NOAA Technical Memorandum NMFS-AFSC-159

Comparison of Size Selectivity Between Marine Mammals and Commercial Fisheries with Recommendations for Restructuring Management Policies

by
M. A. Etnier and C. W. Fowler

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

October 2005

NOAA Technical Memorandum NMFS

The National Marine Fisheries Service's Alaska Fisheries Science Center uses the NOAA Technical Memorandum series to issue informal scientific and technical publications when complete formal review and editorial processing are not appropriate or feasible. Documents within this series reflect sound professional work and may be referenced in the formal scientific and technical literature.

The NMFS-AFSC Technical Memorandum series of the Alaska Fisheries Science Center continues the NMFS-F/NWC series established in 1970 by the Northwest Fisheries Center. The NMFS-NWFSC series is currently used by the Northwest Fisheries Science Center.

This document should be cited as follows:

Etnier, M. A., and C. W. Fowler. 2005. Comparison of size selectivity between marine mammals and commercial fisheries with recommendations for restructuring management policies. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-159, 274 p.

NOAA Technical Memorandum NMFS-AFSC-159

Comparison of Size Selectivity Between Marine Mammals and Commercial Fisheries with Recommendations for Restructuring Management Policies

by
M. A. Etnier and C. W. Fowler

Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA 98115
www.afsc.noaa.gov

U.S. DEPARTMENT OF COMMERCE
Carlos M. Gutierrez, Secretary
National Oceanic and Atmospheric Administration
Vice Admiral Conrad C. Lautenbacher, Jr., U.S. Navy (ret.), Under Secretary and Administrator
National Marine Fisheries Service
William T. Hogarth, Assistant Administrator for Fisheries

October 2005

This document is available to the public through:

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161

www.ntis.gov

ABSTRACT

Conventional fisheries management schemes often maintain harvest practices quite different from those of natural predators, explicitly or implicitly stressing the importance of avoiding strategies similar to those of other species. While this may minimize some of the perceived direct interactions between fisheries and marine mammals, such management often exerts strong abnormal influences, both on the target species and the ecosystems of which they are a part. It is impossible to exhaustively account for the indirect effects of such practices. In contrast, in Systemic Management, it is argued that the patterns of predation exhibited by marine mammals, structured by natural selection over thousands of generations, are evidence of sustainable resource use in the very long term, thus accounting for such complexity. As such, these patterns can be used to guide the ways in which humans extract resources from the environment.

In this study, we compiled prey size data from the food habits literature for 63 marine mammal species as a guide for sustainable harvest practices. Our results show that the overwhelming tendency of marine mammals is to target prey smaller than 30 cm in length. This pattern of selectivity applies regardless of the maximum attainable size of either the predator or the prey species. In contrast, commercial fisheries tend to select individuals larger than 30 cm when possible. Thus, the size selectivity of the commercial catch of small-bodied prey species fits within the norm of the patterns exhibited by marine mammals, but the commercial catch of large-bodied prey species does not. We conclude that, in order to minimize the negative effects of abnormal selective pressures that commercial fisheries exert directly on prey stocks and indirectly on the ecosystems of which they are a part, the targeted size composition of larger prey species should be reduced to more closely mimic the patterns exhibited by marine mammals.

CONTENTS

INTRODUCTION

If we look at managers as those responsible for regulating human impact on other systems (e.g., other species, communities, or ecosystems), one of their challenges is that of finding a way to incorporate all the impacts humans have into the decision-making process. Commercial fisheries have a variety of ecological effects. Commercial fisheries have been known to reduce stock biomasses to fractions of their virgin levels (Myers and Worm 2003), and cause reductions in mean age, age-at-maturity (Jørgensen 1990), and mean and maximum size (Wysokiński 1984). Coincident with these changes, commercial catches shift to lower trophic levels (Pauly et al. 1998a). The cumulative effect is that many of the world's fish stocks are in serious jeopardy (Garcia and Newton 1997, Kock 1985, Pauly et al. 2002, Rosenberg 2003).

Perhaps one of the more serious kinds of ecological effects of commercial fishing is the directional selection and/or genetic change caused by selective harvests—harvest practices which preferentially target a particular demographic of a resource population while preferentially excluding another (Conover 2000, Conover and Munch 2002, Law 2000, Olsen et al. 2004). This is particularly problematic for resource species whose various populations are used as sources of food and fiber for human consumption. Every species (including humans, Orians 1990, NRC 1996) has genetic impacts on the species with which it interacts. These impacts occur through processes lumped under the term "coevolution" (Thompson 1982, Futuyma and Slatkin 1983, Stenseth and Maynard Smith 1984). What is an appropriate or acceptable evolutionary influence on another species and what is excessive? How can managers incorporate knowledge of the genetic effects of our actions in establishing the size of harvests, establish guidelines for selectivity, and account for things like age, size, and sex in the process? How can this be done so that not only the selectivity is accounted for, but so that the indirect effects on other species and ecosystems are also taken into account?

We propose a form of management based on directly relevant, completely consonant guiding information that produces recommendations for changing commercial harvest practices in such a way that long-term sustainability is an option. Because genetic effects are clearly related to selective mortality, it follows that one part of the challenge is that of addressing the issue of selectivity. Selectivity, as such, is also too vague and general to be easily tackled in specific management action, owing to the fact that selectivity can relate to a wide variety of attributes of a species (e.g., sex, age, size, location, growth patterns, and maturation rates). Whatever we do in research to supply management advice, it must involve a measurable aspect of selectivity and it must be a component of fishing practices that can be managed.

In this paper, we address the specific issue of size selectivity as one of many facets of fisheries management that must be dealt with so as to provide quantitative guidance to managers. Commercial fishing, as currently practiced in many of the world's oceans, is not sustainable in the long-term (Fowler 2003). In contrast, predator-prey relationships in marine ecosystems have evolved over thousands of generations and persist over evolutionary time scales. These systems exhibit emergent properties that reflect the effects of a wide range of variables at various spatial and temporal scales. One of the emergent properties is the appropriate, sustainable, or workable size composition for catches of any particular prey species. This is one of the many aspects of harvest practices that must be addressed as part of any form of management intended to apply to the management of our impacts on either individual resource species or ecosystems.

To explore this issue, we examine the size composition, measured as the length of individual prey items (rather than weight or volume, which would also provide valuable information), in the diets of predators that feed on various species of fish, squid, and to a lesser extent, crustaceans. We draw upon information presented in the literature from a variety of studies of food habits for marine mammals. This is done in light of the potential that the patterns of what nonhuman species do, when considered collectively, are evidence of sustainable behaviors following the tenets of management reviewed by Fowler (2003). When viewed in this way, anything that deviates from these normative patterns exerts abnormal effects on the system (as discussed in Fowler 2003, Fowler and Hobbs 2002). Depending on the degree to which the abnormal pattern deviates from the norm, the effects will be more or less problematic.

Within this framework, our objective is to characterize the size composition of prey items within the diets of nonhuman mammalian predators as guidance for fisheries managers. Regarding the science of this paper, our working null hypothesis is that humans are not statistically significantly different from other predatory species in regard to the size composition of their takes (i.e., commercial fishing) in comparison to the size composition of the takes of other predatory species (in parallel with other non-human/human comparisons: Fowler and Hobbs 2003). Thus, we intend to use existing data on the size composition of marine mammal dietary preferences to draw conclusions on what is sustainable to then provide quantitative guidance to fisheries managers. This approach will help to avoid any abnormal effects on any particular resource species or the ecosystems of which both humans as well as the other species are parts.

MATERIALS AND METHODS

The literature regarding the food habits of marine mammals is substantial (see Pauly et al. 1998b), and has increased exponentially over the past two decades (Fig. 1). For the purposes of this study, we restricted our analysis to studies that reported size composition of marine mammal prey based on hard or soft tissues recovered from scats, stomachs, or regurgitations. We have focused on those studies that report prey lengths, rather than weights or volumes, and we have excluded from analysis those food habits studies that quantified only prey species composition (i.e., that lack information on size composition for specific prey species). The information in this report was obtained through examination of peer-reviewed articles, "gray" literature (unpublished progress reports, Ph.D. dissertations, conference proceedings, etc.), and personal communications when data representations necessitated access to the raw data (see below).

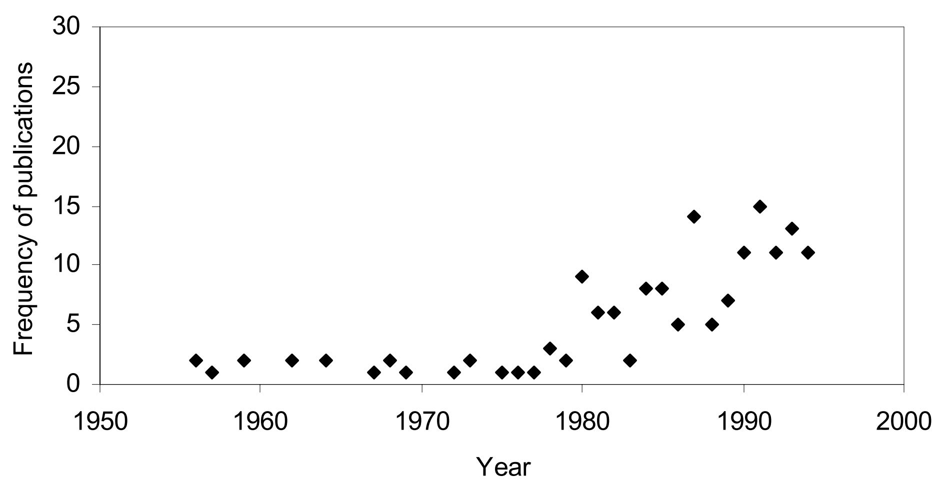

Figure 1.--Number of marine mammal food habits studies published up to 2002, by year (based on citations analyzed in Pauly et al. 1998b).

Caveats

The data analyzed here consist of size estimates of prey items identified primarily to the species level, with a few cases identified to the genus- or family-level. In almost all the cases presented here, prey size (specifically, prey length) has been estimated based on correlations relating body size to the size of those tissue types that preserve well in the digestive systems of marine mammals (e.g., cephalopod beaks, fish otoliths, and bones; Fitch and Brownell 1968). This approach to estimating the size composition of marine mammal diets is known to have several biases (Bigg and Faucett 1985, Dellinger and Trillmich 1988, Pierce and Boyle 1991). Specifically, a host of measures can be under-represented: seasonal variability in the diet, relative importance of small-bodied taxa and small-bodied individuals (Reid and Arnould 1996), relative importance of large-bodied individuals (Kiyota et al. 1999, Gudmundson et al. in press). In addition, body size can be underestimated due to partial or complete digestion of characteristic skeletal elements (Bowen 2000, Tollit et al. 2004a, 2004b; Zeppelin et al. 2004).
Finally, there is some suggestion that estimating body size based on calibration with growth curves (e.g., inverse regression) will systematically bias against values in the tails of the distribution (the so-called "regression towards the mean"; see Konigsberg et al. 1997). Despite the biases inherent in food habits studies, the use of regression to calibrate body size against element size is the standard approach in the literature and provides the basis for the overwhelming majority of the available data.

One of the idealized goals of this research is to characterize marine mammal food habits in the absence of bias due to anthropogenic perturbations to the ecosystem. However, it is almost always the case that food habits studies post-date the development of commercial harvests of the marine mammal species, their prey, or both in any particular ecosystem. Thus, food habits studies based on what marine mammals are eating now may not provide an unbiased view of “normal” behavior of the predators (what they would eat in the absence of abnormal human impacts - a point we will revisit our Discussion section).

Finally, a third bias relates to our goal of providing spatially and temporally relevant comparisons among food habits studies (size composition of prey in the diets of non-human predators), commercial catch data (size composition of harvests), and survey data (size composition of available prey resources). The commercial catch data are typically limited to target species, with size composition of bycatch only rarely reported. An unfortunate parallel is that trawl survey data are also heavily biased towards commercially valuable taxa. Thus, examples that enable comparisons among food habits studies, trawl survey data, and commercial catch data in the same season and area are relatively rare.

Mechanics of Obtaining Data

Prey size data are presented in a variety of formats in the literature we reviewed. Prey size data were occasionally listed in the text or in tabular form. These were transcribed directly. Information on otolith or beak size was used only if the appropriate regression equations were available to allow conversion to prey body size.

Other data were presented in graphic form (e.g., length frequency [LF] distributions, box plots), and presented more of a challenge. In these instances, figures were digitally scanned at a resolution of 300 dpi or higher, then digitized using Didger 3 software. This software allowed us to estimate the plotted values by calibrating the axes directly from the figure. We found that calibration of the vertical axis (e.g., frequency value) is typically more important than calibration of the horizontal axis, since the horizontal axis (e.g., prey size, in size bins ranging from 1 to 10 cm) tends to be spaced at uniform intervals (though this was not always the case).

When using graphic information, the format of the original figure exerts a strong influence on the accuracy with which data can be estimated. For our purposes, the format that resulted in the best estimates was two-dimensional histograms representing individual series of data. Histograms representing multiple series of data in two dimensions were somewhat more difficult, while any representation in three dimensions was extremely difficult or impossible to use. LF distributions represented as curves were arbitrarily estimated at discrete intervals along the curve, with the total values re-scaled such that they summed to 100%.

Body size for crustaceans is listed as total length for shrimp and krill, carapace width for crabs, and carapace length for lobsters. Body size for cephalopods is listed as dorsal mantle length (DML). Conventions on the measure of body size used for fish (e.g., total length, fork length, standard length) tend to be species-specific. As a consequence, we have not consistently used one over the other, but have been consistent within species. Within the text of this document, we use the terms “length” and “prey size” interchangeably, regardless of the taxonomic group.

Summary Statistics for Food Habits Data

If the mean size and size range of prey species were not listed in the text of the food habits study, they were estimated from the LF distributions when available. Means were calculated by weighting each size interval by the appropriate scaling factor (either frequencies or percents). It was not always possible to determine whether midpoints or end-points were used for the size intervals (i.e., the bin size used for bars plotted in LF distributions). Thus, estimates of means calculated this way can be in error by as much as ± 0.5 of the interval of each size class (e.g., Augustyn 1991, Torok 1994). In cases where prey size was presented in both tabular and graphical format, the error rate in estimating the mean from the LF distributions was calculated.

In cases where the range of sizes preyed upon by marine mammals was estimated from the LF distributions, the possibility exists that low values in the tails of the distributions do not appear in graphic representations. Thus, these data represent minimum estimates of the range of prey sizes consumed.

Digitized data were also used to estimate the shape parameters (standard deviation, skew, kurtosis) of the LF distribution. In cases where these statistics were presented in both tabular and graphic form, the accuracy of our estimation from the graphic data was evaluated.

Minimum Sample Size Requirements

Although we chose to extract data in all cases where they represented prey size information, regardless of sample size (see Appendices 1-4), the overall analysis has been arbitrarily limited to those cases where mean prey size was based on samples of 10 or more individuals of any given prey taxon. In cases where we evaluate the central tendency of the distribution of mean prey sizes, all cases have been weighted equally. That is, we calculate the unweighted mean of means.

The exclusion of cases with sample sizes less than 10 from the overall analysis may inadvertently bias against large-bodied prey items simply because fewer large-bodied prey items may be consumed in a foraging trip. To test the hypothesis that our minimum sample size requirement biases against large-bodied prey items, the LF distribution of single prey items was generated by combining data for sample sizes of one, two (if the size range was reported), or three (if the mean and range was reported).

Comparison with Commercial Data

As stated in the Introduction, the objective of the study is to characterize the patterns of prey size selectivity among marine mammals as a guide to what is sustainable over the long term. The claim that commercial fishing practices need to change to match the behavioral patterns of marine mammals first requires a demonstration that there are substantive differences between the two (see Fowler et al. 1999, Livingston 1993 regarding comparisons of total removals).

Toward this end, data describing the size composition of commercial catches were compiled for comparison with the marine mammal food habits data to test the null hypothesis of no difference. This is not as straightforward as it might at first seem. An obvious first step is to eliminate from consideration all those taxa that are not commercially important[1]. Once this is done, however, careful attention must still be paid to obtaining commercial data that are comparable both spatially and temporally. Because many of the world's fisheries actively attempt to minimize the degree of spatial overlap with marine mammals (Kaschner and Pauly 2004), this is typically only feasible at a regional level.

It is particularly difficult to obtain comparable data for prey taxa with highly variable year-class strength because a strong year class will "pulse" through the system for several subsequent years (cf. Castonguay and Mercille 1988, Livingston 1993, Overholtz and Waring 1991, Reid et al. 1996). This will also vary in importance as a function of the periodicity of reproductive cycles. Annual breeders with a very highly constrained breeding period will have

[1] This excludes, almost entirely, bycatch of non-target species.

much more distinctive peaks pulsing through the LF distribution than taxa that have either a much shorter periodicity or a highly protracted breeding period. Prey taxa with short life cycles, like shrimp, squid, and some fish, provide serious complications to the standard approach of using age frequency or LF data to describe/monitor the population being exploited (Pauly 1985). This is because the annual (or seasonal) contribution of recruitment to the overall catch can be substantial. For seasonally/spatially/annually variable LF data, frequencies for each sampling period were first estimated (if possible), and then an overall average frequency calculated for each size interval.

Comparison with Survey Data

In addition to an interest in comparing the size composition of marine mammal prey with that of the commercial fishing industry, it is also important to compare both of these with what is available. This requires having survey data estimating age/size structure of stocks being exploited. Such data provide a means to evaluate the degree to which both marine mammals and commercial fisheries are selective in the size of prey they target, and then to compare this selectivity. Marine mammals have been characterized as "opportunistic" foragers based on comparisons of the prey species in their diets with those found where they forage (Kajimura 1985), suggesting that they might simply consume any prey item that they encounter. However, several studies suggest that the decision-making process is much more elaborate (Sinclair et al. 1994, Croxall and Pilcher 1984, Reid et al. 1996). Thus, survey data provide an index of what marine mammals (as well as the commercial fisheries) are taking relative to what is available and whether it relates to the choice of species consumed or to the size of prey items chosen.

As with the commercial catch data, survey data tend to be fairly limited in scope (either temporally or spatially) relative to the foraging behavior of marine mammals. In an attempt to maximize the comparability of the data, survey data were used in this study only if they corresponded to prey species from the same region and time span as the corresponding food habits study. Ideally, stock structure data derive from fisheries-independent surveys. However, stock structure data are occasionally inferred from analysis of commercial catch data. In no cases were acoustic survey data used for comparison with either the commercial catch data or the food habits data.

Maximum Reported Prey Size

Another metric of interest to this study is the relationship between the targeted size and the maximum reported size of each prey species. For smaller-bodied prey species such as krill (*Euphausia* spp.), we might expect targeting of similar size classes by marine mammals and commercial fisheries alike. In contrast, specific size classes of prey species with larger overall body size such as Atlantic cod (*Gadus morhua*) may be differentially selected by either marine mammals or commercial fisheries. In most cases, maximum reported size was obtained from on-line searchable databases hosted by FishBase (Froese and Pauly 2003) and CephBase (Wood and Day 1998). In cases where the maximum reported size was either not listed in the databases, or was smaller than the maximum reported size from the food habits study, the upper end of the size range listed in the food habits studies was used[2].

[2] Because the size estimates from the food habits literature are typically based on regressions, it may be the case that estimated maximum sizes fail to account for lack-of-fit for extreme values in the growth curves.

Predator Size

Finally, we are also interested in testing the hypothesis that there is a relationship between prey size targeted by marine mammals and the body size of the predator. Information relating gape size of the predators to body size of the prey may provide a more appropriate comparison (Nilsson and Brönmark 2000, Scharf et al. 2000), but those data are not readily available for all marine mammal taxa. Unless otherwise provided in the text of the relevant food habits study, predator size was obtained through internet sources such as the University of Michigan's "Animal Diversity Web" (University of Michigan 1995) for the age and/or size classes of marine mammals included in the study (if known).

Number of Non-overlapping Taxa

In this report, we frequently use the terms "species" and "taxon" in ways that may seem synonymous. The two are not, however, strictly interchangeable. Whereas "species" refers to only one level of taxonomic specificity, "taxon" (or its plural, taxa) can include multiple taxonomic levels simultaneously. With particular reference to this report, identifications of predators and prey vary in taxonomic specificity from sub-species to family.

Counts of how many predators and prey are represented in this study are based on numbers of non-overlapping taxa. To illustrate, a listing of *Enoploteuthis anaspis* and *Enoploteuthis* sp. is tallied as one taxon because of the possibility that the two are not mutually exclusive. In contrast, Gobiidae is listed as a prey item for *Phocoena phocoena* (Appendix 2), possibly representing multiple species. But because it is the only prey entry from that family, it was counted as a single taxon. In speciose genera like *Sebastes* spp., genus-level identifications `were counted multiple times only if they derived from different ocean basins (e.g., Northwest Atlantic versus Northeast Pacific).

Using this protocol, we report the number of non-overlapping taxa of predators for which we have prey size data (regardless of sample size) and the distribution of prey size means (for sample sizes ≥ 10). We also report the total number of prey taxa for which we have size information deriving from marine mammal food habits studies. Taxonomy for marine mammals follows Rice (1998); taxonomy for crustaceans follows the European Register of Marine Species (Costello and Emblow 2004); taxonomy for cephalopods follows Wood and Day (1998); taxonomy for fish follows Froese and Pauly (2003).

RESULTS: PATTERNS OF MARINE MAMMAL FOOD HABITS

Our search of peer-reviewed articles and "gray" literature yielded 135 citations that specified prey size for 63 marine mammal taxa, resulting in 1,166 prey entries (Appendices 1-4). The breakdown, by predator type, is: 13 species of otariid seals, 15 species of phocid seals, 4 taxa of mysticete whales, and 31 species of odontocete whales. From these citations, estimated prey size was obtained for: 17 species of crustaceans, (representing 12 families), 140 taxa of cephalopods (representing 28 families), and 223 taxa of fish (representing 71 families).

This is decidedly ***not*** an exhaustive survey of the literature. Nevertheless, we feel confident that the large number of cases for which we have data ensure that the overall patterns are well documented in this report (with the exception, perhaps, of the part represented by mysticete whales).

Accuracy of Estimating Values from Figures

As discussed above, prey size data for marine mammals are often presented graphically, in a variety of different formats. The accuracy with which figures can be used to provide the data needed for our study is a function of sample size, resolution, and format of the original figure. Sample size dictates the minimum detectable difference between integer values on the histograms. For small ($n \leq 200$) samples, the difference between one and two individuals (or 33 versus 34) is easily detectable, with summed totals usually accurate to within ± 1%. Larger samples ($n > 200$) yield variable results, depending on the quality of the original image and the accuracy of the data/figure.

Other problems encountered include unlisted sample sizes or unlabeled vertical axes. In these cases, it was still possible to estimate the shape of the distribution accurately (e.g., the relative contribution of each size bin), rescaling the values such that the total summed to 100%. In cases where the estimated values were in error by ≥ 1%, the whole data series was rescaled to 100%. For instance, if the initial estimate of the summed total of the digitized LF distribution was 93%, each histogram bin was rescaled by dividing by 0.93. This is a systematic rescaling across all size bins; it cannot correct for random errors within a given size interval. Rather, random errors were detectable only through visual comparison of the estimated distribution and the original published distribution.

Unless otherwise listed in the text of the original article, summary statistics (mean prey size, variance, skew, and kurtosis) were estimated from digitized LF distributions. The accuracy with which we could estimate mean prey size was quite high. Of the 121 cases where mean prey size was reported along with the LF distribution, our estimate of the mean was within ± 2 % of the reported mean 85% of the time (Fig. 2). In practical terms, this translates to 83% of the cases being estimated to within ± 0.50 cm (Fig. 3).

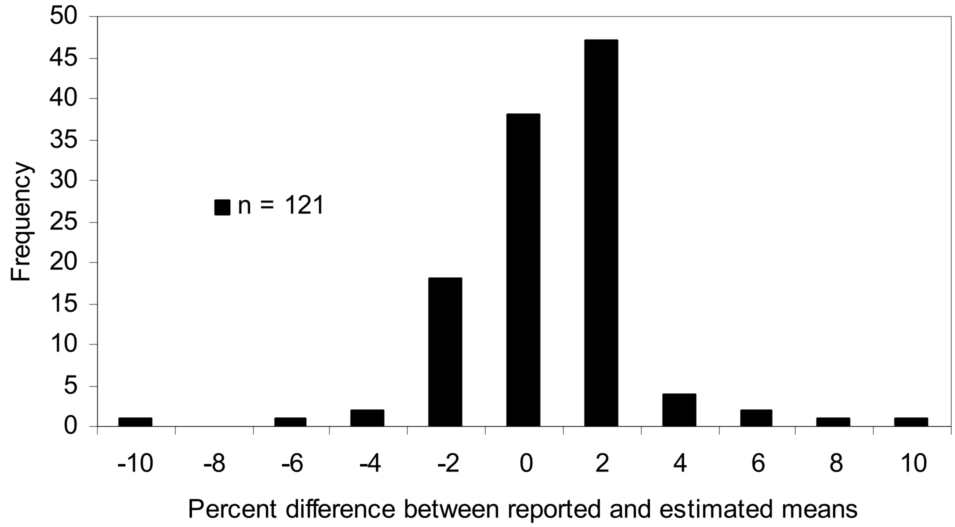

Figure 2.--Distribution of errors in estimated mean prey size from LF distributions, as the percent difference between the reported and the estimated values.

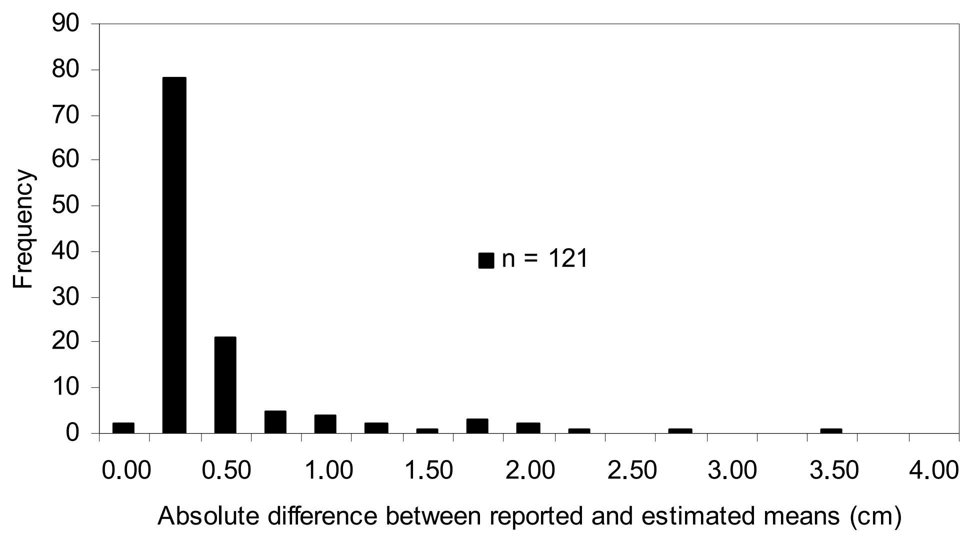

Figure 3.--Distribution of errors in estimated mean prey size determined from graphic LF distributions, as the absolute difference between the reported and estimated values.

Our estimates of the variance of the LF distributions (typically reported as standard deviation, but occasionally reported as standard error) suffered a reduction in accuracy relative to the estimates of the mean. The bulk (81%) of estimated variances fell within ± 10% of reported values (Fig. 4). It is likely that this loss of accuracy is an artifact of the calculation for variance, often referred to as the second moment of the mean, because it involves summing the squared differences between observations and the (estimate of the) mean. Thus, any inaccuracies in estimating the mean will be amplified in calculations of the variance.

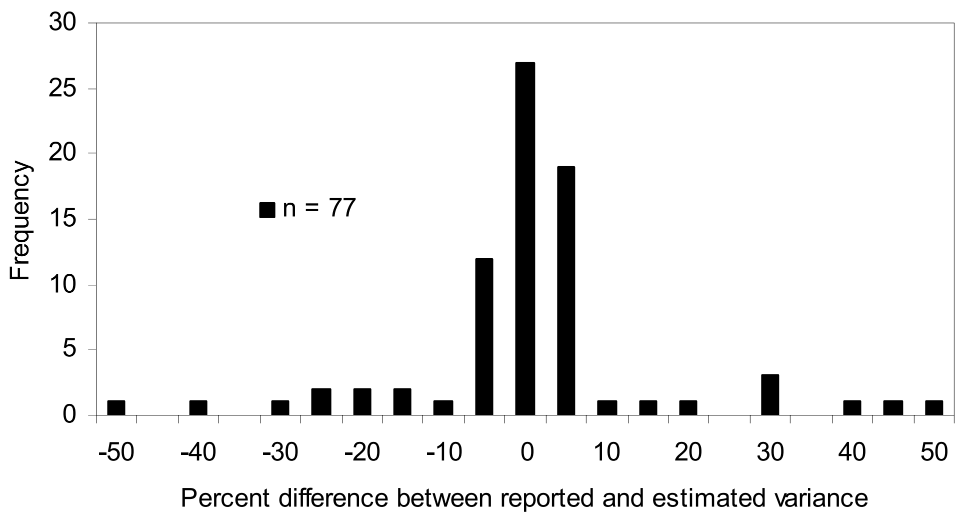

Figure 4.--Distribution of errors in estimated variance from LF distributions, as the percent difference between the reported and estimated values.

With specific reference to the analysis presented here, two biases in reporting must be considered. The first is that prey size information is typically presented in terms of mean prey size. Less commonly, the range of size classes is presented or, less common still, the estimated size frequency distribution of the prey is presented in tabular or graphical form. In most cases where the size frequency distribution of the prey is presented, the distributions are decidedly asymmetric. Specifically, they are typically positively skewed, in which case mean prey size is higher than the modal, or most commonly encountered, prey size.

In a series of 242 LF distributions, relatively few (22%) were significantly different from a normal distribution (Kolmogorov-Smirnov [K-S] test, P-values ≥ 0.050; Fig. 5). However, 33% of the 242 distributions had skew values of 1.0 or higher, indicating that the mean is higher than the mode (Fig. 6).

The tendency toward asymmetry in the LF distributions from food habits studies is perhaps more intuitively shown in the relationship between the mean and the midpoint of the size range for 504 sets of prey data. When the mean is subtracted from the midpoint of the range, the mean is within ± 2 cm of the midpoint of the range in 70% of the cases (Fig. 7). The mean is 2 cm or more lower than the midpoint (resulting in a positive difference, indicative of positive skew) in 23% of the cases. It is 2 cm or greater than the midpoint (indicative of negative skew) in only 7% of the cases. There is an overall mean difference between the midpoint of the size ranges and their means of 1.21 cm. There is a clear but non-uniform tendency toward a positive skew.

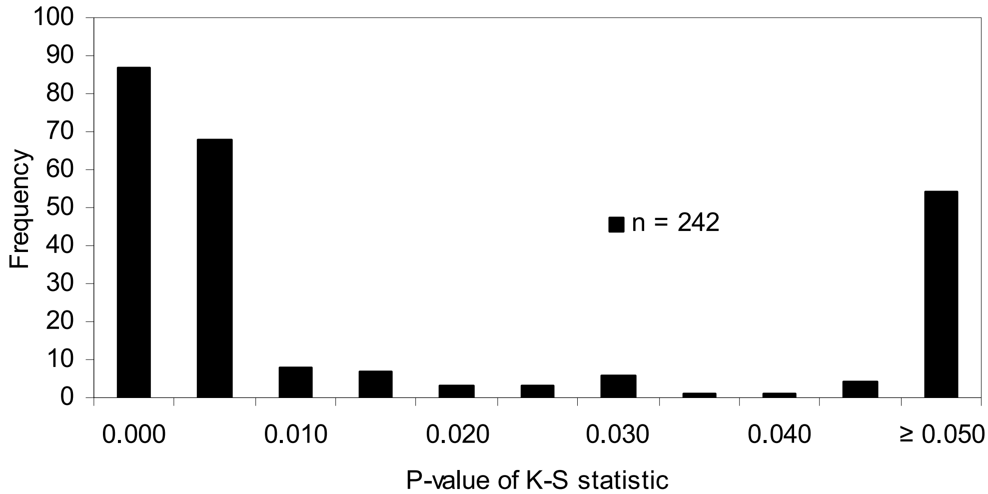

Figure 5.--Distribution of P-values for K-S statistic in 242 LF distributions for prey taxa in marine mammal food habits data, tested against a normal distribution.

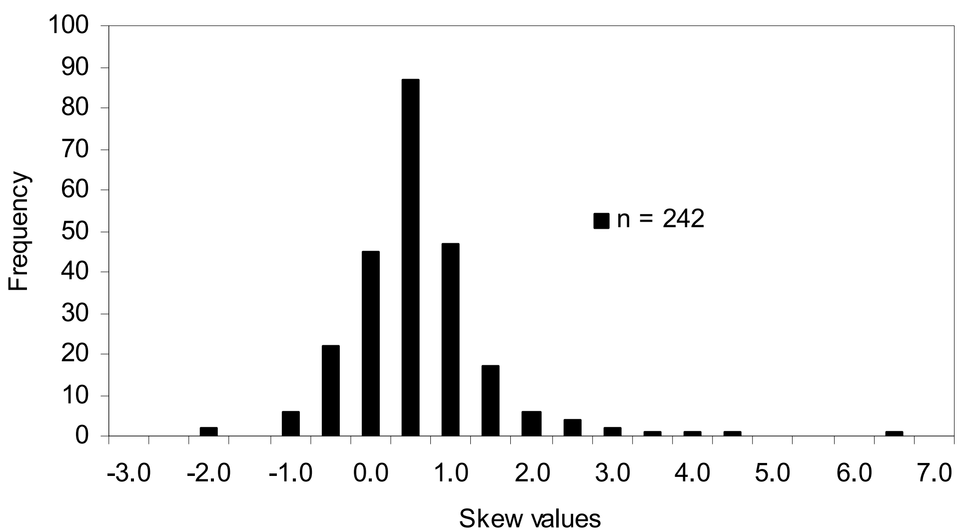

Figure 6.--Distribution of skew values for 242 LF distributions (same sample as represented in Fig. 5).

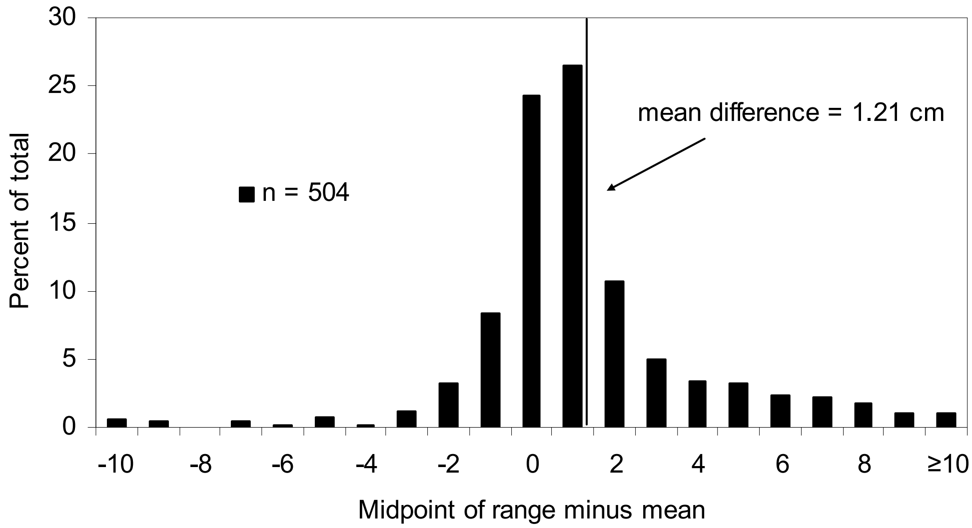

Figure 7.--Distribution of absolute differences between midpoint of range of values and the mean for 504 prey size distributions.

In a few cases in the food habits literature, the authors document the shape of the distribution; in even fewer cases, median or modal sizes are used (Fea et al. 1999); and in even fewer cases still, the distributions are tested for normality (e.g., using a K-S statistic; e.g., Börjesson et al. 2003, McGarvey and Fowler 2002, Poulson et al. 2000). It is important to note that some LF distributions are distinctly bimodal, in which case the mean value may not be represented by a single individual.

Size Composition of Prey Consumed, Sorted by Predator Species

As stated above, we have compiled prey size data for 63 marine mammal taxa (Appendix 1, 2). However, many of the prey size data were based on sample sizes of less than 10 individuals of a particular prey taxon and will not be included in the main analysis. Likewise, even with sample sizes of ≥ 10, many of the entries do not have mean prey size listed. For instance, of the 63 marine mammal taxa for which we have prey size data, seven of them lack data on mean prey size and/or the mean was based on a sample size of less than 10 prey items (Fig. 8). At the other end of the spectrum, 20 marine mammal taxa have 10 or more entries of mean prey size, each of which was based on a sample size of ≥ 10 (Fig. 8; Appendix 1, 2). It is to the specifics of those 20 marine mammal taxa that we will now turn.

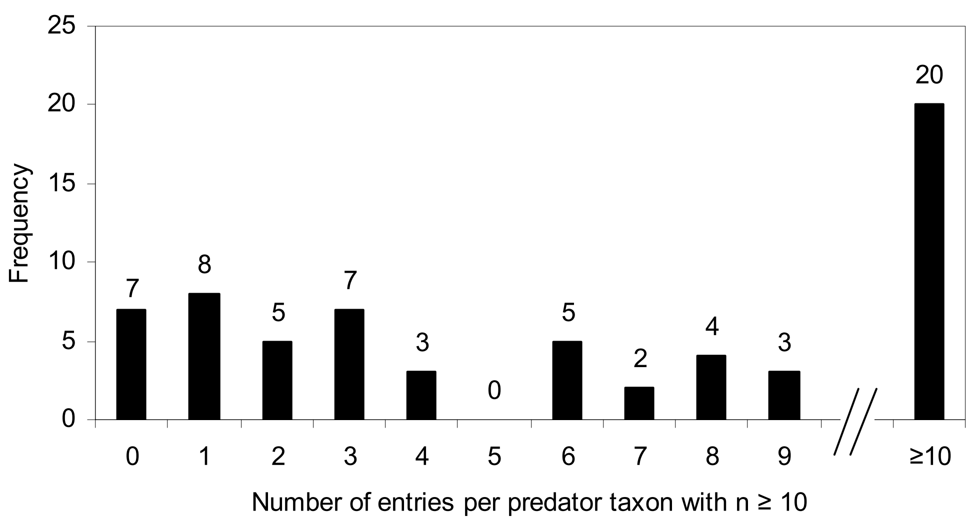

Figure 8.--Frequency distribution of the number of sets of data for prey from studies of marine mammal predator taxa where mean prey size data are available with sample sizes of 10 or more prey items. Note that seven predator taxa had prey size data available, but did not list mean prey size and/or the mean was based on a sample size of less than 10.

For each of those 20 marine mammal taxa, we provide information on the number of taxa of different prey types (i.e., crustaceans, cephalopods, fish) identified in the literature, and the nature of the samples from which the food habits data derive. We also report the number of prey entries (n) that meet our sample size requirements and for which mean prey size is reported or could be estimated graphically. Finally, we also present the LF distribution of prey means and report the overall mean of means ($\bar{x}$) for those prey entries. All of these data except the type of samples utilized (scats versus stomach samples, etc.) are also provided in raw form in Appendix 1.

Otariid Seals

Otariidae: *Arctocephalus gazella*, Antarctic fur seal; n = 99, $\bar{x}$ = 12.33 cm

Prey size information for the Antarctic fur seal was recorded for one crustacean species, 11 cephalopod species, and 35 fish species, based on the citations listed in Table 1. There are 99 entries of mean prey size for *A. gazella* that meet our minimum sample size requirement, with an overall mean of means of 12.33 cm. The modal mean prey size for *A. gazella* is 5-10 cm, with a positively skewed distribution (Fig. 9).

Table 1.--Sources of prey size data for *Arctocephalus gazella*. Cells with "n.a." indicate cases where the sample type is known but the sample size was not reported.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Casaux et al. 1998	51				non-breeding males
Cherel et al. 1997	22				
Croxall and Pilcher 1984		24			
Croxall et al. 1999	n.a.			n.a.	
Daneri 1996	34				
Daneri and Carlini 1999	70				
Daneri and Coria 1993	105				
Daneri et al. 1999	412				
Doidge and Croxall 1985		238			adult females

dos Santos and Haimovici 2001		1			
Goldsworthy et al. 1997	138*				
Green et al. 1989	563				
Green et al. 1997	560				mostly males
Kirkman et al. 2000	123		90		
Klages and Bester 1998	224				
Klages et al. 1999	93				breeding females, some juvenile males
Lea et al. 2002	131				
McCafferty et al. 1998	436				
North 1996	55				
Reid 1995	≥ 376				adult, sub-adult males
Reid and Arnould 1996	497				
Reid and Brierly 2001	n.a.				
Reid et al. 1996				16	adult females (lactating)

*138 scat from an unspecified mix of *A. tropicalis* and *A. gazella*

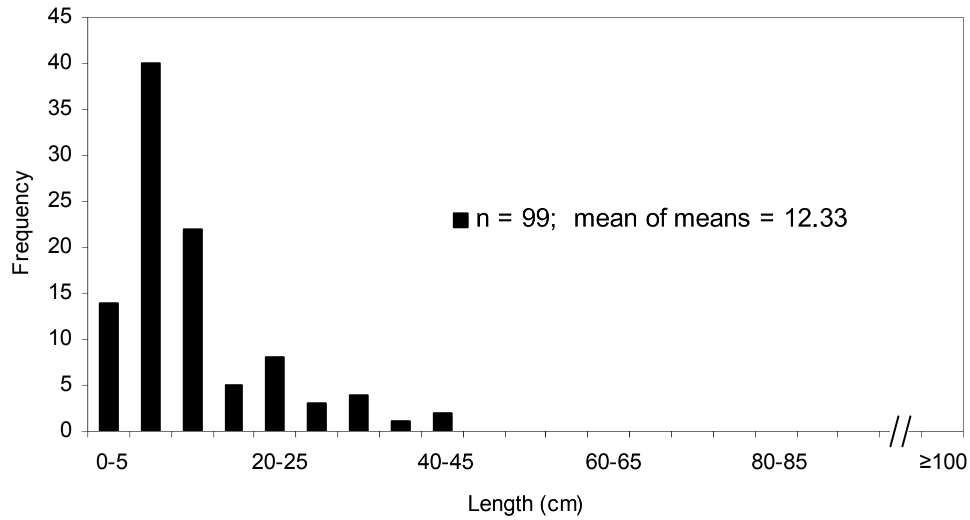

Figure 9.--Frequency distribution of mean prey size for taxa eaten by *Arctocephalus gazella*.

Otariidae: *Arctocephalus pusillus doriferus*, Australian fur seal; n = 11, $\bar{x}$ = 19.97 cm

Prey size information for the Australian fur seal was recorded for nine cephalopod species and five fish species, based on the two citations listed in Table 2. Note that these two publications are based on the same samples, but represent different analyses (cephalopods in one, fish in the other). Eleven entries of mean prey size for *A. p. doriferus* met our minimum sample size requirement, with an overall mean of means of 19.97 cm. The modal mean prey size for *A. p. doriferus* is 15-20 cm, and the distribution is approximately normal (Fig. 10).

Table 2.--Sources of prey size data for *Arctocephalus pusillus doriferus*

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Gales et al. 1993	317	15	40		
Gales and Pemberton 1994	317		40		

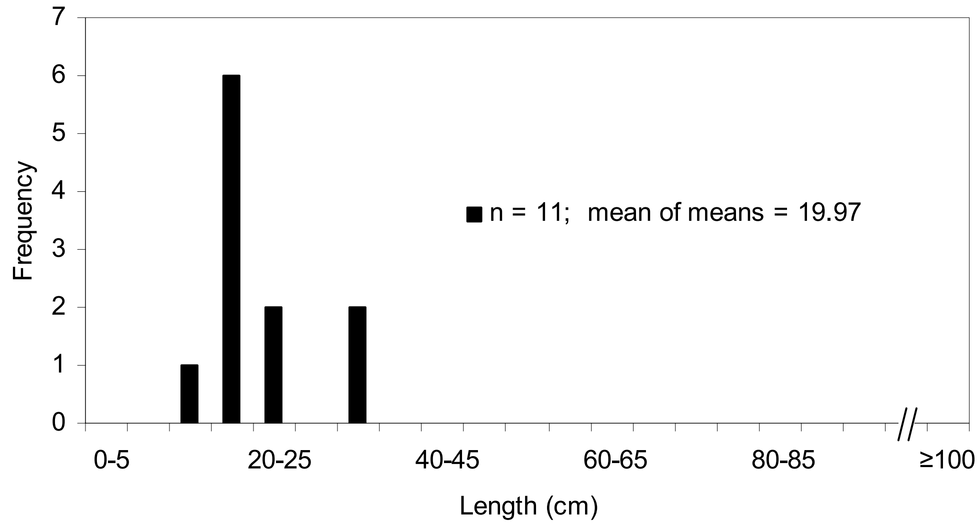

Figure 10.--Frequency distribution of mean prey size for taxa eaten by *Arctocephalus pusillus doriferus*.

Otariidae: *Arctocephalus pusillus pusillus*, South African fur seal; n = 49, $\bar{x}$ = 17.98 cm

Prey size information for the South African fur seal was recorded for one species of crustacean, 5 cephalopod species, and 23 taxa of fish, based on the three citations listed in Table 3. There are 49 entries of mean prey size for *A. p. pusillus* that meet our minimum sample size requirement, with an overall mean of means of 17.98 cm. The modal mean prey size for *A. p. pusillus* is 10-20 cm, with a positively skewed distribution (Fig. 11).

Table 3.--Sources of prey size data for *Arctocephalus pusillus pusillus*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Castley et al. 1991		49			
David 1987		997			
Lipinski and David 1990		2,195			1,522 adults; 673 pups

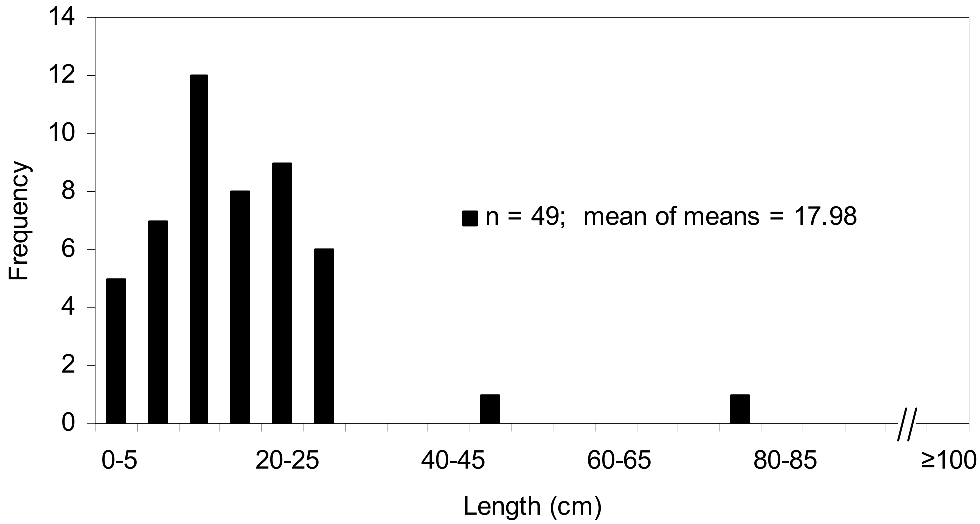

Figure 11.--Frequency distribution of mean prey size for taxa eaten by *Arctocephalus pusillus pusillus*.

Otariidae: *Arctocephalus tropicalis* sub-Antarctic fur seal; n = 12, $\bar{x}$ = 9.47 cm

Prey size information for the sub-Antarctic fur seal was recorded for two cephalopod species and nine species of fish based on the four citations listed in Table 4. Twelve entries of mean prey size for *A. tropicalis* met our minimum sample size requirement, with an overall mean of means of 9.47 cm. The modal mean prey size for *A. tropicalis* is 5-10 cm, and approximates a normal distribution (Fig. 12).

Table 4.--Sources of prey size data for *Arctocephalus tropicalis*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Bester and Laycock 1985		220			
dos Santos and Haimovici 2001		8			
Goldsworthy et al. 1997	<138*				
Klages and Bester 1998	245				

*138 scat from an unspecified mix of *A. tropicalis* and *A. gazella*

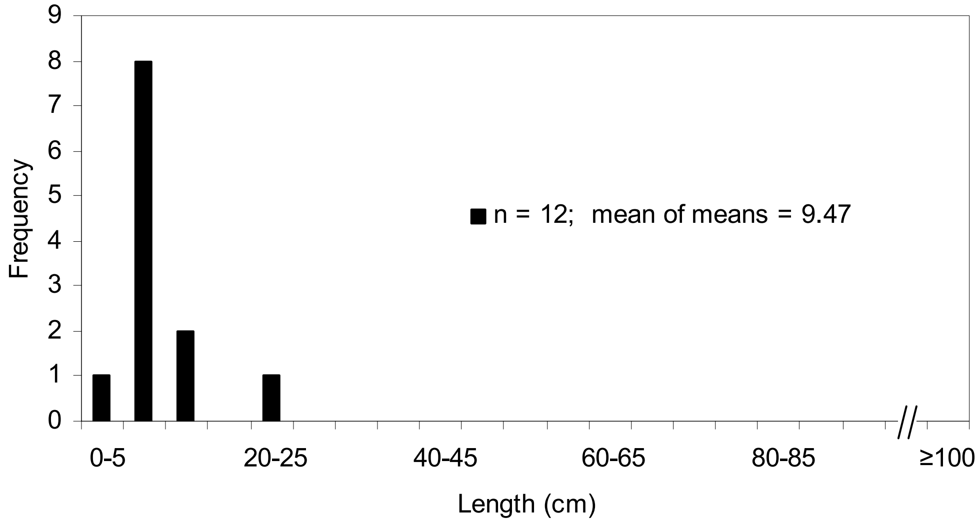

Figure 12.--Frequency distribution of mean prey size for taxa eaten by *Arctocephalus tropicalis*.

Otariidae: *Callorhinus ursinus*, northern fur seal; n = 18, $\bar{x}$ = 12.90 cm

Prey size information for the northern fur seal was recorded for seven taxa of cephalopods and one species of fish based on the citations listed in Table 5. Eighteen entries of mean prey size for *C. ursinus* met our minimum sample size requirement, with an overall mean of means of 12.90 cm. The modal mean prey size for *C. ursinus* is 5-10 cm, with a positively skewed distribution (Fig. 13).

Table 5.--Sources of prey size data for *Callorhinus ursinus*. Cells with "n.a." indicate cases where the sample type is known but the sample size was not reported.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Kiyota et al. 1999	107		6		
Lowry et al. 1989		n.a.[a]			
McAlister et al. 1976		n.a.[b]			
Mori et al. 2001		89			
Sinclair et al. 1994		73			61 adult F; 12 juvenile M

[a] Lowry et al. 1989 cite T. R. Loughlin, pers. com., as the source of data.

[b] McAlister et al. 1976 obtained their sample during one year of the pelagic sampling program of the National Marine Fisheries Service, which took over 16,000 females between 1956 and 1974.

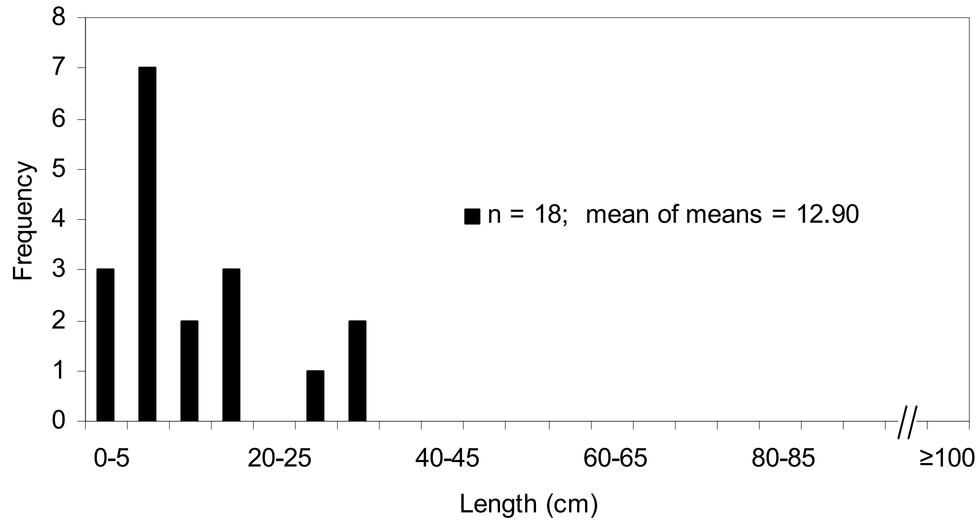

Figure 13.--Frequency distribution of mean prey size for taxa eaten by *Callorhinus ursinus*.

Otariidae: *Zalophus californianus*, California sea lion; n = 12, $\bar{x}$ = 14.27 cm

Prey size information for California sea lions was recorded for one cephalopod species and four species of fish based on the citations listed in Table 6. Twelve entries of mean prey size for *Z. californianus* met our minimum sample size requirement, with an overall mean of means of 14.27 cm. The modal mean prey size for *Z. californianus* is 10-15 cm, with a slightly positively skewed distribution (Fig. 14).

Table 6.--Sources of prey size data for *Zalophus californianus*. Cells with "n.a." indicate cases where the sample type is known but the sample size was not reported.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Antonelis et al. 1984	224				
Bailey and Ainley 1982	n.a.		n.a.		
Lowry and Caretta 1999	6930		187		
Melin 2002	120				
Morejohn et al. 1978		34	n.a.		

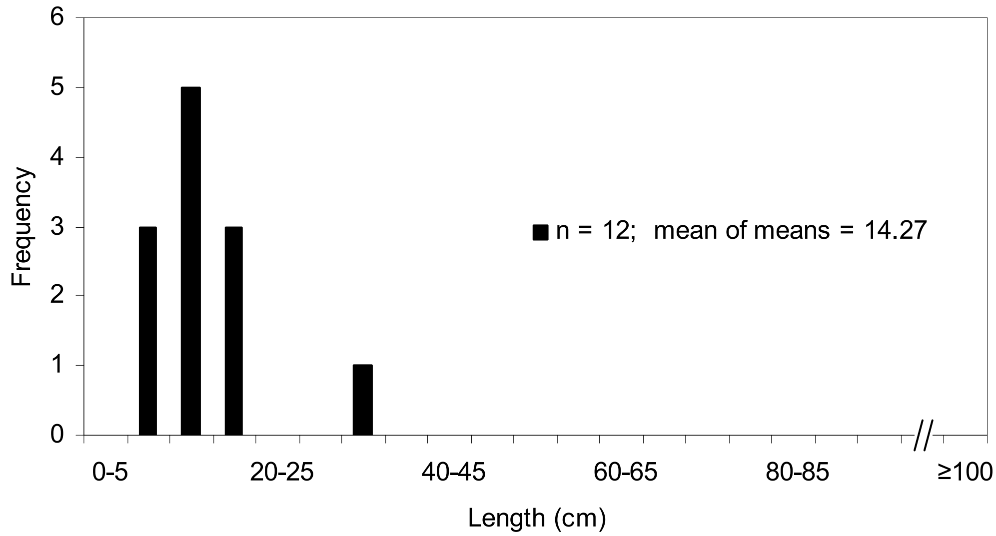

Figure 14.--Frequency distribution of mean prey size for taxa eaten by *Zalophus californianus*.

Phocid Seals

Phocidae: *Halichoerus grypus*, gray seal; n = 52, $\bar{x}$ = 24.64 cm

Prey size information for gray seals was recorded for one cephalopod species and 18 species of fish based on the citations listed in Table 7. There are 52 entries of mean prey size for *H. grypus* that meet our minimum sample size requirement, with an overall mean of means of 24.64 cm. The modal mean prey size for *H. grypus* is 15-30 cm, with a slightly positively skewed distribution (Fig. 15).

Table 7.--Sources of prey size data for *Halichoerus grypus*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Benoit and Bowen 1990		295*			
Bowen and Harrison 1994	393				
Bowen et al. 1993		528			
Hammond et al. 1994a	993				
Hammond et al. 1994b	749				
Hauksson and Bogason 1997		1,059			
Murie and Lavigne 1992		82			
Prime and Hammond 1990	481				

*count includes only food-containing stomachs

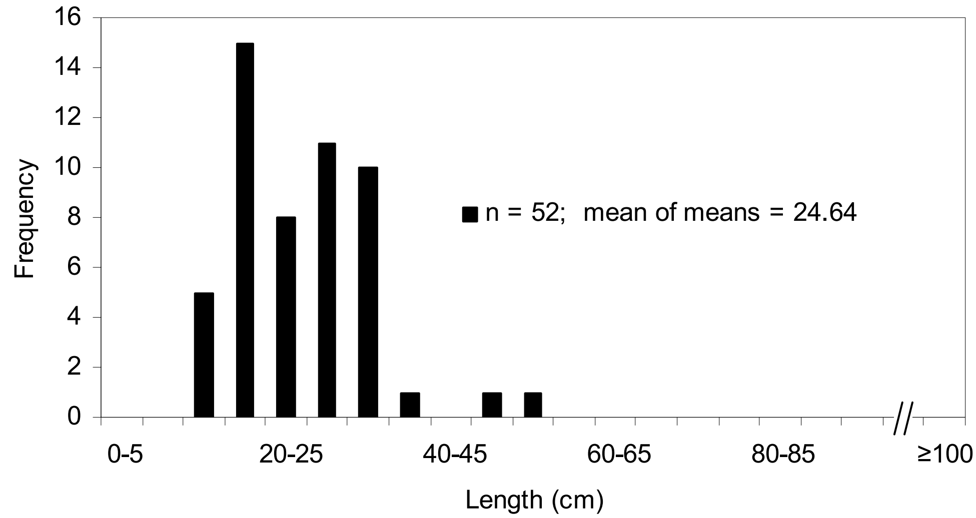

Figure 15.--Frequency distribution of mean prey size for taxa eaten by *Halichoerus grypus*.

Phocidae: *Mirounga leonina*, southern elephant seal; n = 12, $\bar{x}$ = 14.72 cm

Prey size information for southern elephant seals was recorded for nine cephalopod species and one species of fish based on the three citations listed in Table 8. Twelve entries of mean prey size for *M. leonina* met our minimum sample size requirement, with an overall mean of means of 14.72 cm. The modal mean prey size for *M. leonina* is 15-20 cm, with a distribution that is approximately normal (Fig. 16).

Table 8.--Sources of prey size data for *Mirounga leonina*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Daneri and Carlini 2002				153	
Daneri et al. 2000				25	
Rodhouse et al. 1992				51	

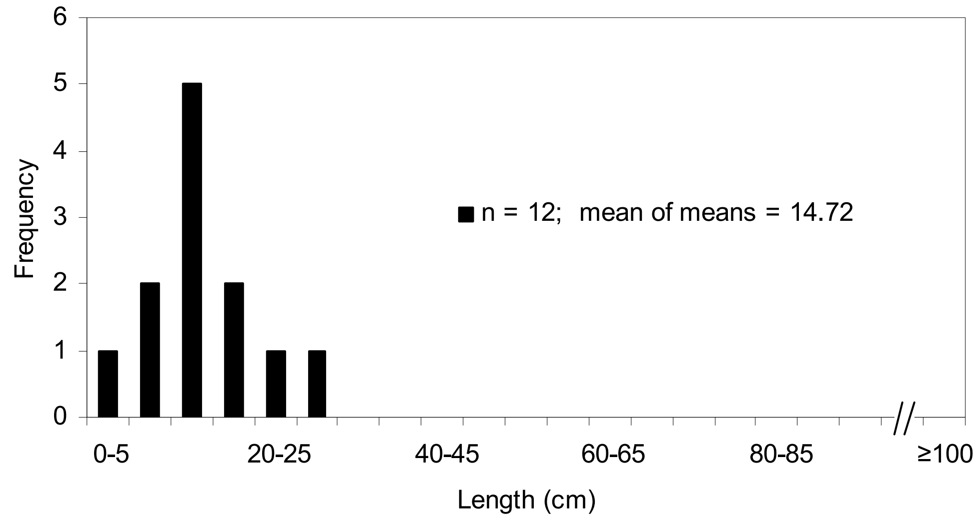

Figure 16.--Frequency distribution of mean prey size for taxa eaten by *Mirounga leonina*.

Phocidae: *Phoca groenlandica*, harp seal; n = 11, $\bar{x}$ = 20.31 cm

Prey size information for harp seals was recorded for seven species of fish based on the citations listed in Table 9. Eleven entries of mean prey size for *P. groenlandica* met our minimum sample size requirement, with an overall mean of means of 20.31 cm. The modal mean prey size for *P. groenlandica* is 15-20 cm, with a slightly positively skewed distribution (Fig. 17).

Table 9.--Sources of prey size data for *Phoca groenlandica*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Beck et al. 1993		247			
Finley et al. 1990		157			
Hauksson and Bogason 1997		1,059			pups and 1-year olds
Murie and Lavigne 1991		25			
Nilssen et al. 1990		59			

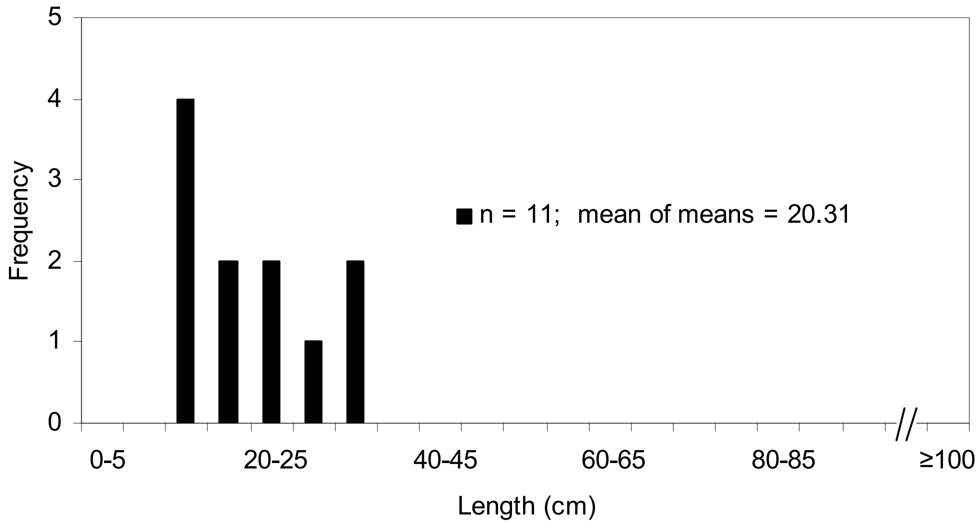

Figure 17.--Frequency distribution of mean prey size for taxa eaten by *Phoca groenlandica*.

Phocidae: *Phoca vitulina*, harbor seal; n = 33, $\bar{x}$ = 15.45 cm

Prey size information for harbor seals was recorded for one cephalopod species and 23 species of fish based on the seven citations listed in Table 10. There are 33 entries of mean prey size for *P. vitulina* that meet our minimum sample size requirement, with an overall mean of means of 15.45 cm. The modal mean prey size for *P. vitulina* is 5-20 cm, with a slightly positively skewed distribution (Fig. 18).

Table 10.--Sources of prey size data for *Phoca vitulina*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Behrends 1982		185			
Bowen and Harrison 1996		338			pups, yearlings, and >1 year old
Brown and Mate 1983	150				
Frost and Lowry 1986		5			
Harvey et al. 1995	30				
Pitcher 1981		548			
Torok 1994	215				

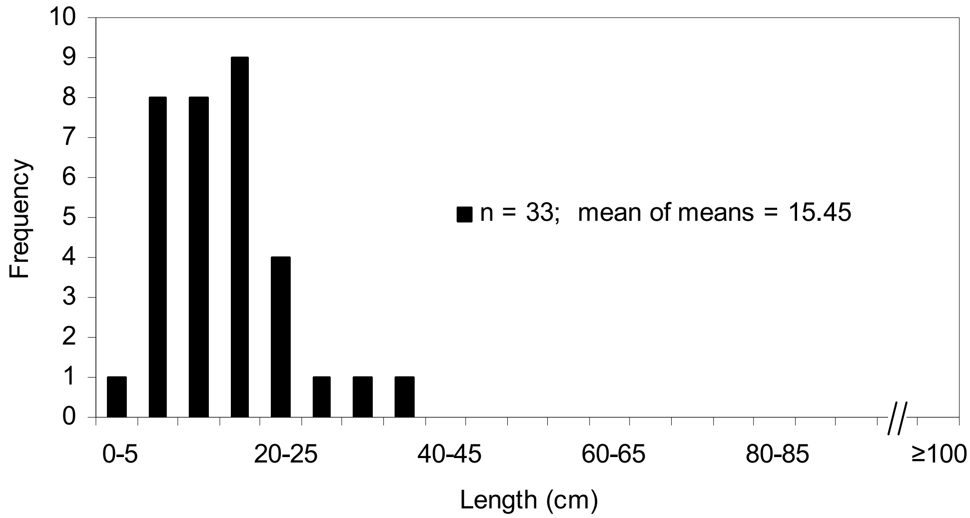

Figure 18.--Frequency distribution of mean prey size for taxa eaten by *Phoca vitulina*.

Odontocete Whales

Delphinidae: *Globicephala melas* = *G. melaena*, long-finned pilot whale; n = 10, $\bar{x}$ = 16.43 cm

Prey size information for long-finned pilot whales was recorded for seven cephalopod species and one species of fish based on the citations listed in Table 11. Ten entries of mean prey size for *G. melas* met our minimum sample size requirement, with an overall mean of means of 16.43 cm. The modal mean prey size for *G. melas* is 15-20 cm, with a slightly positively skewed distribution (Fig. 19).

Table 11.--Sources of prey size data for *Globicephala melas*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Clarke and Goodall 1994		4			1 M; 3 F
Desportes and Mouritsen 1988		720			
dos Santos and Haimovici 2001		5			
Gannon et al. 1997a		30			
Gannon et al. 1997b		8			4 M; 4 F calf to mature

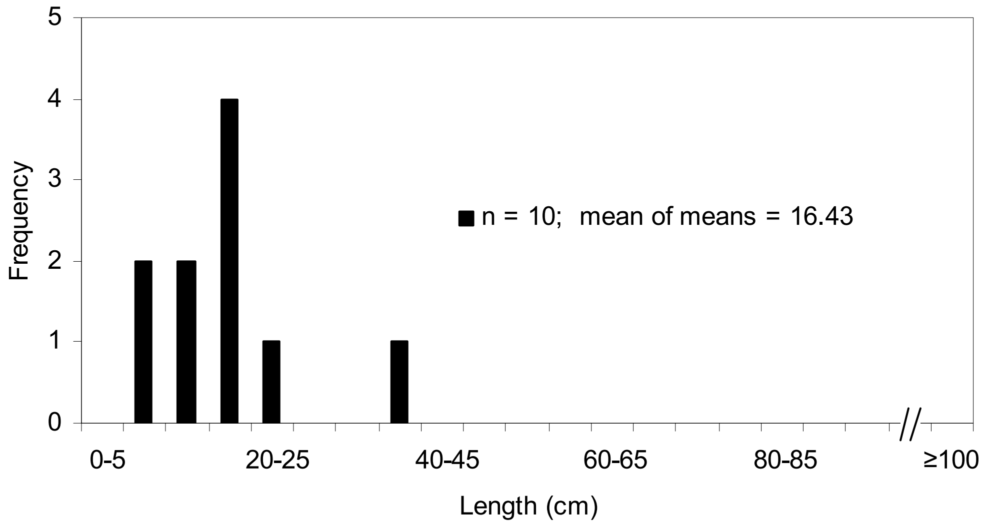

Figure 19.--Frequency distribution of mean prey size for taxa eaten by *Globicephala melas*.

Delphinidae: *Grampus griseus*, Risso's dolphin; n = 15, $\bar{x}$ = 12.08 cm

Prey size information for Risso's dolphins was recorded for 14 cephalopod species based on the two citations listed in Table 12. Fifteen entries of mean prey size for *G. griseus* met our minimum sample size requirement, with an overall mean of means of 12.08 cm. The modal mean prey size for *G. griseus* is 5-10 cm, with a slightly positively skewed distribution (Fig. 20).

Table 12.--Sources of prey size data for *Grampus griseus*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Clarke and Young 1998		1			
Sekiguchi et al. 1992		18			

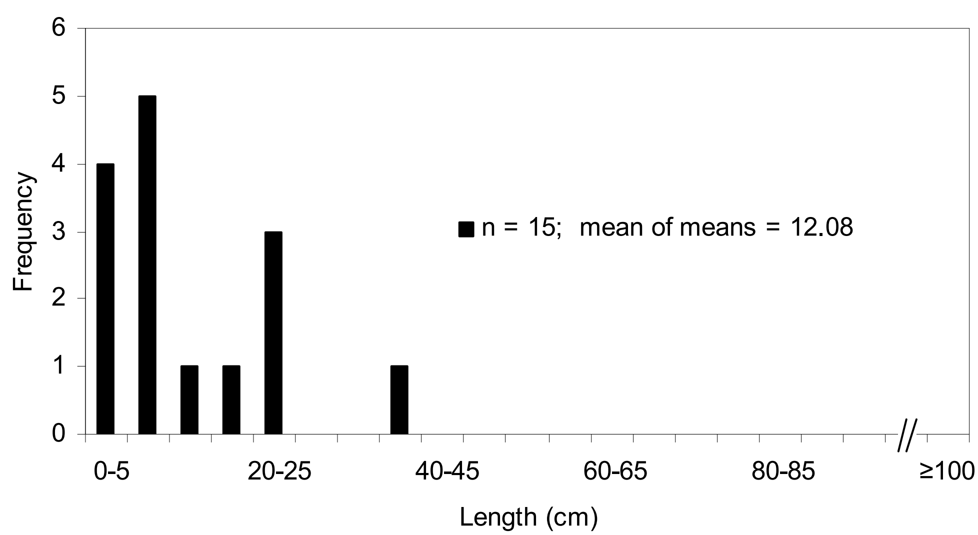

Figure 20.--Frequency distribution of mean prey size for taxa eaten by *Grampus griseus*.

Delphinidae: *Sotalia fluviatilis*, *tucuxi*; n = 10, $\bar{x}$ = 9.71 cm

Prey size information for the *tucuxi* was recorded for three cephalopod species and six species of fish based on the two citations listed in Table 13. Ten entries of mean prey size for *S. fluviatilis* met our minimum sample size requirement, with an overall mean of means of 9.71 cm. The mean prey size for *S. fluviatilis* has weak modes at 0-5 cm and 10-15 cm (Fig. 21).

Table 13.--Sources of prey size data for *Sotalia fluviatilis*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
de Oliveira Santos et al. 2002		9			
dos Santos and Haimovici 2001		56			

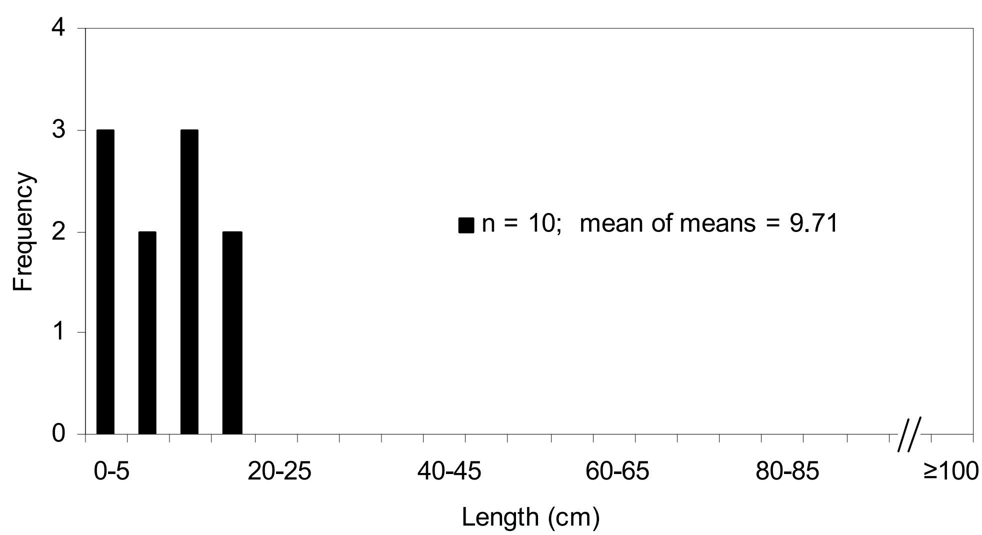

Figure 21.--Frequency distribution of mean prey size for taxa eaten by *Sotalia fluviatilis*.

Delphinidae: *Stenella attenuata*, pan-tropical spotted dolphin; n = 37, $\bar{x}$ = 12.74 cm

Prey size information for pan-tropical spotted dolphins was recorded for five cephalopod species and nine species of fish based on the three citations listed in Table 14. There are 37 entries of mean prey size for *S. attenuata* that meet our minimum sample size requirement, with an overall mean of means of 12.74 cm. The modal mean prey size for *S. attenuata* is 15-20 cm, with a slightly positively skewed distribution (Fig. 22).

Table 14.--Sources of prey size data for *Stenella attenuata*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Perrin et al. 1973		22			
Robertson and Chivers 1997		428			
Sekiguchi et al. 1992		3			
Wang et al. 2003		45			

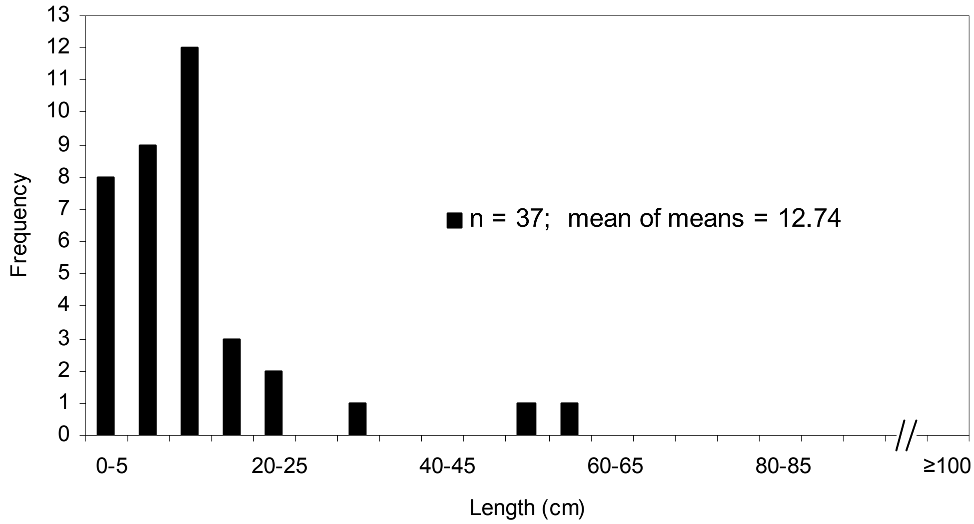

Figure 22.--Frequency distribution of mean prey size for taxa eaten by *Stenella attenuata*.

Phocoenidae: *Phocoena phocoena*, harbor porpoise; n = 31, $\bar{x}$ = 16.99 cm

Prey size information for harbor porpoises was recorded for two cephalopod species and 22 species of fish based on the citations listed in Table 15. There are 31 entries of mean prey size for *P. phocoena* that meet our minimum sample size requirement, with an overall mean of means of 16.99 cm. The modal mean prey size for *P. phocoena* is 15-20 cm, with an approximately normal distribution (Fig. 23).

Table 15.--Sources of prey size data for *Phocoena phocoena*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Börjesson et al. 2003		112			60 M; 52 F juvenile to adult
Fontaine et al. 1994		111*			
Gannon et al. 1998		95			
Morejohn et al. 1978		15			
Recchia and Read 1989		127			
Walker et al. 1998		25			14 M; 11 F

*count of food-containing stomachs only

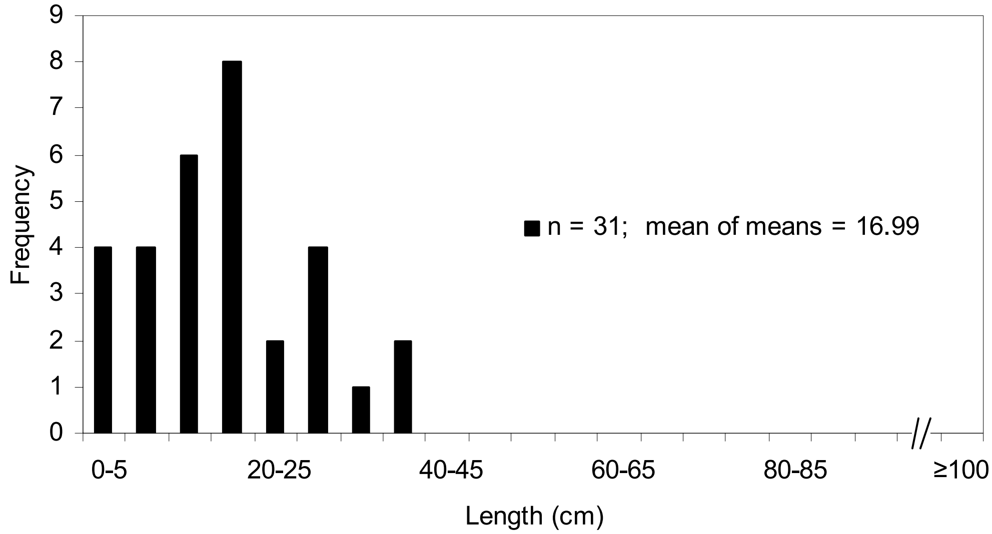

Figure 23.--Frequency distribution of mean prey size for taxa eaten by *Phocoena phocoena*.

Phocoenidae: *Phocoenoides dalli*, Dall's porpoise; n = 37, $\bar{x}$ = 12.88 cm

Prey size information for Dall's porpoises was recorded for 11 cephalopod species and 12 taxa of fish, based on the five citations listed in Table 16. There are 37 entries of mean prey size for *P. dalli* that meet our minimum sample size requirement, with an overall mean of means of 12.88 cm. The modal mean prey size for *P. dalli* is 5-15 cm, with a slightly positively skewed distribution (Fig. 24).

Table 16.--Sources of prey size data for *Phocoenoides dalli*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Crawford 1981		457			
Morejohn et al. 1978		27			
Ohizumi et al. 2000		150			
Walker 1996		85			
Walker et al. 1998		22			11 M; 11 F

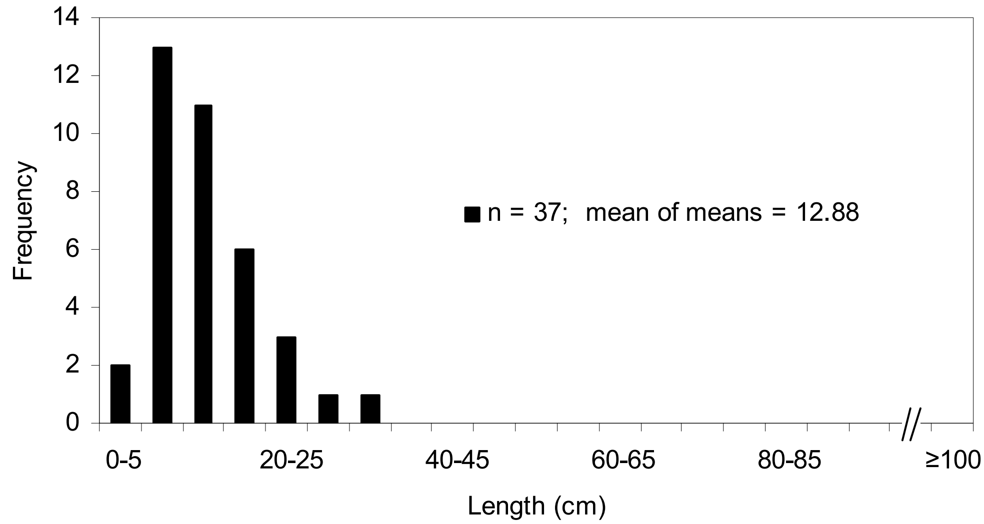

Figure 24.--Frequency distribution of mean prey size for taxa eaten by *Phocoenoides dalli*.

Physeteridae: *Kogia breviceps*, pygmy sperm whale; n = 12, $\bar{x}$ = 15.85 cm

Prey size information for pygmy sperm whales was recorded for 10 cephalopod species and one species of fish based on the three citations listed in Table 17. Twelve entries of mean prey size for *K. breviceps* met our minimum sample size requirement, with an overall mean of means of 15.85 cm. The modal mean prey size for *K. breviceps* is 10-25 cm, with an approximately normal distribution (Fig. 25).

Table 17.--Sources of prey size data for *Kogia breviceps*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
dos Santos and Haimovici 2001		3			
Sekiguchi et al. 1992		24			
Wang et al. 2002		6			

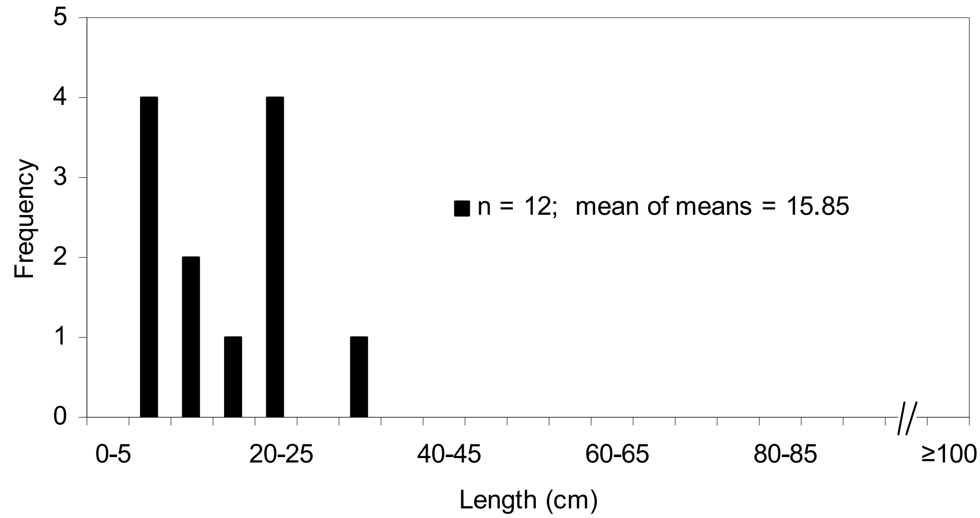

Figure 25.--Frequency distribution of mean prey size for taxa eaten by *Kogia breviceps*.

Physeteridae: *Physeter macrocephalus* = *P. catadon*, sperm whale; n = 47, $\bar{x}$ = 31.35 cm

Prey size information for sperm whales was recorded for 31 cephalopod species based on the citations listed in Table 18. There are 47 entries of mean prey size for *P. macrocephalus* that meet our minimum sample size requirement, with an overall mean of means of 31.35 cm. The modal mean prey size for *P. macrocephalus* is 20-25 cm, with a positively skewed distribution (Fig. 26).

Table 18.--Sources of prey size data for *Physeter macrocephalus*. Cells with "n.a." indicate cases where the sample type is known but the sample size was not reported.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Best 1999		1,268			
Clarke 1997		1			
Clarke and Young 1998		2			
Clarke et al. 1993		17			15 M; 2 F
Nemoto et al. 1985		n.a.			
Nemoto et al. 1987		n.a.			
Santos et al. 1999		17			

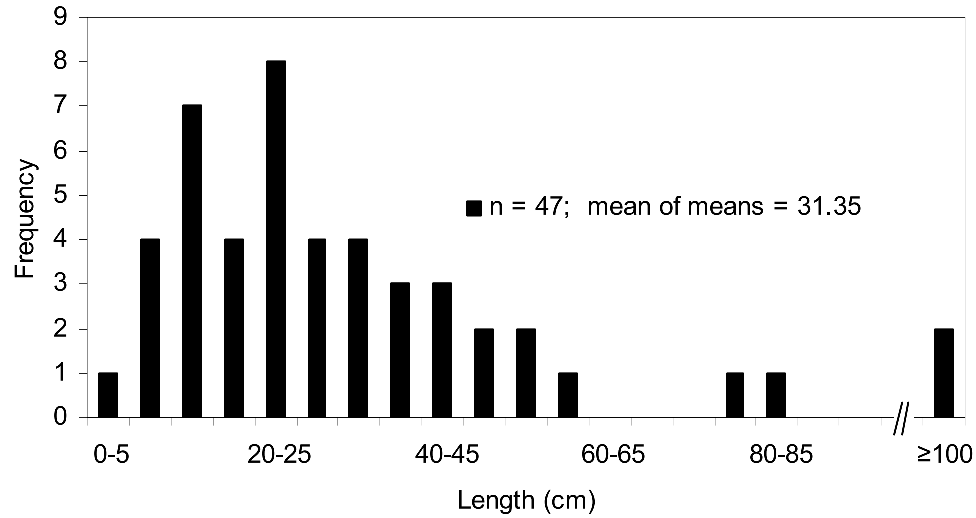

Figure 26.--Frequency distribution of mean prey size for taxa eaten by *Physeter macrocephalus*.

Ziphiidae: *Berardius bairdii*, Baird's beaked whale; n = 15, $\bar{x}$ = 29.35 cm

Prey size information for Baird's beaked whales was recorded for three cephalopod species and six species of fish based on the two citations listed in Table 19. There are 15 entries of mean prey size for *B. bairdii* that meet our minimum sample size requirement, with an overall mean of means of 29.35 cm. The modal mean prey size for *B. bairdii* is 35-40 cm, with an approximately normal distribution (Fig. 27).

Table 19.--Sources of prey size data for *Berardius bairdii*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Ohizumi et al. 2003		26			11 M; 15 F
Walker et al. 2002		127			

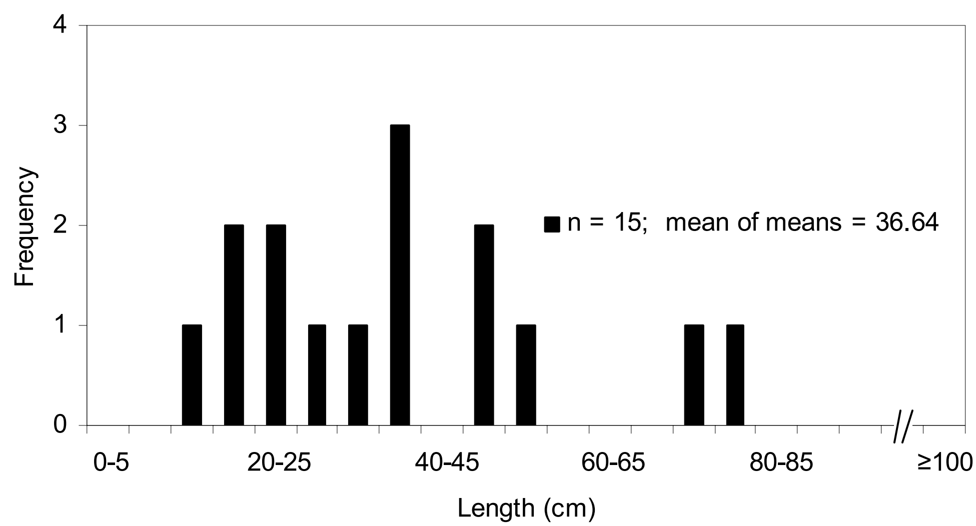

Figure 27.--Frequency distribution of mean prey size for taxa eaten by *Berardius bairdii*.

Ziphiidae: *Hyperoodon planifrons*, southern bottlenosed whale; n = 44, $\bar{x}$ = 25.04 cm

Prey size information for southern bottlenosed whales was recorded for 25 cephalopod species based on the three citations listed in Table 20. There are 44 entries of mean prey size for *H. planifrons* that meet our minimum sample size requirement, with an overall mean of means of 25.04 cm. The modal mean prey size for *H. planifrons* is 5-25 cm, with a positively skewed distribution (Fig. 28).

Table 20.--Sources of prey size data for *Hyperoodon planifrons*.

Citation	Scats	Stomachs	Regurge	Lavage	Age/sex
Clarke and Goodall 1994		2			
Sekiguchi et al. 1993		2			1 M; 1 F
Slip et al. 1995		1			F

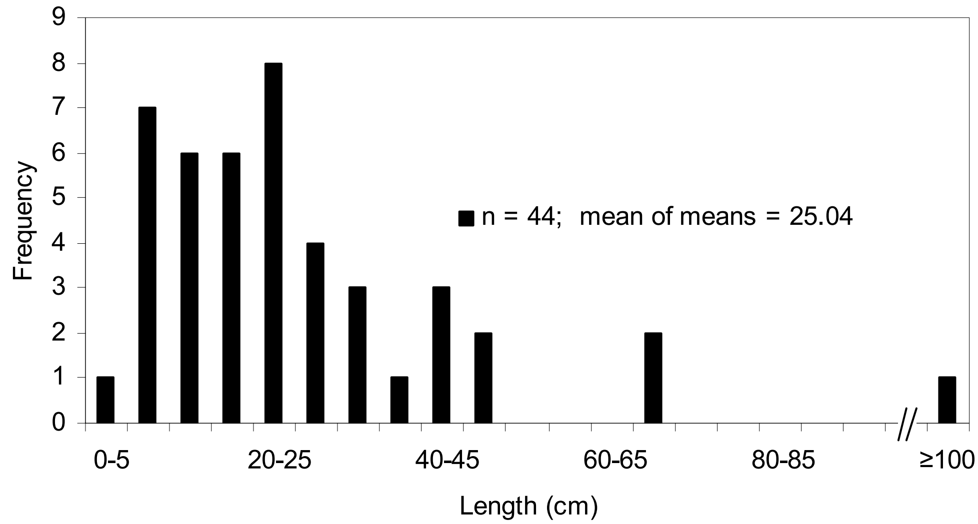

Figure 28.--Frequency distribution of mean prey size for taxa eaten by *Hyperoodon planifrons*.

Size Composition of Prey Consumed, Sorted by Prey Species

In addition to knowing predator-specific patterns in the size of prey targeted by predators, it is also useful to determine the size composition of a single prey species targeted by multiple predators. Most of the prey species for which we have data are represented by fewer than five data entries (Fig. 29; Appendix 3, 4). We use the same minimum sample size requirement for determining which cases were acceptable for examination here as we did to characterize the diets of predators. That is, prey species covered here have ≥ 10 entries for which mean targeted size is known, with each entry based on sample sizes of ≥ 10 individuals of that prey species. Note that individual entries (information from the literature that serves as our data points) may represent multiple studies of the same predator species or independent studies of different predator species.

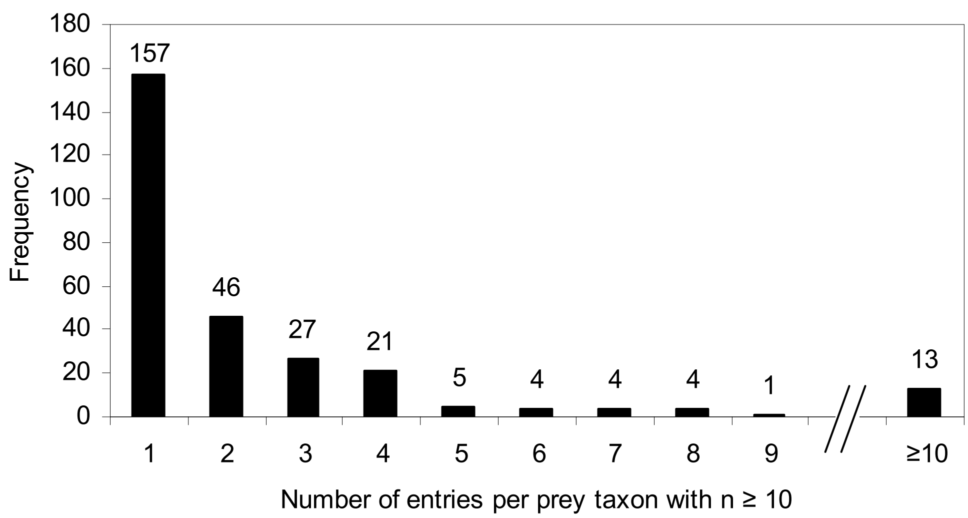

Figure 29.--Frequency distribution of the number of cases per prey taxon for which mean prey size was reported based on a sample size of 10 or larger.

For each of the following prey species, we also present data on what is known about the maximum size individuals are likely to attain. Although most of our data on maximum prey size come from studies where examination of whole animals was possible (Froese and Pauly 2003, Wood and Day 1998), a large proportion of data are based on reconstructed sizes estimated through regressions of body size against the size of hard parts such as squid beaks or fish otoliths likely to survive the digestion process. Specifically, of the 379 non-overlapping taxa for which data on maximum reported size were available, 100 (26%) derive from food habits studies. As discussed in our Methods section, food habits data were used when no other source of data was available, or when the food habits length data exceeded other available data. The effect this is likely to have on subsequent analyses is highly variable. For instance, krill (*Euphausia superba*) are generally regarded as reaching a maximum size of 6.2 cm (FAO 2000). The reconstructed maximum size based on regressions of carapace length to total length has been reported by Reid et al. (1996) to be 6.6 cm—an increase of 6%. In contrast, the maximum size of market squid (*Loligo opalescens*) reported by Lowry and Caretta (1999) was estimated by regressions of beak length to dorsal mantle length to be 23.5 cm, exceeding the largest whole squid measured by Kashiwada et al. (1979) by 4.0 cm—an increase of roughly 21%.

There are several potential explanations for these discrepancies. First, there may be problems with the regressions used to estimate body size. Regressions used for estimating body size are rarely presented with plots of the original data, making it impossible to evaluate if appropriate transformations have been used and whether or not the error structure is uniform throughout the distribution. As a consequence, regressions may be providing biased estimates in the tails of the distribution (Konigsberg et al. 1997).

This assumes, of course, that the prey remains have been identified correctly. If the wrong regressions are used then the estimated size will be unreliable. This is particularly problematic for cephalopod species, since the taxonomy of the beaks, let alone the whole animals, can be problematic even for specialists in the field. By way of example, 53 of the 100 cases for which we used size information from the food habits literature are for cephalopod species. In contrast, fish and crustaceans represent 36/100 and 11/100 cases, respectively.

Finally, we need to consider the theoretical nature of maximum reported size. Most, if not all, of the species considered here are indeterminate in their growth. That is, they grow throughout their lifetime, albeit at a steadily decreasing rate. Therefore, if any of these species were allowed to grow indefinitely, the maximum reported size may well be exceeded. Nevertheless, the available data on maximum reported size provide a valuable reference point for evaluating the size composition of targeted prey species.

Crustacean Prey Species

<u>Euphausiidae: *Euphausia superba*, Antarctic krill; n = 15, $\bar{x}$ = 4.53 cm</u>

Krill reach a maximum size of about 6.6 cm total length (maximum reported size from Reid et al. 1996). The modal mean size of marine mammal predation is 5 cm, with a mean of means of 4.53 cm (Fig. 30).

Table 21.--Predators for which mean size of *Euphausia superba* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus gazella	South Georgia Island, S Atlantic	1972-1977	Croxall and Pilcher 1984
A. gazella	South Georgia Island, S Atlantic	1986	Croxall et al. 1999
A. gazella	South Georgia Island, S Atlantic	1994	Croxall et al. 1999
A. gazella	South Georgia Island, S Atlantic	1982-1983	Doidge and Croxall 1985
A. gazella	Bouvetøya Island, Southern Ocean	1998-1999	Kirkman et al. 2000
A. gazella	South Georgia Island, S Atlantic	1994-1996	McCafferty et al. 1998
A. gazella	South Georgia Island, S Atlantic	1992	Reid 1995
A. gazella	South Georgia Island, S Atlantic	1993	Reid 1995
A. gazella	South Georgia Island, S Atlantic	1991-1994	Reid and Arnould 1996
A. gazella	South Georgia Island, S Atlantic	1994-1999	Reid and Brierly 2001
A. gazella	South Georgia Island, S Atlantic	1986	Reid et al. 1996
Balaenoptera spp.*	Southern Ocean	1950s??	Mackintosh 1974
Balaenoptera spp.*	South Georgia Island, S Atlantic	1929-1930	Marr 1962

Balaenoptera spp.*	South Georgia Island, S Atlantic	1932-1933	Marr 1962
Balaenoptera spp.*	South Georgia Island, S Atlantic	1939-1940	Marr 1962

* samples consist of an unspecified mix of blue (*B. musculus*) and fin (*B. physalus*) whales

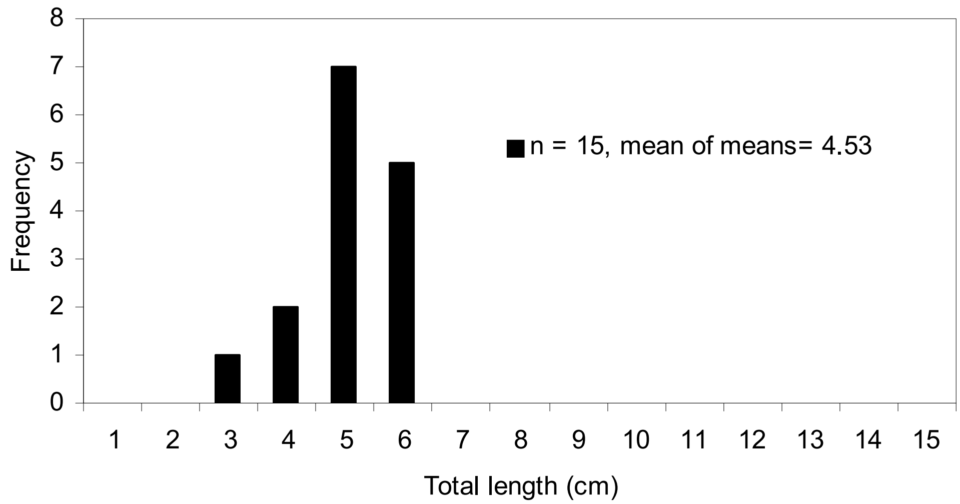

Figure 30.--Frequency distribution of mean size of *Euphausia superba* consumed by marine mammals.

Cephalopod Prey Species

Loliginidae: *Loligo opalescens*, market squid; n = 10, $\bar{x}$ = 11.58 cm

Market squid reach a maximum size of 23.50 cm (maximum reported size from Lowry and Caretta 1999). The size of market squid consumed by marine mammals was determined from food habits studies of three species of pinnipeds and three species of odontocetes (Table 22). The modal mean size of market squid eaten by marine mammals is 10-15 cm, with an overall mean of means of 11.58 cm (Fig. 31).

Table 22.--Predators for which mean size of *Loligo opalescens* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Callorhinus ursinus	N Pacific	1958-1974	Perez and Bigg 1986
Globicephala macrorhynchus	Channel Islands, NE Pacific	1980	Seagars and Henderson 1985
G. macrorhynchus	S California Bight, NE Pacific	1977	Sinclair 1992
G. macrorhynchus	S California Bight, NE Pacific	1969-1977	Sinclair 1992
Mirounga angustirostris	S California Bight, NE Pacific	1969-1983	Sinclair 1994
Phocoena phocoena	Washington and British Columbia	1990-1997	Walker et al. 1998
Phocoenoides dalli	Washington and British Columbia	1990-1997	Walker et al. 1998
Zalophus californianus	San Miguel Island, NE Pacific	1978-1979	Antonelis et al. 1984
Z. californianus	Channel Islands, NE Pacific	1981-1985	Lowry and Caretta 1999
Z. californianus	San Miguel Island, NE Pacific	1993, 1996	Melin 2002
Z. californianus	Monterey Bay, NE Pacific	n.a.	Morejohn et al. 1978

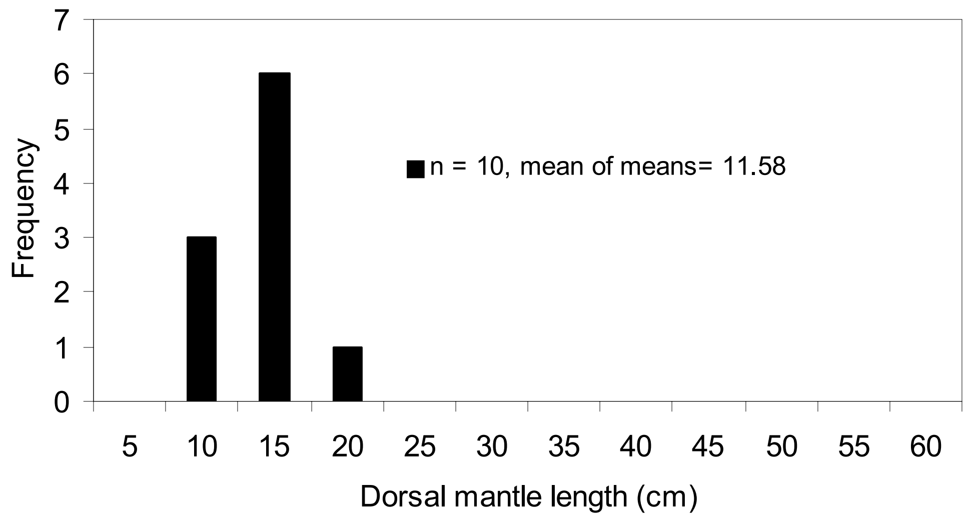

Figure 31.--Frequency distribution of mean size of *Loligo opalescens* consumed by marine mammals.

Loliginidae: *Loligo vulgaris reynaudii*, Cape Horn squid; n = 11, $\bar{x}$ = 14.04 cm

Cape Horn squid reach a maximum size of 40 cm (Wood and Day 1998). The size of Cape Horn squid consumed by marine mammals is based on food habits studies of one species of pinniped and eight species of odontocetes (Table 23). The modal mean size of Cape Horn squid eaten by marine mammals is 10-20 cm, with an overall mean of means of 14.04 cm (Fig. 32).

Table 23.--Predators for which mean size of *Loligo vulgaris reynaudii* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus pusillus pusillus	Benguela, South Africa	1976-1990	Castley et al. 1991
A. p. pusillus	Benguela, South Africa (West Coast)	1974-1985	Lipinski and David 1990
A. p. pusillus	Benguela, South Africa (South Coast)	1974-1985	Lipinski and David 1990
Cephalorhynchus heavisidii	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Delphinus delphis	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Grampus griseus	Benguela, South Africa	1975-1990	Sekiguchi et al. 1992
Kogia breviceps	Benguela, South Africa	1975-1990	Sekiguchi et al. 1992
K. sima	Benguela, South Africa	1975-1988	Sekiguchi et al. 1992
Lagenorhynchus obscurus	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Stenella coeruleoalba	Benguela, South Africa	1975-1989	Sekiguchi et al. 1992
Tursiops truncatus	Benguela, South Africa	1975-1989	Sekiguchi et al. 1992

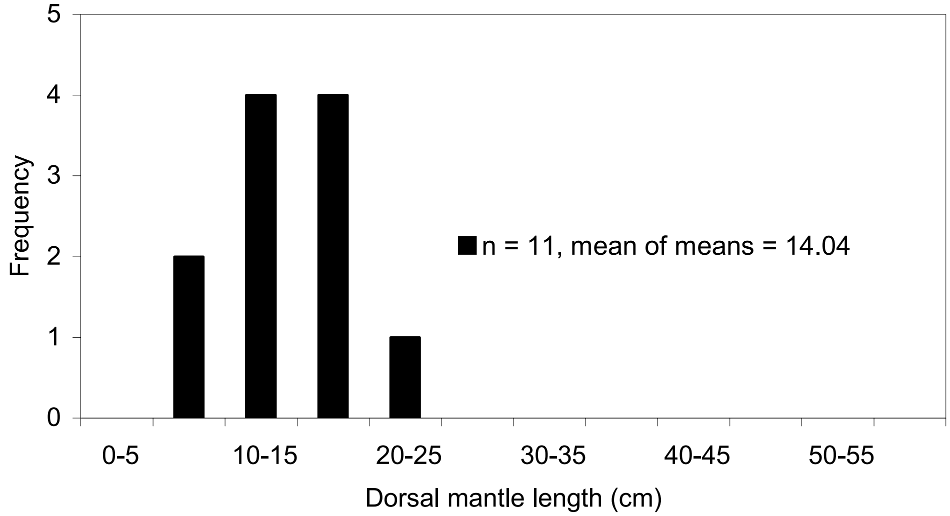

Figure 32.--Frequency distribution of mean size of *Loligo vulgaris reynaudii* consumed by marine mammals.

Fish Prey Species

<u>Clupeidae: *Clupea harengus*, Atlantic herring; n = 10, $\bar{x}$ = 27.49 cm</u>

Atlantic herring reach a maximum size of 45 cm (Froese and Pauly 2003). The size of Atlantic herring consumed by marine mammals was determined from food habits studies of three species of pinniped and one odontocete (Table 24). The modal mean size of Atlantic herring eaten by marine mammals is 25-30 cm, with an overall mean of means of 27.49 cm (Fig. 33).

Table 24.--Predators for which mean size of *Clupea harengus* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Halichoerus grypus	Gulf of St. Lawrence, NW Atlantic	1982-1987	Benoit and Bowen 1990
H. grypus	Scotian Shelf, NW Atlantic	1988-1990	Bowen et al. 1993
H. grypus	Gulf of St. Lawrence, NW Atlantic	1983	Murie and Lavigne 1992
Phoca groenlandica	Iceland	1992-1993	Hauksson and Bogason 1997
P. vitulina	Nova Scotia, Canada	1988-1992	Bowen and Harrison 1996
P. vitulina	Bay of Fundy, NW Atlantic	1988-1992	Bowen and Harrison 1996
Phocoena phocoena	Kattegat Sea and Skagerrak Sea	1989-1996	Börjesson et al. 2003
P. phocoena	Gulf of St. Lawrence, NW Atlantic	1989	Fontaine et al. 1994
P. phocoena	Gulf of Maine, NW Atlantic	1989-1994	Gannon et al. 1998
P. phocoena	Bay of Fundy, NW Atlantic	1985-1987	Recchia and Read 1989

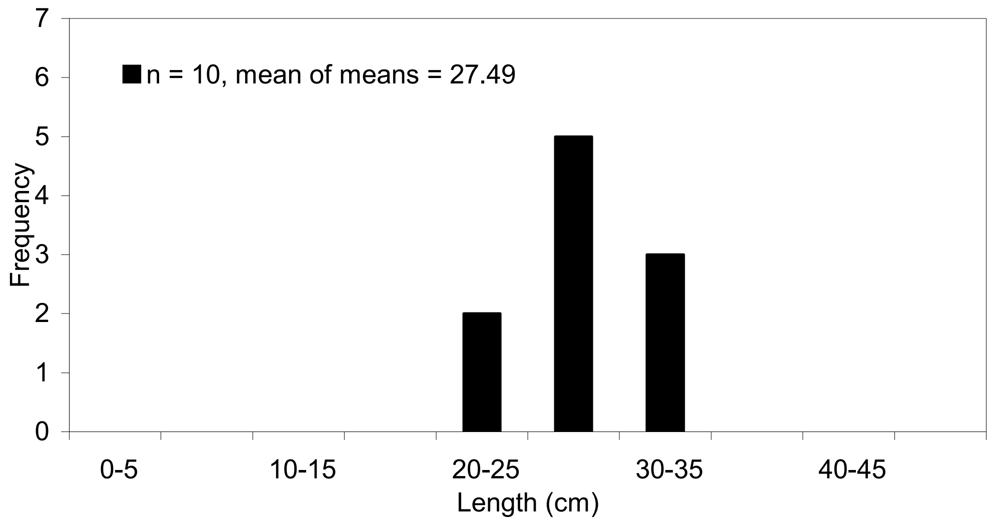

Figure 33.--Frequency distribution of mean size of *Clupea harengus* consumed by marine mammals.

Clupeidae: *Sardinops sagax* = *S. ocellatus*, pilchard/sardine; n = 11, $\bar{x}$ = 16.72 cm

Pilchards reach a maximum size of 39.50 cm (Froese and Pauly 2003). The size of pilchards consumed by marine mammals was determined from food habits studies of four taxa of pinnipeds and three odontocetes (Table 25). The modal mean size of pilchards eaten by marine mammals is 15-20 cm, with an overall mean of means of 16.72 cm (Fig. 34).

Table 25.--Predators for which mean size of *Sardinops sagax* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus galapagoensis	Galapagos Islands, E Tropical Pacific	1983	Dellinger and Trillmich 1999
A. pusilus doriferus	Tasmania	1984-1986	Gales and Pemberton 1994
A. pusillus pusillus	Benguela, South Africa	1974-1985	David 1987
A. p. pusillus	Benguela, South Africa	1974-1985	David 1987
A. p. pusillus	Benguela, South Africa	1974-1985	David 1987
Delphinus delphis	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Lagenorhynchus obscurus	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Phocoenoides dalli	Sea of Okhotsk and Sea of Japan	1988-1996	Ohizumi et al. 2000
P. dalli	Sea of Okhotsk	1988-1989	Walker 1996
Zalophus californianus woelbecki	Galapagos Islands, E Tropical Pacific	1983	Dellinger and Trillmich 1999
Z. c. woelbecki	Galapagos Islands, E Tropical Pacific	1983-1986	Dellinger and Trillmich 1999

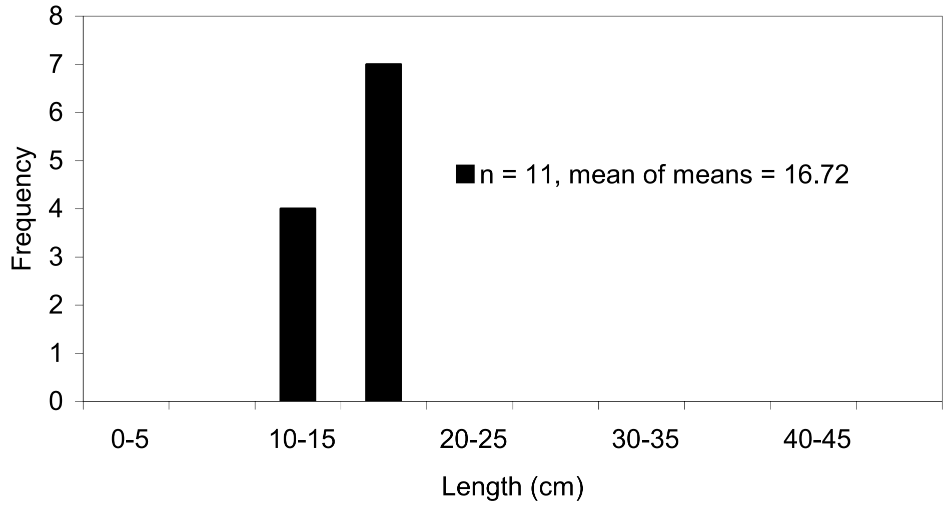

Figure 34.--Frequency distribution of mean size of *Sardinops sagax* consumed by marine mammals.

Myctophidae: *Electrona antarctica*, unnamed lanternfish; n = 12, $\bar{x}$ = 7.83 cm

Electrona antarctica reaches a maximum size of 13.26 cm (maximum reported size from Kirkman et al. 2000). The size of *E. antarctica* consumed by marine mammals was determined from the results of 11 food habits studies of *Arctocephalus gazella* (Table 26). The modal mean size of *E. antarctica* eaten by *A. gazella* is 8 cm, with an overall mean of means of 7.83 cm (Fig. 35).

Table 26.--Predators for which mean size of *Electrona antarctica* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus gazella	South Shetland Islands, S Atlantic	1996-1997	Casaux et al. 1998
A. gazella	Iles Kerguelen, S Atlantic	1994	Cherel et al. 1997
A. gazella	South Shetland Islands, S Atlantic	1992	Daneri 1996
A. gazella	South Shetland Islands, S Atlantic	1993-1994	Daneri and Carlini 1999
A. gazella	South Orkney Islands, S Atlantic	1988	Daneri and Coria 1993
A. gazella	Heard Island, Indian Ocean	1987-1988	Green et al. 1989
A. gazella	Heard Island, Indian Ocean	1987-1988	Green et al. 1989
A. gazella	Heard Island, Indian Ocean	1993-1993	Green et al. 1997
A. gazella	Bouvetøya Island, Southern Ocean	1998-1999	Kirkman et al. 2000
A. gazella	Bouvetøya Island, Southern Ocean	1996-1997	Klages et al. 1999
A. gazella	Iles Kerguelen, S Atlantic	1998-2000	Lea et al. 2002
A. gazella	South Georgia Island, S Atlantic	1983	North 1996

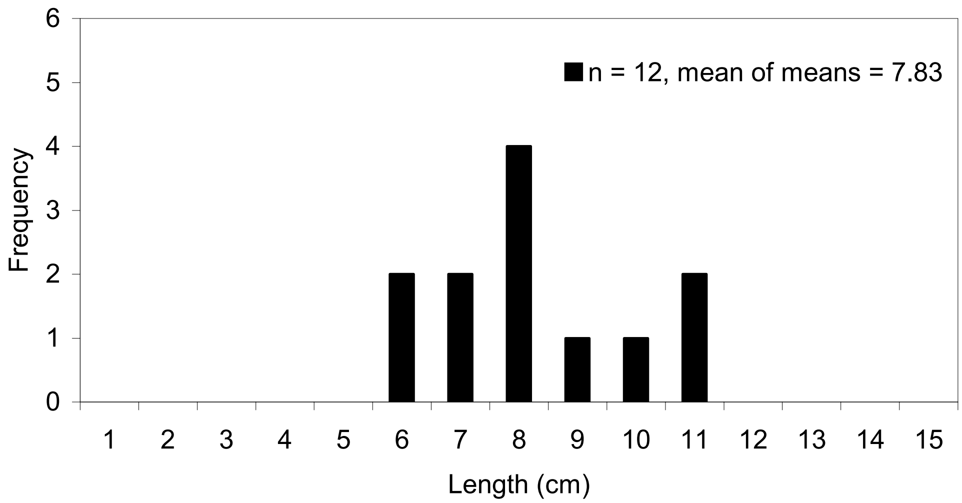

Figure 35.--Frequency distribution of mean size of *Electrona antarctica* consumed by marine mammals.

Mycophidae: *Electrona subaspera*, unnamed lanternfish; n = 10, $\bar{x}$ = 8.04 cm

Electrona subaspera reach a maximum size of 12.75 cm (maximum reported size from Green et al. 1997). The size of *E. subaspera* consumed by marine mammals was determined from the results of food habits studies of three species of fur seal (Table 27). The modal mean size of *E. subaspera* eaten by *Arctocephalus* spp. is 8 cm, with an overall mean of means of 8.04 cm (Fig. 36).

Table 27.--Predators for which mean size of *Electrona subaspera* is known from sample sizes of 10 or more.

Predator	Sampling Region	Dates	Citation
Arctocephalus forsteri	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990
A. forsteri	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990
A. gazella	Macquarie Island, S Atlantic	1990-1991	Goldsworthy et al. 1997
A. gazella	Heard Island, Indian Ocean	1993-1993	Green et al. 1997
A. gazella	Marion Island, S Atlantic	1989-1995	Klages and Bester 1998
A. gazella	Iles Kerguelen, S Atlantic	1998-2000	Lea et al. 2002
A. tropicalis	Macquarie Island, S Atlantic	1990-1991	Goldsworthy et al. 1997
A. tropicalis	Marion Island, S Atlantic	1989-1995	Klages and Bester 1998
Arctocephalus spp.*	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990
Arctocephalus spp.*	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990

*includes an unspecified mix of *A. forsteri*, *A. gazella*, and *A. tropicalis*

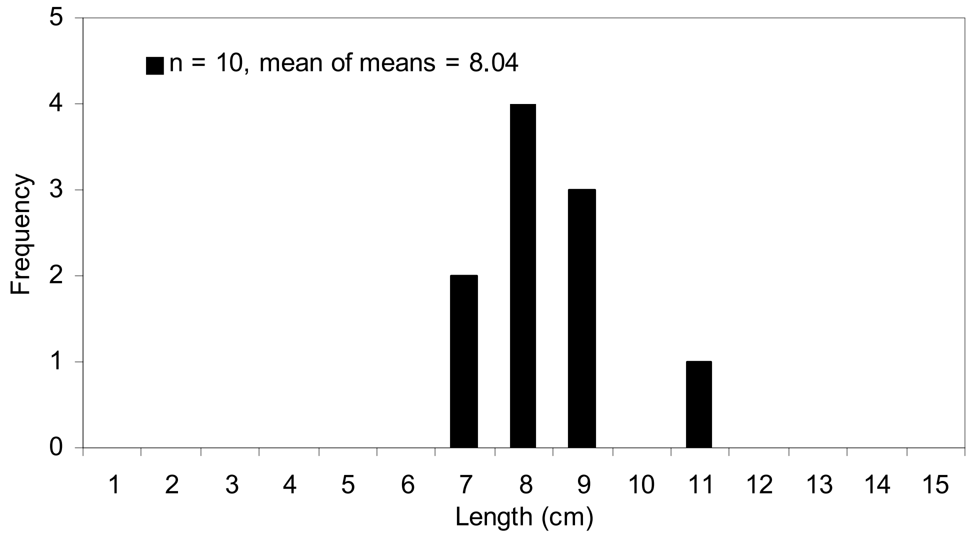

Figure 36.--Frequency distribution of mean size of *Electrona subaspera* consumed by marine mammals.

Myctophidae: *Gymnoscopelus nicholsi*, unnamed lanternfish; n = 15, $\bar{x}$ = 12.06 cm

Gymnoscopelus nicholsi reach a maximum size of 18.90 cm (maximum reported size from Casaux et al. 1998). The size of *G. nicholsi* consumed by marine mammals was determined from food habits studies of three species of fur seal and one phocid (Table 28). The modal mean size of *G. nicholsi* eaten by marine mammals is 13 cm, with an overall mean of means of 12.06 cm (Fig. 37).

Table 28.--Predators for which mean size of *Gymnoscopelus nicholsi* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus gazella	Bouvetøya Island, Southern Ocean	1998-1999	Kirkman et al. 2000
A. gazella	South Shetland Islands, S Atlantic	1996-1997	Casaux et al. 1998
A. gazella	Iles Kerguelen, S Atlantic	1994	Cherel et al. 1997
A. gazella	South Shetland Islands, S Atlantic	1992	Daneri 1996
A. gazella	South Shetland Islands, S Atlantic	1993-1994	Daneri and Carlini 1999
A. gazella	South Orkney Islands, S Atlantic	1988	Daneri and Coria 1993
A. gazella	Heard Island, Indian Ocean	1987-1988	Green et al. 1989
A. gazella	Heard Island, Indian Ocean	1987-1988	Green et al. 1989
A. gazella	Marion Island, S Atlantic	1989-1995	Klages and Bester 1998
A. gazella	Bouvetøya Island, Southern Ocean	1996-1997	Klages et al. 1999
A. gazella	Iles Kerguelen, S Atlantic	1998-2000	Lea et al. 2002
A. tropicalis	Marion Island, S Atlantic	1989-1995	Klages and Bester 1998

Arctocephalus spp.*	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990
Arctocephalus spp.*	Macquarie Island, S Atlantic	1988-1989	Green et al. 1990
Mirounga leonina	South Shetland Islands, S Atlantic	1993-2000	Daneri and Carlini 2002

*includes an unspecified mix of *A. forsteri*, *A. gazella*, and *A. tropicalis*

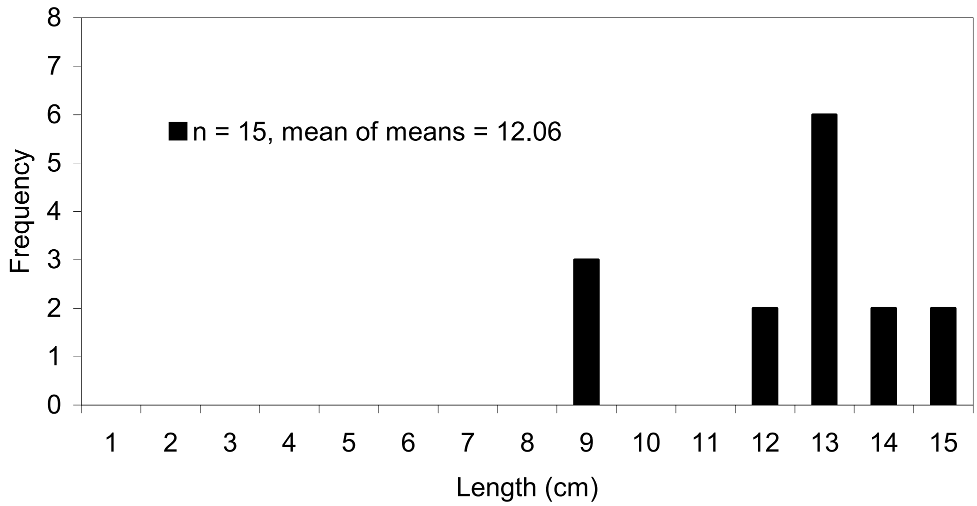

Figure 37.--Frequency distribution of mean size of *Gymnoscopelus nicholsi* consumed by marine mammals.

Gadidae: *Gadus morhua*, Atlantic cod; n = 19, $\bar{x}$ = 26.15 cm

Atlantic cod reach a maximum size of 200 cm (Froese and Pauly 2003). The size of Atlantic cod consumed by marine mammals was determined from food habits studies of five species of pinnipeds and one odontocete (Table 29). The modal mean size of Atlantic cod eaten by marine mammals is 25-30 cm, with an overall mean of means of 26.15 cm (Fig. 38).

Table 29.--Predators for which mean size of *Gadus morhua* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Cystophora cristata	Iceland	1992-1993	Hauksson and Bogason 1997
Halichoerus grypus	Gulf of St. Lawrence, NW Atlantic	1982-1987	Benoit and Bowen 1990
H. grypus	Scotian Shelf, NW Atlantic	1991-1993	Bowen and Harrison 1994
H. grypus	Scotian Shelf, NW Atlantic	1988-1990	Bowen et al. 1993
H. grypus	Orkney Island, NE Atlantic	1985	Hammond et al. 1994a
H. grypus	Orkney Island, NE Atlantic	1985	Hammond et al. 1994a
H. grypus	Hebrides Islands, NE Atlantic	1985	Hammond et al. 1994b
H. grypus	Hebrides Islands, NE Atlantic	1985	Hammond et al. 1994b
H. grypus	Hebrides Islands, NE Atlantic	1985	Hammond et al. 1994b
H. grypus	Gulf of St. Lawrence, NW Atlantic	1983	Murie and Lavigne 1992
H. grypus	Donna Nook, SW North Sea	1985	Prime and Hammond 1990
Phoca groenlandica	Gulf of St. Lawrence, NW Atlantic	1988-1990	Beck et al. 1993
P. groenlandica	Iceland	1992-1993	Hauksson and Bogason 1997
P. groenlandica	Ullsford, Norway	1986	Nilssen et al. 1990
P. groenlandica	Ullsford, Norway	1988	Nilssen et al. 1990

P. vitulina	Waddensea, North Sea	1975-1981	Behrends 1982
P. vitulina	Bay of Fundy, NW Atlantic	1988-1992	Bowen and Harrison 1996
P. vitulina	Nova Scotia, Canada	1988-1992	Bowen and Harrison 1996
Phocoena phocoena	Kattegat Sea and Skagerrak Sea	1989-1996	Börjesson et al. 2003

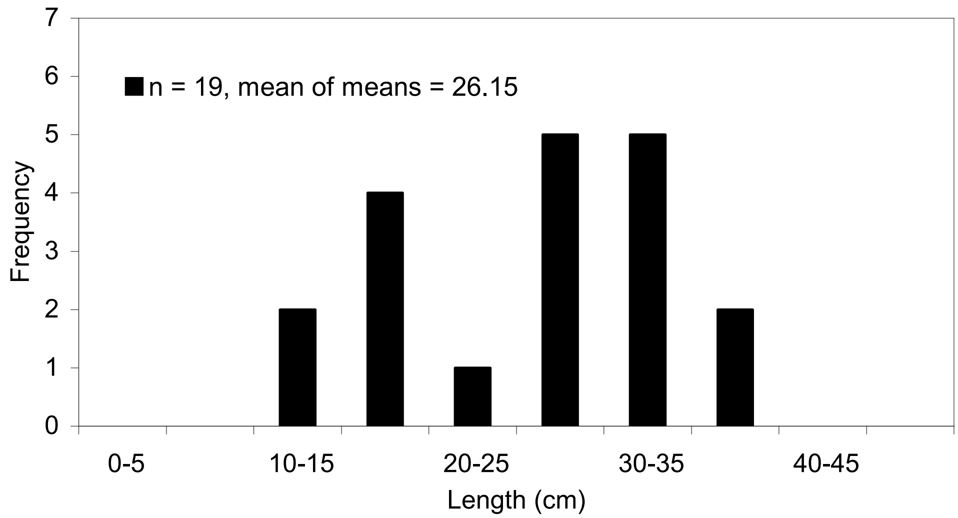

Figure 38.--Frequency distribution of mean size of *Gadus morhua* consumed by marine mammals.

Gadidae: *Theragra chalcogramma*, walleye pollock; 91.00 n = 26, $\bar{x}$ = 24.10 cm

Walleye pollock reach a maximum size of 91 cm (Froese and Pauly 2003). The size of pollock consumed by marine mammals was determined from food habits studies of six species of pinnipeds, two odontocetes, and one mysticete (Table 30). The frequency distribution of mean size of pollock eaten by marine mammals is tri-modal, with strong modes at 10-15 cm and 25-30 cm, and a weak mode at 45-50 cm. The overall mean of means is 24.10 cm (Fig. 39).

Table 30.--Predators for which mean size of *Theragra chalcogramma* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Balaenoptera acutorostrata	Bering Sea	1975	Frost and Lowry 1986
Berardius bairdii	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999	Ohizumi et al. 2003
Callorhinus ursinus	St. Paul Island, Bering Sea	1996	Kiyota et al. 1999
C. ursinus	Bering Sea	1981-1982	Lowry et al. 1989
C. ursinus	Bering Sea	1974	McAlister et al. 1976
C. ursinus	Bering Sea	1981	Sinclair et al. 1994
C. ursinus	Bering Sea	1982	Sinclair et al. 1994
C. ursinus	Bering Sea	1985	Sinclair et al. 1994
Erignathus barbatus	Bering Sea	1981	Antonelis et al. 1994b
Eumetopias jubatus	Kodiak Island, Gulf of Alaska	1985-1986	Calkins and Goodwin 1988
E. jubatus	SE Alaska, Gulf of Alaska	1985-1986	Calkins and Goodwin 1988
E. jubatus	Pribilof Islands, Bering Sea	1976, 1979	Frost and Lowry 1986

E. jubatus	Bering Sea	1981	Frost and Lowry 1986
E. jubatus	Gulf of Alaska	1975-1978	Pitcher 1981
E. jubatus	SE Alaska	1994-1999	Tollit et al. 2004a
E. jubatus	Aleutian Is. (western stock)	1998-2000	Zeppelin et al. 2004
Phoca fasciata	Bering Sea	1976-1979	Frost and Lowry 1980
P. fasciata	Bering Sea	1976-1978	Frost and Lowry 1986
P. largha	Bering Sea	1976-1978	Bukhtiyarov et al. 1984
P. largha	Bering Sea	1978	Frost and Lowry 1986
P. vitulina	Bering Sea	1981	Frost and Lowry 1986
P. vitulina	Pribilof Islands, Bering Sea	1979	Frost and Lowry 1986
P. vitulina	Gulf of Alaska	1975-1978	Pitcher 1981
Phocoenoides dalli	Sea of Okhotsk and Sea of Japan	1988-1996	Ohizumi et al. 2000
P. dalli	Sea of Okhotsk	1988-1989	Walker 1996
P. dalli	Washington and British Columbia	1990-1997	Walker et al. 1998

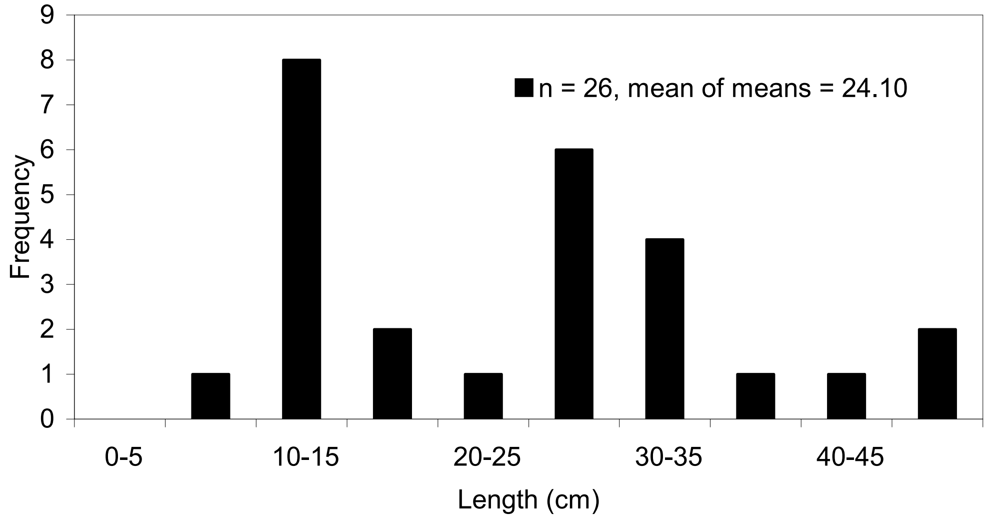

Figure 39.--Frequency distribution of mean size of *Theragra chalcogramma* consumed by marine mammals.

Merlucciidae: *Merluccius* spp. (*M. capensis* and *M. paradoxus*), shallow-water and deep-water Cape hakes, respectively; n = 10, $\bar{x}$ = 20.84 cm

Food habits studies rarely distinguish between the two species of hake common in the Benguela Current of South Africa. However, the shallow-water hake (maximum size = 140 cm; Froese and Pauly 2003) is most abundant in waters shallower than 200 m, whereas the deep-water hake (maximum size = 115 cm; Froese and Pauly 2003) is most abundant in waters 300 m and deeper (Botha 1985). The size of Cape hakes consumed by marine mammals is based on food habits studies of one species of pinniped and seven odontocetes (Table 31). The modal mean size of Cape hakes eaten by marine mammals is 15-25 cm, with an overall mean of means of 20.84 cm (Fig. 40).

Table 31.--Predators for which mean size of *Merluccius capensis* and *M. paradoxus* is known from sample sizes of 10 or more.

Predator	Sampling Region	Dates	Citation
Arctocephalus pusillus pusillus	Benguela, South Africa	1974-1985	David 1987
A. p. pusillus	Benguela, South Africa	1974-1985	David 1987
A. p. pusillus	Benguela, South Africa	1974-1985	David 1987
Cephalorhynchus heavisidii	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Delphinus delphis	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992
Kogia breviceps	Benguela, South Africa	1975-1990	Sekiguchi et al. 1992
K. sima	Benguela, South Africa	1975-1988	Sekiguchi et al. 1992
Lagenorhynchus obscurus	Benguela, South Africa	1969-1990	Sekiguchi et al. 1992

Stenella coeruleoalba	Benguela, South Africa	1975-1989	Sekiguchi et al. 1992
Tursiops truncatus	Benguela, South Africa	1975-1989	Sekiguchi et al. 1992

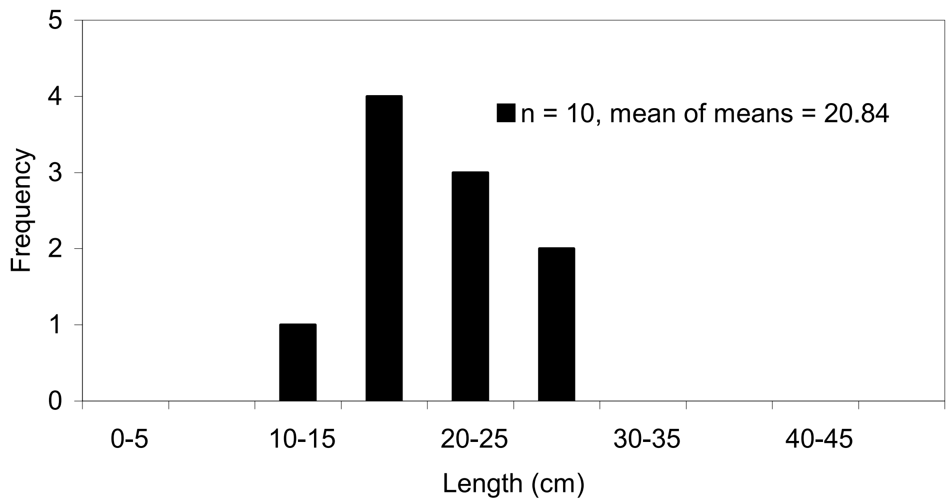

Figure 40.--Frequency distribution of mean size of *Merluccius capensis* and *M. paradoxus* consumed by marine mammals.

Nototheniidae: *Pleuragramma antarcticum*, Antarctic silverfish; 25.91 n = 11, $\bar{x}$ = 14.40 cm

Antarctic silverfish reach a maximum size of 25.91 cm (maximum reported size from Burns et al. 1998). The size of Antarctic silverfish consumed by marine mammals is based on food habits studies of four species of pinnipeds (Table 32). The modal mean size of Antarctic silverfish eaten by marine mammals is 10-15 cm, with an overall mean of means of 14.40 cm (Fig. 41).

Table 32.--Predators for which mean size of *Pleuragramma antarcticum* is known from sample sizes of 10 or more.

Predator	Sampling Region	Dates	Citation
Arctocephalus gazella	South Shetland Islands, S Atlantic	1992	Daneri 1996
A. gazella	South Shetland Islands, S Atlantic	1993-1994	Daneri and Carlini 1999
Hydrurga leptonyx	Davis Station, Antarctica	1984	Green and Williams 1986
Leptonychotes weddelii	McMurdo Sound, Antarctica	1989-1993	Burns et al. 1998
L. weddelii	Mawson, Antarctica	1983-1985	Green and Burton 1987
L. weddelii	McMurdo Sound, Antarctica	1983-1985	Green and Burton 1987
L. weddelii	Davis Station, Antarctica	1983-1985	Green and Burton 1987
L. weddelii	Weddell Sea (eastern shore), Antarctica	1983, 1985	Plotz 1986
L. weddelii	Weddell Sea (southern shore), Antarctica	1983, 1985	Plotz 1986
L. weddelii	Weddell Sea, Antarctica	1998	Plotz et al. 2001
Mirounga leonina	South Shetland Islands, S Atlantic	1993-2000	Daneri and Carlini 2002

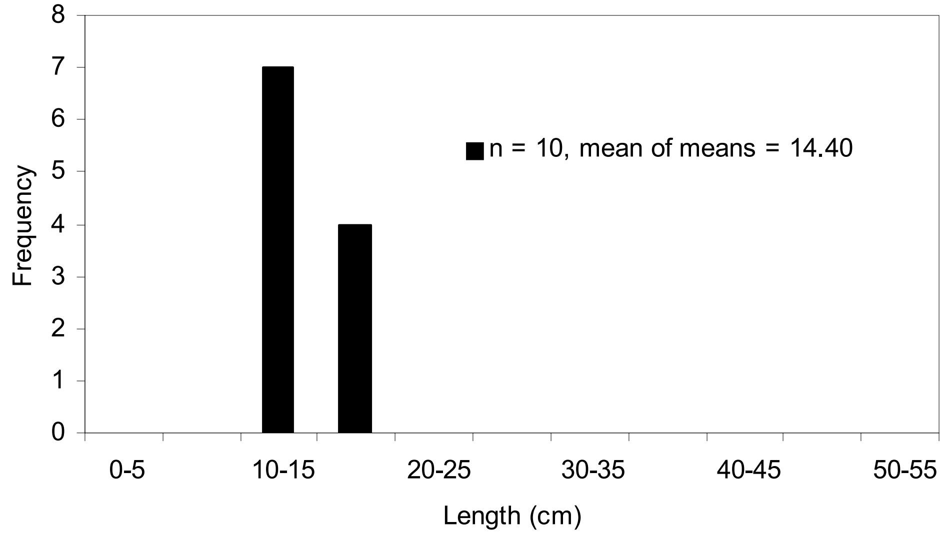

Figure 41.--Frequency distribution of mean size of *Pleuragramma antarcticum* consumed by marine mammals.

Channichthyidae: *Champsocephalus gunnari*, mackerel icefish; n = 10, $\bar{x}$ = 24.85 cm

Mackerel icefish reach a maximum size of 66 cm (Froese and Pauly 2003), however Gon and Heemstra (1990) indicate that fish from Heard and Kerguelen Islands reach a maximum size of 45 cm. The size of mackerel icefish consumed by marine mammals is based on reports of several food habits studies of *Arctocephalus gazella* (Table 33). The frequency distribution of mean size of mackerel icefish eaten by *A. gazella* is strongly modal at 20-25 cm, with an overall mean of means of 24.85 cm (Fig. 42).

Table 33.--Predators for which mean size of *Champsocephalus gunnari* is known from sample sizes of 10 or more.

Predator	**Sampling Region**	**Dates**	**Citation**
Arctocephalus gazella	Heard Island, Indian Ocean	1987-1988	Green et al. 1989
A. gazella	Heard Island, Indian Ocean	1993-1993	Green et al. 1997
A. gazella	Heard Island, Indian Ocean	1993-1993	Green et al. 1997
A. gazella	Iles Kerguelen, Indian Ocean	1998-2000	Lea et al. 2002
A. gazella	South Georgia Island, S Atlantic	1983	North 1996
A. gazella	South Georgia Island, S Atlantic	1993	Reid 1995
A. gazella	South Georgia Island, S Atlantic	1992	Reid 1995
A. gazella	South Georgia Island, S Atlantic	1991	Reid and Arnould 1996
A. gazella	South Georgia Island, S Atlantic	1993	Reid and Arnould 1996
A. gazella	South Georgia Island, S Atlantic	1994	Reid and Arnould 1996

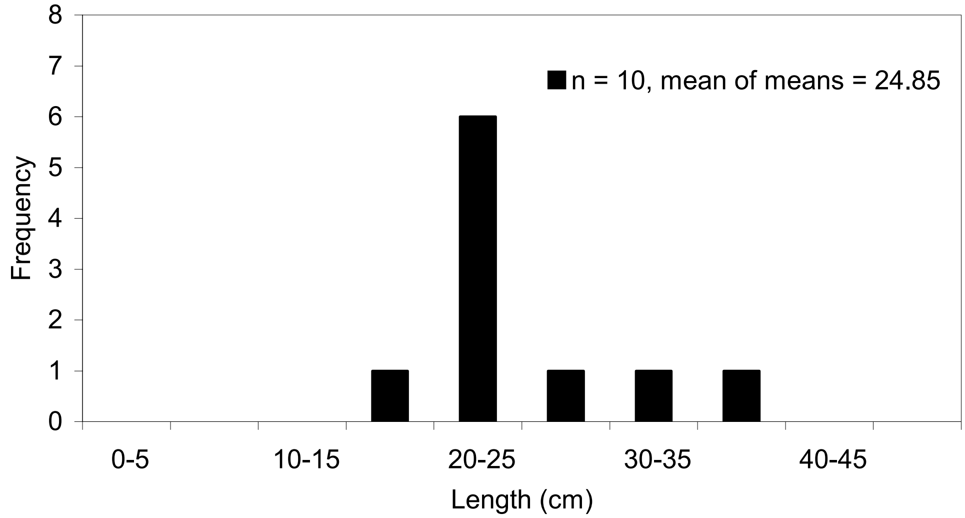

Figure 42.--Frequency distribution of mean size of *Champsocephalus gunnari* consumed by marine mammals.

Overall Patterns in the Size of Prey Consumed By Marine Mammals

The species-specific examinations of prey size consumed by marine mammals suggest that the majority of prey consumed is smaller than 30 cm, as exemplified in the studies summarized above (Figs. 9-28). This conclusion is further supported when the entire set of data for mean prey size is expanded to include the collective set of data that meet our sample size criteria (Fig. 43). Indeed, of the 726 cases plotted in Figure 43, 493 (68%) are ≤ 20 cm, while 625 (86%) are ≤ 30 cm.

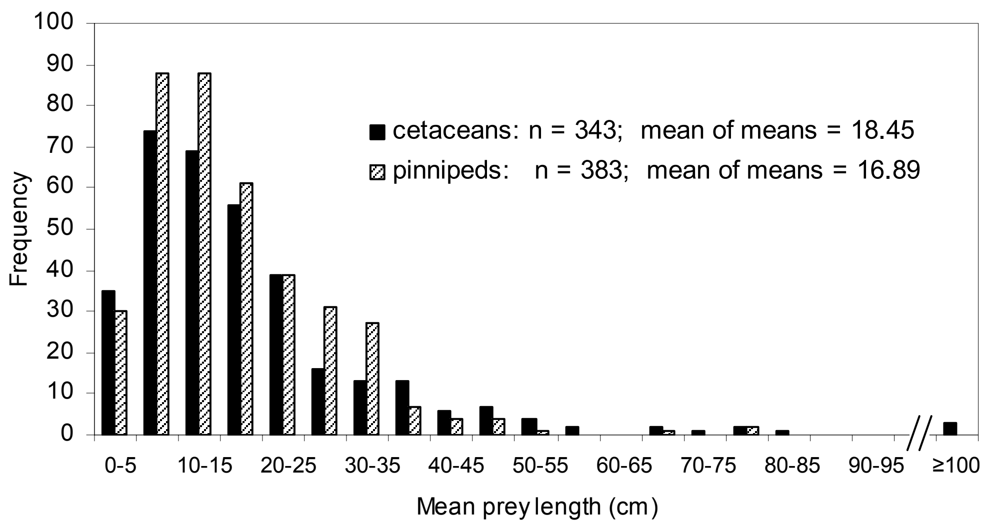

Figure 43.--Frequency distribution of prey size means for cases based on all samples from marine mammal food habits studies with sample sizes ≥ 10.

Evaluation of Biases

Several potential biases were listed previously. One of these is that our minimum sample size requirement might inadvertently bias against large-bodied prey items. Intuitively, marine mammals can consume fewer large prey items than small prey items in any given foraging trip. To evaluate this potential bias, the LF of prey size was generated for rare taxa (defined here as having samples sizes from 1to 3). The data were generated as follows: for taxa where prey size was based on a single specimen, the data were transcribed directly. For taxa where prey size was based on two specimens, the sizes of the individual specimens contributing to that sample could only be calculated if the lower and upper ends of the size range were reported. Finally, individual prey size was calculated for cases where n = 3, but only if mean size was reported along with the lower and upper ends of the size range.

There is no clear pattern to the differences in means (Table 34). Note, however, that the LF distributions are broadly similar to the distributions of means based on large sample sizes in all cases (Figs. 44 – 46 in comparison with Fig. 43).

Table 34.--Mean prey size based on large (n ≥ 10) versus small (n = 1-3) sample sizes.

	cephalopods		fish			
	large	small	large	small	ceph diffs	fish diffs
odontocetes	19.90	14.61	18.55	15.88	5.29	2.67
otariids	12.86	11.80	17.35	17.50	1.06	-0.15
phocids	15.77	20.07	20.11	23.44	-4.30	-3.33

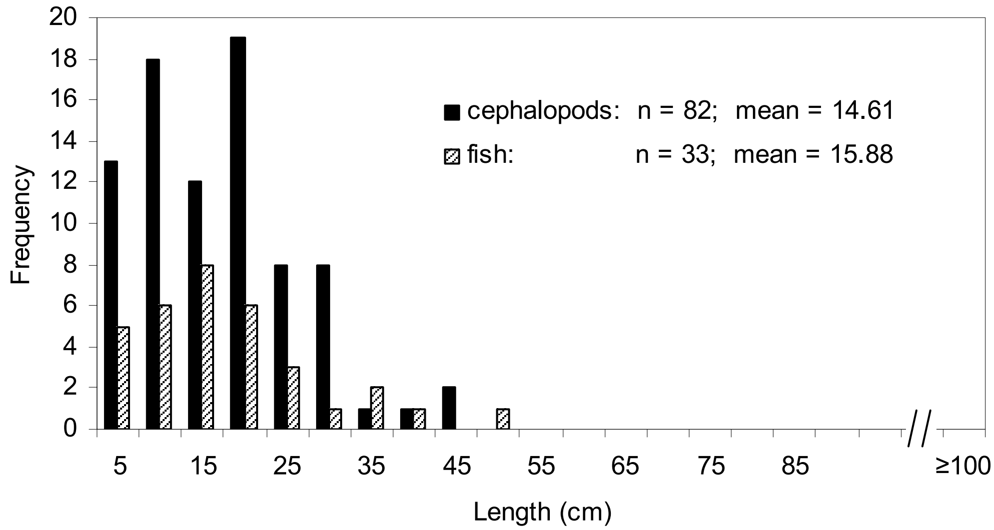

Figure 44.--Length frequency distribution of individual prey items consumed by odontocete whales.

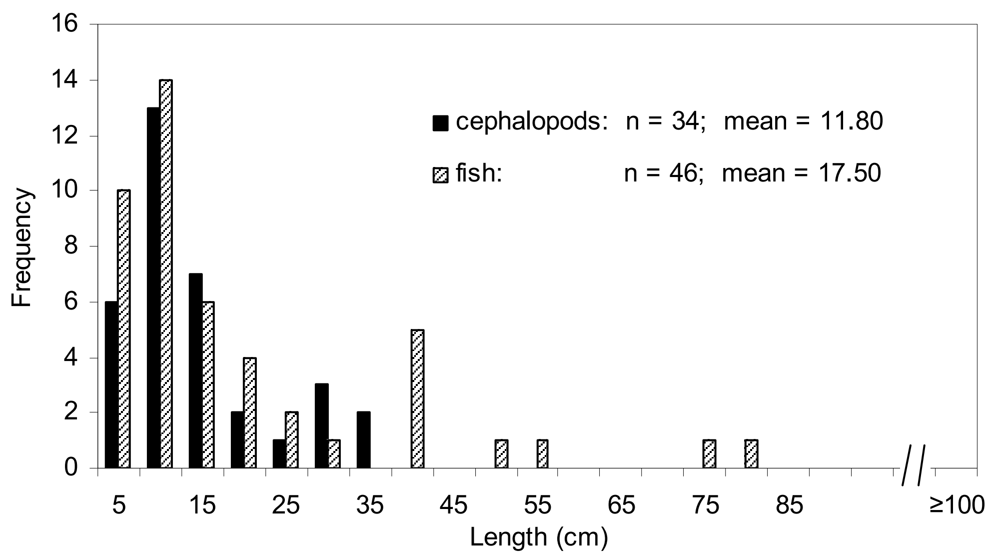

Figure 45.--Length frequency distribution of individual prey items consumed by otariid seals.

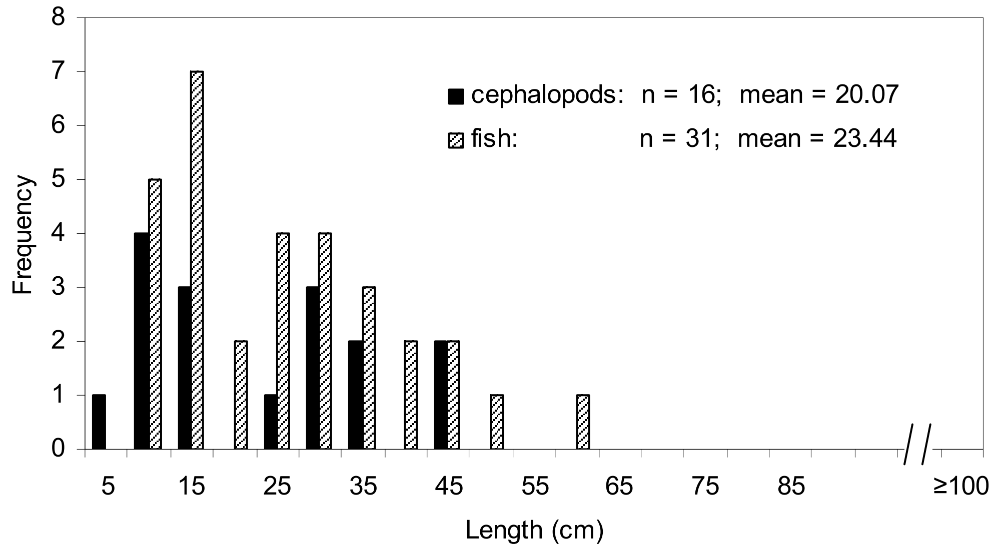

Figure 46.--Length frequency distribution of individual prey items consumed by phocid seals.

A second potential bias relates to the methodology of the majority of food habits studies, wherein prey size is estimated based on regressions relating body size to the size of hard parts (fish bones and otoliths, and cephalopod beaks) that 1) survive the digestive systems of marine mammals and 2) are recovered in the laboratory.

The issue of differential recovery as a source of bias is important, as illustrated by Reid and Arnould's (1996) study of the food habits of lactating female Antarctic fur seals at South Georgia. The samples from 1991 were sorted visually without the aid of magnification, and they found no mackerel icefish (*Champsocephalus gunnari*) otoliths from fish smaller than 26 cm -- fish that are approximately 1 year old. In subsequent years, they sorted samples with the aid of a stereomicroscope and found that otoliths from fish smaller than 26 cm comprised 77% of the sample in 1993 and 7% in 1994. Clearly, year-class strength could be playing a role in this example. However, the point remains that even if small otoliths survive the digestive process, they are more likely to be overlooked than are the larger specimens.

Thus, prey size estimates can be too large if small elements are not recovered or are too badly eroded for identification and/or measurement (Reid and Arnould 1996). However, estimates of prey size can also be too small if prey are incompletely consumed (e.g., if heads are discarded in favor of body parts with more protein and fat) and/or the specific elements used for the regressions are reduced in size through partial or complete digestion (Bowen 2000, Tollit et al. 2004a, 2004b; Zeppelin et al. 2004). Finally, prey size estimates can also be too small if large skeletal elements are differentially regurgitated rather than passed through the digestive system, thus failing to appear in samples restricted to fecal material (Kiyota et al. 1999, Gudmundson et al. in press).

If we assume that all the prey taxa that are part of the diet are recovered and correctly identified, then the distribution of the maximum reported sizes of those prey taxa observed in the diet can provide an indication of the patterns of size selectivity at a very general level. Keeping in mind that our database is limited to those prey taxa for which targeted size was reported, the overall distribution of maximum potential prey size is remarkably similar to the distribution of targeted prey means. This is true regardless of whether all prey entries (482 cephalopods; 637 fish) are plotted (Figs. 47 and 48), or only the list of non-overlapping prey taxa (140 cephalopod taxa; 222 fish taxa) is plotted (Figs. 49 and 50). Although the modal value of maximum potential size is larger than the modal size of prey means (35-40 cm versus 5-10 cm), the overall pattern suggests that, in general, marine mammals target a fairly consistent size category of prey the majority of the time.

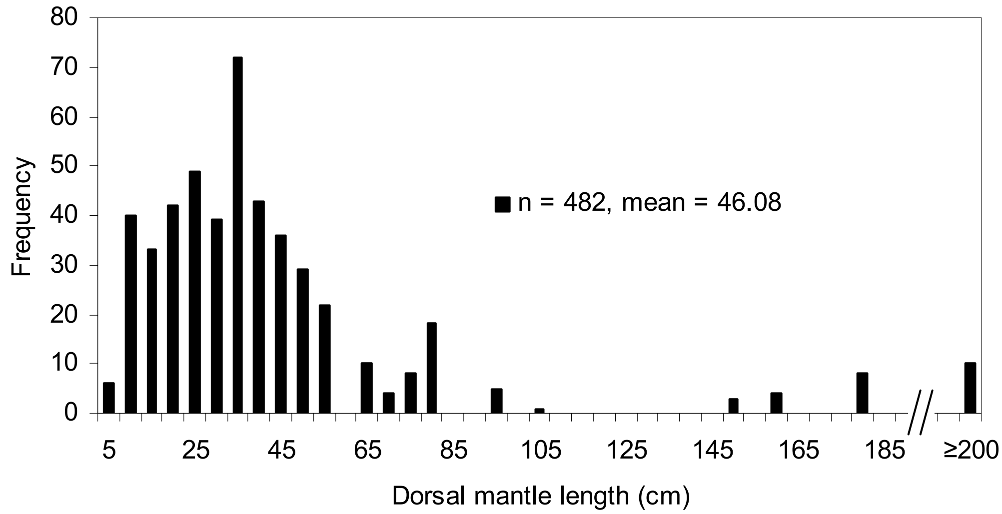

Figure 47.--Frequency distribution of maximum potential cephalopod size for all taxonomic entries consumed by marine mammals.

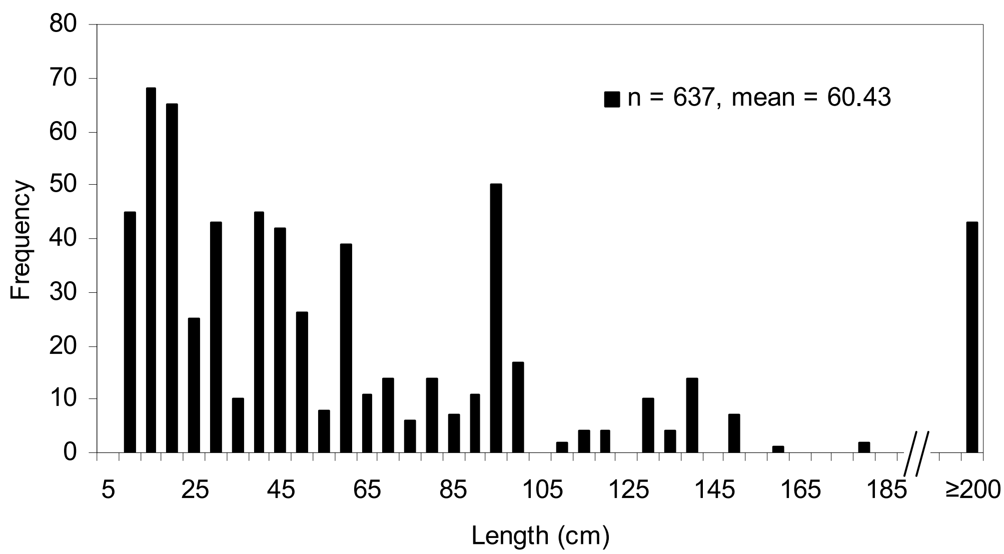

Figure 48.--Frequency distribution of maximum potential fish size for all taxonomic entries consumed by marine mammals.

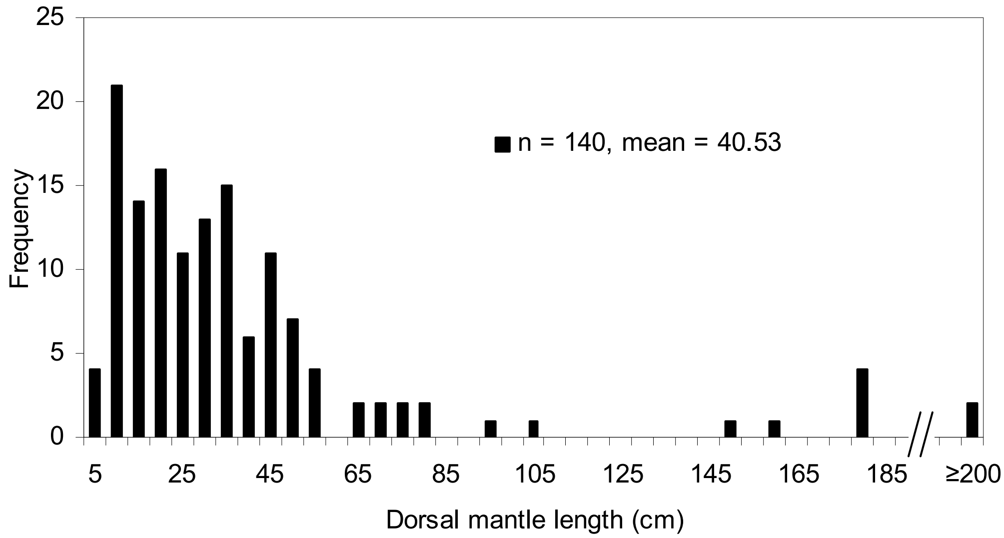

Figure 49.--Frequency distribution of maximum potential size for non-overlapping cephalopod prey taxa consumed by marine mammals.

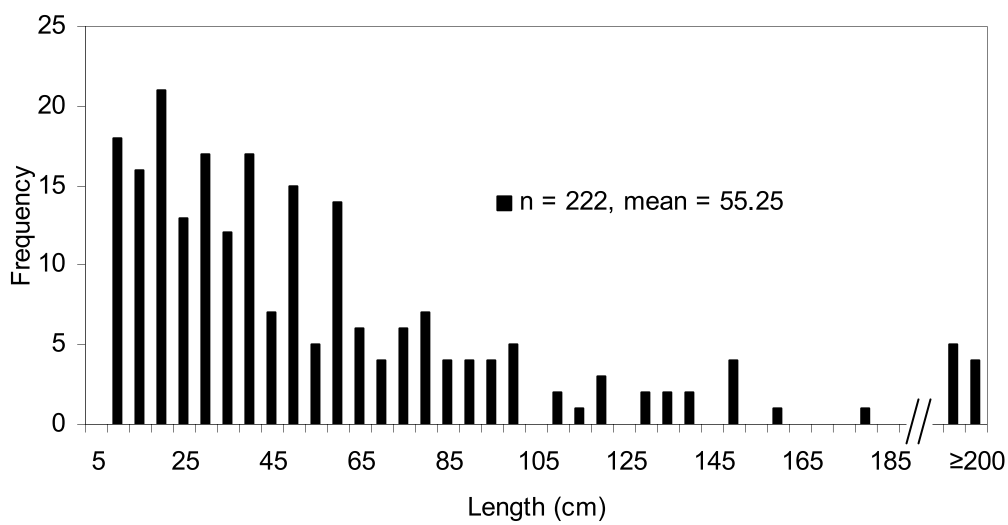

Figure 50.--Frequency distribution of maximum potential size for non-overlapping fish prey taxa consumed by marine mammals.

Relationship Between Predator Size and Prey Size

Despite the fact that the majority of prey targeted by marine mammals is smaller than 30 cm (Fig. 43), examination of the relationship between the size of the predator and mean size of their prey shows a significant positive correlation ($P < 0.001$). This is true for all predator species considered together (Fig. 51), as well as for odontocete whales (Fig. 52, $P < 0.001$) and otariid seals (Fig. 53, $P < 0.001$) considered separately. Surprisingly, the relationship is not significant for phocid seals (Fig. 54; $P = 0.87$).

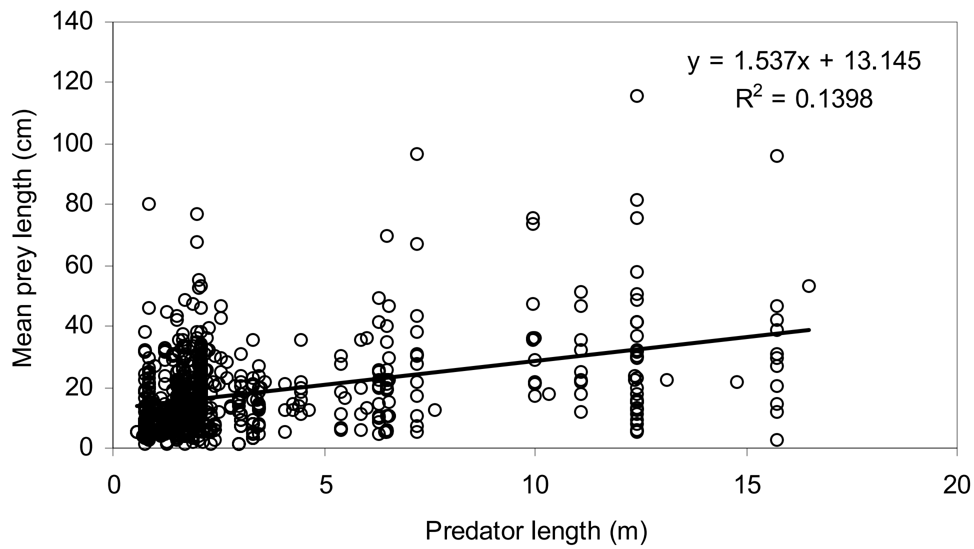

Figure 51.--Relationship between predator length and mean prey length for 699 cases, all marine mammal species combined ($P < 0.001$).

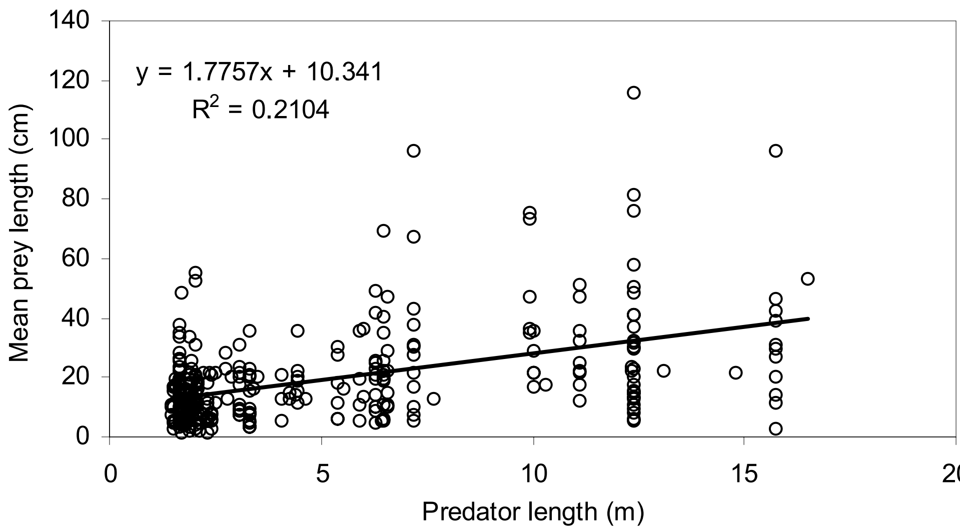

Figure 52.--Relationship between predator length and mean prey length for 146 odontocete entries ($P < 0.001$).

.

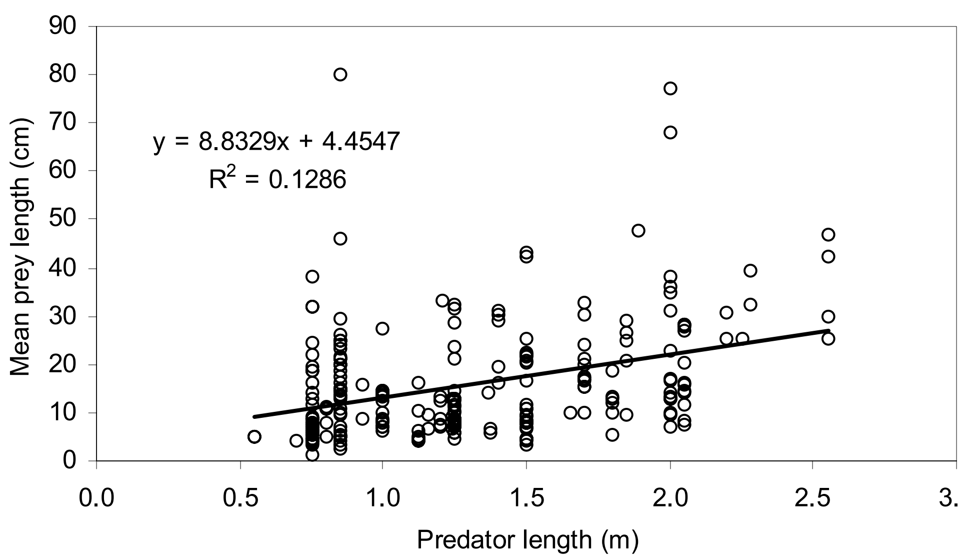

Figure 53.--Relationship between predator length and mean prey length for 237 otariid entries ($P < 0.001$).

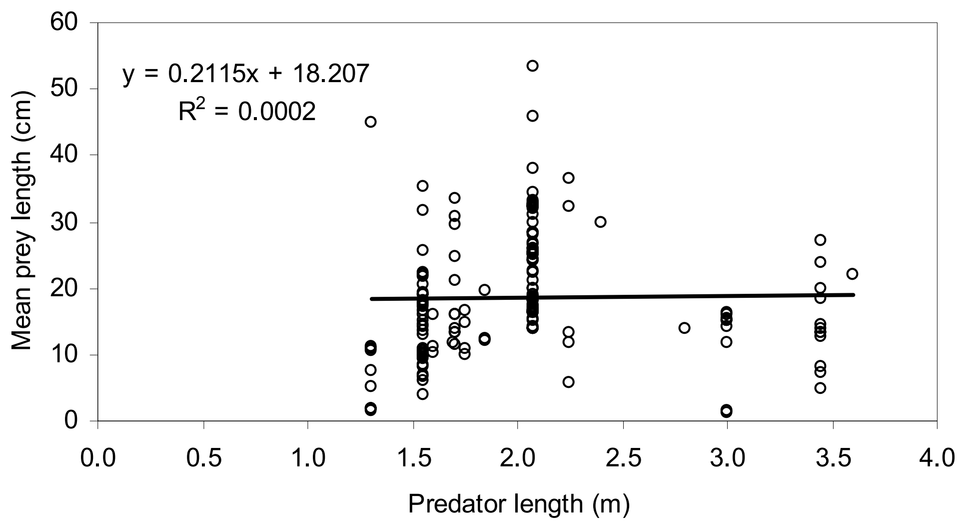

Figure 54.--Relationship between predator length and mean prey length for 146 phocid entries (P = 0.87).

Relationship Between Mean Size of Prey Consumed by Marine Mammals and Maximum Reported Prey Size

Although the relationship between predator size and prey size is significant in most cases, recall from the information presented above that the overall mean prey size is relatively small for each of these groups of predators when compared to the maximum reported size of each prey species. Examination of the relationship between mean prey size targeted by marine mammals and the maximum reported size of the prey species shows that the two are only weakly correlated. Consider, for example, the case of gray seals (*Halichoerus grypus*) foraging around Anticosti Island (Benoit and Bowen 1990). The largest taxon they prey upon is the Atlantic cod (*Gadus morhua*), with a maximum reported length of 200 cm (Froese and Pauly 2003).

However, gray seals restrict their consumption to cod ranging from 6.7 to 79.7 cm, with a mean size of 28.2 cm (Fig. 55). We will evaluate the degree to which that reflects size selectivity versus the relative availability of different size classes of cod when we consider the available survey data below.

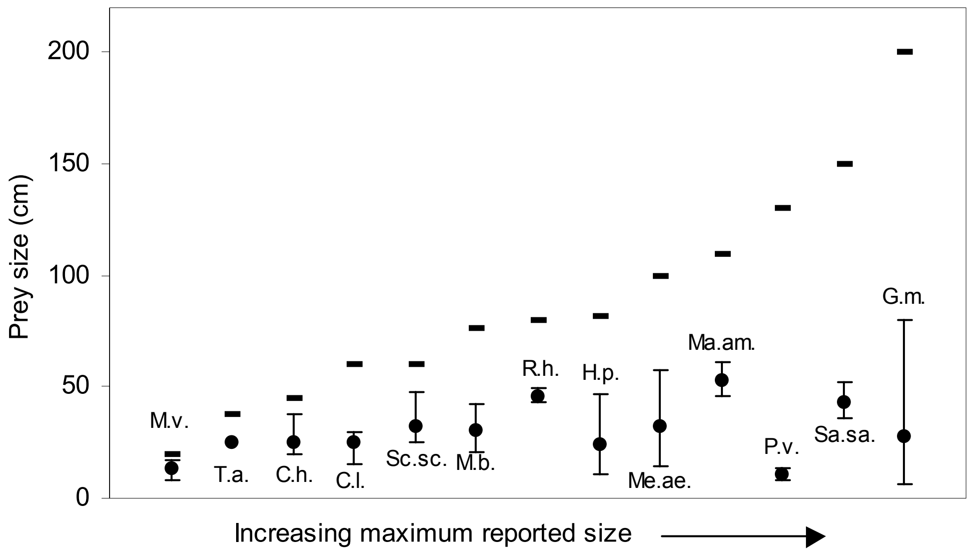

Figure 55.--Relationship between targeted size (shown as mean and range) and increasing maximum reported size (shown as dash above each prey entry) for various prey taxa consumed by gray seal (*Halichoerus grypus*, from Benoit and Bowen 1990). Key to prey species abbreviations: M.v. = *Mallotus villosus*, T.a. = *Tautogolabrus adspersus*, C.h. = *Clupea harengus*, C.l. = *Cyclopterus lumpus*, Sc.sc. = *Scomber scombrus*, M.b. = *Merluccius bilinearis*, R.h. = *Reinhardtius hippoglossoides*, H.p. = *Hippoglossoides platessoides*, Me.ae. = *Melangrammus aeglefinus*, Ma.am. = *Macrozoarces americanus*, P.v. = *Pollachius virens*, Sa.sa. = *Salmo salar*, G.m. = *Gadus morhua*.

There is a clear positive relationship between mean size and maximum reported size for prey consumed by gray seals (Fig. 56), but it appears to be a curvilinear relationship with mean prey size reaching an asymptote well below the maximum reported size for the larger prey species. We have characterized this asymptotic relationship using the Holling disk equation (Holling 1959), which has the form:

$$y = \frac{ax}{1 + bx},$$

where y = mean prey size and x = maximum reported prey size. The shape parameters a and b were estimated in SPSS using non-linear regression (Norusis 1998). In addition to the parameter estimates, SPSS provides the asymptotic standard errors of the parameter estimates (Table 35). These will be examined in more detail below in comparison with commercial fisheries.

Table 35.--Parameter estimates for non-linear estimation of the Holling disk equation (Holling 1959) describing the relationship between mean prey size and the maximum reported size of each prey taxon, for pairings of different predators and major prey types. Lower and upper CI = 95% confidence limits.

Pairing	n	Parameter	Parameter estimate	Asymptotic Standard error	Lower CI	Upper CI
gray seals X fish	13	A	1.7489	1.5502	-1.6631	5.1609
gray seals X fish	13	B	0.0438	0.0492	-0.0646	0.1521
Cephalopods, all prey entries	275	A	0.4915	0.0264	0.4395	0.5435
Cephalopods, all prey entries	275	B	0.0033	0.0006	0.0022	0.0044
Odontocetes X Cephalopods	219	A	0.5037	0.0319	0.4408	0.5667
Odontocetes X Cephalopods	219	B	0.0034	0.0007	0.0021	0.0047
Odontocetes X Cephalopods, 600 cm outlier removed	218	A	0.5575	0.0439	0.4711	0.6440
Odontocetes X Cephalopods, 600 cm outlier removed	218	B	0.0052	0.0012	0.0028	0.0075
Otariids X Cephalopods	38	A	0.7197	0.2466	0.2196	1.2198
Otariids X Cephalopods	38	B	0.0225	0.0160	-0.0099	0.0550
Phocids X Cephalopods	18	A	1.5031	1.1567	-0.9489	3.9552
Phocids X Cephalopods	18	B	0.0612	0.0697	-0.0865	0.2088
Fish, all prey entries	417	A	0.8678	0.0791	0.7123	1.0234

Fish, all prey entries	417	B	0.0227	0.0032	0.0163	0.0290
Odontocetes X Fish	114	A	0.8230	0.1676	0.4910	1.1549
Odontocetes X Fish	114	B	0.0199	0.0069	0.0063	0.0336
Otariids X Fish	181	A	0.7283	0.0766	0.5772	0.8795
Otariids X Fish	181	B	0.0132	0.0027	0.0078	0.0186
Phocids X Fish	120	A	0.8828	0.1520	0.5817	1.1838
Phocids X Fish	120	B	0.0275	0.0067	0.0143	0.0406

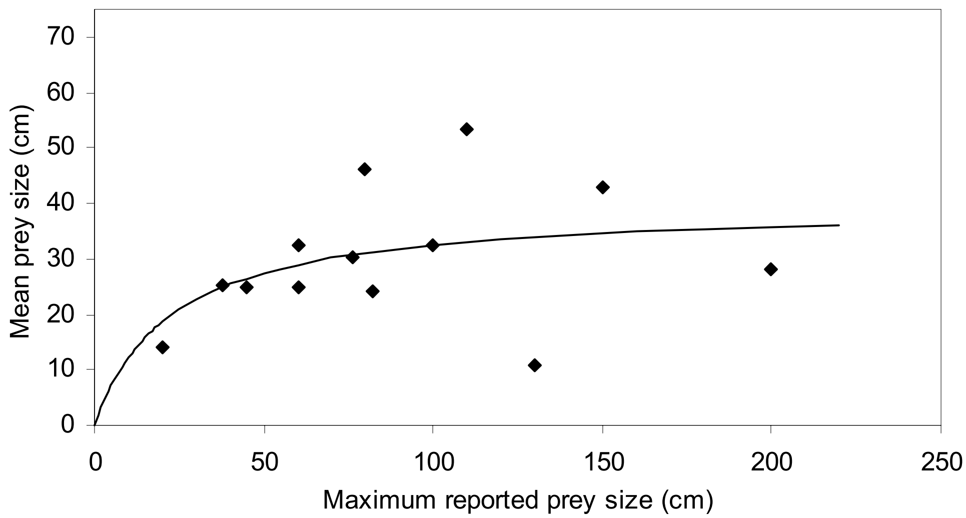

Figure 56.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 13 prey species eaten by gray seals. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

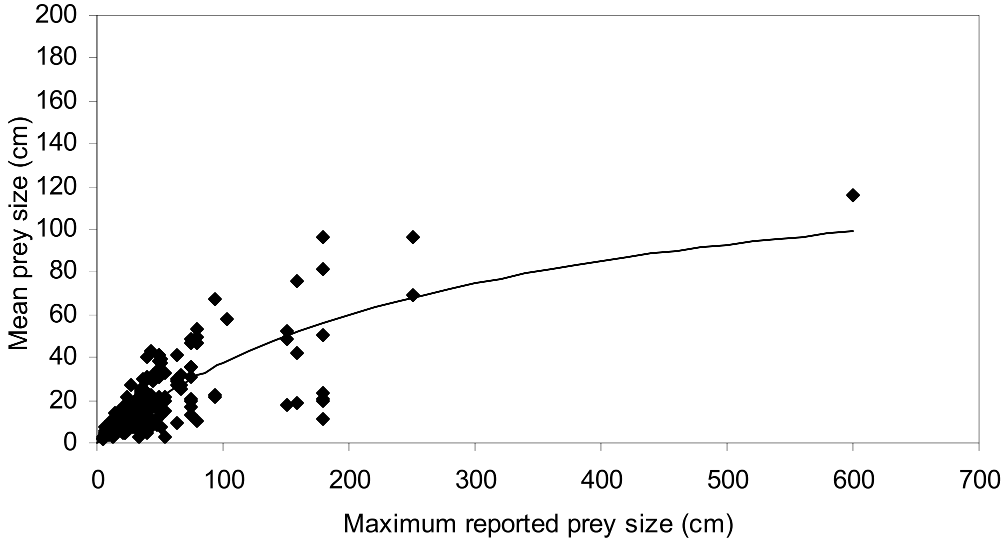

Figure 57.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 219 taxonomic entries of cephalopods eaten by odontocete whales. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

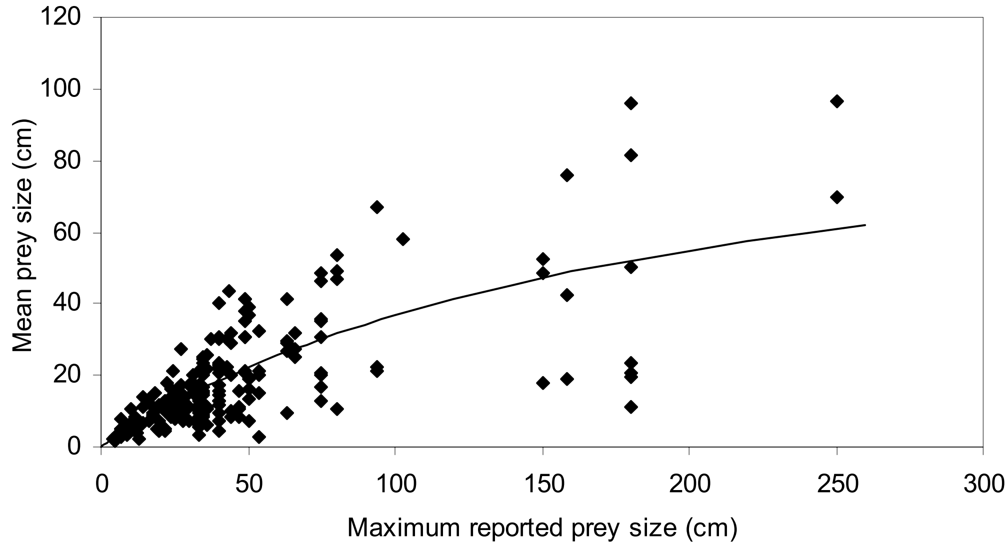

Figure 58.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 218 taxonomic entries of cephalopods eaten by odontocete whales, minus one 600 cm outlier (*Architeuthis dux)*. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

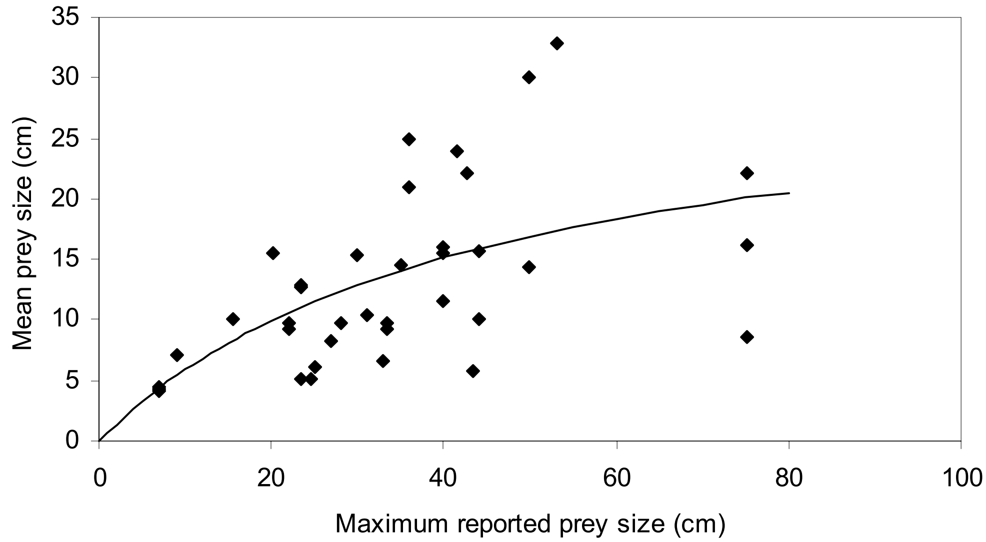

Figure 59.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 38 taxonomic entries of cephalopods eaten by otariid seals. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

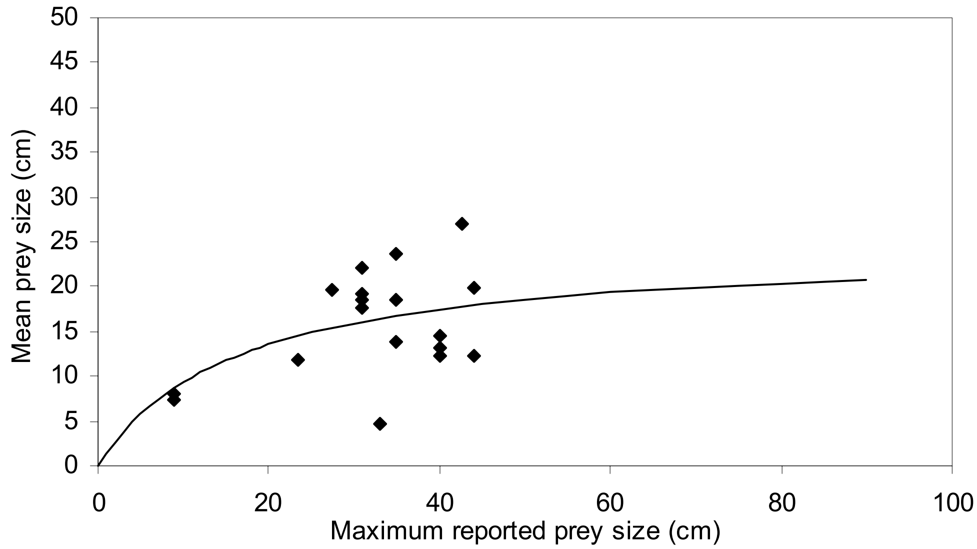

Figure 60.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 18 taxonomic entries of cephalopods eaten by phocid seals. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

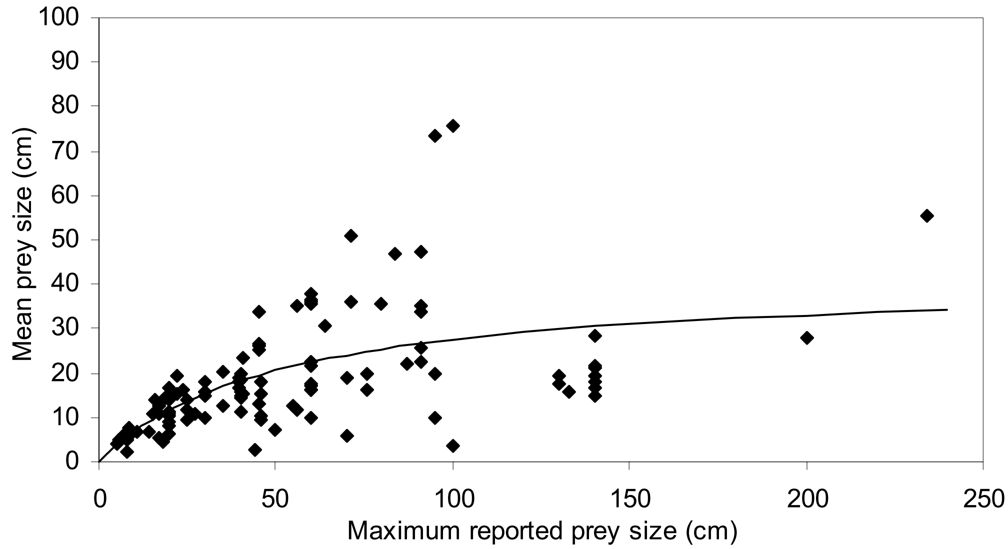

Figure 61.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 114 taxonomic entries of fish eaten by odontocete whales. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

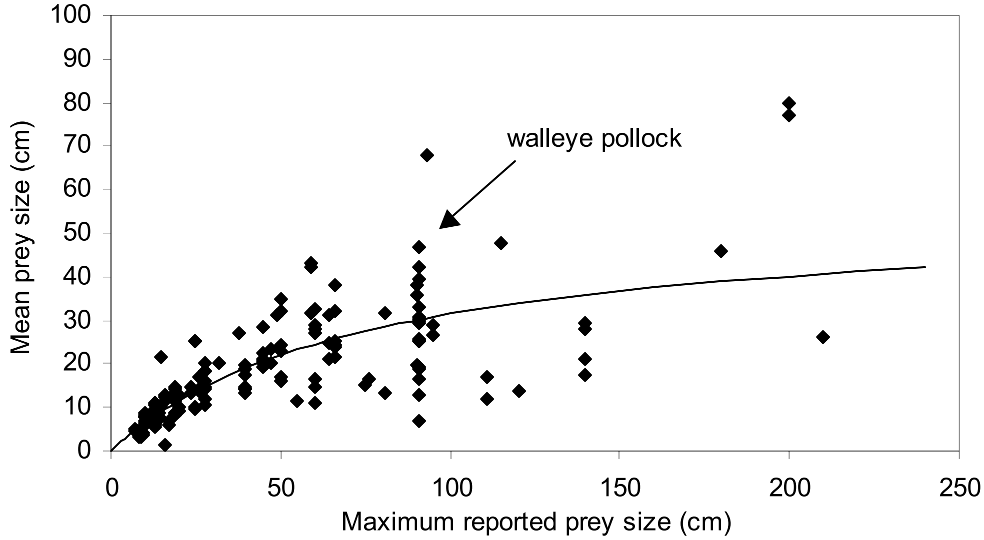

Figure 62.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 181 taxonomic entries of fish eaten by otariid seals. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression. The series of points at 91 cm maximum reported size represents walleye pollock (*Theragra chalcogramma*).

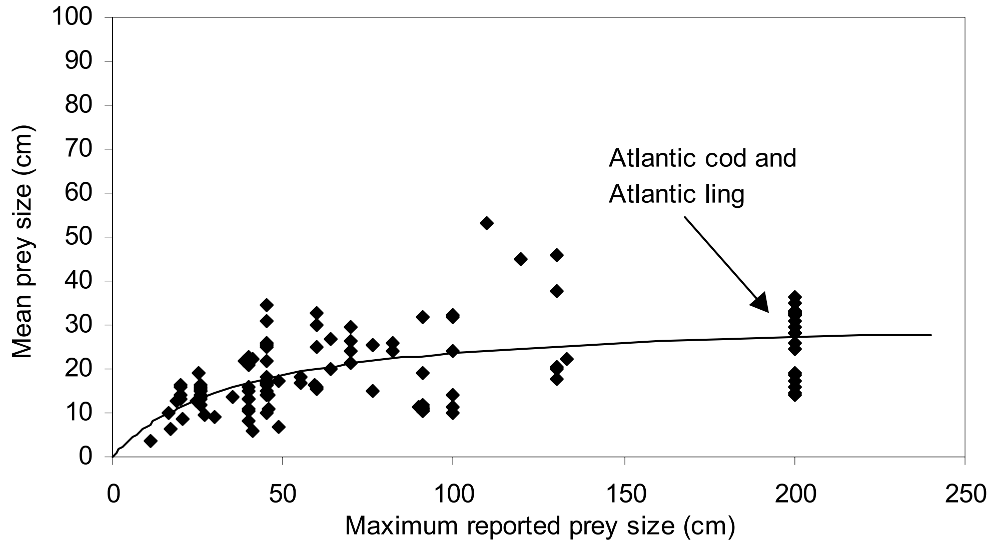

Figure 63.--Relationship between mean size of consumed prey and maximum reported size of individuals in the populations of 120 taxonomic entries of fish eaten by phocid seals. The curve describing the relationship is based on the Holling disk equation (Holling 1959), estimated using non-linear regression. The series of points at 200 cm maximum reported size represents Atlantic cod (*Gadus morhua*) and Atlantic ling (*Molva molva*).

As each of the preceding figures (Figs. 57 – 63) shows, the size of prey targeted by marine mammals is only weakly correlated with the maximum reported size of each prey taxon. This is particularly evident as prey size increases above 100 cm. That is, the majority of targeted prey with maximum size of 100 cm or larger tends to average under 50 cm. This relationship (which we will call a functional response, different from the functional response involving prey density/availability typical of other literature) is likely due to a complex interaction of factors, including swimming speed and gape size of the predator (Nilsson and Brönmark 2000, Scharf et al. 2000), swimming speed and body depth of the prey (Nilsson and Brönmark 2000), and size composition of the available prey. However, we cannot evaluate the extent to which these patterns represent size selectivity on the part of the predators until we have examined the available commercial and survey data in the following sections, which will provide an indication of the size composition of the prey available.

Another feature evident from the preceding figures, and figures to follow, is the distinct clustering of points at certain sizes along the x-axis. Specifically, there is a cluster at 91 cm maximum reported size corresponding to walleye pollock (*Theragra chalcogramma;* Fig. 62) and 200 cm maximum reported size corresponding to Atlantic cod (*Gadus morhua*) and Atlantic ling (*Molva molva*; Fig. 63). These clusters re-emphasize that when enough data are available for a particular prey species or species group, distinct patterns emerge (also illustrated in Figs. 30-42) showing the central tendency, as well as the variability around that central tendency, in the size selectivity of marine mammals. These clusters of points can be used to inform on single-species applications of the management approach advocated here.

RESULTS: COMPARISONS WITH COMMERCIAL CATCH DATA

The ease with which we were able to locate commercial data that corresponded with a particular food habits study relates to the sampling of the food habits study, the prey species involved, and the various ways in which commercial data are presented. Food habits studies conducted over a single season provide easy comparisons, as long as the commercial and survey data were also generated that same season in the same region. In contrast, some food habits studies span multiple sampling seasons, resulting in time-averaged values for the size composition of targeted prey. Consequently, any commercial data used for comparison should, to the extent possible, span the same temporal period as the food habits studies. In many cases this is clearly impossible to achieve. As a result, we have been able to draw direct comparisons between the size selectivity of marine mammals and commercial fisheries in relatively few cases (118 of 1,138 entries: see Appendix 5).

There are multiple ways of comparing food habits data with commercial data. In the context of interactions between commercial fishing and the food habits of birds, Duffy and Schneider (1994) have outlined five specific methods that have been used in the literature to quantify levels of competition. Of these, we will focus on two: the "Horn Ratio," which calculates the overlap in species composition, and a modification of the "Schaefer Ratio," which calculates the total removals of a prey species by a predator relative to the total catch of the commercial fishery.

Species composition is one measure of overlap between commercial and predator interests, and has arguably been either the explicit or implicit focus of the majority of food habits studies to date (Nilssen et al. 1990, Kaschner and Pauly 2004, Baraff and Loughlin 2000). With regard to the list of prey taxa compiled here, it may be the case that because we have limited our compilation to only those taxa for which prey size is available, we may be providing a biased species list. For instance, commercially unimportant taxa may not have been studied sufficiently to have regressions for calibrating body size estimates from measurements of preserved prey remains.

Examination of what is known about the food habits of northern fur seals (*Callorhinus ursinus*) suggests that this is not a significant source of bias. We have compiled prey size data for 28 non-overlapping prey species consumed by northern fur seals. Of these, 19, or 68%, are commercially important. For comparison, Kajimura's (1984) summary of food habits studies based on analysis of over 16,000 stomach samples listed 73 non-overlapping prey species for northern fur seals but did not present data on prey size. Of these, 48, or 66%, are commercially important. Thus, limiting our analysis to prey taxa for which size selectivity data are available does not appear to be biased towards commercially important taxa.

Our database contains data from a large number of independent studies, many of which cover the same predator and/or prey species. Consequently, we have a measure of how often various prey species are listed in food habits studies (a modified form of frequency of occurrence). We can also distill this data to include only the non-overlapping taxa. Either way, the results are broadly similar (Table 36). When all taxonomic entries are considered, 756/1,166, or 65% are, or potentially are, commercially harvested (Appendix 3). When only the non-overlapping taxa are considered, that number drops to 57% (218/380).

Table 36.--Levels of commercial importance for prey species in this study. Crustacean data from original food habits studies. Cephalopod data from Roper et al. 1984 and Nesis 1987. Fish data from FishBase (Froese and Pauly 2003).

Level of commercial importance	All taxonomic entries			Non-overlapping taxonomic entries		
	crustaceans	cephalopods	fish	crustaceans	cephalopods	fish
potential	--	98	10	--	24	4
minor	--	15	120	--	5	43
yes	22	115	360	6	25	110
no	12	221	140	11	81	61
indet.	--	20	5	--	3	--
sub-total	34	469	635	17	138	218
TOTAL	1138			373		

We also examine the overlap between food habits and commercial fisheries by examining modifications of the Schaefer Ratio (Duffy and Schneider 1994). Although we will generally be comparing total removals, we will be using size-structured models to do so. Specifically, we will focus on a comparison between the targeted prey size of marine mammal food habits and the size composition of the commercial take of the same prey species. We will do this in two ways. First, we will draw a comparison between the mean prey size taken by marine mammals and the mean size of the commercial catch. Second, we will evaluate the degree of overlap in the LF distributions for marine mammals compared to commercial fisheries.

Keeping in mind the caveats discussed previously concerning the appropriateness of using mean prey size as the measure of central tendency of size in distributions that are often asymmetrical, the tendency for the size distributions of commercial catch to be asymmetric were evaluated. We have not calculated any of the shape statistics for the commercial data. However, we calculated the same index of symmetry as for the food habits data: the mean is subtracted from the midpoint of the range. When this is done for 118 entries for commercial catch data (each of which corresponds to a food habits entry), the results are broadly similar to what was seen for the food habits data (see Fig. 7), but with a higher tendency for the mean to be less than the midpoint of the size range (i.e., positively skewed). Specifically, the overall mean difference between the midpoint of the size range of and the mean of commercial data is 2.69 cm (compared to 1.21 in the food habits size distributions). The mean is within ± 2 cm of the midpoint of the range in 51% of the cases (Fig. 64). In contrast, the mean is 2 cm or more below the midpoint (resulting in a positive difference, indicative of positive skew) in 41% of the cases while it is 2 cm or more above the midpoint (indicative of negative skew) in 8% of the cases.

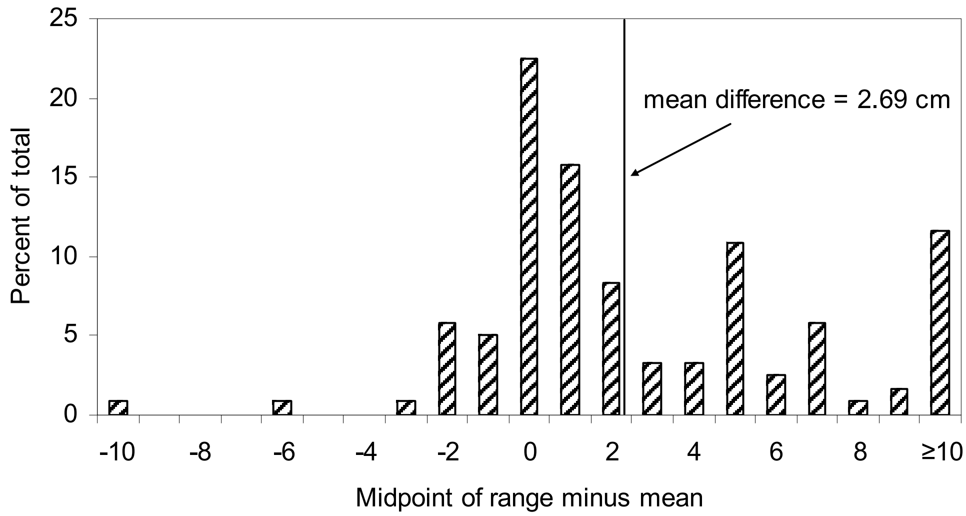

Figure 64.--Distribution of absolute differences between midpoint of range of values and the mean for 120 commercial catch size distributions. Compare this figure with Figure 7.

Regardless of whether or not the mean size of prey species is the most appropriate summary statistic to use, that is the form of the data that are most readily available from the food habits literature for comparison with commercial fisheries data. For our next analysis, we calculated the difference in mean prey size by subtracting the food habits mean from the commercial mean for pairings of data that are from the same region and the same time period. The mean difference in means is 7.37 cm, with the overwhelming majority (71%) being positive values. That is, the mean size of commercial catches was greater than mean size of prey found in the food habits of marine mammals (Fig. 65). This shows a clear tendency for commercial fisheries to target larger individuals than are being targeted by marine mammal predators. Furthermore, the magnitude of the difference increases significantly ($P < 0.001$) with increasing overall body size of the target species (Fig. 66).

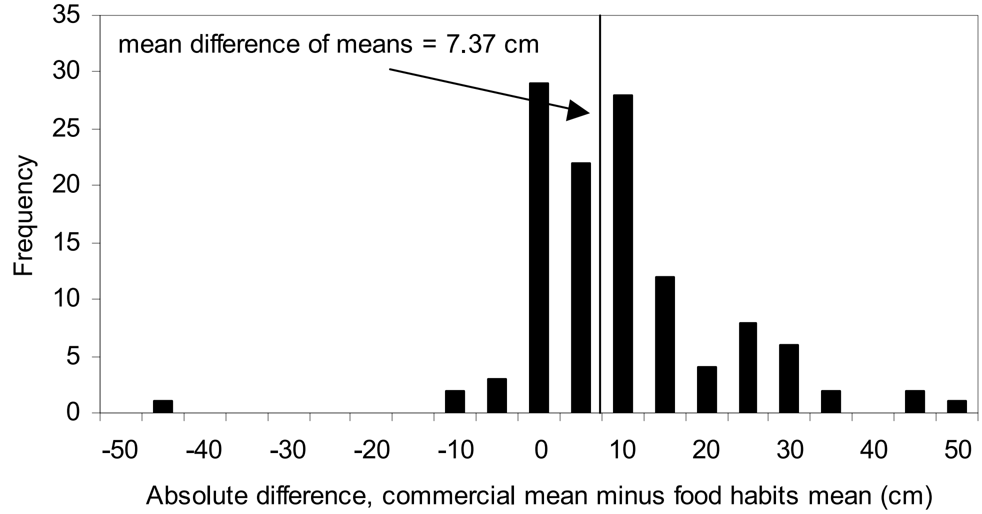

Figure 65.--Distribution of differences in means (commercial mean minus food habits mean) for 120 prey entries.

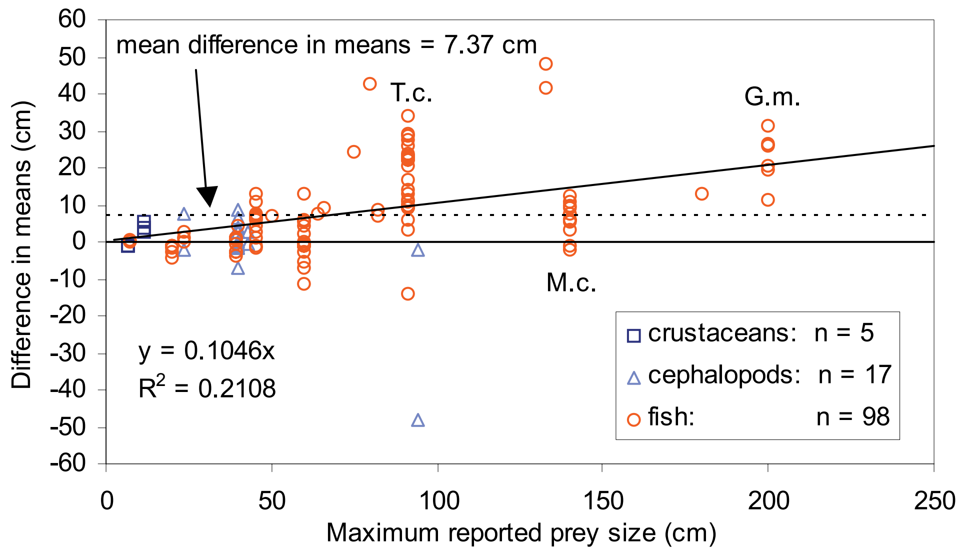

Figure 66.--Distribution of differences in means (commercial mean minus food habits mean) for 120 prey entries, as a function of the maximum reported size for each prey species. Dashed horizontal line indicates the mean difference of means (7.37 cm). Abbreviations in plot refer to prey taxa with multiple entries (T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

Species-specific Patterns of Size Composition

Examination of many of the previous figures shows several clusters of points with the same maximum reported prey size (e.g., Fig. 66). In some cases these clusters represent multiple prey taxa that coincidentally have the same maximum reported size. For example, the cluster at 60 cm maximum reported prey size in Figure 66 is composed of data from three prey taxa: Agulhas sole (*Austroglossus pectoralis*), Atlantic mackerel (*Scomber scombrus*), and Cape horse mackerel (*Trachurus trachurus capensis*). However, some of the clusters are comprised solely, or predominantly, of one prey taxon (e.g., the cluster at 91 cm represents only walleye pollock, *Theragra chalcogramma*). The prey taxa represented by 10 or more cases are the same taxa that appeared in our discussion of patterns of predation by marine mammals on selected prey taxa (Figs. 30-42).

Here we draw a direct comparison between the mean size of prey consumed by marine mammals (Fig. 30-42) and the corresponding commercial data. For many of the cases we have commercial data that match reasonably well in terms of spatial and temporal coverage. However, it is often the case that a single record of commercial catch must be used for comparison with multiple food habits entries. For example, our database (Appendix 2) contains 24 entries of mean prey size for odontocete whales stranded on the South Africa coast between 1969 and 1990 (Sekiguchi et al. 1992). These data cover predation by eight species of odontocetes on seven prey taxa. However, because the food habits data were all collected from the same general area and span approximately the same time period, a single source of data was used for comparison with the commercial catch (Sekiguchi et al. 1992). Consequently, the frequency distribution of means that we use here will include only independent commercial means. That is, rather than repeating the identical commercial catch data for each of the corresponding food habits studies, each commercial data point will only appear once in the following LF distributions.

Of the 15 entries of mean prey size we have for krill (*Euphausia superba*), we were able to locate only two cases of commercial catch data that correspond temporally and spatially with the food habits studies (Fig. 67). These two cases fall within the distribution of mean krill size targeted by marine mammals.

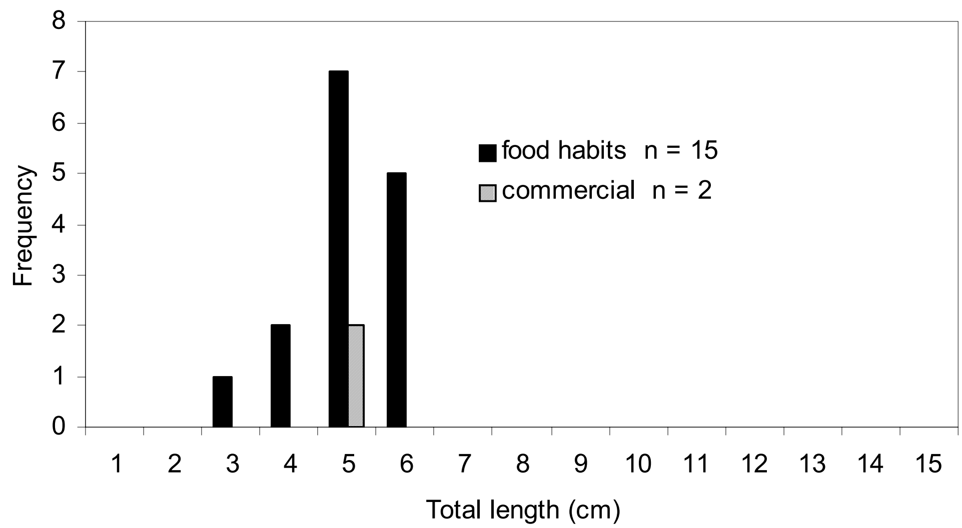

Figure 67.--Frequency distribution of mean size of krill (*Euphausia superba*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

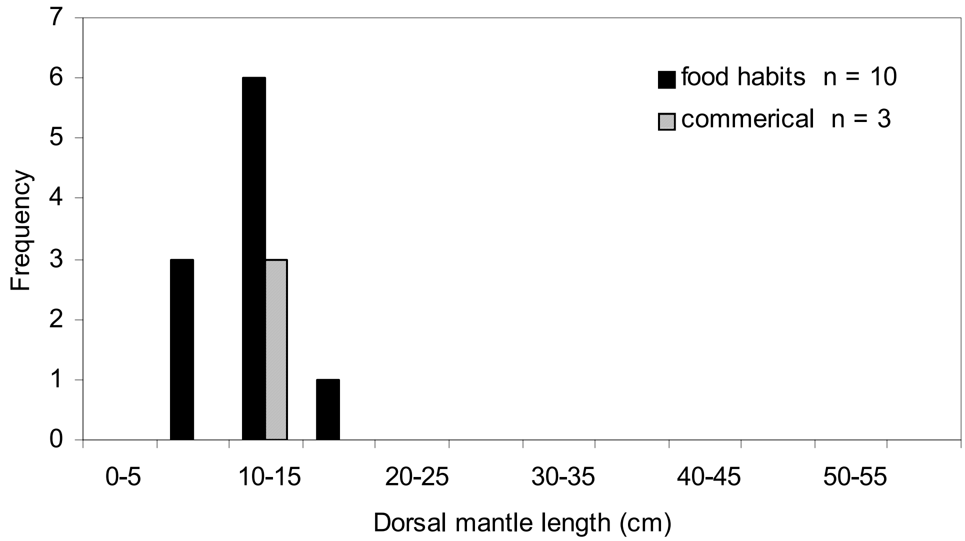

Figure 68.--Frequency distribution of mean size of market squid (*Loligo opalescens*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

The situation is similar for market squid (*Loligo opalescens*), with only 3 of the 10 food habits entries with comparable commercial data available for comparison (Fig. 68). As with krill, the mean size of the commercial catch of market squid is broadly comparable with that of marine mammals. However, it is important to note that the mean size of the commercial catch declined steadily over the latter half of the 20th century (Leos 1998).

The situation for Cape Horn squid (*L. vulgaris reynaudii*) is also similar to the first two examples. The mean size of the commercial catch is similar to the mean size targeted by marine mammals (Fig. 69). One of the two commercial catch records (10.52 cm) corresponds well with eleven separate food habits prey entries (Appendix 5).

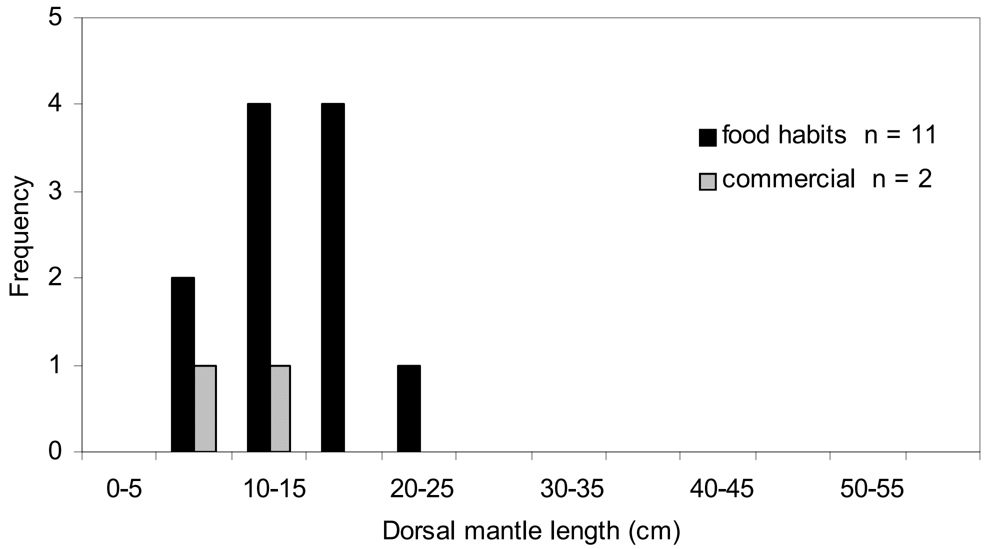

Figure 69.--Frequency distribution of mean size Cape Horn squid (*Loligo vulgaris reynaudii*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

The case of Atlantic herring (*Clupea harengus*), in contrast to the examples above, shows hints of a difference between the commercial catch data and the mean size targeted by marine mammals (Fig. 70). Although we only have two independent cases of commercial data, they correspond to 8 of the 10 food habits entries (Appendix 5), showing a slight tendency for commercial fisheries to target larger herring than do marine mammals.

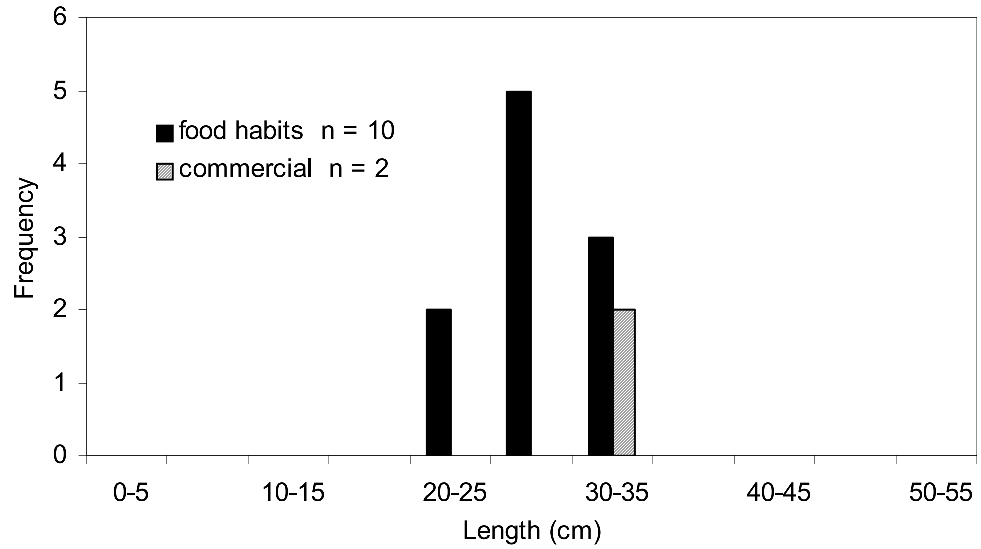

Figure 70.--Frequency distribution of mean size of Atlantic herring (*Clupea harengus*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

We located 3 commercial catch records of pilchard (*Sardinops sagax*) for comparison with 7 of the 11 food habits entries (Fig. 71; Appendix 5). As with the commercial targeting of herring, there is a slight tendency for commercial fisheries to target larger pilchard than do marine mammals.

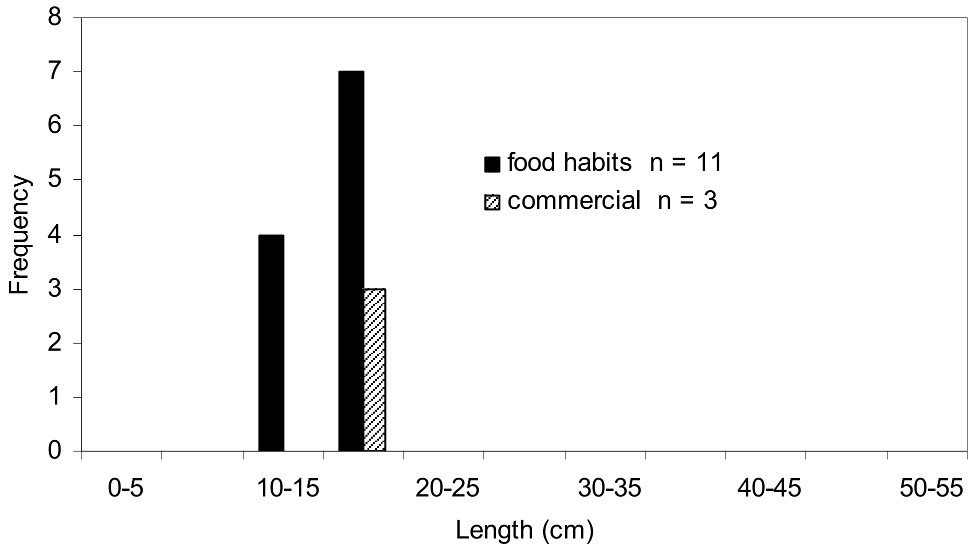

Figure 71.--Frequency distribution of mean size of pilchard (*Sardinops sagax*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

A clear indication of a difference between the mean size of prey targeted by commercial fisheries and marine mammals is seen in the case of Atlantic cod (*Gadus morhua*; Fig. 72). The 2 commercial data points correspond to 5 of the 19 food habits cases, with the mean commercial size larger than the food habits mean in every case.

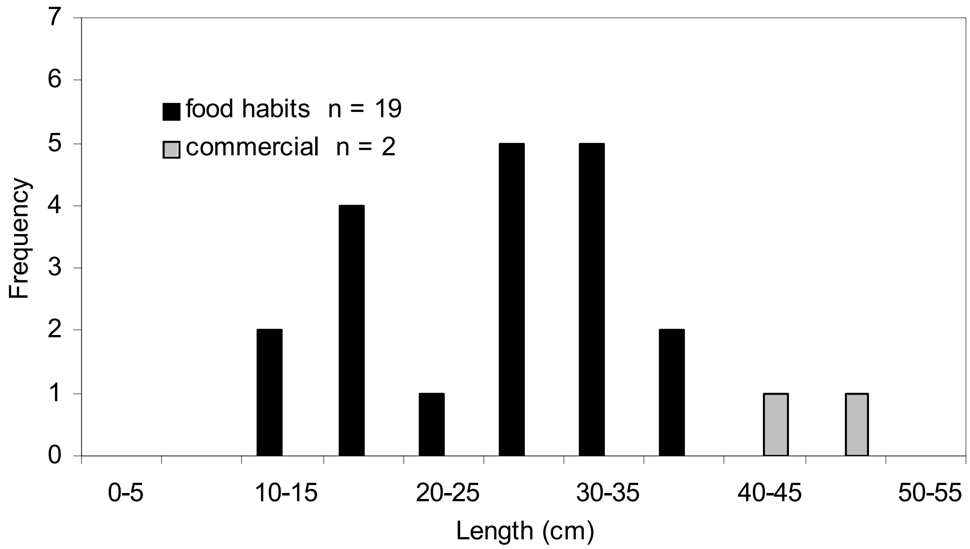

Figure 72.--Frequency distribution of mean size of Atlantic cod (*Gadus morhua*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

Walleye pollock (*Theragra chalcogramma*) is one of the few prey species for which we have a substantial number (14) of independent commercial cases for comparison with the food habits data. Indeed, the temporal and spatial coverage of the commercial data corresponds with 19 of the 25 food habits entries. Recall from the discussion above that the distribution of means targeted by marine mammals has strong modes at 10-15 cm and 25-30 cm, with a weaker mode at 45-50 cm. The distribution of commercial means has a strong mode at 30-35 cm, with a weaker mode at 40-45 cm (Fig. 73). In the 19 pair-wise comparisons between the commercial mean and the food habits mean, the commercial mean is larger than the food habits mean in 18 cases, with an overall mean difference in means of 17.36 cm (Fig. 74; Appendix 5). The single case where the food habits mean was larger than the commercial mean is for Steller sea lions (*Eumetopias jubatus*) sampled in the Pribilof Islands in 1976 and 1979 (Frost and Lowry 1986). In those 2 years, the mean size of pollock targeted by Steller sea lions was 46.9 cm. In contrast, the mean size of the commercial catch in the eastern Bering Sea in 1976 was 33.1 cm (Bakkala 1989).

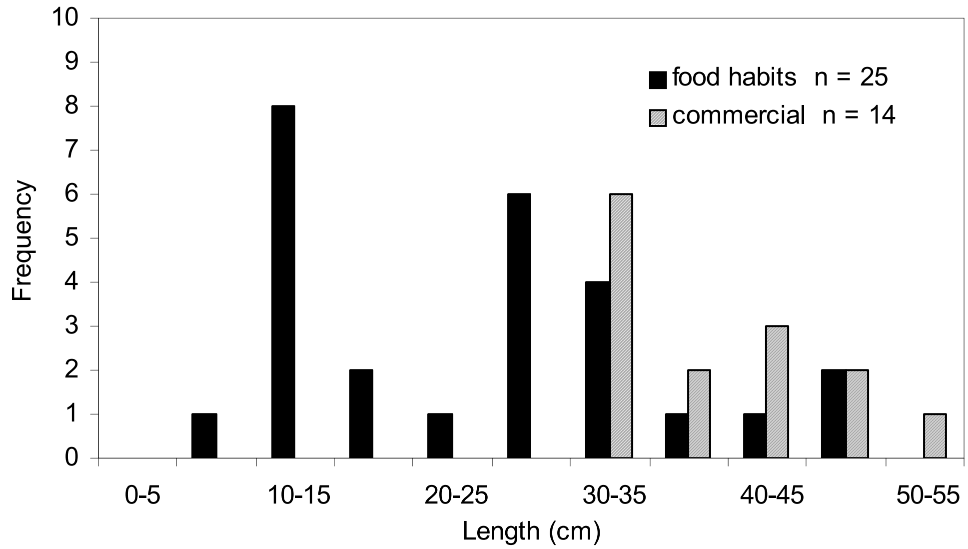

Figure 73.--Frequency distribution of mean size of walleye pollock (*Theragra chalcogramma*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

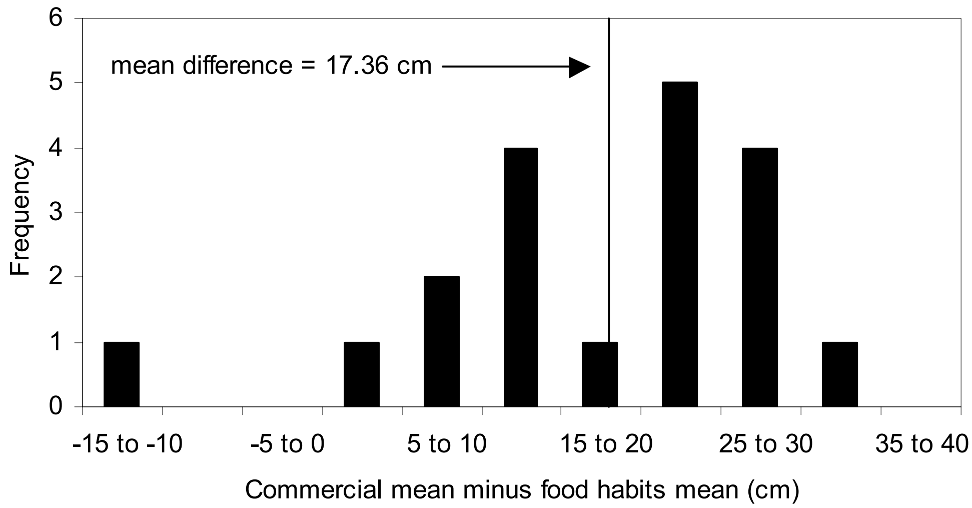

Figure 74.--Distribution of differences in means (commercial mean minus food habits mean) for 19 prey entries for walleye pollock (*Theragra chalcogramma*).

All of the data for marine mammal predation on Cape hakes (*Merluccius* spp.) derive from the Benguela Current of South Africa (n = 10), spanning the years 1969 to 1990 (David 1987, Sekiguchi et al. 1992). Thus, as with the case of Cape Horn squid, a single, time-averaged value for the period 1984 to 1986 (Fig. 75) has been used for the commercial catch (Payne et al. 1985, 1986; Sekiguchi et al. 1992). This value (27.19 cm) is situated in the upper end of the distribution of means from food habits studies. However, the difference of means in the pair-wise comparisons is positive in 8 of the 10 cases, with an overall mean difference of 6.35 cm (Fig. 76).

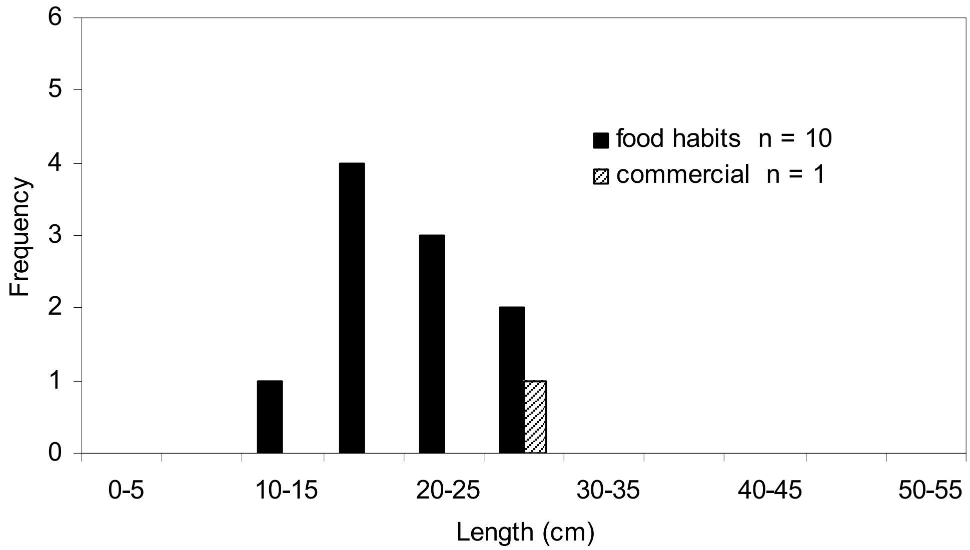

Figure 75.--Frequency distribution of mean size of Cape hakes (*Merluccius* spp.) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

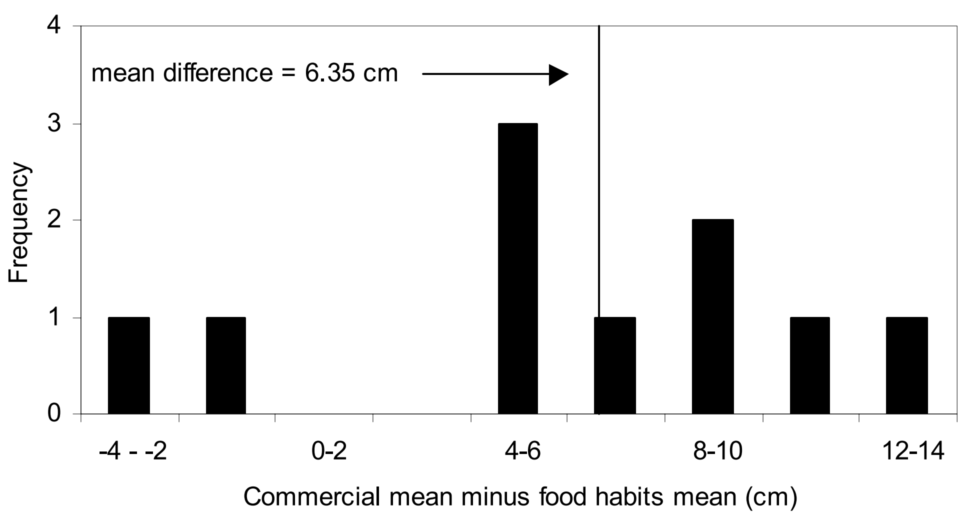

Figure 76.--Distribution of differences in means (commercial mean minus food habits mean) for 10 prey entries for Cape hakes (*Merluccius* spp.).

The final example we use to show the relationship between the mean size of prey targeted by marine mammals and the mean size taken by commercial fisheries is that of the mackerel icefish (*Champsocephalus gunnari*). For this species, we have 3 independent cases of commercial data (Fig. 77) corresponding to 4 of the 10 food habits cases. Generally speaking, the commercial means fall within the distribution of food habits means. However, in each of the four pair-wise comparisons, the commercial mean is larger than the food habits mean (mean difference = 4.9 cm).

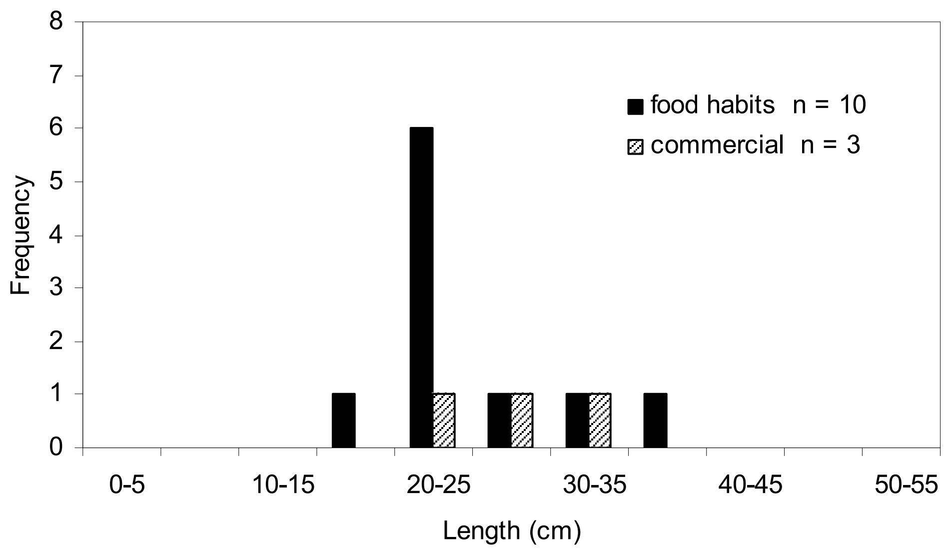

Figure 77.--Frequency distribution of mean size of mackerel icefish (*Champsocephalus gunnari*) targeted by marine mammals (solid bars) versus commercial fisheries (hatched bars).

Relationship Between Mean Size of Commercial Catch and Maximum Reported Size

Recall from the previous discussion that the size of prey targeted by marine mammals is positively correlated in a non-linear fashion with the maximum reported size that a particular prey species attains. Specifically, as maximum prey size increases, the mean size targeted by marine mammals increases asymptotically, but to a point substantially smaller than the maximum size of the prey (Figs. 57-63). This functional response is likely to be constrained by a combination of factors, many of which probably do not apply to the capture techniques used in commercial fisheries. Thus, it is instructive to examine the same relationship for taxa for which there is a commercial fishery to determine the extent to which human removals are, or are not, similar to the removals of other mammalian predators.

We use the same approach here as we did with the food habits data, plotting mean targeted size against maximum reported size for each target species. As before, this relationship is characterized with the Holling disk equation (Holling 1959) using non-linear regression in SPSS (Norusis 1998). Given the relatively small number of commercial fisheries cases we have found that correspond to specific food habits studies, we only have results for targeted species of fish[3].

We have already shown a tendency for commercial fisheries to target larger individuals in any pair-wise comparison with food habits data. Thus, we would expect that the functional response curve for commercial fisheries would be higher than that of marine mammal predation. Indeed, plotting all available data (i.e., all pair-wise comparisons, plus food habits data for which we do not have comparable fisheries data) show that this is the case, with the commercial curve significantly higher than the food habits curves (Fig. 78; Table 37). The same pattern emerges when food habits data are considered separately for Odontocetes, Otariids, and Phocids (Figs. 79-81; Table 38).

[3] Although there are 19 entries for commercial catches of cephalopods, 10 of these are the same commercial catch record for *Loligo vulgaris reynaudii* repeated for comparison with multiple marine mammal predation reported in Castley et al. 1991, Lipinski and David 1990, and Sekiguchi et al. 1992, all of which span the period of approximately 1969-1990.

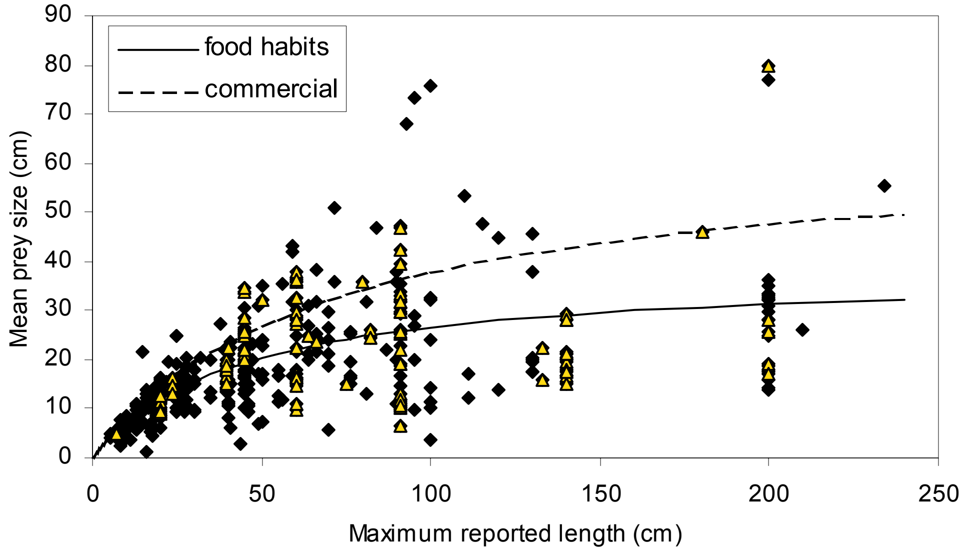

Figure 78.--Relationship between mean prey size and maximum reported size of 417 taxonomic entries of fish eaten by marine mammals (diamonds, solid line) compared with 94 commercial fisheries cases (triangles, dashed line). The curves describing the relationships are based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

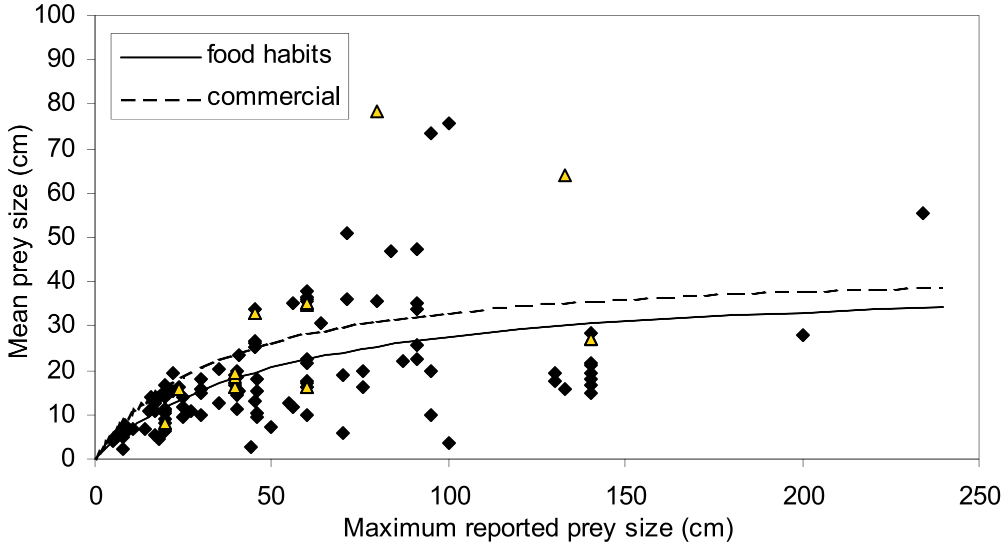

Figure 79.--Relationship between mean prey size and maximum reported size of 114 taxonomic entries of fish eaten by odontocetes (diamonds, solid line) compared with 27 commercial fisheries cases (triangles, dashed line). The curves describing the relationships are based on the Holling disk equation (Holling 1959), estimated using non-linear regression.

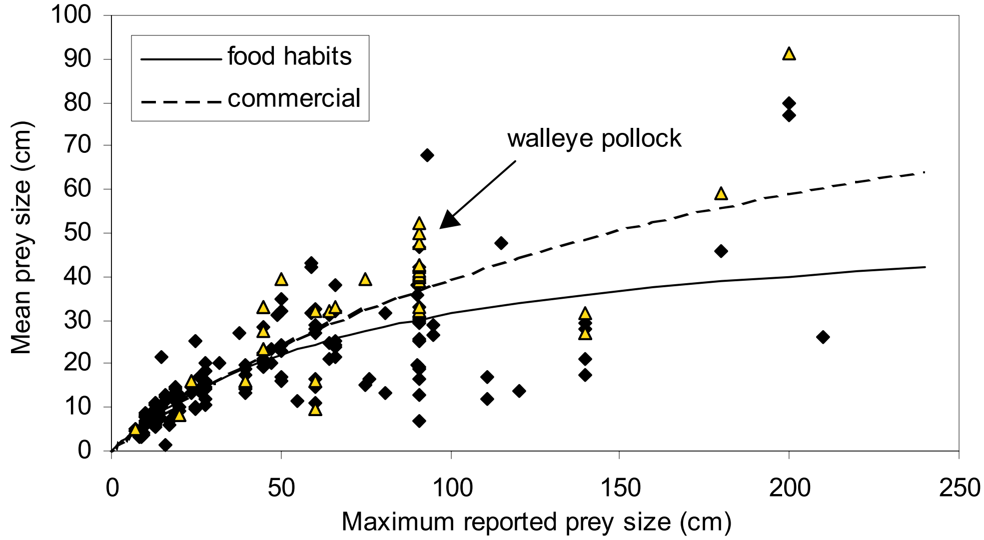

Figure 80.--Relationship between mean prey size and maximum reported size of 181 taxonomic entries of fish eaten by otariids (diamonds, solid line) compared with 44 commercial fisheries cases (triangles, dashed line). The curves describing the relationships are based on the Holling disk equation (Holling 1959), estimated using non-linear regression. The series of points at 91 cm maximum reported size represents walleye pollock (*Theragra chalcogramma*).

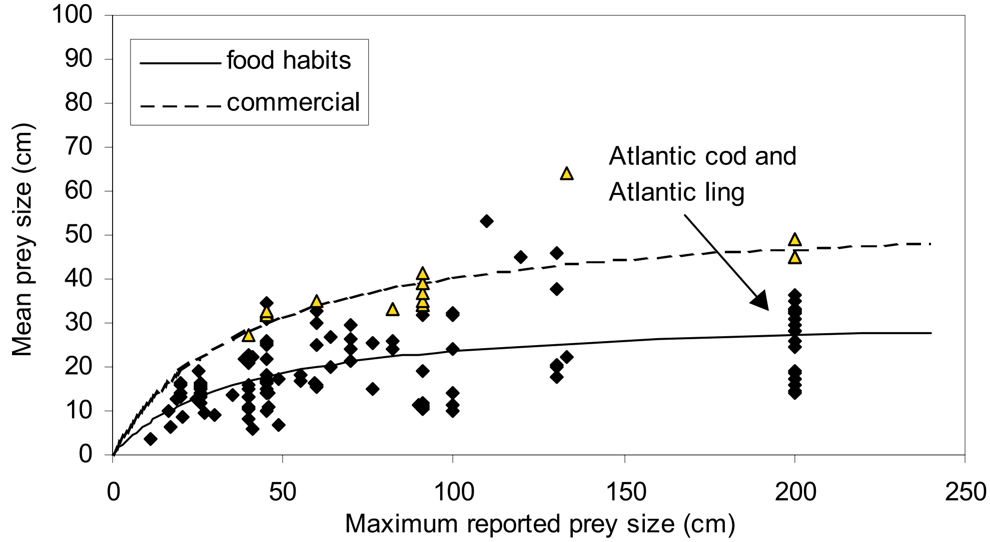

Figure 81.--Relationship between mean prey size and maximum reported size of 120 taxonomic entries of fish eaten by phocids (diamonds, solid line) compared with 23 commercial fisheries cases (triangles, dashed line). The curves describing the relationships are based on the Holling disk equation (Holling 1959), estimated using non-linear regression. The series of points at 200 cm maximum reported size represents Atlantic cod (*Gadus morhua*) and Atlantic ling (*Molva molva*).

Table 37.--Parameter estimates for non-linear estimation of the Holling disk equation (Holling 1959) describing the relationship between mean fish size targeted by commercial fisheries and the maximum reported size of each prey taxon, for commercial data paired with specific food habits studies. Lower and upper CI = 95% confidence limits

Pairing	**n**	**Parameter**	**Parameter estimate**	**Asymptotic Standard error**	**Lower CI**	**Upper CI**
Fish, all commercial entries	94	*a*	0.917399	0.155654	0.608256	1.226542
Fish, all commercial entries	94	*b*	0.014262	0.004157	0.006006	0.022518
Commercial X Fish X Odontocetes	27	*a*	1.285662	0.698803	-0.153550	2.724874
Commercial X Fish X Odontocetes	27	*b*	0.028906	0.022554	-0.017544	0.075356
Commercial X Fish X Otariids	44	*a*	0.598275	0.113277	0.369672	0.826877
Commercial X Fish X Otariids	44	*b*	0.005124	0.002762	-0.000450	0.010699
Commercial X Fish X Phocids	23	*a*	1.418855	0.291042	0.813599	2.024110
Commercial X Fish X Phocids	23	*b*	0.025172	0.007162	0.010279	0.040066

Table 38.--Significance of statistical comparison of parameter estimates using two-sample t-test for each pair of parameters. Note that while the estimates of *b* in the pairing between Phocids and Commercial targeting of fish is not significant, the curves as a whole are.

Pairing	**n**	**Parameter**	**Parameter estimate**	**Asymptotic Standard error**	**P-value**
Fish, all prey entries	417	*a*	0.8678	0.0791	P < 0.01
Fish, all commercial entries	94	*a*	0.9174	0.1557	
Fish, all prey entries	417	*b*	0.0227	0.0032	P < 0.01
Fish, all commercial entries	94	*b*	0.0143	0.0042	
Odontocetes X Fish	114	*a*	0.8230	0.1676	P < 0.01
Commercial X Fish X Odontocetes	27	*a*	1.2857	0.6988	
Odontocetes X Fish	114	*b*	0.0199	0.0069	P < 0.01
Commercial X Fish X Odontocetes	27	*b*	0.0289	0.0226	
Otariids X Fish	181	*a*	0.7283	0.0766	P < 0.01
Commercial X Fish X Otariids	44	*a*	0.5983	0.1133	
Otariids X Fish	181	*b*	0.0132	0.0027	P < 0.01
Commercial X Fish X Otariids	44	*b*	0.0051	0.0028	
Phocids X Fish	120	*a*	0.8828	0.1520	P < 0.01
Commercial X Fish X Phocids	23	*a*	1.4189	0.2910	
Phocids X Fish	120	*b*	0.0275	0.0067	P = 0.07
Commercial X Fish X Phocids	23	*b*	0.0252	0.0072	

Overlap in Size Distributions

If the commercial fishery tends to target larger individuals than predators do, then it stands to reason that the LF distributions will also be different. However, calculating the amount of overlap, or the degree to which they are different (or similar) is surprisingly complicated. Calculating the degree of overlap when the distributions do not intersect is straightforward enough because there is zero overlap (Fig. 82). This is the ideal situation sought under conventional management schemes, because under such a harvest regime there should be no (direct) competition between different stake holders (adding the ever-important caveat "as long as recruitment is not affected"; Frost and Lowry 1986).

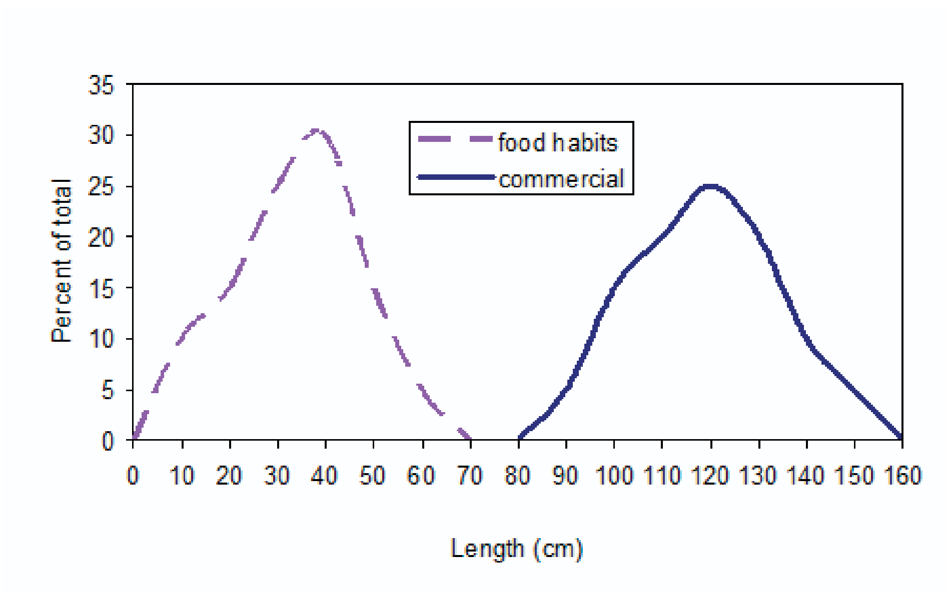

Figure 82.--Hypothetical situation where the LF distribution of the prey size targeted by marine mammals does not overlap with the LF distribution of the commercial fishery.

Although calculating the degree of overlap in this first example is deceptively simple, the situation changes quickly once the LF distributions intersect. Indeed, as we show below, there are at least six different ways to calculate overlap. Each of these will be discussed briefly.

Of the six approaches to calculating overlap, there are two main categories: those that calculate the overlap two dimensionally by summing the *area* of overlap for the two curves; and those that calculate the overlap in only one dimension as the *range* of overlap along the axis of prey size. Both of these approaches can also be sub-divided further depending on whether they calculate the overlap with respect to the total size range of the prey species, the size range targeted by the fishery, or the size range targeted by the predator.

To illustrate further, we demonstrate three cases where the upper end of the LF distribution of the predator overlaps with the lower end of the LF distribution of the fishery between 20 and 90 cm, with the maximum length of 160 cm for the hypothetical prey species. In the first example (Fig. 83), the overlap is calculated with respect to the total size range of the prey species. Thus, the area of overlap calculated in this manner is 24%, while the range of overlap is 44%. If the two curves overlaid one another perfectly, the area and the range of overlap would be 100%.

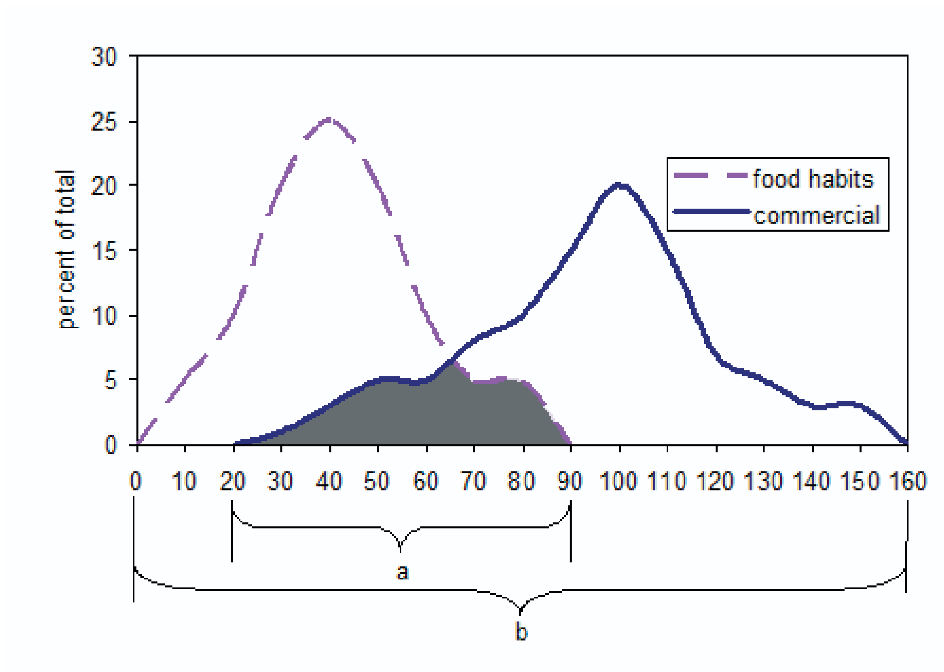

Figure 83.--Overlap in size composition of a hypothetical prey species taken by both marine mammals and commercial fisheries, considered with respect to the total size range of the prey species. The area of the intersection of the two LF distribution curves (shaded area) is 24%, while the range of overlap (a/b = 70/160 X 100) is 44%.

If we examine the range of overlap from the standpoint of the fishery, the picture is much different. Using the same curves as in Figure 83, the two distributions still overlap between 20 and 90 cm. However, if the area of overlap is considered with respect to the fishery (Fig. 84), 32% of the size range targeted by the fishery is also targeted by the predator. Similarly, the two distributions overlap across 70 cm of a total size range of 140 cm targeted by the fishery, for a range of overlap of 50%.

Finally, our hypothetical example changes yet again if we examine the overlap with respect to the size range targeted by the predator (Fig. 85). We still use the same curves, but from the standpoint of the predator, 85% of the area of the LF distribution of the predator's size selectivity is also targeted by the commercial fishery. When examined at the one-dimensional level of the range of overlap, 78% of the size range targeted by the predator is also targeted by the fishery.

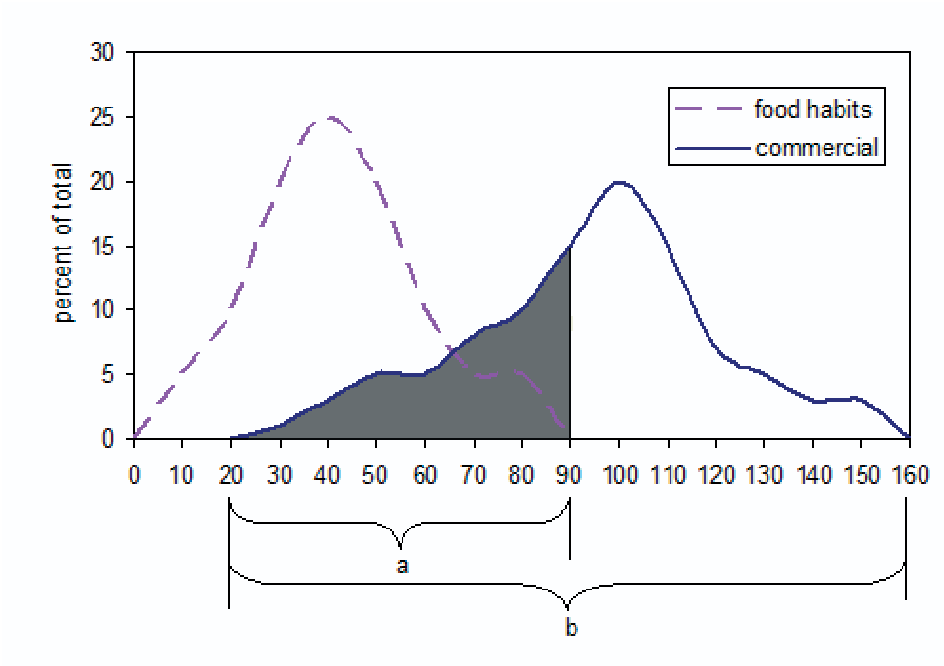

Figure 84.--Overlap in size composition of a hypothetical prey species taken by both marine mammals and commercial fisheries, considered with respect to the size range targeted by the fishery. The area of the intersection of the two LF distribution curves (shaded area) is 32%, while the range of overlap (a/b X 100 = 70/140 X 100) is 50%.

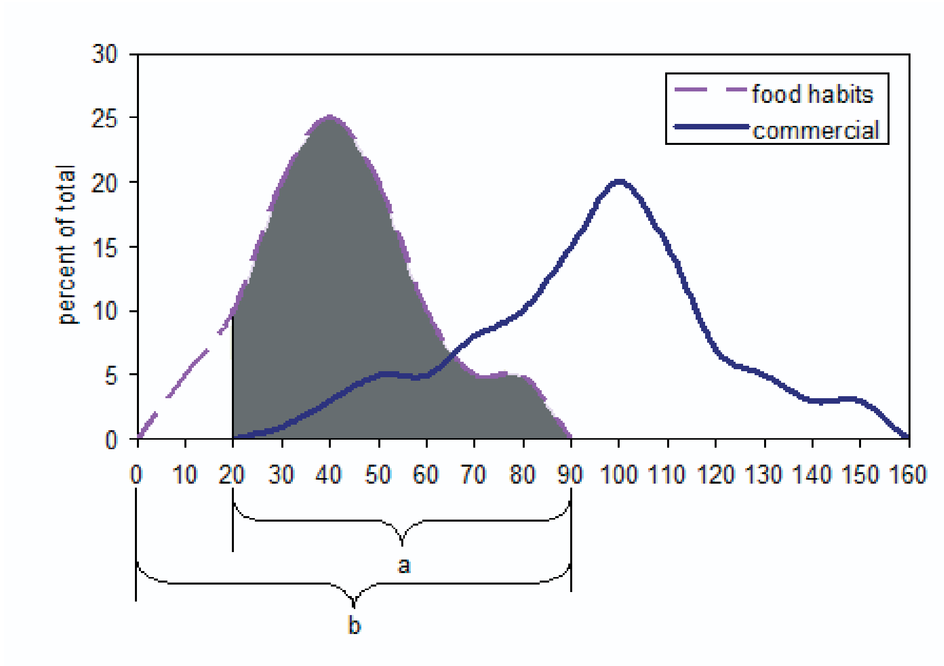

Figure 85.--Overlap in size composition of a hypothetical prey species taken by both marine mammals and commercial fisheries, considered with respect to the size range targeted by the predator. The area of the intersection of the two LF distribution curves (shaded area) is 85%, while the range of overlap (a/b X 100 = 70/90 X 100) is 78%.

As our series of hypothetical examples illustrates, there are numerous approaches to quantifying overlap between the size selectivity of predators and commercial fisheries, all of which yield widely different values. With specific reference to the calculations of the area of overlap, it is important to note that interpretation of the data requires detailed information on the magnitude of each of the sources of removals. For example, if the fishery and predators are removing comparable amounts of biomass, interpretation of the area of overlap is straightforward. However, if information on total removals is lacking, clear interpretation of the area of overlap is difficult or impossible. In contrast, the calculations of the range of overlap are independent of the magnitude of the total removals. Although this approach suffers the loss of a significant source of information, the relationship between a and b in the examples above does not change with different vertical scaling.

Because detailed information on total removals is not available for most food habits studies, we have chosen to focus our analyses on the range of overlap with respect to the total size of the prey, the size range taken by the fishery, and the size range taken by the predators. We will briefly examine overlap in terms of the area of intersection between LF distributions, but that will be discussed below in relationship to size structure of the available prey as indicated by fisheries survey data.

Following the sequence used above, the first relationship we examine is between the range of overlap of the commercial and the food habits distributions with respect to the maximum recorded length of the prey species (as in Fig. 84). There is a significant negative correlation ($P = 0.004$) between the range of overlap and the size of the prey species (Fig. 86). That is, as the size of prey species increases, the range of overlap between commercial fisheries and marine mammal food habits decreases. This makes sense intuitively, considering the fact that marine mammals tend to focus on the lower end (< 30 cm, as shown earlier) of the size distribution of prey, regardless of the maximum length of the prey species targeted. The relationship presented here simply documents that commercial fisheries tend to target larger individuals of a given prey species, and the discrepancy between marine mammals and commercial fisheries increases with body size of the target species.

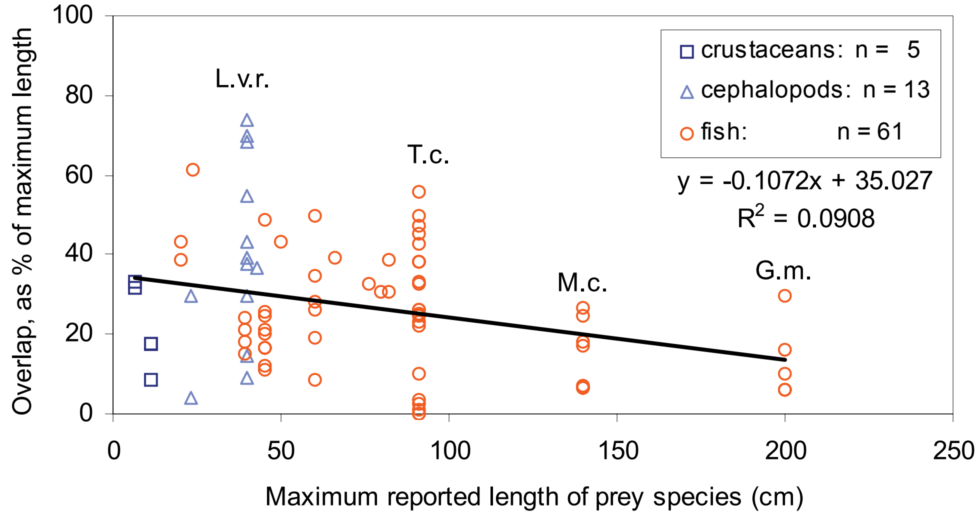

Figure 86.--Overlap between the size range of prey targeted by marine mammals and the size range targeted by commercial fisheries, represented with respect to the maximum reported length of the prey species. Abbreviations in plot refer to prey taxa with multiple entries (L.v.r. = *Loligo vulgaris renaudii*, T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

When viewed with respect to the commercial fishery (Fig. 87), there is also a significant negative correlation (P = 0.002) between the range of overlap and the size of the prey species. This follows directly from the information in Figure 86 because it would be impossible for a fishery to target a wider size range of the target species than was available. Indeed, it simply reflects the fact that commercial fisheries selectively target large fish when it is an option. Thus there is less overlap with marine mammal size selectivity for larger prey species and more overlap for small species where commercial selectivity is less of an option.

The third way in which we examine overlap in the size range of prey consumption is conducted with respect to consumption by marine mammals (Fig. 88). Here, we see that there is no relationship between the degree of overlap and the maximum prey size ($P = 0.90$). This is perhaps due to the fact that, in general, marine mammals tend to target a much narrower range of prey sizes than do comparable fisheries focused on the same prey species (mean range of food habits = 23.82 cm; mean range of commercial fisheries = 35.96), even though the range of sizes targeted by marine mammals is significantly correlated ($P = 0.05$) with the maximum size of the prey species (Fig. 89). Furthermore, the correlation between targeted size range and maximum prey size has a significantly higher slope ($P < 0.01$) for the commercial fisheries data (Fig. 90) than for the marine mammals food habits data (Fig. 89).

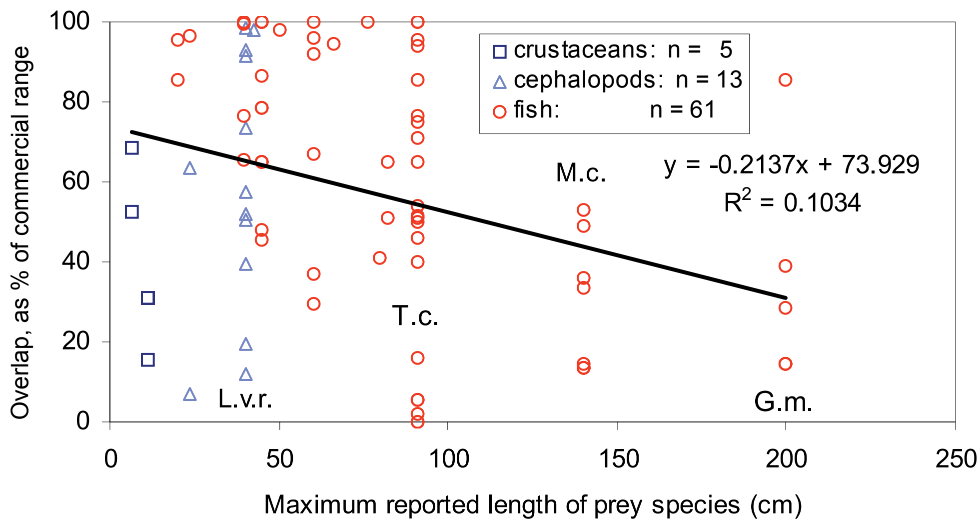

Figure 87.--Overlap between the size range of prey targeted by marine mammals and the size range targeted by commercial fisheries, represented with respect to the commercial fishery. Abbreviations in plot refer to prey taxa with multiple entries (L.v.r. = *Loligo vulgaris renaudi*, T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

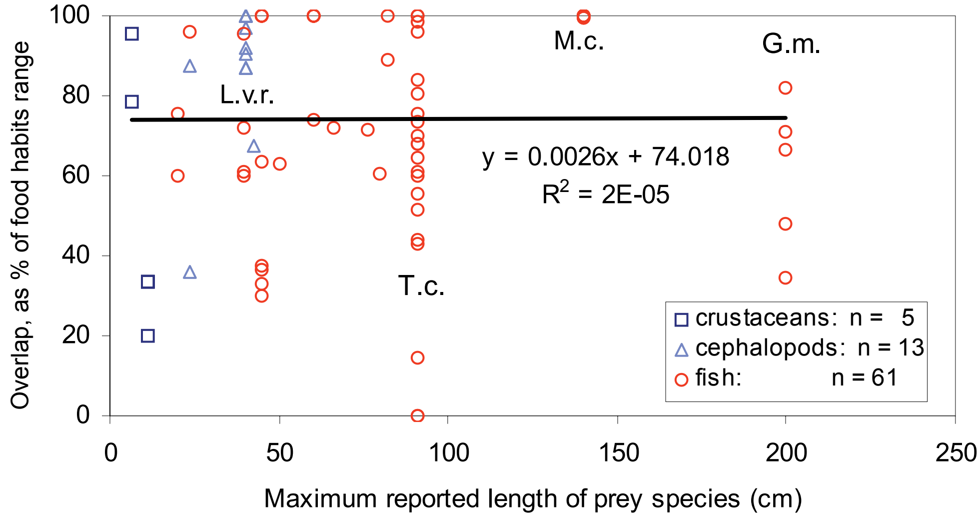

Figure 88.--Overlap between the size range of prey targeted by marine mammals and the size range targeted by commercial fisheries, represented with respect to the predators. Abbreviations in plot refer to prey taxa with multiple entries (L.v.r. = *Loligo vulgaris renaudi*, T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

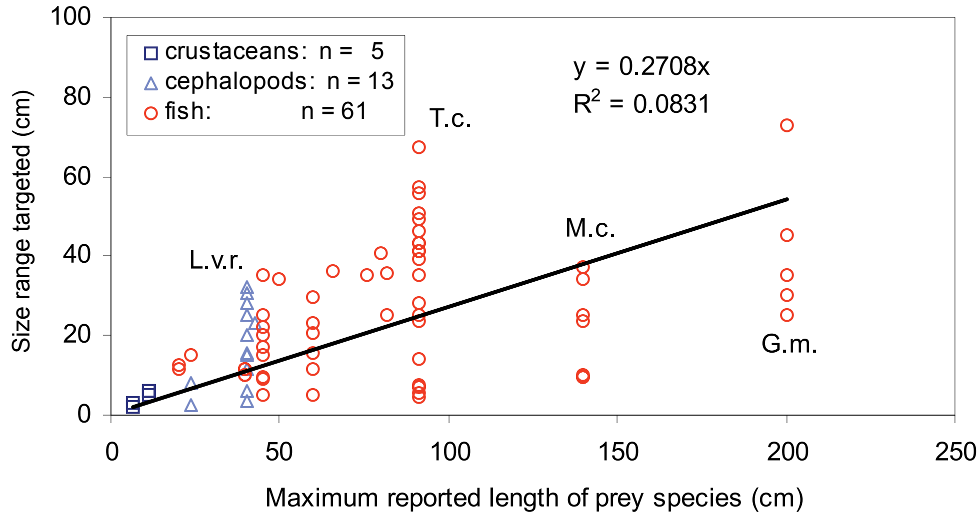

Figure 89.--Relationship between size range of prey (in cm) targeted by marine mammals as a function of the maximum reported length of the prey species. Mean range = 23.82 cm. Regression line is forced through the origin. Abbreviations in plot refer to prey taxa with multiple entries (L.v.r. = *Loligo vulgaris renaudi*, T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

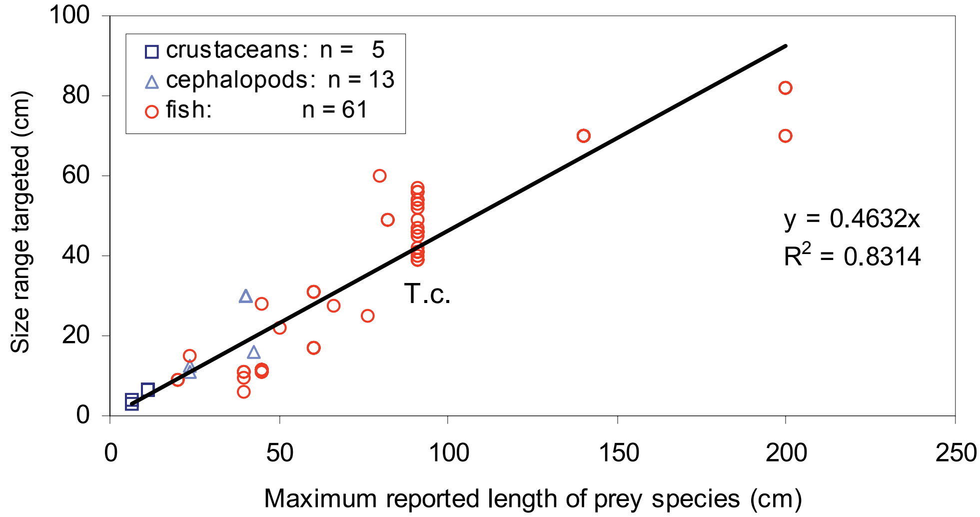

Figure 90.--Relationship between size range of prey (in cm) targeted by commercial fisheries as a function of the maximum reported length of the prey species. Mean range = 35.96 cm. Regression line is forced through the origin. Abbreviation in plot refers to prey taxon with multiple entries (T.c. = *Theragra chalcogramma*).

RESULTS: COMPARISONS WITH SURVEY DATA AND EVALUATIONS OF SELECTIVITY

The comparisons above clearly indicate that commercial fisheries have a tendency to target larger individual fish and squid than do marine mammals foraging in the same areas at the same time. This suggests that size selectivity is occurring. There are several ways this can occur:

1. commercial fisheries may be systematically selecting for the larger size classes available
2. marine mammals may be systematically selecting for the smaller size classes available

3. marine mammals may be opportunistically eating prey in proportion to their natural abundance, which would tend to favor small prey; or
4. combinations of 1 and either 2 or 3 above may be occurring.

We believe that a combination of 1 and 2 above is being observed, but the actual selectivity in each case is not yet clear. It is possible that marine mammals are more selective than commercial fisheries. That is, marine mammals may be systematically targeting a much narrower range of available size classes than do commercial fisheries.

As with the comparisons between mean prey size from food habits studies and the mean targeted catch of commercial fisheries, we can examine the relationship between mean prey size and the mean size of the available prey population (as indicated by survey data). It is only through examination of the survey data that we can be more conclusive about the size selectivity of marine mammals. We proceed with the caveat that surveys are often conducted with gear and procedures so similar to those of commercial fishing operations as to obscure any selectivity on the part of commercial fisheries.

In common with the commercial data needed for comparison with specific food habits studies, the availability of survey data is limited (Appendix 6). Survey data are typically generated in support of stock assessments for commercial fisheries. Thus, there is a heavy bias towards commercially valuable taxa. Furthermore, many research programs have pre-determined sampling regions which are surveyed on a regular basis. It is typically not known (or knowable) the degree to which these sampling regions overlap with the foraging habitat of marine mammal taxa for any given food habits study (but see Kaschner and Pauly 2004).

To evaluate the degree to which commercial fisheries and marine mammals exert size selectivity on their target species, we use the same type of pairings as above to ensure that we used survey data with comparable temporal and spatial coverage to that of the food habits data and/or the commercial data. The mean size of prey from food habits studies and those from commercial fisheries were subtracted from the means from surveys (Appendix 5 and 6). Thus, positive differences reflect situations where mean size of targeted prey was systematically smaller than the mean size of what was available, while negative differences reflect situations where mean size targeted was systematically larger than the mean size of the prey available. As we show below, however, negative values may reflect directional size selectivity, or they may reflect the lack of appropriate survey data for comparison (see Figs. 98 and 99 below).

For the pairings between food habits means and survey means, the difference is consistently positive, indicating that in general, marine mammals systematically target smaller individuals than are present in the prey population (Fig. 91). The magnitude of the difference between food habits means and survey means is significantly correlated with maximum reported body size of the prey species (Fig. 92; $P < 0.001$). That is, the level of selectivity increases as maximum reported size increases for prey species.

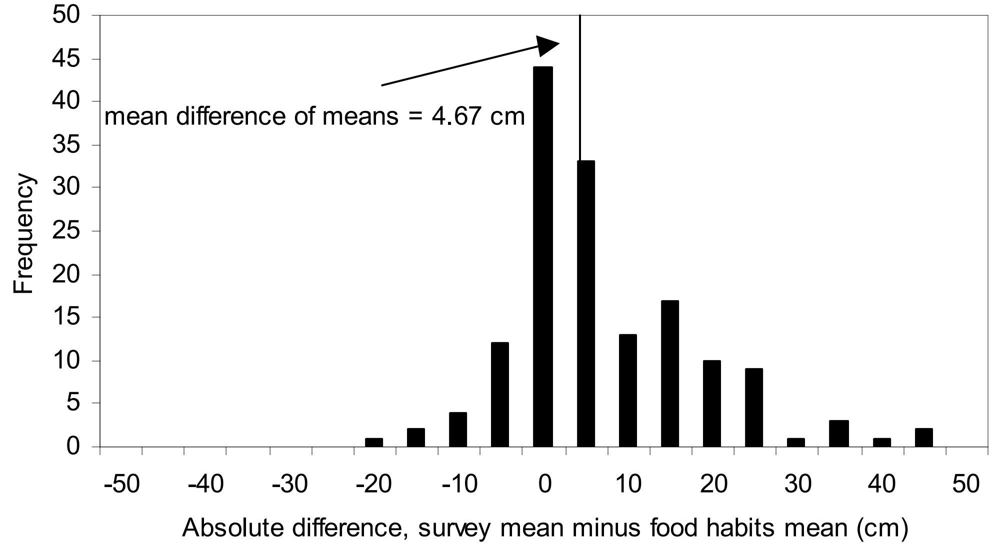

Figure 91.--Distribution of differences in means (survey mean minus food habits mean) for 152 prey entries.

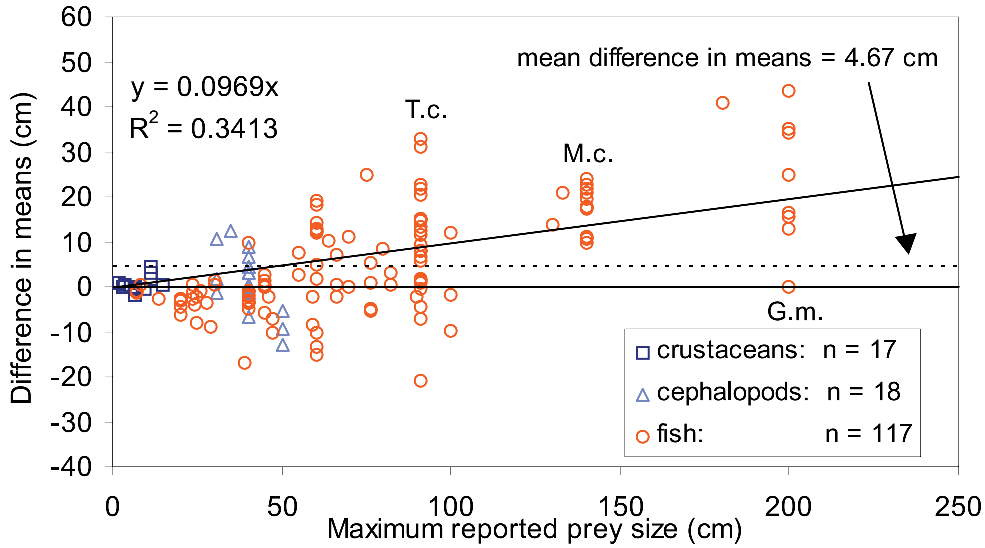

Figure 92.--Distribution of differences in means (survey mean minus food habits mean) for 152 prey entries, as a function of the maximum reported size for each prey species. Solid horizontal line is y = 0. Dashed horizontal line indicates the mean difference of means (4.67 cm). Abbreviations in plot refer to prey taxa with multiple entries (T.c. = *Theragra chalcogramma*, M.c. = *Merluccius capensis*, G.m. = *Gadus morhua*).

In contrast to the case of food habits studies, the difference between mean size of prey as indicated by surveys and the mean size targeted by commercial fisheries is dominated by negative values and values close to zero (Fig. 93), with an overall mean difference of -0.4 cm.

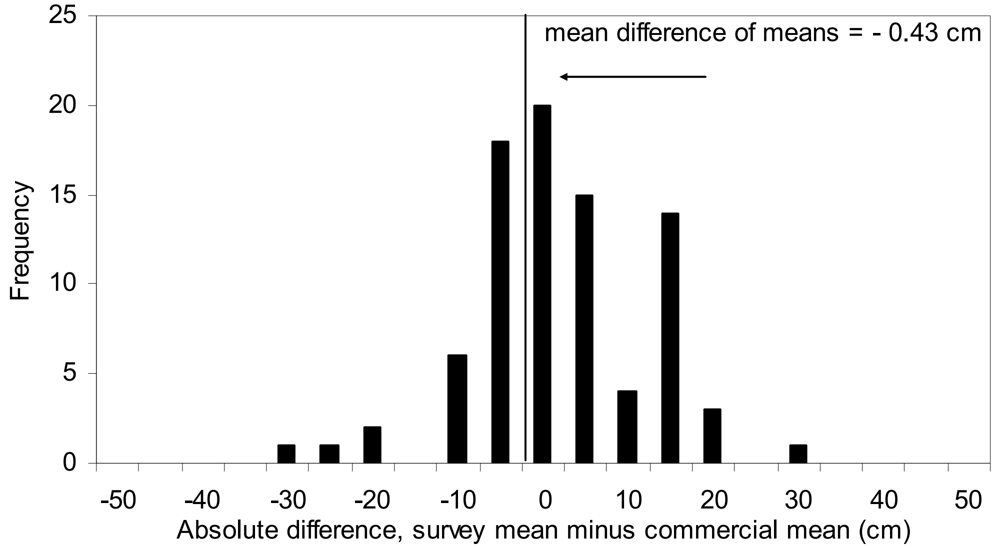

Figure 93.--Distribution of differences in means (survey mean minus commercial mean) for 85 taxonomic entries.

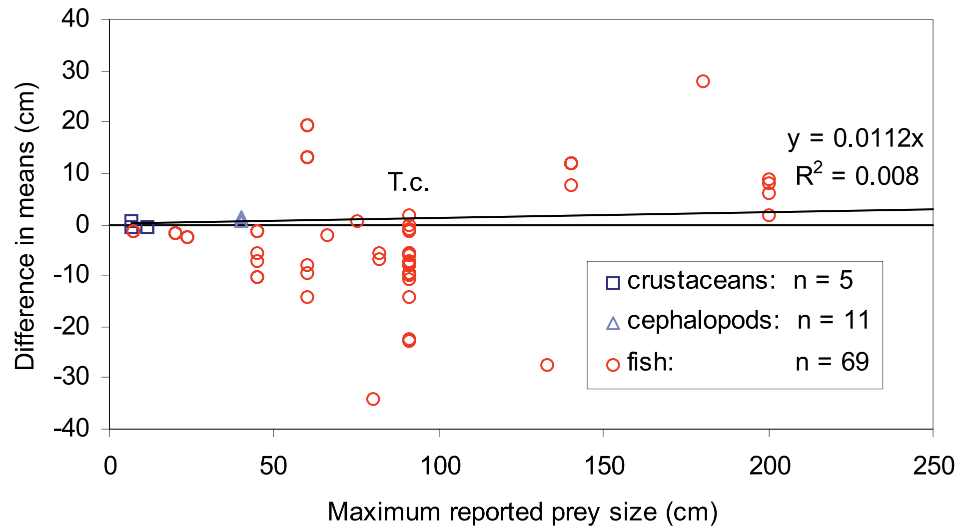

Figure 94.--Distribution of differences in means (survey mean minus commercial mean) for 85 prey entries, as a function of the maximum reported size for each prey species. The slope of the regression line is non-significant (P = 0.37). Solid horizontal line is y = 0. The mean difference of means (-0.43 cm) has not been plotted. Abbreviation in plot refers to prey taxon with multiple entries (T.c. = *Theragra chalcogramma*).

This suggests that commercial fisheries tend to take prey size classes in close proportion to their natural abundance as indicated by survey data. Indeed, although there is variability in the magnitude of the differences, there is no relationship between the difference in means between survey and commercial data and the maximum reported size of the target species (Fig. 94).

Another way to examine the relationships described in Figures 91-94 is to examine scatter plots of mean targeted size (either by marine mammals or by commercial fisheries) as a function of the mean size indicated by survey data. The mean size targeted by commercial fisheries shows a 1:1 relationship with the mean size available according to survey data, whereas marine mammals consistently target smaller individuals than are available (Fig. 95).

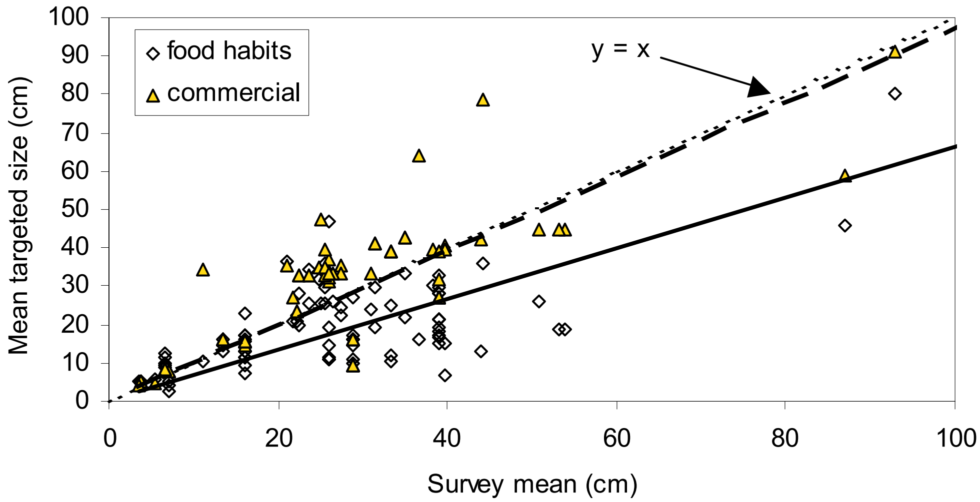

Figure 95.--Relationship between survey means and mean targeted size for commercial and food habits entries considered separately. The slope of the commercial regression (heavy dashed line) is not significantly different from 1.0 (fine dashed line; $P < 0.001$); the slope of the food habits regression (solid line) is significantly different from 1.0 ($P < 0.001$) and is also significantly different from the slope of the commercial regression ($P < 0.001$).

Evaluation of Appropriateness of Survey Data

The preceding analyses show that there are consistent patterns to the size of prey targeted by both commercial fisheries and marine mammals. However, there are some notable outliers that require detailed examination. Next, we will examine a series of LF distributions to illustrate the general patterns of selectivity that we have documented thus far, and to highlight cases where the match between food habits data, commercial data, and survey data needs improvement.

The first set of LF distributions we will examine is for round herring (*Etrumeus whiteheadi*) from the Benguela Current off of South Africa, where this species reaches a maximum size of 23.6 cm (Sekiguchi et al. 1992). Our previous analyses have shown that commercial fisheries and marine mammals target small-bodied prey taxa similarly. Examination of the LF distributions of the round herring targeted as compared to what are available, as indicated by survey data, shows that, in addition to a high degree of overlap between commercial fisheries and marine mammals, both are taking round herring roughly in proportion to their availability (Fig. 96).

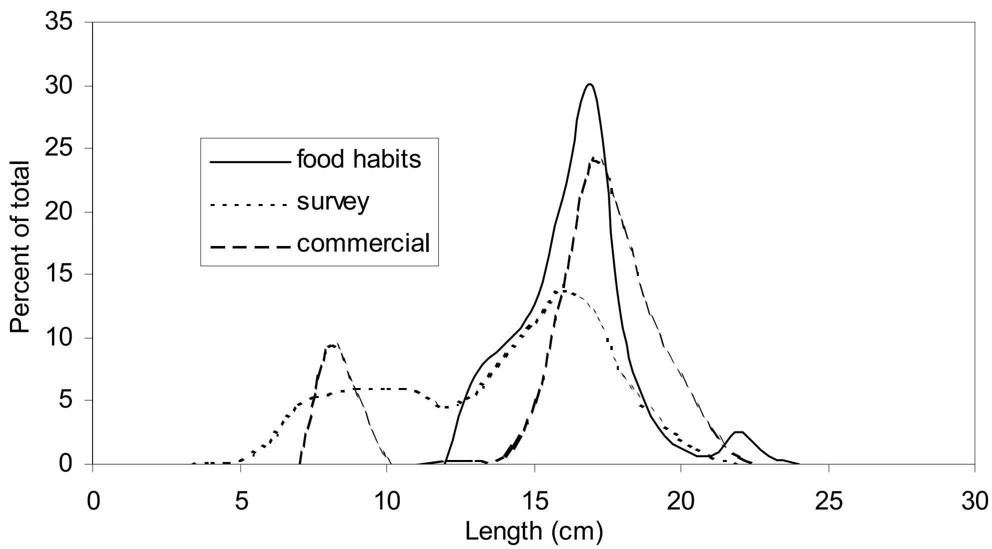

Figure 96.--Comparison of LF distributions of round herring (*Etrumeus whiteheadi*) from food habits data (solid line) from 1969 to 1990 for common dolphin (*Delphinus delphis*), survey data (fine dashed line) from 1984 to 1989, and commercial catch (heavy dashed line) from 1986. Food habits and commercial data are from Sekiguchi et al. (1992) and survey data are from Waldron et al. 1991.

In contrast to the case of round herring, a mid-sized flatfish shows a slightly different pattern. Specifically, American plaice (*Hippoglossoides platessoides*), which reach a maximum reported length of 82 cm (Froese and Pauly 2003), are targeted slightly differently by marine mammals versus commercial fisheries (Fig. 97). Food habits data for gray seal (*Halichoerus grypus*) show a bimodal distribution of size selectivity, with an overall mean size of 24.3 cm (Benoit and Bowen 1990). The mean size targeted by the commercial fishery is substantially larger (33.2 cm), but there is a high degree of overlap in the two LF distributions. Note, however, that the survey data clearly show that marine mammals and commercial fisheries are each targeting a slightly different component of the plaice population: marine mammals tend to target fish 35 cm and smaller, while commercial fisheries tend to target fish 25 cm and larger.

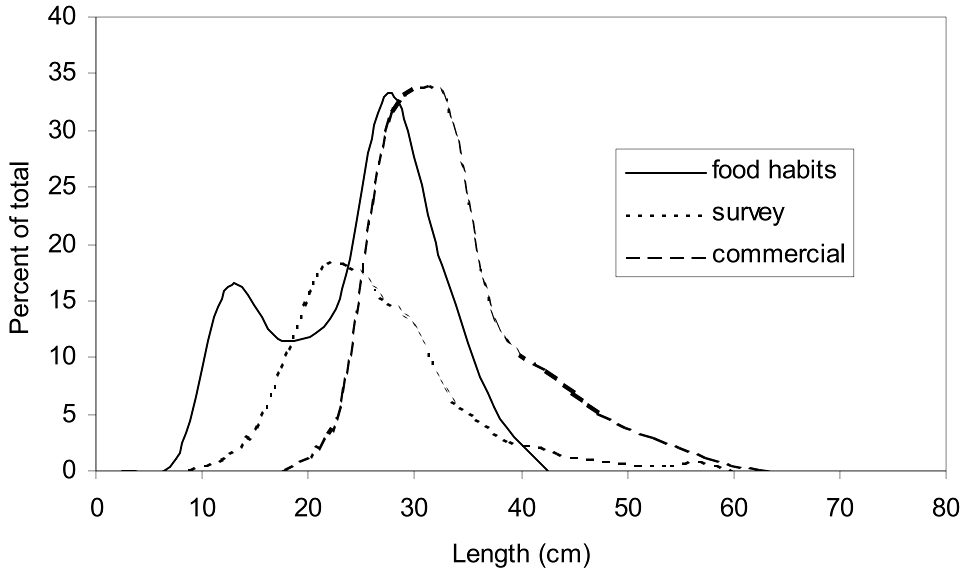

Figure 97.--Comparison of LF distributions of American plaice (*Hippoglossoides platessoides*) from food habits data (solid line) from 1982, 1983, 1986 and 1987 for gray seal (*Halichoerus grypus*), survey data (fine dashed line) from 1975 to 1979, and commercial catch (heavy dashed line) from 1984. Food habits data are from Benoit and Bowen (1990), survey data are from Beacham (1982), and commercial data are from Chouinard and Metuzals (1985).

Moving to a much larger prey species, the LF distributions of Cape hake (*Merluccius paradoxus* and *M. capensis*), with maximum reported sizes of 115 cm and 140 cm, respectively (Froese and Pauly 2003), show a more striking pattern (Fig. 98). In particular, the LF distribution of hake targeted by Heaviside's dolphin (*Cephalorhynchus heavisidii*) overlaps only slightly with the LF distribution of the same two species targeted by the commercial fishery (Sekiguchi et al. 1992). The survey data, however, seem to indicate that the commercial fishery is missing a substantial portion of the larger-bodied fish. In this particular case, the only available survey data are for *M. capensis*, the larger of the two species. Thus, although the commercial and food habits data are comparable, the only available survey data probably are not appropriate for comparison in this case.

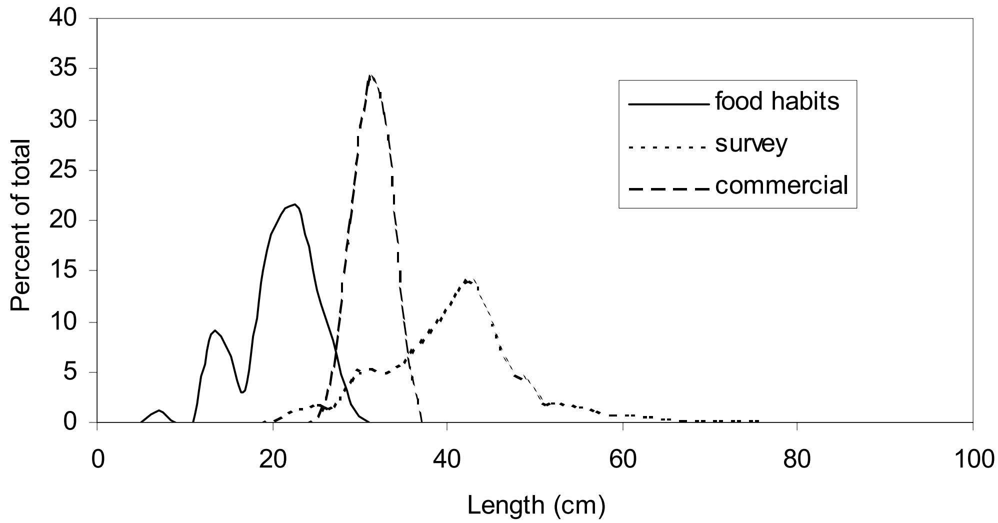

Figure 98.--Comparison of LF distributions of Cape hake (*Merluccius capensis* and *M. paradoxus)* from food habits data (solid line) from 1969 to 1990 for Heaviside's dolphin (*Cephalorhynchus heavisidii*), survey data (fine dashed line) from 1987, and commercial catch (heavy dashed line) from 1984 to 1986. Food habits and commercial data are from Sekiguchi et al. (1992) and survey data are from Morales-Nin (1991).

Another situation in which the available data provide a misleading comparison comes again from the Benguela Current in South Africa. European anchovy (*Engraulis encrasicolus*) reach a maximum size of 20 cm (Froese and Pauly 2003). As a small-bodied prey species of high commercial importance, we would expect to see almost perfect overlap in the sizes targeted. In contrast, the available data seem to indicate that marine mammals systematically target larger individuals than the commercial fishery (11.2 cm versus 8.27 cm; Fig. 99). Note also, however, that the survey data indicate that the available anchovies do not exceed 10 cm in length. There is a clear inconsistency. Indeed, the available survey and commercial data are from along the Namibian coast (Cruikshank et al. 1990, Sekiguchi et al. 1992), which is dominated, for oceanographic reasons, by juvenile anchovies. The marine mammal food habits data, on the other hand, are primarily from marine mammals stranded along the southern coast of West Africa (Sekiguchi et al. 1992), which tends to have higher concentrations of adult anchovies.

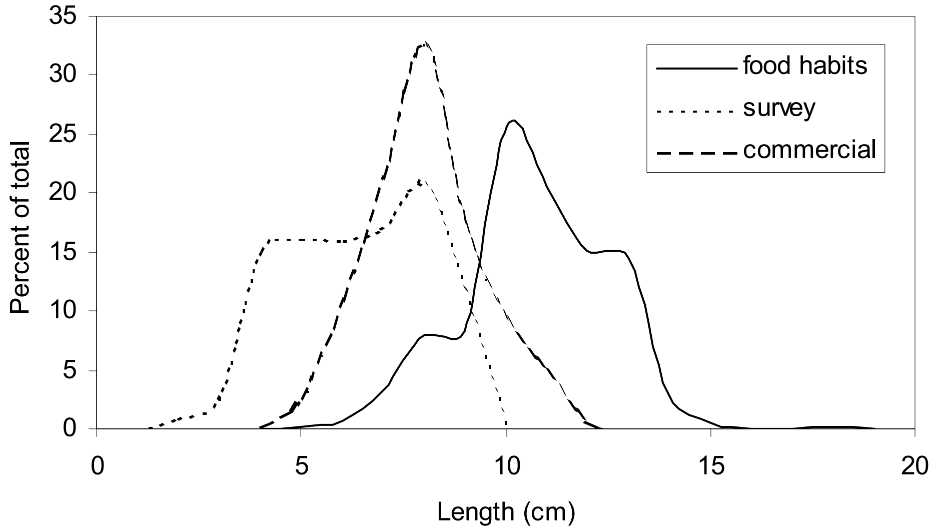

Figure 99.--Comparison of LF distributions of European anchovy (*Engraulis encrasicolus*) from food habits data (solid line) from 1969-1990 for common dolphin (*Delphinus delphis*), survey data (fine dashed line) from 1983, and commercial catch (heavy dashed line) from 1986. Food habits and commercial data are from Sekiguchi et al. (1992) and survey data are from Cruikshank et al. (1990).

Finally, we consider the case of walleye pollock (*Theragra chalcogramma*) in the eastern Bering Sea. Pollock reach a maximum reported size of 91 cm (Froese and Pauly 2003). As with most other prey species, the size range targeted by marine mammals (here, northern fur seals

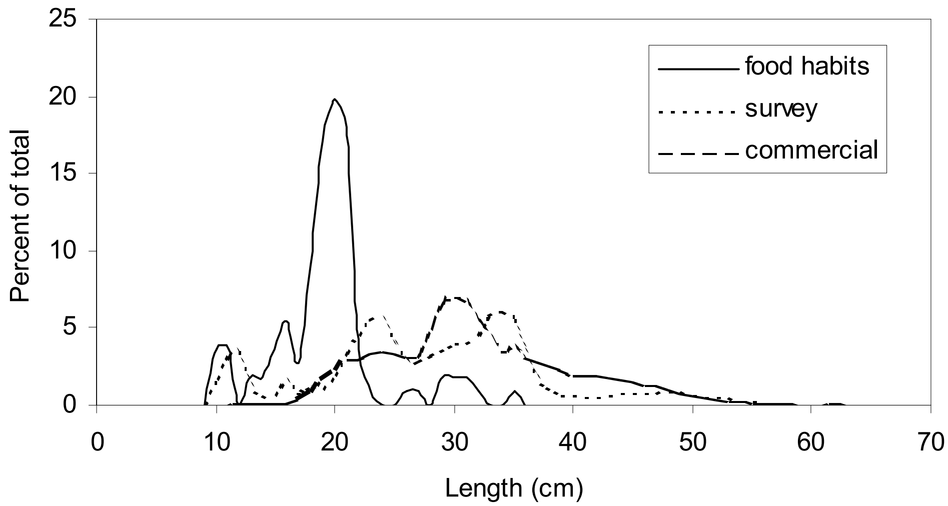

Figure 100.--Comparison of LF distributions of walleye pollock (*Theragra chalcogramma*) from food habits data (solid line) from 1974 for northern fur seals (*Callorhinus ursinus*), survey data (fine dashed line) from 1975, and commercial catch (heavy dashed line) from 1974. Food habits data are from McAlister and Perez (1977); survey and commercial data are from Bakkala (1988).

(*Callorhinus ursinus*)) is primarily smaller than 30 cm (Fig. 100). The commercial and survey data show a high degree of concordance, and both clearly indicate that northern fur seals are selectively targeting small individuals.

On the basis of the overall patterns shown above, we conclude that marine mammals are more selective in the size composition of fish and cephalopods they consume than are commercial fisheries when food habits and fishery catches are compared to what is available, as indicated in surveys. We have not accounted for the selectivity of surveys (or commercial fisheries) relative to the size distribution across the full spectrum of sizes with the populations of resource species. This is because few stock assessment surveys and no commercial fisheries use gear that samples individuals that are only hours (even days or weeks) old – individuals that often fall in the size ranges of species ordinarily considered part of the plankton community.

POTENTIAL APPLICATIONS

Although we have documented consistent patterns in the targeted size composition both across and among different marine mammal taxa, most of these examples cover vast expanses of geographical range. Taken together, the consistency of the patterns suggests that the foraging behavior of marine mammals worldwide is under broadly similar selective pressures. From that, we argue that management should strive to generate the same patterns. We caution, however, that applying a pattern that appears to be global to a resource managed at a local level, under perhaps unique conditions, is unwise without reference to more detailed data. We provide two more examples of the kinds of data that are required under the systemic management approach to inform on local management decisions.

The first example is ecosystem-specific, and examines the size selectivity of marine mammals in the Benguela Current. The Benguela Current flows along the west coast of South Africa and Namibia, and features a strong, nutrient-rich upwelling system that supports one of the most productive ecosystems in the world (O'Toole et al. 2001). In addition to supporting a large commercial fishery, the Benguela Current is also home to hosts of marine mammals. The large set of food habits data from the Benguela Current (David 1987, Sekiguchi et al. 1992) allows examination of the pattern of selectivity exerted by marine mammals on prey stocks in that system.

Using the same criteria as before, 99 food habits cases meet our minimum sample size requirements, including data from one otariid seal and 10 odontocete whales, and their consumption of one crustacean taxon, 25 cephalopods taxa, and 22 fish taxa (Appendix 1, 3). The distribution of mean prey sizes for marine mammals foraging in the Benguela current strongly resembles most of the patterns we have documented above. Specifically, the distribution is distinctly positively skewed (Fig. 101), with a modal mean size of 15-20 cm, and an overall mean of means of 18.26 cm. Because many of the prey species represented in this example are harvested commercially (1/1 crustacean species; 4/25 cephalopod taxa; 21/22 fish taxa), the application to fisheries management is direct: in order to fit within the norm of predation pressure in the Benguela Current, commercial fisheries would need to target the same size distribution as presented here. Within this overarching pattern, patterns like those presented in Figures 30-42 would help guide the species-specific applications.

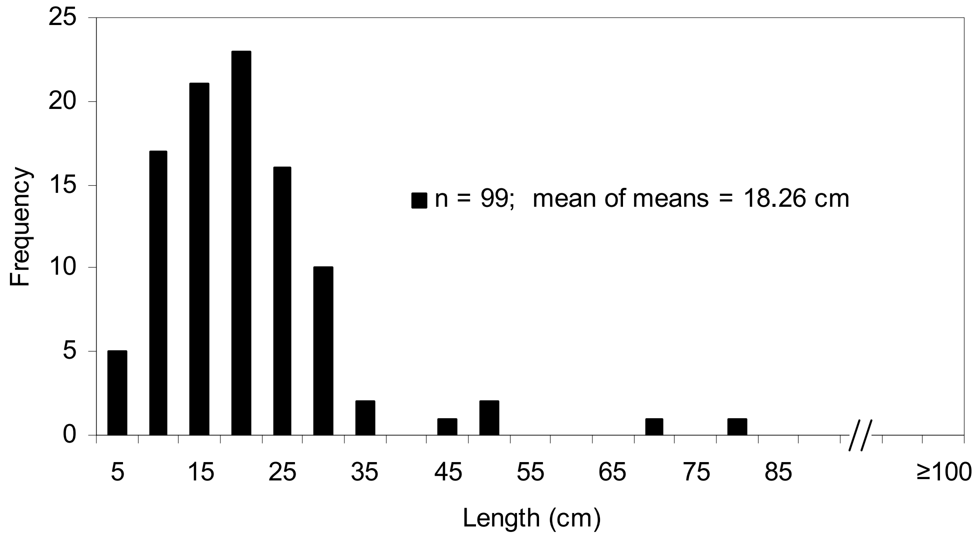

Figure 101.--Frequency distribution of prey size means for cases based on samples the Benguela Current with sample sizes ≥ 10.

The second example spans adjoining oceanic domains highlighting a distinction between near-shore, or coastal, and off-shore, or pelagic systems. Several odontocete whale species have multiple ecotypes, often with distinctive coloration, dorsal fin morphology, and population genetics (Perrin et al. 2002). Not surprisingly, these ecotypes also tend to have distinctly different diets. Specifically, off-shore ecotypes have a tendency to target small-bodied prey taxa, whereas the near-shore ecotypes tend to target taxa with a larger range of sizes. For instance, Crawford (1981) found that 78% of all fish eaten by Dall's porpoise (*Phocoenoides dalli*) in pelagic waters of the North Pacific were *Protomyctophum thompsoni*, which reach a maximum total length of 5.4 cm (Froese and Pauly 2003). The fish taxa measured by Crawford (1981), which did not include *P. thompsoni* (Appendix 1, 3), averaged 10.02 cm in length (5 cases with n ≥ 10). If *P. thompsoni* had been included in Crawford's measurements, the mean size would have been even smaller. In contrast, fish taxa consumed by coastal populations of Dall's porpoise averaged 16.94 cm in length (14 cases with $n \geq 10$; Ohizumi et al. 2000, Walker 1996, Walker et al. 1998).

Examining the distribution of mean prey size for pan-tropical spotted dolphin (*Stenella attenuata*, Fig. 102), we begin to see how these differences are manifested. Food habits data from pelagic waters (Robertson and Chivers 1998) show a pattern similar to that of Dall's porpoise, with a mean prey length of 9.45 cm (23 cases with $n \geq 10$; Appendix 1, 3). Samples from coastal waters (Wang et al. 2003), which average 15.53 cm (13 cases with $n \geq 10$), nevertheless show a strong mode at 10-15 cm (Fig. 102). While it is clear that mean prey size targeted in coastal systems is larger than that targeted in pelagic systems, the difference is accounted for by a positively skewed distribution of means in the coastal system. Thus, while the bulk of the prey are less than 20 cm, a few prey taxa up to 60 cm mean length are also targeted.

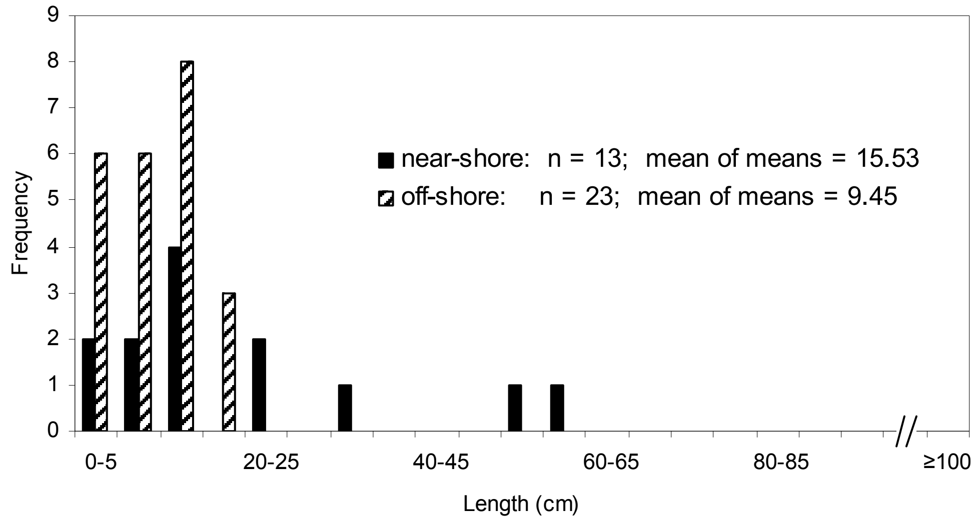

Figure 102.--Frequency distribution of mean prey size for taxa eaten by *Stenella attenuata*. Near-shore data are from Sekiguchi et al. (1992) and Wang et al. (2003). Off-shore data are from Robertson and Chivers (1998).

We have shown several different examples of how the specificity of the existing data can be sub-divided to highlight particular patterns, and emphasize that all of these patterns should be accounted for simultaneously in fisheries management. It is equally important to consider the single-species patterns (e.g., Figs. 30-42) as it is the ecosystem-level patterns (Fig. 101). Because the emergent properties of the components contribute to the emergent properties of the whole, management decisions based on this information can be consonant across all levels of organization.

DISCUSSION AND CONCLUSIONS

Our study crosses a wide diversity and size range of both marine mammal and prey taxa. The emergent pattern is that marine mammals selectively target small-bodied prey. Because the pattern is so pervasive, it seems safe to argue that it is stable much as other macroecological patterns, and is a reflection of the contributing factors that make it a characteristic of marine ecosystems (e.g., it includes the contribution of evolutionary and coevolutionary factors, as well as the selectivity of extinction processes to include macroevolutionary factors). As such, it follows that it is indicative of what is sustainable over very long periods, automatically incorporating and integrating the effects of a wide range of variables at various spatial and temporal scales (including regional and global climate change, changes in ocean circulation or upwelling patterns, etc.). The main caveat to be recognized in this regard is that patterns observed in biotic systems today also reflect human influence. In other words, among the multitude of factors integrated in the patterns shown above are the numerous effects that we humans have, and have had, on our environment (e.g., climate change, pesticides, and especially in many of the cases we present, the effects of intensive fishing pressure).

Recommendations for Restructuring Management Policies

Our results show that, as body size for prey species increases, the size selectivity of commercial harvests of fish exhibit an increasing departure from the size selectivity observed among other mammalian species (Fig. 66). This pattern demonstrates several things simultaneously. First, it provides a measure of the problem of abnormal selectivity exhibited by commercial fishing measured as the difference from what is normally experienced by prey species in these marine systems. Second it shows that the problem is more extreme with the larger-bodied species of prey. Third, it allows for taking the mean or maximum size of prey into account in the advice offered to fisheries managers.

In order to avoid abnormal effects, managers are advised to preferentially target fish and squid such that the average size of the catch is ≤ 30 cm. For small-bodied taxa (e.g., market squid (*Loligo opalescens*), herring (*Clupea harengus*), etc.), the size composition achieved through current management practices match the patterns of marine mammal predation (Figs. 66-71) and, as such, need not be changed. However, in order for management to achieve consistency with marine mammal predation on large-bodied taxa (e.g., Atlantic cod (*Gadus morhua*), walleye pollock (*Theragra chalcogramma*), etc.), substantial changes would need to be made to shift the emphasis towards targeting the small size classes of those taxa (i.e., mimic the selectivity of marine mammals).

Special harvesting strategies (gear type, season, location) and regulations would be necessary to conduct fishing consistent with the selectivity normally experienced by each of the prey species included in this synthesis and collectively by the ecosystems of which they are a part. In the absence of information for individual species, guidance can be tentatively applied in the harvest of other species based on knowledge of their maximum body size.

This advice is in direct contrast to current fishing practices (Figs. 66, 72-77) wherein larger fish are targeted in preference to smaller fish. Indeed, development of fisheries directed at forage (i.e., small, schooling) fish have been banned in some regions (NMFS 1998). In conventional approaches, catching larger fish can be justified on the grounds that it helps avoid direct competition with other consumers such as marine mammals—competition that would occur if small fish were caught. Or it might be argued that harvests with size composition similar to that of wild resource populations is non-selective and minimizes genetic effects. While there is undoubtedly something to such arguments, they fail to account for the complexity of the situation and introduce other problems, such as abnormal selectivity. Competition is a factor to be taken into account and must be dealt with on its own merits. Here we are dealing directly with the issue of selectivity and what might appear to be non-selective from one perspective is actually abnormally selective when evaluated on the basis of natural patterns.

Bias caused by human influence cannot be ignored in the differences we have measured between the selectivity of marine mammals and commercial fisheries. Given that most or all of our data were derived from marine systems that have experienced varying degrees of anthropogenic perturbation, the possibility exists that the patterns of marine mammal size selectivity we observe now do not represent normal or natural behavior. This hypothesis can only be tested by the removal of abnormal anthropogenic influences and recovery of the affected systems. There are also the biases inherent to different approaches to documenting the food habits of marine mammals. These may eventually be remedied (Gudmundson et al. in press, Tollit et al. 2004b, Zeppelin et al. 2004). Removing the bias against large specimens in food habits studies may lead to the conclusion that the pattern we have documented is less clear than the published data show. Therefore, it is incumbent upon us as scientists to continue to document, to the best of our ability, the patterns of marine mammal foraging behavior. This will be particularly important if/when the management recommendations that emerge from studies such as this are implemented.

The matter of taking into account the body size of prey (Fig. 65) is an example of using correlative information to help account for complexity (Fowler 2003). Accounting for the body size of a resource species (prey) is only one aspect of using correlative information and accounting for the body size of the predator is another. Accounting for the body size of humans (as the predator being managed) would be accomplished by using data such as that shown in Figures 51-54 if part of the variance is explained by a relationship between body size of the predator and selectivity in observed consumption patterns. If further research reveals such a correlation, the species chosen to provide the best examples of sustainable selectivity would be of a body size similar to that of humans (or, alternatively, the correlation would be used to estimate the size distribution of prey in a sustainable harvest by species of human body size).

Many modern commercial fishing practices result in systemic effects that are different from those exerted by marine mammals. In applying the principles of management (and systemic management in particular; Fowler 2003), fishing effort would mimic the patterns seen in the feeding habits of marine mammals. This would reduce the mortality on the larger size classes, but not necessarily to zero. It would also avoid the abnormal effects (especially the risks) of either preferentially harvesting larger fish or trying to harvest non-selectively.

Of particular concern are the abnormal genetic effects human harvest practices are likely to be exerting on commercial fish stocks. One might think that accounting for such effects would be of little concern owing to the fact that evolution occurs over relatively long time scales compared to behavioral effects or density dependent responses by a prey species. There are several reasons why it is important to take seriously the need to manage for selectivity typically experienced within the natural system. First, selective effects, and especially abnormal selective effects, can take their toll on time scales measured in just a few generations of the prey species (often less than a decade in lapsed time: Slatkin 1983, Allen 1987, Bradshaw and Hardwick 1989, Conover 2000, Conover and Munch 2002, Cury 1993, Kirkpatrick 1993, Levinton 1992, Mitchell and Arthur 1991, Orians 1975, Reznick et al. 1997, Sutherland 1990). Second, the intensity of fishing rates makes the selective pressure particularly strong (Law 2000). This fact also emphasizes the importance of management to reduce harvests (which themselves can be brought to within the normal range of natural variation through systemic management: Fowler et al. 1999, Fowler 1999, Fowler and Hobbs 2002, 2003; Fowler 2003). Third, one of the goals of management is that of accounting for longer time scales whether or not they seem important to us in daily, weekly, or monthly time scales (Fowler 2003). As mentioned in the literature cited in our introduction, the need is clear and not to be avoided. Genetic effects count as one of the many factors to be addressed in accounting for complexity. This includes not only direct effects but also indirect effects (Conover 2000).

On the surface, it might seem that a benign approach to managing the size composition of harvests would be to harvest such that each age class is represented in the harvest in proportion to its abundance in the resource population. In effect, this would introduce a form of selection different from that experienced in the natural system – selection that is among the forces that cause a system to have its observed form and function (e.g., the patterns in normal variation for the more inclusive systems, such as ecosystems). If we insist on taking larger individuals from the populations of the large-bodied resource species (e.g., adult salmon, *Oncorhynchus* spp., for aesthetic or economic reasons), the appropriate information for managing the harvest (e.g., and especially, the consumption/harvest rate) would come from non-human consumer species that restrict their consumption to adult fish (e.g., bears, *Ursus* spp., in the case of salmon).

It is important to keep in mind that we are not offering the results of our work as a means simply to allow for a Darwinian approach to management. The "evolutionary enlightened manager" acting independent of (and especially instead of) the "ecologically enlightened manager" (Brown and Parman 1993) does not achieve the holism needed in accounting for complexity. Both have to be involved, not so much as separate disciplines, but as a matter of taking into account the elements of natural systems involved in the respective studies. Both the ecological and the evolutionary are taken into account when management is based on mimicking natural patterns (along with all other elements of the complexity taken into account (Fowler and Crawford 2004)).

There is a distinction to be made in single-species applications of the advice from studies such as this and ecosystem applications of the resulting advice. Single species applications would be exemplified by management ensuring that the harvests of walleye pollock (*Theragra chalcogramma*) have a size composition similar to that of the food habits of marine mammals. This would be based on information such as shown in Figure 73. Such management would entail reducing the size of pollock taken by the commercial fishery so that the LF distribution would correspond to that of the food habits of marine mammals (e.g., similar mean and variance). An ecosystem application, however, would entail similar approaches for *all* harvested species in any particular ecosystem, as shown in Figure 101. Likewise, the slope of relationships such as that shown in Figure 66 would be reduced to zero and the slope of the line for commercial fisheries in Figure 95 would be reduced to correspond to that for marine mammals. The pattern for commercial fisheries at the ecosystem level would correspond to the pattern for marine mammals -- a pattern that demonstrates what works within marine ecosystems and a pattern important to the health of these ecosystems.

Changing commercial fishing practices to fit more closely with the patterns documented for marine mammals would, especially for larger bodied prey, require dramatic shifts in the targeted size composition. However, such changes are among those needed to account for the complexity of large systems and must be implemented simultaneously with other changes such as large reductions required in the total catch. Reduction in the size composition of commercial catches would, at a minimum:

1. increase direct competition between commercial fisheries and some marine mammal species -- a step toward consistency in the competition observed in natural systems,
2. raise the question of sustainable harvest rates for large bodied prey if we persist with current selectivity,
3. raise the issue of marketability of small-bodied fish, and
4. force reconsideration of the driving economic factors associated with large-scale commercial fishing practices.

Many of the world's commercial fish stocks are clearly in serious trouble. Although sustainable harvests are typically the stated goal in fisheries management, previous practices have, in large part, failed to meet that goal. Systemic management is based on directly relevant (completely consonant) guiding information that produces recommendations for changing commercial harvest practices in such a way that long-term sustainability is an option.

As has been argued before (Fowler and Hobbs 2002), systemic management automatically incorporates all uncertainties. In contrast, conventional management attempts the difficult, or perhaps impossible task of parameterizing all the variables that are both a) thought to be important and b) measurable. Inasmuch as we agree that it is important to identify the appropriate variables (Fowler and Crawford 2004), we believe that our documentation of the size selectivity of marine mammals provides an elegant solution to the challenge of sufficient parameterization faced by managers today.

ACKNOWLEDGEMENTS

We would like to thank Sandy McFarlane, Loretta O'Brien, Kristin Laidre and Beth Sinclair for access to unpublished data. The manuscript has benefited substantially from thoughtful reviews provided by Gary Duker, Jenny Etnier, Liz Etnier, Anne Hollowed, Jim Lee, Pat Livingston, Beth Sinclair, and Bill Walker. Finally, MAE would like to thank CWF for his constant enthusiasm and support during the process of assembling this report. Is has been an unforgettable experience collaborating on such a fascinating topic.

CITATIONS

Abelló, P., A. Gordoa, M. Manriquez, M. Masó, and E. MacPherson. 1988. Biomass indices and recruitment levels for hake and other commercial species in ICSEAF Divisions 1.4 and 1.5: results from the Spanish Benguela XI research cruise (1987). Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish. 15:7-21.

Ahrens, M. 1985. Two phase sampling of the herring fishery in NAFO Division 4T. CAFSAC Res. Doc. 85/46. 18 p.

Alexander, D. R., and A. H. Vromans. 1985. Status of the Margaree River Gaspereau fishery (1984). CAFSAC Res. Doc. 85/91. 17 p.

Alexander, D. R., and A. H. Vromans. 1988a. Status of the Margaree River alewife (*Alosa pseudoharengus*) fishery 1987. CAFSAC Res. Doc. 88/25. 25 p.

Alexander, D. R., and A. H. Vromans. 1988b. Status of the Miramichi River fishery (1987) for alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). CAFSAC Res. Doc. 88/27. 30 p.

Allen, J. D. 1987. Effects of predation. Science 238:93-94.

Alton, M. S., and R. B. Deriso. 1983. Walleye Pollock, p. 1-62. In D. H. Ito and J. W. Balsiger (eds.), Condition of groundfish resources of the Gulf of Alaska in 1982. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-52.

Antonelis, G. A., Jr., C. H. Fiscus, and R. L. DeLong. 1984. Spring and summer prey of California sea lions, *Zalophus californianus*, at San Miguel Island, California, 1978-79. Fish. Bull., U. S. 82:67-76.

Antonelis, G. A., Jr., M. S. Lowry, C. H. Fiscus, B. S. Stewart, and R. L. DeLong. 1994a. Diet of the northern elephant seal, p. 211-223. In B. J. LeBoeuf and R. M. Laws (eds.), Elephant Seals. University of California Press, Los Angeles.

Antonelis, G. A., Jr., S. R. Melin, and Y. A. Bukhtiyarov. 1994b. Early spring feeding habits of bearded seals (*Erignathus barbatus*) in the central Bering Sea, 1981. Arctic 47:74-79.

Augustyn, C. J. 1991. The biomass and ecology of chokker squid *Loligo vulgaris reynaudii* off the west coast of South Africa. South Afr. J. Zool. 26:164-181.

Badenhorst, A. 1985. Assessment of Agulhas sole in Subarea 2 and recommendation for a TAC. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.12:49-52.

Bailey, K. M., and D. G. Ainley. 1982. The dynamics of California sea lion predation on Pacific hake. Fish. Res. 1:163-176.

Bakkala, R. G. 1988. Condition of groundfish resources of the eastern Bering Sea and Aleutian Islands Region in 1987. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-139.

Bakkala, R. G. 1989. Variability in the size and age composition of eastern Bering Sea walleye pollock, p. 307-322. *In* Proceedings of the International Symposium on the Biology and Management of Walleye Pollock, Anchorage, Alaska, USA, November 14-16, 1988. Alaska Sea Grant Program AK-SG-89-01.

Baldridge, A., and L. L. Rogers. 1991. Harbor seal predation on a wolf-eel. Calif. Fish Game 77:210-211.

Baraff, L. S., and T. R. Loughlin. 2000. Trends and potential interactions between pinnipeds and fisheries of New England and the U. S. west coast. Mar. Fish. Rev. 62(4):1-39.

Beacham, T. D. 1982. Some aspects of growth and exploitation of American plaice (*Hippoglossoides platessoides*) in the Canadian Maritimes area of the Northwest Atlantic. Can. Tech. Rep. Fish. Aquat. Sci. 1080. 46 p.

Beck, G. G., M. O. Hammill, and T. G. Smith. 1993. Seasonal variation in the diet of harp seals (*Phoca groenlandica*) from the Gulf of St. Lawrence and Western Hudson Strait. Can. J. Fish. Aquat. Sci. 50:1363-1371.

Behrends, G. 1982. Analysis of stomach and colon contents of 185 common seals from the Waddensea of Schleswig-Holstein. ICES Council Meeting (Collected Papers) 1982/N:11.

Benoit, D., and W. D. Bowen. 1990. Summer diet of Grey seal (*Halichoerus grypus*) at Anticosti Island, Gulf of St. Lawrence, Canada, p. 227-242. In W. D. Bowen (ed.), Population biology of sealworm (*Pseudoterranova decipiens*) in relation to its intermediate and seal hosts. Can. Bull. Fish. Aquat. Sci. 222.

Best, P. B. 1999. Food and feeding of sperm whales *Physeter macrocephalus* off the west coast of South Africa. South Afr. J. Mar. Sci. 21:393-413.

Bester, M. N., and P. A. Laycock. 1985. Cephalopod prey of the sub-Antarctic fur seal, *Arctocephalus tropicalis*, at Gough Island, p. 551-554. In W. R. Siegfried, P. R. Condy, and R. M. Laws (eds.), Antarctic nutrient cycles and food webs. Springer-Verlag, Berlin.

Bigg, M. A., and I. Faucett. 1985. Two biases in diet determination of northern fur seals (*Callorhinus ursinus*), p. 284-291. In J. R. Beddington, R. J. H. Beverton, and D. M. Lavigne (eds.), Marine Mammals and Fisheries. George Allen and Unwin, London.

Bluhm, B. A., and T. Brey. 2001. Age determination in the Antarctic shrimp *Notocrangon antarcticus* (Crustacea:Decapoda), using the autoflourescent pigment lipofuscin. Mar. Biol. 138:247-257.

Booth, A. J., and C. D. Buxton. 1997. The biology of the panga, *Pterogymnus laniarius* (Teleostei:Sparidae), on the Agulhas Bank, South Africa. Environ. Biol. Fishes 49:207-226.

Booth, A. J., and T. Hecht. 1998. Changes in the Eastern Cape demersal inshore trawl fishery between 1967 and 1995. South Afr. J. Mar. Sci. 19:341-353.

Botha, J. 1985. Occurrence and distribution of cape hakes *Merluccius capensis* Cast. and *M. paradoxus* Franca in the Cape of Good Hope area. South Afr. J. Mar. Sci. 3:179-190.

Börjesson, P., P. Berggren, and B. Ganning. 2003. Diet of harbor porpoises in the Kattegat and Skagerrak seas: accounting for individual variation and sample size. Mar. Mammal Sci. 19:38-58.

Bowen, W. D. 2000. Reconstruction of pinniped diets: accounting for complete digestion of otoliths and cephalopod beaks. Can. J. Fish. Aquat. Sci. 57:898-905.

Bowen, W. D., and G. D. Harrison. 1994. Off-shore diet of grey seals *Halichoerus grypus* near Sable Island, Canada. Mar. Ecol. Prog. Ser. 112:1-11.

Bowen, W. D., and G. D. Harrison. 1996. Comparison of harbor seal diets in two inshore habitats of Atlantic Canada. Can. J. Zool. 74:125-135.

Bowen, W. D., J. W. Lawson, and B. Beck. 1993. Seasonal and geographic variation in the species composition and size of prey consumed by grey seals (*Halichoerus grypus*) on the Scotian Shelf. Can. J. Fish. Aquat. Sci. 50:1768-1778.

Bradshaw, A. D., and K. Hardwick. 1989. Evolution and stress—genotypic and phenotypic components. Biol. J. Linn. Soc. 37:137-155.

Bradstreet, M., K. Finley, A. Sekerak, W. Griffiths, C. Evans, M. Fabijan, and H. Stallard. 1986. Aspects of the biology of arctic cod (*Boreogadus saida*) and its importance in arctic marine food chains. Can. Tech. Rep. Fish. Aquat. Sci. 1491.

Brierly, A. S., P. Ward, J. L. Watkins, and C. Goss. 1998. Acoustic discrimination of Southern Ocean zooplankton. Deep Sea Res. II 45:1155-1173.

Brown, E. S., and C. S. Rose. 1983. Walleye pollock data from the 1977-81 Gulf of Alaska Resource Assessment Surveys, p. 177-185. In D. H. Ito and J. W. Balsiger (eds.), Condition of groundfish resources of the Gulf of Alaska in 1982. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-52.

Brown, J. S., and A. O. Parman. 1993. Consequences of size-selective harvesting as an evolutionary game, p. 248-261. In T. K. Stokes, J. M. McGlade, and R. Law (eds.), The exploitation of evolving resources: proceedings of an international conference, held at Jülich, Germany, September 3-5, 1991. Lecture notes in biomathematics, 99. Springer-Verlag, Berlin.

Brown, R. F., and B. R. Mate. 1983. Abundance, movements, and feeding habits of harbor seals, *Phoca vitulina*, at Netarts and Tillamook Bays, Oregon. Fish. Bull., U. S. 81:291-301.

Bukhtiyarov, Y. A., K. J. Frost, and L. F. Lowry. 1984. New information on foods of the spotted seal, *Phoca largha*, in the Bering Sea in spring, p. 55-59. In F. H. Fay and G. A. Fedoseev (eds.), Soviet-American cooperative research on marine mammals. Vol. 1: Pinnipeds. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 12.

Burns, J. M., S. J. Trumble, M. A. Castellini, and J. W. Testa. 1998. The diet of Weddell seals in McMurdo Sound as determined from scat collections and stable isotope analysis. Polar Biol. 19:272-282.

Calkins, D. G., and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Final Report to National Marine Fisheries Service, U.S. Dep. Commer., National Marine Mammal Lab Contract No. NA-85-ABH-00029. Alaska Department of Fish and Game, 333 Raspberry Rd, Anchorage, AK.

Casaux, R., A. Baroni, and A. Carlini. 1998. The diet of the Antarctic fur seal *Arctocephalus gazella* at Harmony Point, Nelson Island, South Shetland Islands. Polar Biol. 20:424-428.

Castley, J. G., V. G. Cockcroft, and G. I. H. Kerley. 1991. A note on the stomach contents of fur seals *Arctocephalus pusillus pusillus* beached on the South-east coast of South Africa. South Afr. J. Mar. Sci. 11:573-577.

Castonguay, M., and B. Mercille. 1988. Le maquereau bleu (*Scomber scombrus* Linné) du nord-ouest de l'Atlantique, sous-régions 2 á 6 de l'OPANO: évaluation du stock en 1987. CAFSAC Res. Doc. 88/50. 37 p.

Chadwick, E. M. P., and D. K. Cairns. 1988. Assessments of Atlantic herring in NAFO Division 4T, 1987. CAFSAC Res. Doc. 88/38. 48 p.

Cherel, Y., C. Guinet, and Y. Tremblay. 1997. Fish prey of Antarctic fur seals *Arctocephalus gazella* at Ile de Croy, Kerguelen. Polar Biol. 17:87-90.

Chouinard, G. A., and K. I. Metuzals. 1985. Discards of cod (*Gadus morhua*) and American plaice (*Hippoglossoides platessoides*) in NAFO Division 4T in 1984. CAFSAC Res. Doc. 85/84. 20 p.

Clarke, M. R. 1997. Cephalopods in the stomach of a sperm whale stranded between the islands of Terschelling and Ameland, southern North Sea, p. 53-55. In T. G. Jacques and R. H. Lambertson (eds.), Sperm Whale Deaths in the North Sea: Science and Management. Institut royal des sciences naturelles de Belgique, Bruxelles.

Clarke, M. R., and N. P. Goodall. 1994. Cephalopods in the diets of three odontocete cetacean species stranded at Tierra del Fuego, *Globicephala melaena* (Traill, 1809), *Hyperoodon planifrons* Flower, 1882 and *Cephalorhynchus commersonii* (Lacepede, 1804). Antarct. Sci. 6:149-154.

Clarke, M. R., H. R. Martins, and P. Pascoe. 1993. The diet of sperm whales (*Physeter catadon* Linnaeus 1758) off the Azores. Phil. Trans. R. Soc. Lond. B, 339:67-82.

Clarke, M. R., and R. Young 1998. Description and analysis of cephalopod beaks from stomachs of six species of odontocete cetaceans stranded on Hawaiian shores. J. Mar. Biol. Assoc. UK 78:623-641.

Clay, D., L. Currie, and T. Hurlbut. 1985. A first assessment of Gulf white hake: NAFO Division 4T/1985. CAFSAC Res. Doc. 85/64. 38 p.

Conover, D. O. 2000. Darwinian fishery science. Mar. Ecol. Prog. Ser. 208:303-307.

Conover, D. O., and S. B. Munch. 2002. Sustaining fisheries yields over evolutionary time scales. Science 297:94-96.

Costello, M. J., and C. Emblow. 2004. ERMS (European Register of Marine Species). http://erms.biol.soton.ac.uk/. Accessed January 2005.

Crawford, R. J. M. 1980. Occurrence and distribution of lantern-fish *Lampanyctodes hectoris* catches in the South African purse-seine fishery, 1968-1976. Fish. Bull. (S. Afr.) 13:111-136.

Crawford, R. J. M., O. M. Centurier-Harris, G. H. L. Wingate, and B. D. Kriedemann. 1978. Revision of species and age composition of landings in the South African purse-seine fishery, 1950 to 1976. Fish. Bull. (S. Afr.) 10:69-88.

Crawford, R. J. M., L. G. Underhill, and J. D. Venter. 1990. Handline catches and stock identity of snoek *Thyrsites atun* off South Africa and Namibia. South Afr. J. Mar. Sci. 9:95-99.

Crawford, T. W. 1981. Vertebrate prey of *Phocoenoides dalli* (Dall's porpoise), associated with the Japanese high seas salmon fishery in the North Pacific Ocean. Unpublished Master's Thesis, University of Washington, Seattle.

Crespo, E. A., S. N. Pedraza, L. D. Silvana, M. K. Alonso, L. M. Reyes, N. A. García, and M. Coscarella. 1997. Direct and indirect effects of the highseas fisheries on the marine mammal populations in the Northern and Central Patagonian Coast. J. Northwest Atl. Fish. Sci. 22:189-207.

Croxall, J. P., and M. N. Pilcher. 1984. Characteristics of krill *Euphausia superba* eaten by Antarctic fur seals *Arctocephalus gazella* at South Georgia. Br. Antarct. Surv. Bull. 63:117-125.

Croxall, J. P., K. Reid, and P. A. Prince. 1999. Diet, provisioning and productivity responses of marine predators to differences in availability of Antarctic krill. Mar. Ecol. Prog. Ser. 177:115-131.

Cruickshank, R. A., I. Hampton, and M. J. Armstrong. 1990. The origin and movements of juvenile anchovy in the Orange River region as deduced from acoustic surveys. South Afr. J. Mar. Sci. 9:101-114.

Cury, P. 1993. Catastrophe-type regulation of pelagic fish stocks: adaptive management for evolving resources, p. 204-221. In T. K. Stokes, J. M. McGlade, and R. Law (eds.), The exploitation of evolving resources: proceedings of an international conference, held at Jülich, Germany, September 3-5, 1991. Lecture notes in biomathematics, 99. Springer-Verlag, Berlin.

Daneri, G. A. 1996. Fish diet of the Antarctic fur seal, *Arctocephalus gazella*, in summer, at Stranger Point, King George Island, South Shetland Islands. Polar Biol. 16:353–355.

Daneri, G. A., and A. R. Carlini. 2002. Fish prey of southern elephant seals, *Mirounga leonina*, at King George Island. Polar Biol. 25:739-743.

Daneri, G. A., and A. R. Carlini. 1999. Spring and summer predation on fish by the Antarctic fur seal, *Arctocephalus gazella*, at King George Island, South Shetland Islands. Can. J. Zool. 77:1157-1160.

Daneri, G. A., A. R. Carlini, and P. G. K. Rodhouse. 2000. Cephalopod diet of the southern elephant seal, *Mirounga leonina*, at King George Island, South Shetland Islands. Antarct. Sci. 12:16-19.

Daneri, G. A., and N. R. Coria. 1993. Fish prey of Antarctic fur seals, *Arctocephalus gazella*, during the summer-autumn period at Laurie Island, South Orkney Islands. Polar Biol. 13:287-289.

Daneri, G. A., U. Piatkowski, N. R. Coria, and A. R. Carlini. 1999. Predation on cephalopods by Antarctic fur seals, *Arctocephalus gazella*, at two localities of the Scotia Arc, Antarctica. Polar Biol. 21:59–63.

David, J. H. M. 1987. Diet of the South African fur seal (1974-1985) and an assessment of competition with fisheries in southern Africa, p. 693–713. In A. I. L. Payne, J. A. Gulland, and K. H. Brink (eds.), The Benguela and comparable ecosystems. South Afr. J. Mar. Sci. 5.

de Oliveira Santos, M. C., S. Rosso, R. A. dos Santos, S. H. B. Lucato, and M. Bassoi. 2002. Insights on small cetacean feeding habits in southeastern Brazil. Aquat. Mamm. 28:38-45.

Dellinger, T., and F. Trillmich. 1988. Estimating diet composition from scat analysis in otariid seals (Otariidae): is it reliable? Can. J. Zool. 66:1865-1870.

Dellinger, T., and F. Trillmich. 1999. Fish prey of the sympatric Galápagos fur seals and sea lions: seasonal variation and niche separation. Can. J. Zool. 77:1204-1216.

Desportes, G., and R. Mouritsen. 1988. Diet of the pilot whale, *Globicephala melas*, around the Faroe Islands. ICES Council Meeting (Collected Papers) 1988/N:12.

Doidge, D. W., and J. P. Croxall. 1985. Diet and energy budget of the Antarctic fur seal, *Arctocephalus gazella*, at South Georgia, p. 543-550. In W. R. Siegfried, P. R. Condy, and R. M. Laws (eds.), Antarctic nutrient cycles and food webs. Springer-Verlag, Berlin.

Dolar, M. L. L., W. A. Walker, G. L. Kooyman, and W. F. Perrin. 2003. Comparative feeding ecology of spinner dolphins (*Stenella longirostris*) and Fraser's dolphins (*Lagenodelphis hosei*) in the Sulu Sea. Mar. Mammal Sci. 19:1-19.

dos Santos, R. A., and M. Haimovici. 2001. Cephalopods in the diet of marine mammals stranded or incidentally caught along southeastern and southern Brazil (21-34 degree S). Fish. Res. 52:99-112.

Duffy, D. C., and D. C. Schneider. 1994. Seabird-fishery interactions: a manager's guide, p. 26-38. In D. N. Nettleship, J. Burger, and M. Gochfeld (eds.), Seabirds on islands. Birdlife International, Cambridge.

Duhamel, G. 1995. New data on spawning, hatching and growth of *Champsocephalus gunnari* on the shelf of the Kerguelen Islands. CCAMLR Science 2:21-34.

Duhamel, G. 1989. Supplementary data on exploited stocks in Divisions 58.5.1 (Kerguelen). CCAMLR Selected Scientific Papers SC-CAMLR-SSP/6, WG-FSA-89/9:147-161.

Evans, K. G. 1976. Aspects of the population biology of the California market squid (*Loligo opalescens*, Berry). Unpublished Master's Thesis. California State University, Hayward. 88 p.

FAO (Food and Agriculture Organization of the United Nations). 2000. Species Fact Sheet: *Euphausia superba* Dana, 1852. http://www.fao.org/figis/servlet/species?fid=3393/. Accessed 10 June 2005.

Fanning, L. P., S. J. Smith, K. C. T. Zwanenburg, and D. Beanlands. 1988. Assessment of 4VsW cod in 1987. CAFSAC Res. Doc. 88/47. 57 p.

Fea, N., R. G. Harcourt, and C. Lalas. 1999. Seasonal variation in the diet of New Zealand fur seals (*Arctocephalus forsteri*) on Otago Peninsula, New Zealand. Wildl. Res. 26:147-160.

Finley, K. J., M. S. W. Bradstreet, and G. W. Miller. 1990. Summer feeding ecology of harp seals (*Phoca groenlandica*) in relation to Arctic cod (*Boreogadus saida*) in the Canadian high Arctic. Polar Biol. 10:609-618.

Finley, K. J., and C. Evans. 1983. Summer diet of the bearded seal (*Erignathus barbatus*) in eastern Canadian arctic. Arctic 36:82-89.

Finley, K. J., and E. J. Gibb. 1982. Summer diet of the narwhal (*Monodon monoceros*) in Pond Inlet, northern Baffin Island. Can. J. Zool. 60:3353-3363.

Finley, K. J., G. W. Miller, R. Davis, and W. Koski. 1983. A distinctive large breeding population of ringed seals (*Phoca hispida*) inhabiting the Baffin Bay pack ice. Arctic 36:162-173.

Fiscus, C. H., G. A. Baines, and F. Wilke. 1964. Pelagic fur seal investigations, Alaska waters, 1962. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 475.

Fitch, J. E., and R. L. Brownell, Jr. 1968. Fish otoliths in cetacean stomachs and their importance in interpreting feeding habits. J. Fish. Res. Board Can. 25:2561-2574.

Fontaine, P. M., M. O. Hammill, C. Barrette, and M. C. Kingsley. 1994. Summer diet of the harbour porpoise (*Phocoena phocoena*) in the estuary and the northern Gulf of St. Lawrence. Can. J. Fish. Aquat. Sci. 51:172-178.

Fowler, C. W. 1999. Management of multi-species fisheries: from overfishing to sustainability. ICES J. Mar. Sci. 56:927-932.

Fowler, C. W. 2003. Tenets, principles, and criteria for management: the basis for systemic management. Mar. Fish. Rev. 65:1-55.

Fowler, C. W., J. D. Baker, K. E. W. Shelden, P. R. Wade, D. P. DeMaster, and R. C. Hobbs. 1999. Sustainability: Empirical examples and management implications, p. 305-314. *In* Ecosystem approaches for fishery management. Alaska Sea Grant Program AK-SG-99-01.

Fowler, C. W., and L. Hobbs. 2002. Limits to Natural Variation: Implications for Systemic Management. Anim. Biodivers. Conserv. 25:7-45.

Fowler, C. W., and L. Hobbs. 2003. Is humanity sustainable? Proc. R. Soc. Lond. B, 270:2579-2583.

Fowler, C. W., and R. J. M. Crawford. 2004. Systemic management of fisheries in space and time: tradeoffs, complexity, ecosystems, sustainability. Biosphere Conservation 6:25-42.

Froese, R., and D. Pauly. 2003. FishBase. http://www.fishbase.org. Accessed 10 June 2005.

Frolkina, G. A., M. P. Konstantinova, and I. A. Trunov. 1998. Composition and characteristics of ichthyofauna in pelagic waters of South Georgia (Subarea 48.3). CCAMLR Science 5:125-164.

Frost, K. J., and L. F. Lowry. 1980. Feeding of ribbon seals (*Phoca fasciata*) in the Bering Sea in spring. Can. J. Zool. 58:1601-1607.

Frost, K. J., and L. F. Lowry. 1986. Sizes of walleye pollock, *Theragra chalcogramma*, consumed by marine mammals in the Bering Sea. Fish. Bull., U. S. 84:192-197.

Futuyma, D. J., and M. Slatkin. (eds.). 1983. Coevolution. Sinauer Associates, Sunderland, MA, 555 p.

Gales, R. P., and D. Pemberton. 1994. Diet of the Australian fur seal in Tasmania. Aust. J. Mar. Freshw. Res. 45:653-664.

Gales, R. P., D. Pemberton, C. C. Lu, and M. R. Clarke. 1993. Cephalopod diet of the Australian fur seal: variation due to location, season and sample type. Australian Journal of Marine and Freshwater Research 44:657-671.

Gannon, D. P., J. E. Craddock, and A. J. Read. 1998. Autumn food habits of harbor porpoises, *Phocoena phocoena*, in the Gulf of Maine. Fish. Bull., U. S. 96:428-437.

Gannon, D. P., A. J. Read, J. E. Craddock, K. M. Fristrup, and J. R. Nicolas. 1997a. Feeding ecology of long-finned pilot whales *Globicephala melas* in the western North Atlantic. Mar. Ecol. Prog. Ser. 148:1-10.

Gannon, D. P., A. J. Read, J. E. Craddock, and J. G. Mead. 1997b. Stomach contents of long-finned pilot whales (*Globicephala melas*) stranded on the U.S. Mid-Atlantic Coast. Mar. Mammal Sci. 13:405-418.

Garcia, S. M., and C. Newton. 1997. Current situations, trends and prospects in world capture fisheries, 3–27. In E. K. Pikitch, D. D. Huppert, and M. P. Sissenwine (eds.), Global trends: fisheries management. Am. Fish. Soc. Symp. 20.

George-Nascimento, M., R. Bustamante, and C. Oyarzun. 1985. Feeding ecology of the South American sea lion *Otaria flavescens*: food contents and food selectivity. Mar. Ecol. Prog. Ser. 21:135-143.

Goldsworthy, S. D., M. A. Hindell, and H. M. Crowley. 1997. Diet and diving behaviour of sympatric fur seals *Arctocephalus gazella* and *A. tropicalis* at Macquarie Island, p. 151-163. In M. A. Hindell and C. M. Kemper (eds.), Marine Mammal Research in the Southern Hemisphere. Volume 1. Status, Ecology, and Medicine. Surrey Beatty & Sons, Chipping Norton, N.S.W.

Gon, O., and P. C. Heemstra (eds.). 1990. Fishes of the Southern Ocean. J. L. B. Smith Institute of Ichthyology, Grahamstown, South Africa.

González, A. F., P. N. Trathan, C. Yau, and P. G. Rodhouse. 1997. Interactions between oceanography, ecology and fishery biology of the ommastrephid squid *Martialia hyadesi* in the South Atlantic. Mar. Ecol. Prog. Ser. 152:205-215.

Gorny, M., T. Brey, W. Arntz, and T. Bruns. 1993. Growth, development and productivity of *Chorismus antarcticus* (Pfeffer) (Crustacea:Decapoda:Natantia) in the eastern Weddell Sea, Antarctica. J. Exp. Mar. Biol. Ecol. 174:261-275.

Green, K., and H. R. Burton. 1993. Comparison of the stomach contents of southern elephant seals, *Mirounga leonina*, at Macquarie and Heard Islands. Mar. Mammal Sci. 9:10-22.

Green, K., and H. R. Burton. 1987. Seasonal and geographical variation in the food of Weddell seals, *Leptonychotes weddellii*, in Antarctica. Aust. Wildl. Res. 14:475-489.

Green, K., H. R. Burton, and R. Williams. 1989. The diet of Antarctic fur seals, *Arctocephalus gazella* (Peters) during the breeding season at Heard Island. Antarct. Sci. 1:317-324.

Green, K., and R. Williams. 1986. Observations on food remains in faeces of elephant, leopard and crabeater seals. Polar Biol. 6:43-45.

Green, K., R. Williams, and H. R. Burton. 1997. Foraging ecology of Antarctic fur seals *Arctocephalus gazella* Peters around Heard Island, p. 105-113. In M. A. Hindell and C. M. Kemper (eds.), Marine Mammal Research in the Southern Hemisphere. Volume 1. Status, Ecology, and Medicine. Surrey Beatty & Sons, Chipping Norton, N.S.W.

Green, K., R. Williams, K. A. Handasyde, H. R. Burton, and P. D. Shaughnessy. 1990. Interspecific and intraspecific differences in the diets of fur seals, *Arctocephalus* species (Pinnipedia:Otariidae), at Macquarie Island. Aust. Mammal. 13:193-200.

Gudmundson, C. J., T. K. Zeppelin, and R. R. Ream. in press. Comparison of two methodologies for determining diet in northern fur seals (*Callorhinus ursinu*s). Fish. Bull., U. S.

Hammond, P. S., A. J. Hall, and J. H. Prime. 1994a. The diet of grey seals around Orkney and other island and mainland sites in northeastern Scotland. J. Appl. Ecol. 31:340-350.

Hammond, P. S., A. J. Hall, and J. H. Prime. 1994b. The diet of grey seals in the Inner and Outer Hebrides. J. Appl. Ecol. 31:737-746.

Harvey, J. T., R. C. Helm, and G. V. Morejohn. 1995. Food habits of harbor seals inhabiting Elkhorn Slough, California. Calif. Fish Game 81:1-9.

Hauksson, E., and V. Bogason. 1997. Comparative feeding of grey (*Halichoerus grypus*) and common seals (*Phoca vitulina*) in coastal waters of Iceland, with a note on the diet of hooded (*Cystophora cristata*) and harp seals (*Phoca groenlandica*). J. Northwest Atl. Fish. Sci. 22:125-135.

Heide-Jørgensen, M. P., R. Dietz, and S. Leatherwood. 1994. A note on the diet of narwhals (*Monodon monoceros*) in Inglefield Bredning (NW Greenland), p. 213-216. In E. W. Born, R. Dietz, and R. R. Reeves (eds.), Studies of white whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in Greenland and adjacent waters. Meddelelser om Grønland, Bioscience 39.

Holling, C. S. 1959. Some characteristics of simple types of predation and parasitism. Can. Entomol. 91:385-398.

Isarev, A. T. 1986. Some features of reproduction and fecundity dynamics of the cape kingclip (*Genypterus capensis*) in ICSEAF Divisions 1.3 + 1.4. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.13:229-232.

Jackson, G. D., M. J. A. George, and N. G. Buxton. 1998. Distribution and abundance of the squid *Moroteuthis ingens* (Cephalopoda:Onychoteuthidae) in the Falkland Islands region of the South Atlantic. Polar Biol. 20:56-65.

Japp, D. W. 1990. A new study on age and growth of kingklip *Genypterus capensis* off the south and west coasts of South Africa, with comments on its use for stock identification. South Afr. J. Mar. Sci. 9:223-237.

Jazdzewski, K., J. Dzik, J. Porebski, S. Rakusa-Suszzewski, Z. Witek, and N. Wolnomiejski. 1978. Biological and population studies on krill near South Shetland Islands, Scotia Sea and South Georgia in the summer of 1976. Pol. Arch. Hydrobiol. 25:607-631.

Jørgensen, T. 1990. Long-term changes in age at sexual maturity of Northeast Arctic cod (*Gadus morhua* L.). J. Cons. Cons. Int. Explor. Mer 46:235-248.

Kaimmer, S. M., J. E. Reeves, D. R. Gunderson, G. B. Smith, and R. A. MacIntosh (eds.). 1976. Baseline information from the 1975 OCSEAP survey of the demersal fauna of the eastern Bering Sea. Demersal fish and shellfish resources of the eastern Bering Sea in the baseline year of 1975. Northwest Fisheries Center Processed Report, p. 157-366.

Kajimura, H. 1984. Opportunistic feeding of the northern fur seal, *Callorhinus ursinus*, in the eastern North Pacific Ocean and eastern Bering Sea. U.S. Dep. Commer., NOAA Tech. Rep. NMFS SSRF-779.

Kajimura, H. 1985. Opportunistic feeding of the northern fur seal, *Callorhinus ursinus*, in the eastern North Pacific Ocean and eastern Bering Sea, p. 300-318. In J. R. Beddington, R. J. H. Beverton, and D. M. Lavigne (eds.), Marine Mammals and Fisheries. George Allen and Unwin, London.

Kaschner, K., and D. Pauly. 2004. Competition between marine mammals and fisheries: Food for thought. Report for the Humane Society of the United States. 28 p. Available online at http://65.61.158.165/web-files/PDF/FoodForThought_v2.pdf. Accessed January 2005.

Kashiwada, J., C. W. Recksiek, and K. Karpov. 1979. Beaks of the market squid, *Loligo opalescens*, as tools for predator studies. CaliCOFI Rep. XX:65-69.

Kirkman, S. P., W. Wilson, N. T. W. Klages, M. N. Bester, and K. Isaksen. 2000. Diet and estimated food consumption of Antarctic fur seals at Bouvetøya during summer. Polar Biol. 23:745–752.

Kirkpatrick, M. 1993. The evolution of size and growth in harvested natural populations, p. 145-154. In T. K. Stokes, J. M. McGlade, and R. Law (eds.), The exploitation of evolving resources: proceedings of an international conference, held at Jülich, Germany, September 3-5, 1991. Lecture notes in biomathematics, 99. Springer-Verlag, Berlin.

Kiyota, M., C. Kawai, and N. Baba. 1999. Estimation of the diet of male northern fur seals (*Callorhinus ursinus*) based on analysis of fecal and regurgitated materials. Bull. Natl. Res. Inst. Far Seas Fish. 36:1-7.

Klages, N. T. W., and M. N. Bester. 1998. Fish prey of fur seals *Arctocephalus* spp. at subantarctic Marion Island. Mar. Biol. 131:559–566.

Klages, N. T. W., G. J. G. Hofmeyr, and I. L. B. Gjertz. 1999. Prey of Antarctic fur seals at Bouvetøya, Southern Ocean. Polar Rec. 35:255-257.

Kock, K.-H. 1985. The state of exploited Antarctic fish stocks around South Georgia (Antarctic). Archiv Für Fischereiwissenschaft. 1985; 36(1-2):155-183.

Kock, K.-H. 1998. Changes in the fish biomass around Elephant Island (Subarea 48.1) from 1976 to 1996. CCAMLR Science 5:165-189.

Kock, K.-H., and F. W. Köster. 1989. The state of exploited fish stocks in the Atlantic sector of the Southern Ocean. Mitteilungen aus dem Institut für Seefishcherei der Bundesforschungsanstalt für Fischerei 46. 73 p.

Konchina, Yu. V. 1989. Epibenthic species in the Benguela system. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.16:149-168.

Konigsberg, L. W., S. R. Frankenberg, and R. B. Walker. 1997. Regress what on what? Paleodemographic age estimation as a calibration problem, p. 64-87. In R. R. Paine (ed.), Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Laidre, K., and M. P. Heide-Jørgensen. 2005. Seasonal feeding intensity of narwhals (*Monodon monoceros*). Mar. Mammal Sci. 21:45-57.

Laidre, K., M. P. Heide-Jørgensen, O. A. Jørgensen, and M. A. Treble. 2004. Deep ocean predation by a high Arctic cetacean. ICES J. Mar. Sci. 61:430-440.

Lake, S. 1997. Analysis of the diet of New Zealand fur seals *Arctocephalus forsteri* in Tasmania, p. 125-129. In M. A. Hindell and C. M. Kemper (eds.), Marine Mammal Research in the Southern Hemisphere. Volume 1. Status, Ecology, and Medicine. Surrey Beatty & Sons, Chipping Norton, N.S.W.

Lalas, C. 1997. Prey of Hooker's sea lions based at the Otago Peninsula, New Zealand, p. 130-136. In M. A. Hindell and C. M. Kemper (eds.), Marine Mammal Research in the Southern Hemisphere. Volume 1. Status, Ecology, and Medicine. Surrey Beatty & Sons, Chipping Norton, N.S.W.

Law, R. 2000. Fishing, selection, and phenotypic evolution. ICES J. Mar. Sci. 57:659-668.

Lea, M.-A., Y. Cherel, C. Guinet, and P. D. Nichols. 2002. Antarctic fur seals foraging in the Polar Frontal Zone: inter-annual shifts in diet as shown from fecal and fatty acid analyses. Mar. Ecol. Prog. Ser. 245:281-297.

Leos, R. R. 1998. The biological characteristics of the Monterey Bay squid catch and the effect of a two-day-per-week fishing closure. Calif. Coop. Ocean. Fish. Investig. Rep. 39:204-211.

Levinton, J. S. 1992. The big bang of animal evolution. Scientific American 267:84-91.

Lipinski, M. R., and J. H. M. David. 1990. Cephalopods in the diet of the South African fur seal (*Arctocephalus pusillus pusillus*). J. Zool. (London) 221:359-374.

Livingston, P. A. 1993. Importance of predation by groundfish, marine mammals and birds on walleye pollock *Theragra chalcogramma* and Pacific herring *Clupea pallasi* in the eastern Bering Sea. Mar. Ecol. Prog. Ser. 102:205-215.

Lowry, L. F., K. J. Frost, and T. R. Loughlin. 1989. Importance of walleye pollock in the diets of marine mammals in the Gulf of Alaska and Bering Sea, and implications for fishery management, p. 701-726. *In* Proceedings of the International Symposium on the Biology and Management of Walleye Pollock, Anchorage, Alaska, USA, November 14-16, 1988. Alaska Sea Grant Program AK-SG-89-01.

Lowry, M. S., and J. V. Carretta. 1999. Market squid (*Loligo opalescens*) in the diet of California sea lions (*Zalophus californianus*) in southern California (1981-1995). Calif. Coop. Ocean. Fish. Investig. Rep. 40:196-202.

Lozán, J. L. 1988. Distribution, density, and structure of the dab (*Limanda limanda* L.) population in the North Sea and comparisons with the populations around Iceland and in the Baltic Sea based on meristic features. Arch. Fischwiss. 38:165-189.

Mackintosh, N. A. 1974. Sizes of krill eaten by whales in Antarctica. Discov. Rep. 36:157-178.

Marr, J. W. S. 1962. The natural history and geography of the Antarctic krill (*Euphausia superba* Dana). Discov. Rep. 32:33-464.

McAlister, W. B., G. A. Sanger, and M. A. Perez. 1976. Preliminary estimates of pinniped-finfish relationships in the Bering Sea. *In* Unpublished background paper, 19th meeting of the North Pacific Fur Seal Commission, Moscow, 1976.

McAlister, W. B., and M. A. Perez. 1977. A marine mammal ecosystem model for the Bering Sea. Unpublished manuscript on file, National Marine Mammal Laboratory, Seattle, WA.

McCafferty, D. J., I. L. Boyd, T. R. Walker, and R. I. Taylor. 1998. Foraging responses of Antarctic fur seals to changes in the marine environment. Mar. Ecol. Prog. Ser. 166:285-299.

McFarlane, G. A., R. J. Beamish, and L. M. Zverkova. 1996. An examination of age estimates of walleye pollock (*Theragra chalcogramma*) from the Sea of Okhotsk using the burnt otolith method and implications for stock assessment and management, p. 278-285. In Y. Nagata, V. B. Lobanov, and L. D. Talley (eds.), Proceedings of the Workshop on the Okhotsk Sea and Adjacent Areas. PICES Sci. Rep. 6.

McGarvey, R., and A. J. Fowler. 2002. Seasonal growth of King George whiting (*Sillaginodes punctata*) estimated from length-at-age samples of the legal-size harvest. Fish. Bull., U. S. 100:545-558.

McPhail, A. S., T. A. Shipton, W. H. H. Sauer, and R. W. Leslie. 2001. Aspects of the biology of the Cape Gurnard *Chelidonichthys capensis* (Scorpaeniformes:Triglidae) on the Agulhas Bank, South Africa. Vie Milieu 51:217-227.

Melin, S. R. 2002. The foraging ecology and reproduction of the California sea lion (*Zalophus californianus californianus*). Unpublished Ph.D. dissertation, University of Minnesota. 150 p.

Mitchell, P., and W. Arthur. 1991. Extinction due to evolution of a competitor. Evolution 45:307-313.

Morales-Nin, B. Y. O. 1991. Growth of cape hake *Merluccius capensis* off Namibia determined by means of length frequency analysis and age/length data. South Afr. J. Mar. Sci. 10:53-60.

Morejohn, G. V., J. T. Harvey, and L. T. Krasnow. 1978. The importance of *Loligo opalescens* in the food web of marine vertebrates in Monterey Bay, California, p. 67-97. In C. W. Recksiek and H. W. Frey (eds.), Biological, oceanographic and acoustic aspects of the market squid, *Loligo opalescens* Berry. California Department of Fish and Game, Long Beach, CA.

Mori, J., T. Kubodera, and N. Baba. 2001. Squid in the diet of northern fur seals, *Callorhinus ursinus*, caught in the western and central North Pacific Ocean. Fish. Res. 52:91-97.

Murie, D. J., and D. M. Lavigne. 1991. Food consumption of wintering harp seals, *Phoca groenlandica*, in the St. Lawrence Estuary, Canada. Can. J. Zool. 69:1289-1296.

Murie, D. J., and D. M. Lavigne. 1992. Growth and feeding habits of grey seals (*Halichoerus grypus*) in the northwestern Gulf of St. Lawrence, Canada. Can. J. Zool. 70:1604-1613.

Myers, R. A., and B. Worm. 2003. Rapid worldwide depletion of predatory fish communities. Nature 423:280-283.

NMFS (National Marine Fisheries Service). 1998. Fisheries of the Exclusive Economic Zone off Alaska; Forage Fish Species Category. Federal Register 63(51):50 CFR Part 679.

NRC (National Research Council). 1996. Upstream: Salmon and society in the Pacific Northwest. National Academy Press, Washington, D.C. 452 p.

Nelson, M. O., and E. P. Nunnallee. 1987. Results of acoustic-trawl surveys for walleye pollock in the Gulf of Alaska in 1986, p. 15-38. In R. L. Major (ed.), Condition of groundfish resources of the Gulf of Alaska region as assessed in 1986. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-119.

Nemoto, T. 1959. Food of baleen whales with reference to whale movements. Sci. Rep. Whales Res. Inst. Tokyo 14:149-291.

Nemoto, T., M. Okiyama, N. Iwasaki, and T. Kikuchi. 1988. Squid as predators on krill (*Euphausia superba*) and prey for sperm whales in the Southern Ocean, p. 292-296. In D. Sahrhage (ed.), Antarctic Ocean and Resources Variability. Springer-Verlag, Berlin.

Nemoto, T., M. Okiyama, and M. Takahashi. 1985. Aspects of the roles of squid in food chains of marine Antarctic ecosystems, p. 415-420. In W. R. Siegfried, P. R. Condy, and R. M. Laws (eds.), Antarctic nutrient cycles and food webs. Springer-Verlag, Berlin.

Nesis, K. N. 1987. Squids, cuttlefishes, octopuses, and allies. T.F.H. Publications, Neptune City, N.J.

Nicol, S., and Y. Endo. 1997. Krill fisheries of the world. FAO Fish. Tech. Pap. T367.

Nilssen, K. T., P. E. Grotnes, and T. Haug. 1990. The effect of invading harp seals (*Phoca groenlandica*) on local coastal fish stocks of North Norway. Fish. Res. 13:25-37.

Nilsson, P. A., and C. Brönmark. 2000. Prey vulnerability to a gape-size limited predator: behavioural and morphological impacts on northern pike piscivory. Oikos 88:539-546.

North, A. W. 1996. Fish in the diet of Antarctic fur seals (*Arctocephalus gazella*) at South Georgia during winter and spring. Antarct. Sci. 8:155-160.

Norusis, M. J. 1998. SPSS 8.0: Guide to Data Analysis. Prentice Hall, Upper Saddle River, NJ.

Ohizumi, H., T. Kuramochi, M. Amona, and N. Miyazaki. 2000. Prey switching of Dall's porpoise *Phocoenoides dalli* with population decline of Japanese pilchard *Sardinops melanostictus* around Hokkaido, Japan. Mar. Ecol. Prog. Ser. 200:265-275.

Ohizumi, H., T. Isoda, T. Kishiro, and H. Kato. 2003. Feeding habits of Baird's beaked whale *Berardius bairdii*, in the western North Pacific and Sea of Okhotsk off Japan. Fish. Sci. (Tokyo) 69:11-20.

Olsen, E. M., M. Heino, G. R. Lilly, M. J. Morgan, J. Brattey, B. Ernande, and U. Dieckmann. 2004. Maturation trends indicative of rapid evolution preceded the collapse of northern cod. Nature 428:932-935.

Orians, G. H. 1975. Diversity, stability and maturity in natural ecosystems, p. 139-150. In W. H. van Dobben and R. H Lowe-McConnell (eds.), Unifying concepts in ecology. Dr. W. Junk, The Hague, the Netherlands, and the Centre for Agricultural Publishing and Documentation, Wageningen, the Netherlands.

Orians, G. H. 1990. Ecological concepts of sustainability. Environment 32:10-15, 34-39.

O'Toole, M. J., L. V. Shannon, V. de Barros Neto, and D. E. Malan. 2001. Integrated management of the Benguela Current Region, p. 231-253. In B. von Bodungen and R. K. Turner (eds.), Science and Integrated Coastal Management. Dahlem University Press, Berlin.

Overholtz, W. J., and G. T. Waring. 1991. Diet composition of pilot whales *Globicephala* sp. and common dolphins *Delphinus delphis* in the Mid-Atlantic Bight during Spring 1989. Fish. Bull., U. S. 89:723-728.

Parkes, G. 1993. The fishery for Antarctic icefish (*Champsocephalus gunnari*) around South Georgia. Unpublished Ph.D. dissertation, Imperial College, University of London. 465 p.

Pauly, D. 1985. Population dynamics of short-lived species, with emphasis on squids. Northwest Atl. Fish. Organ. Sci. Counc. Stud., Special Session on Squids 9:143-154.

Pauly, D., V. Christensen, S. Guénette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson, and D. Zeller. 2002. Towards sustainability in world fisheries. Nature 418:689-695.

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese, and F. Torres, Jr. 1998a. Fishing down marine food webs. Science 279:860-863.

Pauly, D., A. W. Trites, E. Capuli, and V. Christensen. 1998b. Diet composition and trophic levels of marine mammals. ICES J. Mar. Sci. 55:467-481.

Payne, A. I. L., C. J. Augustyn, and R. W. Leslie. 1985. Biomass indices and catch of Cape hake from random stratified sampling cruises in Division 1.6 during 1984. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.12:99-123.

Payne, A. I. L., C. J. Augustyn, and R. W. Leslie. 1986. Results of the South African Hake Biomass cruises in Division 1.6 in 1985. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.13:181-196.

Perez, M. A., and M. A. Bigg. 1986. Diet of northern fur seals, *Callorhinus ursinus*, off western North America. Fish. Bull., U. S. 84:957-971.

Perrin, W. F., R. R. Warner, C. H. Fiscus, and D. B. Holts. 1973. Stomach contents of porpoise, *Stenella* spp. and yellowfin tuna, *Thunnus albacares*, in mixed species aggregations. Fish. Bull., U. S. 71:1077-1092.

Perrin, W. F., B. Würsig, and J. G. M. Thewissen (eds.). 2002. Encyclopedia of Marine Mammals. Academic Press, New York. 1414 p.

Pierce, G. J., and P. R. Boyle. 1991. A review of methods for diet analysis in piscivorous marine mammals. Oceanogr. Mar. Biol. Ann. Rev. 29:409-486.

Pitcher, K. W. 1981. Prey of the Steller sea lion, *Eumetopias jubatus*, in western Alaska. Fish. Bull., U. S. 79:467-472.

Plötz, J. 1986. Summer diet of Weddell seals (*Leptonychotes weddellii*) in the eastern and southern Weddell Sea, Antarctica. Polar Biol. 6:97-102.

Plötz, J., H. Bornemann, R. Knust, A. Schröder, and M. Bester. 2001. Foraging behaviour of Weddell seals, and its ecological implications. Polar Biol. 24:901-909.

Plötz, J., W. Ekau, and P. J. H. Reijnders. 1991. Diet of Weddell seals *Leptonychotes weddellii* at Vestkapp, eastern Weddell Sea (Antarctica), in relation to local food supply. Mar. Mammal Sci. 7:136-144.

Poulsen, S., J. R. Nielsen, R. Holst, and K.-J. Staehr. 2000. An Atlantic herring (*Clupea harengus*) size selection model for experimental gill nets used in the Sound (ICES Subdivision 23). Can. J. Fish. Aquat. Sci. 57:1551-1561.

Prime, J. H., and P. S. Hammond. 1990. The diet of grey seals from the southwestern North Sea assessed from analyses of hard parts found in faeces. J. Appl. Ecol. 27:435-447.

Prosch, R. M. 1991. Reproductive biology and spawning of the myctophid *Lampanyctodes hectoris* and the sternoptychid *Maurolicus muelleri* in the southern Benguela ecosystem. South Afr. J. Mar. Sci. 10:241-252.

Recchia, C. A., and A. J. Read. 1989. Stomach contents of harbour porpoises, *Phocoena phocoena* (L.), from the Bay of Fundy. Can. J. Zool. 67:2140-2146.

Reid, K. 1995. The diet of Antarctic fur seals (*Arctocephalus gazella* Peters 1875) during winter at South Georgia. Antarct. Sci. 7:241–249.

Reid, K., and J. P. Y. Arnould. 1996. The diet of Antarctic fur seals *Arctocephalus gazella* during the breeding season at South Georgia. Polar Biol. 16:105–114.

Reid, K., and A. S. Brierley. 2001. The use of predator-derived krill length-frequency distributions to calculate krill target strength. CCAMLR Science 8:155-163.

Reid, K., P. N. Trathan, J. P. Croxall, and H. J. Hill. 1996. Krill caught by predators and nets: differences between species and techniques. Mar. Ecol. Prog. Ser. 140:13-20.

Reznick, D. N. 1993. Norms of reaction in fishes, p. 72-90. In T. K. Stokes, J. M. McGlade, and R. Law (eds.), The exploitation of evolving resources: proceedings of an international conference, held at Jülich, Germany, September 3-5, 1991. Lecture notes in biomathematics, 99. Springer-Verlag, Berlin.

Reznick, D. N., F. H. Shaw, F. H. Rodd, and R. G. Shaw. 1997. Evaluation of the rate of evolution in natural populations of guppies (*Poecilia reticulata*). Science 275:1934-1937.

Rice, D. W. 1998. Marine mammals of the world: systematics and distribution. Society for Marine Mammalogy, Lawrence, KS.

Rijnsdorp, A. D. 1989. Maturation of male and female North Sea plaice (*Pleuronectes platessa* L.). J. Cons. Cons. Int. Explor. Mer 46:35-51.

Robertson, K. M., and S. J. Chivers. 1997. Prey occurrence in pantropical spotted dolphins, *Stenella attenuata*, from the eastern tropical Pacific. Fish. Bull., U. S. 95:334-348.

Robison, B. H., and J. E. Craddock. 1983. Mesopelagic fishes eaten by Fraser's dolphin, *Lagenodelphis hosei*. Fish. Bull., U. S. 81:283-289.

Rodhouse, P. G., T. R. Arnbom, M. A. Fedak, J. Yeatman, and W. A. Murray. 1992. Cephalopod prey of the southern elephant seal, *Mirounga leonina* L. Can. J. Zool. 70:1007-1015.

Roper, C. F. E., M. J. Sweeney, and C. E. Nauen. 1984. FAO species catalog. Vol. 3. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. FAO Fish. Synop. 125.

Rubec, P. J., K. Metuzals, and J. Wright. 1985. 1984 stock status of division 4RST redfish. CAFSAC Res. Doc. 85/98. 45 p.

Santos, M. B., G. J. Pierce, P. R. Boyle, R. J. Reid, H. M. Ross, I. A. P. Patterson, C. C. Kinze, S. Tougaard, R. Lick, U. Piatkowski, and V. Hernández-García. 1999. Stomach contents of sperm whales stranded in the North Sea 1990-1996. Mar. Ecol. Prog. Ser. 183:281-294.

Rosenberg, A. A. 2003. Managing to the margins: the overexploitation of fisheries. Front. Ecol. Environ. 1:102–106.

Scharf, F. S., F. Juanes, and R. A. Rountree. 2000. Predator size-prey size relationships of marine fish predators: Interspecific variation and effects of ontogeny and body size on trophic-niche breadth. Mar. Ecol. Prog. Ser. 208:229-248.

Schoeman, D. S., A. C. Cockcroft, D. L. Van Zyl, and P. C. Goosen, 2002. Trap selectivity and the effects of altering gear design in the South African rock lobster *Jasus lalandii* commercial fishery. South Afr. J. Mar. Sci. 24:37-48.

Schwartzlose, R. A., J. Alheit, A. Bakun, T. R. Baumgartner, R. Cloete, R. J. M. Crawford, W. J. Fletcher, Y. Green-Ruiz, E. Hagen, T. Kawasaki, D. Lluch-Belda, S. E. Lluch-Cota, A. D. MacCall, Y. Matsuura, M. O. Nevarez-Mártínez, R. H. Parrish, C. Roy, A. Serra, K. V. Shust, M. N. Ward, and J. Z. Zuzunaga. 1999. Worldwide large-scale fluctuations of sardine and anchovy populations. South Afr. J. Mar. Sci. 21:289-347.

Seagars, D. J., and J. R. Henderson. 1985. Cephalopod remains from the stomach of a short-finned pilot whale collected near Santa Catalina Island, California. J. Mammal. 66:777-779.

Seaman, G. A., L. F. Lowry, and K. J. Frost. 1982. Foods of belukha whales (*Delphinapterus leucas*) in western Alaska. Cetology 44:1-19.

Sekiguchi, K., N. T. W. Klages, and P. B. Best. 1992. Comparative analysis of the diets of smaller odontocete cetaceans along the coast of southern Africa. Benguela Trophic Functioning. South Afr. J. Mar. Sci. 12:843-861.

Sekiguchi, K., N. T. W. Klages, and P. B. Best. 1996. The diet of strap-toothed whales (*Mesoplodon layardii*). J. Zool., London 239:453-463.

Sekiguchi, K., N. Klages, K. Findlay, and P. B. Best. 1993. Feeding habits and possible movements of southern bottlenose whales (*Hyperoodon planifrons*). Proceedings of the NIPR Symposium on Polar Biology. National Institute of Polar Research, Tokyo 6:84-7.

Sergeant, D. E., K. Ronald, J. Boulva, and F. Berkes. 1979. The recent status of *Monachus monachus*, the Mediterranean monk seal. *In* First International Conference on the Mediterranean monk seal, Rodes, Greece. May 1978. Working Paper No. 1. United Nations Environment Programme, Pergamon Press, New York.

Siegel, V. 1986. Structure and composition of the Antarctic krill stock in the Bransfield Strait (Antarctic Peninsula) during the Second International BIOMASS Experiment (SIBEX). Arch. Fischwiss. 37:51-72.

Siegel, V., U. Damm, and V. A. Sushin. 1998. Catch per unit effort (CPUE) data from the early years of commercial krill fishing operations in the Atlantic sector of the Antarctic. CCAMLR Science 5:31-50.

Simonsen, C. S., and J. Boje. 2003. An assessment of the Greenland halibut stock component in NAFO Division 1A inshore. Northwest Atl. Fish. Organ. SCR Document 03/49. 22 p.

Sinclair, E. H. 1994. Prey of juvenile northern elephant seals (*Mirounga angustirostris*) in the Southern California Bight. Mar. Mammal Sci. 10:230-239.

Sinclair, E. H. 1992. Stomach contents of four short-finned pilot whales (*Globicephala macrorhynchus*) from the Southern California Bight. Mar. Mammal Sci. 8:76-81.

Sinclair, E. H., T. R. Loughlin, and W. G. Pearcy. 1994. Prey selection by northern fur seals (*Callorhinus ursinus*) in the eastern Bering Sea. Fish. Bull., U. S. 92:144-156.

Skinner, J. D., and N. T. W. Klages. 1994. On some aspects of the biology of the Ross seal *Ommatophoca rossii* from King Haakon VII Sea, Antarctica. Polar Biol. 14:467-472.

Slatkin, M. 1983. Genetic background, p. 14-32. In D.J. Futuyma and M. Slatkin (eds.), Coevolution. Sinauer Associates, Sunderland, MA.

Slip, D. J., G. J. Moore, and K. Green. 1995. Stomach contents of a southern bottle-nosed whale, *Hyperoodon planifrons*, stranded at Heard Island. Mar. Mammal Sci. 11:575-584.

Stenseth, N. C., and J. Maynard Smith. 1984. Coevolution in ecosystems; Red Queen evolution or stasis? Evolution 38:870-880.

Stroud, R. K., C. H. Fiscus, and H. Kajimura. 1980. Food of the Pacific white-sided dolphin, *Lagenorhynchus obliquidens*, Dall's porpoise, *Phocoenoides dalli*, and northern fur seal, *Callorhinus ursinus*, off California and Washington. Fish. Bull., U. S. 78:951-959.

Sutherland, W. J. 1990. Evolution and fisheries. Nature 344:814-815.

Svedäng, H. 2003. The inshore demersal fish community on the Swedish Skagerrak coast: regulation by recruitment from offshore sources. ICES J. Mar. Sci. 60:23-31.

Swartzman, G., and R. T. Haar. 1983. Interactions between fur seal populations and fisheries in the Bering Sea. Fish. Bull., U. S. 81:121-132.

Thompson, J. N. 1982. Interaction and coevolution. John Wiley and Sons, New York, NY. 179 p.

Tollit, D. J., S. G. Heaslip, and A. W. Trites. 2004a. Sizes of walleye pollock (*Theragra chalcogramma*) consumed by the eastern stock of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska from 1994 to 1999. Fish. Bull., U. S. 102:522-532.

Tollit, D. J., S. G. Heaslip, T. K. Zeppelin, R. Joy, K. A. Call, and A. W. Trites. 2004b. A method to improve size estimates of walleye pollock (*Theragra chalcogramma*) and Atka mackerel (*Pleurogrammus monopterygius*) consumed by pinnipeds: digestion correction factors applied to bones and otoliths recovered in scats. Fish. Bull., U. S. 102:498-508.

Torok, M. L. 1994. Movements, daily activity patterns, dive behavior, and food habits of harbor seals (*Phoca vitulina richardsi*) in San Francisco Bay, California. Unpublished Master's Thesis. California State University, Stanislaus and Moss Landing Marine Laboratories. 88 p.

Tsuchiya, K. 2000. *Enoploteuthis anapsis* Roper 1964. Tree of Life Web Project. http://tolweb.org/tree?group=Enoploteuthis%20anapsis/. Accessed 10 June 2005.

University of Michigan 1995. Animal Diversity Web http://animaldiversity.ummz.umich.edu/. Accessed 10 June 2005.

Waldron, M. E., R. M. Prosch, and M. J. Armstrong. 1991. Growth of juvenile round herring *Etrumeus whiteheadi* in the Benguela system. South Afr. J. Mar. Sci. 10:83-89.

Walker, W. A. 1996. Summer feeding habits of Dall's porpoise, *Phocoenoides dalli*, in the southern Sea of Okhotsk. Mar. Mammal Sci. 12:167-181.

Walker, W. A., and L. L. Jones. 1993. Food habits of northern right whale dolphin, Pacific white-sided dolphin, and northern fur seal caught in the high seas driftnet fisheries of the North Pacific Ocean, 1990, p. 285-295. In J. Ito, W. Shaw, and R. L. Burgner (eds.), Biology, distribution and stock assessment of species caught in the high seas driftnet fisheries in the North Pacific Ocean. INPFC Bulletin 53.

Walker, W. A., M. B. Hanson, R. W. Baird, and T. J. Guenther. 1998. Food habits of the harbor porpoise, *Phocoena phocoena*, and Dall's porpoise, *Phocoenoides dalli*, in the inland waters of British Columbia and Washington, p. 63-75. In P. S. Hill, B. Jones, and D. P. DeMaster (eds.), Marine Mammal Protection Act and Endangered Species Act Implementation Program 1997. U.S. Dep. Commer., AFSC Processed Report 98-10.

Walker, W. A., J. G. Mead, and R. L. Brownell, Jr. 2002. Diets of Baird's beaked whales, *Berardius bairdii*, in the southern Sea of Okhotsk and off the Pacific coast of Honshu, Japan. Mar. Mammal Sci. 18:902-919.

Walsh, S. J., R. B. Millar, C. G. Cooper, and W. M. Hickey. 1992. Codend selection in American plaice: diamond versus square mesh. Fish. Res. 13:235-254.

Wang, M.-C., W. A. Walker, S.-T. Shao, and L.-S. Chou. 2002. Comparative analysis of the diets of pygmy sperm whales and dwarf sperm whales in Taiwanese waters. Acta Zool. Taiwanica 13:53-62.

Wang, M.-C., W. A. Walker, S.-T. Shao, and L.-S. Chou. 2003. Feeding habits of the Pantropical spotted dolphin, *Stenella attenuata*, off the eastern coast of Tawain. Zool. Stud. 42:368-378.

Weslawski, J. M., M. Ryg, T. G. Smith, and N. A. Oritsland. 1994. Diet of ringed seals (*Phoca hispida*) in a fjord of West Svalbard. Arctic 47.

Wolotira, R. J. (ed.). 1985. Saffron cod, *Eleginus gracilis*, in western Alaska: The resource and its potential. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/NWC-79.

Wood, J. B., and C. Day. 1998. CephBase: A database-driven web site on all living cephalopods (octopus, squid, cuttlefish and nautilus). http://www.cephbase.utmb.edu/. Accessed 10 June 2005.

Wysokinski, A. 1984. Length structure of the Cape horse mackerel population and changes in the sexual maturity length in the Namibian region. Coll. Sci. Papers. Int. Comm. Southeast Atl. Fish.11:91-98.

Young, R. E., and K. M. Mangold. 1996a. *Megalocranchia* Pfeffer, 1884. Tree of Life Web Project. http://tolweb.org/tree?group=Megalocranchia/. Accessed 10 June 2005.

Young, R. E., and K. M. Mangold. 1996b. *Taonius* Steenstrup, 1861. Tree of Life Web Project. http://tolweb.org/tree?group=Taonius/. Accessed 10 June 2005.

Young, R. E., and M. Veccione. 2000. *Histioteuthis meleagroteuthis* (Chun 1910). Tree of Life Web Project. http://tolweb.org/tree?group=Histioteuthis%20meleagroteuthis/. Accessed 10 June 2005.

Zeppelin, T. K., D. J. Tollit, K. A. Call, T. J. Orchard, and C. J. Gudmundson. 2004. Sizes of walleye pollock (*Theragra chalcogramma*) and Atka mackerel (*Pleurogrammus monopterygius*) consumed by the western stock of Steller sea lions (*Eumetopias jubatus*) in Alaska from 1998 to 2000. Fish. Bull., U. S. 102:509-521.

Appendix 1: Summary food habits data, sorted phylogenetically by predator.

Predator species	Common name	Total N of cases	N of cases in analysis*	Mean of prey means (cm)
Otariid seals		**361**	**237**	**15.82**
Arctocephalus australis	South American fur seal	2	1	9.80
Arctocephalus forsteri	New Zealand fur seal	14	7	13.72
Arctocephalus galapagoensis	Galapagos fur seal	1	1	14.10
Arctocephalus gazella	Antarctic fur seal	142	99	12.33
Arctocephalus pusillus doriferus	Australian fur seal	14	11	19.97
Arctocephalus pusillus pusillus	South African fur seal	72	49	17.98
Arctocephalus tropicalis	sub-Antarctic fur seal	22	12	9.47
Arctocephalus spp.	sub-Antarctic and Antarctic fur seals, mixed	4	2	6.20
Callorhinus ursinus	northern fur seal	46	18	12.90
Eumetopias jubatus	Steller sea lion	11	8	33.35
Otaria flavescens	South American sea lion	6	6	26.48
Phocarctos hookeri	Hooker's sea lion	11	9	36.11
Zalophus californianus	California sea lion	14	12	14.27
Zalophus californianus woelbecki	Galapagos sea lion	2	2	13.80
Phocid seals		**234**	**146**	**18.64**
Cystophora cristata	hooded seal	2	2	34.40
Erignathus barbatus	bearded seal	4	3	10.30
Halichoerus grypus	grey seal	78	52	24.64
Hydrurga leptonyx	leopard seal	1	1	13.76
Leptonychotes weddelii	Weddell seal	23	9	11.79
Lobodon carcinophagus	crabeater seal	2	0	n.a.
Mirounga angustirostris	northern elephant seal	3	2	16.92
Mirounga leonina	southern elephant seal	33	12	14.72
Monachus monachus	Mediterranean monk seal	2	1	30.00
Ommatophoca rossii	Ross seal	6	3	14.70
Phoca fasciata	ribbon seal	3	3	12.44
Phoca groenlandica	harp seal	26	11	20.31
Phoca hispida	ringed seal	9	9	10.55
Phoca largha	spotted seal	6	5	13.13
Phoca vitulina	harbor seal	36	33	15.45
Mysticete whales		**7**	**5**	**5.90**
Balaenoptera acutorostrata	minke whale	1	1	14.50
Balaenoptera pysalus	fin whale	1	0	n.a.
Balaenoptera spp.	rorquals, mix of fin and blue whales	4	4	4.45
Megaptera novaeangliae	humpback whale	1	0	n.a.

Appendix 1: Summary food habits data, sorted phylogenetically by predator.

Predator species	Common name	Total N of cases	N of cases in analysis*	Mean of prey means (cm)
Odontocete whales		**556**	**338**	**18.64**
Berardius bairdii	Baird's beaked whale	19	15	36.64
Cephalorhynchus commersonii	Commerson's dolphin	3	3	9.50
Cephalorhynchus heavisidii	Heaviside's dolphin	6	4	14.83
Delphinapterus leucas	beluga whale	3	2	13.51
Delphinus delphis	common dolphin	6	6	16.33
Delphinus sp.	common dolphin	4	3	4.20
Feresa attenuata	pygmy killer whale	4	0	n.a.
Globicephala macrorhynchus	short-finned pilot whale	3	3	14.27
Globicephala melas = G. melaena	long-finned pilot whale	21	10	16.43
Globicephala sp.	pilot whale, species not specified	2	2	24.86
Grampus griseus	Risso's dolphin	24	15	12.08
Hyperoodon planifrons	southern bottlenosed whale	71	44	25.04
Kogia breviceps	pygmy sperm whale	27	12	15.85
Kogia sima	dwarf sperm whale	24	8	9.89
Lagenodelphis hosei	Fraser's dolphin	27	8	8.92
Lagenorhynchus obliquidens	Pacific white-sided dolphin	2	0	n.a.
Lagenorhynchus obscurus	dusky dolphin	9	8	12.86
Mesoplodon densirostris	Blainville's beaked whale	1	0	n.a.
Mesoplodon layardii	strap-toothed whale	28	6	16.59
Monodon monoceros	narwhal	8	6	20.55
Orcinus orca	killer whale	9	1	12.60
Phocoena phocoena	harbor porpoise	50	31	16.99
Phocoenoides dalli	Dall's porpoise	43	37	12.88
Physeter macrocephalus = P. catadon	sperm whale	69	47	31.35
Pontoporia blainvillei	*Franciscana*	9	6	9.12
Pseudorca crassidens	false killer whale	2	0	n.a.
Sotalia fluviatilis	*tucuxi*	20	10	9.71
Stenella attenuata	pan-tropical spotted dolphin	42	37	12.74
Stenella coeruleoalba	striped dolphin	2	2	12.10
Stenella frontalis	Atlantic spotted dolphin	1	1	8.90
Stenella longirostris	spinner dolphin	9	7	11.44
Steno bredanensis	rough-toothed dolphin	1	1	21.50
Tursiops truncatus	bottlenosed dolphin	7	3	23.77
mixed taxa**		8	0	n.a.
OVERALL		**1166**	**726**	**17.9**

*includes only those cases where mean prey size was based on a sample size of >=10

**an unspecified mix of northern fur seal, Dall's porpoise, and Pacific white-sided dolphin

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Arctocephalus spp.	Electrona carlsbergi	1.38	5.87	0.35	30	4.85	6.79	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
Arctocephalus spp.	Electrona subaspera	1.38	6.53	0.64	22			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Arctocephalus spp.	Electrona subaspera	1.38	7.94	0.57	5			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Arctocephalus spp.	Gymnoscopelus piabilis	1.38	8.94	3.04	2	6.79	11.09	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
A. australis	Loligo sanpaulensis	1.65	9.80		37	4.50	18.50	dos Santos and Haimovici 2001	Brazil	1985-1998
A. australis	Argonauta nodosa	1.65	1.50		3	1.00	1.80	dos Santos and Haimovici 2001	Brazil	1985-1998
A. forsteri	Nototodarus sloanii	1.40	§ 19.00		386	5.00	43.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Electrona subaspera	1.20	6.94	1.01	42			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
A. forsteri	Electrona subaspera	1.20	8.55	0.70	57			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
A. forsteri	Electrona subaspera	1.20	7.65	1.40	15			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
A. forsteri	Electrona sp.	1.40	§ 5.00		280	2.00	7.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Gymnoscopelus nicholsi	1.20	13.35	1.51	52			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
A. forsteri	Gymnoscopelus nicholsi	1.20	12.53	2.33	99			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
A. forsteri	Lampanyctodes hectoris	1.40	§ 4.60		1801	2.00	6.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Symbolophorus sp.	1.40	§ 8.50		421	2.00	14.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Auchenoceros punctatus	1.40	§ 11.50		871	5.00	15.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Trachurus declivis	1.40	31.00	5.00	145			Lake 1997	Tasmania	1992-1993
A. forsteri	Trachurus sp.	1.40			3	80.00	90.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Trachurus sp.	1.40			10	50.00	60.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
A. forsteri	Emmelichthys nitidus	1.40	16.00	4.00	315			Lake 1997	Tasmania	1992-1993
A. galapagoensis	Sardinops sagax	1.37	14.10		33			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983
A. gazella	Loligo sanpaulensis	1.25	11.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
A. gazella	Brachioteuthis cf. picta	1.00	7.08		26	5.69	8.65	Daneri et al. 1999	South Orkney Islands, S Atlantic	1988
A. gazella	Brachioteuthis cf. picta	1.00	8.09		9	7.69	8.55	Daneri et al. 1999	South Shetland Islands, S Atlantic	1992-1994
A. gazella	Brachioteuthis cf. riisei	0.75	5.84		31			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Brachioteuthis spp.	0.80	5.60		3	4.66	6.27	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Gonatus antarcticus	0.75	8.55		4			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Histioteuthis machrohista	0.80	8.41		1			Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Mastigoteuthis sp. A	0.75	7.65		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Martialia hyadesi	1.25	17.46	1.13	4	15.80	18.30	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Martialia hyadesi	0.75	22.07		39			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Kondakovia longimana	0.80	20.20		1			Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Moroteuthis ingens	0.75	16.45		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Moroteuthis knipovitchi	0.80	20.44		8	13.40	27.10	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Moroteuthis knipovitchi	0.75	9.18		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Psychroteuthis glacialis	1.00	9.07		7	7.83	10.76	Daneri et al. 1999	South Orkney Islands, S Atlantic	1988
A. gazella	Psychroteuthis glacialis	1.00	10.12		13	7.83	12.83	Daneri et al. 1999	Scotia Arc, Antarctica	1988-1994
A. gazella	Psychroteuthis glacialis	1.00	11.26		6	9.98	12.83	Daneri et al. 1999	South Shetland Islands, S Atlantic	1992-1994
A. gazella	Euphausia superba	0.75	5.54		324	3.80	6.60	Reid et al. 1996	South Georgia Island, S Atlantic	1986
A. gazella	Euphausia superba	0.75	4.45		308	3.60	6.20	Croxall et al. 1999	South Georgia Island, S Atlantic	1994
A. gazella	Euphausia superba	0.75	5.54		324	3.80	6.60	Croxall et al. 1999	South Georgia Island, S Atlantic	1986
A. gazella	Euphausia superba	0.55	5.13	0.31	301	3.90	6.10	Croxall and Pilcher 1984	South Georgia Island, S Atlantic	1972-1977
A. gazella	Euphausia superba	0.55	5.14		388	3.50	6.50	Doidge and Croxall 1985	South Georgia Island, S Atlantic	1982-1983
A. gazella	Euphausia superba	0.75	4.67		5587	3.20	6.40	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
A. gazella	Euphausia superba	1.50	4.03		781	2.40	5.60	Reid 1995	South Georgia Island, S Atlantic	1992
A. gazella	Euphausia superba	1.50	4.47		1387	3.60	5.80	Reid 1995	South Georgia Island, S Atlantic	1993
A. gazella	Euphausia superba	0.70	4.26		n.a.**			McCafferty et al. 1998	South Georgia Island, S Atlantic	1994-1996
A. gazella	Euphausia superba	0.75	4.63		n.a.**	3.20	6.10	Reid and Brierly 2001	South Georgia Island, S Atlantic	1994-1999
A. gazella	Euphausia superba	0.80	5.10		241	4.20	5.90	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Notolepis coatsi	1.00	27.18		12	20.72	30.89	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
A. gazella	Electrona antarctica	1.25	9.80	1.00	22	7.70	11.00	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Electrona antarctica	1.00	7.24		114	5.50	9.00	Daneri and Coria 1993	South Orkney Islands, S Atlantic	1988
A. gazella	Electrona antarctica	1.00	8.65	0.92	38	7.15	10.36	Daneri 1996	South Shetland Islands, S Atlantic	1992
A. gazella	Electrona antarctica	0.75	5.61		16	4.13	8.10	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Electrona antarctica	1.25	5.99		112	4.80	8.80	Green et al. 1989	Heard Island, Indian Ocean	1987-1988

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
A. gazella	Electrona antarctica	1.25	7.32		92	5.00	17.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
A. gazella	Electrona antarctica	1.50	7.68		2202	3.75	9.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Electrona antarctica	1.00	7.81		75	5.75	9.50	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
A. gazella	Electrona antarctica	1.25	10.40		78	8.60	11.60	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
A. gazella	Electrona antarctica	1.00	6.20	0.70	340	4.00	8.00	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Electrona antarctica	0.80	10.88		51	6.40	13.26	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Electrona antarctica	0.75	6.35		92			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Electrona carlsbergi	1.25	7.10	1.33	56	3.40	9.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Electrona carlsbergi	1.25	8.10		18	7.30	8.40	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
A. gazella	Electrona carlsbergi	1.00	8.50	1.00	80	6.00	10.10	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Electrona carlsbergi	0.80	8.01		23	6.30	8.98	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Electrona carlsbergi	0.75	8.02		26			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Electrona subaspera	0.75	7.14		8	4.84	8.41	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Electrona subaspera	1.25	8.00	1.34	98	3.90	10.60	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Electrona subaspera	1.25	8.52	1.59	103	1.69	12.59	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
A. gazella	Electrona subaspera	1.50	10.82		2030	6.25	12.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Electrona subaspera	0.75	7.40		120			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Gymnoscopelus bolini	0.75	6.50		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gymnoscopelus bolini	1.25	11.70	1.41	12	9.70	14.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gymnoscopelus bolini	0.75	18.50		17			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Gymnoscopelus braueri	0.75	6.59		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gymnoscopelus braueri	1.00	8.20	1.10	5	6.90	9.60	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Gymnoscopelus braueri	1.25	10.30		6	8.60	11.60	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
A. gazella	Gymnoscopelus braueri	0.80	10.63		19	8.16	12.49	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Gymnoscopelus braueri	0.75	9.59		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Gymnoscopelus fraseri	0.75	7.90		15	6.77	8.56	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gymnoscopelus fraseri	1.25	8.80	2.08	189	5.80	13.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gymnoscopelus fraseri	0.75	7.62		156			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Gymnoscopelus microlampas	1.25	9.00		2			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gymnoscopelus nicholsi	1.00	12.28		109	10.00	14.00	Daneri and Coria 1993	South Orkney Islands, S Atlantic	1988
A. gazella	Gymnoscopelus nicholsi	1.00	14.42	0.77	134	12.60	16.55	Daneri 1996	South Shetland Islands, S Atlantic	1992
A. gazella	Gymnoscopelus nicholsi	0.75	8.90		295	5.50	12.89	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gymnoscopelus nicholsi	1.25	12.92		114	5.20	8.80	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
A. gazella	Gymnoscopelus nicholsi	1.25	12.78		474	6.00	17.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
A. gazella	Gymnoscopelus nicholsi	1.25	8.40	2.22	46	5.70	14.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gymnoscopelus nicholsi	1.00	13.36		105	11.51	15.29	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
A. gazella	Gymnoscopelus nicholsi	1.25	12.90		38	10.80	15.10	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
A. gazella	Gymnoscopelus nicholsi	1.00	14.70	2.30	369	6.20	18.90	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Gymnoscopelus nicholsi	0.80	11.34		14	8.79	12.80	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
A. gazella	Gymnoscopelus nicholsi	0.75	11.74		144			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Gymnoscopelus piabilis	0.75	1.30		32	8.22	14.29	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gymnoscopelus piabilis	1.25	12.30	1.80	447	4.70	15.50	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gymnoscopelus piabilis	0.75	12.84		139			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Krefftichthys anderssoni	1.25	3.30		2	3.30	3.30	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Krefftichthys anderssoni	0.75	3.90		7	2.90	5.40	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Krefftichthys anderssoni	1.25	5.60		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Krefftichthys anderssoni	1.50	4.55		2790	2.75	7.25	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Krefftichthys anderssoni	1.50	3.38		350	2.75	8.25	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Krefftichthys anderssoni	1.25	5.60		1			Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
A. gazella	Krefftichthys anderssoni	1.00	8.50	0.30	3	8.20	8.70	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Krefftichthys anderssoni	0.75	3.52		47			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Lampichthys procerus	1.25	6.90	0.64	4	6.00	7.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Metelectrona ventralis	0.75	6.18		16	4.90	7.16	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Metelectrona ventralis	1.25	7.10	1.26	78	3.80	10.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Metelectrona ventralis	0.75	6.90		11			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
A. gazella	Protomyctophum andriashevi	0.75	5.12		2			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Protomyctophum bolini	1.25	4.80	1.60	3	3.70	6.70	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Protomyctophum bolini	0.75	3.70		17	3.25	4.14	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Protomyctophum bolini	1.25	5.70	1.94	11	2.80	9.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Protomyctophum bolini	0.75	3.99		81			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Protomyctophum choriodon	1.25	7.10	0.50	4	6.50	7.50	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Protomyctophum choriodon	0.75	7.00		11	5.78	7.85	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Protomyctophum choriodon	1.25	8.60	2.07	82	4.00	13.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Protomyctophum choriodon	0.75	8.52		261	7.25	9.25	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
A. gazella	Protomyctophum choriodon	0.75	8.73		241	7.25	9.75	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
A. gazella	Protomyctophum choriodon	0.75	9.25		215	7.25	11.25	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
A. gazella	Protomyctophum choriodon	0.75	6.68		114			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Protomyctophum tenisoni	0.75	4.02		2	3.52	4.52	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Protomyctophum tenisoni	1.25	4.60	0.51	322	1.90	6.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Protomyctophum tenisoni	0.75	4.16		32			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Muraenolepis microps	1.25	38.30	0.70	4	37.50	39.10	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Dissostichus eleginoides	1.25	45.40		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Gobionotothen acuta	0.75	7.32		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Gobionotothen gibberifrons	1.25	31.60	11.70	55	5.90	54.00	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Gobionotothen gibberifrons	1.50	42.10		49	23.00	59.00	Reid 1995	South Georgia Island, S Atlantic	1992
A. gazella	Gobionotothen gibberifrons	1.50	43.22		46	21.00	59.00	Reid 1995	South Georgia Island, S Atlantic	1993
A. gazella	Gobionotothen gibberifrons	1.00	37.00		1			Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Gobionotothen marionensis	1.25	11.60	2.59	4	9.70	15.30	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Lepidonotothen larseni	1.25	14.70	3.30	91	7.80	22.00	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Lepidonotothen larseni	0.75	16.20		142	10.50	23.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
A. gazella	Lepidonotothen larseni	0.75	14.04		110	10.50	23.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
A. gazella	Lepidonotothen larseni	0.75	18.55		65	13.50	25.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
A. gazella	Lepidonotothen larseni	1.50	16.79		193	4.00	26.00	Reid 1995	South Georgia Island, S Atlantic	1992
A. gazella	Lepidonotothen larseni	1.50	20.30		187	11.00	28.00	Reid 1995	South Georgia Island, S Atlantic	1993
A. gazella	Lepidonotothen squamifrons	0.75	3.53		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Notothenia squamifrons	1.25	11.40	4.96	12	3.60	22.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Paranotothenia magellanica	1.25	14.00		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. gazella	Pleuragramma antarcticum	1.00	14.26	1.24	136	11.59	17.80	Daneri 1996	South Shetland Islands, S Atlantic	1992
A. gazella	Pleuragramma antarcticum	1.00	13.87		33	11.90	16.88	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
A. gazella	Pleuragramma antarcticum	1.00	15.00	1.60	6	12.90	17.00	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Chaenocephalus aceratus	1.25	49.30	4.50	7	41.40	53.40	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Champsocephalus gunnari	1.25	23.80	8.60	201	10.00	46.00	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Champsocephalus gunnari	0.75	21.50		7	18.49	22.94	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Champsocephalus gunnari	1.25	21.09		530	12.00	34.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
A. gazella	Champsocephalus gunnari	0.75	31.88		328	15.00	45.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
A. gazella	Champsocephalus gunnari	0.75	24.27		158	15.00	47.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
A. gazella	Champsocephalus gunnari	0.75	38.11		18	27.00	49.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
A. gazella	Champsocephalus gunnari	1.50	21.72		1522	12.00	44.00	Reid 1995	South Georgia Island, S Atlantic	1992
A. gazella	Champsocephalus gunnari	1.50	25.09		660	16.00	46.00	Reid 1995	South Georgia Island, S Atlantic	1993
A. gazella	Champsocephalus gunnari	1.50	20.80		1263	18.75	23.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Champsocephalus gunnari	1.50	22.42		877	18.25	27.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
A. gazella	Champsocephalus gunnari	0.75	19.29	9.80	161			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. gazella	Channichthys rhinoceratus	1.25	32.52		101	20.00	44.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
A. gazella	Chionodraco rastrospinosus	1.00	15.10	2.20	2	13.60	16.70	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Cryodraco antarcticus	1.00	36.60	2.00	3	35.30	38.90	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
A. gazella	Pseudochaenichthys georgianus	1.25	28.80	2.40	26	24.10	34.80	North 1996	South Georgia Island, S Atlantic	1983
A. gazella	Paradiplospinus gracilis	0.75	3.97		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
A. gazella	Icichthys australis	0.75	31.81		17			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
A. p. doriferus	Sepia apama	1.70	30.10	5.67	43	21.00	41.30	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Sepia novaehollandiae	1.70	15.50	4.51	23	3.70	20.10	Gales et al. 1993	Tasmania	1989-1990

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
A. p. doriferus	Sepioteuthis australis	1.70	32.80	11.33	29	13.50	53.10	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Nototodarus gouldi	1.70	23.90	6.99	213	8.80	41.50	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Argonauta nodosa	1.70	5.70	3.58	3	1.60	8.20	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Octopus australis	1.70	10.10	2.63	13	4.50	15.50	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Octopus maorum	1.70	15.30	3.03	13	11.70	22.70	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Octopus pallidus	1.70	11.70	1.40	2	10.70	12.70	Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Octopus superciliosus	1.70	5.02		1			Gales et al. 1993	Tasmania	1989-1990
A. p. doriferus	Sardinops sagax cf. neopilchardus	1.70	17.30	1.00	15	15.00	19.00	Gales and Pemberton 1994	Tasmania	1984-1986
A. p. doriferus	Pseudophycis bachus	1.70	19.80	5.70	13	15.00	35.00	Gales and Pemberton 1994	Tasmania	1984-1986
A. p. doriferus	Trachurus declivis	1.70	21.20	2.80	48	16.00	31.00	Gales and Pemberton 1994	Tasmania	1984-1986
A. p. doriferus	Emmelichthys nitidus	1.70	17.00	1.20	194	14.00	21.00	Gales and Pemberton 1994	Tasmania	1984-1986
A. p. doriferus	Seriolella brama	1.70	16.70	1.50	15	14.00	19.00	Gales and Pemberton 1994	Tasmania	1984-1986
A. p. pusillus	Sepia officinalis	1.70	16.31		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Sepia sp.	2.05	14.29		76	4.80	21.70	Lipinski and David 1990	Benguela, South Africa	1974-1985
A. p. pusillus	Loligo vulgaris reynaudii	2.05	11.50		51	7.10	18.90	Lipinski and David 1990	Benguela, South Africa	1974-1985
A. p. pusillus	Loligo vulgaris reynaudii	2.05	15.60		596	4.10	32.40	Lipinski and David 1990	Benguela, South Africa	1974-1985
A. p. pusillus	Loligo vulgaris reynaudii	2.05	16.06		183			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Lycoteuthis lorigera	2.05	8.71		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Ommastrephes bartramii	2.05	20.82		9			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Todarodes angolensis	2.05	14.60		22	3.40	29.10	Lipinski and David 1990	Benguela, South Africa	1974-1985
A. p. pusillus	Todaropsis eblanae	2.05	8.30		94	3.50	16.10	Lipinski and David 1990	Benguela, South Africa	1974-1985
A. p. pusillus	Onychoteuthis banksii	2.05	14.95		2			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Argonauta nodosa	2.05	7.21		3			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Octopus sp.	2.05	7.42		15			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Jasus lalandii	0.85	4.18		89	1.00	7.00	David 1987	Benguela, South Africa	1981
A. p. pusillus	Jasus lalandii	0.85	5.20		38	1.00	7.00	David 1987	Benguela, South Africa	1984
A. p. pusillus	Jasus lalandii	0.85	2.50		253	1.00	6.00	David 1987	Benguela, South Africa	1985
A. p. pusillus	Etrumeus whiteheadi	0.85	14.70		17			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Etrumeus whiteheadi	0.85	13.20		32			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Sardinops sagax = S. ocellatus	2.05	21.66		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Sardinops sagax cf. ocellatus	0.85	14.90		24			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Sardinops sagax cf. ocellatus	0.85	19.80		134			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Sardinops sagax cf. ocellatus	0.85	18.70		214			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Engraulis encrasicolus	0.85	12.70		1799			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Engraulis encrasicolus	0.85	9.90		2911			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Engraulis encrasicolus	0.85	9.40		15871			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Engraulis encrasicolus	2.05	13.47		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Maurolicus muelleri	0.85	3.40		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Maurolicus muelleri	0.85	3.40		1257			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Lampanyctodes hectoris	0.85	4.80		595			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Lampanyctodes hectoris	0.85	5.00		1849			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Macrouridae	0.85	26.10		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Macrouridae	0.85	26.10		144			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Merluccius capensis	2.05	28.19		64			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Merluccius spp.	0.85	29.50		116			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Merluccius spp.	0.85	17.40		350			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Merluccius spp.	0.85	21.30		1177			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Genypterus capensis	0.85	45.90		25			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Genypterus capensis	2.05	52.73		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Chorisochismus dentex	0.85	9.50		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Scomberesox saurus	0.85	24.20		29			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Helicolenus dactylopterus	0.85	20.00		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Helicolenus dactylopterus	0.85	23.20		13			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Helicolenus dactylopterus	0.85	20.00		145			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Chelidonichthys capensis	0.85	15.00		10			David 1987	Benguela, South Africa	1974-1985

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
A. p. pusillus	Trachurus capensis	0.85	10.80		66			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Trachurus capensis	0.85	16.30		449			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Trachurus capensis	0.85	14.80		3542			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Trachurus capensis	2.05	27.15		56			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Argyrozona argyrozona	0.85	16.10		2			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Argyrozona argyrozona	2.05	37.03		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Cheimerius nufar	2.05	11.75		1			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Pagellus natalensis	2.05	22.87		7			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Pterogymnus laniarius	0.85	20.00		15			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Pterogymnus laniarius	2.05	28.36		15			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Argyrosomus hololepidotus	2.05	34.68		2			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Mugil cephalus	0.85	13.80		38			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Gymnammodytes capensis	0.85	25.00		12			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Gymnammodytes capensis	0.85	25.00		25			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Clinus sp.	0.85	11.30		7			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Callionymidae	0.85	21.50		86			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Sufflogobius bibarbatus	0.85	6.10		64			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Sufflogobius bibarbatus	0.85	6.90		48078			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Thyrsites atun	0.85	80.00		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Thyrsites atun	0.85	80.00		2			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Thyrsites atun	0.85	80.00		10			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Lepidopus caudatus	0.85	75.00		1			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Lepidopus caudatus	0.85	75.00		5			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Scomber japonicus	0.85	32.50		6			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Scomber japonicus	0.85	24.70		15			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Pleuronectidae	0.85	21.10		32			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Pleuronectidae	0.85	14.60		144			David 1987	Benguela, South Africa	1974-1985
A. p. pusillus	Austroglossus pectoralis	2.05	27.90		10			Castley et al. 1991	Benguela, South Africa	1976-1990
A. p. pusillus	Cynoglossus zanzibarensis	2.05	20.20		117			Castley et al. 1991	Benguela, South Africa	1976-1990
A. tropicalis	Loligo sanpaulensis	1.50	9.30		14	5.80	13.50	dos Santos and Haimovici 2001	Brazil	1985-1998
A. tropicalis	Illex argentinus	1.50	33.20		6	29.70	35.90	dos Santos and Haimovici 2001	Brazil	1985-1998
A. tropicalis	Ommastrephes bartramii	1.50	22.10		23	9.30	34.30	dos Santos and Haimovici 2001	Brazil	1985-1998
A. tropicalis	Moroteuthis knipovitchi	1.50	10.54		6			Bester and Laycock 1985	South Georgia Island, S Atlantic	1977-1978
A. tropicalis	Argonauta nodosa	1.50	10.30		2	7.30	13.10	dos Santos and Haimovici 2001	Brazil	1985-1998
A. tropicalis	Electrona antarctica	1.50	7.20	0.30	7	6.90	7.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Electrona carlsbergi	1.50	6.50	0.87	114	3.80	8.80	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Electrona subaspera	1.50	7.80	1.34	70	5.00	12.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Electrona subaspera	1.50	8.21	1.48	58	1.69	12.59	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
A. tropicalis	Gymnoscopelus bolini	1.50	10.60	2.71	40	6.50	14.50	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Gymnoscopelus fraseri	1.50	7.80	1.46	275	3.50	13.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Gymnoscopelus microlampas	1.50	8.60	0.34	2	8.40	8.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Gymnoscopelus nicholsi	1.50	8.50	2.83	62	4.80	15.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Gymnoscopelus piabilis	1.50	11.60	2.17	283	5.80	16.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Krefftichthys anderssoni	1.50	4.40		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Metelectrona ventralis	1.50	7.10	1.44	188	3.20	12.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Protomyctophum bolini	1.50	4.00	0.54	9	2.90	5.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Protomyctophum choriodon	1.50	9.50	1.37	73	5.40	13.10	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Protomyctophum tenisoni	1.50	4.60	0.60	225	2.60	7.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Paranotothenia magellanica	1.50	17.90		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Champsocephalus gunnari	1.50	14.10		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
A. tropicalis	Paradiplospinus gracilis	1.50	21.50	2.19	2	19.90	23.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
C. ursinus	Loligo bleekeri	1.12	12.45		8	6.93	17.97	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Loligo opalescens	1.40			43	7.00	15.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Loliolus japonica	1.12	9.61		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Chiroteuthis imperator	1.12	6.14		28	4.48	7.18	Mori et al. 2001	Honshu, NW Pacific	1987-1994

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
C. ursinus	Enoploteuthis chunii	1.12	10.75		3			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Watasenia scintillans	1.12	4.40		99	3.00	5.60	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Watasenia scintillans	1.12	4.20		978	3.00	5.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Watasenia scintillans	1.12	4.30		1248	2.52	6.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Berryteuthis anonychus	0.93	29.68		3	27.21	31.99	Mori et al. 2001	N Pacific	1987-1991
C. ursinus	Gonatopsis borealis	0.93	8.22		8	5.96	10.36	Mori et al. 2001	N Pacific	1987-1991
C. ursinus	Gonatopsis borealis	1.12	10.40		37	5.56	16.68	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Gonatus berryi	1.12	9.21		5	6.45	12.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Gonatus onyx	1.12	11.40		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Gonatidae	1.40			>59	5.00	24.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Mastigoteuthis sp.	1.12	13.73		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Octopoteuthis sp.	1.12	6.68		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Eucleoteuthis luminosa	1.12	5.07		10			Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Ommastrephes bartramii	0.93	8.61		10	7.09	9.96	Mori et al. 2001	N Pacific	1987-1991
C. ursinus	Ommastrephes bartramii	1.12	16.24		24	12.65	21.76	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Todarodes pacificus	1.12	14.15		3	5.04	33.55	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Moroteuthis loennbergi	1.12	21.19		2	13.88	29.20	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Onychoteuthis borealijaponica	0.93	15.64		42	6.86	27.58	Mori et al. 2001	N Pacific	1987-1991
C. ursinus	Onychoteuthis borealijaponica	1.12	11.06		9	1.54	35.29	Mori et al. 2001	Honshu, NW Pacific	1987-1994
C. ursinus	Onychoteuthidae	1.40			>3	14.00	22.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Clupea harengus pallasi	1.40			>27	10.00	25.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Engraulis mordax	1.40			27	9.00	18.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Bathylagidae	1.40			986	8.00	12.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Mallotus villosus	1.40			64	7.00	14.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Thaleichthys pacificus	1.40			11	12.00	21.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Salmonidae	1.40			>26	15.00	41.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Theragra chalcogramma	1.40	tly <30-35 cm (p. 36)"					Fiscus et al. 1964, cited in Frost and Lowry 1986	Bering Sea	1962
C. ursinus	Theragra chalcogramma	1.40	19.30		n.a.**	10.00	35.00	McAlister et al. 1976	Bering Sea	1974
C. ursinus	Theragra chalcogramma	1.21	32.97		39	6.00	41.00	Sinclair et al. 1994	Bering Sea	1981
C. ursinus	Theragra chalcogramma	1.16	6.70		1191	3.00	42.00	Sinclair et al. 1994	Bering Sea	1982
C. ursinus	Gonatopsis/Berryteuthis	1.16	9.71		166	7.00	17.00	Sinclair et al. 1994	Bering Sea	1982
C. ursinus	Gonatopsis/Berryteuthis	1.24	9.22		136	5.00	17.00	Sinclair et al. 1994	Bering Sea	1985
C. ursinus	Gonatus madokai/G. middendorffi	1.24	6.67		86	5.00	9.00	Sinclair et al. 1994	Bering Sea	1985
C. ursinus	Theragra chalcogramma	1.24	13.03		1428	4.00	47.00	Sinclair et al. 1994	Bering Sea	1985
C. ursinus	Theragra chalcogramma	1.40	29.19		59	6.80	48.00	Kiyota et al. 1999	St. Paul Island, Bering Sea	1996
C. ursinus	Theragra chalcogramma	1.40			1721	4.00	40.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Theragra chalcogramma	1.40			n.a.**	6.00	20.00	Swartzman and Haar 1983	NE Pacific & Bering Sea	1960-1974
C. ursinus	Theragra chalcogramma	1.40	30.40		n.a.**			Lowry et al. 1989	Bering Sea	1981-1982
C. ursinus	Merluccius productus	1.40	15.00		2			Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Cololabis saira	1.40	25.00		4			Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Sebastes spp.	1.40			>19	11.00	31.00	Perez and Bigg 1986	N Pacific	1958-1974
C. ursinus	Pleurogrammus monopterygius	1.40			>5	15.00	23.00	Perez and Bigg 1986	N Pacific	1958-1974
E. jubatus	Theragra chalcogramma	2.55	25.20		1135	8.30	64.20	Frost and Lowry 1986	Bering Sea	1981
E. jubatus	Theragra chalcogramma	2.55	21.80			10.30	51.60	Lowry et al. 1989	St. Matthew Island, Bering Sea	1985
E. jubatus	Theragra chalcogramma	2.55	33.50			20.80	44.50	Lowry et al. 1989	St. Paul Island, Bering Sea	1985
E. jubatus	Theragra chalcogramma	2.55	29.80	11.60	2030	5.60	62.90	Pitcher 1981	Gulf of Alaska	1975-1978
E. jubatus	Theragra chalcogramma	2.55	46.90		280	18.40	61.40	Frost and Lowry 1986	Pribilof Islands, Bering Sea	1976, 1979
E. jubatus	Theragra chalcogramma	2.55	29.90			1.70	42.70	Lowry et al. 1989	E Aleutian Islands, Gulf of Alaska	1981-1982
E. jubatus	Theragra chalcogramma	2.20	25.50		80	4.80	55.70	Calkins and Goodwin 1988	Kodiak Island, Gulf of Alaska	1985-1986
E. jubatus	Theragra chalcogramma	2.25	25.40		1064	7.90	54.20	Calkins and Goodwin 1988	SE Alaska, Gulf of Alaska	1985-1986
E. jubatus	Theragra chalcogramma	2.55	42.40	11.6	909	10.00	78.10	Tollit et al. 2004a	SE Alaska	1994-1999
E. jubatus	Theragra chalcogramma	2.28	39.30	14.3	666	3.70	70.80	Zeppelin et al. 2004	Aleutian Is. (western stock)	1998-2000
E. jubatus	Pleurogrammus monopterygius	2.28	32.30	5.9	1685	15.30	49.60	Zeppelin et al. 2004	Aleutian Is. (western stock)	1998-2000
O. flavescens	Loligo gahi	1.85	9.70		n.a.**	4.00	23.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
O. flavescens	Illex argentinus	1.85	20.90		n.a.**	14.00	30.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
O. flavescens	Illex argentinus	1.85	25.00		n.a.**	18.00	30.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
O. flavescens	Macruronus magellanicus	1.89	47.50	8.90	206	20.00	70.00	George-Nascimento et al. 1985	Chile	1979-1981
O. flavescens	Merluccius hubbsi	1.85	26.70		n.a.**	10.00	55.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
O. flavescens	Merluccius hubbsi	1.85	29.10		n.a.**	15.00	60.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
P. hookeri	Octopus maorum	2.00	120.00		33	30.00	150.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Ovalipes catharus	2.00	7.00		118	4.00	11.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Raja spp.	2.00	68.00		13	53.00	93.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Auchenoceros punctatus	2.00	10.00		166	7.00	13.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Pseudophycis sp.	2.00	36.00		20	20.00	50.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Genypterus blacodes	2.00			4	68.00	124.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Trachurus sp.	2.00	38.00		47	27.00	45.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Notolabrus sp.	2.00	23.00		21	9.00	40.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Odax pullus	2.00	31.00		36	22.00	49.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Thyrsites atun	2.00	77.00		14	49.00	86.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
P. hookeri	Rhombosolea sp.	2.00	35.00		54	16.00	50.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Z. californianus	Loligo opalescens	2.00	12.89		300	7.50	22.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Z. californianus	Loligo opalescens	2.00				9.50	17.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Z. californianus	Loligo opalescens	2.00	12.70	1.70	76	6.20	18.50	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Z. californianus	Loligo opalescens	1.80	12.70		25386	1.00	23.50	Lowry and Caretta 1999	Channel Islands, NE Pacific	1981-1985
Z. californianus	Loligo opalescens	1.80	5.20		164	4.20	6.70	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. californianus	Sardinops sagax	1.80	9.20		5	8.20	11.50	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. californianus	Engraulis mordax	2.00	9.50	0.80	94	5.50	14.10	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Z. californianus	Engraulis mordax	1.80	10.00		12	9.00	11.10	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. californianus	Merluccius productus	2.20	30.70		1856	13.00	58.00	Bailey and Ainley 1982	Farallon Islands, NE Pacific	1974-1978
Z. californianus	Merluccius productus	2.00	16.60	6.00	222	8.90	26.10	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Z. californianus	Merluccius productus	1.80	18.60		35	4.90	26.80	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. californianus	Sebastes sp.	2.00	17.10	2.20	155	12.90	22.70	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Z. californianus	Sebastes spp.	1.80	12.10		31	9.20	14.60	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. californianus	Trachurus symmetricus	1.80	13.10		12	10.90	16.20	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Z. c. woelbecki	Sardinops sagax	2.00	14.20		66			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983
Z. c. woelbecki	Sardinops sagax	2.00	13.40		334			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983-1986
C. cristata	Gadus morhua	2.25	36.40		68	14.00	73.00	Hauksson and Bogason 1997	Iceland	1992-1993
C. cristata	Sebastes sp.	2.25	32.40		n.a.**	23.00	43.00	Hauksson and Bogason 1997	Iceland	1992-1993
E. barbatus	Chionoectes opilio	2.25	5.70	1.20	336	3.20	12.30	Antonelis et al. 1994b	Bering Sea	1981
E. barbatus	Boreogadus saida	2.25	13.40		272	6.90	23.60	Finley and Evans 1983	Baffin Bay, NW Atlantic	1978-1979
E. barbatus	Theragra chalcogramma	2.25	11.80	0.15	56	6.90	14.30	Antonelis et al. 1994b	Bering Sea	1981
E. barbatus	Theragra chalcogramma	2.25	8.20					Antonelis pers. com., cited in Frost and Lowry 1986	St. Matthew Island, Bering Sea	<1983
H. grypus	Illex illecebrosus	2.08	18.50	SE 0.32	78	10.00	25.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Raja sp.	2.08	70.00		2			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Alosa pseudoharengus	2.08	22.60		10			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Clupea harengus	2.08	25.40	5.60	48			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Clupea harengus	2.08	24.90		111	20.00	37.30	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Clupea harengus	2.08	34.50	SE 0.47	160	5.00	40.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Clupea harengus	2.08			n.a.**	25.00	35.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Mallotus villosus	2.08	16.30	0.40	219			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Mallotus villosus	2.08	13.90		891	8.30	17.40	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Mallotus villosus	2.08			n.a.**	10.00	15.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Osmerus mordax	2.08	12.00		1			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Salmo salar	2.08	43.00		5	35.70	52.10	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Gadus morhua	2.08	17.30	11.40	101	10.00	40.00	Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Gadus morhua	2.08	32.14		63	5.00	65.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Gadus morhua	2.08	32.21		61	5.00	75.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Gadus morhua	2.08	28.27		49	5.00	75.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
H. grypus	Gadus morhua	2.08	29.75		180	2.50	72.50	Prime and Hammond 1990	Donna Nook, SW North Sea	1985
H. grypus	Gadus morhua	2.08	31.01		172	2.50	67.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Gadus morhua	2.08	32.29		145	2.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Gadus morhua	2.08	28.20		269	6.70	79.70	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Gadus morhua	2.08	25.80	SE 0.92	115	10.00	55.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Gadus morhua	2.08	18.80		81	2.50	37.50	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Gadus morhua	2.08			468	30.00	50.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Melanagrammus aeglefinus	2.08	23.50		2			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Melanagrammus aeglefinus	2.08	32.40		2	14.80	57.20	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Melanagrammus aeglefinus	2.08			20	20.00	40.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Merlangius merlangus	2.08	21.25		1318	9.00	37.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Merlangius merlangus	2.08	26.50		203	9.00	43.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Pollachius virens	2.08	37.94		79	7.50	72.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Pollachius virens	2.08	45.71		63	22.50	92.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Pollachius virens	2.08	10.90		2	8.10	13.80	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Pollachius virens	2.08	20.00	SE 1.04	55	5.00	35.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Pollachius virens	2.08			48	10.00	60.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Molva molva	2.08	28.06		81	5.00	85.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Molva molva	2.08	32.83		60	5.00	85.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Molva molva	2.08	32.53		77	5.00	105.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Molva molva	2.08	33.30		256	2.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Urophycis tenuis	2.08	22.20	SE 1.48	12			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Merluccius bilinearis	2.08	30.30		2	21.10	42.30	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Merluccius bilinearis	2.08	25.40	SE 1.03	43	10.00	45.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Merluccius bilinearis	2.08	25.67		30	15.00	35.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Sebastes sp.	2.08			n.a.**	20.00	30.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Sebastes spp.	2.08	14.15		71	10.00	25.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Myoxocephalus scorpius	2.08	24.60		1			Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Myoxocephalus scorpius	2.08			n.a.**	15.00	25.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Cyclopterus lumpus	2.08	15.50	0.50	15			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Cyclopterus lumpus	2.08	24.90		26	15.00	29.20	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Tautogolabrus adspersus	2.08	25.40		1			Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Zoarces americanus	2.08	53.30		12	45.70	61.00	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Anarhichas lupus	2.08	29.60		3	22.90	35.60	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Anarhichas lupus	2.08			n.a.**	20.00	60.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Ammodytes dubius	2.08	19.10	SE 0.47	139	5.00	25.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Ammodytes sp.	2.08	18.10		62			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Ammodytes sp.	2.08			n.a.**	15.00	35.00	Hauksson and Bogason 1997	Iceland	1992-1993
H. grypus	Ammodytes spp.	2.08	16.72		324	5.00	31.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	17.50		1878	5.00	43.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	16.29		418	3.00	43.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	16.82		1220	3.00	45.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	13.93		6752	3.00	25.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	13.96		5943	1.00	25.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	16.67		1536	3.00	31.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Ammodytes spp.	2.08	15.00		876	5.00	30.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Ammodytidae	2.08	16.37		2341	1.50	34.50	Prime and Hammond 1990	Donna Nook, SW North Sea	1985
H. grypus	Scomber scombrus	2.08	32.60		24	25.00	47.90	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Scomber scombrus	2.08	20.90	SE 5.05	8			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Glyptocephalus cynoglossus	2.08	31.30		1			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Hippoglossoides platessoides	2.08	34.40	5.20	6			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
H. grypus	Hippoglossoides platessoides	2.08	24.30		269	11.10	46.80	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Hippoglossoides platessoides	2.08	14.70	SE 1.56	9			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Hippoglossoides platessoides	2.08	25.91		23	15.00	40.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Limanda ferruginea	2.08	37.50		1			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
H. grypus	Limanda ferruginea	2.08	20.00	SE 1.95	14			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Limanda ferruginea	2.08	26.76		27	10.00	40.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
H. grypus	Pleuronectes americanus	2.08	24.30	SE 2.01	2			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
H. grypus	Pleuronectes platessa	2.08	31.99		247	2.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Pleuronectes platessa	2.08	24.07		51	7.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
H. grypus	Reinhardtius hippoglossoides	2.08	46.10		2	43.00	49.10	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
H. grypus	Solea solea	2.08	24.04		550	2.50	57.50	Prime and Hammond 1990	Donna Nook, SW North Sea	1985
H. leptonyx	Pleuragramma antarcticum	2.80	13.76	2.43	226	8.80	17.50	Green and Williams 1986	Davis Station, Antarctica	1984
L. weddelii	Psychroteuthis glacialis	2.00	§ 35.10		5	12.30	38.30	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Chorismus antarcticus	3.00	1.33	0.14	1496	0.71	2.00	Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
L. weddelii	Notocrangon antarcticus	3.00	1.41	0.14	836			Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
L. weddelii	Pleuragramma antarcticum	3.00	16.24		80	12.00	21.00	Plötz et al. 1991	Weddell Sea, Antarctica	1998
L. weddelii	Pleuragramma antarcticum	3.00	15.41		1296	5.00	21.50	Plötz 1986	Weddell Sea, Antarctica	1983, 1985
L. weddelii	Pleuragramma antarcticum	3.00	16.05		1034	6.00	22.00	Plötz 1986	Weddell Sea, Antarctica	1983, 1985
L. weddelii	Pleuragramma antarcticum	3.00	11.64	2.33	26	5.20	19.10	Green and Burton 1987	Mawson, Antarctica	1983-1985
L. weddelii	Pleuragramma antarcticum	3.00	15.03	1.69	169	7.20	21.00	Green and Burton 1987	Davis Station, Antarctica	1983-1985
L. weddelii	Pleuragramma antarcticum	3.00	14.97	2.33	330	5.20	25.00	Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
L. weddelii	Pleuragramma antarcticum	3.00	14.07	4.27	168	5.07	25.91	Burns et al. 1998	McMurdo Sound, Antarctica	1989-1993
L. weddelii	Trematomus eulepidotus	2.00	§ 18.70		68	14.40	23.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Trematomus lepidorhinus	2.00	§ 14.90		12	12.30	19.30	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Trematomus nicolai	2.00	§ 18.90		3	16.70	20.00	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Trematomus spp.	3.00	23.34	7.89	6	12.73	34.10	Burns et al. 1998	McMurdo Sound, Antarctica	1989-1993
L. weddelii	Artedidraco loennbergi	2.00	8.70		2	8.50	8.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Dolloidraco longedorsalis	2.00	§ 9.40		5	7.70	9.60	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Histiodraco velifer	2.00	9.85		2	8.90	10.80	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Gerlachea australis	2.00	§ 20.60		7	19.00	22.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Gymnodraco acuticeps	2.00	§ 24.60		7	18.00	29.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Racovitzia glacialis	2.00	§ 19.10		65	12.20	22.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Chionodraco myersi	2.00	§ 27.30		107	20.10	34.40	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Cryodraco antarcticus	2.00	§ 27.00		28	20.80	32.40	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. weddelii	Pagetopsis maculatus	2.00	§ 16.90		66	13.30	20.50	Plötz et al. 1991	Weddell Sea, Antarctica	1986
L. carcinophagus	Antarctomysis maxima	2.40			75	2.00	2.50	Green and Williams 1986	Davis Station, Antarctica	1984
L. carcinophagus	Pleuragramma antarcticum	2.40	15.50		4	12.20	18.40	Green and Williams 1986	Davis Station, Antarctica	1984
M. angustirostris	Loligo opalescens	1.69	11.84		90	6.17	20.51	Sinclair 1994	S California Bight, NE Pacific	1969-1983
M. angustirostris	Gonatopsis borealis	3.60	22.00	5.40	22	13.60	28.00	Antonelis et al. 1994a	San Miguel Island, NE Pacific	1978-1979
M. angustirostris	Merluccius productus	3.60	28.74		252	15.40	51.80	Antonelis et al. 1994a	San Miguel Island, NE Pacific	1978-1979
M. leonina	Batoteuthis skolops	3.45	10.30		3	8.90	10.90	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Brachioteuthis cf. picta	3.45	8.10		192			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Brachioteuthis cf. picta	3.45	7.28		26			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
M. leonina	Chiroteuthis veranyi	3.45	14.10		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1994
M. leonina	Chiroteuthis sp.	3.45	13.50		6	10.20	15.60	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Galiteuthis glacialis	3.45	18.70		7	13.00	23.60	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Mesonychoteuthis hamiltoni	3.45	36.20		2	31.90	40.50	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Gonatus antarcticus	3.45	13.90		67			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Gonatus antarcticus	3.45	18.53		12			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
M. leonina	Histioteuthis sp. B	3.45	4.70		58			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Histioteuthis sp.	3.45	5.30		1			dos Santos and Haimovici 2001	Brazil	1985-1998
M. leonina	Lycoteuthis lorigera	3.45	7.80		1			dos Santos and Haimovici 2001	Brazil	1985-1998
M. leonina	Mastigoteuthis psychrophila	3.45	11.00		5	10.10	13.00	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Alluroteuthis antarctica	3.45	14.50		51			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Alluroteuthis antarctica	3.45	13.13		13			Daneri et al. 2000	South Shetland Islands, S Atlantic	1992-1994
M. leonina	Illex argentinus	3.45	26.30		2	26.00	26.50	dos Santos and Haimovici 2001	Brazil	1985-1998
M. leonina	Martialia hyadesi	3.45	27.10		43	19.3	42.6	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Kondakovia longimana	3.45	26.19		7			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1995
M. leonina	Moroteuthis knipovitchi	3.45	23.70		121			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
M. leonina	Moroteuthis knipovitchi	3.45	22.13		3			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1996
M. leonina	Psychroteuthis glacialis	3.45	19.78		231			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
M. leonina	Pareledone charcoti	3.45	4.80		5	4.20	4.80	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Pareledone cf. charcoti	3.45	5.71		5			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1997
M. leonina	Pareledone cf. turqueti	3.45	7.25		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1999
M. leonina	Pareledone polymorpha	3.45	3.60		6	3.00	4.50	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
M. leonina	Pareledone cf. polymorpha	3.45	4.51		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1998
M. leonina	Electrona subaspera	3.45	10.70		1			Green and Burton 1993	Macquarie Island, Southern Ocean	1988
M. leonina	Gymnoscopelus braueri	3.45	11.20		1			Green and Burton 1993	Heard Island, Indian Ocean	1988
M. leonina	Gymnoscopelus nicholsi	3.45	12.71	1.85	72	7.95	16.71	Daneri and Carlini 2002	South Shetland Islands, S Atlantic	1993-2000
M. leonina	Pleuragramma antarcticum	3.45	13.15	4.14	16	9.06	22.62	Daneri and Carlini 2002	South Shetland Islands, S Atlantic	1993-2000
M. leonina	Champsocephalus gunnari	3.45	30.11		6			Green and Burton 1993	Heard Island, Indian Ocean	1988
M. leonina	Channichthys rhinoceratus	3.45	37.83		4			Green and Burton 1993	Heard Island, Indian Ocean	1988
M. leonina	mixed fish taxa	3.45				6.23	27.82	Daneri and Carlini 2002	South Shetland Islands, S Atlantic	1993-2000
M. monachus	Trachurus sp.	2.40	30.00		50			Sergeant et al. 1979	Madeira, North Atlantic	1957
M. monachus	Pagrus africanus	2.40	35.00		1			Sergeant et al. 1979	Madeira, North Atlantic	1957
O. rossii	Galiteuthis armata	1.85	19.60		14	13.50	23.70	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
O. rossii	Alluroteuthis antarctica	1.85	12.20		57	6.10	18.40	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
O. rossii	Kondakovia longimana	1.85	41.20		1			Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
O. rossii	Moroteuthis knipovitchi	1.85	28.40		3	23.20	33.70	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
O. rossii	Psychroteuthis glacialis	1.85	12.30		97	5.80	34.40	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
O. rossii	Pleuragramma antarcticum	1.85	15.10		9	11.20	18.50	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
P. fasciata	Boreogadus saida	1.60	15.87		92	12.00	21.00	Frost and Lowry 1980	Bering Sea	1976-1979
P. fasciata	Theragra chalcogramma	1.60	10.26		447	6.00	20.00	Frost and Lowry 1980	Bering Sea	1976-1979
P. fasciata	Theragra chalcogramma	1.60	11.20		468	6.50	34.40	Frost and Lowry 1986	Bering Sea	1976-1978
P. groenlandica	Alosa pseudoharengus	1.70	10.10		3			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Clupea harengus	1.70	30.70		n.a.**	23.00	36.00	Hauksson and Bogason 1997	Iceland	1992-1993
P. groenlandica	Mallotus villosus	1.70	16.00		2244			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Mallotus villosus	1.70	13.20		30	8.80	15.70	Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Osmerus mordax	1.70	12.00		4			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Salmo salar	1.70	29.10		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Arctozenus risso	1.70	13.00		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Nezumia bairdi	1.70	30.50		9			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Arctogadus glacialis	1.70	21.10		338			Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
P. groenlandica	Boreogadus saida	1.70	13.40		648	4.80	23.60	Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
P. groenlandica	Boreogadus saida	1.70	13.30		7			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Gadus morhua	1.70	23.80		2			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Gadus morhua	1.70	24.70		25	15.00	40.00	Nilssen et al. 1990	Ullsford, Norway	1986
P. groenlandica	Gadus morhua	1.70	33.40		99	5.00	65.00	Nilssen et al. 1990	Ullsford, Norway	1988
P. groenlandica	Gadus morhua	1.70	14.00		43			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Gadus morhua	1.70	15.90		38	3.00	48.00	Hauksson and Bogason 1997	Iceland	1992-1993
P. groenlandica	Gadus ogac	1.70	14.00		3			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Melanagrammus aeglefinus	1.70	16.80		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Enchelyopus cimbrius	1.70	25.90		5			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Urophycis tenuis	1.70	27.30		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Merluccius albidus	1.70	29.60		24			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Merluccius bilinearis	1.70	26.00		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Sebastes sp.	1.70	11.40		257			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
P. groenlandica	Cottidae	1.70	12.00		7			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Scophthalmus aquosus	1.70	23.50		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. groenlandica	Pleuronectidae	1.70	25.40		5			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
P. hispida	Gammarus setosus	1.30	1.53		35	1.20	2.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Themisto libellula	1.30	1.66		279	1.40	3.40	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Thysanoessa inermis	1.30	1.75		189	1.20	2.60	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Sabinea septemcarinata	1.30	5.02		19	3.60	5.60	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
P. hispida	Pandalus borealis	1.30	7.47		51	4.80	9.20	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Boreogadus saida	1.30	10.50		4047	4.80	23.60	Finley et al. 1983, Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
P. hispida	Boreogadus saida	1.30	10.90	2.00	4847	4.90	16.10	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Sebastes marinus	1.30	45.00		3286	10.00	120.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. hispida	Myoxocephalus scorpius	1.30	11.14		35	8.00	18.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
P. largha	Boreogadus saida	1.75	14.90		326	7.60	20.50	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
P. largha	Eleginus gracilis	1.75	16.70		131	6.20	25.10	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
P. largha	Theragra chalcogramma	2.25	10.90		21	8.00	15.00	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
P. largha	Theragra chalcogramma	1.75	10.90		21	8.00	15.00	Frost and Lowry 1986	Bering Sea	1978
P. largha	Cottidae	1.75	10.00		19	3.30	16.50	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
P. largha	Lycodes sp.	1.75	27.30		6	22.30	30.90	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
P. vitulina	Illex illecebrosus	1.55	17.60	SE 0.17	139	5.00	20.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
P. vitulina	Illex illecebrosus	1.55	19.10	SE 0.36	51	15.00	25.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
P. vitulina	Clupea harengus	1.55	22.00	SE 0.36	197	10.00	35.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
P. vitulina	Clupea harengus	1.55	25.70	SE 0.51	84	15.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
P. vitulina	Engraulis mordax	1.55	12.90		81	4.00	15.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
P. vitulina	Osmerus eperlanus	1.55	10.20		41			Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Gadus morhua	1.55	14.40		49			Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Gadus morhua	1.55	35.20	SE 2.08	33	5.00	50.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
P. vitulina	Gadus morhua	1.55	19.00	SE 0.75	46	10.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
P. vitulina	Microgadus proximus	1.55	14.00		8	4.00	23.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Pollachius virens	1.55	20.50	SE 1.56	19	5.00	30.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
P. vitulina	Pollachius virens	1.55	17.70	SE 0.38	122	10.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
P. vitulina	Theragra chalcogramma	1.55	31.80		23	10.30	56.30	Frost and Lowry 1986	Pribilof Islands, Bering Sea	1979
P. vitulina	Theragra chalcogramma	1.55	10.60		12	8.20	12.60	Frost and Lowry 1986	Bering Sea	1981
P. vitulina	Theragra chalcogramma	1.55	19.20	9.60	2180	4.20	53.20	Pitcher 1981	Gulf of Alaska	1975-1978
P. vitulina	Porichthys notatus	1.55	21.80		73	7.00	39.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
P. vitulina	Leptocottus armatus	1.55	11.00		85	4.00	21.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Leptocottus armatus	1.55	14.03		72	5.00	25.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
P. vitulina	Genyonemus lineatus	1.55	22.20		40	13.00	29.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
P. vitulina	Cymatogaster aggregata	1.55	8.50		31	6.50	11.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Anarrhichthys ocellatus		200.00		1			Baldridge and Rogers 1991	Point Lobos State Reserve, CA	1986
P. vitulina	Ammodytes hexapterus	1.55	9.50		621	8.00	13.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Acanthogobius flavimanus	1.55	9.20	2.30	1021	3.50	20.20	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
P. vitulina	Pomatoschistus spp.	1.55	3.84		641			Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Citharichthys sordidus	1.55	6.00		74	4.00	21.50	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Citharichthys stigmaeus	1.55	6.50		29	5.00	10.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Glyptocephalus zachirus	1.55	16.50		113	5.00	28.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Isopsetta isolepis	1.55	18.00		10	7.00	26.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Limanda limanda	1.55	8.13		219	< 7.0	20.00	Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Lyopsetta exilis	1.55	13.50		21	8.00	20.50	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Microstomus pacificus	1.55	15.00		62	7.00	21.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Parophrys vetulus	1.55	17.20		26	12.00	32.00	Harvey et al. 1995	Elkhorn Slough, NE Pacific	1975-1977
P. vitulina	Parophrys vetulus	1.55	7.00		140	4.00	24.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
P. vitulina	Platichthys flesus	1.55	16.00		139			Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Pleuronectes platessa	1.55	10.00		199			Behrends 1982	Waddensea, North Sea	1975-1981
P. vitulina	Psettichthys melanostictus	1.55	14.00		2	10.00	18.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Balaenoptera spp.	Euphausia superba	23.50	2.66		2745	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1932-1933
Balaenoptera spp.	Euphausia superba	23.50	3.38		3562	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1939-1940
Balaenoptera spp.	Euphausia superba	23.50	3.94		39081	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1929-1930
Balaenoptera spp.	Euphausia superba	23.50	5.00		>2000	1.10	6.50	Mackintosh 1974	Southern Ocean	1950s??
B. acutorostrata	Theragra chalcogramma	7.30	14.50		121	11.80	17.50	Frost and Lowry 1986	Bering Sea	1975
B. pysalus	Theragra chalcogramma	20.70	<=30.00		n.a.**			Nemoto 1959	N Pacific	1952-1958
M. novaeangliae	Theragra chalcogramma	13.00	>=30.00		n.a.**			Nemoto 1959	N Pacific	1952-1958
B. bairdii	Taonius borealis	11.10	25.20		240	14.26	49.11	Walker et al. 2002	Honshu, NW Pacific	1985-1991

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
B. bairdii	Taonius borealis	11.10	32.09		85	13.85	45.06	Walker et al. 2002	Sea of Okhotsk	1988-1989
B. bairdii	Berryteuthis magister	11.10	21.37		697	11.12	33.43	Walker et al. 2002	Sea of Okhotsk	1988-1989
B. bairdii	Gonatopsis borealis	11.10	17.70		56	9.06	31.02	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Albatrossia pectoralis	11.10	21.28		5	10.18	34.58	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Albatrossia pectoralis	11.10	21.91		7	16.90	28.16	Walker et al. 2002	Sea of Okhotsk	1988-1989
B. bairdii	Coryphaenoides acrolepis	9.95	73.30	11.08	72	45.00	95.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
B. bairdii	Coryphaenoides acrolepis	11.10	22.07		55	4.06	28.74	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Coryphaenoides cinereus	11.10	11.92		330	6.99	17.92	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Coryphaenoides cinereus	10.32	35.84	3.1	3	30.00	35.00	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
B. bairdii	Coryphaenoides cinereus	9.95	35.33	4.25	40	25.00	45.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
B. bairdii	Coryphaenoides cinereus	11.10	10.85		5	9.13	12.13	Walker et al. 2002	Sea of Okhotsk	1988-1989
B. bairdii	Coryphaenoides longifilis	9.95	75.70	6.54	158	55.00	100.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
B. bairdii	Antimora microlepis	11.10	46.94		13	28.74	83.80	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Laemonema longipes	11.10	51.01		766	18.73	71.26	Walker et al. 2002	Honshu, NW Pacific	1985-1991
B. bairdii	Laemonema longipes	10.32	17.79	6.3	27	5.00	30	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
B. bairdii	Laemonema longipes	9.95	36.04	9.09	55	15.00	55	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
B. bairdii	Laemonema longipes	11.10	35.82		41	30.76	42.78	Walker et al. 2002	Sea of Okhotsk	1988-1989
B. bairdii	Theragra chalcogramma	9.95	47.32	8.44	13	35.00	60.00	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
C. commersonii	Loligo gahi	1.48	7.60		n.a.**	2.00	18.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
C. commersonii	Illex argentinus	1.48	11.00		n.a.**	6.00	28.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
C. commersonii	Merluccius hubbsi	1.48	9.90		n.a.**	0.10	20.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
C. heavisidii	Loligo vulgaris reynaudii	1.57	17.40	4.70	11	9.30	24.40	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
C. heavisidii	Sardinops sagax = S. ocellatus	1.57	20.60		2	20.60	20.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
C. heavisidii	Engraulis encrasicolus	1.57	10.90		1			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
C. heavisidii	Merluccius spp.	1.57	19.50	4.20	160	4.90	28.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
C. heavisidii	Trachurus capensis	1.57	17.10	2.40	23	10.70	22.20	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
C. heavisidii	Sufflogobius bibarbatus	1.57	5.30	2.00	n.a.**			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. leucas	Boreogadus saida	4.25	14.54		125	9.00	21.50	Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
D. leucas	Eleginus gracilis	4.25	12.48		530	5.50	30.50	Seaman et al. 1982	Bering Sea	1978
D. leucas	Pungitius pungitius	4.25	3.20		1			Seaman et al. 1982	Bering Sea and Chukchi Sea	1978
D. delphis	Loligo vulgaris reynaudii	2.08	17.30	6.80	322	2.50	34.50	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. delphis	Etrumeus whiteheadi	2.08	16.20	2.70	171	8.50	23.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. delphis	Sardinops sagax = S. ocellatus	2.08	19.00	1.80	163	12.60	24.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. delphis	Engraulis encrasicolus	2.08	11.20	1.80	413	5.30	18.10	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. delphis	Merluccius spp.	2.08	18.10	8.00	203	5.10	39.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
D. delphis	Trachurus capensis	2.08	16.20	6.20	134	4.60	34.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Delphinus sp.	Semirossia tenera	2.15	1.70		69	1.00	2.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Delphinus sp.	Loligo plei	2.15	18.00		2	17.70	18.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Delphinus sp.	Loligo sanpaulensis	2.15	5.00		58	2.80	8.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Delphinus sp.	Illex argentinus	2.15	5.90		20	2.10	27.60	dos Santos and Haimovici 2001	Brazil	1985-1998
F. attenuata	Loligo plei	2.35	14.90		2	13.60	16.20	dos Santos and Haimovici 2001	Brazil	1985-1998
F. attenuata	Illex argentinus	2.35	22.70		2	18.70	26.70	dos Santos and Haimovici 2001	Brazil	1985-1998
F. attenuata	Ornithoteuthis antillarum	2.35	13.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
F. attenuata	Merluccius spp.	2.33	6.30	0.50	6	5.70	7.20	Sekiguchi et al. 1992	Benguela, South Africa	1990
Globicephala sp.	Loligo pealeii	6.00	13.40		68			Overholtz and Waring 1991	Mid-Atlantic Bight, USA	1989
Globicephala sp.	Scomber scombrus	6.00	36.32		22			Overholtz and Waring 1991	Mid-Atlantic Bight, USA	1989
G. macrorhynchus	Loligo opalescens	4.40	13.80		11	11.00	17.09	Sinclair 1992	S California Bight, NE Pacific	1977
G. macrorhynchus	Loligo opalescens	4.63	12.80		11	11.20	14.20	Seagars and Henderson 1985	Channel Islands, NE Pacific	1980
G. macrorhynchus	Loligo opalescens	5.52	16.20		609	8.70	23.20	Sinclair 1992	S California Bight, NE Pacific	1969-1977
G. melas	Loligo gahi	4.06	12.80		34			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Loligo pealeii	3.40	16.07		145	5.00	42.00	Gannon et al. 1997b	Mid-Atlantic Bight, USA	1973-1993
G. melas	Loligo pealeii	5.90	19.60		578	3.70	43.60	Gannon et al. 1997a	NW Atlantic	1989-1991
G. melas	Ancistrocheirus lesueurii	5.90	17.20		3	6.10	24.40	dos Santos and Haimovici 2001	Brazil	1985-1998
G. melas	Brachioteuthis riisei	4.06	13.60		9			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Chiroteuthis veranyi	4.06	16.10		5			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
G. melas	Galiteuthis armata	4.06	26.80		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Mesonychoteuthis hamiltoni	4.06	22.00		7			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Gonatus antarcticus	4.06	15.10		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Histioteuthis eltaninae	4.06	5.20		32			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Histioteuthis sp.	5.90	5.60		68	4.80	11.50	dos Santos and Haimovici 2001	Brazil	1985-1998
G. melas	Lycoteuthis lorigera	5.90	11.00		45	9.30	14.10	dos Santos and Haimovici 2001	Brazil	1985-1998
G. melas	Alluroteuthis antarctica	4.06	29.30		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Octopoteuthis sp.	5.90	14.40		6	13.00	17.30	dos Santos and Haimovici 2001	Brazil	1985-1998
G. melas	Illex argentinus	5.90	22.10		6	15.00	33.20	dos Santos and Haimovici 2001	Brazil	1985-1998
G. melas	Todarodes sagittatus	1.50	17.00		n.a.**		25.00	Desportes and Mouritsen 1988	Faroe Islands, NE Atlantic	1986-1987
G. melas	Todarodes sagittatus	3.50	20.00		n.a.**		50.00	Desportes and Mouritsen 1988	Faroe Islands, NE Atlantic	1986-1987
G. melas	Moroteuthis ingens	4.06	21.20		19			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Octopodidae	4.06	16.00		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
G. melas	Squalus acanthias	3.40	75.00		6			Gannon et al. 1997b	Mid-Atlantic Bight, USA	1973-1993
G. melas	Scomber scombrus	5.90	35.80		45	26.50	42.10	Gannon et al. 1997a	NW Atlantic	1989-1991
G. griseus	Loligo vulgaris reynaudii	2.79	13.00	7.30	67	2.10	32.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
G. griseus	Ancistrocheirus lesueurii	3.33	15.80		55			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Bathyteuthis abyssicola	3.33	4.00		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Brachioteuthis sp.	3.33	7.30		7			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Chiroteuthis sp.	3.33	8.00		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Planctoteuthis sp.	3.33	5.80		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Megalocranchia fisheri A	3.33	20.80		240			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Megalocranchia sp. B	3.33	23.20		45			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Abraliopsis sp. A	3.33	4.40		241			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Abraliopsis sp. B	3.33	3.20		46			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Abraliopsis sp. C	3.33	3.40		19			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Abraliopsis sp. D	3.33	5.30		12			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Enoploteuthis cf. anaspis	3.33	7.70		208			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Enoploteuthis sp. A	3.33	9.50		279			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Histioteuthis sp. A	3.33	3.10		10			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Pholidoteuthis boschmai	3.33	19.60		2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Lycoteuthis lorigera	3.33	6.80		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Octopoteuthis spp.	3.33	5.70		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Octopoteuthis spp.	3.33	12.70		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Ommastrephes bartramii	3.33	35.40		17			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Onychoteuthis sp. 1	3.33	8.10		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Onychoteuthis sp. 2	3.33	20.30		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Pyroteuthis addolux	3.33	4.50		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
G. griseus	Trachurus capensis	2.79	32.60		1			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
H. planifrons	Bathyteuthis abyssicola	6.55	7.33	4.61	4			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Bathyteuthis abyssicola	7.20	3.60		6			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Batoteuthis skolops	7.20	9.60		6			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Brachioteuthis riisei	7.20	43.40		32			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Brachioteuthis sp.	6.30	8.57	0.86	5			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Chiroteuthis veranyi	7.20	12.40		5			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Chiroteuthis sp.	6.30	10.38	1.05	74			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Chiroteuthis sp.	6.49	10.61	1.34	388			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Galiteuthis armata	7.20	27.30		154			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Galiteuthis glacialis	6.30	19.52	1.54	375			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Galiteuthis glacialis	6.49	19.25	1.75	394			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Liocranchia reinhardti	6.55	24.90	3.33	9			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Liocranchia sp.	6.43	36.01	21.15	2			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Liocranchia sp.	6.30	25.40	4.46	334			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Megalocranchia sp.	6.49	19.65	5.98	77			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Mesonychoteuthis hamiltoni	6.30	92.51	16.12	5			Slip et al. 1995	Heard Island, Indian Ocean	1992

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
H. planifrons	Mesonychoteuthis hamiltoni	6.49	69.58	25.78	65			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Mesonychoteuthis hamiltoni	7.20	96.40		22			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Taonius megalops	6.43	40.55	4.92	2			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Taonius pavo	6.30	41.55	7.18	178			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Taonius pavo	6.49	34.91	8.27	614			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Taonius pavo	7.20	37.90		1663			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Teuthowenia megalops	6.55	22.17	4.66	160			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Teuthowenia pellucida	6.43	18.55	1.25	8			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Teuthowenia pellucida	7.20	18.40		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Cycloteuthis sp.	6.55	46.19	1.32	2			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Discoteuthis discus	6.55	10.33	0.85	60			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Discoteuthis cf. laciniosa	7.20	7.50		13			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Enoploteuthidae	6.55	5.01		1			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Enoploteuthis sp.	7.20	18.00		2			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Gonatus antarcticus	6.30	20.54	2.07	191			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Gonatus antarcticus	6.49	25.32	5.93	304			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Gonatus antarcticus	7.20	21.50		274			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Gonatidae	6.43	23.63	3.86	3			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Histioteuthis bonnellii corpuscula	6.43	4.90	0.73	6			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Histioteuthis eltaninae	6.30	4.85	0.46	77			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Histioteuthis eltaninae	6.49	5.90	0.90	132			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Histioteuthis eltaninae	7.20	5.50		752			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Histioteuthis machrohista	6.43	4.42	0.77	8			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Histioteuthis meleagroteuthis	6.43	5.49	0.73	397			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Histioteuthis sp.	6.49	5.40	1.71	506			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Pholidoteuthis boschmai	6.49	29.60	2.51	7			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Lycoteuthis lorigera	6.55	8.53		1			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Mastigoteuthis sp. A	7.20	18.80		4			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Mastigoteuthis sp.	6.55	10.79	1.48	20			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Mastigoteuthis sp.	6.30	8.57	0.57	12			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Alluroteuthis antarctica	6.30	14.41	1.51	49			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Alluroteuthis antarctica	6.49	40.13	14.06	39			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Alluroteuthis antarctica	7.20	30.80		18			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Octopoteuthis rugosa	6.55	15.02	2.20	17			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Octopoteuthis sp.	6.43	16.64	2.34	8			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Taningia danae	6.49	18.92	13.04	36			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Taningia danae	7.20	44.40		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Martialia hyadesi	6.30	22.60	1.52	65			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Martialia hyadesi	7.20	30.10		25			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Todarodes sagittatus	6.55	39.82		1			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Todaropsis eblanae	6.43	7.14		1			Sekiguchi et al. 1993	South Africa, east coast	1975
H. planifrons	Kondakovia longimana	6.55	46.94	6.95	59			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Kondakovia longimana	6.30	49.36	9.67	99			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Kondakovia longimana	7.20	10.40		77			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Moroteuthis ingens	6.55	70.36	5.02	5			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Moroteuthis ingens	7.20	67.20		13			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Moroteuthis knipovitchi	6.30	24.70	8.85	37			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Moroteuthis knipovitchi	6.49	22.10	3.49	34			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Moroteuthis knipovitchi	7.20	17.00		16			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
H. planifrons	Moroteuthis robsoni	6.49	20.71	8.36	60			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Moroteuthis sp.	6.49	22.42	4.42	74			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
H. planifrons	Onychoteuthis banksii	6.55	21.36	9.73	8			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Onychoteuthis sp.	6.55	29.26	5.24	10			Sekiguchi et al. 1993	South Africa, west coast	1990
H. planifrons	Psychroteuthis glacialis	6.30	9.87	1.96	1513			Slip et al. 1995	Heard Island, Indian Ocean	1992
H. planifrons	Dissostichus eleginoides	6.30	35.23	16.34	3			Slip et al. 1995	Heard Island, Indian Ocean	1992

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
K. breviceps	Loligo vulgaris reynaudii	2.52	11.60	5.20	21	5.30	20.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
K. breviceps	Chiroteuthis veranyi	3.05	10.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Chiroteuthis cf. veranyi	3.05	15.82		1			Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Taonius pavo	3.05	30.94		70	17.63	49.02	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Teuthowenia sp.	3.05	18.03		5	15.04	20.55	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Discoteuthis sp.	3.05	14.01		2	8.71	19.31	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Abralia sp.	3.05	3.60		5	3.00	4.30	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Enoploteuthis chunii	3.05	7.17		180	5.59	8.78	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Histioteuthis hoylei	3.05	10.47		7	7.81	15.52	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Histioteuthis miranda	3.05	9.44		17	6.39	10.83	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Histioteuthis reversa	3.05	5.31		6	4.86	5.79	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Histioteuthis spp.	3.05	7.10		16	5.70	9.30	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Pholidoteuthis boschmai	3.05	29.24		5	25.70	36.63	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Lycoteuthis lorigera	3.05	8.90		17	7.50	12.20	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Idioteuthis hjorti	3.05	11.00		17	7.58	14.62	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Octopoteuthis cf. deletron	3.05	16.65		6	14.26	18.57	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Octopoteuthis sp.	3.05	16.20		4	14.50	19.70	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Octopoteuthis sp.	3.05	16.89		2	16.01	17.78	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Eucleoteuthis luminosa	3.05	13.35		4	12.02	14.65	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Illex argentinus	3.05	21.70		25	14.60	28.10	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Ornithoteuthis antillarum	3.05	8.10		2	6.90	9.30	dos Santos and Haimovici 2001	Brazil	1985-1998
K. breviceps	Ornithoteuthis volatilis	3.05	20.12		13	13.28	25.24	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Sthenoteuthis oualaniensis	3.05	23.35		20	16.48	30.53	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Moroteuthis loennbergi	3.05	17.58		11	11.15	21.21	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Onychoteuthis banksii	3.05	16.63		2	10.77	22.49	Wang et al. 2002	Taiwan	1998-2000
K. breviceps	Engraulis encrasicolus	2.52	10.00		3	10.00	10.00	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
K. breviceps	Merluccius spp.	2.52	21.30	2.60	11	16.20	25.50	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
K. sima	Semirossia tenera	2.40	2.00		2	1.80	2.30	dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Loligo vulgaris reynaudii	2.23	7.10	1.40	11	5.30	8.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
K. sima	Chiroteuthis veranyi	2.40	11.90		1			dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Chtenopteryx sicula	2.40	7.07		1			Wang et al. 2002	Taiwan	1998-2000
K. sima	Chtenopteryx sp.	2.40	7.04		6	6.36	7.91	Wang et al. 2002	Taiwan	1998-2000
K. sima	Galiteuthis armata	2.40	7.93		2	7.34	8.52	Wang et al. 2002	Taiwan	1998-2000
K. sima	Leachia dislocata	2.40	2.27		2	2.25	2.29	Wang et al. 2002	Taiwan	1998-2000
K. sima	Taonius pavo	2.40	20.59		14	10.01	34.83	Wang et al. 2002	Taiwan	1998-2000
K. sima	Discoteuthis sp.	2.40	13.33		1			Wang et al. 2002	Taiwan	1998-2000
K. sima	Abralia redfieldi	2.40	2.90		23	2.20	3.60	dos Santos and Haimovici 2001	Brazil	1994, 1998
K. sima	Enoploteuthis chunii	2.40	7.13		72	5.63	8.84	Wang et al. 2002	Taiwan	1998-2000
K. sima	Histioteuthis miranda	2.40	8.13		13	3.04	10.63	Wang et al. 2002	Taiwan	1998-2000
K. sima	Histioteuthis spp.	2.40	6.00		94	2.60	13.40	dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Lycoteuthis lorigera	2.40	9.40		7	8.10	10.90	dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Octopoteuthis sp.	2.40	14.70		1			dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Eucleoteuthis luminosa	2.40	13.06		4	6.98	18.22	Wang et al. 2002	Taiwan	1998-2000
K. sima	Illex argentinus	2.40	22.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Ornithoteuthis antillarum	2.40	5.70		24	3.00	9.60	dos Santos and Haimovici 2001	Brazil	1985-1998
K. sima	Ornithoteuthis volatilis	2.40	17.80		3	9.64	23.10	Wang et al. 2002	Taiwan	1998-2000
K. sima	Sthenoteuthis oualaniensis	2.40	15.18		1			Wang et al. 2002	Taiwan	1998-2000
K. sima	Moroteuthis loennbergi	2.40	10.77		1			Wang et al. 2002	Taiwan	1998-2000
K. sima	Onychoteuthis banksii	2.40	13.76		3	9.25	16.20	Wang et al. 2002	Taiwan	1998-2000
K. sima	Engraulis encrasicolus	2.23	11.60	2.80	7	9.30	17.60	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
K. sima	Merluccius spp.	2.23	21.60	3.20	20	16.60	26.80	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
L. hosei	Loligo sanpaulensis	2.33	12.90		19	5.10	21.90	dos Santos and Haimovici 2001	Brazil	1985-1998
L. hosei	Abraliopsis cf. lineata	2.33	5.09	SE 0.14	30	3.70	6.70	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Argonauta nodosa	2.33	0.60		1			dos Santos and Haimovici 2001	Brazil	1985-1998
L. hosei	Acanthephyra carinata	2.33	3.76	SE 0.35	5	3.00	5.00	Dolar et al. 2003	Sulu Sea, Philippines	n.a.

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
L. hosei	Acanthephyra quadrispinsoa	2.33	1.47	SE 0.06	19	1.00	1.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Notostomus elegans	2.33	3.74	SE 0.43	5	2.30	4.50	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Gonostoma cf. elongatum	2.33			184	8.30	22.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Argyropelecus affinis	2.33			177	4.00	7.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Maurolicus cf. muelleri	2.33			112	2.50	3.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Ichthyococcus cf. irregularis	2.33			120	4.00	6.90	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Chauliodus cf. barbatus	2.33	18.00		238	8.50	20.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Rosenblattichthys cf. volucris	2.33			67	6.50	14.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Scopelarchus guentheri	2.33			127	8.00	16.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Paralepididae	2.33			87	20.00	30.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Evermanella cf. ahlstromi	2.33			119	3.50	9.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Ceratoscopelus warmingii	2.33	5.93	SE 0.04	171	4.20	6.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Lampadena luminosa	2.33			255	7.50	10.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Lampadena luminosa	2.33	10.20	SE 0.09	245	8.10	14.60	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Lampadena sp.	2.33			9	6.00	7.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Lampanyctus cf. idostigma	2.33			208	6.00	9.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Lampanyctus cf. nobilis	2.33			103	7.00	12.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Myctophum nitidulum	2.33	4.50	SE 0.44	3	3.70	5.10	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Symbolophorus evermanni	2.33	6.48	SE 0.05	43	5.80	7.60	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. hosei	Melanonus sp.	2.33			71	12.00	22.00	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Scopelogadus mizolepis bispinosus	2.33			143	3.00	6.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Diretmus argenteus	2.33			363	6.00	28.50	Robison and Craddock 1983	E Tropical Pacific	1972
L. hosei	Cubiceps pauciradiatus	2.33	11.30	SE 0.17	55	8.50	14.20	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
L. obliquidens	Loligo opalescens	2.05				4.70	17.60	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
L. obliquidens	Ommastrephes bartramii	2.05	32.10		8	27.00	39.50	Walker and Jones 1993	N Pacific	1990
L. obscurus	Loligo gahi	2.05	7.50		n.a.**	2.00	23.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
L. obscurus	Loligo vulgaris reynaudii	1.71	12.90	6.60	23	1.70	27.00	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
L. obscurus	Illex argentinus	2.05	10.40		n.a.**	4.00	28.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
L. obscurus	Etrumeus whiteheadi	1.71	11.20	3.50	5	9.20	17.40	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
L. obscurus	Sardinops sagax = S. ocellatus	1.71	16.60	3.60	21	13.80	25.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
L. obscurus	Engraulis encrasicolus	1.71	9.10	1.80	188	4.40	15.80	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
L. obscurus	Merluccius hubbsi	2.05	20.00		n.a.**	0.10	45.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
L. obscurus	Merluccius spp.	1.71	16.50	7.20	216	4.80	42.10	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
L. obscurus	Trachurus capensis	1.71	9.90	3.00	723	4.20	24.90	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
M. densirostris	Merluccius spp.	3.52	6.90	1.20	6	5.90	8.50	Sekiguchi et al. 1992	Benguela, South Africa	1981
M. layardii	Chiroteuthis sp.	6.15	11.17	0.42	3			Sekiguchi et al. 1996	New Zealand	1966
M. layardii	Chiroteuthis sp.	5.41	10.64	1.12	9			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Galiteuthis armata	5.41	19.60		2			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Megalocranchia sp.	5.41	25.40	6.44	3			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Taonius pavo	6.15	25.8		1			Sekiguchi et al. 1996	New Zealand	1966
M. layardii	Taonius pavo	5.41	30.56	10.84	39			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Taonius sp.	5.41	27.34	1.38	10			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Teuthowenia megalops	5.41	25.27		2			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Teuthowenia pellucida	6.15	22.22	0.86	2			Sekiguchi et al. 1996	New Zealand	1966
M. layardii	Teuthowenia pellucida	5.41	18.12	2.39	12			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Teuthowenia sp.	5.41	34.25		1			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Cycloteuthis sp.	5.41	24.80		1			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Discoteuthis discus	5.41	9.19		1			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Discoteuthis laciniosa	5.41	12.78	1.97	5			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Gonatus antarcticus	5.41	34.49	0.66	5			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Gonatidae	5.41	12.17	4.55	2			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Histioteuthis machrohista	5.41	6.30	1.12	21			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Histioteuthis meleagroteuthis	6.15	7.75		1			Sekiguchi et al. 1996	New Zealand	1966
M. layardii	Histioteuthis meleagroteuthis	5.41	5.22	0.30	5			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Histioteuthis miranda	6.15	15.96		1			Sekiguchi et al. 1996	New Zealand	1966

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
M. layardii	Histioteuthis sp.	5.41	5.83	1.25	58			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Mastigoteuthis sp.	5.41	11.37	1.18	22			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Octopoteuthis rugosa	5.41	7.93		2			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Octopoteuthis sp.	5.41	13.48		2			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Ommastrephidae	5.41	6.00		1			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Moroteuthis knipovitchi	5.41	5.80	4.30	3			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Moroteuthis robsoni	5.41	28.40		1			Sekiguchi et al. 1996	South Africa	1965-1995
M. layardii	Vampyroteuthis infernalis	5.41	5.00	1.26	3			Sekiguchi et al. 1996	South Africa	1965-1995
M. monoceros	Gonatus fabricii	4.45	22.00		5473	6.80	40.25	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
M. monoceros	Boreomysis sp.	4.45			n.a.**	3.00	5.00	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
M. monoceros	Arctogadus glacialis	4.45	18.60		376	9.30	26.60	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
M. monoceros	Arctogadus glacialis	4.45	20.00		616	10.00	40.00	Heide-Jorgensen et al. 1994	Inglefield Bredning, Greenland	1984, 1985
M. monoceros	Boreogadus saida	4.45	11.30		607	4.80	21.50	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
M. monoceros	Boreogadus saida	4.45	15.70		557	12.00	24.00	Heide-Jorgensen et al. 1994	Inglefield Bredning, Greenland	1984, 1985
M. monoceros	Reinhardtius hippoglossoides	4.45			n.a.**	45.00	61.00	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
M. monoceros	Reinhardtius hippoglossoides	4.45	35.70	9.00	140	13.80	54.70	Laidre and Heide-Jorgensen 2005	Disko Bay, Greenland	2002-2003
O. orca	Loligo plei	7.65	14.30		2	12.40	16.20	dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Loligo sanpaulensis	7.65	12.60		10	5.80	18.50	dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Ancistrocheirus lesueurii	7.65	29.30		1			dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Gonatus antarcticus	7.65	20.10		6	18.80	21.40	dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Histioteuthis spp.	7.65	9.60		7	6.90	13.70	dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Lycoteuthis lorigera	7.65	11.00		1			dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Octopoteuthis sp.	7.65	16.50		4	15.60	19.00	dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Ommastrephes bartramii	7.65	28.70		1			dos Santos and Haimovici 2001	Brazil	1985-1998
O. orca	Ornithoteuthis antillarum	7.65	4.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
P. phocoena	Rossia macrosoma	1.65	4.40	0.20	2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Sepietta oweniana	1.65	2.60		9			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Loligo opalescens	1.65				5.60	13.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
P. phocoena	Loligo opalescens	1.65	8.14		1673	5.80	12.50	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Loligo pealeii	1.65	12.90	3.00	8			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Loligo subulata	1.65	7.10	1.10	71			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Loligo vulgaris vulgaris	1.65	2.90		2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Bathypolypus arcticus	1.65	5.20		1			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Myxine glutinosa	1.65	31.60		1			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Anguilla anguilla	1.65	26.40	10.00	9			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Clupea harengus	1.65	33.70		47	29.00	38.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
P. phocoena	Clupea harengus	1.65	26.50	SE 0.32	136			Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
P. phocoena	Clupea harengus	1.65	25.40	3.60	507	18.00	33.00	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Clupea harengus	1.65	26.10	4.90	103			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Clupea harengus pallasi	1.65	17.86		53	12.30	22.80	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Sprattus sprattus	1.65	14.00	0.90	166			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Mallotus villosus	1.65	13.80	0.80	23	13.00	15.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
P. phocoena	Thaleichthys pacificus	1.65	15.30		3	12.40	18.10	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Maurolicus muelleri	1.65	5.00	0.50	146	3.60	6.80	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Maurolicus weitzmani	1.65	5.00	0.40	5898	3.00	5.50	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Gadus morhua	1.65	29.00		5	26.00	32.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
P. phocoena	Gadus morhua	1.65	15.90	SE 1.72				Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
P. phocoena	Gadus morhua	1.65	24.10	13.30	5			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Gadus morhua	1.65	28.10	5.80	30			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Melanagrammus aeglefinus	1.65	18.20	3.00	4			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Merlangius merlangus	1.65	18.70	4.00	65	14.00	29.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Merlangius merlangus	1.65	5.77	2.60	449	2.00	12.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Micromesistius poutassou	1.65	27.80	13.70	5			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Pollachius pollachius	1.65	5.60	0.10	2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Pollachius virens	1.65	19.50	10.10	76			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
P. phocoena	Pollachius virens	1.65	17.40	6.40	91			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Theragra chalcogramma	1.65	18.64		3	18.50	18.80	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Trisopterus esmarkii	1.65	12.40	2.20	381			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Trisopterus minutus	1.65	14.70	1.30	14			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Enchelyopus cimbrius	1.65	23.60	4.70	18			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Urophycis spp.	1.65	15.90	14.60	474			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Merluccius bilinearis	1.65	19.60	SE 0.18	173			Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
P. phocoena	Merluccius bilinearis	1.65	16.40	9.60	1605	3.00	38.00	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Merluccius merluccius	1.65	14.50	1.50	4			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Merluccius productus	1.65	35.30		15	33.80	37.10	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Sebastes spp.	1.65	3.70	0.30	47			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Lycodopsis pacifica	1.65	10.43		1786	8.00	11.00	Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Ammodytes hexapterus	1.65	15.70		2			Walker et al. 1998	Washington and British Columbia	1990-1997
P. phocoena	Ammodytidae	1.65	13.10	6.20	13			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Gobiidae	1.65	4.50	2.00	79	1.50	9.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
P. phocoena	Scomber scombrus	1.65	37.70	1.60	10	35.00	40.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
P. phocoena	Scomber scombrus	1.65	29.60	SE 1.44				Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
P. phocoena	Scomber scombrus	1.65	22.40	5.30	15			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Peprilus triacanthus	1.65	9.70	1.20	38			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
P. phocoena	Citharichthys sordidus	1.65	15.20		10	12.50	17.60	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Loligo opalescens	1.95				4.70	17.40	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
P. dalli	Loligo opalescens	1.95	9.52		44	6.90	12.70	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Taonius pavo	1.89	21.10		12	13.98	30.61	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Watasenia scintillans	1.89	3.39		462	2.44	4.51	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Berryteuthis magister	1.95	13.31		538	5.50	32.50	Walker 1996	Sea of Okhotsk	1988-1989
P. dalli	Berryteuthis magister	1.89	8.30	1.20	22	5.50	10.50	Ohizumi et al. 2000	Sea of Japan	May-89
P. dalli	Berryteuthis magister	1.89	7.10	4.20	90	0.50	18.50	Ohizumi et al. 2000	Sea of Japan	May-95
P. dalli	Berryteuthis magister	1.89	11.50	3.60	69	2.50	18.50	Ohizumi et al. 2000	Sea of Japan	May-96
P. dalli	Berryteuthis magister	1.89	9.30	3.30	62	4.50	17.50	Ohizumi et al. 2000	Sea of Okhotsk	Oct-94
P. dalli	Berryteuthis magister	1.89	10.60	4.20	120	4.50	19.50	Ohizumi et al. 2000	Sea of Okhotsk	Aug-95
P. dalli	Berryteuthis magister	1.89	12.80	3.60	70	3.50	25.50	Ohizumi et al. 2000	Sea of Okhotsk	Jun-88
P. dalli	Gonatopsis borealis	1.89	14.97		28	10.86	21.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatopsis makko	1.89	9.96		647	2.10	28.91	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatopsis octopedatus	1.89	9.11		560	1.00	15.14	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatus berryi	1.89	13.99		10	4.87	22.48	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatus madokai	1.89	10.12		459	2.36	17.10	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatus onyx	1.89	8.59		191	5.22	10.76	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Gonatus sp.	1.89	8.24		872	4.00	14.77	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Todarodes pacificus	1.89	7.37		2125	3.09	22.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Clupea harengus pallasi	1.95	15.10		66	10.20	21.70	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Sardinops sagax melanostictus	1.95	18.01		1419	13.25	23.25	Walker 1996	Sea of Okhotsk	1988-1989
P. dalli	Sardinops sagax cf. melanosticus	1.89	17.89		372	12.53	22.46	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Engraulis japonicus	1.89	12.73		978	9.77	17.16	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Nansenia candida	1.95	7.07		6	2.70	14.80	Crawford 1981	N Pacific	1978-1979
P. dalli	Bathylagidae	1.95	9.43		60	5.00	17.90	Crawford 1981	N Pacific	1978-1979
P. dalli	Bathylagidae	1.89	11.77		315	11.12	12.46	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Thaleichthys pacificus	1.95	15.80		21	12.80	17.60	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Maurolicus muelleri	1.89	2.27		661	1.48	3.01	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Scopelosaurus harryi	1.95	15.34		37	7.50	21.50	Crawford 1981	N Pacific	1978-1979
P. dalli	Paralepididae	1.95	43.00		2	38.00	48.00	Crawford 1981	N Pacific	1978-1979
P. dalli	Myctophidae	1.95	6.54		166	3.50	10.50	Crawford 1981	N Pacific	1978-1979
P. dalli	Theragra chalcogramma	1.95	22.61		135	6.50	60.50	Walker 1996	Sea of Okhotsk	1988-1989
P. dalli	Theragra chalcogramma	1.89	33.64		639	15.08	52.48	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Theragra chalcogramma	1.95	25.90		113	12.70	36.30	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Merluccius productus	1.95	41.75		7	39.70	43.80	Walker et al. 1998	Washington and British Columbia	1990-1997

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
P. dalli	Melamphaes sp.	1.95	8.38		8	7.80	9.00	Crawford 1981	N Pacific	1978-1979
P. dalli	Pleurogrammus azonus	1.89	21.60		154	13.70	28.94	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	Pleurogrammus monopterygius	1.95	13.10		1			Crawford 1981	N Pacific	1978-1979
P. dalli	Lycodopsis pacifica	1.95	9.50		10175	8.00	10.50	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Ammodytes hexapterus	1.95	10.90		61	9.30	13.30	Walker et al. 1998	Washington and British Columbia	1990-1997
P. dalli	Ammodytes personatus	1.89	19.44		277	12.75	22.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
P. dalli	mixed fish taxa	1.95	10.22		98	3.00	33.00	Crawford 1981	N Pacific	1978-1979
P. dalli	mixed fish taxa	1.95	8.56		378	2.70	48.00	Crawford 1981	N Pacific	1978-1979
P. macrocephalus	Ancistrocheirus lesueurii	15.75	20.45		60	14.00	30.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Ancistrocheirus lesueurii	10.00	21.66		73	10.00	40.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Ancistrocheirus lesueurii	15.75	16.40		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Ancistrocheirus lesueurii	12.40	23.00		204	16.70	28.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Architeuthis cf. dux	12.40	115.90		135	34.60	186.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Architeuthis sp.	15.75	107.75		4	82.00	151.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Architeuthis sp.	10.00	82.56		9	42.00	116.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Architeuthis sp.	15.75	166.30		2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Chiroteuthis picteti	15.75	13.90		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Chiroteuthis sp.	12.40	12.60		168	10.90	20.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Helicocranchia sp. ?	12.40	25.80		4			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Liguriella sp.	12.40	12.90		1			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Liocranchia reinhardti	12.40	25.80		4			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Megalocranchia fisheri	15.75	96.00		36			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Megalocranchia sp. A	12.40	50.50		200	28.30	69.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Megalocranchia sp. G	12.40	81.70		30	49.50	140.80	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Taonius pavo	15.75	41.10		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Taonius pavo	12.40	41.20		12			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Teuthowenia maculata	12.40	29.90		200	19.20	37.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Teuthowenia megalops	12.40	30.10		200	20.40	35.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Teuthowenia megalops	12.35	23.71		110	14.50	31.50	Santos et al. 1999	North Sea	1990-1996
P. macrocephalus	Teuthowenia sp.	12.40	19.90		8			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Cycloteuthis akimushkini	15.75	38.90		18			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Cycloteuthis akimushkini	12.40	37.00		152	18.90	50.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Discoteuthis laciniosa	15.75	16.10	.	2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Discoteuthis laciniosa	12.40	13.20		200	9.80	15.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Gonatus berryi	15.75	28.50		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Gonatus fabricii	14.80	21.80		2000			Clarke 1997	North Sea	1994
P. macrocephalus	Gonatus cf. fabricii	13.12	22.30		2116	15.50	28.50	Santos et al. 1999	North Sea	1990-1996
P. macrocephalus	Gonatus cf. fabricii	12.35	22.02		14468	14.50	29.50	Santos et al. 1999	North Sea	1990-1996
P. macrocephalus	Gonatus steenstrupi	12.40	14.90		200	11.50	18.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis arcturi	12.40	11.10		200	8.30	13.00	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis bonnellii bonnellii	12.40	17.50		200	7.80	29.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis bonnellii corpuscula	12.40	5.90		20	4.10	6.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis cf. celetaria	12.40	9.10		200	7.50	13.30	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis hoylei	15.75	11.60		129			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Histioteuthis meleagroteuthis	12.40	8.10		59	5.20	9.60	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis miranda	15.75	16.67		6	13.00	22.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Histioteuthis miranda	10.00	17.16		19	14.00	21.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Histioteuthis cf. miranda	12.40	15.00		200	11.20	18.90	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis reversa	12.40	5.20		19	4.40	6.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Histioteuthis sp.	10.00	4.67		6	3.00	8.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Histioteuthis sp.	15.75	5.50		6	5.00	6.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Lepidoteuthis grimaldii	12.40	57.90		200	30.60	102.40	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Pholidoteuthis boschmai	15.75	26.91		11	16.00	39.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Pholidoteuthis boschmai	15.75	29.85		47	14.00	63.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Pholidoteuthis boschmai	10.00	28.84		57	20.00	36.00	Best 1999	Donkergat, South Africa	1962-1963

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
P. macrocephalus	Pholidoteuthis boschmai	12.40	41.10		200	19.60	38.40	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Pholidoteuthis cf. boschmai	15.75	28.00		6			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Idioteuthis famelica	15.75	14.20		21			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Mastigoteuthis sp. A	12.40	15.50		83	12.60	20.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Mastigoteuthis sp. B	12.40	18.60		2			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Octopoteuthis cf. neilseni	15.75	2.50		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Octopoteuthis rugosa	15.75	15.75		4	15.00	17.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Octopoteuthis rugosa	10.00	21.36		45	9.00	54.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Octopoteuthis rugosa	15.75	2.70		13			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Octopoteuthis rugosa	12.40	20.00		200	13.30	24.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Octopoteuthis sp. G	12.40	32.50		115	23.00	41.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Taningia danae	15.75	42.30		13			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Taningia danae	12.40	75.80		200	18.00	158.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Ommastrephes bartramii	15.75	46.60		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Ommastrephes bartramii	12.40	48.60		6	15.50	75.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Todarodes sagittatus	12.40	48.40		200	25.80	69.60	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Kondakovia longimana	16.50	53.50		81	26.00	80.00	Nemoto et al. 1985, 1987	Southern Ocean	1972-1973
P. macrocephalus	Moroteuthis robsoni	15.75	30.90		10	19.00	42.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Moroteuthis robsoni	10.00	35.87		23	17.00	56.00	Best 1999	Donkergat, South Africa	1962-1963
P. macrocephalus	Onychoteuthis borealijaponica	12.40	31.70		110	16.30	44.00	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. macrocephalus	Onychoteuthis sp.	15.75	28.00		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
P. macrocephalus	Vampyroteuthis infernalis	12.40	10.40		5	9.60	12.90	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
P. blainvillei	Semirossia tenera	1.50	3.80		2	3.20	4.50	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Loligo plei	1.50	15.40		27	6.80	21.10	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Loligo plei	1.50	16.60		155	6.60	26.60	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Loligo sanpaulensis	1.50	5.10		593	2.00	21.90	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Loligo sanpaulensis	1.50	10.30		2686	2.20	22.00	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Lolliguncula brevis	1.50	4.90		134	2.40	8.40	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Argonauta nodosa	1.50	2.40		55	0.50	4.40	dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Eledone gaucha	1.50	2.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
P. blainvillei	Octopus tehuelchus	1.50	2.70		3	2.40	2.90	dos Santos and Haimovici 2001	Brazil	1985-1998
P. crassidens	Loligo vulgaris reynaudii	3.73	21.10	4.70	3	16.00	25.30	Sekiguchi et al. 1992	Benguela, South Africa	1971-1982
P. crassidens	Ommastrephes bartramii	5.50	28.20		5	19.10	32.90	dos Santos and Haimovici 2001	Brazil	1985-1998
S. fluviatilis	Loligo plei	1.75	15.20		137	4.10	26.60	dos Santos and Haimovici 2001	Brazil	1985-1998
S. fluviatilis	Loligo sanpaulensis	1.75	4.50		260	1.40	19.50	dos Santos and Haimovici 2001	Brazil	1985-1998
S. fluviatilis	Lolliguncula brevis	1.75	4.10		199	2.50	6.00	dos Santos and Haimovici 2001	Brazil	1985-1998
S. fluviatilis	Lolliguncula brevis	1.78	4.01	0.79	172	2.84	5.84	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Anchoa sp.	1.78	7.34	1.31	17	5.52	10.60	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Eucinostomus argenteus	1.78	11.91		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Orthopristis ruber	1.78	3.73	0.73	2	3.21	4.24	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Pomadasys corvinaeformis	1.78	9.06	1.98	7	4.92	10.80	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Cynoscion jamaicensis	1.78	9.35	5.16	2	5.70	13.00	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Cynoscion leiarchus	1.78	24.80		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Isopisthus parvipinnis	1.78	13.98	2.73	56	10.24	19.81	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Larimus breviceps	1.78	10.51	1.60	6	8.71	12.98	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Macrodon ancylodon	1.78	28.10		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Micropogonias furnieri	1.78	16.23	7.16	11	5.68	33.08	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Paralonchurus brasiliensis	1.78	14.93	3.96	57	3.93	20.81	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Stellifer brasiliensis	1.78	10.61	1.82	52	6.09	15.54	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Stellifer rastrifer	1.78	6.19	0.99	657	3.48	10.84	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Mugil spp.	1.78	14.76	0.35	2	14.51	15.00	de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Trichiurus lepturus	1.78	18.29		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
S. fluviatilis	Paralichthys orbignyanus	1.78	9.31		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
S. attenuata	Loligo vulgaris reynaudii	2.03	7.10	2.90	7	4.20	11.50	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
S. attenuata	Ancistrocheirus lesueurii	2.05	4.69	2.96	139	0.88	20.31	Robertson and Chivers 1997	E Tropical Pacific	1989-1991

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 2. Raw food habits data, sorted phylogenetically by predator species. See Appendix 1 for common and full scientific names of predator species.

Predator species	Prey species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
S. attenuata	Architeuthis sp.	2.05	6.29	2.58	2	4.47	8.12	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Chtenopteryx sicula	2.05	3.47	0.63	39	2.17	5.16	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Leachia dislocata	2.05	12.79	3.34	628	4.96	24.81	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Liocranchia reinhardti	2.05	12.54	3.44	238	4.22	19.96	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Megalocranchia sp.	2.05	10.91	5.42	479	0.24	25.39	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Abraliopsis affinis	2.05	3.00	0.49	3671	1.87	4.54	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Enoploteuthis chunii	2.05	7.12		877	6.10	8.20	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Pholidoteuthis boschmai	2.05	9.73	2.55	150	4.29	18.19	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Mastigoteuthis dentata	2.05	6.91	1.42	870	2.06	13.24	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Octopoteuthis deletron	2.05	4.56	2.35	63	1.03	13.02	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Dosidicus gigas	2.05	52.27		596	46.71	59.95	Perrin et al. 1973	E Tropical Pacific	1968
S. attenuata	Dosidicus gigas	2.05	18.08	4.31	207	9.92	31.94	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Eucleoteuthis luminosa	2.05	11.27	3.39	475	5.16	21.94	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Eucleoteuthis luminosa	2.05	21.03		23	19.14	24.55	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Hyaloteuthis pelagica	2.05	7.53	1.27	114	5.06	11.79	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Nototodarus hawaiiensis	2.05	7.08	0.99	5	6.5	8.79	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Ommastrephes bartramii	2.05	12.92	3.53	1158	6.97	27.35	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Sthenoteuthis oualaniensis	2.05	14.42	4.21	287	7.34	32.09	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Sthenoteuthis oualaniensis	2.05	12.36		23	9.31	14.31	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Onychoteuthis banksii	2.05	7.43	2	646	0.86	13.99	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Onychoteuthis banksii	2.05	11.37		47	6.01	19.17	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Pterygioteuthis giardi	2.05	2.18	0.34	65	1.64	3.17	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Engraulis japonicus	2.05	10.77		115	9.30	12.84	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Ceratoscopelus warmingii	2.05	4.93	0.48	114	3.38	6.15	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Diaphus schmidti	2.05	4.20		396	2.65	5.30	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Diaphus watasei	2.05	12.64		167	8.62	16.69	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Lampanyctodes hectoris	2.05	5.66		88	4.43	6.71	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Myctophum asperum	2.05	7.60		675	6.63	8.42	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Myctophum nitidulum	2.05	5.64	0.52	14	4.67	6.31	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Symbolophorus spp.	2.05	6.66	0.7	273	4.09	8.24	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Oxyporhamphus micropterus	2.05	14.34	1.51	40	12.22	18.01	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Exocoetus moncirrhus	2.05	16.47	1.68	19	13.69	19.37	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Exocoetus volitans	2.05	15.87	2.22	68	9.09	18.74	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Decapterus macrosoma	2.05	20.06		55	16.11	22.20	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Trichiurus lepturus	2.05	55.50		74	49.62	65.65	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Scomber australasicus	2.05	2.76		29	16.39	33.27	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Scomber japonicus	2.05	30.77		15	28.00	33.50	Wang et al. 2003	Taiwan	1994-1995
S. attenuata	Auxis thazard	2.05	21.15	2.29	8	19	26	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Cubiceps baxteri	2.05	14.09	0.49	3	13.61	14.58	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. attenuata	Cubiceps pauciradiatus	2.05	10.91	0.98	233	7.46	12.98	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
S. coeruleoalba	Loligo vulgaris reynaudii	2.03	9.30	4.00	183	2.40	22.30	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Crustaceans			**34**	**29**	**3.99**			
Mysidae								
Antarctomysis maxima	4.30	Brierly et al. 1998	1	0	n.a.		no	
Boreomysis sp.	5.00	Finley and Gibb 1982	1	0	n.a.		yes	
Gammaridae								
Gammarus setosus	2.00	Weslawski et al. 1994	1	1	1.53	76.50	no	
Hyperiidae								
Themisto libellula	3.40	Weslawski et al. 1994	1	1	1.66	48.82	no	
Euphausiidae								
Euphausia superba	6.60	Reid et al. 1996	15	15	4.53	68.64	yes	
Thysanoessa inermis	3.20	Nicol and Endo 1997	1	1	1.75	54.69	yes	
Oplophoridae								
Acanthephyra carinata	5.00	Dolar et al. 2003	1	0	n.a.		no	
Acanthephyra quadrispinsoa	1.90	Dolar et al. 2003	2	2	1.45	76.32	no	
Notostomus elegans	4.50	Dolar et al. 2003	1	0	n.a.		no	
Majidae								
Chionoectes opilio	15.00	Kaimmer et al. 1976	1	1	5.70	38.00	yes	
Hippolytidae								
Chorismus antarcticus	2.00	Gorny et al. 1993	1	1	1.33	66.50	no	
Aristeidae								
Aristeus sp. = *Hemipenaeus* sp.	1.60	Dolar et al. 2003	1	0	n.a.		no	
Penaeidae								
Hemipenaeus sp. (see *Aristeus* sp.)							no	
Palinuridae								
Jasus lalandii	11.50	Schoeman et al. 2002	3	3	3.96	34.43	yes	
Crangonidae								
Notocrangon antarcticus	2.50	Bluhm and Brey 2001	1	1	1.41	56.40	no	
Sabinea septemcarinata	5.60	Weslawski et al. 1994	1	1	5.02	89.64	no	
Portunidae								
Ovalipes catharus	11.00	Lalas 1997	1	1	7.00	63.64	no	
Pandalidae								
Pandalus borealis	9.20	Weslawski et al. 1994	1	1	7.47	81.20	yes	
Cephalopods			**487**	**275**	**18.94**			
Sepiidae								
Sepia apama	50.00	Wood and Day 1998	1	1	30.10	60.20	minor	
Sepia novaehollandiae	20.10	Gales et al. 1993	1	1	15.50	77.11	no	
Sepia officinalis	45.00	Wood and Day 1998	1	0	n.a.		minor	
Sepia sp.	50.00	Wood and Day 1998	1	1	14.29	28.58	minor	
Sepiolidae								
Rossia macrosoma	8.00	Wood and Day 1998	1	0	n.a.		minor	
Semirossia tenera	5.00	Wood and Day 1998	3	1	1.70	34.00	no	
Sepietta oweniana	7.00	Wood and Day 1998	1	0	n.a.		no	
Loliginidae								
Alloteuthis subulata (see *Loligo subulata*)							n.a.	
Loligo bleekeri	40.00	Wood and Day 1998	1	0	n.a.		yes	
Loligo gahi	28.00	Wood and Day 1998	4	4	9.40	33.57	yes	
Loligo japonica (see *Loliolus japonica*)							yes	
Loligo opalescens	23.50	Lowry and Caretta 1999	15	10	11.58	49.27	yes	
Loligo pealeii	50.00	Wood and Day 1998	4	3	16.36	32.71	yes	
Loligo plei	35.00	Wood and Day 1998	10	6	16.32	46.62	yes	
Loligo sanpaulensis	22.00	dos Santos and Haimovici 2001	9	8	8.69	39.49	yes	
Loligo subulata = *Alloteuthis subulata*	20.00	Wood and Day 1998	1	1	7.10	35.50	yes	
Loligo vulgaris reynaudii	40.00	Wood and Day 1998	13	11	14.04	35.10	yes	
Loligo vulgaris vulgaris	64.00	Wood and Day 1998	1	0	n.a.		yes	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type Family Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Loliolus japonica = Loligo japonica	12.00	Wood and Day 1998	1	0	n.a.		no	
Lolliguncula brevis	12.00	Wood and Day 1998	3	3	4.34	36.14	no	
Sepioteuthis australis	53.10	Gales et al. 1993	1	1	32.80	61.77	yes	
Ancistrocheiridae								
Ancistrocheirus alessandrini (see A. lesueurii)							n.a.	
Ancistrocheirus lesueurii = A. alessandrini	40.00	Best 1999	8	5	17.12	42.80	potential	
Architeuthidae								
Architeuthis cf. *dux*	600.00	Wood and Day 1998	1	1	115.90		no	
Architeuthis sp.	600.00	Wood and Day 1998	4	0	n.a.	19.32	no	
Bathyteuthidae								
Bathyteuthis abyssicola	7.33	Sekiguchi et al. 1993	3	0	n.a.		no	based on a report of mean size
Batoteuthidae								
Batoteuthis skolops	27.00	Wood and Day 1998	2	0	n.a.		no	
Brachioteuthidae								
Brachioteuthis cf. *picta*	9.00	Wood and Day 1998	4	3	7.49	83.20	indet.	
Brachioteuthis riisei	43.40	Clarke and Goodall 1994	2	1	43.40	100.00	indet.	based on a report of mean size
Brachioteuthis cf. *riisei*	43.40	Clarke and Goodall 1994	1	1	5.84	13.46	indet.	based on a report of mean size
Brachioteuthis sp.	43.40	Clarke and Goodall 1994	1	0	n.a.		indet.	based on a report of mean size
Brachioteuthis spp.	43.40	Clarke and Goodall 1994	1	0	n.a.		indet.	based on a report of mean size
Chiroteuthidae								
Chiroteuthis imperator	25.00	Wood and Day 1998	1	1	6.14	24.56	no	
Chiroteuthis picteti	25.00	Wood and Day 1998	1	0	n.a.		no	
Chiroteuthis veranyi	16.10	Clarke and Goodall 1994	5	0	n.a.		no	based on a report of mean size
Chiroteuthis cf. *veranyi*	16.10	Clarke and Goodall 1994	1	0	n.a.		no	based on a report of mean size
Chiroteuthis sp.	25.00	Wood and Day 1998	7	4	10.40	41.59	no	
Planctoteuthis sp. = *Valbyteuthis* sp.	8.00	Wood and Day 1998	1	0	n.a.		no	
Valbyteuthis sp. (see *Planctoteuthis* sp.)							no	
Chtenopterygidae								
Chtenopteryx sicula	9.00	Wood and Day 1998	2	1	3.47	38.56	no	
Chtenopteryx sp.	9.00	Wood and Day 1998	1	0	n.a.		no	
Cranchiidae								
Galiteuthis armata	27.30	Clarke and Goodall 1994	5	2	23.45	85.90	no	
Galiteuthis glacialis	50.00	Wood and Day 1998	3	2	19.39	38.77	no	
Helicocranchia sp. ?	25.80	Clarke et al. 1993	1	0	n.a.		no	based on a report of mean size
Leachia dislocata	24.81	Robertson and Chivers 1997	2	1	12.79	51.55	no	
Liguriella sp.	24.00	Wood and Day 1998	1	0	n.a.		no	
Liocranchia reinhardti	25.80	Clarke et al. 1993	3	1	12.54	48.60	no	based on a report of mean size
Liocranchia sp.	36.01	Sekiguchi et al. 1993	2	1	25.40	70.54	no	based on a report of mean size
Megalocranchia fisheri	180.00	Young and Mangold 1996a	1	1	96.00	53.33	no	
Megalocranchia fisheri A	180.00	Young and Mangold 1996a	1	1	20.80	11.56	no	
Megalocranchia sp. A	180.00	Young and Mangold 1996a	1	1	50.50	28.06	no	
Megalocranchia sp. B	180.00	Young and Mangold 1996a	1	1	23.20	12.89	no	
Megalocranchia sp. G	180.00	Young and Mangold 1996a	1	1	81.70	45.39	no	
Megalocranchia sp.	180.00	Young and Mangold 1996a	3	2	15.28	8.49	no	
Mesonychoteuthis hamiltoni	250.00	Wood and Day 1998	5	2	82.99	33.20	potential	
Taonius borealis	66.00	Young and Mangold 1996b	2	2	28.65	43.40	no	
Taonius megalops	66.00	Young and Mangold 1996b	1	0	n.a.		no	maximum for genus
Taonius pavo	49.02	Wang et al. 2002	10	8	32.34	65.98	no	
Taonius sp.	66.00	Young and Mangold 1996b	1	1	27.34	41.42	no	
Teuthowenia maculata	37.10	Clarke et al. 1993	1	1	29.90	80.59	no	
Teuthowenia megalops	40.00	Wood and Day 1998	4	3	25.33	63.32	no	
Teuthowenia pellucida	22.22	Sekiguchi et al. 1996	4	1	18.12	81.55	no	based on a report of mean size
Teuthowenia sp.	40.00	Wood and Day 1998	3	0	n.a.		no	
Cycloteuthidae								
Cycloteuthis akimushkini	50.50	Clarke and Young 1998	2	2	37.95	75.15	no	
Cycloteuthis sp.	50.50	Clarke and Young 1998	2	0	n.a.		no	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type Family Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Discoteuthis discus	10.33	Sekiguchi et al. 1993	2	1	10.33	100.00	no	based on a report of mean size
Discoteuthis laciniosa	16.10	Clarke and Young 1998	3	1	13.20	81.99	no	based on a report of mean size
Discoteuthis cf. *laciniosa*	16.10	Clarke and Young 1998	1	1	7.50	46.58	no	based on a report of mean size
Discoteuthis sp.	19.31	Wang et al. 2002	2	0	n.a.		no	
Enoploteuthidae								
Abralia redfieldi	7.00	Wood and Day 1998	1	1	2.90	41.43	no	
Abralia sp.	7.00	Wood and Day 1998	1	0	n.a.		no	
Abraliopsis affinis	4.54	Robertson and Chivers 1997	1	1	3.00	66.08	no	
Abraliopsis cf. *lineata*	6.70	Dolar et al. 2003	2	2	4.46	66.49	no	
Abraliopsis sp. A	7.00	Wood and Day 1998	1	1	4.40	62.86	no	
Abraliopsis sp. B	7.00	Wood and Day 1998	1	1	3.20	45.71	no	
Abraliopsis sp. C	7.00	Wood and Day 1998	1	1	3.40	48.57	no	
Abraliopsis sp. D	7.00	Wood and Day 1998	1	1	5.30	75.71	no	
Enoploteuthis cf. *anaspis*	7.00	Tsuchiya 2000	1	1	7.70	110.00	no	
Enoploteuthis chunii	10.75	Mori et al. 2001	4	3	7.14	66.42	no	
Enoploteuthis sp. A	18.00	Clarke and Goodall 1994	1	1	9.50	52.78	no	
Enoploteuthis sp.	18.00	Clarke and Goodall 1994	1	0	n.a.		no	
Watasenia scintillans	7.00	Wood and Day 1998	4	4	4.07	58.14	yes	
Enoploteuthidae	n.a.		1	0	n.a.		no	
Gonatidae								
Berryteuthis anonychus	31.99	Mori et al. 2001	1	0	n.a.		indet.	
Berryteuthis magister	33.43	Walker et al. 2002	8	8	11.79	35.27	yes	
Gonatopsis borealis/Berryteuthis magister	33.43	Walker et al. 2002	2	2	9.47	28.33	yes	
Gonatopsis borealis	31.02	Walker et al. 2002	5	4	16.27	52.44	potential	
Gonatopsis makko	28.91	Ohizumi et al. 2000	1	1	9.96	34.46	no	
Gonatopsis octopedatus	24.00	Wood and Day 1998	1	1	9.11	37.94	no	
Gonatus antarcticus	35.00	Wood and Day 1998	9	5	19.96	57.02	no	
Gonatus berryi	28.50	Clarke and Young 1998	3	1	13.99	49.09	no	
Gonatus fabricii	40.25	Finley and Gibb 1982	2	2	21.90	54.41	potential	
Gonatus cf. *fabricii*	40.25	Finley and Gibb 1982	2	2	22.16	55.06	potential	
Gonatus madokai	33.00	Wood and Day 1998	1	1	10.12	30.66	yes	
Gonatus madokai/G. middendorffi	33.00	Wood and Day 1998	1	1	6.67	20.21	yes	
Gonatus onyx	18.00	Wood and Day 1998	2	1	8.59	47.70	no	
Gonatus steenstrupi	18.20	Clarke et al. 1993	1	1	14.90	81.87	potential	
Gonatus sp.	35.00	Wood and Day 1998	1	1	8.24	23.55	yes	
Gonatidae	n.a.		4	0	n.a.		yes	
Histioteuthidae								
Histioteuthis arcturi	20.00	Wood and Day 1998	1	1	11.10	55.50	no	
Histioteuthis bonnellii bonnellii	33.00	Wood and Day 1998	1	1	17.50	53.03	potential	
Histioteuthis bonnellii corpuscula	33.00	Wood and Day 1998	2	1	5.90	17.88	potential	
Histioteuthis cf. *celetaria*	26.00	Wood and Day 1998	1	1	9.10	35.00	no	
Histioteuthis eltaninae	10.00	Wood and Day 1998	4	4	5.36	53.63	no	
Histioteuthis hoylei	20.00	Wood and Day 1998	2	1	11.60	58.00	no	
Histioteuthis macrohista	8.41	Kirkman et al. 2000	3	1	6.30	74.91	no	
Histioteuthis meleagroteuthis	11.40	Young and Veccione 2000	4	2	6.80	59.61	no	size at maturity for females
Histioteuthis miranda	27.00	Wood and Day 1998	5	3	11.58	42.87	potential	
Histioteuthis cf. *miranda*	27.00	Wood and Day 1998	1	1	15.00	55.56	no	
Histioteuthis reversa	19.00	Wood and Day 1998	2	1	5.20	27.37	no	
Histioteuthis sp. A	33.00	Wood and Day 1998	1	1	3.10	9.39	potential	
Histioteuthis sp. B	33.00	Wood and Day 1998	1	1	4.70	14.24	potential	
Histioteuthis sp.	33.00	Wood and Day 1998	6	3	5.61	17.00	potential	
Histioteuthis spp.	33.00	Wood and Day 1998	3	2	6.55	19.85	potential	
Lepidoteuthidae								
Lepidoteuthis grimaldii	102.40	Clarke et al. 1993	1	1	57.90	56.54	no	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type Family Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Pholidoteuthidae								
Pholidoteuthis boschmai	63.00	Best 1999	8	5	27.29	43.32	potential	
Pholidoteuthis cf. *boschmai*	63.00	Best 1999	1	0	n.a.		potential	
Lycoteuthidae								
Lycoteuthis diadema (See *Lycoteuthis lorigera*)							no	
Lycoteuthis lorigera	18.00	Wood and Day 1998	8	2	9.95	55.28	no	
Mastigoteuthidae								
Idioteuthis famelica = Mastigoteuthis famelica	14.20	Clarke and Young 1998	1	1	14.20	100.00	no	based on a report of mean size
Idioteuthis hjorti = Mastigoteuthis hjorti	14.62	Wang et al. 2002	1	1	11.00	75.24	no	
Mastigoteuthis dentata	14.00	Wood and Day 1998	1	1	6.91	49.36	no	
Mastigoteuthis famelica (see *Idioteuthis famelica*)							no	
Mastigoteuthis hjorti (see *Idioteuthis hjorti*)							no	
Mastigoteuthis psychrophila	14.30	Wood and Day 1998	1	0	n.a.		no	
Mastigoteuthis sp. A	47.00	Wood and Day 1998	3	1	15.50	32.98	no	
Mastigoteuthis sp. B	47.00	Wood and Day 1998	1	0	n.a.		no	
Mastigoteuthis sp.	47.00	Wood and Day 1998	4	3	10.24	21.79	no	
Neoteuthidae								
Alluroteuthis antarctica	40.13	Sekiguchi et al. 1993	7	6	20.86	51.99	no	based on a report of mean size
Octopoteuthidae								
Octopoteuthis deletron	20.00	Wood and Day 1998	1	0	n.a.		no	
Octopoteuthis cf. *deletron*	20.00	Wood and Day 1998	1	0	n.a.		no	
Octopoteuthis cf. *neilseni*	20.00	Wood and Day 1998	1	0	n.a.		no	
Octopoteuthis rugosa	54.00	Best 1999	6	4	14.77	27.35	no	
Octopoteuthis sp. G	54.00	Best 1999	1	1	32.50	60.19	no	
Octopoteuthis sp.	54.00	Best 1999	8	0	n.a.		no	
Octopoteuthis spp.	54.00	Best 1999	2	0	n.a.		no	
Taningia danae	158.70	Clarke et al. 1993	4	3	45.67	28.78	potential	
Ommastrephidae								
Dosidicus gigas	150.00	Wood and Day 1998	3	3	39.61	26.41	yes	
Eucleoteuthis luminosa	24.55	Wang et al. 2002	5	3	12.46	50.75	no	
Hyaloteuthis pelagica	11.79	Robertson and Chivers 1997	1	1	7.53	63.87	no	
Illex argentinus	35.90	dos Santos and Haimovici 2001	11	6	15.82	44.06	yes	
Illex illecebrosus	31.00	Wood and Day 1998	3	3	18.40	59.35	yes	
Martialia hyadesi	42.60	Rodhouse et al. 1992	5	4	25.47	59.78	potential	
Nototodarus gouldi	41.50	Gales et al. 1993	1	1	23.90	57.59	yes	
Nototodarus hawaiiensis	16.00	Wood and Day 1998	1	0	n.a.		potential	
Nototodarus sloanii	43.00	Fea et al. 1999	1	0	n.a.		potential	
Ommastrephes bartramii	75.10	Clarke et al. 1993	11	6	23.65	31.49	yes	
Ornithoteuthis antillarum	20.00	Wood and Day 1998	4	1	5.70	28.50	potential	
Ornithoteuthis volatilis	31.00	Wood and Day 1998	2	1	20.12	64.90	potential	
Sthenoteuthis oualaniensis	35.00	Wood and Day 1998	4	3	16.71	47.74	no	
Todarodes angolensis	35.00	Wood and Day 1998	1	1	14.60	41.71	no	
Todarodes pacificus	50.00	Wood and Day 1998	2	1	7.37	14.74	yes	
Todarodes sagittatus	75.00	Wood and Day 1998	4	3	28.47	37.96	yes	
Todaropsis eblanae	27.00	Wood and Day 1998	2	1	8.30	30.74	yes	
Ommastrephidae	n.a.		1	0	n.a.		n.a.	
Onychoteuthidae								
Kondakovia longimana	80.00	Nemoto et al. 1985, 1987	7	4	40.05	50.06	no	
Moroteuthis ingens	94.00	Wood and Day 1998	4	2	44.20	47.02	potential	
Moroteuthis knipovitchi	35.00	Wood and Day 1998	10	4	21.88	62.50	potential	
Moroteuthis loennbergi	30.00	Wood and Day 1998	3	1	17.58	58.60	potential	
Moroteuthis robsoni	75.00	Wood and Day 1998	4	3	29.16	38.88	potential	
Moroteuthis sp.	94.00	Wood and Day 1998	1	1	22.42	23.85	potential	
Onychoteuthis banksii	30.00	Wood and Day 1998	6	2	9.40	31.33	minor	
Onychoteuthis borealijaponica	44.00	Clarke et al. 1993	3	2	23.67	53.80	potential	
Onychoteuthis sp. 1	44.00	Clarke et al. 1993	1	1	8.10	18.41	potential	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Onychoteuthis sp. 2	44.00	Clarke et al. 1993	1	1	20.30	46.14	potential	
Onychoteuthis sp.	44.00	Clarke et al. 1993	2	1	29.26	66.50	n.a.	
Onychoteuthidae	n.a.		1	0	n.a.		n.a.	
Psychroteuthidae								
Psychroteuthis glacialis	44.00	Wood and Day 1998	7	4	13.02	29.59	potential	
Pyroteuthidae								
Pterygioteuthis giardi	4.00	Wood and Day 1998	1	1	2.18	54.50	no	
Pyroteuthis addolux	4.50	Clarke and Young 1998	1	0	n.a.		no	
Argonautidae								
Argonauta nodosa	13.10	dos Santos and Haimovici 2001	6	1	2.40	18.32	minor	
Octopodidae								
Bathypolypus arcticus	10.00	Wood and Day 1998	1	0	n.a.		no	
Eledone gaucha	6.50	Wood and Day 1998	1	0	n.a.		no	
Octopus australis	15.50	Gales et al. 1993	1	1	10.10	65.16	no	
Octopus maorum	30.00	Wood and Day 1998	2	1	15.30	51.00	no	
Octopus pallidus	15.00	Wood and Day 1998	1	0	n.a.		no	
Octopus superciliosus	5.02	Gales et al. 1993	1	0	n.a.		no	
Octopus tehuelchus	20.00	Wood and Day 1998	1	0	n.a.		yes	
Octopus vulgaris	25.00	Wood and Day 1998	1	0	n.a.		yes	
Octopus sp.	n.a.		1	1	7.42		yes	
Pareledone charcoti	7.00	Wood and Day 1998	1	0	n.a.		no	
Pareledone cf. *charcoti*	7.00	Wood and Day 1998	1	0	n.a.		no	
Pareledone cf. *turqueti*	15.00	Wood and Day 1998	1	0	n.a.		no	
Pareledone polymorpha	10.00	Wood and Day 1998	1	0	n.a.		no	
Pareledone cf. *polymorpha*	10.00	Wood and Day 1998	1	0	n.a.		no	
Octopodidae	n.a.		1	0	n.a.		yes	
Vampyroteuthidae								
Vampyroteuthis infernalis	13.00	Wood and Day 1998	2	0	n.a.		no	
Bony and cartilaginous fishes			**645**	**421**	**18.46**			
Myxinidae								
Myxine glutinosa	80.00	Froese and Pauly 2003	1	0	n.a.		no	
Squalidae								
Squalus acanthias	160.00	Froese and Pauly 2003	1	0	n.a.		yes	
Rajidae								
Raja sp.	n.a.		1	1	68.00		minor	
Raja spp.	93.00	Lalas 1997	1	0	n.a.		minor	
Anguillidae								
Anguilla anguilla	133.00	Froese and Pauly 2003	1	0	n.a.		yes	
Clupeidae								
Alosa pseudoharengus	40.00	Froese and Pauly 2003	2	1	22.60	56.50	yes	
Clupea harengus	45.00	Froese and Pauly 2003	11	10	27.49	61.09	yes	
Clupea harengus pallasi	46.00	Froese and Pauly 2003	4	2	16.48	35.83	yes	
Etrumeus whiteheadi	23.60	Sekiguchi et al. 1992	4	3	14.70	62.29	yes	
Sardinops ocellatus see *S. sagax*							yes	
Sardinops sagax = *S. ocellatus*	39.50	Froese and Pauly 2003	14	11	16.72	42.33	yes	
Sprattus sprattus	16.00	Froese and Pauly 2003	1	1	14.00	87.50	yes	
Engraulidae								
Anchoa sp.	50.00	Froese and Pauly 2003	1	1	7.34	14.68	yes	
Engraulis encrasicolus = *capensis*	20.00	Froese and Pauly 2003	10	5	10.46	52.30	yes	
Engraulis japonicus	17.16	Ohizumi et al. 2000	2	2	11.75	68.46	yes	
Engraulis mordax	24.80	Froese and Pauly 2003	5	3	10.80	43.55	yes	
Microstomatidae								
Nansenia candida	22.20	Froese and Pauly 2003	1	0	n.a.		no	
Bathylagidae								
Bathylagidae	25.00	Froese and Pauly 2003	3	2	10.60	42.40	no	basin-wide maximum for family
Osmeridae								

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Mallotus villosus	20.00	Froese and Pauly 2003	8	5	14.64	73.20	yes	
Osmerus eperlanus	45.00	Froese and Pauly 2003	1	1	10.20	22.67	yes	
Osmerus mordax	35.60	Froese and Pauly 2003	2	0	n.a.		yes	
Thaleichthys pacificus	30.00	Froese and Pauly 2003	4	1	15.80	52.67	yes	
Salmonidae								
Oncorhynchus gorbuscha	76.00	Froese and Pauly 2003	1	0	n.a.		yes	
Oncorhynchus kisutch	108.00	Froese and Pauly 2003	1	0	n.a.		yes	
Oncorhynchus tshawytscha	150.00	Froese and Pauly 2003	1	0	n.a.		yes	
Salmo salar	150.00	Froese and Pauly 2003	2	0	n.a.		yes	
Salmonidae	150.00	Froese and Pauly 2003	1	0	n.a.		yes	basin-wide maximum for genus
Gonostomatidae								
Gonostoma cf. *elongatum*	27.50	Froese and Pauly 2003	1	0	n.a.		no	
Sternoptychidae								
Argyropelecus affinis	8.40	Froese and Pauly 2003	1	0	n.a.		no	
Maurolicus muelleri	8.00	Froese and Pauly 2003	4	3	3.56	44.45	minor	
Maurolicus cf. *muelleri*	8.00	Froese and Pauly 2003	1	0	n.a.		minor	
Maurolicus weitzmani	5.50	Gannon et al. 1998	1	1	5.00	90.91	no	
Phosichthyidae								
Ichthyococcus cf. *irregularis*	7.60	Froese and Pauly 2003	1	0	n.a.		no	
Stomiidae								
Chauliodus cf. *barbatus*	35.00	Froese and Pauly 2003	1	1	18.00	51.43	no	basin-wide maximum for genus
Scopelarchidae								
Rosenblattichthys cf. *volucris*	14.00	Robison and Craddock 1983	1	0	n.a.		no	
Scopelarchus guentheri	16.00	Robison and Craddock 1983	1	0	n.a.		no	
Notosudidae								
Scopelosaurus harryi	22.00	Froese and Pauly 2003	1	1	15.34	69.74	no	
Paralepididae								
Arctozenus risso = *Notolepis risso*	30.00	Froese and Pauly 2003	1	0	n.a.		no	
Notolepis coatsi	38.00	Froese and Pauly 2003	1	1	27.18	71.51	no	
Notolepis risso (see *Arctozenus risso*)							no	
Paralepididae	n.a.		2	0	n.a.		no	
Evermannellidae								
Evermanella cf. *ahlstromi*	16.90	Froese and Pauly 2003	1	0	n.a.		no	
Myctophidae								
Ceratoscopelus warmingii	8.10	Froese and Pauly 2003	3	3	5.59	69.01	no	
Diaphus schmidti	5.30	Wang et al. 2003	1	1	4.20	79.25	no	
Diaphus watasei	17.00	Froese and Pauly 2003	1	1	12.64	74.35	no	
Electrona antarctica	13.26	Kirkman et al. 2000	13	12	7.83	59.05	no	
Electrona carlsbergi	10.10	Casaux et al. 1998	7	7	7.44	73.70	minor	
Electrona subaspera	12.75	Green et al. 1997	13	10	8.04	63.07	no	
Electrona sp.	13.26	Kirkman et al. 2000	1	0	n.a.		no	basin-wide maximum for genus
Gymnoscopelus bolini	28.00	Froese and Pauly 2003	4	3	13.60	48.57	minor	
Gymnoscopelus braueri	13.20	Froese and Pauly 2003	6	1	10.63	80.53	minor	
Gymnoscopelus fraseri	13.90	Klages and Bester 1998	4	4	8.03	57.76	minor	
Gymnoscopelus microlampas	11.70	Froese and Pauly 2003	2	0	n.a.		no	
Gymnoscopelus nicholsi	18.90	Casaux et al. 1998	15	15	12.06	63.81	minor	
Gymnoscopelus piabilis	16.00	Klages and Bester 1998	5	4	9.51	59.43	no	
Krefftichthys anderssoni	8.70	Casaux et al. 1998	9	3	3.81	43.79	no	
Lampadena luminosa	20.00	Froese and Pauly 2003	3	2	9.22	46.10	no	
Lampadena sp.	20.00	Froese and Pauly 2003	1	0	n.a.		no	
Lampanyctodes hectoris	7.00	Froese and Pauly 2003	4	3	5.15	73.62	yes	
Lampanyctus cf. *idostigma*	9.60	Froese and Pauly 2003	1	0	n.a.		no	
Lampanyctus cf. *nobilis*	12.40	Froese and Pauly 2003	1	0	n.a.		no	
Lampichthys procerus	9.50	Froese and Pauly 2003	1	0	n.a.		no	
Metelectrona ventralis	12.20	Cherel et al. 1997	4	4	6.82	55.90	no	
Myctophum asperum	8.42	Wang et al. 2003	1	1	7.60	90.26	no	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Myctophum nitidulum	8.30	Froese and Pauly 2003	3	2	5.68	68.43	no	
Protomyctophum andriashevi	6.00	Froese and Pauly 2003	1	0	n.a.		no	
Protomyctophum bolini	9.70	Cherel et al. 1997	5	3	4.46	46.03	no	
Protomyctophum choriodon	13.70	Klages and Bester 1998	8	7	8.33	60.80	no	
Protomyctophum tenisoni	7.90	Klages and Bester 1998	4	3	4.45	56.36	no	
Symbolophorus evermanni	8.00	Froese and Pauly 2003	2	2	6.48	81.00	no	
Symbolophorus sp.	16.00	Froese and Pauly 2003	1	0	n.a.		no	
Symbolophorus spp.	14.00	Froese and Pauly 2003	1	1	6.66	47.57	no	
Mycotophidae	n.a.		1	1	6.54		n.a.	
Muraenolepididae								
Muraenolepis microps	39.10	North 1996	1	0	n.a.		no	
Coryphaenoididae								
see Macrouridae							n.a.	
Macrouridae								
Albatrossia pectoralis	150.00	Froese and Pauly 2003	2	0	n.a.		yes	
Coryphaenoides acrolepis	87.00	Froese and Pauly 2003	2	2	47.69	54.82	yes	
Coryphaenoides cinereus	56.00	Froese and Pauly 2003	4	2	23.63	42.20	minor	
Coryphaenoides longifilis	100.00	Ohizumi et al. 2003	1	1	75.70	75.70	minor	
Nezumia bairdi	40.00	Froese and Pauly 2003	1	0	n.a.		minor	
Macrouridae = Coryphaenoididae	n.a.		2	1	26.10		no	
Moridae								
Antimora microlepis	83.80	Walker et al. 2002	1	1	46.94	56.01	yes	
Auchenoceros punctatus	15.00	Fea et al. 1999	2	1	10.00	66.67	potential	
Laemonema longipes	71.26	Walker et al. 2002	4	4	35.17	49.35	yes	
Pseudophycis bachus	90.00	Froese and Pauly 2003	1	1	19.80	22.00	yes	
Pseudopycis sp.	90.00	Froese and Pauly 2003	1	1	36.00	40.00	yes	
Melanonidae								
Melanonus sp.	26.60	Froese and Pauly 2003	1	0	n.a.		no	
Gadidae								
Arctogadus glacialis	40.00	Heide-Jorgensen et al. 1994	3	3	19.90	49.75	yes	
Boreogadus saida	40.00	Froese and Pauly 2003	10	9	13.39	33.48	yes	
Eleginus gracilis	55.00	Froese and Pauly 2003	2	2	14.34	26.07	yes	
Gadus morhua	200.00	Froese and Pauly 2003	24	19	26.15	13.08	yes	
Gadus ogac	77.00	Froese and Pauly 2003	1	0	n.a.		yes	
Melanagrammus aeglefinus	100.00	Froese and Pauly 2003	5	0	n.a.		yes	
Merlangius merlangus	70.00	Froese and Pauly 2003	4	4	18.05	25.79	yes	
Microgadus proximus	30.50	Froese and Pauly 2003	1	0	n.a.		minor	
Micromesistius poutassou	50.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pollachius pollachius	130.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pollachius virens	130.00	Froese and Pauly 2003	9	7	25.54	19.65	yes	
Theragra chalcogramma	91.00	Froese and Pauly 2003	36	26	24.10	26.48	yes	
Trisopterus esmarkii	35.00	Froese and Pauly 2003	1	1	12.40	35.43	yes	
Trisopterus minutus	40.00	Froese and Pauly 2003	1	1	14.70	36.75	yes	
Lotidae								
Enchelyopus cimbrius	41.00	Froese and Pauly 2003	2	1	23.60	57.56	minor	
Molva molva	200.00	Froese and Pauly 2003	4	4	31.68	15.84	yes	
Phycidae								
Urophycis tenuis	133.00	Froese and Pauly 2003	2	1	22.20	16.69	yes	
Urophycis spp.	133.00	Froese and Pauly 2003	1	1	15.90	11.95	yes	
Merlucciidae								
Macruronus magellanicus	115.00	Froese and Pauly 2003	1	1	47.50	41.30	yes	
Merluccius albidus	70.00	Froese and Pauly 2003	1	1	29.60	42.29	yes	
Merluccius bilinearis	76.00	Froese and Pauly 2003	6	4	21.14	27.82	yes	
Merluccius capensis	140.00	Froese and Pauly 2003	1	1	28.19	20.14	yes	
Merluccius hubbsi	95.00	Froese and Pauly 2003	4	4	21.43	22.55	yes	
Merluccius merluccius	140.00	Froese and Pauly 2003	1	0	n.a.		yes	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Merluccius productus	91.00	Froese and Pauly 2003	7	4	25.30	27.80	yes	
Merluccius spp.	140.00	Froese and Pauly 2003	12	10	20.84	14.89	yes	
Ophidiidae								
Genypterus blacodes	200.00	Froese and Pauly 2003	1	0	n.a.		yes	
Genypterus capensis	180.00	Froese and Pauly 2003	2	1	45.90	25.50	yes	
Batrachoididae								
Porichthys notatus	39.00	Torok 1994	1	1	21.80	55.90	potential	
Gobiesocidae								
Chorisochismus dentex	30.00	Froese and Pauly 2003	1	0	n.a.		no	
Scomberesocidae								
Cololabis saira	40.00	Froese and Pauly 2003	1	0	n.a.		yes	
Scomberesox saurus	50.00	Froese and Pauly 2003	1	1	24.20	48.40	minor	
Hemiramphidae								
Oxyporamphus micropterus	18.50	Froese and Pauly 2003	1	1	14.34	77.51	no	
Exocoetidae								
Exocoetus monocirrhus	20.00	Froese and Pauly 2003	1	1	16.47	82.35	minor	
Exocoetus volitans	30.00	Froese and Pauly 2003	1	1	15.87	52.90	no	
Melamphaidae								
Melamphaes sp.	9.00	Crawford 1981	1	0	n.a.		no	
Scopelogadus mizolepis bispinosus	11.00	Froese and Pauly 2003	1	0	n.a.		no	
Diretmidae								
Diretmus argenteus	28.50	Robison and Craddock 1983	1	0	n.a.		potential	
Gasterosteidae								
Pungitius pungitius	9.00	Froese and Pauly 2003	1	0	n.a.		minor	
Sebastidae								
Helicolenus dactylopterus	47.00	Froese and Pauly 2003	3	2	21.60	45.96	yes	
Sebastes marinus	120.00	Weslawski et al. 1994	1	1	45.00	37.50	yes	
Sebastes sp.	100.00	Froese and Pauly 2003	4	3	20.30	20.30	yes	maximum for genus in W. Atlantic
Sebastes spp.	111.00	Froese and Pauly 2003	4	3	9.98	9.00	yes	maximum for genus in NE Pacific
Triglidae								
Chelidonichthys capensis	75.00	Froese and Pauly 2003	1	1	15.00	20.00	yes	
Anoplopomatidae								
Anoplopoma fimbria	120.00	Froese and Pauly 2003	1	0	n.a.		yes	
Hexagrammidae								
Pleurogrammus azonus	60.00	Froese and Pauly 2003	1	1	21.60	36.00	yes	
Pleurogrammus monopterygius	50.00	Froese and Pauly 2003	3	1	32.30		yes	
Cottidae								
Leptocottus armatus	46.00	Froese and Pauly 2003	2	2	12.52	27.21	minor	
Myoxocephalus scorpius	90.00	Froese and Pauly 2003	3	1	11.14	12.38	no	
Cottidae	n.a.		2	1	10.00		no	
Cyclopteridae								
Cyclopterus lumpus	60.00	Froese and Pauly 2003	2	2	20.20	33.67	yes	
Carangidae								
Decapterus macrosoma	35.00	Froese and Pauly 2003	1	1	20.06	57.31	yes	
Trachurus capensis	60.00	Froese and Pauly 2003	9	7	16.04	26.73	yes	
Trachurus declivis	64.00	Froese and Pauly 2003	2	2	26.10	40.78	yes	
Trachurus symmetricus	81.00	Froese and Pauly 2003	1	1	13.10	16.17	yes	
Trachurus sp.	90.00	Fea et al. 1999	4	2	34.00	37.78	yes	
Emmelichthyidae								
Emmelichthys nitidus	50.00	Froese and Pauly 2003	2	2	16.50	33.00	minor	
Gerreidae								
Eucinostomus argenteus	20.00	Froese and Pauly 2003	1	0	n.a.		minor	
Haemulidae								
Orthopristis ruber	40.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pomadasys corvinaeformis	25.00	Froese and Pauly 2003	1	0	n.a.		minor	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type Family Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Sparidae								
Argyrozona argyrozona	90.00	Froese and Pauly 2003	2	0	n.a.		minor	
Cheimerius nufar	75.00	Froese and Pauly 2003	1	0	n.a.		minor	
Pagellus natalensis	30.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pagrus africanus	75.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pterogymnus laniarius	45.00	Froese and Pauly 2003	2	2	24.18	53.73	yes	
Sciaenidae								
Argyrosomus hololepidotus	200.00	Froese and Pauly 2003	1	0	n.a.		yes	
Cynoscion jamaicensis	50.00	Froese and Pauly 2003	1	0	n.a.		yes	
Cynoscion leiarchus	90.80	Froese and Pauly 2003	1	0	n.a.		yes	
Genyonemus lineatus	29.00	Froese and Pauly 2003	1	1	22.20	76.55	yes	
Isopisthus parvipinnis	25.00	Froese and Pauly 2003	1	1	13.98	55.92	minor	
Larimus breviceps	31.00	Froese and Pauly 2003	1	0	n.a.		yes	
Macrodon ancylodon	45.00	Froese and Pauly 2003	1	0	n.a.		minor	
Micropogonias furnieri	60.00	Froese and Pauly 2003	1	1	16.23	27.05	yes	
Paralonchurus brasiliensis	30.00	Froese and Pauly 2003	1	1	14.93	49.77	minor	
Stellifer brasiliensis	15.54	de Oliveira Santos et al. 2002	1	1	10.61	68.28	minor	
Stellifer rastrifer	20.00	Froese and Pauly 2003	1	1	6.19	30.95	minor	
Mugilidae								
Mugil cephalus	120.00	Froese and Pauly 2003	1	1	13.80	11.50	yes	
Mugil spp.	120.00	Froese and Pauly 2003	1	0	n.a.		yes	basin-wide maximum for genus
Embiotocidae								
Cymatogaster aggregata	20.30	Froese and Pauly 2003	1	1	8.50	41.87	minor	
Labridae								
Notolabrus sp.	50.00	Froese and Pauly 2003	1	1	23.00	46.00	no	basin-wide maximum for genus
Tautogolabrus adspersus	38.00	Froese and Pauly 2003	1	0	n.a.		yes	
Odacidae								
Odax pullus	49.00	Lalas 1997	1	1	31.00	63.27	minor	
Zoarcidae								
Lycodes sp.	75.00	Froese and Pauly 2003	1	0	n.a.		no	basin-wide maximum for genus
Lycodopsis pacifica	46.00	Froese and Pauly 2003	2	2	9.97	21.66	yes	
Zoarces americanus	110.00	Froese and Pauly 2003	1	1	53.30	48.45	yes	
Anarhichadidae								
Anarhichas lupus	150.00	Froese and Pauly 2003	2	0	n.a.		yes	
Anarrhichthys ocellatus	240.00	Froese and Pauly 2003	1	0	n.a.		minor	
Nototheniidae								
Dissostichus eleginoides	215.00	Froese and Pauly 2003	2	0	n.a.		yes	
Gobionotothen acuta	35.00	Froese and Pauly 2003	1	0	n.a.		no	
Gobionotothen gibberifrons	59.00	Reid 1995	4	3	38.97	66.05	minor	
Gobionotothen marionensis	20.00	Froese and Pauly 2003	1	0	n.a.		no	
Lepidonotothen larseni	28.00	Reid 1995	6	6	16.76	59.86	no	
Lepidonotothen squamifrons = *Notothenia squamifrons*	55.00	Froese and Pauly 2003	2	1	11.40	20.73	minor	
Notothenia squamifrons (see *Lepidonotothen squamifrons*)							minor	
Paranotothenia magellanica	38.00	Froese and Pauly 2003	2	0	n.a.		yes	
Pleuragramma antarcticum	25.91	Burns et al. 1998	14	11	14.40	55.58	minor	
Trematomus eulepidotus	34.00	Froese and Pauly 2003	1	0	n.a.		yes	
Trematomus lepidorhinus	31.00	Froese and Pauly 2003	1	0	n.a.		no	
Trematomus nicolai	36.00	Froese and Pauly 2003	1	0	n.a.		no	
Trematomus spp.	41.00	Froese and Pauly 2003	1	0	n.a.		yes	basin-wide maximum for genus
Artedidraconidae								
Artedidraco loennbergi	11.00	Froese and Pauly 2003	1	0	n.a.		no	
Dolloidraco longedorsalis	13.70	Froese and Pauly 2003	1	0	n.a.		no	
Histiodraco velifer	19.20	Froese and Pauly 2003	1	0	n.a.		no	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type Family Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Bathydraconidae								
Gerlachea australis	24.00	Froese and Pauly 2003	1	0	n.a.		no	
Gymnodraco acuticeps	34.00	Froese and Pauly 2003	1	0	n.a.		no	
Racovitzia glacialis	24.00	Froese and Pauly 2003	1	0	n.a.		no	
Channichthyidae								
Chaenocephalus aceratus	72.00	Froese and Pauly 2003	1	0	n.a.		minor	
Champsocephalus gunnari (Heard Island population)	45.00	Gon and Heemstra 1990	6	4	20.90	46.44	minor	
Champsocephalus gunnari (South Georgia population)	66.00	Froese and Pauly 2003	7	6	27.48	41.64	minor	
Channichthys rhinoceratus	60.00	Froese and Pauly 2003	2	1	32.52	54.20	minor	
Chionodraco myersi	38.00	Froese and Pauly 2003	1	0	n.a.		no	
Chionodraco rastrospinosus	52.00	Froese and Pauly 2003	1	0	n.a.		minor	
Cryodraco antarcticus	57.00	Froese and Pauly 2003	2	0	n.a.		minor	
Pagetopsis maculatus	25.00	Froese and Pauly 2003	1	0	n.a.		no	
Pseudochaenichthys georgianus	60.00	Froese and Pauly 2003	1	1	28.80	48.00	minor	
Ammodytidae								
Ammodytes dubius	25.00	Froese and Pauly 2003	1	1	19.10	76.40	potential	
Ammodytes hexapterus	27.00	Froese and Pauly 2003	3	2	10.20	37.78	yes	
Ammodytes personatus	22.21	Froese and Pauly 2003	1	1	19.44	87.53	yes	
Ammodytes sp.	45.00	Hammond et al. 1994b	2	1	18.10	40.22	yes	
Ammodytes spp.	45.00	Hammond et al. 1994b	8	8	15.86	35.24	yes	
Gymnammodytes capensis = Ammodytes capensis	17.00	David 1987	2	2	25.00	147.06	yes	
Ammodytidae	n.a.		2	2	14.74		yes	
Clinidae								
Clinus sp.	30.00	Froese and Pauly 2003	1	0	n.a.		minor	
Callionymidae								
Callionymidae	15.00	Froese and Pauly 2003	1	1	21.50		no	
Gobiidae								
Acanthogobius flavimanus	30.00	Froese and Pauly 2003	1	1	9.20	30.67	no	
Pomatoschistus spp.	11.00	Froese and Pauly 2003	1	1	3.84	34.91	no	
Sufflogobius bibarbatus	17.00	Froese and Pauly 2003	3	3	6.10	35.88	minor	
Gobiidae	n.a.		1	1	4.50		no	
Gempylidae								
Paradiplospinus gracilis	52.00	Froese and Pauly 2003	2	0	n.a.		no	
Thyrsites atun	200.00	Froese and Pauly 2003	4	2	78.50	39.25	yes	
Trichiuridae								
Lepidopus caudatus	210.00	Froese and Pauly 2003	2	0	n.a.		yes	
Trichiurus lepturus	234.00	Froese and Pauly 2003	2	1	55.50	23.72	yes	
Scombridae								
Auxis thazard	65	Froese and Pauly 2003	1	0	n.a.		yes	
Scomber australasicus	33.27	Wang et al. 2003	1	1	2.76	8.29	yes	
Scomber japonicus	64.00	Froese and Pauly 2003	3	2	27.74	43.34	yes	
Scomber scombrus	60.00	Froese and Pauly 2003	7	5	32.96	54.94	yes	
Centrolophidae								
Icichthys australis	81.00	Froese and Pauly 2003	1	1	31.81	39.27	no	
Seriolella brama	76.00	Froese and Pauly 2003	1	1	16.70	21.97	yes	
Nomeidae								
Cubiceps baxteri	100.00	Froese and Pauly 2003	1	0	n.a.		no	
Cubiceps pauciradiatus	20.00	Froese and Pauly 2003	3	2	11.11	55.55	no	
Stromateidae								
Peprilus triacanthus	30.00	Froese and Pauly 2003	1	1	9.70	32.33	yes	
Scophthalmidae								
Scophthalmus aquosus	45.00	Froese and Pauly 2003	1	0	n.a.		yes	
Paralichthyidae								
Citharichthys sordidus	41.00	Froese and Pauly 2003	2	2	10.60	25.85	yes	
Citharichthys stigmaeus	17.00	Froese and Pauly 2003	1	1	6.50	38.24	minor	
Paralichthys orbignyanus	50.00	Froese and Pauly 2003	1	0	n.a.		minor	

Appendix 3: Summary food habits data, sorted phylogenetically by prey species.

Prey Type / Family / Prey Species	Maximum size	Source for maximum size	Total N of cases	N of cases in analysis	Mean of means (cm)	As % of maximum size	Commercial?	Comments
Pleuronectidae								
Glyptocephalus cynoglossus	60.00	Froese and Pauly 2003	1	0	n.a.		yes	
Glyptocephalus zachirus	59.00	Froese and Pauly 2003	1	1	16.50	27.97	yes	
Hippoglossoides platessoides	82.00	Froese and Pauly 2003	4	2	25.41	30.99	yes	
Isopsetta isolepis	55.00	Froese and Pauly 2003	1	1	18.00	32.73	minor	
Limanda ferruginea	64.00	Froese and Pauly 2003	3	2	23.38	36.53	yes	
Limanda limanda	40.00	Froese and Pauly 2003	1	1	8.13	20.33	yes	
Lyopsetta exilis	35.00	Froese and Pauly 2003	1	1	13.50	38.57	yes	
Microstomus pacificus	76.00	Froese and Pauly 2003	1	1	15.00	19.74	yes	
Parophrys vetulus	49.00	Froese and Pauly 2003	2	2	12.10	24.69	yes	
Platichthys flesus	60.00	Froese and Pauly 2003	1	1	16.00	26.67	yes	
Pleuronectes americanus	64.00	Froese and Pauly 2003	1	0	n.a.		yes	
Pleuronectes platessa	100.00	Froese and Pauly 2003	3	3	22.02	22.02	yes	
Psettichthys melanostictus	63.00	Froese and Pauly 2003	1	0	n.a.		yes	
Reinhardtius hippoglossoides	80.00	Froese and Pauly 2003	3	1	35.70	44.63	yes	
Rhombosolea sp.	50.00	Lalas 1997	1	1	35.00	70.00	yes	
Pleuronectidae	n.a.		3	2	17.85		yes	
Soleidae								
Austroglossus pectoralis	60.00	Froese and Pauly 2003	1	1	27.90	46.50	minor	
Solea solea	70.00	Froese and Pauly 2003	1	1	31.83	45.47	yes	
Cynoglossidae								
Cynoglossus zanzibarensis	32.00	Froese and Pauly 2003	1	1	20.20	63.13	yes	
Osteichthys								
mixed fish taxa	n.a.		3	2	9.39		n.a.	size data presented only in aggregate
Overall Total			**1166**	**725**	**18.04**			

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Antarctomysis maxima	L. carcinophagus	2.40			75	2.00	2.50	Green and Williams 1986	Davis Station, Antarctica	1984
Boreomysis sp.	M. monoceros	4.45			n.a.**	3.00	5.00	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
Gammarus setosus	P. hispida	1.30	1.53		35	1.20	2.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Themisto libellula	P. hispida	1.30	1.66		279	1.40	3.40	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Euphausia superba	A. gazella	0.75	5.54		324	3.80	6.60	Reid et al. 1996	South Georgia Island, S Atlantic	1986
Euphausia superba	A. gazella	0.75	4.45		308	3.60	6.20	Croxall et al. 1999	South Georgia Island, S Atlantic	1994
Euphausia superba	A. gazella	0.75	5.54		324	3.80	6.60	Croxall et al. 1999	South Georgia Island, S Atlantic	1986
Euphausia superba	A. gazella	0.55	5.13	0.31	301	3.90	6.10	Croxall and Pilcher 1984	South Georgia Island, S Atlantic	1972-1977
Euphausia superba	A. gazella	0.55	5.14		388	3.50	6.50	Doidge and Croxall 1985	South Georgia Island, S Atlantic	1982-1983
Euphausia superba	A. gazella	0.75	4.67		5587	3.20	6.40	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
Euphausia superba	A. gazella	1.50	4.03		781	2.40	5.60	Reid 1995	South Georgia Island, S Atlantic	1992
Euphausia superba	A. gazella	1.50	4.47		1387	3.60	5.80	Reid 1995	South Georgia Island, S Atlantic	1993
Euphausia superba	A. gazella	0.70	4.26		n.a.**			McCafferty et al. 1998	South Georgia Island, S Atlantic	1994-1996
Euphausia superba	A. gazella	0.75	4.63		n.a.**	3.20	6.10	Reid and Brierly 2001	South Georgia Island, S Atlantic	1994-1999
Euphausia superba	A. gazella	0.80	5.10		241	4.20	5.90	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Euphausia superba	Balaenoptera spp.	23.50	2.66		2745	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1932-1933
Euphausia superba	Balaenoptera spp.	23.50	3.38		3562	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1939-1940
Euphausia superba	Balaenoptera spp.	23.50	3.94		39081	1.10	6.00	Marr 1962	South Georgia Island, S Atlantic	1929-1930
Euphausia superba	Balaenoptera spp.	23.50	5.00		>2000	1.10	6.50	Mackintosh 1974	Southern Ocean	1950s??
Thysanoessa inermis	P. hispida	1.30	1.75		189	1.20	2.60	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Acanthephyra carinata	L. hosei	2.33	3.76	SE 0.35	5	3.00	5.00	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Acanthephyra quadrispinsoa	L. hosei	2.33	1.47	SE 0.06	19	1.00	1.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Acanthephyra quadrispinsoa	S. longirostris	1.70	1.42	SE 0.04	15	1.20	1.80	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Notostomus elegans	L. hosei	2.33	3.74	SE 0.43	5	2.30	4.50	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Chionoectes opilio	E. barbatus	2.25	5.70	1.20	336	3.20	12.30	Antonelis et al. 1994b	Bering Sea	1981
Chorismus antarcticus	L. weddelii	3.00	1.33	0.14	1496	0.71	2.00	Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
Hemipenaeus sp.	S. longirostris	1.70	1.53	SE 0.03	7	1.40	1.60	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Jasus lalandii	A. p. pusillus	0.85	4.18		89	1.00	7.00	David 1987	Benguela, South Africa	1981
Jasus lalandii	A. p. pusillus	0.85	5.20		38	1.00	7.00	David 1987	Benguela, South Africa	1984
Jasus lalandii	A. p. pusillus	0.85	2.50		253	1.00	6.00	David 1987	Benguela, South Africa	1985
Notocrangon antarcticus	L. weddelii	3.00	1.41	0.14	836			Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
Sabinea septemcarinata	P. hispida	1.30	5.02		19	3.60	5.60	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Ovalipes catharus	P. hookeri	2.00	7.00		118	4.00	11.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Pandalus borealis	P. hispida	1.30	7.47		51	4.80	9.20	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Sepia apama	A. p. doriferus	1.70	30.10	5.67	43	21.00	41.30	Gales et al. 1993	Tasmania	1989-1990
Sepia novaehollandiae	A. p. doriferus	1.70	15.50	4.51	23	3.70	20.10	Gales et al. 1993	Tasmania	1989-1990
Sepia officinalis	A. p. pusillus	1.70	16.31		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Sepia sp.	A. p. pusillus	2.05	14.29		76	4.80	21.70	Lipinski and David 1990	Benguela, South Africa	1974-1985
Rossia macrosoma	P. phocoena	1.65	4.40	0.20	2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Semirossia tenera	Delphinus sp.	2.15	1.70		69	1.00	2.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Semirossia tenera	K. sima	2.40	2.00		2	1.80	2.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Semirossia tenera	P. blainvillei	1.50	3.80		2	3.20	4.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Sepietta oweniana	P. phocoena	1.65	2.60		9			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Loligo bleekeri	C. ursinus	1.12	12.45		8	6.93	17.97	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Loligo gahi	C. commersonii	1.48	7.60		n.a.**	2.00	18.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Loligo gahi	G. melas	4.06	12.80		34			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Loligo gahi	L. obscurus	2.05	7.50		n.a.**	2.00	23.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Loligo gahi	O. flavescens	1.85	9.70		n.a.**	4.00	23.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Loligo opalescens	C. ursinus	1.40			43	7.00	15.00	Perez and Bigg 1986	N Pacific	1958-1974
Loligo opalescens	G. macrorhynchus	4.40	13.80		11	11.00	17.09	Sinclair 1992	S California Bight, NE Pacific	1977
Loligo opalescens	G. macrorhynchus	4.63	12.80		11	11.20	14.20	Seagars and Henderson 1985	Channel Islands, NE Pacific	1980
Loligo opalescens	G. macrorhynchus	5.52	16.20		609	8.70	23.20	Sinclair 1992	S California Bight, NE Pacific	1969-1977
Loligo opalescens	L. obliquidens	2.05				4.70	17.60	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Loligo opalescens	M. angustirostris	1.69	11.84		90	6.17	20.51	Sinclair 1994	S California Bight, NE Pacific	1969-1983
Loligo opalescens	P. phocoena	1.65				5.60	13.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Loligo opalescens	P. phocoena	1.65	8.14		1673	5.80	12.50	Walker et al. 1998	Washington and British Columbia	1990-1997
Loligo opalescens	P. dalli	1.95				4.70	17.40	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Loligo opalescens	P. dalli	1.95	9.52		44	6.90	12.70	Walker et al. 1998	Washington and British Columbia	1990-1997
Loligo opalescens	Z. californianus	2.00	12.89		300	7.50	22.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Loligo opalescens	Z. californianus	2.00				9.50	17.50	Morejohn et al. 1978	Monterey Bay, NE Pacific	??
Loligo opalescens	Z. californianus	2.00	12.70	1.70	76	6.20	18.50	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Loligo opalescens	Z. californianus	1.80	12.70		25386	1.00	23.50	Lowry and Caretta 1999	Channel Islands, NE Pacific	1981-1985
Loligo opalescens	Z. californianus	1.80	5.20		164	4.20	6.70	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Loligo pealeii	G. melas	3.40	16.07		145	5.00	42.00	Gannon et al. 1997b	Mid-Atlantic Bight, USA	1973-1993
Loligo pealeii	G. melas	5.90	19.60		578	3.70	43.60	Gannon et al. 1997a	NW Atlantic	1989-1991
Loligo pealeii	Globicephala sp.	6.00	13.40		68			Overholtz and Waring 1991	Mid-Atlantic Bight, USA	1989
Loligo pealeii	P. phocoena	1.65	12.90	3.00	8			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Loligo plei	Delphinus sp.	2.15	18.00		2	17.70	18.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	F. attenuata	2.35	14.90		2	13.60	16.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	O. orca	7.65	14.30		2	12.40	16.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	P. blainvillei	1.50	15.40		27	6.80	21.10	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	P. blainvillei	1.50	16.60		155	6.60	26.60	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	S. fluviatilis	1.75	15.20		137	4.10	26.60	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	S. frontalis	1.75	8.90		121	2.10	22.00	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	S. bredanensis	2.35	21.50		38	15.30	27.80	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	T. truncatus	2.88	17.10		2	16.60	17.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo plei	T. truncatus	2.88	20.30		10	13.50	23.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	A. australis	1.65	9.80		37	4.50	18.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	A. gazella	1.25	11.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	A. tropicalis	1.50	9.30		14	5.80	13.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	Delphinus sp.	2.15	5.00		58	2.80	8.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	L. hosei	2.33	12.90		19	5.10	21.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	O. orca	7.65	12.60		10	5.80	18.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	P. blainvillei	1.50	5.10		593	2.00	21.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	P. blainvillei	1.50	10.30		2686	2.20	22.00	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo sanpaulensis	S. fluviatilis	1.75	4.50		260	1.40	19.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Loligo subulata	P. phocoena	1.65	7.10	1.10	71			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Loligo vulgaris reynaudii	A. p. pusillus	2.05	11.50		51	7.10	18.90	Lipinski and David 1990	Benguela, South Africa	1974-1985
Loligo vulgaris reynaudii	A. p. pusillus	2.05	15.60		596	4.10	32.40	Lipinski and David 1990	Benguela, South Africa	1974-1985
Loligo vulgaris reynaudii	A. p. pusillus	2.05	16.06		183			Castley et al. 1991	Benguela, South Africa	1976-1990
Loligo vulgaris reynaudii	C. heavisidii	1.57	17.40	4.70	11	9.30	24.40	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Loligo vulgaris reynaudii	D. delphis	2.08	17.30	6.80	322	2.50	34.50	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Loligo vulgaris reynaudii	G. griseus	2.79	13.00	7.30	67	2.10	32.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
Loligo vulgaris reynaudii	K. breviceps	2.52	11.60	5.20	21	5.30	20.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
Loligo vulgaris reynaudii	K. sima	2.23	7.10	1.40	11	5.30	8.90	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
Loligo vulgaris reynaudii	L. obscurus	1.71	12.90	6.60	23	1.70	27.00	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Loligo vulgaris reynaudii	P. crassidens	3.73	21.10	4.70	3	16.00	25.30	Sekiguchi et al. 1992	Benguela, South Africa	1971-1982
Loligo vulgaris reynaudii	S. attenuata	2.03	7.10	2.90	7	4.20	11.50	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Loligo vulgaris reynaudii	S. coeruleoalba	2.03	9.30	4.00	183	2.40	22.30	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Loligo vulgaris reynaudii	T. truncatus	2.72	22.70	2.00	12	20.20	26.10	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Loligo vulgaris vulgaris	P. phocoena	1.65	2.90		2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Loliolus japonica	C. ursinus	1.12	9.61		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Lolliguncula brevis	P. blainvillei	1.50	4.90		134	2.40	8.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Lolliguncula brevis	S. fluviatilis	1.75	4.10		199	2.50	6.00	dos Santos and Haimovici 2001	Brazil	1985-1998
Lolliguncula brevis	S. fluviatilis	1.78	4.01	0.79	172	2.84	5.84	de Oliveira Santos et al. 2002	Brazil	1995-1998
Sepioteuthis australis	A. p. doriferus	1.70	32.80	11.33	29	13.50	53.10	Gales et al. 1993	Tasmania	1989-1990
Ancistrocheirus lesueurii	G. melas	5.90	17.20		3	6.10	24.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Ancistrocheirus lesueurii	G. griseus	3.33	15.80		55			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Ancistrocheirus lesueurii	O. orca	7.65	29.30		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Ancistrocheirus lesueurii	P. macrocephalus	15.75	20.45		60	14.00	30.00	Best 1999	Donkergat, South Africa	1962-1963

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Ancistrocheirus lesueurii	P. macrocephalus	10.00	21.66		73	10.00	40.00	Best 1999	Donkergat, South Africa	1962-1963
Ancistrocheirus lesueurii	P. macrocephalus	15.75	16.40		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Ancistrocheirus lesueurii	P. macrocephalus	12.40	23.00		204	16.70	28.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Ancistrocheirus lesueurii	S. attenuata	2.05	4.69	2.96	139	0.88	20.31	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Architeuthis cf. dux	P. macrocephalus	12.40	115.90		135	34.60	186.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Architeuthis sp.	P. macrocephalus	15.75	107.75		4	82.00	151.00	Best 1999	Donkergat, South Africa	1962-1963
Architeuthis sp.	P. macrocephalus	10.00	82.56		9	42.00	116.00	Best 1999	Donkergat, South Africa	1962-1963
Architeuthis sp.	S. attenuata	2.05	6.29	2.58	2	4.47	8.12	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Architeuthis sp.	P. macrocephalus	15.75	166.30		2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Bathyteuthis abyssicola	G. griseus	3.33	4.00		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Bathyteuthis abyssicola	H. planifrons	6.55	7.33	4.61	4			Sekiguchi et al. 1993	South Africa, west coast	1990
Bathyteuthis abyssicola	H. planifrons	7.20	3.60		6			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Batoteuthis skolops	H. planifrons	7.20	9.60		6			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Batoteuthis skolops	M. leonina	3.45	10.30		3	8.90	10.90	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Brachioteuthis cf. picta	A. gazella	1.00	7.08		26	5.69	8.65	Daneri et al. 1999	South Orkney Islands, S Atlantic	1988
Brachioteuthis cf. picta	A. gazella	1.00	8.09		9	7.69	8.55	Daneri et al. 1999	South Shetland Islands, S Atlantic	1992-1994
Brachioteuthis cf. picta	M. leonina	3.45	8.10		192			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Brachioteuthis cf. picta	M. leonina	3.45	7.28		26			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
Brachioteuthis riisei	G. melas	4.06	13.60		9			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Brachioteuthis riisei	H. planifrons	7.20	43.40		32			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Brachioteuthis cf. riisei	A. gazella	0.75	5.84		31			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Brachioteuthis sp.	G. griseus	3.33	7.30		7			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Brachioteuthis sp.	H. planifrons	6.30	8.57	0.86	5			Slip et al. 1995	Heard Island, Indian Ocean	1992
Brachioteuthis spp.	A. gazella	0.80	5.60		3	4.66	6.27	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Chiroteuthis imperator	C. ursinus	1.12	6.14		28	4.48	7.18	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Chiroteuthis picteti	P. macrocephalus	15.75	13.90		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Chiroteuthis veranyi	G. melas	4.06	16.10		5			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Chiroteuthis veranyi	H. planifrons	7.20	12.40		5			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Chiroteuthis veranyi	K. breviceps	3.05	10.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Chiroteuthis veranyi	K. sima	2.40	11.90		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Chiroteuthis veranyi	M. leonina	3.45	14.10		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1994
Chiroteuthis cf. veranyi	K. breviceps	3.05	15.82		1			Wang et al. 2002	Taiwan	1998-2000
Chiroteuthis sp.	G. griseus	3.33	8.00		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Chiroteuthis sp.	H. planifrons	6.30	10.38	1.05	74			Slip et al. 1995	Heard Island, Indian Ocean	1992
Chiroteuthis sp.	H. planifrons	6.49	10.61	1.34	388			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Chiroteuthis sp.	M. layardii	6.15	11.17	0.42	3			Sekiguchi et al. 1996	New Zealand	1966
Chiroteuthis sp.	M. layardii	5.41	10.64	1.12	9			Sekiguchi et al. 1996	South Africa	1965-1995
Chiroteuthis sp.	M. leonina	3.45	13.50		6	10.20	15.60	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Chiroteuthis sp.	P. macrocephalus	12.40	12.60		168	10.90	20.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Planctoteuthis sp.	G. griseus	3.33	5.80		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Chtenopteryx sp.	K. sima	2.40	7.04		6	6.36	7.91	Wang et al. 2002	Taiwan	1998-2000
Chtenopteryx sicula	K. sima	2.40	7.07		1			Wang et al. 2002	Taiwan	1998-2000
Chtenopteryx sicula	S. attenuata	2.05	3.47	0.63	39	2.17	5.16	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Galiteuthis armata	G. melas	4.06	26.80		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Galiteuthis armata	H. planifrons	7.20	27.30		154			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Galiteuthis armata	K. sima	2.40	7.93		2	7.34	8.52	Wang et al. 2002	Taiwan	1998-2000
Galiteuthis armata	M. layardii	5.41	19.60		2			Sekiguchi et al. 1996	South Africa	1965-1995
Galiteuthis armata	O. rossii	1.85	19.60		14	13.50	23.70	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
Galiteuthis glacialis	H. planifrons	6.30	19.52	1.54	375			Slip et al. 1995	Heard Island, Indian Ocean	1992
Galiteuthis glacialis	H. planifrons	6.49	19.25	1.75	394			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Galiteuthis glacialis	M. leonina	3.45	18.70		7	13.00	23.60	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Helicocranchia sp. ?	P. macrocephalus	12.40	25.80		4			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Leachia dislocata	K. sima	2.40	2.27		2	2.25	2.29	Wang et al. 2002	Taiwan	1998-2000
Leachia dislocata	S. attenuata	2.05	12.79	3.34	628	4.96	24.81	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Liguriella sp.	P. macrocephalus	12.40	12.90		1			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Liocranchia reinhardti	H. planifrons	6.55	24.90	3.33	9			Sekiguchi et al. 1993	South Africa, west coast	1990
Liocranchia reinhardti	P. macrocephalus	12.40	25.80		4			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Liocranchia reinhardti	S. attenuata	2.05	12.54	3.44	238	4.22	19.96	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Liocranchia sp.	H. planifrons	6.43	36.01	21.15	2			Sekiguchi et al. 1993	South Africa, east coast	1975
Liocranchia sp.	H. planifrons	6.30	25.40	4.46	334			Slip et al. 1995	Heard Island, Indian Ocean	1992
Megalocranchia fisheri	P. macrocephalus	15.75	96.00		36			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Megalocranchia fisheri A	G. griseus	3.33	20.80		240			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Megalocranchia sp.	H. planifrons	6.49	19.65	5.98	77			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Megalocranchia sp.	S. attenuata	2.05	10.91	5.42	479	0.24	25.39	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Megalocranchia sp.	M. layardii	5.41	25.40	6.44	3			Sekiguchi et al. 1996	South Africa	1965-1995
Megalocranchia sp. A	P. macrocephalus	12.40	50.50		200	28.30	69.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Megalocranchia sp. B	G. griseus	3.33	23.20		45			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Megalocranchia sp. G	P. macrocephalus	12.40	81.70		30	49.50	140.80	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Mesonychoteuthis hamiltoni	G. melas	4.06	22.00		7			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Mesonychoteuthis hamiltoni	H. planifrons	6.30	92.51	16.12	5			Slip et al. 1995	Heard Island, Indian Ocean	1992
Mesonychoteuthis hamiltoni	H. planifrons	6.49	69.58	25.78	65			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Mesonychoteuthis hamiltoni	H. planifrons	7.20	96.40		22			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Mesonychoteuthis hamiltoni	M. leonina	3.45	36.20		2	31.90	40.50	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Taonius borealis	B. bairdii	11.10	25.20		240	14.26	49.11	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Taonius borealis	B. bairdii	11.10	32.09		85	13.85	45.06	Walker et al. 2002	Sea of Okhotsk	1988-1989
Taonius megalops	H. planifrons	6.43	40.55	4.92	2			Sekiguchi et al. 1993	South Africa, east coast	1975
Taonius pavo	H. planifrons	6.30	41.55	7.18	178			Slip et al. 1995	Heard Island, Indian Ocean	1992
Taonius pavo	H. planifrons	6.49	34.91	8.27	614			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Taonius pavo	H. planifrons	7.20	37.90		1663			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Taonius pavo	K. breviceps	3.05	30.94		70	17.63	49.02	Wang et al. 2002	Taiwan	1998-2000
Taonius pavo	K. sima	2.40	20.59		14	10.01	34.83	Wang et al. 2002	Taiwan	1998-2000
Taonius pavo	M. layardii	6.15	25.8		1			Sekiguchi et al. 1996	New Zealand	1966
Taonius pavo	M. layardii	5.41	30.56	10.84	39			Sekiguchi et al. 1996	South Africa	1965-1995
Taonius pavo	P. dalli	1.89	21.10		12	13.98	30.61	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Taonius pavo	P. macrocephalus	15.75	41.10		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Taonius pavo	P. macrocephalus	12.40	41.20		12			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Taonius sp.	M. layardii	5.41	27.34	1.38	10			Sekiguchi et al. 1996	South Africa	1965-1995
Teuthowenia maculata	P. macrocephalus	12.40	29.90		200	19.20	37.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Teuthowenia megalops	H. planifrons	6.55	22.17	4.66	160			Sekiguchi et al. 1993	South Africa, west coast	1990
Teuthowenia megalops	M. layardii	5.41	25.27		2			Sekiguchi et al. 1996	South Africa	1965-1995
Teuthowenia megalops	P. macrocephalus	12.40	30.10		200	20.40	35.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Teuthowenia megalops	P. macrocephalus	12.35	23.71		110	14.50	31.50	Santos et al. 1999	North Sea	1990-1996
Teuthowenia pellucida	H. planifrons	6.43	18.55	1.25	8			Sekiguchi et al. 1993	South Africa, east coast	1975
Teuthowenia pellucida	H. planifrons	7.20	18.40		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Teuthowenia pellucida	M. layardii	6.15	22.22	0.86	2			Sekiguchi et al. 1996	New Zealand	1966
Teuthowenia pellucida	M. layardii	5.41	18.12	2.39	12			Sekiguchi et al. 1996	South Africa	1965-1995
Teuthowenia sp.	K. breviceps	3.05	18.03		5	15.04	20.55	Wang et al. 2002	Taiwan	1998-2000
Teuthowenia sp.	M. layardii	5.41	34.25		1			Sekiguchi et al. 1996	South Africa	1965-1995
Teuthowenia sp.	P. macrocephalus	12.40	19.90		8			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Cycloteuthis akimushkini	P. macrocephalus	15.75	38.90		18			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Cycloteuthis akimushkini	P. macrocephalus	12.40	37.00		152	18.90	50.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Cycloteuthis sp.	H. planifrons	6.55	46.19	1.32	2			Sekiguchi et al. 1993	South Africa, west coast	1990
Cycloteuthis sp.	M. layardii	5.41	24.80		1			Sekiguchi et al. 1996	South Africa	1965-1995
Discoteuthis discus	H. planifrons	6.55	10.33	0.85	60			Sekiguchi et al. 1993	South Africa, west coast	1990
Discoteuthis discus	M. layardii	5.41	9.19		1			Sekiguchi et al. 1996	South Africa	1965-1995
Discoteuthis laciniosa	M. layardii	5.41	12.78	1.97	5			Sekiguchi et al. 1996	South Africa	1965-1995
Discoteuthis laciniosa	P. macrocephalus	15.75	16.10	.	2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Discoteuthis laciniosa	P. macrocephalus	12.40	13.20		200	9.80	15.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Discoteuthis cf. laciniosa	H. planifrons	7.20	7.50		13			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Discoteuthis sp.	K. breviceps	3.05	14.01		2	8.71	19.31	Wang et al. 2002	Taiwan	1998-2000

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Discoteuthis sp.	K. sima	2.40	13.33		1			Wang et al. 2002	Taiwan	1998-2000
Abralia redfieldi	K. sima	2.40	2.90		23	2.20	3.60	dos Santos and Haimovici 2001	Brazil	1994, 1998
Abralia sp.	K. breviceps	3.05	3.60		5	3.00	4.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Abraliopsis affinis	S. attenuata	2.05	3.00	0.49	3671	1.87	4.54	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Abraliopsis cf. lineata	L. hosei	2.33	5.09	SE 0.14	30	3.70	6.70	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Abraliopsis cf. lineata	S. longirostris	1.70	3.82	SE 0.10	112	1.70	6.30	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Abraliopsis sp. A	G. griseus	3.33	4.40		241			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Abraliopsis sp. B	G. griseus	3.33	3.20		46			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Abraliopsis sp. C	G. griseus	3.33	3.40		19			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Abraliopsis sp. D	G. griseus	3.33	5.30		12			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Enoploteuthis cf. anaspis	G. griseus	3.33	7.70		208			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Enoploteuthis chunii	C. ursinus	1.12	10.75		3			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Enoploteuthis chunii	K. breviceps	3.05	7.17		180	5.59	8.78	Wang et al. 2002	Taiwan	1998-2000
Enoploteuthis chunii	K. sima	2.40	7.13		72	5.63	8.84	Wang et al. 2002	Taiwan	1998-2000
Enoploteuthis chunii	S. attenuata	2.05	7.12		877	6.10	8.20	Wang et al. 2003	Taiwan	1994-1995
Enoploteuthis sp.	H. planifrons	7.20	18.00		2			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Enoploteuthis sp. A	G. griseus	3.33	9.50		279			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Watasenia scintillans	C. ursinus	1.12	4.40		99	3.00	5.60	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Watasenia scintillans	C. ursinus	1.12	4.20		978	3.00	5.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Watasenia scintillans	C. ursinus	1.12	4.30		1248	2.52	6.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Watasenia scintillans	P. dalli	1.89	3.39		462	2.44	4.51	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Enoploteuthidae	H. planifrons	6.55	5.01		1			Sekiguchi et al. 1993	South Africa, west coast	1990
Berryteuthis anonychus	C. ursinus	0.93	29.68		3	27.21	31.99	Mori et al. 2001	N Pacific	1987-1991
Berryteuthis magister	B. bairdii	11.10	21.37		697	11.12	33.43	Walker et al. 2002	Sea of Okhotsk	1988-1989
Berryteuthis magister	P. dalli	1.95	13.31		538	5.50	32.50	Walker 1996	Sea of Okhotsk	1988-1989
Berryteuthis magister	P. dalli	1.89	8.30	1.20	22	5.50	10.50	Ohizumi et al. 2000	Sea of Japan	May-89
Berryteuthis magister	P. dalli	1.89	7.10	4.20	90	0.50	18.50	Ohizumi et al. 2000	Sea of Japan	May-95
Berryteuthis magister	P. dalli	1.89	11.50	3.60	69	2.50	18.50	Ohizumi et al. 2000	Sea of Japan	May-96
Berryteuthis magister	P. dalli	1.89	9.30	3.30	62	4.50	17.50	Ohizumi et al. 2000	Sea of Okhotsk	Oct-94
Berryteuthis magister	P. dalli	1.89	10.60	4.20	120	4.50	19.50	Ohizumi et al. 2000	Sea of Okhotsk	Aug-95
Berryteuthis magister	P. dalli	1.89	12.80	3.60	70	3.50	25.50	Ohizumi et al. 2000	Sea of Okhotsk	Jun-88
Gonatopsis/Berryteuthis	C. ursinus	1.16	9.71		166	7.00	17.00	Sinclair et al. 1994	Bering Sea	1982
Gonatopsis/Berryteuthis	C. ursinus	1.24	9.22		136	5.00	17.00	Sinclair et al. 1994	Bering Sea	1985
Gonatopsis borealis	B. bairdii	11.10	17.70		56	9.06	31.02	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Gonatopsis borealis	C. ursinus	0.93	8.22		8	5.96	10.36	Mori et al. 2001	N Pacific	1987-1991
Gonatopsis borealis	C. ursinus	1.12	10.40		37	5.56	16.68	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Gonatopsis borealis	M. angustirostris	3.60	22.00	5.40	22	13.60	28.00	Antonelis et al. 1994a	San Miguel Island, NE Pacific	1978-1979
Gonatopsis borealis	P. dalli	1.89	14.97		28	10.86	21.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatopsis makko	P. dalli	1.89	9.96		647	2.10	28.91	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatopsis octopedatus	P. dalli	1.89	9.11		560	1.00	15.14	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatus antarcticus	A. gazella	0.75	8.55		4			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gonatus antarcticus	G. melas	4.06	15.10		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Gonatus antarcticus	H. planifrons	6.30	20.54	2.07	191			Slip et al. 1995	Heard Island, Indian Ocean	1992
Gonatus antarcticus	H. planifrons	6.49	25.32	5.93	304			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Gonatus antarcticus	H. planifrons	7.20	21.50		274			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Gonatus antarcticus	M. layardii	5.41	34.49	0.66	5			Sekiguchi et al. 1996	South Africa	1965-1995
Gonatus antarcticus	M. leonina	3.45	13.90		67			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Gonatus antarcticus	M. leonina	3.45	18.53		12			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
Gonatus antarcticus	O. orca	7.65	20.10		6	18.80	21.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Gonatus berryi	C. ursinus	1.12	9.21		5	6.45	12.80	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Gonatus berryi	P. dalli	1.89	13.99		10	4.87	22.48	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatus berryi	P. macrocephalus	15.75	28.50		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Gonatus fabricii	M. monoceros	4.45	22.00		5473	6.80	40.25	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
Gonatus fabricii	P. macrocephalus	14.80	21.80		2000			Clarke 1997	North Sea	1994
Gonatus cf. fabricii	P. macrocephalus	13.12	22.30		2116	15.50	28.50	Santos et al. 1999	North Sea	1990-1996

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Gonatus cf. fabricii	P. macrocephalus	12.35	22.02		14468	14.50	29.50	Santos et al. 1999	North Sea	1990-1996
Gonatus madokai	P. dalli	1.89	10.12		459	2.36	17.10	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatus madokai/G. middendorffi	C. ursinus	1.24	6.67		86	5.00	9.00	Sinclair et al. 1994	Bering Sea	1985
Gonatus onyx	C. ursinus	1.12	11.40		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Gonatus onyx	P. dalli	1.89	8.59		191	5.22	10.76	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatus steenstrupi	P. macrocephalus	12.40	14.90		200	11.50	18.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Gonatus sp.	P. dalli	1.89	8.24		872	4.00	14.77	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Gonatidae	C. ursinus	1.40			>59	5.00	24.00	Perez and Bigg 1986	N Pacific	1958-1974
Gonatidae	H. planifrons	6.43	23.63	3.86	3			Sekiguchi et al. 1993	South Africa, east coast	1975
Gonatidae	M. layardii	5.41	12.17	4.55	2			Sekiguchi et al. 1996	South Africa	1965-1995
Histioteuthis arcturi	P. macrocephalus	12.40	11.10		200	8.30	13.00	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis bonnellii bonnellii	P. macrocephalus	12.40	17.50		200	7.80	29.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis bonnellii corpuscula	H. planifrons	6.43	4.90	0.73	6			Sekiguchi et al. 1993	South Africa, east coast	1975
Histioteuthis bonnellii corpuscula	P. macrocephalus	12.40	5.90		20	4.10	6.50	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis cf. celetaria	P. macrocephalus	12.40	9.10		200	7.50	13.30	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis eltaninae	G. melas	4.06	5.20		32			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Histioteuthis eltaninae	H. planifrons	6.30	4.85	0.46	77			Slip et al. 1995	Heard Island, Indian Ocean	1992
Histioteuthis eltaninae	H. planifrons	6.49	5.90	0.90	132			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Histioteuthis eltaninae	H. planifrons	7.20	5.50		752			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Histioteuthis hoylei	K. breviceps	3.05	10.47		7	7.81	15.52	Wang et al. 2002	Taiwan	1998-2000
Histioteuthis hoylei	P. macrocephalus	15.75	11.60		129			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Histioteuthis machrohista	A. gazella	0.80	8.41		1			Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Histioteuthis machrohista	H. planifrons	6.43	4.42	0.77	8			Sekiguchi et al. 1993	South Africa, east coast	1975
Histioteuthis machrohista	M. layardii	5.41	6.30	1.12	21			Sekiguchi et al. 1996	South Africa	1965-1995
Histioteuthis meleagroteuthis	H. planifrons	6.43	5.49	0.73	397			Sekiguchi et al. 1993	South Africa, east coast	1975
Histioteuthis meleagroteuthis	M. layardii	6.15	7.75		1			Sekiguchi et al. 1996	New Zealand	1966
Histioteuthis meleagroteuthis	M. layardii	5.41	5.22	0.30	5			Sekiguchi et al. 1996	South Africa	1965-1995
Histioteuthis meleagroteuthis	P. macrocephalus	12.40	8.10		59	5.20	9.60	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis miranda	K. breviceps	3.05	9.44		17	6.39	10.83	Wang et al. 2002	Taiwan	1998-2000
Histioteuthis miranda	K. sima	2.40	8.13		13	3.04	10.63	Wang et al. 2002	Taiwan	1998-2000
Histioteuthis miranda	M. layardii	6.15	15.96		1			Sekiguchi et al. 1996	New Zealand	1966
Histioteuthis miranda	P. macrocephalus	15.75	16.67		6	13.00	22.00	Best 1999	Donkergat, South Africa	1962-1963
Histioteuthis miranda	P. macrocephalus	10.00	17.16		19	14.00	21.00	Best 1999	Donkergat, South Africa	1962-1963
Histioteuthis cf. miranda	P. macrocephalus	12.40	15.00		200	11.20	18.90	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis reversa	K. breviceps	3.05	5.31		6	4.86	5.79	Wang et al. 2002	Taiwan	1998-2000
Histioteuthis reversa	P. macrocephalus	12.40	5.20		19	4.40	6.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Histioteuthis sp. A	G. griseus	3.33	3.10		10			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Histioteuthis sp. B	M. leonina	3.45	4.70		58			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Histioteuthis sp.	G. melas	5.90	5.60		68	4.80	11.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Histioteuthis sp.	H. planifrons	6.49	5.40	1.71	506			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Histioteuthis sp.	M. layardii	5.41	5.83	1.25	58			Sekiguchi et al. 1996	South Africa	1965-1995
Histioteuthis sp.	M. leonina	3.45	5.30		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Histioteuthis sp.	P. macrocephalus	10.00	4.67		6	3.00	8.00	Best 1999	Donkergat, South Africa	1962-1963
Histioteuthis sp.	P. macrocephalus	15.75	5.50		6	5.00	6.00	Best 1999	Donkergat, South Africa	1962-1963
Histioteuthis spp.	K. breviceps	3.05	7.10		16	5.70	9.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Histioteuthis spp.	K. sima	2.40	6.00		94	2.60	13.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Histioteuthis spp.	O. orca	7.65	9.60		7	6.90	13.70	dos Santos and Haimovici 2001	Brazil	1985-1998
Lepidoteuthis grimaldii	P. macrocephalus	12.40	57.90		200	30.60	102.40	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Pholidoteuthis boschmai	G. griseus	3.33	19.60		2			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Pholidoteuthis boschmai	H. planifrons	6.49	29.60	2.51	7			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Pholidoteuthis boschmai	K. breviceps	3.05	29.24		5	25.70	36.63	Wang et al. 2002	Taiwan	1998-2000
Pholidoteuthis boschmai	P. macrocephalus	15.75	26.91		11	16.00	39.00	Best 1999	Donkergat, South Africa	1962-1963
Pholidoteuthis boschmai	P. macrocephalus	15.75	29.85		47	14.00	63.00	Best 1999	Donkergat, South Africa	1962-1963
Pholidoteuthis boschmai	S. attenuata	2.05	9.73	2.55	150	4.29	18.19	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Pholidoteuthis boschmai	P. macrocephalus	10.00	28.84		57	20.00	36.00	Best 1999	Donkergat, South Africa	1962-1963

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Pholidoteuthis boschmai	P. macrocephalus	12.40	41.10		200	19.60	38.40	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Pholidoteuthis cf. boschmai	P. macrocephalus	15.75	28.00		6			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Lycoteuthis lorigera	A. p. pusillus	2.05	8.71		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Lycoteuthis lorigera	G. griseus	3.33	6.80		1			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Lycoteuthis lorigera	H. planifrons	6.55	8.53		1			Sekiguchi et al. 1993	South Africa, west coast	1990
Lycoteuthis lorigera	G. melas	5.90	11.00		45	9.30	14.10	dos Santos and Haimovici 2001	Brazil	1985-1998
Lycoteuthis lorigera	K. breviceps	3.05	8.90		17	7.50	12.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Lycoteuthis lorigera	K. sima	2.40	9.40		7	8.10	10.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Lycoteuthis lorigera	M. leonina	3.45	7.80		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Lycoteuthis lorigera	O. orca	7.65	11.00		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Idioteuthis famelica	P. macrocephalus	15.75	14.20		21			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Idioteuthis hjorti	K. breviceps	3.05	11.00		17	7.58	14.62	Wang et al. 2002	Taiwan	1998-2000
Mastigoteuthis dentata	S. attenuata	2.05	6.91	1.42	870	2.06	13.24	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Mastigoteuthis psychrophila	M. leonina	3.45	11.00		5	10.10	13.00	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Mastigoteuthis sp. A	A. gazella	0.75	7.65		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Mastigoteuthis sp. A	H. planifrons	7.20	18.80		4			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Mastigoteuthis sp. A	P. macrocephalus	12.40	15.50		83	12.60	20.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Mastigoteuthis sp. B	P. macrocephalus	12.40	18.60		2			Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Mastigoteuthis sp.	C. ursinus	1.12	13.73		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Mastigoteuthis sp.	H. planifrons	6.55	10.79	1.48	20			Sekiguchi et al. 1993	South Africa, west coast	1990
Mastigoteuthis sp.	H. planifrons	6.30	8.57	0.57	12			Slip et al. 1995	Heard Island, Indian Ocean	1992
Mastigoteuthis sp.	M. layardii	5.41	11.37	1.18	22			Sekiguchi et al. 1996	South Africa	1965-1995
Alluroteuthis antarctica	G. melas	4.06	29.30		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Alluroteuthis antarctica	H. planifrons	6.30	14.41	1.51	49			Slip et al. 1995	Heard Island, Indian Ocean	1992
Alluroteuthis antarctica	H. planifrons	6.49	40.13	14.06	39			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Alluroteuthis antarctica	H. planifrons	7.20	30.80		18			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Alluroteuthis antarctica	M. leonina	3.45	14.50		51			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Alluroteuthis antarctica	M. leonina	3.45	13.13		13			Daneri et al. 2000	South Shetland Islands, S Atlantic	1992-1994
Alluroteuthis antarctica	O. rossii	1.85	12.20		57	6.10	18.40	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
Octopoteuthis deletron	S. attenuata	2.05	4.56	2.35	63	1.03	13.02	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Octopoteuthis cf. deletron	K. breviceps	3.05	16.65		6	14.26	18.57	Wang et al. 2002	Taiwan	1998-2000
Octopoteuthis cf. neilseni	P. macrocephalus	15.75	2.50		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Octopoteuthis rugosa	H. planifrons	6.55	15.02	2.20	17			Sekiguchi et al. 1993	South Africa, west coast	1990
Octopoteuthis rugosa	M. layardii	5.41	7.93		2			Sekiguchi et al. 1996	South Africa	1965-1995
Octopoteuthis rugosa	P. macrocephalus	15.75	15.75		4	15.00	17.00	Best 1999	Donkergat, South Africa	1962-1963
Octopoteuthis rugosa	P. macrocephalus	10.00	21.36		45	9.00	54.00	Best 1999	Donkergat, South Africa	1962-1963
Octopoteuthis rugosa	P. macrocephalus	15.75	2.70		13			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Octopoteuthis rugosa	P. macrocephalus	12.40	20.00		200	13.30	24.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Octopoteuthis sp. G	P. macrocephalus	12.40	32.50		115	23.00	41.20	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Octopoteuthis sp.	C. ursinus	1.12	6.68		1			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Octopoteuthis sp.	G. melas	5.90	14.40		6	13.00	17.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Octopoteuthis sp.	H. planifrons	6.43	16.64	2.34	8			Sekiguchi et al. 1993	South Africa, east coast	1975
Octopoteuthis sp.	K. breviceps	3.05	16.20		4	14.50	19.70	dos Santos and Haimovici 2001	Brazil	1985-1998
Octopoteuthis sp.	K. breviceps	3.05	16.89		2	16.01	17.78	Wang et al. 2002	Taiwan	1998-2000
Octopoteuthis sp.	K. sima	2.40	14.70		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Octopoteuthis sp.	M. layardii	5.41	13.48		2			Sekiguchi et al. 1996	South Africa	1965-1995
Octopoteuthis sp.	O. orca	7.65	16.50		4	15.60	19.00	dos Santos and Haimovici 2001	Brazil	1985-1998
Octopoteuthis spp.	G. griseus	3.33	5.70		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Octopoteuthis spp.	G. griseus	3.33	12.70		3			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Taningia danae	H. planifrons	6.49	18.92	13.04	36			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Taningia danae	H. planifrons	7.20	44.40		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Taningia danae	P. macrocephalus	15.75	42.30		13			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Taningia danae	P. macrocephalus	12.40	75.80		200	18.00	158.70	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Dosidicus gigas	S. attenuata	2.05	52.27		596	46.71	59.95	Perrin et al. 1973	E Tropical Pacific	1968
Dosidicus gigas	S. attenuata	2.05	18.08	4.31	207	9.92	31.94	Robertson and Chivers 1997	E Tropical Pacific	1989-1991

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Dosidicus gigas	S. longirostris	1.70	48.47		15			Perrin et al. 1973	E Tropical Pacific	1968
Eucleoteuthis luminosa	C. ursinus	1.12	5.07		10			Mori et al. 2001	Honshu, NW Pacific	1987-1994
Eucleoteuthis luminosa	K. breviceps	3.05	13.35		4	12.02	14.65	Wang et al. 2002	Taiwan	1998-2000
Eucleoteuthis luminosa	K. sima	2.40	13.06		4	6.98	18.22	Wang et al. 2002	Taiwan	1998-2000
Eucleoteuthis luminosa	S. attenuata	2.05	11.27	3.39	475	5.16	21.94	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Eucleoteuthis luminosa	S. attenuata	2.05	21.03		23	19.14	24.55	Wang et al. 2003	Taiwan	1994-1995
Hyaloteuthis pelagica	S. attenuata	2.05	7.53	1.27	114	5.06	11.79	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Illex argentinus	A. tropicalis	1.50	33.20		6	29.70	35.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	C. commersonii	1.48	11.00		n.a.**	6.00	28.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Illex argentinus	Delphinus sp.	2.15	5.90		20	2.10	27.60	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	F. attenuata	2.35	22.70		2	18.70	26.70	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	G. melas	5.90	22.10		6	15.00	33.20	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	K. breviceps	3.05	21.70		25	14.60	28.10	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	K. sima	2.40	22.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	L. obscurus	2.05	10.40		n.a.**	4.00	28.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Illex argentinus	M. leonina	3.45	26.30		2	26.00	26.50	dos Santos and Haimovici 2001	Brazil	1985-1998
Illex argentinus	O. flavescens	1.85	20.90		n.a.**	14.00	30.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Illex argentinus	O. flavescens	1.85	25.00		n.a.**	18.00	30.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Illex illecebrosus	H. grypus	2.08	18.50	SE 0.32	78	10.00	25.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Illex illecebrosus	P. vitulina	1.55	17.60	SE 0.17	139	5.00	20.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
Illex illecebrosus	P. vitulina	1.55	19.10	SE 0.36	51	15.00	25.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
Martialia hyadesi	A. gazella	1.25	17.46	1.13	4	15.80	18.30	North 1996	South Georgia Island, S Atlantic	1983
Martialia hyadesi	A. gazella	0.75	22.07		39			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Martialia hyadesi	H. planifrons	6.30	22.60	1.52	65			Slip et al. 1995	Heard Island, Indian Ocean	1992
Martialia hyadesi	H. planifrons	7.20	30.10		25			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Martialia hyadesi	M. leonina	3.45	27.10		43	19.3	42.6	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Nototodarus gouldi	A. p. doriferus	1.70	23.90	6.99	213	8.80	41.50	Gales et al. 1993	Tasmania	1989-1990
Nototodarus hawaiiensis	S. attenuata	2.05	7.08	0.99	5	6.5	8.79	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Nototodarus sloanii	A. forsteri	1.40	§ 19.00		386	5.00	43.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Ommastrephes bartramii	A. p. pusillus	2.05	20.82		9			Castley et al. 1991	Benguela, South Africa	1976-1990
Ommastrephes bartramii	A. tropicalis	1.50	22.10		23	9.30	34.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Ommastrephes bartramii	C. ursinus	0.93	8.61		10	7.09	9.96	Mori et al. 2001	N Pacific	1987-1991
Ommastrephes bartramii	C. ursinus	1.12	16.24		24	12.65	21.76	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Ommastrephes bartramii	G. griseus	3.33	35.40		17			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Ommastrephes bartramii	L. obliquidens	2.05	32.10		8	27.00	39.50	Walker and Jones 1993	N Pacific	1990
Ommastrephes bartramii	O. orca	7.65	28.70		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Ommastrephes bartramii	P. macrocephalus	15.75	46.60		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Ommastrephes bartramii	P. macrocephalus	12.40	48.60		6	15.50	75.10	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Ommastrephes bartramii	P. crassidens	5.50	28.20		5	19.10	32.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Ommastrephes bartramii	S. attenuata	2.05	12.92	3.53	1158	6.97	27.35	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Ornithoteuthis antillarum	F. attenuata	2.35	13.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Ornithoteuthis antillarum	K. breviceps	3.05	8.10		2	6.90	9.30	dos Santos and Haimovici 2001	Brazil	1985-1998
Ornithoteuthis antillarum	K. sima	2.40	5.70		24	3.00	9.60	dos Santos and Haimovici 2001	Brazil	1985-1998
Ornithoteuthis antillarum	O. orca	7.65	4.40		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Ornithoteuthis volatilis	K. breviceps	3.05	20.12		13	13.28	25.24	Wang et al. 2002	Taiwan	1998-2000
Ornithoteuthis volatilis	K. sima	2.40	17.80		3	9.64	23.10	Wang et al. 2002	Taiwan	1998-2000
Sthenoteuthis oualaniensis	K. breviceps	3.05	23.35		20	16.48	30.53	Wang et al. 2002	Taiwan	1998-2000
Sthenoteuthis oualaniensis	K. sima	2.40	15.18		1			Wang et al. 2002	Taiwan	1998-2000
Sthenoteuthis oualaniensis	S. attenuata	2.05	14.42	4.21	287	7.34	32.09	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Sthenoteuthis oualaniensis	S. attenuata	2.05	12.36		23	9.31	14.31	Wang et al. 2003	Taiwan	1994-1995
Todarodes angolensis	A. p. pusillus	2.05	14.60		22	3.40	29.10	Lipinski and David 1990	Benguela, South Africa	1974-1985
Todarodes pacificus	C. ursinus	1.12	14.15		3	5.04	33.55	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Todarodes pacificus	P. dalli	1.89	7.37		2125	3.09	22.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Todarodes sagittatus	G. melas	1.50	17.00		n.a.**		25.00	Desportes and Mouritsen 1988	Faroe Islands, NE Atlantic	1986-1987
Todarodes sagittatus	G. melas	3.50	20.00		n.a.**		50.00	Desportes and Mouritsen 1988	Faroe Islands, NE Atlantic	1986-1987

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Todarodes sagittatus	H. planifrons	6.55	39.82		1			Sekiguchi et al. 1993	South Africa, west coast	1990
Todarodes sagittatus	P. macrocephalus	12.40	48.40		200	25.80	69.60	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Todaropsis eblanae	A. p. pusillus	2.05	8.30		94	3.50	16.10	Lipinski and David 1990	Benguela, South Africa	1974-1985
Todaropsis eblanae	H. planifrons	6.43	7.14		1			Sekiguchi et al. 1993	South Africa, east coast	1975
Ommastrephidae	M. layardii	5.41	6.00		1			Sekiguchi et al. 1996	South Africa	1965-1995
Kondakovia longimana	A. gazella	0.80	20.20		1			Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Kondakovia longimana	H. planifrons	6.55	46.94	6.95	59			Sekiguchi et al. 1993	South Africa, west coast	1990
Kondakovia longimana	H. planifrons	6.30	49.36	9.67	99			Slip et al. 1995	Heard Island, Indian Ocean	1992
Kondakovia longimana	H. planifrons	7.20	10.40		77			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Kondakovia longimana	M. leonina	3.45	26.19		7			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1995
Kondakovia longimana	O. rossii	1.85	41.20		1			Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
Kondakovia longimana	P. macrocephalus	16.50	53.50		81	26.00	80.00	Nemoto et al. 1985, 1987	Southern Ocean	1972-1973
Moroteuthis ingens	A. gazella	0.75	16.45		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Moroteuthis ingens	G. melas	4.06	21.20		19			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Moroteuthis ingens	H. planifrons	6.55	70.36	5.02	5			Sekiguchi et al. 1993	South Africa, west coast	1990
Moroteuthis ingens	H. planifrons	7.20	67.20		13			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Moroteuthis knipovitchi	A. gazella	0.80	20.44		8	13.40	27.10	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Moroteuthis knipovitchi	A. gazella	0.75	9.18		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Moroteuthis knipovitchi	A. tropicalis	1.50	10.54		6			Bester and Laycock 1985	South Georgia Island, S Atlantic	1977-1978
Moroteuthis knipovitchi	H. planifrons	6.30	24.70	8.85	37			Slip et al. 1995	Heard Island, Indian Ocean	1992
Moroteuthis knipovitchi	H. planifrons	6.49	22.10	3.49	34			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Moroteuthis knipovitchi	H. planifrons	7.20	17.00		16			Clarke and Goodall 1994	Tierra del Fuego, Argentina	late 1970s?
Moroteuthis knipovitchi	M. layardii	5.41	5.80	4.30	3			Sekiguchi et al. 1996	South Africa	1965-1995
Moroteuthis knipovitchi	M. leonina	3.45	23.70		121			Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Moroteuthis knipovitchi	M. leonina	3.45	22.13		3			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1996
Moroteuthis knipovitchi	O. rossii	1.85	28.40		3	23.20	33.70	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
Moroteuthis loennbergi	C. ursinus	1.12	21.19		2	13.88	29.20	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Moroteuthis loennbergi	K. breviceps	3.05	17.58		11	11.15	21.21	Wang et al. 2002	Taiwan	1998-2000
Moroteuthis loennbergi	K. sima	2.40	10.77		1			Wang et al. 2002	Taiwan	1998-2000
Moroteuthis robsoni	H. planifrons	6.49	20.71	8.36	60			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Moroteuthis robsoni	M. layardii	5.41	28.40		1			Sekiguchi et al. 1996	South Africa	1965-1995
Moroteuthis robsoni	P. macrocephalus	15.75	30.90		10	19.00	42.00	Best 1999	Donkergat, South Africa	1962-1963
Moroteuthis robsoni	P. macrocephalus	10.00	35.87		23	17.00	56.00	Best 1999	Donkergat, South Africa	1962-1963
Moroteuthis sp.	H. planifrons	6.49	22.42	4.42	74			Sekiguchi et al. 1993	South Africa, east and west coasts	1975, 1990
Onychoteuthis banksii	A. p. pusillus	2.05	14.95		2			Castley et al. 1991	Benguela, South Africa	1976-1990
Onychoteuthis banksii	S. attenuata	2.05	7.43	2	646	0.86	13.99	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Onychoteuthis banksii	H. planifrons	6.55	21.36	9.73	8			Sekiguchi et al. 1993	South Africa, west coast	1990
Onychoteuthis banksii	K. breviceps	3.05	16.63		2	10.77	22.49	Wang et al. 2002	Taiwan	1998-2000
Onychoteuthis banksii	K. sima	2.40	13.76		3	9.25	16.20	Wang et al. 2002	Taiwan	1998-2000
Onychoteuthis banksii	S. attenuata	2.05	11.37		47	6.01	19.17	Wang et al. 2003	Taiwan	1994-1995
Onychoteuthis borealijaponica	C. ursinus	0.93	15.64		42	6.86	27.58	Mori et al. 2001	N Pacific	1987-1991
Onychoteuthis borealijaponica	C. ursinus	1.12	11.06		9	1.54	35.29	Mori et al. 2001	Honshu, NW Pacific	1987-1994
Onychoteuthis borealijaponica	P. macrocephalus	12.40	31.70		110	16.30	44.00	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Onychoteuthis sp. 1	G. griseus	3.33	8.10		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Onychoteuthis sp. 2	G. griseus	3.33	20.30		22			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Onychoteuthis sp.	H. planifrons	6.55	29.26	5.24	10			Sekiguchi et al. 1993	South Africa, west coast	1990
Onychoteuthis sp.	P. macrocephalus	15.75	28.00		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	1978, 1990
Onychoteuthidae	C. ursinus	1.40			>3	14.00	22.00	Perez and Bigg 1986	N Pacific	1958-1974
Psychroteuthis glacialis	A. gazella	1.00	9.07		7	7.83	10.76	Daneri et al. 1999	South Orkney Islands, S Atlantic	1988
Psychroteuthis glacialis	A. gazella	1.00	10.12		13	7.83	12.83	Daneri et al. 1999	Scotia Arc, Antarctica	1988-1994
Psychroteuthis glacialis	A. gazella	1.00	11.26		6	9.98	12.83	Daneri et al. 1999	South Shetland Islands, S Atlantic	1992-1994
Psychroteuthis glacialis	H. planifrons	6.30	9.87	1.96	1513			Slip et al. 1995	Heard Island, Indian Ocean	1992
Psychroteuthis glacialis	L. weddelii	2.00	§ 35.10		5	12.30	38.30	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Psychroteuthis glacialis	M. leonina	3.45	19.78		231			Daneri et al. 2000	South Shetland Islands, S Atlantic	1995-1996
Psychroteuthis glacialis	O. rossii	1.85	12.30		97	5.80	34.40	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Pterygioteuthis giardi	S. attenuata	2.05	2.18	0.34	65	1.64	3.17	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Pyroteuthis addolux	G. griseus	3.33	4.50		5			Clarke and Young 1998	Hawaiian Islands, E Tropical Pacific	n.a.
Argonauta nodosa	A. australis	1.65	1.50		3	1.00	1.80	dos Santos and Haimovici 2001	Brazil	1985-1998
Argonauta nodosa	A. p. doriferus	1.70	5.70	3.58	3	1.60	8.20	Gales et al. 1993	Tasmania	1989-1990
Argonauta nodosa	A. p. pusillus	2.05	7.21		3			Castley et al. 1991	Benguela, South Africa	1976-1990
Argonauta nodosa	A. tropicalis	1.50	10.30		2	7.30	13.10	dos Santos and Haimovici 2001	Brazil	1985-1998
Argonauta nodosa	L. hosei	2.33	0.60		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Argonauta nodosa	P. blainvillei	1.50	2.40		55	0.50	4.40	dos Santos and Haimovici 2001	Brazil	1985-1998
Bathypolypus arcticus	P. phocoena	1.65	5.20		1			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Eledone gaucha	P. blainvillei	1.50	2.10		1			dos Santos and Haimovici 2001	Brazil	1985-1998
Octopus australis	A. p. doriferus	1.70	10.10	2.63	13	4.50	15.50	Gales et al. 1993	Tasmania	1989-1990
Octopus maorum	A. p. doriferus	1.70	15.30	3.03	13	11.70	22.70	Gales et al. 1993	Tasmania	1989-1990
Octopus maorum	P. hookeri	2.00	120.00		33	30.00	150.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Octopus pallidus	A. p. doriferus	1.70	11.70	1.40	2	10.70	12.70	Gales et al. 1993	Tasmania	1989-1990
Octopus superciliosus	A. p. doriferus	1.70	5.02		1			Gales et al. 1993	Tasmania	1989-1990
Octopus tehuelchus	P. blainvillei	1.50	2.70		3	2.40	2.90	dos Santos and Haimovici 2001	Brazil	1985-1998
Octopus vulgaris	T. truncatus	2.88	11.00		5	7.70	14.70	dos Santos and Haimovici 2001	Brazil	1985-1998
Octopus sp.	A. p. pusillus	2.05	7.42		15			Castley et al. 1991	Benguela, South Africa	1976-1990
Pareledone charcoti	M. leonina	3.45	4.80		5	4.20	4.80	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Pareledone cf. charcoti	M. leonina	3.45	5.71		5			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1997
Pareledone cf. turqueti	M. leonina	3.45	7.25		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1999
Pareledone polymorpha	M. leonina	3.45	3.60		6	3.00	4.50	Rodhouse et al. 1992	South Georgia Island, S Atlantic	1986, 1988-1989
Pareledone cf. polymorpha	M. leonina	3.45	4.51		1			Daneri et al. 2000	South Shetland Islands, S Atlantic	1993-1998
Octopodidae	G. melas	4.06	16.00		1			Clarke and Goodall 1994	Tierra del Fuego, Argentina	1977-1982
Vampyroteuthis infernalis	M. layardii	5.41	5.00	1.26	3			Sekiguchi et al. 1996	South Africa	1965-1995
Vampyroteuthis infernalis	P. macrocephalus	12.40	10.40		5	9.60	12.90	Clarke et al. 1993	Azores Islands, N Atlantic	1981-1984
Myxine glutinosa	P. phocoena	1.65	31.60		1			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Squalus acanthias	G. melas	3.40	75.00		6			Gannon et al. 1997b	Mid-Atlantic Bight, USA	1973-1993
Raja sp.	H. grypus	2.08	70.00		2			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Raja spp.	P. hookeri	2.00	68.00		13	53.00	93.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Anguilla anguilla	P. phocoena	1.65	26.40	10.00	9			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Alosa pseudoharengus	H. grypus	2.08	22.60		10			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Alosa pseudoharengus	P. groenlandica	1.70	10.10		3			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Clupea harengus	H. grypus	2.08	25.40	5.60	48			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Clupea harengus	H. grypus	2.08	24.90		111	20.00	37.30	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Clupea harengus	H. grypus	2.08	34.50	SE 0.47	160	5.00	40.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Clupea harengus	H. grypus	2.08			n.a.**	25.00	35.00	Hauksson and Bogason 1997	Iceland	1992-1993
Clupea harengus	P. groenlandica	1.70	30.70		n.a.**	23.00	36.00	Hauksson and Bogason 1997	Iceland	1992-1993
Clupea harengus	P. vitulina	1.55	22.00	SE 0.36	197	10.00	35.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
Clupea harengus	P. vitulina	1.55	25.70	SE 0.51	84	15.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
Clupea harengus	P. phocoena	1.65	33.70		47	29.00	38.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
Clupea harengus	P. phocoena	1.65	26.50	SE 0.32	136			Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
Clupea harengus	P. phocoena	1.65	25.40	3.60	507	18.00	33.00	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Clupea harengus	P. phocoena	1.65	26.10	4.90	103			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Clupea harengus pallasi	C. ursinus	1.40			>27	10.00	25.00	Perez and Bigg 1986	N Pacific	1958-1974
Clupea harengus pallasi	mixed taxa	n.a.			11	28.50	31.30	Stroud et al. 1980	NE Pacific	1958-1972
Clupea harengus pallasi	P. phocoena	1.65	17.86		53	12.30	22.80	Walker et al. 1998	Washington and British Columbia	1990-1997
Clupea harengus pallasi	P. dalli	1.95	15.10		66	10.20	21.70	Walker et al. 1998	Washington and British Columbia	1990-1997
Etrumeus whiteheadi	A. p. pusillus	0.85	14.70		17			David 1987	Benguela, South Africa	1974-1985
Etrumeus whiteheadi	A. p. pusillus	0.85	13.20		32			David 1987	Benguela, South Africa	1974-1985
Etrumeus whiteheadi	D. delphis	2.08	16.20	2.70	171	8.50	23.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Etrumeus whiteheadi	L. obscurus	1.71	11.20	3.50	5	9.20	17.40	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Sardinops sagax = S. ocellatus	A. p. pusillus	2.05	21.66		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Sardinops sagax = S. ocellatus	C. heavisidii	1.57	20.60		2	20.60	20.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Sardinops sagax = S. ocellatus	D. delphis	2.08	19.00	1.80	163	12.60	24.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Sardinops sagax = S. ocellatus	L. obscurus	1.71	16.60	3.60	21	13.80	25.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Sardinops sagax	A. galapagoensis	1.37	14.10		33			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983
Sardinops sagax	Z. californianus	1.80	9.20		5	8.20	11.50	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Sardinops sagax	Z. c. woelbecki	2.00	14.20		66			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983
Sardinops sagax	Z. c. woelbecki	2.00	13.40		334			Dellinger and Trillmich 1999	Galapagos Islands, E Tropical Pacific	1983-1986
Sardinops sagax cf. neopilchardus	A. p. doriferus	1.70	17.30	1.00	15	15.00	19.00	Gales and Pemberton 1994	Tasmania	1984-1986
Sardinops sagax cf. ocellatus	A. p. pusillus	0.85	14.90		24			David 1987	Benguela, South Africa	1974-1985
Sardinops sagax cf. ocellatus	A. p. pusillus	0.85	19.80		134			David 1987	Benguela, South Africa	1974-1985
Sardinops sagax cf. ocellatus	A. p. pusillus	0.85	18.70		214			David 1987	Benguela, South Africa	1974-1985
Sardinops sagax melanostictus	P. dalli	1.95	18.01		1419	13.25	23.25	Walker 1996	Sea of Okhotsk	1988-1989
Sardinops sagax cf. melanosticus	P. dalli	1.89	17.89		372	12.53	22.46	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Sprattus sprattus	P. phocoena	1.65	14.00	0.90	166			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Anchoa sp.	S. fluviatilis	1.78	7.34	1.31	17	5.52	10.60	de Oliveira Santos et al. 2002	Brazil	1995-1998
Engraulis encrasicolus	A. p. pusillus	0.85	12.70		1799			David 1987	Benguela, South Africa	1974-1985
Engraulis encrasicolus	A. p. pusillus	0.85	9.90		2911			David 1987	Benguela, South Africa	1974-1985
Engraulis encrasicolus	A. p. pusillus	0.85	9.40		15871			David 1987	Benguela, South Africa	1974-1985
Engraulis encrasicolus	A. p. pusillus	2.05	13.47		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Engraulis encrasicolus	C. heavisidii	1.57	10.90		1			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Engraulis encrasicolus	D. delphis	2.08	11.20	1.80	413	5.30	18.10	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Engraulis encrasicolus	K. breviceps	2.52	10.00		3	10.00	10.00	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
Engraulis encrasicolus	K. sima	2.23	11.60	2.80	7	9.30	17.60	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
Engraulis encrasicolus	L. obscurus	1.71	9.10	1.80	188	4.40	15.80	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Engraulis encrasicolus	T. truncatus	2.72	12.20		1			Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Engraulis japonicus	P. dalli	1.89	12.73		978	9.77	17.16	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Engraulis japonicus	S. attenuata	2.05	10.77		115	9.30	12.84	Wang et al. 2003	Taiwan	1994-1995
Engraulis mordax	C. ursinus	1.40			27	9.00	18.00	Perez and Bigg 1986	N Pacific	1958-1974
Engraulis mordax	mixed taxa	n.a.			19	14.50	17.80	Stroud et al. 1980	NE Pacific	1958-1972
Engraulis mordax	P. vitulina	1.55	12.90		81	4.00	15.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
Engraulis mordax	Z. californianus	2.00	9.50	0.80	94	5.50	14.10	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Engraulis mordax	Z. californianus	1.80	10.00		12	9.00	11.10	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Nansenia candida	P. dalli	1.95	7.07		6	2.70	14.80	Crawford 1981	N Pacific	1978-1979
Bathylagidae	C. ursinus	1.40			986	8.00	12.00	Perez and Bigg 1986	N Pacific	1958-1974
Bathylagidae	P. dalli	1.95	9.43		60	5.00	17.90	Crawford 1981	N Pacific	1978-1979
Bathylagidae	P. dalli	1.89	11.77		315	11.12	12.46	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Mallotus villosus	C. ursinus	1.40			64	7.00	14.00	Perez and Bigg 1986	N Pacific	1958-1974
Mallotus villosus	H. grypus	2.08	16.30	0.40	219			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Mallotus villosus	H. grypus	2.08	13.90		891	8.30	17.40	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Mallotus villosus	H. grypus	2.08			n.a.**	10.00	15.00	Hauksson and Bogason 1997	Iceland	1992-1993
Mallotus villosus	mixed taxa	n.a.			26	10.90	15.50	Stroud et al. 1980	NE Pacific	1958-1972
Mallotus villosus	P. groenlandica	1.70	16.00		2244			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Mallotus villosus	P. groenlandica	1.70	13.20		30	8.80	15.70	Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Mallotus villosus	P. phocoena	1.65	13.80	0.80	23	13.00	15.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
Osmerus eperlanus	P. vitulina	1.55	10.20		41			Behrends 1982	Waddensea, North Sea	1975-1981
Osmerus mordax	H. grypus	2.08	12.00		1			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Osmerus mordax	P. groenlandica	1.70	12.00		4			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Thaleichthys pacificus	C. ursinus	1.40			11	12.00	21.00	Perez and Bigg 1986	N Pacific	1958-1974
Thaleichthys pacificus	mixed taxa	n.a.			4	15.30	20.50	Stroud et al. 1980	NE Pacific	1958-1972
Thaleichthys pacificus	P. phocoena	1.65	15.30		3	12.40	18.10	Walker et al. 1998	Washington and British Columbia	1990-1997
Thaleichthys pacificus	P. dalli	1.95	15.80		21	12.80	17.60	Walker et al. 1998	Washington and British Columbia	1990-1997
Oncorhynchus gorbuscha	mixed taxa	n.a.			3	25.00	40.50	Stroud et al. 1980	NE Pacific	1958-1972
Oncorhynchus kisutch	mixed taxa	n.a.			5	21.00	33.00	Stroud et al. 1980	NE Pacific	1958-1972
Oncorhynchus tshawytscha	mixed taxa	n.a.	22.75		2	21.00	24.50	Stroud et al. 1980	NE Pacific	1958-1972
Salmo salar	H. grypus	2.08	43.00		5	35.70	52.10	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Salmo salar	P. groenlandica	1.70	29.10		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Salmonidae	C. ursinus	1.40			>26	15.00	41.00	Perez and Bigg 1986	N Pacific	1958-1974

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Gonostoma cf. elongatum	L. hosei	2.33			184	8.30	22.50	Robison and Craddock 1983	E Tropical Pacific	1972
Argyropelecus affinis	L. hosei	2.33			177	4.00	7.00	Robison and Craddock 1983	E Tropical Pacific	1972
Maurolicus muelleri	A. p. pusillus	0.85	3.40		1			David 1987	Benguela, South Africa	1974-1985
Maurolicus muelleri	A. p. pusillus	0.85	3.40		1257			David 1987	Benguela, South Africa	1974-1985
Maurolicus muelleri	P. phocoena	1.65	5.00	0.50	146	3.60	6.80	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Maurolicus muelleri	P. dalli	1.89	2.27		661	1.48	3.01	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Maurolicus cf. muelleri	L. hosei	2.33			112	2.50	3.50	Robison and Craddock 1983	E Tropical Pacific	1972
Maurolicus weitzmani	P. phocoena	1.65	5.00	0.40	5898	3.00	5.50	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Ichthyococcus cf. irregularis	L. hosei	2.33			120	4.00	6.90	Robison and Craddock 1983	E Tropical Pacific	1972
Chauliodus cf. barbatus	L. hosei	2.33	18.00		238	8.50	20.00	Robison and Craddock 1983	E Tropical Pacific	1972
Rosenblattichthys cf. volucris	L. hosei	2.33			67	6.50	14.00	Robison and Craddock 1983	E Tropical Pacific	1972
Scopelarchus guentheri	L. hosei	2.33			127	8.00	16.00	Robison and Craddock 1983	E Tropical Pacific	1972
Scopelosaurus harryi	P. dalli	1.95	15.34		37	7.50	21.50	Crawford 1981	N Pacific	1978-1979
Arctozenus risso	P. groenlandica	1.70	13.00		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Notolepis coatsi	A. gazella	1.00	27.18		12	20.72	30.89	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
Paralepididae	L. hosei	2.33			87	20.00	30.00	Robison and Craddock 1983	E Tropical Pacific	1972
Paralepididae	P. dalli	1.95	43.00		2	38.00	48.00	Crawford 1981	N Pacific	1978-1979
Evermanella cf. ahlstromi	L. hosei	2.33			119	3.50	9.00	Robison and Craddock 1983	E Tropical Pacific	1972
Ceratoscopelus warmingii	L. hosei	2.33	5.93	SE 0.04	171	4.20	6.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Ceratoscopelus warmingii	S. attenuata	2.05	4.93	0.48	114	3.38	6.15	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Ceratoscopelus warmingii	S. longirostris	1.70	5.91	SE 0.03	420	4.50	6.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Diaphus schmidti	S. attenuata	2.05	4.20		396	2.65	5.30	Wang et al. 2003	Taiwan	1994-1995
Diaphus watasei	S. attenuata	2.05	12.64		167	8.62	16.69	Wang et al. 2003	Taiwan	1994-1995
Electrona antarctica	A. gazella	1.25	9.80	1.00	22	7.70	11.00	North 1996	South Georgia Island, S Atlantic	1983
Electrona antarctica	A. gazella	1.00	7.24		114	5.50	9.00	Daneri and Coria 1993	South Orkney Islands, S Atlantic	1988
Electrona antarctica	A. gazella	1.00	8.65	0.92	38	7.15	10.36	Daneri 1996	South Shetland Islands, S Atlantic	1992
Electrona antarctica	A. gazella	0.75	5.61		16	4.13	8.10	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Electrona antarctica	A. gazella	1.25	5.99		112	4.80	8.80	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Electrona antarctica	A. gazella	1.25	7.32		92	5.00	17.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Electrona antarctica	A. gazella	1.50	7.68		2202	3.75	9.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Electrona antarctica	A. gazella	1.00	7.81		75	5.75	9.50	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
Electrona antarctica	A. gazella	1.25	10.40		78	8.60	11.60	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
Electrona antarctica	A. gazella	1.00	6.20	0.70	340	4.00	8.00	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Electrona antarctica	A. gazella	0.80	10.88		51	6.40	13.26	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Electrona antarctica	A. gazella	0.75	6.35		92			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Electrona antarctica	A. tropicalis	1.50	7.20	0.30	7	6.90	7.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Electrona carlsbergi	A. gazella	1.25	7.10	1.33	56	3.40	9.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Electrona carlsbergi	A. gazella	1.25	8.10		18	7.30	8.40	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
Electrona carlsbergi	A. gazella	1.00	8.50	1.00	80	6.00	10.10	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Electrona carlsbergi	A. gazella	0.80	8.01		23	6.30	8.98	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Electrona carlsbergi	A. gazella	0.75	8.02		26			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Electrona carlsbergi	Arctocephalus spp.	1.38	5.87	0.35	30	4.85	6.79	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
Electrona carlsbergi	A. tropicalis	1.50	6.50	0.87	114	3.80	8.80	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Electrona subaspera	A. forsteri	1.20	6.94	1.01	42			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Electrona subaspera	A. forsteri	1.20	8.55	0.70	57			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Electrona subaspera	A. gazella	0.75	7.14		8	4.84	8.41	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Electrona subaspera	A. gazella	1.25	8.00	1.34	98	3.90	10.60	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Electrona subaspera	A. gazella	1.25	8.52	1.59	103	1.69	12.59	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
Electrona subaspera	A. gazella	1.50	10.82		2030	6.25	12.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Electrona subaspera	A. gazella	0.75	7.40		120			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Electrona subaspera	Arctocephalus spp.	1.38	7.94	0.57	5			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Electrona subaspera	Arctocephalus spp.	1.38	6.53	0.64	22			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Electrona subaspera	A. forsteri	1.20	7.65	1.40	15			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Electrona subaspera	A. tropicalis	1.50	7.80	1.34	70	5.00	12.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Electrona subaspera	A. tropicalis	1.50	8.21	1.48	58	1.69	12.59	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Electrona subaspera	M. leonina	3.45	10.70		1			Green and Burton 1993	Macquarie Island, Southern Ocean	1988
Electrona sp.	A. forsteri	1.40	§ 5.00		280	2.00	7.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Gymnoscopelus bolini	A. gazella	0.75	6.50		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gymnoscopelus bolini	A. gazella	1.25	11.70	1.41	12	9.70	14.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus bolini	A. gazella	0.75	18.50		17			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gymnoscopelus bolini	A. tropicalis	1.50	10.60	2.71	40	6.50	14.50	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus braueri	A. gazella	0.75	6.59		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gymnoscopelus braueri	A. gazella	1.00	8.20	1.10	5	6.90	9.60	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Gymnoscopelus braueri	A. gazella	1.25	10.30		6	8.60	11.60	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
Gymnoscopelus braueri	A. gazella	0.80	10.63		19	8.16	12.49	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Gymnoscopelus braueri	A. gazella	0.75	9.59		1			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gymnoscopelus braueri	M. leonina	3.45	11.20		1			Green and Burton 1993	Heard Island, Indian Ocean	1988
Gymnoscopelus fraseri	A. gazella	0.75	7.90		15	6.77	8.56	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gymnoscopelus fraseri	A. gazella	1.25	8.80	2.08	189	5.80	13.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus fraseri	A. gazella	0.75	7.62		156			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gymnoscopelus fraseri	A. tropicalis	1.50	7.80	1.46	275	3.50	13.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus microlampas	A. gazella	1.25	9.00		2			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus microlampas	A. tropicalis	1.50	8.60	0.34	2	8.40	8.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus nicholsi	A. gazella	1.00	12.28		109	10.00	14.00	Daneri and Coria 1993	South Orkney Islands, S Atlantic	1988
Gymnoscopelus nicholsi	A. gazella	1.00	14.42	0.77	134	12.60	16.55	Daneri 1996	South Shetland Islands, S Atlantic	1992
Gymnoscopelus nicholsi	A. gazella	0.75	8.90		295	5.50	12.89	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gymnoscopelus nicholsi	A. gazella	1.25	12.92		114	5.20	8.80	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Gymnoscopelus nicholsi	A. gazella	1.25	12.78		474	6.00	17.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Gymnoscopelus nicholsi	A. gazella	1.25	8.40	2.22	46	5.70	14.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus nicholsi	A. gazella	1.00	13.36		105	11.51	15.29	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
Gymnoscopelus nicholsi	A. gazella	1.25	12.90		38	10.80	15.10	Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
Gymnoscopelus nicholsi	A. gazella	1.00	14.70	2.30	369	6.20	18.90	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Gymnoscopelus nicholsi	A. gazella	0.80	11.34		14	8.79	12.80	Kirkman et al. 2000	Bouvetøya Island, Southern Ocean	1998-1999
Gymnoscopelus nicholsi	A. gazella	0.75	11.74		144			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gymnoscopelus nicholsi	A. forsteri	1.20	13.35	1.51	52			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Gymnoscopelus nicholsi	A. forsteri	1.20	12.53	2.33	99			Green et al. 1990	Macquarie Island, Southern Ocean	1988-1989
Gymnoscopelus nicholsi	A. tropicalis	1.50	8.50	2.83	62	4.80	15.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus nicholsi	M. leonina	3.45	12.71	1.85	72	7.95	16.71	Daneri and Carlini 2002	South Shetland Islands, S Atlantic	1993-2000
Gymnoscopelus piabilis	A. gazella	0.75	1.30		32	8.22	14.29	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gymnoscopelus piabilis	A. gazella	1.25	12.30	1.80	447	4.70	15.50	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Gymnoscopelus piabilis	A. gazella	0.75	12.84		139			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Gymnoscopelus piabilis	Arctocephalus spp.	1.38	8.94	3.04	2	6.79	11.09	Goldsworthy et al. 1997	Macquarie Island, Southern Ocean	1990-1991
Gymnoscopelus piabilis	A. tropicalis	1.50	11.60	2.17	283	5.80	16.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Krefftichthys anderssoni	A. gazella	1.25	3.30		2	3.30	3.30	North 1996	South Georgia Island, S Atlantic	1983
Krefftichthys anderssoni	A. gazella	0.75	3.90		7	2.90	5.40	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Krefftichthys anderssoni	A. gazella	1.25	5.60		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Krefftichthys anderssoni	A. gazella	1.50	4.55		2790	2.75	7.25	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Krefftichthys anderssoni	A. gazella	1.50	3.38		350	2.75	8.25	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Krefftichthys anderssoni	A. gazella	1.25	5.60		1			Klages et al. 1999	Bouvetøya Island, Southern Ocean	1996-1997
Krefftichthys anderssoni	A. gazella	1.00	8.50	0.30	3	8.20	8.70	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Krefftichthys anderssoni	A. gazella	0.75	3.52		47			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Krefftichthys anderssoni	A. tropicalis	1.50	4.40		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Lampadena luminosa	L. hosei	2.33			255	7.50	10.50	Robison and Craddock 1983	E Tropical Pacific	1972
Lampadena luminosa	L. hosei	2.33	10.20	SE 0.09	245	8.10	14.60	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Lampadena luminosa	S. longirostris	1.70	8.24	SE 0.09	241	4.90	11.40	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Lampadena sp.	L. hosei	2.33			9	6.00	7.00	Robison and Craddock 1983	E Tropical Pacific	1972
Lampanyctodes hectoris	A. forsteri	1.40	§ 4.60		1801	2.00	6.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Lampanyctodes hectoris	A. p. pusillus	0.85	4.80		595			David 1987	Benguela, South Africa	1974-1985
Lampanyctodes hectoris	A. p. pusillus	0.85	5.00		1849			David 1987	Benguela, South Africa	1974-1985
Lampanyctodes hectoris	S. attenuata	2.05	5.66		88	4.43	6.71	Wang et al. 2003	Taiwan	1994-1995

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Lampanyctus cf. idostigma	L. hosei	2.33			208	6.00	9.50	Robison and Craddock 1983	E Tropical Pacific	1972
Lampanyctus cf. nobilis	L. hosei	2.33			103	7.00	12.00	Robison and Craddock 1983	E Tropical Pacific	1972
Lampichthys procerus	A. gazella	1.25	6.90	0.64	4	6.00	7.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Metelectrona ventralis	A. gazella	0.75	6.18		16	4.90	7.16	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Metelectrona ventralis	A. gazella	1.25	7.10	1.26	78	3.80	10.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Metelectrona ventralis	A. gazella	0.75	6.90		11			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Metelectrona ventralis	A. tropicalis	1.50	7.10	1.44	188	3.20	12.20	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Myctophum asperum	S. attenuata	2.05	7.60		675	6.63	8.42	Wang et al. 2003	Taiwan	1994-1995
Myctophum nitidulum	L. hosei	2.33	4.50	SE 0.44	3	3.70	5.10	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Myctophum nitidulum	S. attenuata	2.05	5.64	0.52	14	4.67	6.31	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Myctophum nitidulum	S. longirostris	1.70	5.72	SE 0.05	166	4.10	7.30	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Protomyctophum andriashevi	A. gazella	0.75	5.12		2			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Protomyctophum bolini	A. gazella	1.25	4.80	1.60	3	3.70	6.70	North 1996	South Georgia Island, S Atlantic	1983
Protomyctophum bolini	A. gazella	0.75	3.70		17	3.25	4.14	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Protomyctophum bolini	A. gazella	1.25	5.70	1.94	11	2.80	9.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Protomyctophum bolini	A. gazella	0.75	3.99		81			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Protomyctophum bolini	A. tropicalis	1.50	4.00	0.54	9	2.90	5.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Protomyctophum choriodon	A. gazella	1.25	7.10	0.50	4	6.50	7.50	North 1996	South Georgia Island, S Atlantic	1983
Protomyctophum choriodon	A. gazella	0.75	7.00		11	5.78	7.85	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Protomyctophum choriodon	A. gazella	1.25	8.60	2.07	82	4.00	13.70	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Protomyctophum choriodon	A. gazella	0.75	8.52		261	7.25	9.25	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
Protomyctophum choriodon	A. gazella	0.75	8.73		241	7.25	9.75	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
Protomyctophum choriodon	A. gazella	0.75	9.25		215	7.25	11.25	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
Protomyctophum choriodon	A. gazella	0.75	6.68		114			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Protomyctophum choriodon	A. tropicalis	1.50	9.50	1.37	73	5.40	13.10	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Protomyctophum tenisoni	A. gazella	0.75	4.02		2	3.52	4.52	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Protomyctophum tenisoni	A. gazella	1.25	4.60	0.51	322	1.90	6.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Protomyctophum tenisoni	A. gazella	0.75	4.16		32			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Protomyctophum tenisoni	A. tropicalis	1.50	4.60	0.60	225	2.60	7.90	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Symbolophorus evermanni	L. hosei	2.33	6.48	SE 0.05	43	5.80	7.60	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Symbolophorus evermanni	S. longirostris	1.70	6.48	SE 0.03	243	5.30	7.90	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Symbolophorus sp.	A. forsteri	1.40	§ 8.50		421	2.00	14.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Symbolophorus spp.	S. attenuata	2.05	6.66	0.7	273	4.09	8.24	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Myctophidae	P. dalli	1.95	6.54		166	3.50	10.50	Crawford 1981	N Pacific	1978-1979
Muraenolepis microps	A. gazella	1.25	38.30	0.70	4	37.50	39.10	North 1996	South Georgia Island, S Atlantic	1983
Albatrossia pectoralis	B. bairdii	11.10	21.28		5	10.18	34.58	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Albatrossia pectoralis	B. bairdii	11.10	21.91		7	16.90	28.16	Walker et al. 2002	Sea of Okhotsk	1988-1989
Coryphaenoides acrolepis	B. bairdii	9.95	73.30	11.08	72	45.00	95.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
Coryphaenoides acrolepis	B. bairdii	11.10	22.07		55	4.06	28.74	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Coryphaenoides cinereus	B. bairdii	11.10	11.92		330	6.99	17.92	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Coryphaenoides cinereus	B. bairdii	10.32	35.84	3.1	3	30.00	35.00	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
Coryphaenoides cinereus	B. bairdii	9.95	35.33	4.25	40	25.00	45.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
Coryphaenoides cinereus	B. bairdii	11.10	10.85		5	9.13	12.13	Walker et al. 2002	Sea of Okhotsk	1988-1989
Coryphaenoides longifilis	B. bairdii	9.95	75.70	6.54	158	55.00	100.00	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
Nezumia bairdi	P. groenlandica	1.70	30.50		9			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Macrouridae	A. p. pusillus	0.85	26.10		1			David 1987	Benguela, South Africa	1974-1985
Macrouridae	A. p. pusillus	0.85	26.10		144			David 1987	Benguela, South Africa	1974-1985
Antimora microlepis	B. bairdii	11.10	46.94		13	28.74	83.80	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Auchenoceros punctatus	A. forsteri	1.40	§ 11.50		871	5.00	15.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Auchenoceros punctatus	P. hookeri	2.00	10.00		166	7.00	13.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Laemonema longipes	B. bairdii	11.10	51.01		766	18.73	71.26	Walker et al. 2002	Honshu, NW Pacific	1985-1991
Laemonema longipes	B. bairdii	10.32	17.79	6.3	27	5.00	30	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
Laemonema longipes	B. bairdii	9.95	36.04	9.09	55	15.00	55	Ohizumi et al. 2003	Wada, Japan, N Pacific	Jul - Aug 1999
Laemonema longipes	B. bairdii	11.10	35.82		41	30.76	42.78	Walker et al. 2002	Sea of Okhotsk	1988-1989
Pseudophycis bachus	A. p. doriferus	1.70	19.80	5.70	13	15.00	35.00	Gales and Pemberton 1994	Tasmania	1984-1986

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Pseudophycis sp.	P. hookeri	2.00	36.00		20	20.00	50.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Melanonus sp.	L. hosei	2.33			71	12.00	22.00	Robison and Craddock 1983	E Tropical Pacific	1972
Arctogadus glacialis	M. monoceros	4.45	18.60		376	9.30	26.60	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
Arctogadus glacialis	M. monoceros	4.45	20.00		616	10.00	40.00	Heide-Jorgensen et al. 1994	Inglefield Bredning, Greenland	1984, 1985
Arctogadus glacialis	P. groenlandica	1.70	21.10		338			Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	D. leucas	4.25	14.54		125	9.00	21.50	Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	E. barbatus	2.25	13.40		272	6.90	23.60	Finley and Evans 1983	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	M. monoceros	4.45	11.30		607	4.80	21.50	Finley and Gibb 1982	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	M. monoceros	4.45	15.70		557	12.00	24.00	Heide-Jorgensen et al. 1994	Inglefield Bredning, Greenland	1984, 1985
Boreogadus saida	P. fasciata	1.60	15.87		92	12.00	21.00	Frost and Lowry 1980	Bering Sea	1976-1979
Boreogadus saida	P. groenlandica	1.70	13.40		648	4.80	23.60	Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	P. groenlandica	1.70	13.30		7			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Boreogadus saida	P. hispida	1.30	10.50		4047	4.80	23.60	Finley et al. 1983, Finley et al. 1990	Baffin Bay, NW Atlantic	1978-1979
Boreogadus saida	P. hispida	1.30	10.90	2.00	4847	4.90	16.10	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Boreogadus saida	P. largha	1.75	14.90		326	7.60	20.50	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
Eleginus gracilis	D. leucas	4.25	12.48		530	5.50	30.50	Seaman et al. 1982	Bering Sea	1978
Eleginus gracilis	P. largha	1.75	16.70		131	6.20	25.10	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
Gadus morhua	C. cristata	2.25	36.40		68	14.00	73.00	Hauksson and Bogason 1997	Iceland	1992-1993
Gadus morhua	H. grypus	2.08	17.30	11.40	101	10.00	40.00	Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Gadus morhua	H. grypus	2.08	32.14		63	5.00	65.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Gadus morhua	H. grypus	2.08	32.21		61	5.00	75.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Gadus morhua	H. grypus	2.08	28.27		49	5.00	75.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Gadus morhua	H. grypus	2.08	29.75		180	2.50	72.50	Prime and Hammond 1990	Donna Nook, SW North Sea	1985
Gadus morhua	H. grypus	2.08	31.01		172	2.50	67.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Gadus morhua	H. grypus	2.08	32.29		145	2.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Gadus morhua	H. grypus	2.08	28.20		269	6.70	79.70	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Gadus morhua	H. grypus	2.08	25.80	SE 0.92	115	10.00	55.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Gadus morhua	H. grypus	2.08	18.80		81	2.50	37.50	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
Gadus morhua	H. grypus	2.08			468	30.00	50.00	Hauksson and Bogason 1997	Iceland	1992-1993
Gadus morhua	P. groenlandica	1.70	23.80		2			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Gadus morhua	P. groenlandica	1.70	24.70		25	15.00	40.00	Nilssen et al. 1990	Ullsford, Norway	1986
Gadus morhua	P. groenlandica	1.70	33.40		99	5.00	65.00	Nilssen et al. 1990	Ullsford, Norway	1988
Gadus morhua	P. groenlandica	1.70	14.00		43			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Gadus morhua	P. groenlandica	1.70	15.90		38	3.00	48.00	Hauksson and Bogason 1997	Iceland	1992-1993
Gadus morhua	P. vitulina	1.55	14.40		49			Behrends 1982	Waddensea, North Sea	1975-1981
Gadus morhua	P. vitulina	1.55	35.20	SE 2.08	33	5.00	50.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
Gadus morhua	P. vitulina	1.55	19.00	SE 0.75	46	10.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
Gadus morhua	P. phocoena	1.65	29.00		5	26.00	32.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
Gadus morhua	P. phocoena	1.65	15.90	SE 1.72				Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
Gadus morhua	P. phocoena	1.65	24.10	13.30	5			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Gadus morhua	P. phocoena	1.65	28.10	5.80	30			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Gadus ogac	P. groenlandica	1.70	14.00		3			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Melanagrammus aeglefinus	H. grypus	2.08	23.50		2			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Melanagrammus aeglefinus	H. grypus	2.08	32.40		2	14.80	57.20	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Melanagrammus aeglefinus	H. grypus	2.08			20	20.00	40.00	Hauksson and Bogason 1997	Iceland	1992-1993
Melanagrammus aeglefinus	P. groenlandica	1.70	16.80		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Melanagrammus aeglefinus	P. phocoena	1.65	18.20	3.00	4			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Merlangius merlangus	H. grypus	2.08	21.25		1318	9.00	37.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Merlangius merlangus	H. grypus	2.08	26.50		203	9.00	43.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Merlangius merlangus	P. phocoena	1.65	18.70	4.00	65	14.00	29.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Merlangius merlangus	P. phocoena	1.65	5.77	2.60	449	2.00	12.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Microgadus proximus	P. vitulina	1.55	14.00		8	4.00	23.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Micromesistius poutassou	P. phocoena	1.65	27.80	13.70	5			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Pollachius pollachius	P. phocoena	1.65	5.60	0.10	2			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Pollachius virens	H. grypus	2.08	37.94		79	7.50	72.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Pollachius virens	H. grypus	2.08	45.71		63	22.50	92.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Pollachius virens	H. grypus	2.08	10.90		2	8.10	13.80	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Pollachius virens	H. grypus	2.08	20.00	SE 1.04	55	5.00	35.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Pollachius virens	H. grypus	2.08			48	10.00	60.00	Hauksson and Bogason 1997	Iceland	1992-1993
Pollachius virens	P. vitulina	1.55	20.50	SE 1.56	19	5.00	30.00	Bowen and Harrison 1996	Bay of Fundy, NW Atlantic	1988-1992
Pollachius virens	P. vitulina	1.55	17.70	SE 0.38	122	10.00	35.00	Bowen and Harrison 1996	Nova Scotia, Canada	1988-1992
Pollachius virens	P. phocoena	1.65	19.50	10.10	76			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Pollachius virens	P. phocoena	1.65	17.40	6.40	91			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Theragra chalcogramma	C. ursinus	1.40	19.30		n.a.**	10.00	35.00	McAlister et al. 1976	Bering Sea	1974
Theragra chalcogramma	C. ursinus	1.21	32.97		39	6.00	41.00	Sinclair et al. 1994	Bering Sea	1981
Theragra chalcogramma	C. ursinus	1.16	6.70		1191	3.00	42.00	Sinclair et al. 1994	Bering Sea	1982
Theragra chalcogramma	C. ursinus	1.24	13.03		1428	4.00	47.00	Sinclair et al. 1994	Bering Sea	1985
Theragra chalcogramma	C. ursinus	1.40	29.19		59	6.80	48.00	Kiyota et al. 1999	St. Paul Island, Bering Sea	1996
Theragra chalcogramma	C. ursinus	1.40			n.a.**	6.00	20.00	Swartzman and Haar 1983	NE Pacific & Bering Sea	1960-1974
Theragra chalcogramma	C. ursinus	1.40	30.40		n.a.**			Lowry et al. 1989	Bering Sea	1981-1982
Theragra chalcogramma	E. jubatus	2.55	25.20		1135	8.30	64.20	Frost and Lowry 1986	Bering Sea	1981
Theragra chalcogramma	E. jubatus	2.55	29.80	11.60	2030	5.60	62.90	Pitcher 1981	Gulf of Alaska	1975-1978
Theragra chalcogramma	E. jubatus	2.55	46.90		280	18.40	61.40	Frost and Lowry 1986	Pribilof Islands, Bering Sea	1976, 1979
Theragra chalcogramma	E. jubatus	2.20	25.50		80	4.80	55.70	Calkins and Goodwin 1988	Kodiak Island, Gulf of Alaska	1985-1986
Theragra chalcogramma	E. jubatus	2.25	25.40		1064	7.90	54.20	Calkins and Goodwin 1988	SE Alaska, Gulf of Alaska	1985-1986
Theragra chalcogramma	E. jubatus	2.55	42.40	11.6	909	10.00	78.10	Tollit et al. 2004a	SE Alaska	1994-1999
Theragra chalcogramma	E. jubatus	2.28	39.30	14.3	666	3.70	70.80	Zeppelin et al. 2004	Aleutian Is. (western stock)	1998-2000
Theragra chalcogramma	E. barbatus	2.25	11.80	0.15	56	6.90	14.30	Antonelis et al. 1994b	Bering Sea	1981
Theragra chalcogramma	P. fasciata	1.60	10.26		447	6.00	20.00	Frost and Lowry 1980	Bering Sea	1976-1979
Theragra chalcogramma	P. fasciata	1.60	11.20		468	6.50	34.40	Frost and Lowry 1986	Bering Sea	1976-1978
Theragra chalcogramma	P. largha	2.25	10.90		21	8.00	15.00	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
Theragra chalcogramma	P. largha	1.75	10.90		21	8.00	15.00	Frost and Lowry 1986	Bering Sea	1978
Theragra chalcogramma	P. vitulina	1.55	31.80		23	10.30	56.30	Frost and Lowry 1986	Pribilof Islands, Bering Sea	1979
Theragra chalcogramma	P. vitulina	1.55	10.60		12	8.20	12.60	Frost and Lowry 1986	Bering Sea	1981
Theragra chalcogramma	P. vitulina	1.55	19.20	9.60	2180	4.20	53.20	Pitcher 1981	Gulf of Alaska	1975-1978
Theragra chalcogramma	B. acutorostrata	7.30	14.50		121	11.80	17.50	Frost and Lowry 1986	Bering Sea	1975
Theragra chalcogramma	B. bairdii	9.95	47.32	8.44	13	35.00	60.00	Ohizumi et al. 2003	Abahiri, Japan, Sea of Okhotsk	Jul - Aug 1999
Theragra chalcogramma	P. dalli	1.95	22.61		135	6.50	60.50	Walker 1996	Sea of Okhotsk	1988-1989
Theragra chalcogramma	P. dalli	1.89	33.64		639	15.08	52.48	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Theragra chalcogramma	P. dalli	1.95	25.90		113	12.70	36.30	Walker et al. 1998	Washington and British Columbia	1990-1997
Theragra chalcogramma	B. pysalus	20.70	<=30.00		n.a.**			Nemoto 1959	N Pacific	1952-1958
Theragra chalcogramma	C. ursinus	1.40	tly <30-35 cm (p. 36)"					Fiscus et al. 1964, cited in Frost and Lowry 1986	Bering Sea	1962
Theragra chalcogramma	C. ursinus	1.40			1721	4.00	40.00	Perez and Bigg 1986	N Pacific	1958-1974
Theragra chalcogramma	E. barbatus	2.25	8.20					Antonelis pers. com., cited in Frost and Lowry 1986	St. Matthew Island, Bering Sea	<1983
Theragra chalcogramma	E. jubatus	2.55	21.80			10.30	51.60	Lowry et al. 1989	St. Matthew Island, Bering Sea	1985
Theragra chalcogramma	E. jubatus	2.55	33.50			20.80	44.50	Lowry et al. 1989	St. Paul Island, Bering Sea	1985
Theragra chalcogramma	E. jubatus	2.55	29.90			1.70	42.70	Lowry et al. 1989	E Aleutian Islands, Gulf of Alaska	1981-1982
Theragra chalcogramma	M. novaeangliae	13.00	>=30.00		n.a.**			Nemoto 1959	N Pacific	1952-1958
Theragra chalcogramma	P. phocoena	1.65	18.64		3	18.50	18.80	Walker et al. 1998	Washington and British Columbia	1990-1997
Trisopterus esmarkii	P. phocoena	1.65	12.40	2.20	381			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Trisopterus minutus	P. phocoena	1.65	14.70	1.30	14			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Enchelyopus cimbrius	P. groenlandica	1.70	25.90		5			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Enchelyopus cimbrius	P. phocoena	1.65	23.60	4.70	18			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Molva molva	H. grypus	2.08	28.06		81	5.00	85.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Molva molva	H. grypus	2.08	32.83		60	5.00	85.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Molva molva	H. grypus	2.08	32.53		77	5.00	105.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Molva molva	H. grypus	2.08	33.30		256	2.50	77.50	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Urophycis tenuis	H. grypus	2.08	22.20	SE 1.48	12			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Urophycis tenuis	P. groenlandica	1.70	27.30		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Urophycis spp.	P. phocoena	1.65	15.90	14.60	474			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Macruronus magellanicus	O. flavescens	1.89	47.50	8.90	206	20.00	70.00	George-Nascimento et al. 1985	Chile	1979-1981
Merluccius albidus	P. groenlandica	1.70	29.60		24			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Merluccius bilinearis	H. grypus	2.08	30.30		2	21.10	42.30	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Merluccius bilinearis	H. grypus	2.08	25.40	SE 1.03	43	10.00	45.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Merluccius bilinearis	H. grypus	2.08	25.67		30	15.00	35.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
Merluccius bilinearis	P. groenlandica	1.70	26.00		1			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Merluccius bilinearis	P. phocoena	1.65	19.60	SE 0.18	173			Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
Merluccius bilinearis	P. phocoena	1.65	16.40	9.60	1605	3.00	38.00	Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Merluccius capensis	A. p. pusillus	2.05	28.19		64			Castley et al. 1991	Benguela, South Africa	1976-1990
Merluccius hubbsi	C. commersonii	1.48	9.90		n.a.**	0.10	20.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Merluccius hubbsi	L. obscurus	2.05	20.00		n.a.**	0.10	45.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Merluccius hubbsi	O. flavescens	1.85	26.70		n.a.**	10.00	55.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Merluccius hubbsi	O. flavescens	1.85	29.10		n.a.**	15.00	60.00	Crespo et al. 1997	San Jorge Gulf, Patagonia	1989-1994
Merluccius merluccius	P. phocoena	1.65	14.50	1.50	4			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Merluccius productus	C. ursinus	1.40	15.00		2			Perez and Bigg 1986	N Pacific	1958-1974
Merluccius productus	M. angustirostris	3.60	28.74		252	15.40	51.80	Antonelis et al. 1994a	San Miguel Island, NE Pacific	1978-1979
Merluccius productus	P. phocoena	1.65	35.30		15	33.80	37.10	Walker et al. 1998	Washington and British Columbia	1990-1997
Merluccius productus	P. dalli	1.95	41.75		7	39.70	43.80	Walker et al. 1998	Washington and British Columbia	1990-1997
Merluccius productus	Z. californianus	2.20	30.70		1856	13.00	58.00	Bailey and Ainley 1982	Farallon Islands, NE Pacific	1974-1978
Merluccius productus	Z. californianus	2.00	16.60	6.00	222	8.90	26.10	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Merluccius productus	Z. californianus	1.80	18.60		35	4.90	26.80	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Merluccius spp.	A. p. pusillus	0.85	29.50		116			David 1987	Benguela, South Africa	1974-1985
Merluccius spp.	A. p. pusillus	0.85	17.40		350			David 1987	Benguela, South Africa	1974-1985
Merluccius spp.	A. p. pusillus	0.85	21.30		1177			David 1987	Benguela, South Africa	1974-1985
Merluccius spp.	C. heavisidii	1.57	19.50	4.20	160	4.90	28.60	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Merluccius spp.	D. delphis	2.08	18.10	8.00	203	5.10	39.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Merluccius spp.	F. attenuata	2.33	6.30	0.50	6	5.70	7.20	Sekiguchi et al. 1992	Benguela, South Africa	1990
Merluccius spp.	K. breviceps	2.52	21.30	2.60	11	16.20	25.50	Sekiguchi et al. 1992	Benguela, South Africa	1975-1990
Merluccius spp.	K. sima	2.23	21.60	3.20	20	16.60	26.80	Sekiguchi et al. 1992	Benguela, South Africa	1975-1988
Merluccius spp.	L. obscurus	1.71	16.50	7.20	216	4.80	42.10	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Merluccius spp.	M. densirostris	3.52	6.90	1.20	6	5.90	8.50	Sekiguchi et al. 1992	Benguela, South Africa	1981
Merluccius spp.	S. coeruleoalba	2.03	14.90	2.60	12	7.80	17.20	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Merluccius spp.	T. truncatus	2.72	28.30	6.00	15	17.10	42.30	Sekiguchi et al. 1992	Benguela, South Africa	1975-1989
Genypterus blacodes	P. hookeri	2.00			4	68.00	124.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Genypterus capensis	A. p. pusillus	0.85	45.90		25			David 1987	Benguela, South Africa	1974-1985
Genypterus capensis	A. p. pusillus	2.05	52.73		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Porichthys notatus	P. vitulina	1.55	21.80		73	7.00	39.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
Chorisochismus dentex	A. p. pusillus	0.85	9.50		1			David 1987	Benguela, South Africa	1974-1985
Cololabis saira	C. ursinus	1.40	25.00		4			Perez and Bigg 1986	N Pacific	1958-1974
Scomberesox saurus	A. p. pusillus	0.85	24.20		29			David 1987	Benguela, South Africa	1974-1985
Oxyporhamphus micropterus	S. attenuata	2.05	14.34	1.51	40	12.22	18.01	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Exocoetus moncirrhus	S. attenuata	2.05	16.47	1.68	19	13.69	19.37	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Exocoetus volitans	S. attenuata	2.05	15.87	2.22	68	9.09	18.74	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Melamphaes sp.	P. dalli	1.95	8.38		8	7.80	9.00	Crawford 1981	N Pacific	1978-1979
Scopelogadus mizolepis bispinosus	L. hosei	2.33			143	3.00	6.50	Robison and Craddock 1983	E Tropical Pacific	1972
Diretmus argenteus	L. hosei	2.33			363	6.00	28.50	Robison and Craddock 1983	E Tropical Pacific	1972
Pungitius pungitius	D. leucas	4.25	3.20		1			Seaman et al. 1982	Bering Sea and Chukchi Sea	1978
Helicolenus dactylopterus	A. p. pusillus	0.85	20.00		1			David 1987	Benguela, South Africa	1974-1985
Helicolenus dactylopterus	A. p. pusillus	0.85	23.20		13			David 1987	Benguela, South Africa	1974-1985
Helicolenus dactylopterus	A. p. pusillus	0.85	20.00		145			David 1987	Benguela, South Africa	1974-1985
Sebastes marinus	P. hispida	1.30	45.00		3286	10.00	120.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Sebastes sp.	C. cristata	2.25	32.40		n.a.**	23.00	43.00	Hauksson and Bogason 1997	Iceland	1992-1993
Sebastes sp.	H. grypus	2.08			n.a.**	20.00	30.00	Hauksson and Bogason 1997	Iceland	1992-1993

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Sebastes sp.	P. groenlandica	1.70	11.40		257			Murie and Lavigne 1991	Gulf of St. Lawrence, NW Atlantic	1983
Sebastes sp.	Z. californianus	2.00	17.10	2.20	155	12.90	22.70	Antonelis et al. 1984	San Miguel Island, NE Pacific	1978-1979
Sebastes spp.	C. ursinus	1.40			>19	11.00	31.00	Perez and Bigg 1986	N Pacific	1958-1974
Sebastes spp.	H. grypus	2.08	14.15		71	10.00	25.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
Sebastes spp.	P. phocoena	1.65	3.70	0.30	47			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Sebastes spp.	Z. californianus	1.80	12.10		31	9.20	14.60	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Chelidonichthys capensis	A. p. pusillus	0.85	15.00		10			David 1987	Benguela, South Africa	1974-1985
Anoplopoma fimbria	mixed taxa	n.a.	25.00		1			Stroud et al. 1980	NE Pacific	1958-1972
Pleurogrammus azonus	P. dalli	1.89	21.60		154	13.70	28.94	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Pleurogrammus monopterygius	C. ursinus	1.40			>5	15.00	23.00	Perez and Bigg 1986	N Pacific	1958-1974
Pleurogrammus monopterygius	E. jubatus	2.28	32.30	5.9	1685	15.30	49.60	Zeppelin et al. 2004	Aleutian Is. (western stock)	1998-2000
Pleurogrammus monopterygius	P. dalli	1.95	13.10		1			Crawford 1981	N Pacific	1978-1979
Leptocottus armatus	P. vitulina	1.55	11.00		85	4.00	21.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Leptocottus armatus	P. vitulina	1.55	14.03		72	5.00	25.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
Myoxocephalus scorpius	H. grypus	2.08	24.60		1			Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Myoxocephalus scorpius	H. grypus	2.08			n.a.**	15.00	25.00	Hauksson and Bogason 1997	Iceland	1992-1993
Myoxocephalus scorpius	P. hispida	1.30	11.14		35	8.00	18.00	Weslawski et al. 1994	Svalbard, Greenland Sea	1985-1987
Cottidae	P. groenlandica	1.70	12.00		7			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Cottidae	P. largha	1.75	10.00		19	3.30	16.50	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
Cyclopterus lumpus	H. grypus	2.08	15.50	0.50	15			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Cyclopterus lumpus	H. grypus	2.08	24.90		26	15.00	29.20	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Decapterus macrosoma	S. attenuata	2.05	20.06		55	16.11	22.20	Wang et al. 2003	Taiwan	1994-1995
Trachurus capensis	A. p. pusillus	0.85	10.80		66			David 1987	Benguela, South Africa	1974-1985
Trachurus capensis	A. p. pusillus	0.85	16.30		449			David 1987	Benguela, South Africa	1974-1985
Trachurus capensis	A. p. pusillus	0.85	14.80		3542			David 1987	Benguela, South Africa	1974-1985
Trachurus capensis	A. p. pusillus	2.05	27.15		56			Castley et al. 1991	Benguela, South Africa	1976-1990
Trachurus capensis	C. heavisidii	1.57	17.10	2.40	23	10.70	22.20	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Trachurus capensis	D. delphis	2.08	16.20	6.20	134	4.60	34.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Trachurus capensis	G. griseus	2.79	32.60		1			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Trachurus capensis	L. obscurus	1.71	9.90	3.00	723	4.20	24.90	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Trachurus capensis	T. truncatus	2.72	20.10	1.10	8	18.10	21.30	Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Trachurus declivis	A. forsteri	1.40	31.00	5.00	145			Lake 1997	Tasmania	1992-1993
Trachurus declivis	A. p. doriferus	1.70	21.20	2.80	48	16.00	31.00	Gales and Pemberton 1994	Tasmania	1984-1986
Trachurus symmetricus	Z. californianus	1.80	13.10		12	10.90	16.20	Melin 2002	San Miguel Island, NE Pacific	1993, 1996
Trachurus sp.	A. forsteri	1.40			3	80.00	90.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Trachurus sp.	A. forsteri	1.40			10	50.00	60.00	Fea et al. 1999	Otago Peninsula, New Zealand	1993-1994
Trachurus sp.	M. monachus	2.40	30.00		50			Sergeant et al. 1979	Madeira, North Atlantic	1957
Trachurus sp.	P. hookeri	2.00	38.00		47	27.00	45.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Emmelichthys nitidus	A. forsteri	1.40	16.00	4.00	315			Lake 1997	Tasmania	1992-1993
Emmelichthys nitidus	A. p. doriferus	1.70	17.00	1.20	194	14.00	21.00	Gales and Pemberton 1994	Tasmania	1984-1986
Eucinostomus argenteus	S. fluviatilis	1.78	11.91		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
Orthopristis ruber	S. fluviatilis	1.78	3.73	0.73	2	3.21	4.24	de Oliveira Santos et al. 2002	Brazil	1995-1998
Pomadasys corvinaeformis	S. fluviatilis	1.78	9.06	1.98	7	4.92	10.80	de Oliveira Santos et al. 2002	Brazil	1995-1998
Argyrozona argyrozona	A. p. pusillus	0.85	16.10		2			David 1987	Benguela, South Africa	1974-1985
Argyrozona argyrozona	A. p. pusillus	2.05	37.03		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Cheimerius nufar	A. p. pusillus	2.05	11.75		1			Castley et al. 1991	Benguela, South Africa	1976-1990
Pagellus natalensis	A. p. pusillus	2.05	22.87		7			Castley et al. 1991	Benguela, South Africa	1976-1990
Pagrus africanus	M. monachus	2.40	35.00		1			Sergeant et al. 1979	Madeira, North Atlantic	1957
Pterogymnus laniarius	A. p. pusillus	0.85	20.00		15			David 1987	Benguela, South Africa	1974-1985
Pterogymnus laniarius	A. p. pusillus	2.05	28.36		15			Castley et al. 1991	Benguela, South Africa	1976-1990
Argyrosomus hololepidotus	A. p. pusillus	2.05	34.68		2			Castley et al. 1991	Benguela, South Africa	1976-1990
Cynoscion jamaicensis	S. fluviatilis	1.78	9.35	5.16	2	5.70	13.00	de Oliveira Santos et al. 2002	Brazil	1995-1998
Cynoscion leiarchus	S. fluviatilis	1.78	24.80		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
Genyonemus lineatus	P. vitulina	1.55	22.20		40	13.00	29.00	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
Isopisthus parvipinnis	S. fluviatilis	1.78	13.98	2.73	56	10.24	19.81	de Oliveira Santos et al. 2002	Brazil	1995-1998

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Larimus breviceps	S. fluviatilis	1.78	10.51	1.60	6	8.71	12.98	de Oliveira Santos et al. 2002	Brazil	1995-1998
Macrodon ancylodon	S. fluviatilis	1.78	28.10		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
Micropogonias furnieri	S. fluviatilis	1.78	16.23	7.16	11	5.68	33.08	de Oliveira Santos et al. 2002	Brazil	1995-1998
Paralonchurus brasiliensis	S. fluviatilis	1.78	14.93	3.96	57	3.93	20.81	de Oliveira Santos et al. 2002	Brazil	1995-1998
Stellifer brasiliensis	S. fluviatilis	1.78	10.61	1.82	52	6.09	15.54	de Oliveira Santos et al. 2002	Brazil	1995-1998
Stellifer rastrifer	S. fluviatilis	1.78	6.19	0.99	657	3.48	10.84	de Oliveira Santos et al. 2002	Brazil	1995-1998
Mugil cephalus	A. p. pusillus	0.85	13.80		38			David 1987	Benguela, South Africa	1974-1985
Mugil spp.	S. fluviatilis	1.78	14.76	0.35	2	14.51	15.00	de Oliveira Santos et al. 2002	Brazil	1995-1998
Cymatogaster aggregata	P. vitulina	1.55	8.50		31	6.50	11.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Notolabrus sp.	P. hookeri	2.00	23.00		21	9.00	40.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Tautogolabrus adspersus	H. grypus	2.08	25.40		1			Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Odax pullus	P. hookeri	2.00	31.00		36	22.00	49.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Lycodes sp.	P. largha	1.75	27.30		6	22.30	30.90	Bukhtiyarov et al. 1984	Bering Sea	1976-1978
Lycodopsis pacifica	P. phocoena	1.65	10.43		1786	8.00	11.00	Walker et al. 1998	Washington and British Columbia	1990-1997
Lycodopsis pacifica	P. dalli	1.95	9.50		10175	8.00	10.50	Walker et al. 1998	Washington and British Columbia	1990-1997
Zoarces americanus	H. grypus	2.08	53.30		12	45.70	61.00	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Anarhichas lupus	H. grypus	2.08	29.60		3	22.90	35.60	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Anarhichas lupus	H. grypus	2.08			n.a.**	20.00	60.00	Hauksson and Bogason 1997	Iceland	1992-1993
Anarrhichthys ocellatus	P. vitulina		200.00		1			Baldridge and Rogers 1991	Point Lobos State Reserve, CA	1986
Dissostichus eleginoides	A. gazella	1.25	45.40		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Dissostichus eleginoides	H. planifrons	6.30	35.23	16.34	3			Slip et al. 1995	Heard Island, Indian Ocean	1992
Gobionotothen acuta	A. gazella	0.75	7.32		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Gobionotothen gibberifrons	A. gazella	1.25	31.60	11.70	55	5.90	54.00	North 1996	South Georgia Island, S Atlantic	1983
Gobionotothen gibberifrons	A. gazella	1.50	42.10		49	23.00	59.00	Reid 1995	South Georgia Island, S Atlantic	1992
Gobionotothen gibberifrons	A. gazella	1.50	43.22		46	21.00	59.00	Reid 1995	South Georgia Island, S Atlantic	1993
Gobionotothen gibberifrons	A. gazella	1.00	37.00		1			Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Gobionotothen marionensis	A. gazella	1.25	11.60	2.59	4	9.70	15.30	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Lepidonotothen larseni	A. gazella	1.25	14.70	3.30	91	7.80	22.00	North 1996	South Georgia Island, S Atlantic	1983
Lepidonotothen larseni	A. gazella	0.75	16.20		142	10.50	23.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
Lepidonotothen larseni	A. gazella	0.75	14.04		110	10.50	23.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
Lepidonotothen larseni	A. gazella	0.75	18.55		65	13.50	25.50	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
Lepidonotothen larseni	A. gazella	1.50	16.79		193	4.00	26.00	Reid 1995	South Georgia Island, S Atlantic	1992
Lepidonotothen larseni	A. gazella	1.50	20.30		187	11.00	28.00	Reid 1995	South Georgia Island, S Atlantic	1993
Lepidonotothen squamifrons	A. gazella	0.75	3.53		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Notothenia squamifrons	A. gazella	1.25	11.40	4.96	12	3.60	22.40	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Paranotothenia magellanica	A. gazella	1.25	14.00		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Paranotothenia magellanica	A. tropicalis	1.50	17.90		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Pleuragramma antarcticum	A. gazella	1.00	14.26	1.24	136	11.59	17.80	Daneri 1996	South Shetland Islands, S Atlantic	1992
Pleuragramma antarcticum	A. gazella	1.00	13.87		33	11.90	16.88	Daneri and Carlini 1999	South Shetland Islands, S Atlantic	1993-1994
Pleuragramma antarcticum	A. gazella	1.00	15.00	1.60	6	12.90	17.00	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Pleuragramma antarcticum	H. leptonyx	2.80	13.76	2.43	226	8.80	17.50	Green and Williams 1986	Davis Station, Antarctica	1984
Pleuragramma antarcticum	L. weddelii	3.00	16.24		80	12.00	21.00	Plötz et al. 1991	Weddell Sea, Antarctica	1998
Pleuragramma antarcticum	L. weddelii	3.00	15.41		1296	5.00	21.50	Plötz 1986	Weddell Sea, Antarctica	1983, 1985
Pleuragramma antarcticum	L. weddelii	3.00	16.05		1034	6.00	22.00	Plötz 1986	Weddell Sea, Antarctica	1983, 1985
Pleuragramma antarcticum	L. weddelii	3.00	11.64	2.33	26	5.20	19.10	Green and Burton 1987	Mawson, Antarctica	1983-1985
Pleuragramma antarcticum	L. weddelii	3.00	15.03	1.69	169	7.20	21.00	Green and Burton 1987	Davis Station, Antarctica	1983-1985
Pleuragramma antarcticum	L. weddelii	3.00	14.97	2.33	330	5.20	25.00	Green and Burton 1987	McMurdo Sound, Antarctica	1983-1985
Pleuragramma antarcticum	L. weddelii	3.00	14.07	4.27	168	5.07	25.91	Burns et al. 1998	McMurdo Sound, Antarctica	1989-1993
Pleuragramma antarcticum	L. carcinophagus	2.40	15.50		4	12.20	18.40	Green and Williams 1986	Davis Station, Antarctica	1984
Pleuragramma antarcticum	M. leonina	3.45	13.15	4.14	16	9.06	22.62	Daneri and Carlini 2002	South Shetland Islands, S Atlantic	1993-2000
Pleuragramma antarcticum	O. rossii	1.85	15.10		9	11.20	18.50	Skinner and Klages 1994	King Haakon VII Sea, Antarctica	1980-1982
Trematomus eulepidotus	L. weddelii	2.00	§ 18.70		68	14.40	23.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Trematomus lepidorhinus	L. weddelii	2.00	§ 14.90		12	12.30	19.30	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Trematomus nicolai	L. weddelii	2.00	§ 18.90		3	16.70	20.00	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Trematomus spp.	L. weddelii	3.00	23.34	7.89	6	12.73	34.10	Burns et al. 1998	McMurdo Sound, Antarctica	1989-1993

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Artedidraco loennbergi	L. weddelii	2.00	8.70		2	8.50	8.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Dolloidraco longedorsalis	L. weddelii	2.00	§ 9.40		5	7.70	9.60	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Histiodraco velifer	L. weddelii	2.00	9.85		2	8.90	10.80	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Gerlachea australis	L. weddelii	2.00	§ 20.60		7	19.00	22.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Gymnodraco acuticeps	L. weddelii	2.00	§ 24.60		7	18.00	29.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Racovitzia glacialis	L. weddelii	2.00	§ 19.10		65	12.20	22.90	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Chaenocephalus aceratus	A. gazella	1.25	49.30	4.50	7	41.40	53.40	North 1996	South Georgia Island, S Atlantic	1983
Champsocephalus gunnari	A. gazella	0.75	21.50		7	18.49	22.94	Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Champsocephalus gunnari	A. gazella	1.25	21.09		530	12.00	34.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Champsocephalus gunnari	A. gazella	1.50	20.80		1263	18.75	23.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Champsocephalus gunnari	A. gazella	1.50	22.42		877	18.25	27.75	Green et al. 1997	Heard Island, Indian Ocean	1993-1993
Champsocephalus gunnari	A. gazella	0.75	19.29	9.80	161			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Champsocephalus gunnari	M. leonina	3.45	30.11		6			Green and Burton 1993	Heard Island, Indian Ocean	1988
Champsocephalus gunnari	A. gazella	1.25	23.80	8.60	201	10.00	46.00	North 1996	South Georgia Island, S Atlantic	1983
Champsocephalus gunnari	A. gazella	0.75	31.88		328	15.00	45.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1994
Champsocephalus gunnari	A. gazella	0.75	24.27		158	15.00	47.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1993
Champsocephalus gunnari	A. gazella	0.75	38.11		18	27.00	49.00	Reid and Arnould 1996	South Georgia Island, S Atlantic	1991
Champsocephalus gunnari	A. gazella	1.50	21.72		1522	12.00	44.00	Reid 1995	South Georgia Island, S Atlantic	1992
Champsocephalus gunnari	A. gazella	1.50	25.09		660	16.00	46.00	Reid 1995	South Georgia Island, S Atlantic	1993
Champsocephalus gunnari	A. tropicalis	1.50	14.10		1			Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Channichthys rhinoceratus	A. gazella	1.25	32.52		101	20.00	44.00	Green et al. 1989	Heard Island, Indian Ocean	1987-1988
Channichthys rhinoceratus	M. leonina	3.45	37.83		4			Green and Burton 1993	Heard Island, Indian Ocean	1988
Chionodraco myersi	L. weddelii	2.00	§ 27.30		107	20.10	34.40	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Chionodraco rastrospinosus	A. gazella	1.00	15.10	2.20	2	13.60	16.70	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Cryodraco antarcticus	A. gazella	1.00	36.60	2.00	3	35.30	38.90	Casaux et al. 1998	South Shetland Islands, S Atlantic	1996-1997
Cryodraco antarcticus	L. weddelii	2.00	§ 27.00		28	20.80	32.40	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Pagetopsis maculatus	L. weddelii	2.00	§ 16.90		66	13.30	20.50	Plötz et al. 1991	Weddell Sea, Antarctica	1986
Pseudochaenichthys georgianus	A. gazella	1.25	28.80	2.40	26	24.10	34.80	North 1996	South Georgia Island, S Atlantic	1983
Ammodytes dubius	H. grypus	2.08	19.10	SE 0.47	139	5.00	25.00	Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Ammodytes hexapterus	P. vitulina	1.55	9.50		621	8.00	13.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Ammodytes hexapterus	P. phocoena	1.65	15.70		2			Walker et al. 1998	Washington and British Columbia	1990-1997
Ammodytes hexapterus	P. dalli	1.95	10.90		61	9.30	13.30	Walker et al. 1998	Washington and British Columbia	1990-1997
Ammodytes personatus	P. dalli	1.89	19.44		277	12.75	22.21	Ohizumi et al. 2000	Sea of Okhotsk & Sea of Japan	1988-1996
Ammodytes sp.	H. grypus	2.08	18.10		62			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Ammodytes sp.	H. grypus	2.08			n.a.**	15.00	35.00	Hauksson and Bogason 1997	Iceland	1992-1993
Ammodytes spp.	H. grypus	2.08	16.72		324	5.00	31.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	17.50		1878	5.00	43.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	16.29		418	3.00	43.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	16.82		1220	3.00	45.00	Hammond et al. 1994b	Hebrides Islands, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	13.93		6752	3.00	25.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	13.96		5943	1.00	25.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	16.67		1536	3.00	31.00	Hammond et al. 1994a	Orkney Island, NE Atlantic	1985
Ammodytes spp.	H. grypus	2.08	15.00		876	5.00	30.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
Gymnammodytes capensis	A. p. pusillus	0.85	25.00		12			David 1987	Benguela, South Africa	1974-1985
Gymnammodytes capensis	A. p. pusillus	0.85	25.00		25			David 1987	Benguela, South Africa	1974-1985
Ammodytidae	H. grypus	2.08	16.37		2341	1.50	34.50	Prime and Hammond 1990	Donna Nook, SW North Sea	1985
Ammodytidae	P. phocoena	1.65	13.10	6.20	13			Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996
Clinus sp.	A. p. pusillus	0.85	11.30		7			David 1987	Benguela, South Africa	1974-1985
Callionymidae	A. p. pusillus	0.85	21.50		86			David 1987	Benguela, South Africa	1974-1985
Acanthogobius flavimanus	P. vitulina	1.55	9.20	2.30	1021	3.50	20.20	Torok 1994	San Francisco Bay, NE Pacific	1991-1992
Pomatoschistus spp.	P. vitulina	1.55	3.84		641			Behrends 1982	Waddensea, North Sea	1975-1981
Sufflogobius bibarbatus	A. p. pusillus	0.85	6.10		64			David 1987	Benguela, South Africa	1974-1985
Sufflogobius bibarbatus	A. p. pusillus	0.85	6.90		48078			David 1987	Benguela, South Africa	1974-1985
Sufflogobius bibarbatus	C. heavisidii	1.57	5.30	2.00	n.a.**			Sekiguchi et al. 1992	Benguela, South Africa	1969-1990
Gobiidae	P. phocoena	1.65	4.50	2.00	79	1.50	9.00	Borjesson et al. 2003	Kattegat Sea and Skagerrak Sea	1989-1996

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 4. Raw food habits data, sorted phylogenetically by prey species. See Appendix 1 for common and full scientific names of predator species.

Prey species	Predator species	Predator length (m)	Mean prey length (cm)	SD	N	range low	range high	Reference	Locality	Dates
Paradiplospinus gracilis	A. gazella	0.75	3.97		1			Cherel et al. 1997	Iles Kerguelen, Indian Ocean	1994
Paradiplospinus gracilis	A. tropicalis	1.50	21.50	2.19	2	19.90	23.00	Klages and Bester 1998	Marion Island, Indian Ocean	1989-1995
Thyrsites atun	A. p. pusillus	0.85	80.00		1			David 1987	Benguela, South Africa	1974-1985
Thyrsites atun	A. p. pusillus	0.85	80.00		2			David 1987	Benguela, South Africa	1974-1985
Thyrsites atun	A. p. pusillus	0.85	80.00		10			David 1987	Benguela, South Africa	1974-1985
Thyrsites atun	P. hookeri	2.00	77.00		14	49.00	86.00	Lalas 1997	Otago Peninsula, New Zealand	1991-1992
Lepidopus caudatus	A. p. pusillus	0.85	75.00		1			David 1987	Benguela, South Africa	1974-1985
Lepidopus caudatus	A. p. pusillus	0.85	75.00		5			David 1987	Benguela, South Africa	1974-1985
Trichiurus lepturus	S. fluviatilis	1.78	18.29		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
Trichiurus lepturus	S. attenuata	2.05	55.50		74	49.62	65.65	Wang et al. 2003	Taiwan	1994-1995
Auxis thazard	S. attenuata	2.05	21.15	2.29	8	19	26	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Scomber australasicus	S. attenuata	2.05	2.76		29	16.39	33.27	Wang et al. 2003	Taiwan	1994-1995
Scomber japonicus	A. p. pusillus	0.85	32.50		6			David 1987	Benguela, South Africa	1974-1985
Scomber japonicus	A. p. pusillus	0.85	24.70		15			David 1987	Benguela, South Africa	1974-1985
Scomber japonicus	S. attenuata	2.05	30.77		15	28.00	33.50	Wang et al. 2003	Taiwan	1994-1995
Scomber scombrus	G. melas	5.90	35.80		45	26.50	42.10	Gannon et al. 1997a	NW Atlantic	1989-1991
Scomber scombrus	Globicephala sp.	6.00	36.32		22			Overholtz and Waring 1991	Mid-Atlantic Bight, USA	1989
Scomber scombrus	H. grypus	2.08	32.60		24	25.00	47.90	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Scomber scombrus	H. grypus	2.08	20.90	SE 5.05	8			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Scomber scombrus	P. phocoena	1.65	37.70	1.60	10	35.00	40.00	Fontaine et al. 1994	Gulf of St. Lawrence, NW Atlantic	1989
Scomber scombrus	P. phocoena	1.65	29.60	SE 1.44				Recchia and Read 1989	Bay of Fundy, NW Atlantic	1985-1987
Scomber scombrus	P. phocoena	1.65	22.40	5.30	15			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Icichthys australis	A. gazella	0.75	31.81		17			Lea et al. 2002	Iles Kerguelen, Indian Ocean	1998-2000
Seriolella brama	A. p. doriferus	1.70	16.70	1.50	15	14.00	19.00	Gales and Pemberton 1994	Tasmania	1984-1986
Cubiceps baxteri	S. attenuata	2.05	14.09	0.49	3	13.61	14.58	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Cubiceps pauciradiatus	L. hosei	2.33	11.30	SE 0.17	55	8.50	14.20	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Cubiceps pauciradiatus	S. attenuata	2.05	10.91	0.98	233	7.46	12.98	Robertson and Chivers 1997	E Tropical Pacific	1989-1991
Cubiceps pauciradiatus	S. longirostris	1.70	11.89	SE 0.33	9	11.00	13.40	Dolar et al. 2003	Sulu Sea, Philippines	n.a.
Peprilus triacanthus	P. phocoena	1.65	9.70	1.20	38			Gannon et al. 1998	Gulf of Maine, NW Atlantic	1989-1994
Scophthalmus aquosus	P. groenlandica	1.70	23.50		1			Beck et al. 1993	Gulf of St. Lawrence, NW Atlantic	1988-1990
Citharichthys sordidus	P. vitulina	1.55	6.00		74	4.00	21.50	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Citharichthys sordidus	P. phocoena	1.65	15.20		10	12.50	17.60	Walker et al. 1998	Washington and British Columbia	1990-1997
Citharichthys stigmaeus	P. vitulina	1.55	6.50		29	5.00	10.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Paralichthys orbignyanus	S. fluviatilis	1.78	9.31		1			de Oliveira Santos et al. 2002	Brazil	1995-1998
Glyptocephalus cynoglossus	H. grypus	2.08	31.30		1			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Glyptocephalus zachirus	P. vitulina	1.55	16.50		113	5.00	28.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980
Hippoglossoides platessoides	H. grypus	2.08	34.40	5.20	6			Murie and Lavigne 1992	Gulf of St. Lawrence, NW Atlantic	1983
Hippoglossoides platessoides	H. grypus	2.08	24.30		269	11.10	46.80	Benoit and Bowen 1990	Gulf of St. Lawrence, NW Atlantic	1982-1987
Hippoglossoides platessoides	H. grypus	2.08	14.70	SE 1.56	9			Bowen et al. 1993	Scotian Shelf, NW Atlantic	1988-1990
Hippoglossoides platessoides	H. grypus	2.08	25.91		23	15.00	40.00	Bowen and Harrison 1994	Scotian Shelf, NW Atlantic	1991-1993
Isopsetta isolepis	P. vitulina	1.55	18.00		10	7.00	26.00	Brown and Mate 1983	Netarts Bay, NE Pacific	1978-1980

§ = median prey size; n.a.** = sample size not available, but probably large.

Appendix 5. Pairings of food habits and commercial catch data. See Appendix 3 for full scientific names of prey species. See Appendix 1 for common and full scientific names of predator species. See Appendix 7 for key to numbered citations.

Prey species	Predator species	Prey mean	N	Range, low	Range, high	Food habits citation	Food habits locality	Food habits dates	Comm. mean	N	Range, low	Range, high	Commercial catch citations	Commercial catch locality	Commercial catch dates
A. pectoralis	*A. p. pusillus*	27.90	10			24	Benguela, South Africa	1976-1990	32.1	n.a.*	23.00	46.00	9	Benguela (ICSEAF Divs. 2.1 and 2.2)	1978-1984
A. pseudoharengus	*H. grypus*	22.60	10			79	Gulf of St. Lawrence, NW Atlantic	1983	27.14	3M	22.00	33.00	3, 4, 5	Gulf of St. Lawrence (Margaree and Miramichi Rivers)	1983
C. capensis	*A. p. pusillus*	15.00	10			36	Benguela, South Africa	1974-1985	39.4	624	7.50	67.50	75	Benguela, Agulhas Bank	Aug 1995 - Jan 1997
C. gunnari	*A. gazella*	21.09	530	12.00	34.00	54	Heard Island, Indian Ocean	1987-1988	27.3	18060	12.00	40.00	38	Kerguelen Island, Indian Ocean (NE zone)	1987-1988
C. gunnari	*A. gazella*	22.42	877	18.25	27.75	55	Heard Island, Indian Ocean	1993-1993	23.6	1140	18.00	29.00	39	Kerguelen Island, Indian Ocean (outer shelf)	1993
C. gunnari	*A. gazella*	20.80	1263	18.75	23.75	55	Heard Island, Indian Ocean	1993-1993	23.6	1140	18.00	29.00	39	Kerguelen Island, Indian Ocean (outer shelf)	1993
C. gunnari	*A. gazella*	23.80	201	10.00	46.00	82	South Georgia Island, S Atlantic	1983	33.2	82974	20.00	47.50	63	South Georgia Island, S Atlantic	Oct 1982 - Jun 1983
C. harengus	*H. grypus*	24.90	111	20.00	37.30	13	Gulf of St. Lawrence, NW Atlantic	1982-1987	32.0	456	25.00	36.00	2	Gulf of St. Lawrence (NAFO Div. 4T)	1984
C. harengus	*H. grypus*	25.40	48			79	Gulf of St. Lawrence, NW Atlantic	1983	32.0	456	25.00	36.00	2	Gulf of St. Lawrence (NAFO Div. 4T)	1984
C. harengus	*H. grypus*	34.50	160	5.00	40.00	19	Scotian Shelf, NW Atlantic	1988-1990	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
C. harengus	*P. phocoena*	33.70	47	29.00	38.00	46	Gulf of St. Lawrence, NW Atlantic	1989	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
C. harengus	*P. phocoena*	25.40	507	18.00	33.00	52	Gulf of Maine, NW Atlantic	1989-1994	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
C. harengus	*P. phocoena*	26.50	136			92	Bay of Fundy, NW Atlantic	1985-1987	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
C. harengus	*P. vitulina*	25.70	84	15.00	35.00	18	Nova Scotia, Canada	1988-1992	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
C. harengus	*P. vitulina*	22.00	197	10.00	35.00	18	Bay of Fundy, NW Atlantic	1988-1992	32.8	164M	27.50	39.00	26	Gulf of St. Lawrence (NAFO Div. 4T)	1987
E. encrasicolus	*A. p. pusillus*	12.70	1799			36	Benguela, South Africa	1974-1985	8.27	n.a.*	4.00	13.00	103	Benguela, west coast	1986
E. encrasicolus	*A. p. pusillus*	9.90	2911			36	Benguela, South Africa	1974-1985	8.27	n.a.*	4.00	13.00	103	Benguela, west coast	1986
E. encrasicolus	*A. p. pusillus*	9.40	15871			36	Benguela, South Africa	1974-1985	8.27	n.a.*	4.00	13.00	103	Benguela, west coast	1986
E. encrasicolus	*D. delphis*	11.20	413	5.30	18.10	103	Benguela, South Africa	1969-1990	8.27	n.a.*	4.00	13.00	103	Benguela, west coast	1986
E. encrasicolus	*L. obscurus*	9.10	188	4.40	15.80	103	Benguela, South Africa	1969-1990	8.27	n.a.*	4.00	13.00	103	Benguela, west coast	1986
E. superba	*A. gazella*	5.13	301	3.90	6.10	33	South Georgia Island, S Atlantic	1972-1977	4.1	n.a.*	2.00	6.00	104	South Georgia Island, S Atlantic	1975-1980
E. superba	*A. gazella*	5.54	324	3.80	6.60	96	South Georgia Island, S Atlantic	1986	4.6	n.a.*	2.80	6.00	104	South Orkney and Antarctic Peninsula	1985-1986
E. whiteheadi	*A. p. pusillus*	13.20	32			36	Benguela, South Africa	1974-1985	15.94	n.a.*	8.00	23.00	103	Benguela, west coast	1986
E. whiteheadi	*A. p. pusillus*	14.70	17			36	Benguela, South Africa	1974-1985	15.94	n.a.*	8.00	23.00	103	Benguela, west coast	1986
E. whiteheadi	*D. delphis*	16.20	171	8.50	23.60	103	Benguela, South Africa	1969-1990	15.94	n.a.*	8.00	23.00	103	Benguela, west coast	1986
G. capensis	*A. p. pusillus*	45.90	25			36	Benguela, South Africa	1974-1985	59.0	108	46.00	108.00	57	Benguela (ICSEAF Divs. 1.3 and 1.4)	1967-1976
G. morhua	*H. grypus*	28.20	269	6.70	79.70	13	Gulf of St. Lawrence, NW Atlantic	1982-1987	48.9	138K	20.00	90.00	27	Gulf of St. Lawrence (NAFO Div. 4T)	1984
G. morhua	*H. grypus*	17.30	101	10.00	40.00	79	Gulf of St. Lawrence, NW Atlantic	1983	48.9	138K	20.00	90.00	27	Gulf of St. Lawrence (NAFO Div. 4T)	1984
G. morhua	*H. grypus*	18.80	81	0.00	35.00	17	Scotian Shelf, NW Atlantic	1991-1993	45.0	134K	23.00	105.00	41	Scotian Shelf (NAFO Div. 4VsW)	1983-1987
G. morhua	*H. grypus*	25.80	115	10.00	55.00	19	Scotian Shelf, NW Atlantic	1988-1990	45.0	134K	23.00	105.00	41	Scotian Shelf (NAFO Div. 4VsW)	1983-1987
G. morhua	*P. vitulina*	19.00	46	10.00	35.00	18	Nova Scotia, Canada	1988-1992	45.0	134K	23.00	105.00	41	Scotian Shelf (NAFO Div. 4VsW)	1983-1987
H. platessoides	*H. grypus*	24.30	77	11.10	46.80	13	Gulf of St. Lawrence, NW Atlantic	1982-1987	33.2	71K	15.00	64.00	27	Gulf of St. Lawrence (NAFO Div. 4T)	1985
H. platessoides	*H. grypus*	25.91	23	15.00	40.00	17	Scotian Shelf, NW Atlantic	1991-1993	33.2	71K	15.00	64.00	27	Gulf of St. Lawrence (NAFO Div. 4T)	1985
J. lalandii	*A. p. pusillus*	4.18	89	1.00	7.00	36	Benguela, South Africa	1981	7.91	4332	5.00	11.50	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
J. lalandii	*A. p. pusillus*	5.20	38	1.00	7.00	36	Benguela, South Africa	1984	7.91	4332	5.00	11.50	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
J. lalandii	*A. p. pusillus*	2.50	253	1.00	6.00	36	Benguela, South Africa	1985	7.91	4332	5.00	11.50	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
L. hectoris	*A. p. pusillus*	4.80	595			36	Benguela, South Africa	1974-1985	5.2	737	3.00	7.00	30	Benguela (mostly ICSEAF Div. 1.6)	1968-1976
L. hectoris	*A. p. pusillus*	5.00	1849			36	Benguela, South Africa	1974-1985	5.2	737	3.00	7.00	30	Benguela (mostly ICSEAF Div. 1.6)	1968-1976
L. opalescens	*G. macrorhynchus*	16.20	609	8.70	23.20	107	S California Bight, NE Pacific	1969-1977	14.01	n.a.*			40	Monterey Bay, CA	1974
L. opalescens	*Z. californianus*	5.2	164	4.2	6.7	76	San Miguel Island, NE Pacific	1993, 1996	12.7	6200	5.8	18.5	67	Monterey Bay, CA	1989-1992, 1994
L. v. reynaudii	*A. p. pusillus*	16.06	183			24	Benguela, South Africa	1976-1990	14.8	1000	5.00	33.00	103	Benguela (ICSEAF Div. 2.1)	1986
L. v. reynaudii	*A. p. pusillus*	11.50	51	7.10	18.90	68	Benguela, South Africa	1974-1985	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*A. p. pusillus*	15.60	596	4.10	32.40	68	Benguela, South Africa	1974-1985	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*C. heavisidii*	17.40	11	9.30	24.40	103	Benguela, South Africa	1969-1990	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*D. delphis*	17.30	322	2.50	34.50	103	Benguela, South Africa	1969-1990	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*G. griseus*	13.00	67	2.10	32.90	103	Benguela, South Africa	1975-1990	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*K. breviceps*	11.60	21	5.30	20.90	103	Benguela, South Africa	1975-1990	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*K. sima*	7.10	11	5.30	8.90	103	Benguela, South Africa	1975-1988	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*L. obscurus*	12.90	23	1.70	27.00	103	Benguela, South Africa	1969-1990	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*S. coeruleoalba*	9.30	183	2.40	22.30	103	Benguela, South Africa	1975-1989	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
L. v. reynaudii	*T. truncatus*	22.70	12	20.20	26.10	103	Benguela, South Africa	1975-1989	15.52	n.a.*	5.00	35.00	103	Benguela, east and west coasts	1986
M. capensis	*A. p. pusillus*	28.19	64			24	Benguela, South Africa	1976-1990	31.6	480	26.00	34.00	103	Benguela (ICSEAF Div. 2.1)	1986
M. hyadesi	*H. planifrons*	30.10	25			28	Tierra del Fuego, Argentina	late 1970s?	29.7	336	19.00	35.00	53	Falkland Islands, S Atlantic	May 1995
M. hyadesi	*M. leonina*	27.10	43	19.30	42.60	98	South Georgia Island, S Atlantic	1986, 1988-1989	29.7	336	19.00	35.00	53	Falkland Islands, S Atlantic	May 1995
M. ingens	*G. melas*	21.20	19			28	Tierra del Fuego, Argentina	1977-1982	18.86	4205	5.00	50.50	58	Patgonian Shelf, Falkland Islands	1988-1996
M. ingens	*H. planifrons*	67.20	13			28	Tierra del Fuego, Argentina	late 1970s?	18.86	4205	5.00	50.50	58	Patgonian Shelf, Falkland Islands	1988-1996
Merluccius spp.	*A. p. pusillus*	29.50	116			36	Benguela, South Africa	1974-1985	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*A. p. pusillus*	17.40	350			36	Benguela, South Africa	1974-1985	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*A. p. pusillus*	21.30	1177			36	Benguela, South Africa	1974-1985	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*C. heavisidii*	19.50	160	4.90	28.60	103	Benguela, South Africa	1969-1990	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*D. delphis*	18.10	203	5.10	39.30	103	Benguela, South Africa	1969-1990	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*K. breviceps*	21.30	11	16.20	25.50	103	Benguela, South Africa	1975-1990	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*K. sima*	21.60	20	16.60	26.80	103	Benguela, South Africa	1975-1988	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*L. obscurus*	16.50	216	4.80	42.10	103	Benguela, South Africa	1969-1990	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*S. coeruleoalba*	14.90	12	7.80	17.20	103	Benguela, South Africa	1975-1989	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
Merluccius spp.	*T. truncatus*	28.30	15	17.10	42.30	103	Benguela, South Africa	1975-1989	27.19	90K	5.00	75.00	87, 88, 103	Benguela (ICSEAF Div. 1.6)	1984-1986
P. laniarius	*A. p. pusillus*	28.36	15			24	Benguela, South Africa	1976-1990	32.8	n.a.*	20.00	44.00	15	Benguela (mostly ICSEAF Div. 2.2)	1974-1975
P. laniarius	*A. p. pusillus*	20.00	15			36	Benguela, South Africa	1974-1985	32.8	n.a.*	20.00	44.00	15	Benguela (mostly ICSEAF Div. 2.2)	1974-1975
P. monoptyergius	*E. jubatus*	32.30	1685	15.30	49.60	117	Aleutian Is. (western stock)	1998-2000	39.33	92877	28.00	50.00	117	Aleutian Islands; trawl fishery	1998-2000
Pleuronectidae	*A. p. pusillus*	21.10	32			36	Benguela, South Africa	1974-1985	32.1	n.a.*	23.00	46.00	9	Benguela (ICSEAF Divs. 2.1 and 2.2)	1978-1984
Pleuronectidae	*A. p. pusillus*	14.60	144			36	Benguela, South Africa	1974-1985	32.1	n.a.*	23.00	46.00	9	Benguela (ICSEAF Divs. 2.1 and 2.2)	1978-1984

n.a.* = sample size not available, but probably large

Appendix 5. Pairings of food habits and commercial catch data. See Appendix 3 for full scientific names of prey species. See Appendix 1 for common and full scientific names of predator species. See Appendix 7 for key to numbered citations.

Prey species	Predator species	Prey mean	N	Range, low	Range, high	Food habits citation	Food habits locality	Food habits dates	Comm. mean	N	Range, low	Range, high	Commercial catch citations	Commercial catch locality	Commercial catch dates
R. hippoglossoides	*M. monoceros*	35.70	140	13.80	54.70	65	Disko Bay, Greenland	2002-2003	78.4	n.a.*	30.00	90.00	106	Disko Bay, Greenland (inshore longline fishery)	2002
S. japonicus	*A. p. pusillus*	24.70	15			36	Benguela, South Africa	1974-1985	32.2	1913	11.50	56.50	31	Benguela, west coast	1972-1974
S. sagax	*A. p. pusillus*	14.90	24			36	Benguela, South Africa	1974-1985	16.15	n.a.*	10.00	21.00	103	Benguela, west coast	1986
S. sagax	*A. p. pusillus*	19.80	134			36	Benguela, South Africa	1974-1985	16.15	n.a.*	10.00	21.00	103	Benguela, west coast	1986
S. sagax	*A. p. pusillus*	18.70	214			36	Benguela, South Africa	1974-1985	16.15	n.a.*	10.00	21.00	103	Benguela, west coast	1986
S. sagax	*D. delphis*	19.00	163	12.60	24.30	103	Benguela, South Africa	1969-1990	16.15	n.a.*	10.00	21.00	103	Benguela, west coast	1986
S. sagax	*L. obscurus*	16.60	21	13.80	25.60	103	Benguela, South Africa	1969-1990	16.15	n.a.*	10.00	21.00	103	Benguela, west coast	1986
S. sagax	*P. dalli*	17.89	372	12.53	22.46	84	Sea of Okhotsk & Sea of Japan	1988-1996	19.2	n.a.*	13.00	22.50	101	NW Pacific, SE of Hokkaido	1988-1992
S. sagax	*P. dalli*	18.01	1419	13.25	23.25	113	Sea of Okhotsk	1988-1989	18.3	n.a.*	15.00	21.00	101	NW Pacific, SE of Hokkaido	1988
S. scombrus	*G. melas*	35.80	45	26.50	42.10	50	NW Atlantic	1989-1991	35.2	321M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 3-6)	1986-1987
S. scombrus	*Globicephala* sp.	36.32	22			85	Mid-Atlantic Bight, USA	1989	35.3	228M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 5-6)	1986-1987
S. scombrus	*H. grypus*	32.60	24	25.00	47.90	13	Gulf of St. Lawrence, NW Atlantic	1982-1987	34.9	92M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 3-4)	1986-1987
S. scombrus	*P. phocoena*	37.70	10	35.00	40.00	46	Gulf of St. Lawrence, NW Atlantic	1989	34.9	92M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 3-4)	1986-1987
S. scombrus	*P. phocoena*	22.40	15			52	Gulf of Maine, NW Atlantic	1989-1994	35.3	228M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 5-6)	1986-1987
S. scombrus	*P. phocoena*	29.60	n.a.			92	Bay of Fundy, NW Atlantic	1985-1987	35.3	228M	26.00	43.00	25	NW Atlantic (CAFSAC Divs. 5-6)	1986-1987
Sebastes sp.	*P. groenlandica*	11.40	257			78	Gulf of St. Lawrence, NW Atlantic	1983	31.32	1160	10.00	46.00	99	Gulf of St. Lawrence	1983
T. atun	*A. p. pusillus*	80.00	10			36	Benguela, South Africa	1974-1985	91.2	n.a.*	75.00	95.00	32	Benguela, Namibian coast (ICSEAF Divs. 1.3-1.5)	1978-1986
T. capensis	*A. p. pusillus*	10.80	66			36	Benguela, South Africa	1974-1985	9.5	n.a.*	4.00	16.00	103	Benguela, west coast	1986
T. capensis	*A. p. pusillus*	16.30	449			36	Benguela, South Africa	1974-1985	9.5	n.a.*	4.00	16.00	103	Benguela, west coast	1986
T. capensis	*A. p. pusillus*	14.80	3542			36	Benguela, South Africa	1974-1985	9.5	n.a.*	4.00	16.00	103	Benguela, west coast	1986
T. chalcogramma	*B. acutorostrata*	14.50	121	11.80	17.50	49	Bering Sea	1975	31.40	n.a.*	15.00	62.00	10	Bering Sea, eastern	1975
T. chalcogramma	*C. ursinus*	30.40	n.a.*			69	Bering Sea	1981-1982	39.80	n.a.*	20.00	62.00	10	Bering Sea, eastern	1981-1982
T. chalcogramma	*C. ursinus*	19.30	n.a.*	10.00	35.00	71	Bering Sea	1974	32.10	n.a.*	11.00	63.00	10	Bering Sea, eastern	1974
T. chalcogramma	*C. ursinus*	32.97	39	6.00	41.00	108	Bering Sea	1981	39.08	n.a.*	20.00	61.00	10	Bering Sea, eastern	1981
T. chalcogramma	*C. ursinus*	6.70	1191	3.00	42.00	108	Bering Sea	1982	40.55	n.a.*	22.00	62.00	10	Bering Sea, eastern	1982
T. chalcogramma	*C. ursinus*	13.03	1428	4.00	47.00	108	Bering Sea	1985	42.43	n.a.*	17.00	63.00	10	Bering Sea, eastern	1985
T. chalcogramma	*E. barbatus*	11.80	56	6.90	14.30	7	Bering Sea	1981	39.20	n.a.*	20.00	61.00	10	Bering Sea, eastern	1981
T. chalcogramma	*E. jubatus*	29.80	2030	5.60	62.90	89	Gulf of Alaska	1975-1978	41.2	n.a.*	23.40	62.30	6	Gulf of Alaksa	1977-1978
T. chalcogramma	*E. jubatus*	46.90	280	18.40	61.40	49	Pribilof Islands, Bering Sea	1976, 1979	33.10	n.a.*	17.00	62.00	10	Bering Sea, eastern	1976
T. chalcogramma	*E. jubatus*	25.20	1135	8.30	64.20	49	Bering Sea	1981	39.20	n.a.*	20.00	61.00	10	Bering Sea, eastern	1981
T. chalcogramma	*E. jubatus*	21.8	n.a.	10.30	51.60	69	St. Matthew Island, Bering Sea	1985	42.60	n.a.*	17.00	63.00	10	Bering Sea, eastern	1985
T. chalcogramma	*E. jubatus*	33.5	n.a.	20.80	44.50	69	St. Paul Island, Bering Sea	1985	42.60	n.a.*	17.00	63.00	10	Bering Sea, eastern	1985
T. chalcogramma	*E. jubatus*	29.9	n.a.	1.70	42.70	69	E Aleutian Islands, Gulf of Alaska	1981-1982	39.80	n.a.*	20.00	62.00	10	Bering Sea, eastern	1981-1982
T. chalcogramma	*E. jubatus*	25.5	80	4.80	55.70	23	Kodiak Island, Gulf of Alaska	1985-1986	47.6	n.a.*	21.00	70.00	80	Gulf of Alaska, Kodiak Island region	1985-1986
T. chalcogramma	*E. jubatus*	42.40	909	10.00	78.10	110	SE Alaska	1994-1999	52.2	2103			110	Dixon Entrance, BC	1993-1999
T. chalcogramma	*E. jubatus*	39.30	666	3.70	70.80	117	Aleutian Is. (western stock)	1998-2000	49.9	92133	20.00	74.00	117	Aleutian Islands; trawl fishery	1998-2000
T. chalcogramma	*P. fasciata*	10.26	447	6.00	20.00	48	Bering Sea	1976-1976	34.17	n.a.*	11.00	68.00	10	Bering Sea, eastern	1976-1979
T. chalcogramma	*P. fasciata*	11.20	468	6.50	34.40	49	Bering Sea	1976-1978	33.90	n.a.*	12.00	68.00	10	Bering Sea, eastern	1976-1978
T. chalcogramma	*P. largha*	10.90	21	8.00	15.00	22	Bering Sea	1976-1978	33.90	n.a.*	12.00	68.00	10	Bering Sea, eastern	1976-1978
T. chalcogramma	*P. largha*	10.90	21	8.00	15.00	49	Bering Sea	1978	36.80	n.a.*	14.00	68.00	10	Bering Sea, eastern	1978
T. chalcogramma	*P. vitulina*	19.20	2180	4.20	53.20	89	Gulf of Alaska	1975-1978	41.2	n.a.*	23.40	62.30	6	Gulf of Alaksa	1977-1978
T. chalcogramma	*P. vitulina*	31.80	23	10.30	56.30	49	Pribilof Islands, Bering Sea	1979	34.90	n.a.*	11.00	64.00	10	Bering Sea, eastern	1979
T. chalcogramma	*P. vitulina*	10.60	12	8.20	12.60	49	Bering Sea	1981	39.2	n.a.*	20.00	61.00	10	Bering Sea, eastern	1981
T. t. capensis	*A. p. pusillus*	27.15	56			24	Benguela, South Africa	1976-1990	16	n.a.*	4.00	35.00	103	Benguela, east and west coasts	1986
T. t. capensis	*C. heavisidii*	17.10	23	10.70	22.20	103	Benguela, South Africa	1969-1990	16	n.a.*	4.00	35.00	103	Benguela, east and west coasts	1986
T. t. capensis	*D. delphis*	16.20	134	4.60	34.30	103	Benguela, South Africa	1969-1990	16	n.a.*	4.00	35.00	103	Benguela, east and west coasts	1986
T. t. capensis	*L. obscurus*	9.90	723	4.20	24.90	103	Benguela, South Africa	1969-1990	16	n.a.*	4.00	35.00	103	Benguela, east and west coasts	1986

n.a.* = sample size not available, but probably large

Appendix 6. Pairings of food habits and survey data. See Appendix 3 for full scientific names of prey species. See Appendix 1 for common and full scientific names of predator species. See Appendix 7 for key to numbered citations.

Prey species	Predator species	Food habits mean	N	Range, low	Range, high	Food habits citation	Food habits locality	Food habits dates	Survey mean	N	Range, low	Range, high	Survey citations	Locality of survey	Survey dates
A. flavimanus	*P. vitulina*	9.20	1021	3.50	20.20	111	San Francisco Bay, NE Pacific	1991-1992	9.78	219	2	18	111	San Francisco Bay, NE Pacific	1980-1992
B. saida	*D. leucas*	14.54	125	9.00	21.50	45	Baffin Bay, NW Atlantic	1978-1979	9.72	172	5	22.5	20	Pond Inlet, NW Atlantic	1978-1979
B. saida	*E. barbatus*	13.40	272	6.90	23.60	42	Baffin Bay, NW Atlantic	1978-1979	9.72	172	5	22.5	20	Pond Inlet, NW Atlantic	1978-1979
B. saida	*M. monoceros*	11.30	607	4.80	21.50	43	Baffin Bay, NW Atlantic	1978-1979	9.72	172	5	22.5	20	Pond Inlet, NW Atlantic	1978-1979
B. saida	*P. fasciata*	15.87	92	12.00	21.00	48	Bering Sea	1976-1979	13.81	119	7	22	48	Bering Sea, northern	
B. saida	*P. groenlandica*	13.40	648	4.80	23.60	45	Baffin Bay, NW Atlantic	1978-1979	9.72	172	5	22.5	20	Pond Inlet, NW Atlantic	1978-1979
B. saida	*P. hispida*	10.50	4047	4.80	23.60	44	Baffin Bay, NW Atlantic	1978-1979	9.72	172	5	22.5	20	Pond Inlet, NW Atlantic	1978-1979
B. saida	*P. hispida*	10.90	4847	4.90	16.10	115	Svalbard, Greenland Sea	1985-1987	8.00				115	Kongsfjorden	1988-1989
B. saida	*P. largha*	14.90	326	7.60	20.50	22	Bering Sea	1976-1978	14.20	121	7.00	22	22	Bering Sea	1976-1978
C. capensis	*A. p. pusillus*	15.00	10			36	Benguela, South Africa	1974-1985	39.80	125	28	56	64	Benguela, South Africa (ICSEAF Div. 1.3)	1988
C. gunnari	*A. gazella*	21.09	530	12.00	34.00	54	Heard Island, Indian Ocean	1987-1988	21.73	3762	5	38	39	Kerguelen Island, inner shelf	1989-1992
C. gunnari	*A. gazella*	22.42	877	18.25	27.75	55	Heard Island, Indian Ocean	1993-1993	22.23	827	5	38	39	Kerguelen Island, inner shelf	1992
C. gunnari	*A. gazella*	20.80	1263	18.75	23.75	55	Heard Island, Indian Ocean	1993-1993	22.23	827	5	38	39	Kerguelen Island, inner shelf	1992
C. gunnari	*A. gazella*	23.80	201	10.00	46.00	82	South Georgia Island, S Atlantic	1983	30.99	666	11	46	62	Elephant Island	1983
C. gunnari	*A. gazella*	27.80	580	14.00	48.00	94	South Georgia Island, S Atlantic	1991-1994	28.39	1665	10	49	62	Elephant Island	1996
C. gunnari	*A. gazella*	22.74	1920	12.00	46.00	93	South Georgia Island, S Atlantic	1992-1993	20.65		10	50	86	South Georgia Island, S Atlantic	1991
C. harengus	*P. phocoena*	25.40	507	18.00	33.00	52	Gulf of Maine, NW Atlantic	1989-1994	25.56	33352	8	35	83	Gulf of Maine	Fall 1989-1994
C. opilio	*E. barbatus*	5.70	336	3.20	12.30	7	Bering Sea	1981	6.25		12.5	132.5	61	Bering Sea, eastern	1975
E. encrasicolus	*A. p. pusillus*	12.70	1799			36	Benguela, South Africa	1974-1985	6.60	1671	2	9.5	35	Benguela, Orange River to Olifants River	1983
E. encrasicolus	*A. p. pusillus*	9.90	2911			36	Benguela, South Africa	1974-1985	6.60	1671	2	9.5	35	Benguela, Orange River to Olifants River	1983
E. encrasicolus	*A. p. pusillus*	9.40	15871			36	Benguela, South Africa	1974-1985	6.60	1671	2	9.5	35	Benguela, Orange River to Olifants River	1983
E. encrasicolus	*D. delphis*	11.20	413	5.30	18.10	103	Benguela, South Africa	1969-1990	6.60	1671	2	9.5	35	Benguela, Orange River to Olifants River	1983
E. encrasicolus	*L. obscurus*	9.10	188	4.40	15.80	103	Benguela, South Africa	1969-1990	6.60	1671	2	9.5	35	Benguela, Orange River to Olifants River	1983
E. gracilis	*P. largha*	16.70	131	6.20	25.10	22	Bering Sea	1976-1978	19.56	903	6.00	35	116	Norton Sound and Chukchi Seas	1976, 1979
E. mordax	*P. vitulina*	12.90	81	4.00	15.00	111	San Francisco Bay, NE Pacific	1991-1992	4.9	13000	3	14	111	San Francisco Bay, NE Pacific	1980-1992
E. superba	*A. gazella*	5.13	301	3.90	6.10	33	South Georgia Island, S Atlantic	1972-1977	3.55	1471	1.8	5.2	60	South Georgia to South Shetlands	1976
E. superba	*A. gazella*	4.45	308	3.60	6.20	34	South Georgia Island, S Atlantic	1994	4.32		2.2	6.1	95	South Georgia Island, S Atlantic	1994
E. superba	*A. gazella*	4.26	n.a.*			72	South Georgia Island, S Atlantic	1994-1996	3.76	n.a.*	2.2	6.1	95	South Georgia Island, S Atlantic	1994, 1996
E. superba	*A. gazella*	4.42	2206	2.40	5.80	93	South Georgia Island, S Atlantic	1992-1993	4.32		2.2	6.1	95	South Georgia Island, S Atlantic	1994
E. superba	*A. gazella*	4.67	5585	3.20	6.40	94	South Georgia Island, S Atlantic	1991-1994	4.32		2.2	6.1	95	South Georgia Island, S Atlantic	1994
E. superba	*A. gazella*	4.63	n.a.*	3.20	6.10	95	South Georgia Island, S Atlantic	1994-1999	4.05	n.a.*	2.1	6.3	95	South Georgia Island, S Atlantic	1994-1999
E. superba	*A. gazella*	5.54	324	3.80	6.60	96	South Georgia Island, S Atlantic	1986	5.35	3465	2.8	6.6	96	South Georgia Island, S Atlantic	1986
E. superba	*A. gazella*	5.14	388	3.50	6.50	37	South Georgia Island, S Atlantic	1982-1983	3.29	7666	1.9	5.25	104	Bransfield Strait, South Georgia	1983
E. whiteheadi	*A. p. pusillus*	14.70	17			36	Benguela, South Africa	1974-1985	13.44		4	21	112	Benguela, west coast of South Africa	1984-1989
E. whiteheadi	*A. p. pusillus*	13.20	32			36	Benguela, South Africa	1974-1985	13.44		4	21	112	Benguela, west coast of South Africa	1984-1989
E. whiteheadi	*D. delphis*	16.20	171	8.50	23.60	103	Benguela, South Africa	1969-1990	13.44		4	21	112	Benguela, west coast of South Africa	1984-1989
E.s gracilis	*D. leucas*	11.98	530	5.00	30.00	102	Bering Sea	1978	19.56	903	6.00	35	116	Norton Sound and Chukchi Seas	1976, 1979
G. capensis	*A. p. pusillus*	45.90	25			36	Benguela, South Africa	1974-1985	86.90	810	26.5	134.5	59	Benguela, Cape Town to Luderitz	1986-1988
G. gibberifrons	*A. gazella*	31.60	55	5.90	54.00	82	South Georgia Island, S Atlantic	1983	29.53	12151	13	45	62	Elephant Island	1983, 1985
G. gibberifrons	*A. gazella*	42.10	95	21.00	59.00	93	South Georgia Island, S Atlantic	1992-1993	33.87	3256	18	47	62	Elephant Island	1996
G. lineatus	*P. vitulina*	22.20	40	13.00	29.00	111	San Francisco Bay, NE Pacific	1991-1992	13.5	4171	1	30	111	San Francisco Bay, NE Pacific	1980-1992
G. morhua	*H. grypus*	18.80	81	0.00	35.00	17	Scotian Shelf, NW Atlantic	1991-1993	53.87	235	14	118	83	NW Atlantic (NAFO Divs. 464, 465)	1983-1987
G. morhua	*H. grypus*	25.80	115	10.00	55.00	19	Scotian Shelf, NW Atlantic	1988-1990	50.88	231	4	124	83	NW Atlantic (NAFO Divs. 464, 465)	1983-1987
G. morhua	*P. groenlandica*	29.55	133	5.00	65.00	81	Ullsford, Norway	1986, 1988	45.00	527	25	85	81	Atlantic, NE; Ullsford, North Norway	1986, 1988
G. morhua	*P. phocoena*	15.90				92	Bay of Fundy, NW Atlantic	1985-1987	59.34	148	22	110	83	Bay of Fundy	1985-1987
G. morhua	*P. phocoena*	28.10	30			16	Kattegat Sea and Skagerrak Sea	1989-1996	27.89		13	48	109	Skagerrak Sea	2000-2001
G. morhua	*P. vitulina*	35.20	33	5.00	50.00	18	Bay of Fundy, NW Atlantic	1988-1992	51.69	94	5	116	83	Bay of Fundy	1988-1991
G. morhua	*P. vitulina*	19.00	46	10.00	35.00	18	Nova Scotia, Canada	1988-1992	53.18	366	4	124	83	NW Atlantic (NAFO Divs. 464, 465)	1983-1987
G. setosus	*P. hispida*	1.53	35	1.20	2.00	115	Svalbard, Greenland Sea	1985-1987	2.50	29	2.2	3.4	115	Kongsfjorden	1988-1989
H. dactylopterus	*A. p. pusillus*	23.20	13			36	Benguela, South Africa	1974-1985	12.96	1722	5	35	1	Benguela (ICSEAF Divs. 1.4 and 1.5)	1987
H. dactylopterus	*A. p. pusillus*	20.00	145			36	Benguela, South Africa	1974-1985	12.96	1722	5	35	1	Benguela (ICSEAF Divs. 1.4 and 1.5)	1987
H. platessoides	*H. grypus*	24.30	77	11.10	46.80	13	Gulf of St. Lawrence, NW Atlantic	1982-1987	27.40	5213	9	57	11	NW Atlantic (CAFSCA Div. 4T, 195-79)	1975-1979
H. platessoides	*H. grypus*	25.91	23	15.00	40.00	17	Scotian Shelf, NW Atlantic	1991-1993	26.55	3264	10	62	114	Scotian Shelf, NW Atlantic	1998
I. illecebrosus	*H. grypus*	18.50	78	10.00	25.00	19	Scotian Shelf, NW Atlantic	1988-1990	29.00	3124	13	29	83	Scotian Shelf, NW Atlantic	Fall 1988-1990
I. illecebrosus	*P. vitulina*	17.60	139	5.00	20.00	18	Bay of Fundy, NW Atlantic	1988-1992	19.57	3034	13	29	83	Bay of Fundy, fall 1988 and 1989	Fall, 1988-1989
I. illecebrosus	*P. vitulina*	19.10	51	15.00	25.00	18	Nova Scotia, Canada	1988-1992	17.93	3239	9	29	83	Scotian Shelf, NW Atlantic	Fall 1988-1992
J. lalandii	*A. p. pusillus*	5.20	38	1.00	7.00	36	Benguela, South Africa	1984	7.16	8170	4.5	11.5	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
J. lalandii	*A. p. pusillus*	4.18	89	1.00	7.00	36	Benguela, South Africa	1981	7.16	8170	4.5	11.5	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
J. lalandii	*A. p. pusillus*	2.50	253	1.00	6.00	36	Benguela, South Africa	1985	7.16	8170	4.5	11.5	100	Benguela, Olifants River to St. Helena Bay	Oct 1996, Mar 1999
L. armatus	*P. vitulina*	14.03	72	5.00	25.00	111	San Francisco Bay, NE Pacific	1991-1992	11.64	704	2	20	111	San Francisco Bay, NE Pacific	1980-1992
L. ferruginea	*H. grypus*	20.00	14			19	Scotian Shelf, NW Atlantic	1988-1990	30.33	85	18	44	83	Scotian Shelf, NW Atlantic	1988, 1990
L. hectoris	*A. p. pusillus*	4.80	595			36	Benguela, South Africa	1974-1985	3.87	144	0.8	6.8	91	Benguela	1982-1983
L. hectoris	*A. p. pusillus*	5.00	1849			36	Benguela, South Africa	1974-1985	3.87	144	0.8	6.8	91	Benguela	1982-1983
L. larseni	*A. gazella*	14.70	91	7.80	22.00	82	South Georgia Island, S Atlantic	1983	10.49	11494	3	23	47	South Georgia Island, S Atlantic	1984
L. larseni	*A. gazella*	18.52	380	4.00	28.00	93	South Georgia Island, S Atlantic	1992-1993	14.93	2525	6	22	62	Elephant Island	1996
L. larseni	*A. gazella*	17.21	482	10.00	25.00	94	South Georgia Island, S Atlantic	1991-1994	14.93	2525	6	22	62	Elephant Island	1996
L. limanda	*P. vitulina*	8.13	219	< 7.0	20.00	12	Waddensea, North Sea	1975-1981	17.82	56416	9.5	31.5	70	Deutsche Bucht, Waddensea	1983-1986

n.a.* = sample size not available, but probably large

Appendix 6. Pairings of food habits and survey data. See Appendix 3 for full scientific names of prey species. See Appendix 1 for common and full scientific names of predator species. See Appendix 7 for key to numbered citations.

Prey species	Predator species	Food habits mean	N	Range, low	Range, high	Food habits citation	Food habits locality	Food habits dates	Survey mean	N	Range, low	Range, high	Survey citations	Locality of survey	Survey dates
L. pealeii	*G. melas*	19.60	578	3.70	43.60	50	NW Atlantic	1989-1991	6.79	94000	1	38	83	Mid-Atlantic Bight, USA	1989-1991
L. pealeii	*G. melas*	16.07	145	5.00	42.00	51	Mid-Atlantic Bight, USA	1973-1993	6.90	#####	1	44	83	Mid-Atlantic Bight, USA	1980-1993
L. pealeii	*Globicephala* sp.	13.40	68			85	Mid-Atlantic Bight, USA	1989	8.22	36000	1	33	83	Mid-Atlantic Bight, USA	1989
L. v. reynaudii	*A. p. pusillus*	16.06	183			24	Benguela, South Africa	1976-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*A. p. pusillus*	11.50	51	7.10	18.90	68	Benguela, South Africa	1974-1985	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*A. p. pusillus*	15.60	596	4.10	32.40	68	Benguela, South Africa	1974-1985	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*C. heavisidii*	17.40	11	9.30	24.40	103	Benguela, South Africa	1969-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*D. delphis*	17.30	322	2.50	34.50	103	Benguela, South Africa	1969-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*G. griseus*	13.00	67	2.10	32.90	103	Benguela, South Africa	1975-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*K. breviceps*	11.60	21	5.30	20.90	103	Benguela, South Africa	1975-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*K. sima*	7.10	11	5.30	8.90	103	Benguela, South Africa	1975-1988	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*L. obscurus*	12.90	23	1.70	27.00	103	Benguela, South Africa	1969-1990	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*S. coeruleoalba*	9.30	183	2.40	22.30	103	Benguela, South Africa	1975-1989	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
L. v. reynaudii	*T. truncatus*	22.70	12	20.20	26.10	103	Benguela, South Africa	1975-1989	16.13	11357	4	29	8	Benguela, Orange River to Cape Agulhas	1984-1987
M. bilinearis	*H. grypus*	25.67	30	15.00	35.00	17	Scotian Shelf, NW Atlantic	1991-1993	20.34	8968	3	47	83	Scotian Shelf, NW Atlantic	1991-1993
M. bilinearis	*H. grypus*	25.40	43	10.00	45.00	19	Scotian Shelf, NW Atlantic	1988-1990	20.47	5410	4	49	83	Scotian Shelf, NW Atlantic	1988-1990
M. bilinearis	*P. phocoena*	16.40	1605	3.00	38.00	52	Gulf of Maine, NW Atlantic	1989-1994	21.52	47949	2	54	83	Gulf of Maine	Fall 1989-1994
M. bilinearis	*P. phocoena*	19.60	173			92	Bay of Fundy, NW Atlantic	1985-1987	20.35	723	4	49	83	Bay of Funday, fall 1985-86	Fall, 1985-1986
M. capensis	*A. p. pusillus*	28.19	64			24	Benguela, South Africa	1976-1990	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
M. merlangus	*P. phocoena*	18.70	65			16	Kattegat Sea and Skagerrak Sea	1989-1996	18.49		11	31	109	Skagerrak Sea	2000-2001
M. merlangus	*P. phocoena*	7.50	449			16	Kattegat Sea and Skagerrak Sea	1989-1996	18.49		11	31	109	Skagerrak Sea	2000-2001
M. muelleri	*A. p. pusillus*	3.40	1257			36	Benguela, South Africa	1974-1985	3.65	944	1	5.2	91	Benguela	1982-1983
M. scorpius	*P. hispida*	11.14	35	8.00	18.00	115	Svalbard, Greenland Sea	1985-1987	8.90	130	2	28	115	Kongsfjorden	1988-1989
Merluccius spp.	*A. p. pusillus*	29.50	116			36	Benguela, South Africa	1974-1985	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*A. p. pusillus*	17.40	350			36	Benguela, South Africa	1974-1985	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*A. p. pusillus*	21.30	1177			36	Benguela, South Africa	1974-1985	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*C. heavisidii*	19.50	160	4.90	28.60	103	Benguela, South Africa	1969-1990	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*D. delphis*	18.10	203	5.10	39.30	103	Benguela, South Africa	1969-1990	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*K. breviceps*	21.30	11	16.20	25.50	103	Benguela, South Africa	1975-1990	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*K. sima*	21.60	20	16.60	26.80	103	Benguela, South Africa	1975-1988	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*L. obscurus*	16.50	216	4.80	42.10	103	Benguela, South Africa	1969-1990	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*S. coeruleoalba*	14.90	12	7.80	17.20	103	Benguela, South Africa	1975-1989	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
Merluccius spp.	*T. truncatus*	28.30	15	17.10	42.30	103	Benguela, South Africa	1975-1989	39.11	12780	19	71	77	Benguela (ICSEAF Divs. 1.3, 1.4, 1.5)	1987
P. antarcticum	*L. weddelii*	16.24	80	12.00	21.00	90	Weddell Sea, Antarctica	1998	15.47	466	3	24	90	Drescher Inlet, Weddell Sea	1988
P. borealis	*P. hispida*	7.47	51	4.80	9.20	115	Svalbard, Greenland Sea	1985-1987	7.00	20	2.4	7.6	115	Kongsfjorden	1988-1989
P. choriodon	*A. gazella*	8.56	752	7.00	11.00	94	South Georgia Island, S Atlantic	1991-1994	5.87	2378	5	10	47	South Georgia Island, S Atlantic	1986-1987
P. georgianus	*A. gazella*	28.80	26	24.10	34.80	82	South Georgia Island, S Atlantic	1983	15.27	706	9	51	47	South Georgia Island, S Atlantic	1984
P. laniarius	*A. p. pusillus*	28.36	15			24	Benguela, South Africa	1976-1990	22.47	2762	3	37	14	Benguela, Algulhas Bank	May-Oct 1994
P. laniarius	*A. p. pusillus*	20.00	15			36	Benguela, South Africa	1974-1985	22.47	2762	3	37	14	Benguela, Algulhas Bank	May-Oct 1994
P. notatus	*P. vitulina*	21.80	73	7.00	39.00	111	San Francisco Bay, NE Pacific	1991-1992	4.79	2054	1	32	111	San Francisco Bay, NE Pacific	1980-1992
P. platessa	*H. grypus*	24.07	51	7.50	77.50	56	Orkney Island, NE Atlantic	1985	22.13	4542	7	46	97	North Sea	Winter 1985-1986
P. platessa	*H. grypus*	31.99	247	2.50	77.50	56	Orkney Island, NE Atlantic	1985	22.13	4542	7	46	97	North Sea	Winter 1985-1986
P. platessa	*P. vitulina*	10.00	199			12	Waddensea, North Sea	1975-1981	22.13	4542	7	46	97	North Sea	Winter 1985-1986
P. triacanthus	*P. phocoena*	9.70	38			52	Gulf of Maine, NW Atlantic	1989-1994	11.07	19225	2	20	83	Gulf of Maine	Fall 1989-1994
P. virens	*P. phocoena*	19.50	76			52	Gulf of Maine, NW Atlantic	1989-1994	33.45	875	8	112	83	Gulf of Maine	Fall 1989-1994
R. hippoglossoides	*M. monoceros*	35.70	140	13.80	54.70	65	Disko Bay, Greenland	2002-2003	44.27	2355	13	99	66	Central Baffin Bay and No. Davis Strait	
S. scombrus	*G. melas*	35.80	45	26.50	42.10	50	NW Atlantic	1989-1991	25.60	11490	5	44	83	Mid-Atlantic Bight, USA	1989-1991
S. scombrus	*Globicephala* sp.	36.32	22			85	Mid-Atlantic Bight, USA	1989	21.04	1462	14	43	83	Mid-Atlantic Bight, USA	1989
S. scombrus	*P. phocoena*	22.40	15			52	Gulf of Maine, NW Atlantic	1989-1994	27.31	1353	17	43	83	Gulf of Maine	Fall 1989-1994
S. septemcarinata	*P. hispida*	5.02	19	3.60	5.60	115	Svalbard, Greenland Sea	1985-1987	5.20	29	2	6.4	115	Kongsfjorden	1988-1989
T. angolensis	*A. p. pusillus*	14.60	22	3.40	29.10	68	Benguela, South Africa	1974-1985	27.20	417	15	45	1	Benguela (ICSEAF Divs. 1.4 and 1.5)	1987
T. atun	*A. p. pusillus*	80.00	10			36	Benguela, South Africa	1974-1985	92.90	51	70	114	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. capensis	*A. p. pusillus*	10.80	66			36	Benguela, South Africa	1974-1985	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. capensis	*A. p. pusillus*	16.30	449			36	Benguela, South Africa	1974-1985	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. capensis	*A. p. pusillus*	14.80	3542			36	Benguela, South Africa	1974-1985	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. chalcogramma	*B. acutorostrata*	14.50	121	11.80	17.50	49	Bering Sea	1975	25.90		10	58	10	Bering Sea, eastern	1975
T. chalcogramma	*C. ursinus*	19.30	n.a.*	10.00	35.00	71	Bering Sea	1974	25.90		10	58	10	Bering Sea, eastern	1975
T. chalcogramma	*C. ursinus*	30.40				69	Bering Sea	1981-1982	38.30		9	68	69	Bering Sea, southeast	1981-1982
T. chalcogramma	*C. ursinus*	32.97	39	6.00	41.00	108	Bering Sea	1981	38.90				108	Bering Sea, eastern	1981
T. chalcogramma	*C. ursinus*	6.70	1191	3.00	42.00	108	Bering Sea	1982	39.70				108	Bering Sea, eastern	1982
T. chalcogramma	*C. ursinus*	13.03	1428	4.00	47.00	108	Bering Sea	1985	44.00				108	Bering Sea, eastern	1985
T. chalcogramma	*E. barbatus*	11.80	56	6.90	14.30	7	Bering Sea	1981	33.40		9	68	10	Bering Sea, eastern	1981
T. chalcogramma	*E. jubatus*	46.90	280	18.40	61.40	49	Pribilof Islands, Bering Sea	1976, 1979	26.00		6.00	63	10	Bering Sea, eastern	1975. 1979-1980
T. chalcogramma	*E. jubatus*	25.20	1135	8.30	64.20	49	Bering Sea	1981	33.40		9	68	10	Bering Sea, eastern	1981
T. chalcogramma	*E. jubatus*	33.5		20.8	44.5	69	St. Paul Island, Bering Sea	1985	35.00		9	67	10	Bering Sea, eastern	1985

n.a.* = sample size not available, but probably large

Appendix 6. Pairings of food habits and survey data. See Appendix 3 for full scientific names of prey species. See Appendix 1 for common and full scientific names of predator species. See Appendix 7 for key to numbered citations.

Prey species	Predator species	Food habits mean	N	Range, low	Range, high	Food habits citation	Food habits locality	Food habits dates	Survey mean	N	Range, low	Range, high	Survey citations	Locality of survey	Survey dates
T. chalcogramma	*E. jubatus*	21.8		10.3	51.6	69	St. Matthew Island, Bering Sea	1985	35.00		9	67	10	Bering Sea, eastern	1985
T. chalcogramma	*E. jubatus*	29.80	2030	5.60	62.90	89	Gulf of Alaska	1975-1978	31.50		9	58	21	Gulf of Alaska	
T. chalcogramma	*E. jubatus*	29.9		1.7	42.7	69	E Aleutian Islands, Gulf of Alaska	1981-1982	25.50				69	Gulf of Alaska, eastern Aleutians	1981-1982
T. chalcogramma	*E. jubatus*	25.5	80	4.8	55.7	23	Kodiak Island, Gulf of Alaska	1985-1986	25.14		10	57	80	Gulf of Alaska, Shelikof Strait	1985-1986
T. chalcogramma	*P. dalli*	33.64	639	15.08	52.48	84	Sea of Okhotsk & Sea of Japan	1988-1996	43.15	894	26	58	73,74	Sea of Okhotsk	1990-1991, 1996
T. chalcogramma	*P. dalli*	22.61	135	6.50	60.50	113	Sea of Okhotsk	1988-1989	43.15	894	26	58	73,74	Sea of Okhotsk	1990-1991, 1996
T. chalcogramma	*P. fasciata*	11.20	468	6.50	34.40	49	Bering Sea	1976-1978	26.00		6.00	63	10	Bering Sea, eastern	1975. 1979-1980
T. chalcogramma	*P. fasciata*	10.26	447	6.00	20.00	48	Bering Sea	1976-1976	11.16	899	8	23	48	Bering Sea, northern	
T. chalcogramma	*P. largha*	10.90	21	8.00	15.00	22	Bering Sea	1976-1978	26.00		6.00	63	10	Bering Sea, eastern	1975. 1979-1980
T. chalcogramma	*P. largha*	10.90	21	8.00	15.00	49	Bering Sea	1978	26.00		6.00	63	10	Bering Sea, eastern	1975. 1979-1980
T. chalcogramma	*P. vitulina*	10.60	12	8.20	12.60	49	Bering Sea	1981	33.40		9	68	10	Bering Sea, eastern	1981
T. chalcogramma	*P. vitulina*	31.80	23	10.30	56.30	49	Pribilof Islands, Bering Sea	1979	24.90		6	61	10	Bering Sea, eastern	1979
T. chalcogramma	*P. vitulina*	19.20	2180	4.20	53.20	89	Gulf of Alaska	1975-1978	31.50		9	58	21	Gulf of Alaska	
T. inermis	*P. hispida*	1.75	189	1.20	2.60	115	Svalbard, Greenland Sea	1985-1987	1.90	23	1.2	2.4	115	Kongsfjorden	1988-1989
T. libellula	*P. hispida*	1.66	279	1.40	3.40	115	Svalbard, Greenland Sea	1985-1987	2.30	21	0.2	3.8	115	Kongsfjorden	1988-1989
T. t. capensis	*A. p. pusillus*	27.15	56			24	Benguela, South Africa	1976-1990	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. t. capensis	*C. heavisidii*	17.10	23	10.70	22.20	103	Benguela, South Africa	1969-1990	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. t. capensis	*D. delphis*	16.20	134	4.60	34.30	103	Benguela, South Africa	1969-1990	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
T. t. capensis	*L. obscurus*	9.90	723	4.20	24.90	103	Benguela, South Africa	1969-1990	28.90	912	20	36	64	Benguela, South Africa (ICSEAF Div. 1.3)	
Urophycis spp.	*P. phocoena*	15.90	474			52	Gulf of Maine, NW Atlantic	1989-1994	36.62	6120	3	91	83	Gulf of Maine	Fall 1989-1994

n.a.* = sample size not available, but probably large

Appendix 7. Key to numbered citations in Appendices 5 and 6.

Citation number	Citation	Citation number	Citation
1	Abello et al. 1988	49	Frost and Lowry 1986
2	Ahrens 1985	50	Gannon et al. 1997a
3	Alexander and Vromans 1985	51	Gannon et al. 1997b
4	Alexander and Vromans 1988a	52	Gannon et al. 1998
5	Alexander and Vromans 1988b	53	Gonzales et al. 1997
6	Alton and Deriso 1983	54	Green et al. 1989
7	Antonelis et al. 1994b	55	Green et al. 1997
8	Augustyn 1991	56	Hammond et al. 1994a
9	Badenhorst 1985	57	Isarev 1985
10	Bakkala 1989	58	Jackson et al. 1998
11	Beacham 1982	59	Japp 1990
12	Behrends 1982	60	Jazdzewski et al. 1978
13	Benoit and Bowen 1990	61	Kaimmer et al. 1976
14	Booth and Buxton 1997	62	Kock 1998
15	Booth and Hecht 1998	63	Kock and Köster 1989
16	Borjesson et al. 2003	64	Konchina 1989
17	Bowen and Harrison 1994	65	Laidre and Heide-Jorgensen 2005
18	Bowen and Harrison 1996	66	Laidre et al. 2004
19	Bowen et al. 1993	67	Leos 1998
20	Bradstreet et al. 1986	68	Lipinski and David 1990
21	Brown and Rose 1983	69	Lowry et al. 1989
22	Bukhtiyarov et al. 1984	70	Lozan 1988
23	Calkins and Goodwin 1988	71	McAlister et al. 1976
24	Castley et al. 1991	72	McCafferty et al. 1998
25	Castonguay and Mercille 1988	73	McFarlane et al. 1996
26	Chadwick and Cairns 1988	74	McFarlane, n.d.[†]
27	Chouinard and Metuzals 1985	75	McPhail et al. 2001
28	Clarke and Goodall 1994	76	Melin 2002
29	Clay et al. 1985	77	Morales-Nin 1991
30	Crawford 1980	78	Murie and Lavigne 1991
31	Crawford et al. 1978	79	Murie and Lavigne 1992
32	Crawford et al. 1990	80	Nelson and Nunnallee 1987
33	Croxall and Pilcher 1984	81	Nilssen et al. 1990
34	Croxall et al. 1999	82	North 1996
35	Cruickshank et al. 1990	83	O'Brien, n.d.[‡]
36	David 1987	84	Ohizumi et al. 2000
37	Doidge and Croxall 1985	85	Overholtz and Waring 1991
38	Duhamel 1989	86	Parkes 1993, via Reid 1995
39	Duhamel 1995	87	Payne et al. 1985
40	Evans 1976	88	Payne et al. 1986
41	Fanning et al. 1988	89	Pitcher 1981
42	Finley and Evans 1983	90	Plotz et al. 2001
43	Finley and Gibb 1982	91	Prosch 1991
44	Finley et al. 1983	92	Recchia and Read 1989
45	Finley et al. 1990	93	Reid 1995
46	Fontaine et al. 1994	94	Reid and Arnould 1996
47	Frolkina et al. 1998	95	Reid and Brierly 2001
48	Frost and Lowry 1980	96	Reid et al. 1996

[†] G. A. "Sandy" McFarlane, Fisheries and Oceans Canada, Pacific Region, Nanaimo, British Columbia, Canada, pers. commun. Length frequencies of walleye pollock (Theragra chalcogramma) from the Sea of Okhotsk. Unpublished data, 23 September 2003.

[‡] L. O'Brien, Northeast Fisheries Science Center, Woods Hole, Massachusetts, U.S.A., pers. commun. Fish length frequency data sampled during fishery independent surveys conducted by Northeast Fisheries Science Center. Unpublished data, 1 October 2003.

Appendix 7. Key to numbered citations in Appendices 5 and 6.

Citation number	**Citation**
97	Rijnsdorp 1989
98	Rodhouse et al. 1992
99	Rubec et al. 1985
100	Schoeman et al. 2002
101	Schwartzlose et al. 1999
102	Seaman et al. 1982
103	Sekiguchi et al. 1992
104	Siegel 1986
105	Siegel et al. 1998
106	Simonsen and Boje 2003
107	Sinclair 1992
108	Sinclair et al. 1994
109	Svedang 2003
110	Tollit et al. 2004a
111	Torok 1994
112	Waldron et al. 1991
113	Walker 1996
114	Walsh et al. 1992
115	Weslawski et al. 1994
116	Wolotira 1985

RECENT TECHNICAL MEMORANDUMS

Copies of this and other NOAA Technical Memorandums are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22167 (web site: *www.ntis.gov)*. Paper and microfiche copies vary in price.

AFSC-

158 LANG, G. M., P. A. LIVINGSTON, and K. A. DODD, 2005. Groundfish food habits and predation on commercially important prey species in the eastern Bering Sea from 1997 through 2001, 222 p. NTIS number pending.

157 JOHNSON, S. W., A. DARCIE NEFF, and J. F. THEDINGA. 2005. An atlas on the distribution and habitat of common fishes in shallow nearshore waters of southeastern Alaska, 89 p. NTIS number pending.

156 HOFF, G. R., and L. L. BRITT. 2005. Results of the 2004 Eastern Bering Sea upper continental slope survey of groundfish and invertebrate resources, 276 p. NTIS number pending.

155 YANG, M-S., K. AYDIN, A. GRIEG, G. LANG, and P. LIVINGSTON. 2005. Historical review of capelin (*Mallotus villosus*) consumption in the Gulf of Alaska and Eastern Bering Sea, 89 p. NTIS No. PB2005-110464.

154 HOLLAND D. S. 2005. Economic analysis of protection of essential fish habitat in Alaskan fisheries: An analysis of research needs, 35 p. NTIS No. PB2005-110129.

153 FRITZ, L. W., and C. STINCHCOMB. 2005. Aerial, ship, and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in the western stock in Alaska, June and July 2003 and 2004, 56 p. NTIS number PB2005-108287.

152 AMES, R. T., G. H. WILLIAMS, and S. M. FITZGERALD. 2005. Using digital video monitoring systems in fisheries: Application for monitoring compliance of seabird avoidance devices and seabird mortality in Pacific halibut longline fisheries, 93 p. NTIS No. PB2005-107312.

151 TESTA, J. W. (editor). 2005. Fur seal investigations, 2002-2003, 72 p. NTIS No. PB2005-104811.

150 GULLAND, F. M. D., H. PÉREZ-CORTÉS M., J. URBÁN R., L. ROJAS-BRACHO, G. YLITALO, J. WEIR, S. A. NORMAN, M. M. MUTO, D. J. RUGH, C. KREUDER, and T. ROWLES. 2005. Eastern North Pacific gray whale (*Eschrichtius robustus*) unusual mortality event, 1999-2000: A compilation, 33 p. NTIS No. PB2005-105795.

149 RUGH, D. J., K. E. W. SHELDEN, C. L. SIMS, B. A. MAHONEY, B. K. SMITH, L. K. LITZKY, and R. C. HOBBS. 2005. Aerial surveys of belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004, 71 p. NTIS No. PB2005-103921.

148 EILER, J. H., T. R. SPENCER, J. J. PELLA, M. M. MASUDA, and R. R. HOLDER. 2004. Distribution and movement patterns of chinook salmon returning to the Yukon River basin in 2000-2002, 99 p. NTIS No. PB2005-100707.

147 MCELDERRY, H., J. SCHRADER, D. MCCULLOUGH, J. ILLINGWORTH, S. FITZGERALD, and S. DAVIS. 2004. Electronic monitoring of seabird interactions with trawl third-wire cables on trawl vessels - a pilot study, 39 p. NTIS No. PB2005-100243.

146 WING, B. L., and D. R. BARNARD. 2004. A field guide to Alaskan corals, 67 p. NTIS No. PB2005-100429.

145 RUGH, D. J., B. A. MAHONEY, and B. K. SMITH. 2004. Aerial surveys of beulga whales in Cook Inlet, Alaska, between June 2001 and June 2002, 26 p. NTIS No. PB2004-106479.