Incidental Catch and Interactions of Marine Mammals and Birds in the Cook Inlet Salmon Driftnet and Setnet Fisheries, 1999-2000

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Summary

- The Marine Mammal Protection Act is reviewed in terms of the use of the Potential Biological Removal (PBR) of a stock, and the two tier analysis for allocating fisheries to Categories I, II or III are defined. The application of the process to Alaskan fisheries is also summarized, and the Alaska Marine Mammal Observer Program (AMMOP) is described.

- The Cook Inlet setnet and driftnet fisheries were observed in 1999 and 2000, partly because in 1999 the status of the Cook Inlet beluga whale was being reviewed under the Marine Mammal Protection Act and the Endangered Species Act because of declining numbers. These fisheries are described, with information about potential interactions with marine mammals and birds.

- The method for determining the appropriate amount of observer coverage of the fisheries is described, and how the actual effort related to the planned effort.

- The calculation of ratio estimates of total incidental take numbers of marine mammals and birds is decribed.

- During the 1999 season the Upper Cook Inlet driftnet fishery had a total of 5709 permit-days (one permit fished for one day) of fishing. All or part of 100 of these permit-days were observed. Two harbor porpoises were observed to be entangled in nets, but both were released alive, without serious injuries. Five marine birds were also observed to be entangled, with three released dead and two released alive, without serious injuries. In the same fishery in 2000 there were a total of 3889 permit-days of fishing, with all or part of 141 of these observed. Two harbor porpoises and a minke whale were observed to be entangled in nets. One of the harbor porpoises was apparently dead when it was released, but the other porpoise and the whale were released alive, without serious injuries. One marine bird was observed to be entangled in nets and it was released alive, without serious injuries.

- In the Upper Cook Inlet setnet fishery in 1999 there were a total of 5455 permit-days of fishing. All or part of 399 of these permits-days were observed. Two marine birds were observed to be entangled in nets, with one released alive, without serious injuries and one released dead. In the same fishery in 2000 there was a total of 3239 permit-days, with all or part of 269 permit-days observed. One harbor seal was observed entangled in a net, and was released alive, without serious injuries. Two marine birds were also observed to be entangled, and these were both released dead.

- In the Lower Cook Inlet setnet fishery in 1999 there was an estimated total of 968 permit-days of fishing, of which all or part of 28 permit-days were observed. One harbor porpoise was observed entangled in a net and was released alive, without serious injuries. Two marine birds were also observed entangled in nets, and both

were released alive, without serious injuries. In the same fishery in 2000 there is an estimated total of 1045 permit-days of fishing, with 34 of these observed. In this case no entanglements of marine mammals or birds were observed.

- Using a regression method, the total estimated fishing effort for the Upper Cook Inlet driftnet fishery is estimated at 51,586.9 permit hours in 1999. Using this total fishing effort with incidental take rates per hour estimated from the observer data, the total incidental take for the fishery is estimated at 183 common murres (released alive, without serious injuries) with a standard error (SE) of 257, 122 gulls (released alive, without serious injuries) with a SE of 211, and 122 harbor porpoises (released alive, without serious injuries)with a SE of 202. The large SE values for these and other estimates of incidental take means that the estimates should be treated with some reservations. Similar methods applied to the 2000 data for the same fishery give an estimated 28,870.9 permit hours of fishing, with total estimated incidental take of 31 common murres (released alive, without serious injuries) with a SE of 55, 31 live harbor porpoises (released alive, without serious injuries) with a SE of 59, 31 harbor porpoises (released dead) with a SE of 55, and 31 minke whales (released alive, without serious injuries) with a SE of 56.

- For the Upper Cook Inlet setnet fishery in 1999 it was assumed that the observed mean fishing time of 8.14 hours was an accurate estimate of the mean fishing time of a permit holder for a fishing open period. This gives a total fishing effort of 44,104.4 permit hours. Using this total effort and the incidental take rates per hour estimated from the observer data, the estimated total incidental take for the fishery was estimated as 89 gulls (released alive, without serious injuries) with a SE of 89, and 89 common loons (released dead) with a SE of 89. Applying similar methods with the 2000 data gave a mean fishing time for an open period of 7.97 hours, and a total fishing effort of 25,823.8 permit hours. The estimated total incidental take was 37 marbled murrelets (released dead) with a SE of 37, 39 white-winged scoters (released dead) with a SE of 37, and 37 harbor seals (released alive) with a SE of 37. The large SE values with all of the incidental take estimates means that the estimates should be treated with some reservations.

- For the Lower Cook Inlet setnet fishery it was necessary to assume that the permits were fished whenever the fishery was open. In 1999 this gives a total fishing effort of 23,232 permit hours. Combined with the estimated rates of incidental take per hour from the observer data, this leads to the total incidental take for the fishery being estimated as 628 white-winged scoters (released alive) with a SE of 664, 628 common loons (released alive) with a SE of 665, and 628 harbor porpoises (released alive) with a SE of 624. In 2000 the total fishing effort was assessed at 25,080 hours, with no incidental take observed, so that the estimated total incidental take was zero. The observer coverage for this fishery was very low, which has led to the very large SEs for the estimated incidental take in 1999. These incidental take estimates should therefore be treated with even more reservation than the estimates for the other fisheries.

- Marine mammal and bird sightings near nets are summarized, wit maps showing the locations of sightings.

- A graphical analysis of factors that may influence incidental take rates is presented, although the small number of observed takes means that the results are indicative only of factors that may be important.

- No interactions with beluga whales were observed in the Cook Inlet fisheries in 1999 and 2000. The only marine mammal incidental take of importance was of one dead harbor porpoise in the Upper Cook Inlet driftnet fishery in 2000. The level of observer coverage is not sufficient to get a reasonably good estimate of the annual serious injury and mortality rate for this species in the fishery. The best estimate is 5.9% of the PBR, but the true rate may be as high as 27.6% of the PBR. Based on the best estimate, the Upper Cook Inlet driftnet fishery has been retained as a Category II fishery.

- No marine mammal or serious injuries were observed in the setnet fisheries. On this basis the Upper Cook Inlet and Lower Cook Inlet setnet fisheries have been changed from Category II to Category III fisheries.

1. The Marine Mammal Protection Act and the Observer Program

The Marine Mammal Protection Act directs the Secretary of Commerce to monitor marine mammal mortality and serious injury occurring incidentally to commercial fishing, and to monitor the progress of commercial fisheries in reducing incidental takes to insignificant levels approaching a zero mortality rate goal (ZMRG). The National Marine Fishery Service (NMFS) currently uses a value of 10% of the stock's potential biological removal (PBR, Wade and Angliss, 1997) as a criterion to evaluate whether the incidental take of a stock is at an insignificant level approaching the ZMRG.

The PBR is defined to be

$$(N_{min})(0.5\ r_{max})(F_R),$$

where N_{min} is the minimum estimate of the population size for the stock, r_{max} is the maximum yearly rate of increase of the stock, and F_R is a recovery factor between 0.1 and 1.0. The PBR is considered to be the maximum number of animals (not including natural mortality) that may be removed from a stock while still allowing that stock to reach its optimum sustainable population size.

Under the Marine Mammal Protection Act, the NMFS classifies each U.S. commercial fishery (state and federal) in one of three categories, based on the level of incidental serious injury and mortality of marine mammals that occurs in the fishery. Each fishery is classified through a two-tiered analysis which assesses the potential impact of fisheries on each marine mammal stock by comparing serious injury and mortality levels to the stock's PBR.

The Tier 1 analysis proceeds as follows. For each marine mammal stock, serious injuries and mortalities from all commercial U.S. fisheries are totaled. If the total is less than or equal to 10% of the PBR of that stock, then all fisheries interacting with this stock are placed in Category III. This process is repeated for each stock. A fishery remains in Category III unless it interacts with a stock for which the serious injury or mortality rate exceeds 10% of the PBR. All fisheries that interact with a stock for which the serious injury or mortality rate exceeds 10% of the PBR are subject to a Tier 2 analysis. Fisheries with no serious injuries or mortalities to any marine mammal stock are placed in Category III.

If a Tier 2 analysis is required then this proceeds as follows. For each fishery, the annual mortality and serious injury for each marine mammal stock is evaluated relative to the PBR of that stock. The fishery is categorized as Category I if the serious injury and mortality exceeds 50% of the PBR, as Category II if the serious injury and mortality is greater than 1% and less than 50% of the PBR, and as Category III if the serious injury and mortality is less than or equal to 1% of the PBR.

The NMFS relies on observer data in the analyses, but also evaluates other factors such as fishing techniques, the gear, the methods used to deter marine mammals, the seasons and the areas fished.

The Alaska Scientific Review Group was set up in 1994 to review the science used as the basis for marine mammal management. This group reviews stock assessment reports on the marine mammals in the regions and advises the NMFS on the status and trends in each population, and on the research and management needs to reduce incidental fisheries mortality if this is necessary.

In Alaska logbook programs were used from 1990 to 1993, and fisher self-reporting programs from 1995 to 2001 in an attempt to estimate the fishing related mortality of marine mammals. However, this was unsuccessful as logbook data were found to under-estimate mortality rates in comparison to more reliable observer data (Credle *et al.*, 1994), and there were almost no self-reports of injuries or mortalities. As a result, the Alaska SRG directed the NMFS not to use self-reporting data for producing estimates of fishing related mortality (Alaska Scientific Review Group, 1998), leading to many Alaskan fisheries being categorized as II or III using a combination of data five to ten years old, stranding reports, and their similarity to other fisheries.

The Alaska Marine Mammal Observer Program

The Alaska Marine Mammal Observer Program (AMMOP) was set up in 1990 to:

(a) obtain reliable estimates of the level of incidental serious injury and mortality of marine mammals during fishing operations;

(b) determine the reliability of reports submitted by vessel owners and operators;

(c) identify changes in fishing methods or technology that may increase or decrease incidental serious injury and mortality;

(d) collect biological samples that may otherwise be unobtainable for scientific studies; and

(e) record data on incidental take and discard levels of all species.

Although the collection of data on the incidental injury and mortality of marine birds during fishing operations is not part of these goals, the collection of such data is fully supported and considered to be an important secondary benefit from the program.

As part of this program, the NMFS is currently placing observers in Alaskan fisheries on a rotational basis, to gather data to monitor the level and nature of incidental mortalities and serious injuries. These data are also used to place Alaska federal and state

commercial fisheries into the appropriate List of Fisheries category, as required under the Marine Mammal Protection Act. There are currently no Category I fisheries (frequent serious injuries and mortalities) in Alaska, and Category II fisheries (occasional serious injuries and mortalities) have priority for observer coverage. Category III fisheries are not required to accommodate observers and therefore unlikely to be covered by the AMMOP.

The AMMOP began observer coverage in 1991 and 1992 on the Prince William Sound setnet and driftnet fisheries, and the Aleutian Peninsula driftnet fisheries. It continued with the Cook Inlet salmon setnet and driftnet fisheries in 1999 and 2000, and covered the Kodiak Island setnet fishery in 2002. This report covers the 1999 and 2000 surveys of the Cook Inlet salmon setnet and driftnet fisheries.

Part of the reason for observing the Cook Inlet fisheries was the review of the status of beluga whales taking place in 1999 under the Marine Mammal Protection Act and the Endangered Species Act because of declining stock numbers. There was therefore interest in obtaining data on the interaction of the fisheries with beluga whales.

The Role of Observers

The NMFS specifically required the hiring of experienced observers for the first year of the Cook Inlet observer program because of the need for high quality data and the provision of useful information for the further development of the program. It was considered that their presentation of the program to the fishing community was of the utmost importance because most of the fishers had never before had to cooperate with any kind of observer program and might have had little understanding of the implications of the Marine Mammal Protection Act on their fishery or of the impact of their fishery on marine mammal stocks. The ability of the observer to understand and present the program in a professional and clear manner to the fishing community was therefore considered to be critical to the success of the program and future programs.

The observer's duties involved the collection and recording of accurate and precise data in the field. These data included information on fishing gear deployment and operations, marine mammal and bird presences, interactions and entanglements in the fishing gear, the deterrents used against marine mammals, fish catch information, species identification of birds, mammals, and fish, environmental conditions and other elements covered in the *Observer Manual*. In addition, observers collected biological specimens and/or tissue of marine mammals, birds, and some fish, worked cooperatively and professionally with fishers, provided information to the industry regarding the program, conducted data reviews and editing, entered data into computers, and attended debriefing meetings. All data and biological specimen collection were required to be made in accordance with instructions provided in the *Observer Manual*. Appendix A provides copies of the forms used for recording data in 2000.

Lead observers acted as field coordinators and primary debriefers of observers. The lead observers were the main field staff responsible for implementing the observer program in their districts. They were the contact people who cooperated with the NMFS in addressing sampling, data, and deployment issues and provided reports as needed. The lead observers were responsible for the oversight and tracking of debriefing, final data reviews, data editing and data entry. In addition, lead observers were required to organize open meetings with the fishing community to provide updates and consider suggestions and concerns. Whenever possible lead observers participated as field observers in the collection of data.

It was required that debriefings for observers occurred at least once a week, and preferably after every opener (i.e., a period when a fishery is open). The debriefings consisted of (1) a preliminary interview reviewing sampling methods, answering questions, and discussing observer concerns; (2) a preliminary data review; (3) correction by the observer of any data errors noted; and (4) a review and correction of any errors in data turned in by the observer in a previous debriefing, including data entered on a computer after an audit had been run. Any changes to data made by an observer or others were required to be made using a colored pencil, with the identity of the person making the corrections noted on the data form so that questions could be directed at them later if necessary.

When at sea, observers were required to maintain a high standard of conduct as prescribed by the NMFS, with a professional, objective demeanor at all times. They were not permitted to have a direct, financial or political interest in any organization that might be aided by the performance or nonperformance of their duties. Observers received a NMFS certificate acknowledging their successful completion of the observer training program, and to maintain this certificate they had to have satisfactory work standards while deployed, maintain prescribed standards of conduct, not violate the conflict of interest guidelines, and successfully complete additional certification training when required.

2. The Cook Inlet Salmon Setnet and Driftnet Fisheries

Figure 1 shows the location of the Cook Inlet setnet and driftnet salmon fisheries. There are three Alaska Department of Fish and Game (ADFG) fishing districts, with setnet fishing in the Northern District, setnet and driftnet fishing in the Central District, and setnet fishing in the Southern District. The Northern and Central Districts are also called the Upper Cook Inlet fisheries, while the Southern District is called the Lower Cook Inlet fishery. These fisheries were the only ones observed under the Marine Mammal Protection Act in Cook Inlet in 1999 and 2000. A subsistence setnet fishery also exists in the area, but is not required to be observed under the AMMOP.

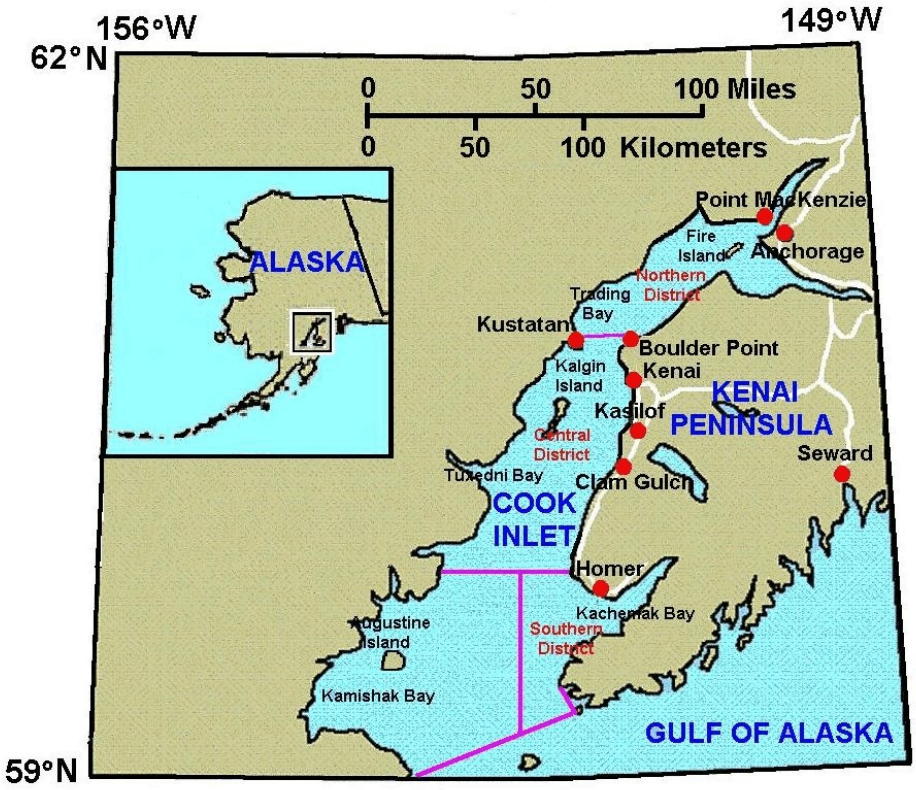


Figure 1 The location of the Cook Inlet salmon setnet and driftnet fisheries. Setnet fishing takes place in the Northern, Central and Southern Districts, while driftnet fishing only takes place in the Central District. There is no fishing around Kamishak Bay and Augustine Island in the southwest.

The salmon gillnet fisheries are the primary commercial fisheries in the Upper Cook Inlet. Other commercial fisheries in the Inlet include purse seining for pink and chum salmon, and herring and razor clam fishing, with the purse seining being the most important commercial fishery in the Lower Cook Inlet. The area is also important for recreational fishing and many sport fishers come to Cook Inlet area during the summer to fish for salmon. Their primary destination is the Kenai River and the main fish of interest is king salmon.

ADFG is the agency responsible for the management of the gillnet fisheries. The agency divides Cook Inlet into the Upper Cook Inlet and Lower Cook Inlet commercial salmon management areas. There are two management area offices, one in Kenai-Soldotna for the Upper Cook Inlet and one in Homer for the Lower Cook Inlet. ADFG regulates the fisheries as three management units, which are the Upper Cook Inlet driftnet fishery, the Upper Cook Inlet setnet fishery, and the Lower Cook Inlet setnet fishery. For management purposes, the Upper Cook Inlet Districts are divided further into subdistricts, as shown in Figure 2, with a further division into the statistical areas that are shown in Figure 3. Similarly, the Lower Cook Inlet setnet fishery is divided into subdistricts

with corresponding statistical areas, as shown in Figure 4. In the Marine Mammal Protection Act categorization of these fisheries, the Upper and Lower Cook Inlet setnet fisheries are jointly referred to as the Cook Inlet setnet fishery.

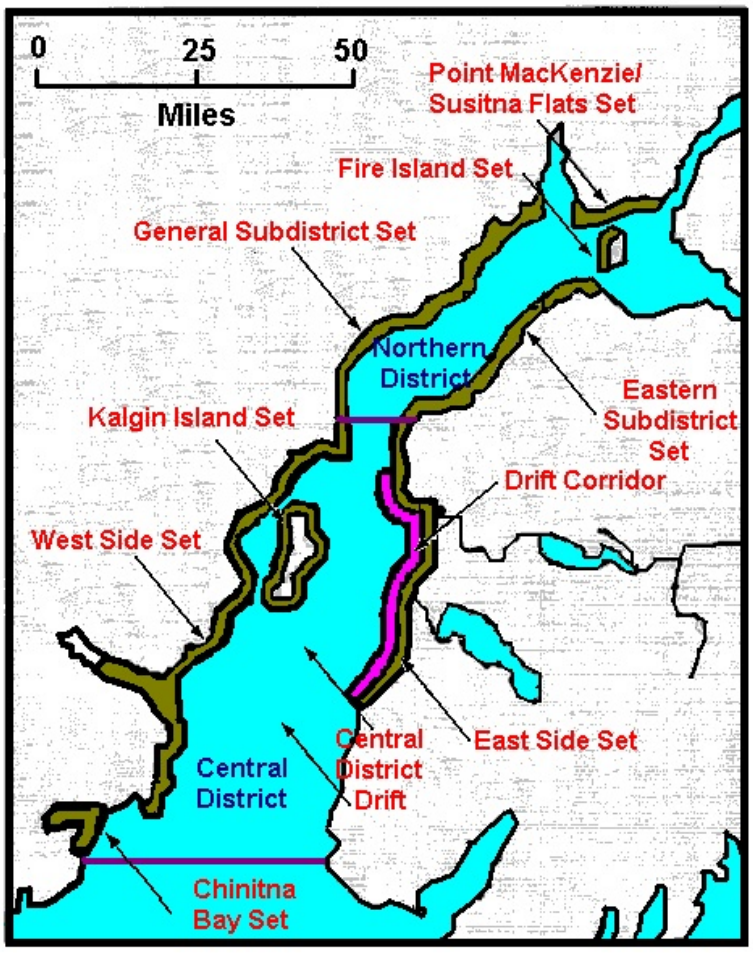


Figure 2 Fishing subdistricts names in the Upper Cook Inlet. There is setnet fishing in the Northern and Central Districts, and driftnet fishing in the Central District only in the drift corridor and in the middle waters.

The fisheries are limited entry, state-managed, inshore, salmon gillnet fisheries. Fishing occurs each year within state waters, primarily from June to the end of September. Fishing opener schedules are laid out by district in the ADFG Commercial Fishing Regulations for Cook Inlet. In the Upper Cook Inlet notices of fishing openers are posted weekly and announced on regular radio channels some time before each opener. There are usually two regular openers a week of 12 hours each, but these are sometimes extended by Emergency Order during the last few hours of the opener. The fishing effort can change dramatically at any time because of alterations in management policy, the salmon run strength, the price, and strikes within the industry. By contrast, there is little active management during the fishing season in the Lower Cook Inlet.

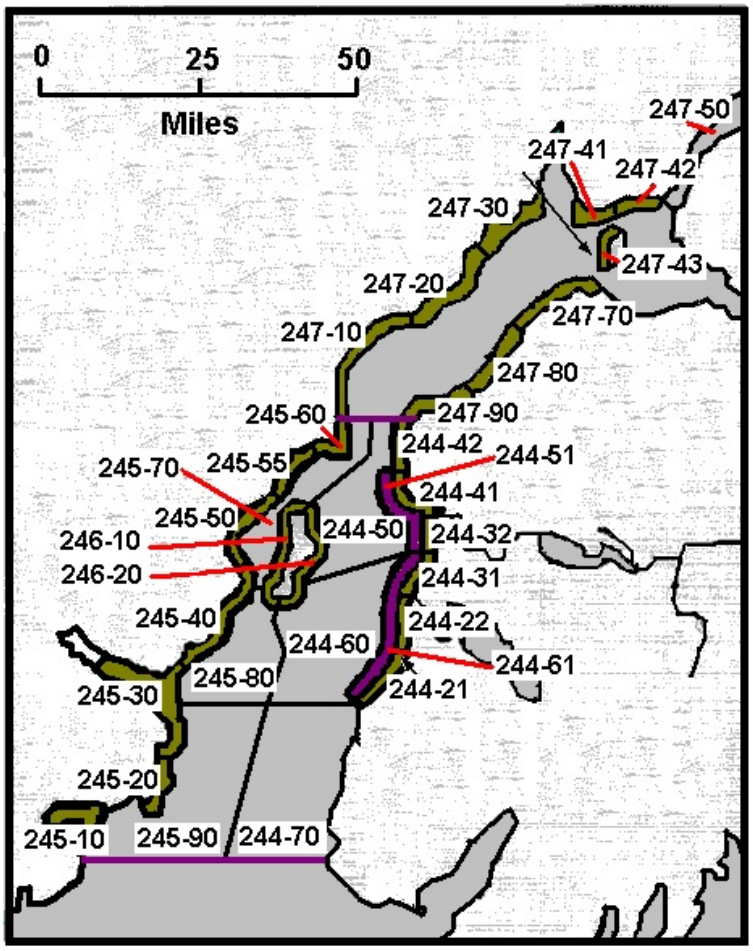


Figure 3 Statistical area codes for the Upper Cook Inlet setnet and driftnet fisheries, 1999-2000. The statistical areas starting with 247 are all setnet fisheries in the Northern District. The statistical areas starting 246, 245 and 244 are in the Central District. Setnet and driftnet fishing occurs in area 245-10, and driftnet fishing occurs in areas 244-50, 244-60, 244-70, 244-51, 244-61, 245-70, 245-80, and 245-90. The areas 244-51 and 244-61 form the Drift Gillnet Corridor, which is also labeled 244-55.

The Setnet Fishery

The Cook Inlet commercial setnet fishery usually begins early in June and runs through until September or October. Typically the Northern and Central District setnet fishery is open for two 12 hour periods each week during daylight hours, but there are often extensions. The Southern District usually fishes two 48 hour periods per week, with one subdistrict having this period extended after July 4. The majority of the effort occurs in the Northern District and the upper part of the Central District. Fishing effort in the Northern District generally peaks between late June and mid-August, while the fishing effort in the Central District peaks from July to mid-August. The fishery had approximately 740 active permit holders in 1999 and 2000.

Setnets are stationary surface-hanging multifilament nets that are staked, anchored, or otherwise fixed in place. Nets can be up to 35 fathoms (210 feet) in length, but a permit holder is allowed to fish three or four nets providing that the total length does not exceed 105 fathoms. The nets are usually set perpendicular to the shore in the path of salmon moving along rivers or the ocean shoreline. Most nets are attached to the shore but in some areas nets are anchored and set offshore. Small skiffs are used to collect fish picked from the net and to reach offshore sites. Nets can be picked in sections allowing them to effectively be fished for the entire period. Nets may be picked continuously or according to the tides, catch, and stamina of the crew. The crew may take shifts tending the nets with usually one to three crew per shift. Some sites are located in remote areas far from roads or accommodations, and are often reachable only by boat, aircraft, or all-terrain vehicles. Most fish are delivered to shore-based processors by land vehicles, aircraft or tenders. Permit holders often live near the setnet site for the season, many in a small cabins or wall tents.

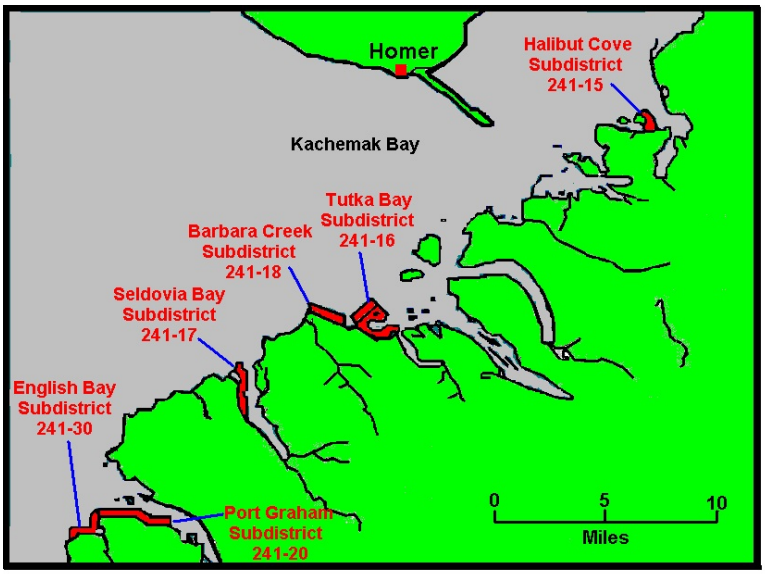


Figure 4 The subdistricts for the Lower Cook Inlet setnet fishery 1999-2000, with the corresponding statistical area numbers.

The Driftnet Fishery

The driftnet fishery usually runs from June 25 until August 9. Currently driftnet fishing only occurs in the entire Central District areas for the two regular 12 hour openers on Mondays and Thursdays, with all extra fishing restricted to the drift corridor that is shown on Figure 2. Also, according to the fishery management plan, three regular periods during the season must also be restricted to the drift corridor, although these restrictions can be relaxed for two of these three periods under conditions that are related to sockeye salmon abundance and achieving escapement goals for other species. The fishery had approximately 585 permit holders in 1999 and 2000.

Between openers the driftnet fleet primarily anchors in the mouth of the Kenai River, near the mouth of the Anchor River, or in the ports of Kasilof, Ninilchik, and Homer. The fishing effort peaks in mid to late July while the fleet fishes for sockeye. The productive driftnet fishing season is relatively short in Cook Inlet and many boats also fish other areas before and after the salmon driftnet season. Driftnet fishing accounts for approximately 60% of the average annual salmon harvest for the region.

The driftnet vessels deploy and retrieve a gillnet from either the stern or bow of the vessel. The net is usually 150 fathoms long, although sometimes shorter than this. Primarily stern picking is used although there are bow pickers in the fleet. The net is suspended from floats and stays attached to the vessel as it soaks. The duration of sets can vary from 20 minutes to four or more hours, depending on fishing conditions and other variables, with between four and 20 sets per day. In general, fishing only occurs during daylight hours, and on long openers fishing is stopped from about 11 pm until early the next morning.

Because driftnet openers are short, fishers will often deliver their catch to fish processors in local ports, although sometimes there are tenders on the fishing grounds to collect the fish. Vessels range in size from 25 - 40 feet, with two to four bunks, a head, and a small galley, to accommodate crews of one to two fishermen for the entire opener.

Potential Marine Mammal Interactions

The Cook Inlet set and drift gillnet fisheries were originally placed into Category II (occasional serious injury or mortality of marine mammals) under the Marine Mammal Protection Act, based on a logbook reporting program in operation during 1991-93. As noted above, the AMMOP was conducted in Cook Inlet in 1999 and 2000 partly because the status of the Cook Inlet stock of beluga whales (*Delphinapterus leucas*) was in the process of being reviewed under both the Marine Mammal Protection Act and the Endangered Species Act because of the declining numbers.

Apart from beluga whales, the marine mammal stocks that had been documented to interact with the Cook Inlet fisheries are the Gulf of Alaska stock of the harbor porpoise (*Phocoena phocoena*), the Alaska stock of Dall's porpoise (*Phocoenoides dalli*), the western United States stock of the Steller sea lion (*Eumetopias jubatus*), and the Gulf of Alaska stock of the harbor seal (*Phoca vitulina richardsi*) (Federal Register, 2006).

A Minke whale (*Balaenoptera acutorostrata*) was observed to be entangled in nets in the Upper Cook Inlet driftnet fishery in 2000. Mike whales are not listed as depleted under the Marine Mammal Protection Act, or as threatened or endangered under the Endangered Species Act, and there have been no other incidental takes of minke whales in this fishery. Minke whales are common off the coast of Alaska, with minimal mortalities related to human activities. Therefore, it is not considered to be a strategic stock. Currently there is no estimate available of the population size, and no PBR has been calculated.

The estimate of the population size of the Cook Inlet beluga whales from a 2004 aerial survey is 366, with a coefficient of variation (CV = standard error/estimated population size) of 0.20. Using a minimum population size of N_{min} = 310, a maximum yearly rate of increase of R_{max} = 0.04, and a recovery factor of F_R = 0.3, the NMFS has determined that the PBR for this species should be 326 x 0.5 x 0.04 x 0.3 = 1.86 (NMFS, 2006a). Currently the stock is listed as depleted under the Marine Mammal Protection Act. There has been a recent announcement of a reduction in the estimated population size to 278 (NMFS, 2006b).

The latest estimate of the population size for the Gulf of Alaska stock of harbor porpoise is 30,506, with a CV of 0.214, from aerial surveys in 1998. For this stock the parameters used for the PBR are N_{min} = 25,536, R_{max} = 0.04, and F_R = 0.5, so that the PBR is 25,536 x 0.5 x 0.04 x 0.5 = 255 (Angliss and Outlaw, 2005, p. 137). At present there is no reliable information about trends in abundance for the stock, which is therefore considered to have an unknown population status under the Marine Mammal Protection Act.

The currently used population size estimate for the Alaska stock of Dall's porpoise is 83,400, with a CV of 0.097. This is based on vessel surveys from 1987 to 1993, with a correction for vessel attraction behavior. More recent survey results will soon be used to produce a new estimate. For this stock N_{min} = 76,874, R_{max} = 0.04, and F_R = 1.0, so that the PBR is currently 76,874 x 0.5 x 0.04 x 1.0 = 1537 (Angliss and Outlaw, 2005, p. 146). The stock is not listed as depleted under the Marine Mammal Protection Act.

A minimum population size estimate for the western U.S. stock of Steller sea lions based on aerial surveys of non-pups in 2004 and counts of pups at rookeries and haul out sites from 2004 to 2005 is 38,988. Using this value for N_{min}, R_{max} = 0.12, and F_R = 0.1, the PBR is 38,513 x 0.5 x 0.12 x 0.1 = 234 (NMFS, 2006c). The stock is listed as endangered under the Endangered Species Act and depleted under the Marine Mammal Protection Act.

The estimated population size of the Gulf of Alaska stock of the harbor seal is 45,975 with a CV of 0.04. Based on N_{min} = 44,453, R_{max} = 0.12, and F_R = 0.5, the PBR is currently 44,453 x 0.5 x 0.12 x 0.5 = 1,334 (NMFS, 2006d). The stock is not listed as depleted under the Marine Mammal Protection Act.

Potential Marine Bird Interactions

Potential marine bird interactions are of concern in the setnet and driftnet fisheries, because of the high numbers of marine birds in Cook Inlet in the summer, perhaps as high as two to three million birds. Densities of up to 300 birds/km^2 have been reported. In particular, there is very high primary productivity around Kachemak Bay on the eastern side of Lower Cook Inlet, leading to high concentrations of birds. The concern with marine birds is also related to a regime change in the oceanic conditions in the early 1980's that reduced the availability of food for some bird species, plus the effects of the Exxon Valdez

oil spill in 1989, which had many adverse effects on the availability of food (Agler *et al*., 1995, 1998; Speckman, 2002).

Yearly surveys for the years 1995 to 1999 in the Lower Cook Inlet showed short-tailed shearwaters (*Puffinus tenuirostris*) to be the most commonly sighted species (48.2% of records). Other species of in the order of their frequency of sightings were tufted puffins (*Fratercula cirrhata*, 13.6%), black-legged kittiwakes (*Rissa tridactyla*, 9.3%), common murres (*Uria aalge*, 8.0%), *Brachyramphus* murrelets (6.2%), phalaropes (mainly red-necked phalaropes, *Phalaropus lobatus*, 3.0%), fork-tailed storm-petrels (*Oceanodroma furcata*, 2.7%), northern fulmars (*Fulmarus glacialis*, 2.3%), glaucous-winged gulls (*Larus glaucescens*, 1.8%), horned puffins (*Fratercula corniculata*, 1.3%), and pigeon guillemots (*Cepphus columba*, 1.1%). The remaining 2.5% sightings were of a number of species each contributing less than 1% of to the total (Speckman, 2002).

3. Fishing Effort and Observer Coverage

The method used to determine the observer effort for the Cook Inlet setnet and driftnet fisheries in 1999 and 2000 identified the minimum number of fishing days that need to be observed to ensure that if no mortalities or serious injuries are observed for a marine mammal stock of concern then there is 95% confidence that the actual level of mortality or serious injury is not greater than the PBR level for that stock (Wade, 1999). The calculations were made for this purpose using the harbor porpoise because this species is thought to interact with all the Alaskan gillnet fisheries at detectable rates.

When the Cook Inlet observer program for 1999 and 2000 was being planned in 1998 the yearly PBR for the harbor porpoise was 71 (Hill and DeMaster , 1999, p. 99). It was changed to 166 in 2000 (Ferrero *et al*., 2000, p. 99) and to 255 in 2003 (Angliss and Lodge, 2004, p. 111). Based on the PBR of 71 and past fishing effort data collected by the ADFG, it was determined that it required 600 observed fishing days for the setnet fishery to ensure a probability of 0.95 of observing some harbor porpoise incidental take if the total incidental take of this species is equal to the PBR of 71. Similarly, for the driftnet fishery it was determined that it required 360 observed fishing days to ensure a probability of 0.95 of observing some harbor porpoise incidental take if the total incidental take of the species is equal to the PBR of 71.

These target numbers of observed fishing days apply if the fisheries are sampled for one year. If sampling is spread out over two years then the total fishing effort and the PBR are doubled but this has almost no effect on the probabilities of observing some incidental take of harbor porpoise during the two years. For this reason the target level of coverage was 300 fishing days per year for the Cook Inlet setnet fishery and 180 fishing days for the Cook Inlet driftnet fishery. This required the assumption that the conditions in the fishery with regard to fishing effort and incidental take were stable over the two sampled years.

The target coverage levels were not adhered to. In 1999 there were 427 observed permit-days in the setnet fishery (399 in Upper Cook Inlet and 28 in Lower Cook Inlet), and 100 observed permit-days in the driftnet fishery. The target permit-days were therefore exceeded in the setnet fishery at the expense of the target days in the driftnet fishery. This was due to logistic difficulties in sampling enough driftnet days through the season, for example because of difficulty in getting observers on boats. In 2000 there were 303 observed permit-days in the setnet fishery (269 in Upper Cook Inlet and 34 in Lower Cook Inlet), and 141 sampled permit-days in the driftnet fishery. This was on target for the setnet fishery, but still short of the target for the driftnet fishery.

Table 1 shows the open periods for the Upper Cook Inlet driftnet fishery in 1999 and 2000, and the potential fishing effort in terms of permit-hours (the number of permits operating times the open hours available). Because of the large number of districts, only a summary of the open periods in the Upper Cook Inlet setnet fishery in 1999 and 2000 is provided in Table 2, with fuller data provided in Appendix C. Table 3 provides a summary of the open periods for the same two years in the Lower Cook Inlet setnet fishery.

The potential fishing efforts that are shown in Tables 1 to 3 are not the actual fishing effort that took place, as the individual fishers did not necessarily fish for the entire open periods. Allowances for this factor are discussed in the following sections on the estimation of incidental take numbers for the entire fisheries.

4. Ratio Estimation of Total Incidental Take Numbers

For the estimation of the total marine bird and mammal incidental take numbers, the Upper Cook Inlet driftnet fishery, the Upper Cook Inlet setnet fishery, and the Lower Cook Inlet setnet fishery are treated separately. The method used in each case is ratio estimation, as described in detail by Cochran (1977, Chapter 6). Estimates are needed separately for animals entangled in nets but released alive (without serious injuries), and those released either dead or seriously injured. It is the second group that is most important for management purposes.

The principle behind ratio estimation is quite simple. For each of n sample units (here a permit observed for one day) there is a measure of sampling effort X (here the observed fishing time in hours), and the value of a variable of interest Y (here the number of birds or mammals of a certain type caught in the net or nets). The incidental take per hour is then estimated by

$$r = \bar{y} / \bar{x}, \qquad (1)$$

where $\bar{y}$ is the mean of Y and $\bar{x}$ is the mean of X over the n sample units.

Table 1. The potential driftnet effort in 1999 and 2000 based on the maximum number of permits being fished on each open day. Except as noted in 2000, All fishing areas are as shown in Figure 3 (statistical areas 244-50 to 244-70 and 245-70 to 245-90). The potential fishing effort is equal to the number of permits times the open hours.

			Statistical Area Open Hours			Total	Potential
Year	Date	Permits	All	244-61	244-55	Hours	Effort
1999	28-Jun	225	12			12	2700
	01-Jul	361	12			12	4332
	03-Jul	84		15		15	1260
	05-Jul	421	12			12	5052
	08-Jul	407	12	4		16	6512
	09-Jul	112		10		10	1120
	11-Jul	189		13		13	2457
	12-Jul	256			12	12	3072
	15-Jul	475	12			12	5700
	19-Jul	477	12			12	5724
	22-Jul	444			12	12	5328
	27-Jul	356		3	14	17	6052
	28-Jul	47		6		6	282
	29-Jul	431	12		3	15	6465
	30-Jul	130		9	7	16	2080
	31-Jul	153		17		17	2601
	01-Aug	188			18	18	3384
	02-Aug	348	12		5	17	5916
	03-Aug	94			17	17	1598
	04-Aug	137			17	17	2329
	05-Aug	256	12		2	14	3584
	09-Aug	118	12			12	1416
	Totals	5709	120	77	107	304	78964
2000	26-Jun	194	12			12	2328
	29-Jun	262	12			12	3144
	03-Jul	414	12			12	4968
	06-Jul	458	12			12	5496
	10-Jul	262			12	12	3144
	12-Jul	132		13		13	1716
	13-Jul	477	12		4	16	7632
	15-Jul	304		13		13	3952
	16-Jul	87		7		7	609
	17-Jul *	431	12		4	16	6896
	18-Jul	144			9	9	1296
	20-Jul	474	12			12	5688
	31-Jul *	161	12			12	1932
	03-Aug *	59	12			12	708
	07-Aug *	30	12			12	360
	Totals	3889	120	33	29	182	49869

*Fishing was restricted to the statistical areas on the west side of the Central District on these days.

Table 2. Potential setnet effort in the Upper Cook Inlet fishery for 1999 and 2000 based on the total hours that different statistical areas were open[1].

	Potential Fishing Effort	
Statistical Area[2]	1999	2000
244-21	16780	6696
244-22	15162	6255
244-31	15850	6705
244-32	8872	2212
244-41	6688	2103
244-42	3644	1165
245-10	84	0
245-20	702	0
245-30	4637	7366
245-40	448	36
245-50	360	312
245-55	480	564
245-60	192	60
246-10	2088	1884
246-20	492	396
247-10	276	568
247-20	2784	2404
247-30	1200	1208
247-41	480	508
247-42	444	848
247-43	360	500
247-70	1668	1680
247-80	960	528
247-90	720	968
Total	85371	44966

[1]The potential fishing effort is the product of the number of permits operating and the number of hours the area was open, summed over all openings.
[2]The statistical areas are shown in Figure 3.

Table 3. Potential setnet fishing effort in the Lower Cook Inlet in terms of the permits times the number of open hours in 1999 and 2000. The statistical areas are shown in Figure 4.

	Statistical Area						
	241-15	241-16	241-17	241-18	241-20	241-30	Total
Permits in 1999	5	6	7	5	0	0	
Potential effort in the Week Starting on the Sunday Shown in 1999							
30-May	72	72	72	72	0	0	
6-Jun	96	96	96	96	0	0	
13-Jun	96	96	96	96	0	0	
20-Jun	96	96	96	96	0	0	
27-Jun	96	96	96	96	0	0	
4-Jul	120	96	96	96	0	0	
11-Jul	120	96	96	96	0	0	
18-Jul	120	96	96	96	0	0	
25-Jul	120	96	96	96	0	0	
1-Aug	120	96	96	96	0	0	
8-Aug*	48	48	48	48	0	0	
Total Hours	1104	984	984	984	0	0	
Total Permit Hours	5520	5904	6888	4920	0	0	23232
Permits in 2000	5	5	4	6	2	3	
Potential Effort in the Week Starting on the Sunday Shown in 2000							
28-May	48	48	48	48	48	48	
04-Jun	96	96	96	96	96	96	
11-Jun	96	96	96	96	96	96	
18-Jun	96	96	96	96	0	0	
25-Jun	96	96	96	96	0	0	
02-Jul	120	96	96	96	0	0	
09-Jul	120	96	96	96	0	0	
16-Jul	120	96	96	96	0	0	
23-Jul	120	96	96	96	0	0	
30-Jul	120	96	96	96	0	0	
06-Aug	120	96	96	96	0	0	
13-Aug	120	96	96	96	0	0	
20-Aug*	48	48	48	48	0	0	
Total Hours	1320	1152	1152	1152	240	240	
Permit Hours	6600	5760	4608	6912	480	720	25080

*Although the fishery season remained open until 30 September by regulation, fishing did not continue that long. In 1999 the last delivery of fish was on 11 August, and in 2000 the last delivery was on 23 August. The hours shown for these last fishing weeks reflect this curtailment of the fishing effort by the fishers themselves.

Providing that the sampling fraction n/N is small, where N is the total number of possible sample units, the variance of r can be estimated by

$$\mathrm{Var}(r) = \left[\sum_{i=1}^{n} (y_i - r\,x_i)^2 / (n - 1) \right] / (n\bar{x}^2), \qquad (2)$$

where x_i is the observed fishing hours and y_i is the observed incidental take on the ith sample unit. The standard error of r is then estimated by $SE(r) = \sqrt{\mathrm{Var}(r)}$.

To estimate the total incidental take of the bird or mammal being considered, the catch per hour is multiplied by the estimated total amount of effort E for the fishery (here the total fishing time for all of the permits). Thus the estimated total incidental take is

$$B = r \cdot E. \qquad (3)$$

If E has an estimated variance of Var(E) and an estimated standard error of $SE(E) = \sqrt{\mathrm{Var}(E)}$ then Goodman's (1960) equation for the estimated variance of B becomes

$$\mathrm{Var}(B) = r^2\mathrm{Var}(E) + E^2\mathrm{Var}(r) - \mathrm{Var}(E).\mathrm{Var}(r). \qquad (4)$$

This estimator assumes that the sampling errors in E and r are uncorrelated, which will be reasonable providing that different data are used for the estimation of E and r. The estimated standard error of B is then $SE(B) = \sqrt{\mathrm{Var}(B)}$. However, if the total effort is known either exactly or with a negligible error then the standard error of B can be estimated by the simple equation

$$SE(B) = SE(r).E. \qquad (5)$$

In using the above equations with the Cook Inlet data it is not assumed that all of the effort on a sampled permit was always observed during the sample day. Instead, the observed effort is based on the hours covered, irrespective of whether this was or was not the total hours fished on the permit. However, it is assumed that all incidental take on the permit was recorded during the observed period. In particular, if there were several nets with a setnet permit it is assumed that all picks were observed with these nets during the observed hours.

The Upper Cook Inlet Driftnet Fishery

There were n = 100 permit-days sampled in the Upper Cook Inlet driftnet fishery in 1999. The observed incidental take was of the common murre (*Uria aalge*, three released dead), gulls (two released alive, without serious injuries), and harbor porpoises (two released alive, without serious injuries). The mean observed fishing time for a permit was 8.44 hours, with a total of 844.3 hours observed.

The statistical fishing area codes were generally not recorded in 1999, and the level of incidental take was very low overall. For these reasons the total estimated incidental take has been calculated for the whole of the driftnet fishery, rather than for the individual statistical areas. On this basis, for the common murre the mean sample effort per permit was $\bar{x} = 8.44$ hours, and the mean incidental take per permit was $\bar{y} = 0.030$. This leads to an estimate from equation (1) of

$$r_{COMU} = 0.030/8.44 = 0.0036$$

individual birds caught in the nets per fishing hour. From equation (2) it is also found that

$$SE(r_{COMU}) = 0.0050.$$

Carrying out similar calculations for gulls and harbor porpoises leads to the estimates $r_{gull} = 0.0024$ gulls per hour with $SE(r_{gull}) = 0.0041$, and $r_{HAPO} = 0.0024$ porpoises per hour with $SE(r_{HAPO}) = 0.0039$.

The total potential driftnet fishing effort for all areas for the whole of 1999 is shown in Table 1 to be 78,964 hours. However, the actual fishing effort was lower than this because permits were not generally fished for entire open periods. For example, with the 12 hour open periods the mean fishing time for the observed permits was only about nine hours. Furthermore, inspection of the data suggests that the actual fishing time varied with the length of the open period and also with the time within the fishing season.

To examine the effect of the time in the season and the length in hours of the open period, the data on the total fishing time from the 100 observed sample units were used as the dependent variable in a multiple regression relating this time to the day in the season and the length of the opener. The form of regression equation used for this purpose was

$$FT = \beta_0 + \beta_1(DS) + \beta_2(DS^2) + \beta3(OT) + \beta_4(OT^2) + \beta5(DS.OT) + \varepsilon, \qquad (6)$$

where FT is the fishing time in hours, DS is the day in the season relative to 1 June, OT is the open time in hours, the β values are constants to be estimated, and ε represents the random element in an observed fishing time.

The fitted equation only accounted for 16.9% of the variation in FT, but this is very highly significant ($F = 5.02$ with 5 and 94 df, $p < 0.001$). Table 4 shows the estimated coefficients, with their standard errors and significance levels. Although the coefficients of OT and OT^2 are not significant at the 5% level, the coefficient of the product term is significant. Therefore the terms for OT have been left in the equation.

Table 4. The estimated regression equation relating the actual fishing time to the day in the season and the hours of opening, for the driftnet fishery in 1999.

Parameter	Estimate	Standard Error	T-Value	P-Value
Constant	1.23920	17.28500	-	-
DS	-0.00093	0.13654	-0.01	0.995
DS^2	-0.00320	0.00112	-2.87	0.005
OT	1.20257	2.48328	0.48	0.629
OT^2	-0.07392	0.09065	-0.82	0.417
DS.OT	0.02003	0.00890	2.25	0.027

Using the fitted equation, the fishing mean fishing time per permit, and hence the total fishing time for all permits can be estimated, as shown in Table 5. The mean fishing times per day estimated from the regression all appear reasonable except for the six hour open period on 6 July, where the mean fishing time is estimated as only 1.94 hours from the regression equation. As there were no observations on this day, the figure of 1.94 represents an extrapolation of the observer results that are available, and a value of 6.00 hours has been used instead. This estimated total fishing effort is then E = 51,586.6 hours, which is about 65% of the potential effort from the open hours of the fishery. The observers covered a total of 844.3 hours of fishing. This represents a coverage rate of 1.6% of the estimated total fishing effort.

Bootstrap resampling (Manly, 1997) was used to estimate the variance of E. To this end the residuals from the fitted regression equation(6) were randomly resampled with replacement and added to the predicted values from the equation. This then produced a bootstrap set of data which was used to refit the regression equation and then recalculate the values in Table 5. This process was repeated 5000 times to produce 5000 bootstrap estimates of the total effort. The variance of these estimates was 1,224,784.9, which is then the bootstrap value for the standard deviation of E for use in equation (4). The standard deviation of E is then estimated as 1106.7, indicating a small relative error in the estimation of E, with a CV of 0.021. For all bootstrap sets of data the mean fishing hours on 28 July was set equal to 6.00, as it was for the real data. The calculations were carried out using Resampling Stats for Excel (Blank, 2004).

Using equation (4) and the results presented above, it is now possible to estimate the standard error associated with the estimates of total incidental take. The estimates and their standard errors are provided in Table 6. As only two or three animals were observed for the incidental take of different species, the estimated variances and standard errors of the incidental take rates per hour are not very reliable. Consequently, the standard errors and CVs shown in Table 6 should only be viewed as rough approximations for the true values.

Table 5. Estimation of the total number of hours of driftnet fishing in 1999 based on the regression model of Table 4, which related the actual mean fishing hours for a permit to the day in the season and the number of open hours on that day.

Date	Day in Season	Permits	Open Hours	Permit Hours	Mean Fishing Hours[1]	Total Fishing Hours
28-Jun	28	225	12	2700	9.22	2074.2
01-Jul	31	361	12	4332	9.37	3382.7
03-Jul	33	84	15	1260	9.04	759.6
05-Jul	35	421	12	5052	9.48	3992.3
08-Jul	38	407	16	6512	9.08	3693.7
09-Jul	39	112	10	1120	8.78	983.1
11-Jul	41	189	13	2457	9.63	1821.0
12-Jul	42	256	12	3072	9.43	2414.8
15-Jul	45	475	12	5700	9.32	4424.9
19-Jul	49	477	12	5724	9.07	4326.1
22-Jul	52	444	12	5328	8.82	3914.9
27-Jul	57	356	17	6052	9.27	3300.8
28-Jul	58	47	6	282	6.00[2]	282.0
29-Jul	59	431	15	6465	9.17	3952.6
30-Jul	60	130	16	2080	9.20	1196.3
31-Jul	61	153	17	2601	9.12	1395.2
01-Aug	62	188	18	3384	8.92	1677.3
02-Aug	63	348	17	5916	9.00	3133.4
03-Aug	64	94	17	1598	8.94	840.1
04-Aug	65	137	17	2329	8.86	1214.3
05-Aug	66	256	14	3584	8.08	2069.7
09-Aug	70	118	12	1416	6.10	719.3
Totals		5709	304	78964		51568.6

[1]As estimated from the fitted regression model.
[2]An unrealistic estimate of 1.94 hours was replaced by the open hours.

Table 6. Estimated total incidental take from the Upper Cook Inlet driftnet fishery in 1999, together with standard errors (SE), coefficients of variation (CV) and whether the animals are released alive (without serious injuries) or dead.

Species	Incidental take	SE	CV
Common Murre (Dead)	182.6	257.8	1.41
Gulls (Alive)	121.7	211.4	1.73
Harbor Porpoises (Alive)	121.7	201.1	1.65

There were n = 141 permits sampled in the Upper Cook Inlet driftnet fishery in 2000. The observed incidental take was of one common murre (released alive, without serious injuries), two harbor porpoises (one released alive without serious injuries, and one that may have been dead), and a minke whale (released alive, without serious injuries). The mean observed fishing time was 7.41 hours, with a total of 1044.7 hours observed.

Information on the statistical areas where fishing took place was recorded in 2000. However, because of the low levels of observed incidental take the total estimated take has only been calculated for the whole of the driftnet fishery, rather than for the individual statistical areas. On this basis, for the common murre the mean sample effort per sample unit is $\bar{x}$ = 7.41 hours, and the mean incidental take per sample unit is $\bar{y}$ = 0.007. This leads to an estimate from equation (1) of

$$r_{COMU} = 0.007/7.41 = 0.0010$$

individual birds caught in the nets per fishing hour. From equation (2) it is also found that

$$SE(r_{COMU}) = 0.0017.$$

Carrying out similar calculations for live harbor porpoises, dead harbor porpoises, and minke whales leads to the exactly the same incidental take rate per hour for each of these types of incidental take. The estimated standard error of the incidental take rate is also 0.0017 except for live harbor porpoises, in which case the estimated standard error is 0.0018.

The total potential driftnet fishing effort for all areas for the whole of 2000 is shown in Table 1 to be 49,869 hours. However, as was the case in 1999, the actual fishing effort was lower than this because permits were not fished for entire open periods.

To examine the effect of the time in the season and the length in hours of the open period, the data on the total fishing time from the 141 observed sample units were used as the dependent variable (FT) in a multiple regression relating this time to the day in the season and the length of the opener, in the same was as way done for 1999. The fitted equation only accounted for 8.6% of the variation in FT, but this was highly significant ($F = 3.62$ with 5 and 135 df, $p = 0.004$). However, the coefficients of DS, DS^2 and DS.OT were not significant. These terms were therefore removed to produce a reduced equation in which all the coefficients are significant. This equation accounts for 9.2% of the variation in the data and is very highly significant ($F = 5.75$ with 3 and 137 df, $p < 0.001$). Table 7 shows the estimated coefficients, with their standard errors and significance levels.

Using the fitted equation, the fishing mean fishing time per permit, and hence the total fishing time for all permits can be estimated, as shown in Table 8. The mean fishing times per day estimated from the regression were all apparently reasonable except for the days with seven and nine hour openings. There were no observations on these days, so that the regression estimates are extrapolations outside the range of the data used to estimate the equation. The regression estimates of the mean number of fishing hours is 42.17 hours for the seven hour opener, and 23.11 hours for the nine hour opener. Both values are clearly absurd. These values were therefore replaced by the open times.

Table 7. The estimated regression equation relating the actual driftnet fishing time to the day in the season and the hours of opening, for 2000.

Parameter	Estimate	Standard Error	T-Value	P-Value
Constant	162.7630	70.81380	-	-
DS	-0.06814	0.02256	-3.02	0.003
OT	-22.46900	10.33540	-2.17	0.031
OT^2	0.81283	0.36899	2.20	0.029

With these adjustments, the estimated total fishing effort is E = 28,870.9 hours, which is about 65% of the potential effort from the open hours of the fishery, and close to the percentage for 1999. The observers covered a total of 1044.7 hours of fishing. This represents a coverage rate of 3.6% of the estimated total fishing effort.

Table 8. Estimation of the total number of hours driftnet fishing in 2000 based on the regression model of Table 7, which related the actual mean fishing hours for a permit to the day in the season and the number of open hours on that day.

Date	Day in Season	Permits	Open Hours	Permit Hours	Mean Fishing Hours[1]	Total Fishing Hours
26-Jun	26	194	12	2328	8.41	1631.7
29-Jun	29	262	12	3144	8.21	2150.0
03-Jul	33	414	12	4968	7.93	3284.5
06-Jul	36	458	12	5496	7.73	3540.0
10-Jul	40	262	12	3144	7.46	1953.7
12-Jul	42	132	13	1716	5.17	682.7
13-Jul	43	477	16	7632	8.41	4013.0
15-Jul	45	304	13	3952	4.97	1510.2
16-Jul	46	87	7	609	7.00[2]	609.0
17-Jul	47	431	16	6896	8.14	3508.5
18-Jul	48	144	9	1296	9.00[2]	1296.0
20-Jul	50	474	12	5688	6.78	3211.5
31-Jul	61	161	12	1932	6.03	970.1
03-Aug	64	59	12	708	5.82	343.5
07-Aug	68	30	12	360	5.55	166.5
Totals		3889	182	49869		28870.9

[1]As estimated from the regression model, except as indicated.
[2]The mean fishing times for openings of less than 12 hours were set equal to the open hours because the fitted regression model gave impossible extrapolated values.

Bootstrapping was used to estimate the variance associated with the estimate E, using the same approach as was used for the 1999 data. This resulted in an estimated variance of Var(E) = 612,462.8 and hence an estimated standard error of SE(E) = 782.6. The

relative error in estimating E should therefore be small, with the estimated CV being only 0.027.

Using equations (4) the estimates and their standard errors shown in Table 9 were calculated. As only one animal was observed for the incidental take of different types of animals, the estimated variances and standard errors of the incidental take rates per hour are not very reliable. Consequently, the standard errors and CVs shown in Table 9 should be viewed as being only rough approximations for the true values.

Figure 5 shows the approximate locations where incidental take took place for the driftnet fishery. Overall the most common incidental take was the common murre. The colony locations are shown on the figure for this bird species.

Table 9. Estimated total incidental take from the Upper Cook Inlet driftnet fishery in 2000, together with standard errors (SE), coefficients of variation (CV) and whether the animals are released alive (without serious injuries) or dead.

Species	Incidental take	SE	CV
Common Murre (Alive)	31.2	55.0	1.76
Harbor Porpoises (Alive)	31.2	59.1	1.90
Harbor Porpoises (Dead)	31.2	55.1	1.77
Minke Whales (Alive)	31.2	55.8	1.79

The Upper Cook Inlet Setnet Fishery

There were 399 permit-days sampled in the Upper Cook Inlet setnet fishery in 1999. As statistical areas were generally not recorded, the assignment to areas was based on whether or not observations were recorded as being above latitude 59°46'N, which divides the Upper and Lower Cook Inlet fisheries. In some cases the latitude was not recorded but could be determined from the information on other records for the same sampled permit. There were four cases where it was not possible to determine whether the permit was in the Upper or Lower Cook Inlet fishery.

The incidental take observed in 1999 was of one gull (released alive, without serious injuries), and one common loon (released dead). For the calculation of the total incidental take of these species it was necessary to take into account the fact that a setnet permit will generally involve more than one net, and the observers recorded the information on one net at a time. To allow for this, the observer effort for a haul was calculated as the time observed divided by the total number of nets for the permit. For example, if a permit had three nets and one of these was observed for six hours then this was regarded as equivalent to observing the whole permit for 6/3 = 2 hours. On this basis the total observer effort was 499.9 permit hours, with an average of $\bar{x}$ = 1.25 hours per sampled permit.

For gulls and the common loon the average incidental take per sampled unit was $\bar{y}$ = 1/399 = 0.0025. Using equation (1) the incidental take per permit hour is therefore estimated as 0.0020 for both birds. Also, applying equation (2) gives an estimated standard error of 0.0020 for each bird.

From Table 2 the potential fishing effort in the Upper Cook Inlet setnet fishery was 85,371 permit hours in 1999. However, the observer data indicates that the actual fishing effort is less than this because typically whole open periods are not fished by the permit holders. There were 131 sampled permits where the observers were recorded as present for all of the hauls, and where the times of the start of the first set and the end of the last haul were recorded. These sampled permits have a mean fishing time of 8.14 hours.

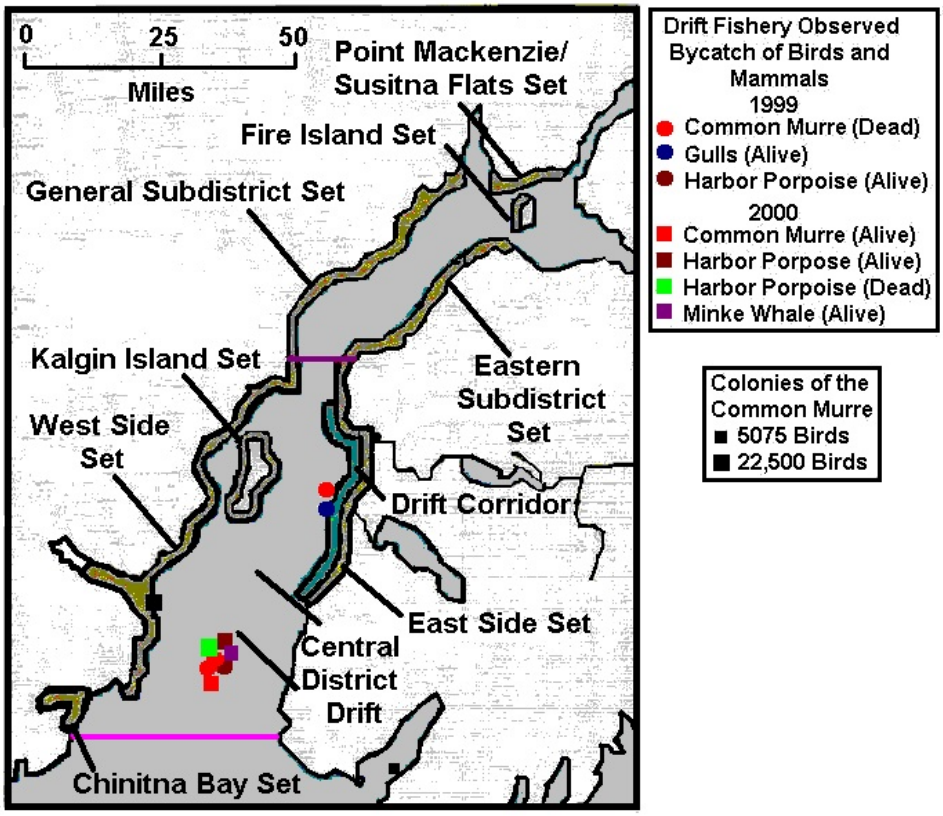


Figure 5. Approximate locations where incidental take occurred with the driftnet fishery, with the location of the two common murre colonies in Cook Inlet also indicated.

A regression of the fishing times in hours (FT) against the day in the season (DS) and the maximum opening time on that day (OT), with square and product terms as in equation (6) was fitted to the data. This accounted for only 3.7% of the variation in the data, and was not quite significant at the 5% level ($F = 1.99$ with 5 and 125 df, $p = 0.084$). Furthermore, when applied to fishing days that were not observed the equation predicted some negative fishing times. For this reason the equation was not used to estimate the

total fishing effort. Instead it was assumed that the observed mean fishing time of 8.14 hours represents the typical fishing time for an opener. The total fishing effort can be calculated as 8.14 x 5455 = 44,410.4 permit hours, where 5455 is the total number of permit-days for the fishery in 1999 (Appendix C). On this basis the observer coverage was 1.1% of the entire fishery.

The estimated standard error associated with the observed mean fishing time of 8.14 hours is 0.32. The standard error for the estimated total permit hours is therefore 0.32 x 5455 = 1,729.2. The CV for the estimated total effort of 44,410.4 is then 0.039.

Using equations (3) and (4) the total incidental take of gulls in the Upper Cook Inlet setnet fishery is therefore estimated as B = 44,410.4 x 0.00020 = 88.8, with a standard error of 88.8, and the total incidental take of common loons is also estimated as 88.8 with a standard error of 88.8. As was the case for the incidental take estimates presented before, the standard errors are not reliable as they are based on only one individual captured for each type of bird. These estimates are summarized in Table 10.

Table 10. Estimated total incidental take from the Upper Cook Inlet setnet fishery in 1999, together with standard errors (SE), percentage coefficients of variation (CV) and whether the animals are released alive, without serious injuries or dead.

Species	Incidental take	SE	CV
Gull (alive)	88.8	88.8	100
Common Loon (Dead)	88.8	89.2	104

There were 269 permit-days sampled in the Upper Cook Inlet in 2000. In this year the statistical areas where fishing took place were recorded, although in some cases these did not correspond to listed open periods. However, because of the low level of incidental take, estimates of the total take have only been calculated for the entire fishery. The incidental take observed was of one marbled murrelet (released dead), one white-winged scoter (released dead), and one harbor seal (released alive, without serious injuries). There was also one gull with an unknown species that was found in a net and classified as "previously dead". This gull is assumed to have died before entering the net, and is therefore not included in the incidental take. The white-winged scoter was classified as "fresh dead, cause unknown" although it was found entangled in the net. In this case it is assumed that in fact the death was due to the entanglement.

As was the case for 1999, the observer effort was calculated taking into account the fact that a setnet permit will generally involve more than one net, and the observers recorded the information on one net at a time. Therefore, the observer effort for a haul was calculated as the time observed divided by the total number of nets for the permit. On this basis the total observer effort was 780.7 permit hours, with an average of $\bar{x}$ = 2.59 hours per sampled permit.

Because there was one individual observed for all three types of incidental take, the average incidental take per sampled unit was $\bar{y}$ = 1/269 = 0.0037. Using equation (1) the incidental take per permit hour is therefore estimated as 0.0014 for all types of incidental take. Also, applying equations (2) and (3) gives an estimated standard error of 0.0014 for each of these estimates.

From Table 2 the potential fishing effort in the Upper Cook Inlet setnet fishery was 44,966 permit hours in 2000. However, as was the case in 1999, the observer data indicates that the actual fishing effort is less than this because typically whole open periods are not fished by the permit holders. There were 104 sampled permits where the an observer was recorded as being present for all of the hauls, and where the times of the start of the first set and the end of the last haul were recorded. These sampled permits have a mean fishing time of 7.97 hours, with a range of individual times from 0.98 to 15.38 hours. The standard error associated with the mean is 0.32.

A regression of the fishing times in hours (FT) against the day in the season (DS) and the time on that day (OT), with square and product terms as in equation (6) was fitted to the data. This accounted for 24.9% of the variation in the data, and was very highly significant ($F = 7.83$ with 5 and 98 df, $p < 0.001$). However, as was the case with the similar regression equation fitted to the 1999 data, the equation did not produce sensible mean fishing times when it was applied to conditions that were not observed. In particular, it predicted fishing times longer than the open period for some 23 and 24 hour open periods in statistical area 245-30. For this reason the equation was not used to estimate the total fishing effort. Instead it was assumed that the observed mean fishing time of 7.97 hours represent the typical fishing time for an opener throughout the season. The total fishing effort can then be calculated as 7.97 x 3239 = 25,823.8 permit hours with a standard error of 0.32 x 3239 = 1047.0, where 3239 is the total number of permit-days for the fishery in 1999 (Appendix C). On this basis the observer coverage of 780.7 hours was 2.7% of the entire fishery.

Using equations (2) to (4) the total incidental take of marbled murrelets in the Upper Cook Inlet setnet fishery is therefore estimated as B = 25,823.8 x 0.0014 = 37.1, with a standard error of 37.2. Because there was one capture of each type of incidental take, the estimates and standard errors are the same in all cases, as shown in Table 11. As was the case for the incidental take estimates presented before, the standard errors are not reliable as they are based on only one individual captured for each type of incidental take.

Figure 6 shows the approximate locations where incidental take took place for the Upper Cook Inlet setnet fishery in 1999 and 2000.

Table 11. Estimated total incidental take from the Upper Cook Inlet setnet fishery in 2000, together with standard errors (SE), percentage coefficients of variation (CV) and whether the animals are released alive (without serious injuries) or dead.

Species	Incidental take	SE	CV
Marbled Murrelet (Dead)	37.1	37.2	1.00
White-winged Scoter (Dead)	37.1	37.2	1.00
Harbor Seal (Alive)	37.1	37.2	1.00

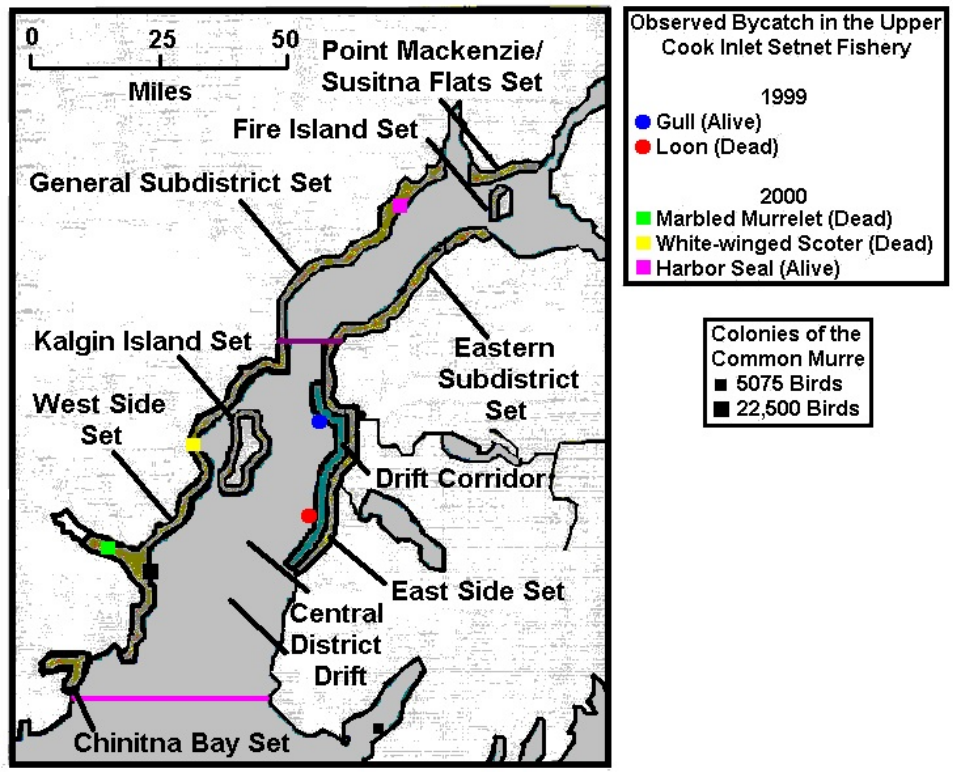


Figure 6. Approximate locations where incidental take occurred in the Upper Cook Inlet Setnet Fisheries in 1999 and 2000.

The Lower Cook Inlet Setnet Fishery

There were 28 permits sampled in the Lower Cook Inlet setnet fishery in 1999. As the fishing statistical areas were generally not recorded, the assignment of observations to this fishery was based on the latitude being below 59°46'N, which divides the Upper and Lower Cook Inlet fisheries. As noted above, in some cases the latitude was not recorded but could be determined from the information on other records for the same sampled permit. There were four cases where it was not possible to determine whether the permit was in the Upper or Lower Cook Inlet fishery.

The incidental take observed in 1999 was of one white-winged scoter (*Melanitta fusca*, released alive, without serious injuries), one common loon (*Gavia immer*, released alive, without serious injuries), and one harbor porpoise (released alive, without serious injuries).

As has been done for the Upper Cook Inlet setnet fishery, the observer effort is expressed as permit hours, where this is the time that an observer was watching a net, divided by the total nets used by the permit. On this basis the total observer coverage was of 37.0 net hours, with an average of $\bar{x}$ = 1.32 hours per permit.

For all three types of incidental take, the average incidental take per sampled unit was $\bar{y}$ = 1/28 = 0.027. Using equation (1) the incidental take per permit hour is therefore estimated as r = 0.0357 in each case. Also, applying equation (2) gives an estimated standard error of 0.0286 for the white-winged scoter and the common loon, and 0.0268 for the harbor porpoises.

From Table 2 the potential fishing effort in the Lower Cook Inlet setnet fishery was 23,232 permit hours in 1999. As the open periods were generally for 48 hours and the observers were apparently never present for the entire time with any of the permits, it must be assumed that the nets were fishing for the entire open periods, and use the 23,232 hours as the value for the total fishing effort. This may lead to some over-estimation because some of the permits may not have been fished at the start and end of the season.

Using the assumed total effort with equations (4) and (5) gives the total incidental take of white-winged scoters, common loons and harbor porpoises all estimated to be B = 23,232 x 0.00357 = 627.9, with the standard errors that are shown in Table 12. The standard errors were calculated using equation (5) as the assumed total fishing effort is known without error. The approximate locations of the incidental take are shown in Figure 7

Table 12. Estimated total incidental take from the Lower Cook Inlet setnet fishery in 1999, together with standard errors (SE), percentage coefficients of variation (CV) and whether the animals are released alive, without serious injuries or dead.

Species	Incidental take	SE	CV
White-winged scoter (Alive)	627.9	663.6	1.06
Common Loon (Alive)	627.9	664.7	1.06
Harbor Porpoise (Alive)	627.9	623.5	0.99

The observer coverage of 37 hours is 0.16% of the total assumed fishing effort of 23,232 permit hours. Given this very low level, and the low incidental take observed, the estimates and standard errors shown in Table 12 need to be treated with some reservations.

There were 34 permits sampled in the Lower Cook Inlet setnet fishery in 2000, based on the recorded fishing statistical areas. These permits were observed for an average of 2.48 permit hours, taking into account the number of nets being fished, with a total observation time of 84.4 hours. From Table 3, the total number of permit hours available for fishing was 25,080. Assuming that this was the total fishing effort that actually occurred, the observer coverage was therefore 0.34%. No incidental take of marine birds or mammals was observed in 2000 in this fishery, which is not surprising given the low level of observer cover.

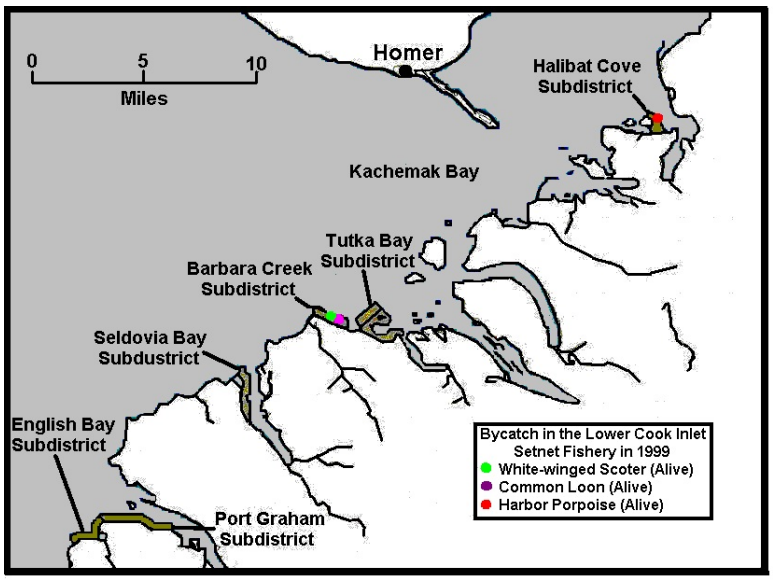


Figure 7. Approximate locations where incidental take was taken in the Lower Cook Inlet setnet fishery in 1999.

5. Mammal and Bird Sightings Near Nets

In 1999 detailed records of sightings of marine birds and mammals from 10 to 300m from nets were not kept. Animals closer than 10m to nets were considered to be encounters with the nets, which were recorded. The main encounters of birds were with gulls (almost all with an unknown species), black legged kittiwakes, shearwaters (all with unidentified species), murres (mainly common murres, but five with unidentified species), horned puffins, loons (mainly common loons), murrelets (marbled murrelets, Kittlitz's murrelets or unidentified), and terns (all with unidentified species). The locations of these encounters are shown on Figure 8, where an absence indicates a location where an observer watched a net without observing the bird group in question, while a presence indicates that at least one bird from that group was observed. There were a few other bird encounters not shown in these figures that involved either unidentified birds or the sighting of a species only on one occasion by the observers. For example, there is only one record of a pigeon guillemot being seen within 10m of a net.

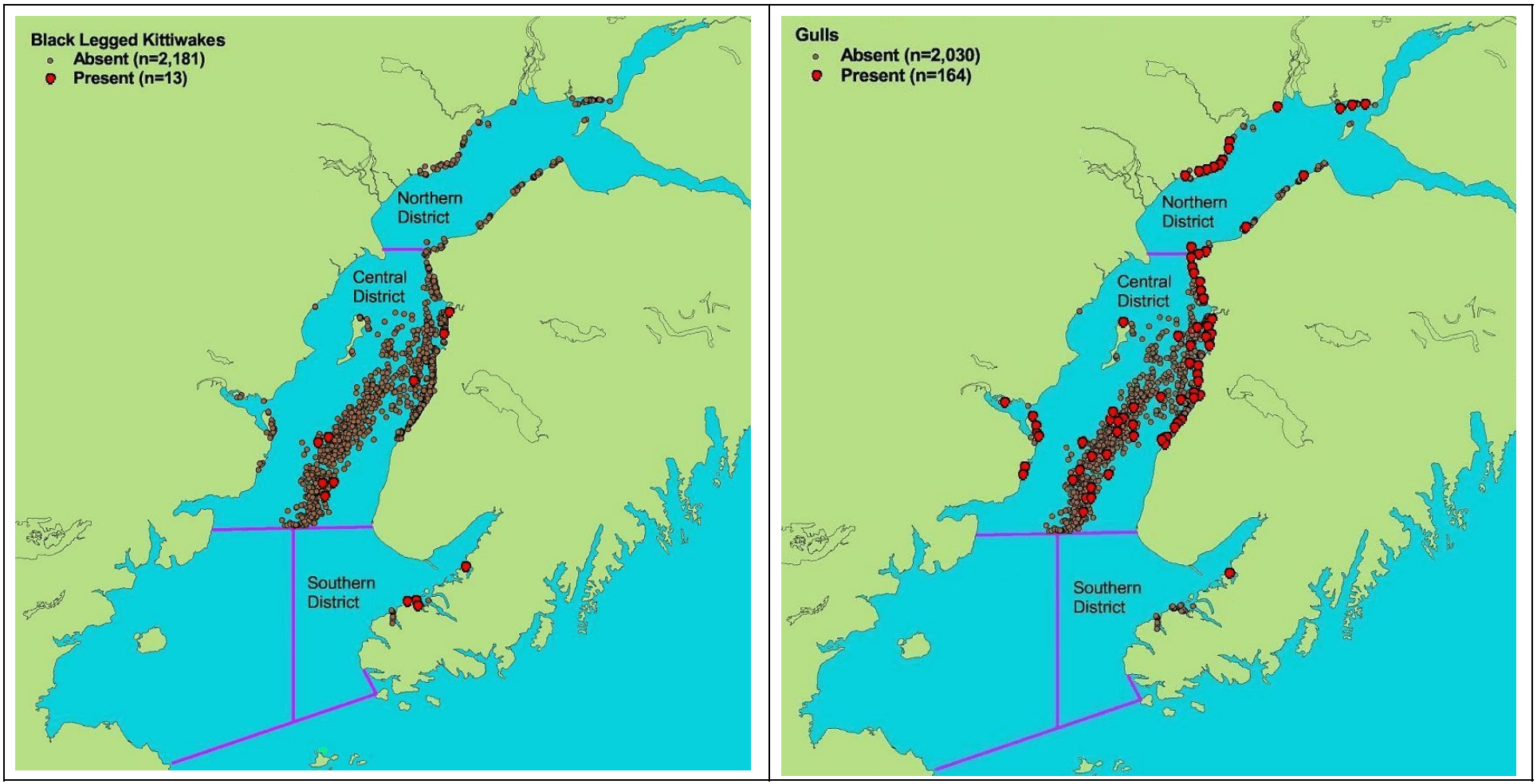
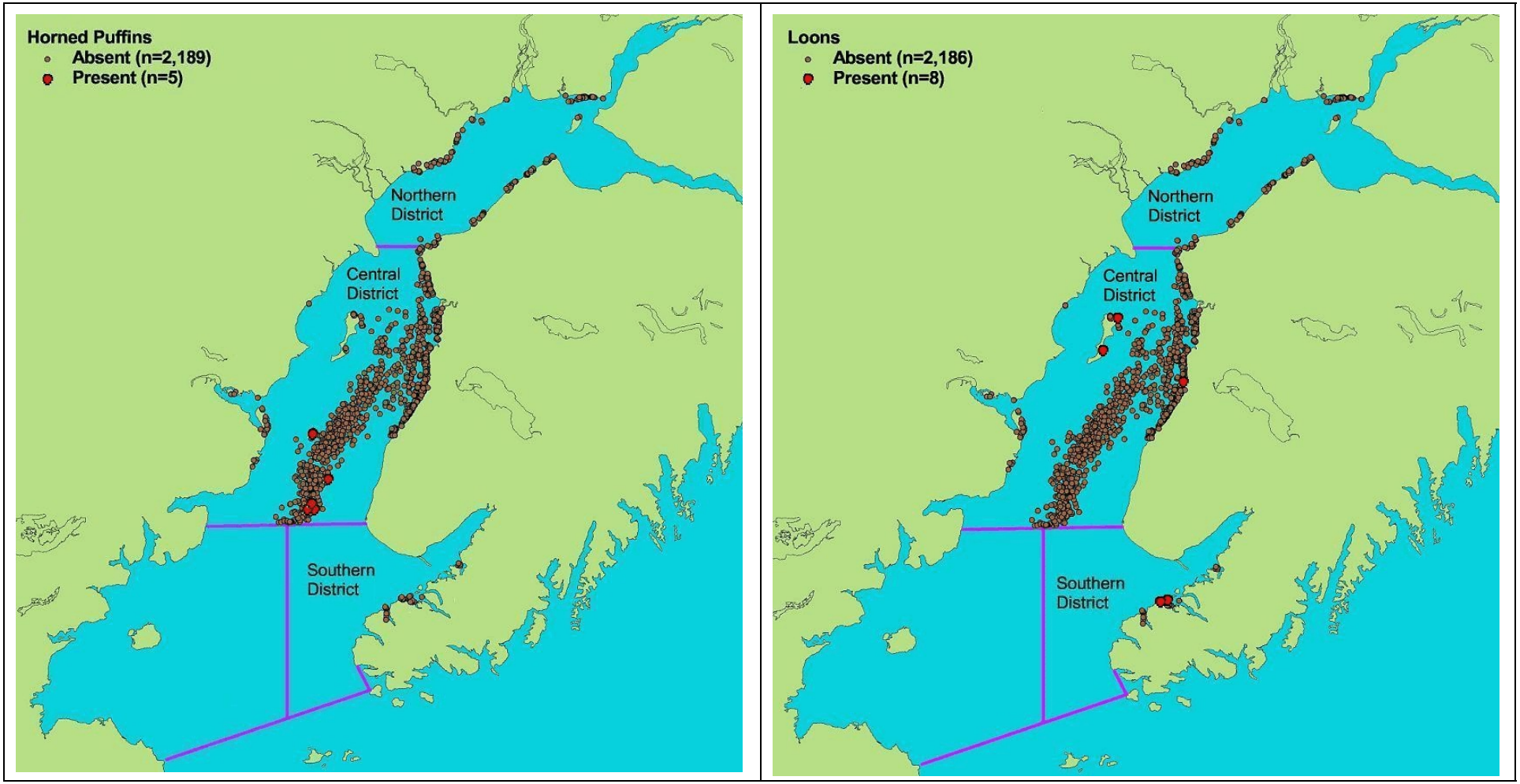


Figure 8 Sightings of birds closer that 10m to nets in 1999. The positions of all hauls are shown, and present means one or more bird sightings.



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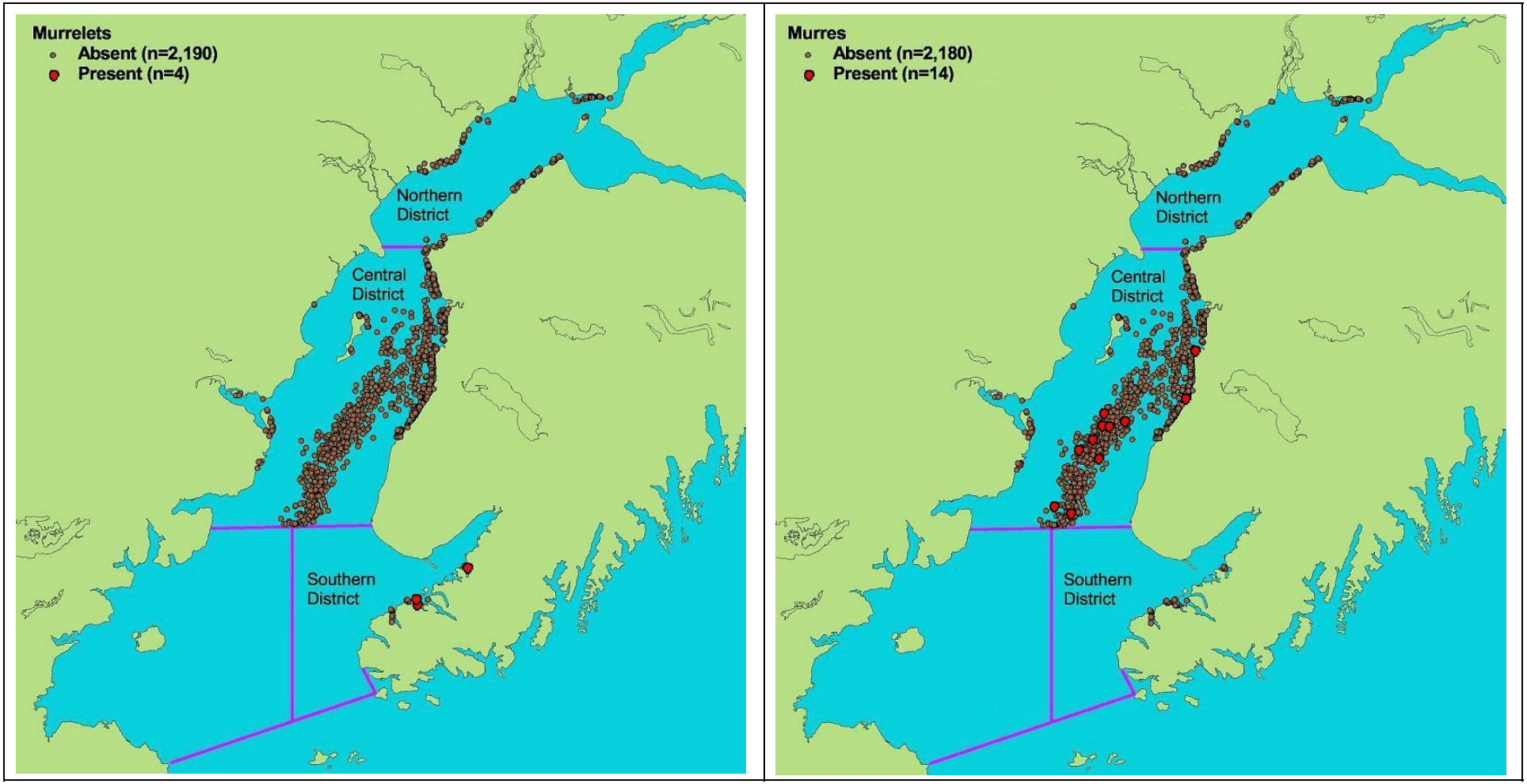

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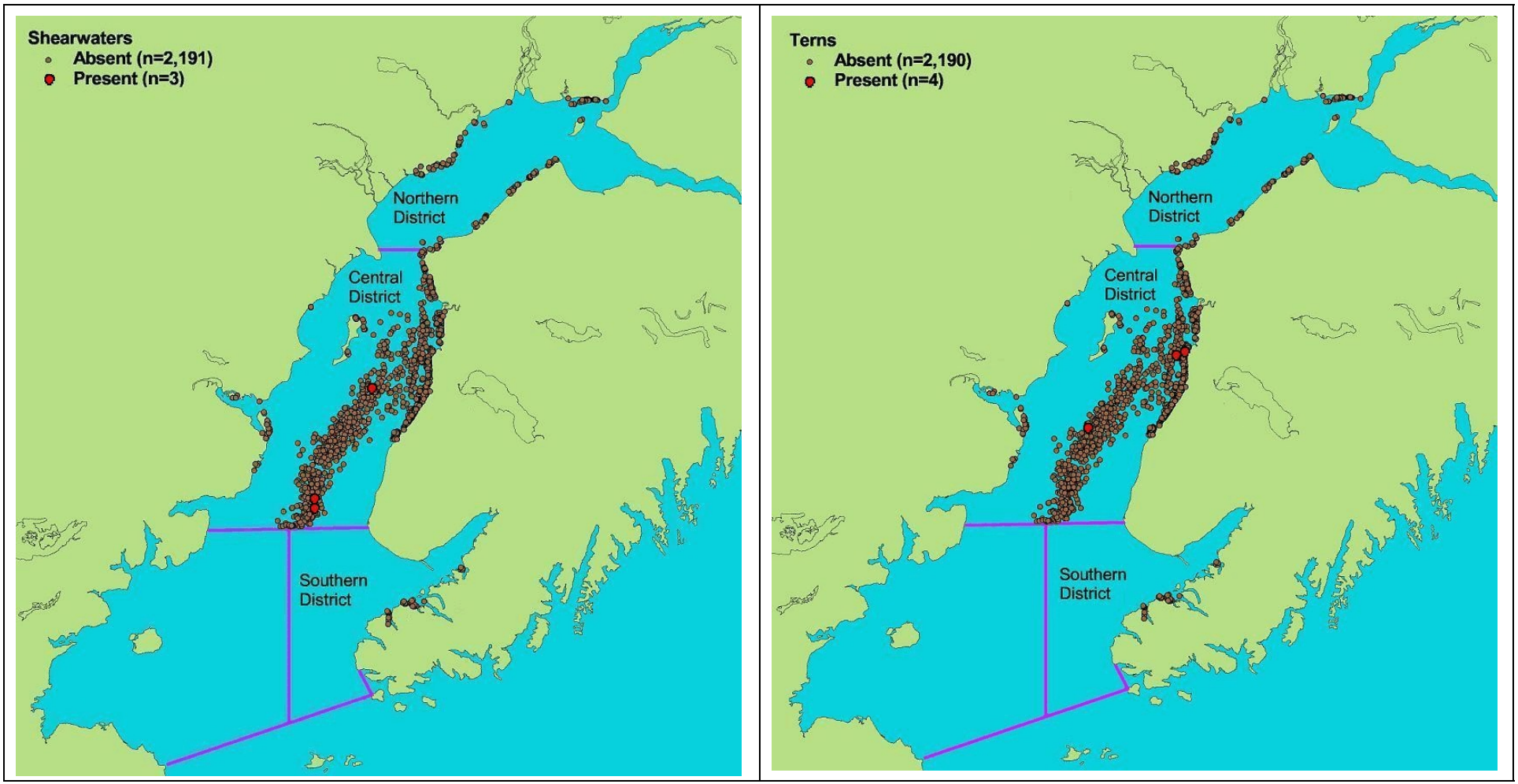

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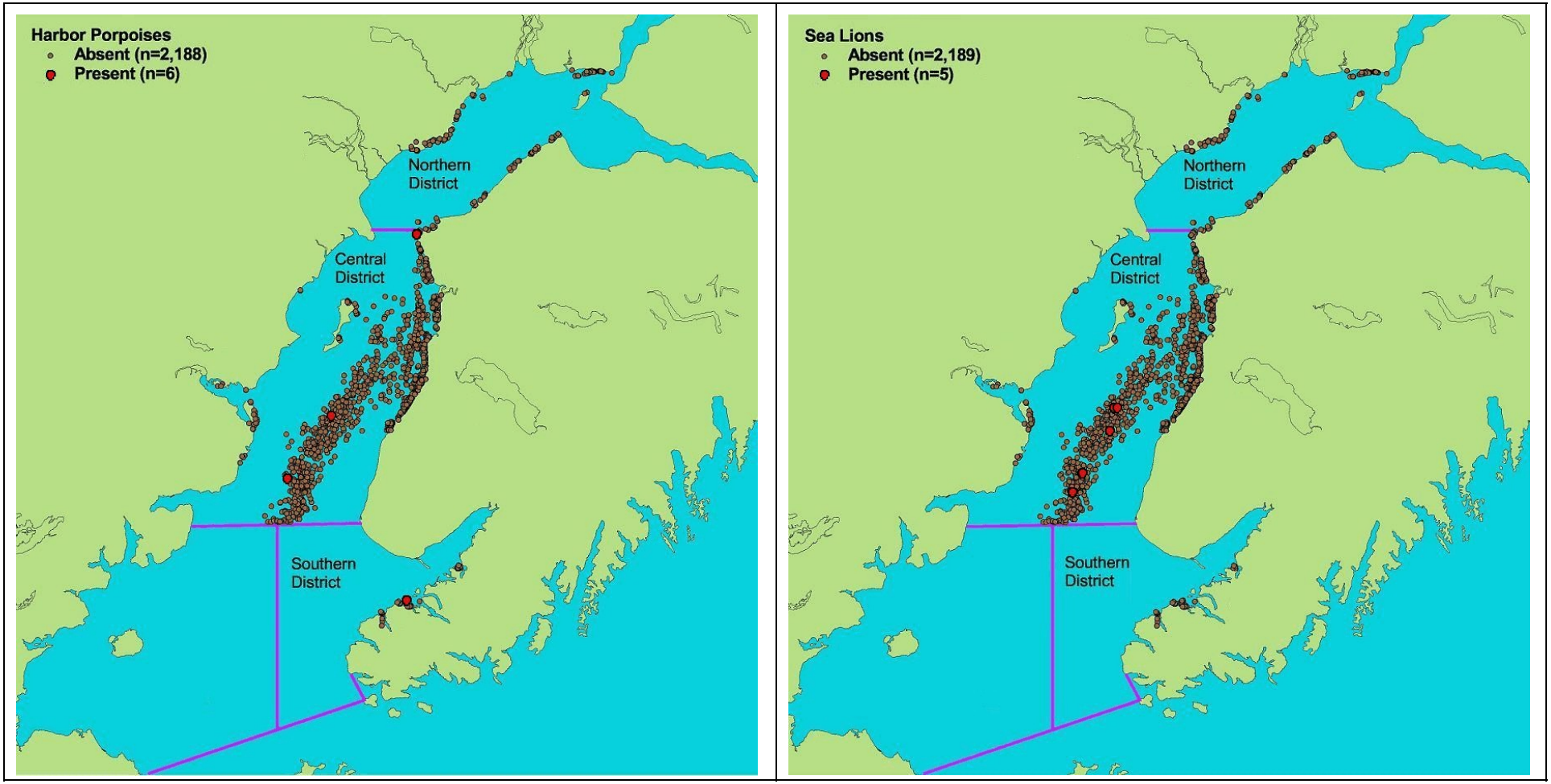


Figure 9 Sightings marine mammals closer than 10m to nets in 1999. The positions of all hauls are shown, and present means one or more animal sightings.

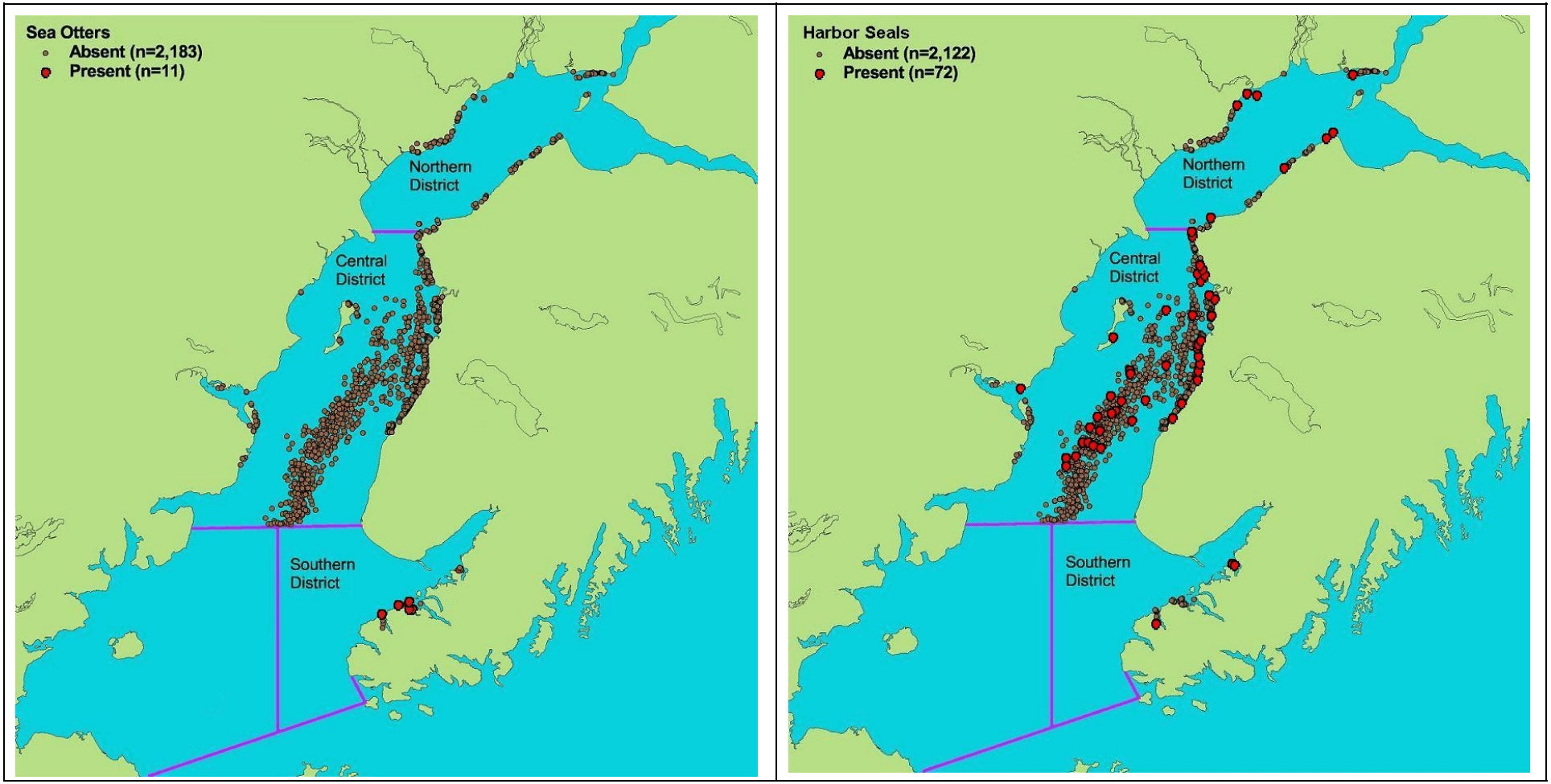


Figure 9, continued.

Most marine mammals seen within 10m of nets were seals (mainly harbor seals, but also two northern fur seals), but sea lions (four Steller sea lions and one California sea lion), sea otters, and harbor porpoises were also recorded. Figure 9 shows the locations of these encounters. In four cases there were records of encounters with a cetacean, a phocid, a pinniped, and a large whale, all with unidentified species.

In 2000 records were kept of sightings of birds and mammals from 10 to 300m from nets, and also closer than 10m. Figure 10 shows the locations of the bird sightings from 10 to 300m from nets. The most common sightings were of gulls (mostly with unknown species), murres (mostly with unknown species), pigeon guillemots, loons (half common loons, two Pacific loons, and the remainder of unknown species), terns (mostly with unknown species, but with about one third Arctic terns), puffins (mainly horned puffins), black legged kittiwakes, marbled murrelets, northern fulmars, marbled murrelets, scoters (white winged scoters, surf scoters or of unknown species), cormorants (with unknown species), harlequin ducks, and shearwaters (with one identified as a sooty shearwater). There were also 352 sightings of unknown marine birds or shorebirds and a few bird species seen on only one occasion.

Figure 11 shows the location of the marine mammal sightings in 2000 from 10 to 300m from nets. Most sightings were of harbor seals, with fewer otters (sea otters, except for one river otter), porpoises (mainly harbor porpoises, but with a few sightings of Dall's porpoises), and Steller sea lions. One Minke whale was also seen between 10 and 300m from a net in the statistical area 24470 in the Central District (Figure 3). There were seven sightings of cetaceans, otariids, and pinnipeds with unknown species.

Figure 12 shows the locations of the bird sightings closer than 10m to nets in 2000. The most common sightings this close were of gulls (mostly of unknown species), murres (mostly of unknown species, but with 24 common murres and two thickbilled murres), loons (about half with unknown species, but with 7 common loons and one Pacific loon), terns (mainly Arctic terns, but three with unknown species), guillemonts (mostly pigeon guillemonts, but with seven of unknown species), black-legged kittiwakes, marbled murrelets, northern fulmars, and cormorants (with unknown species). A few other bird species were either seen only once or were not well identified. On one occasion 17 horned puffins were seen within 10m of a net in statistical area 24590 in the Central District.

Figure 13 shows the marine mammal sightings closer than 10m to the nets in 2000. As was the case with the more distant sightings, most were of harbor seals, with fewer otters (all except one a sea otter), harbor porpoises and Steller sea lions. There were also four sightings of unknown pinnipeds or otariids.

Appendix B provides the observer's comments on interactions between nets and marine mammals and birds.

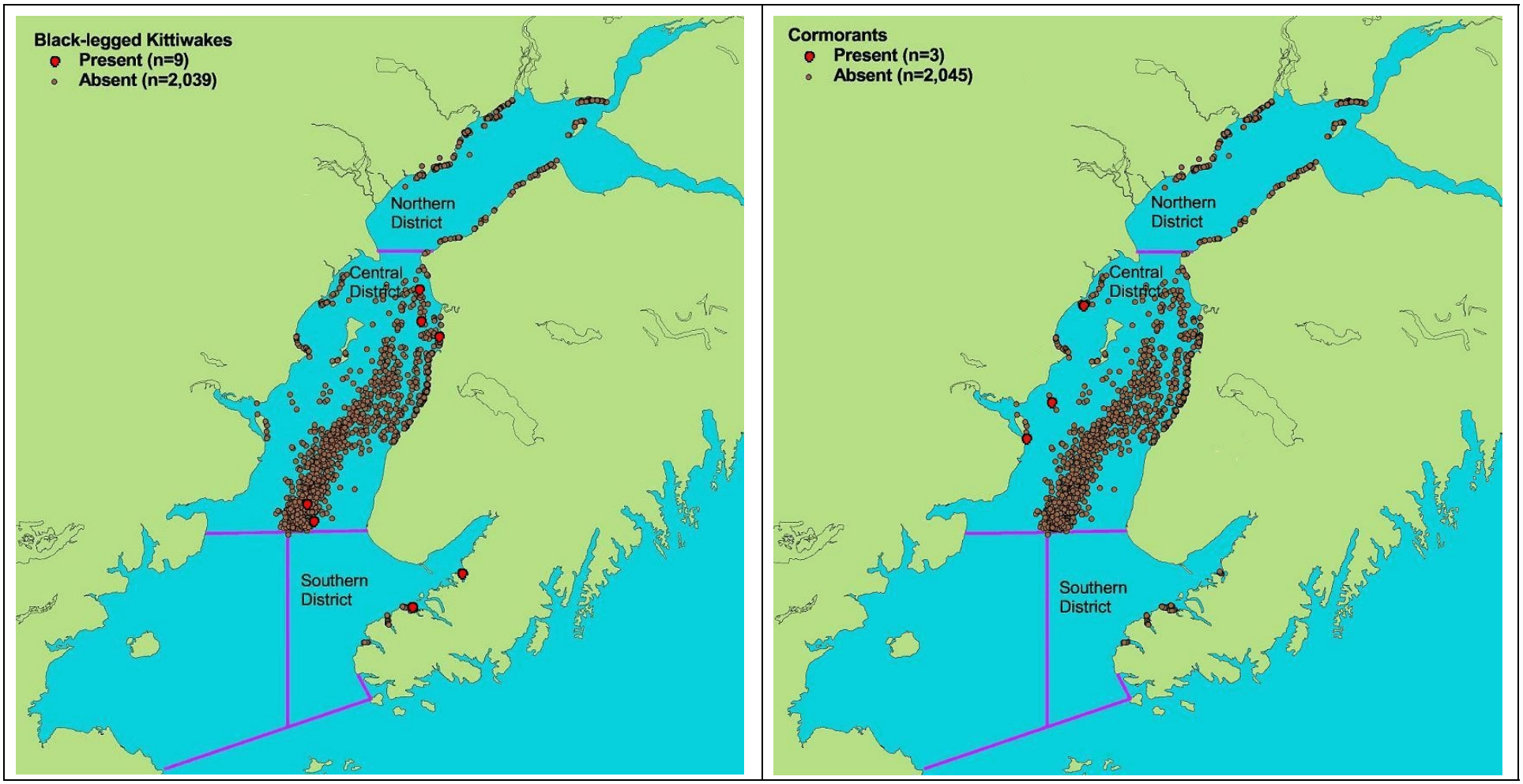
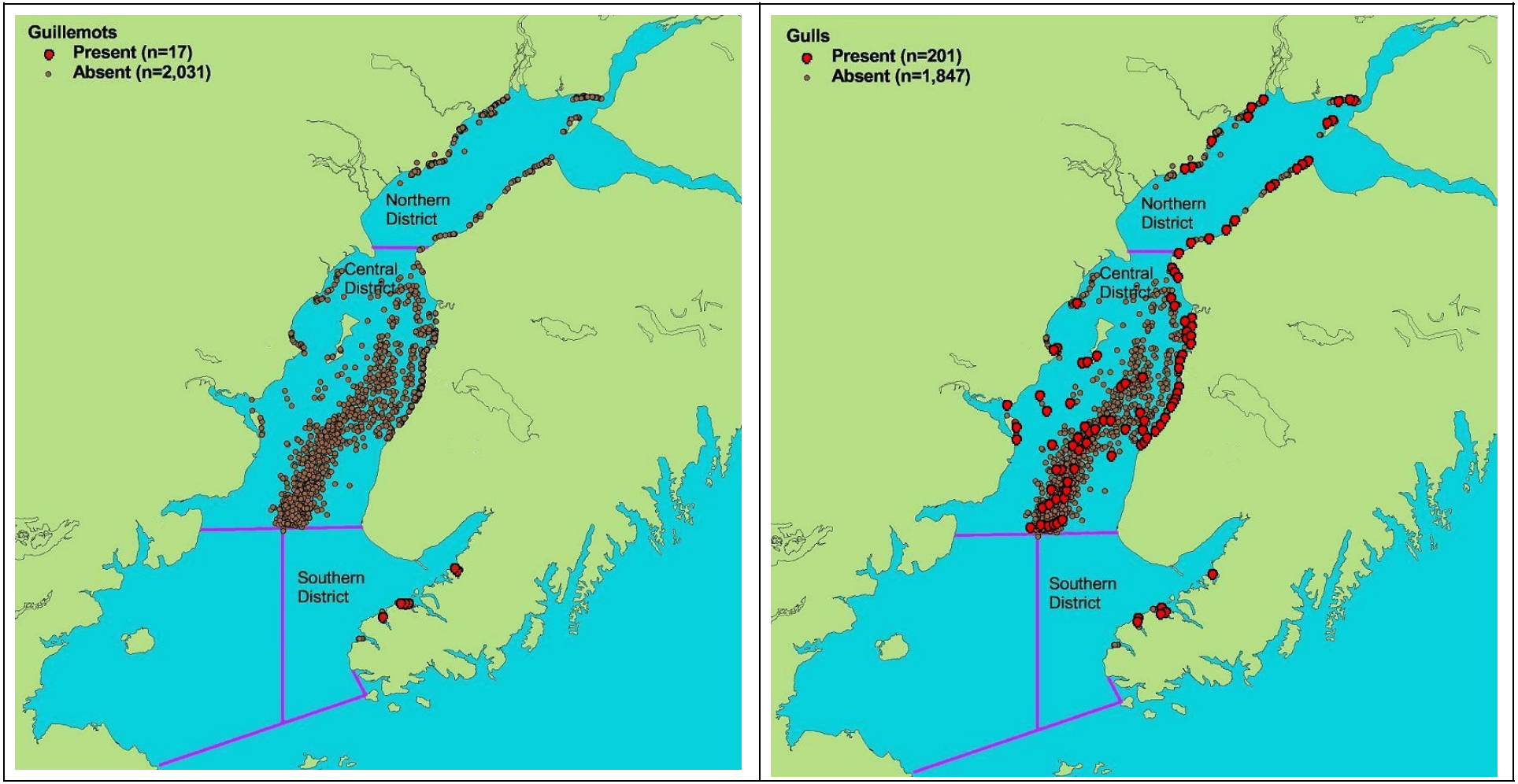


Figure 10 Sightings of birds from 10 to 300m from nets in 2000. The positions of all hauls are shown, and present means one or more bird sightings.



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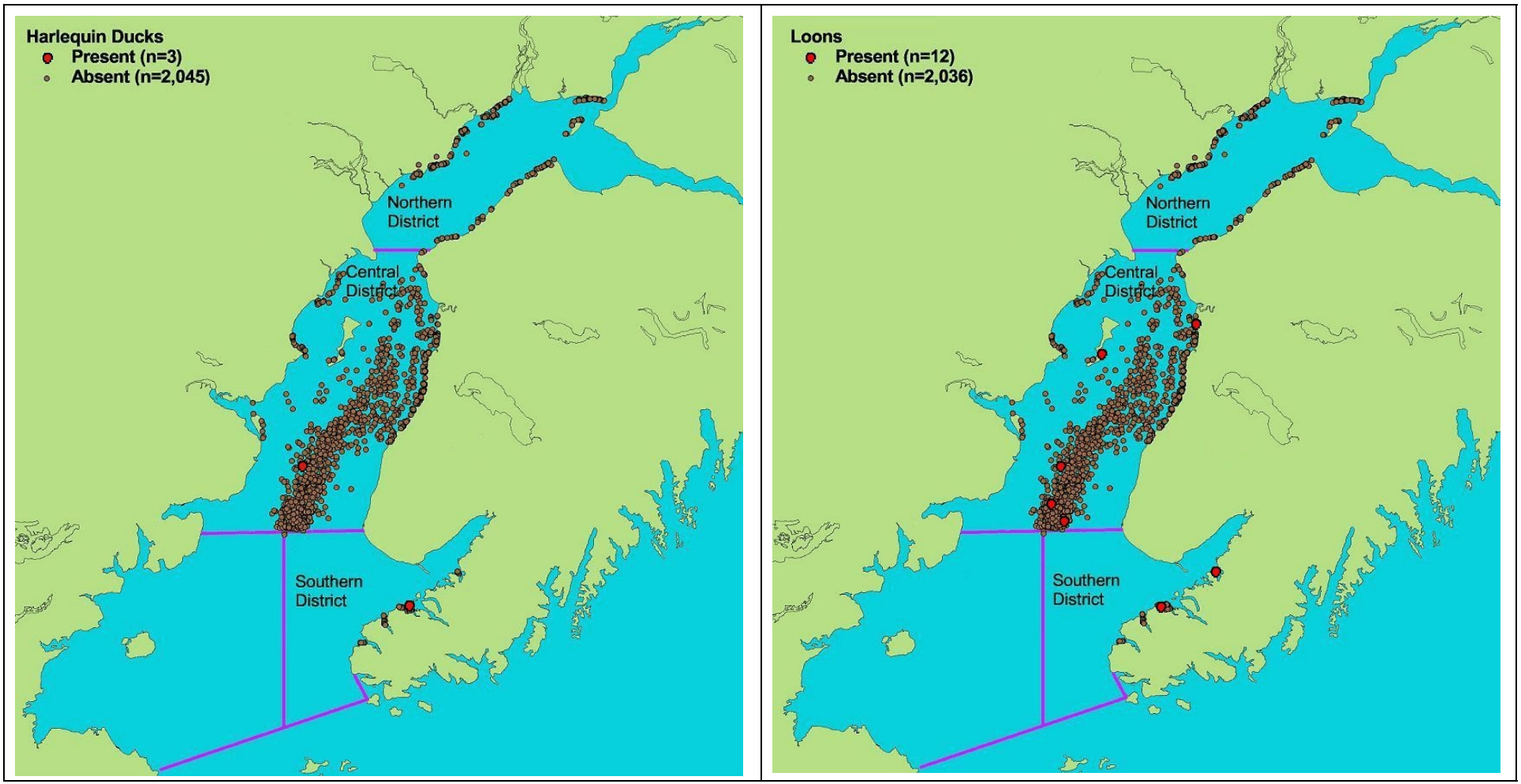

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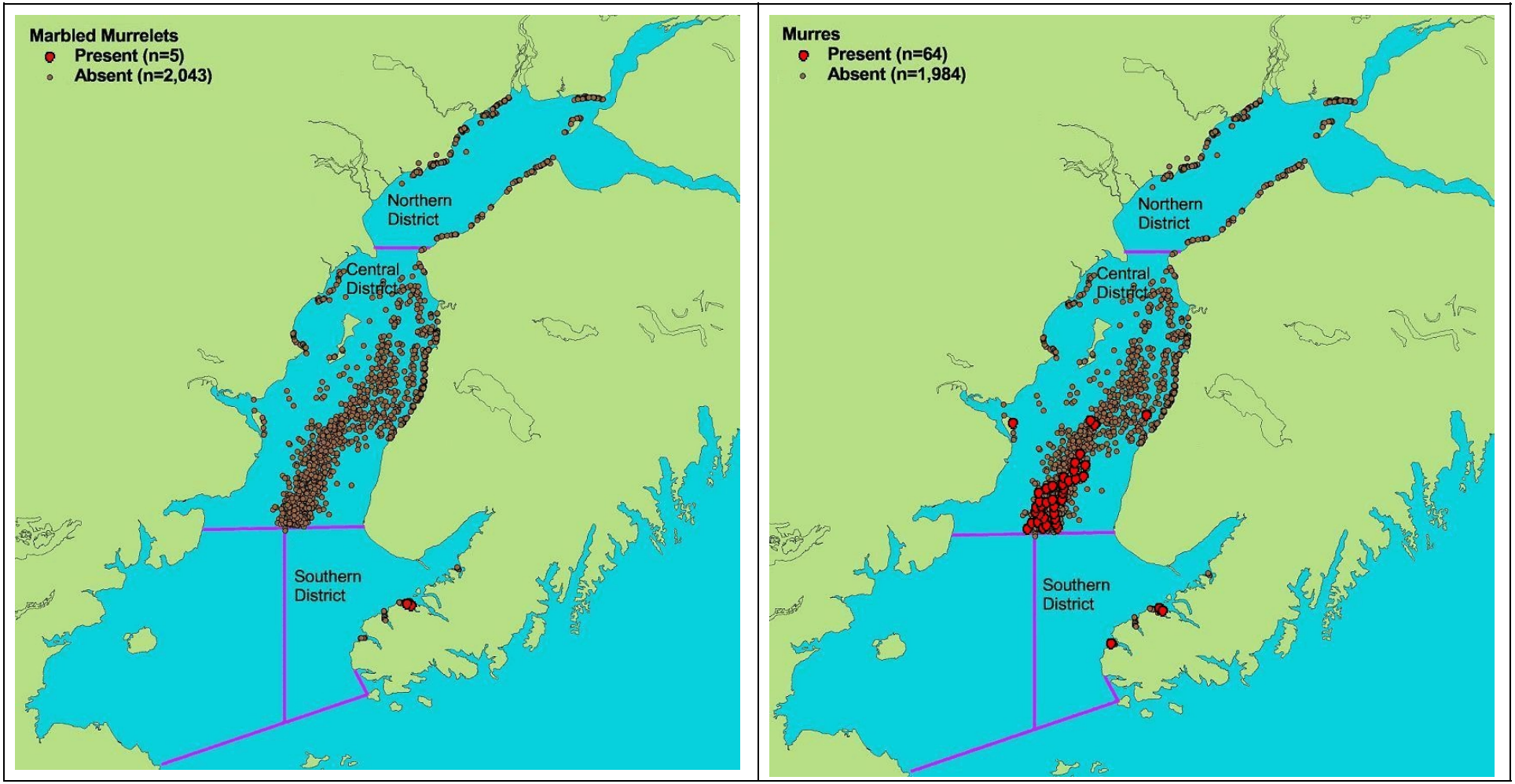

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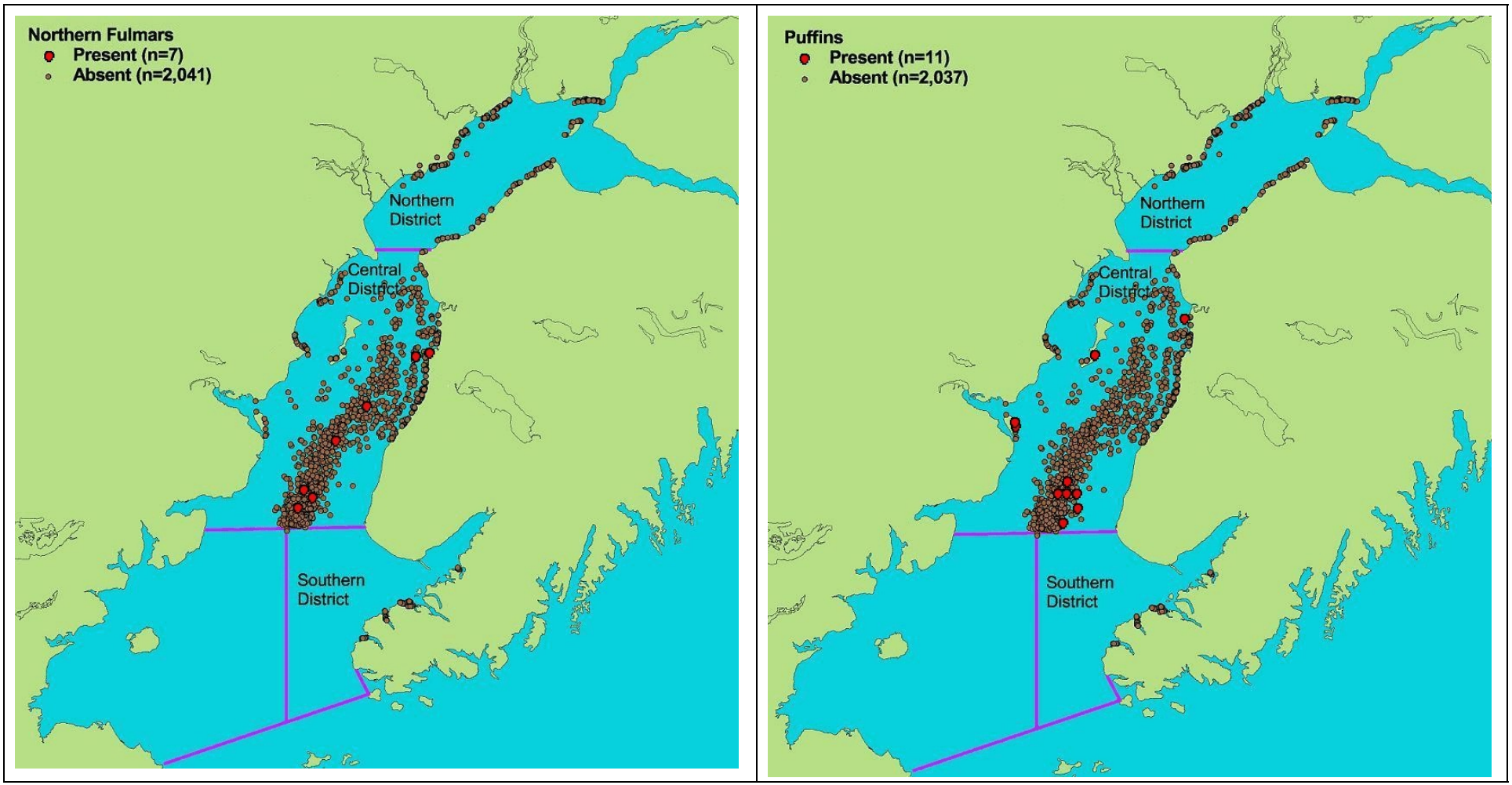

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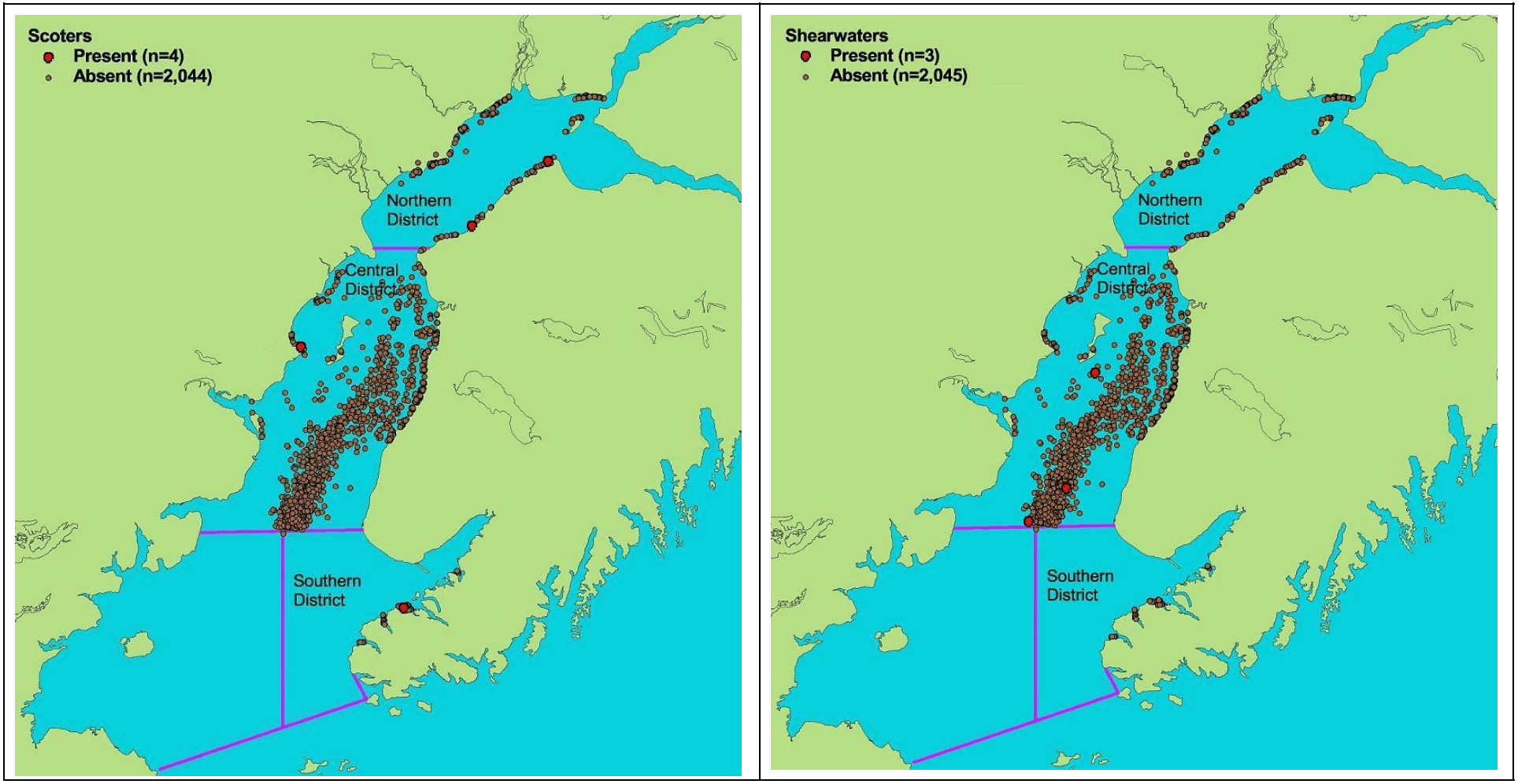

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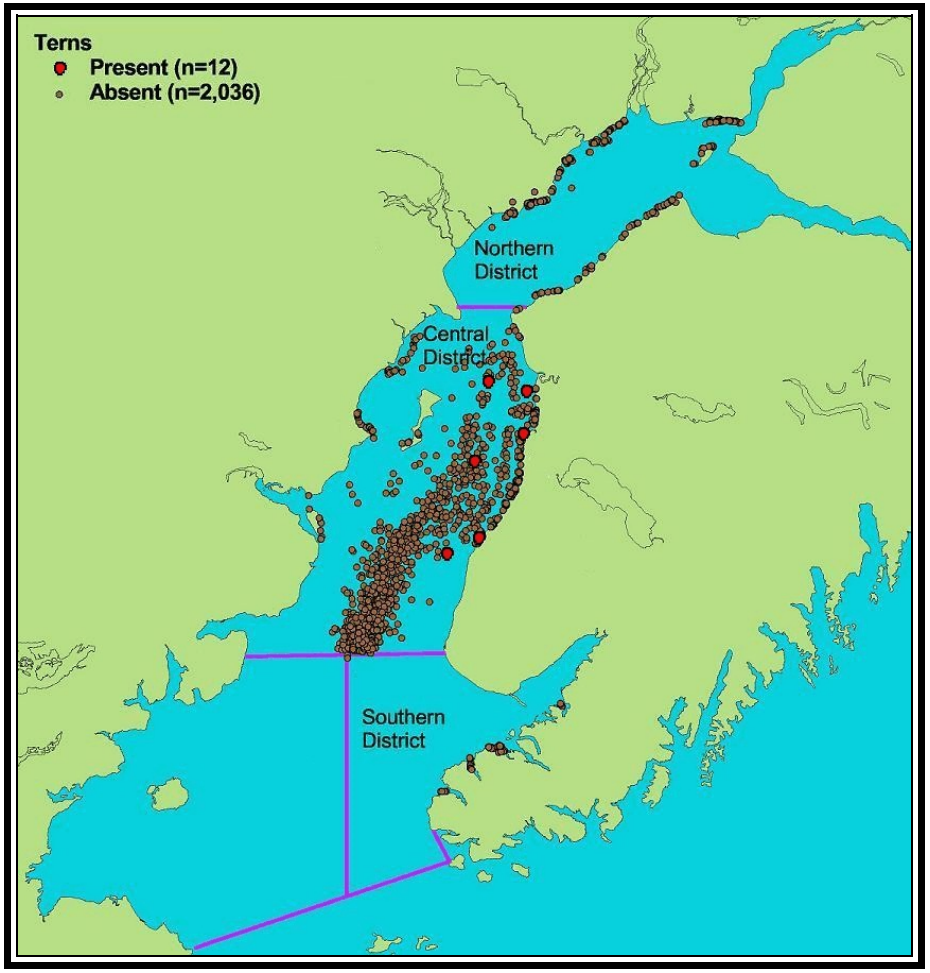

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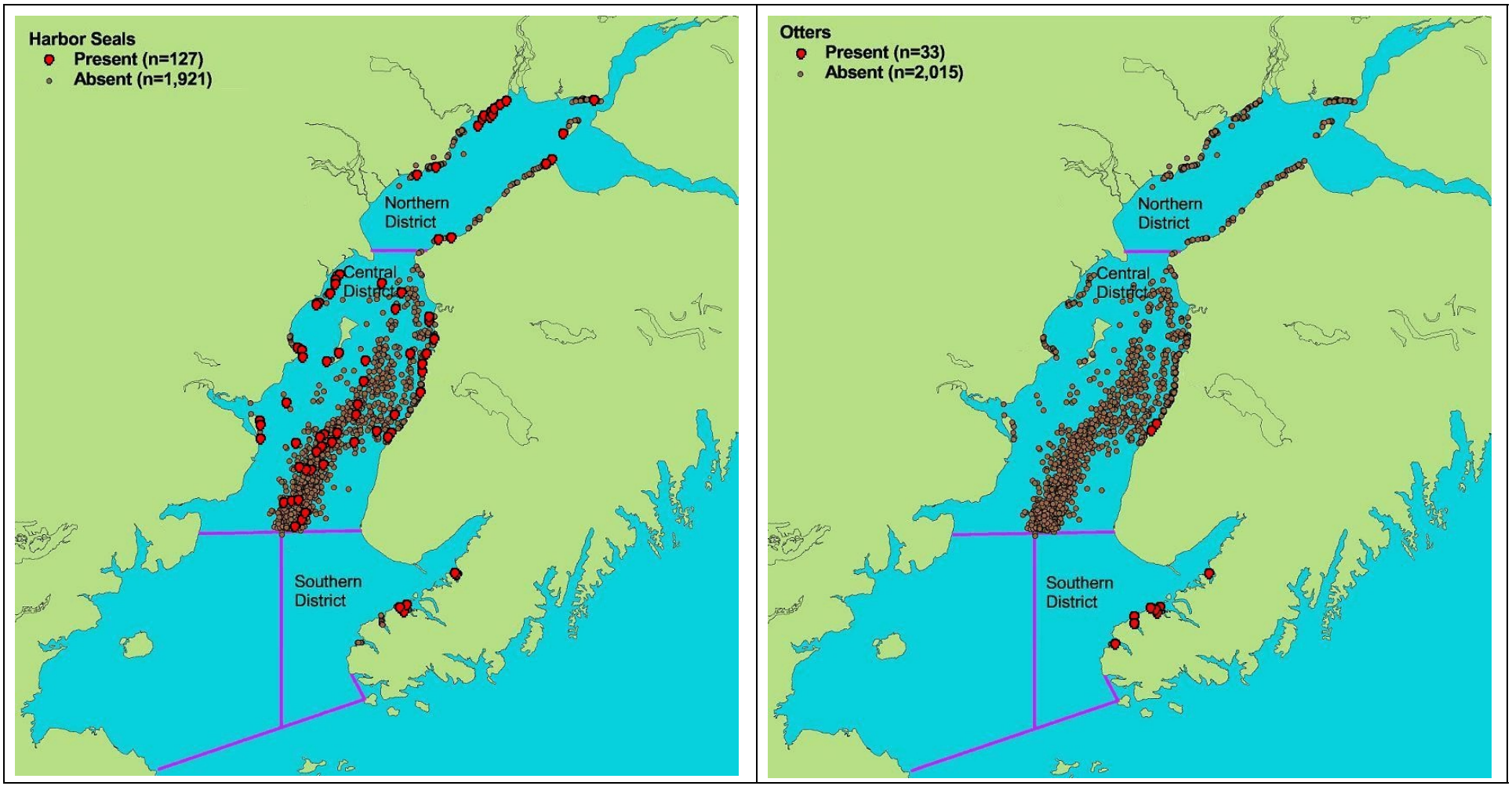
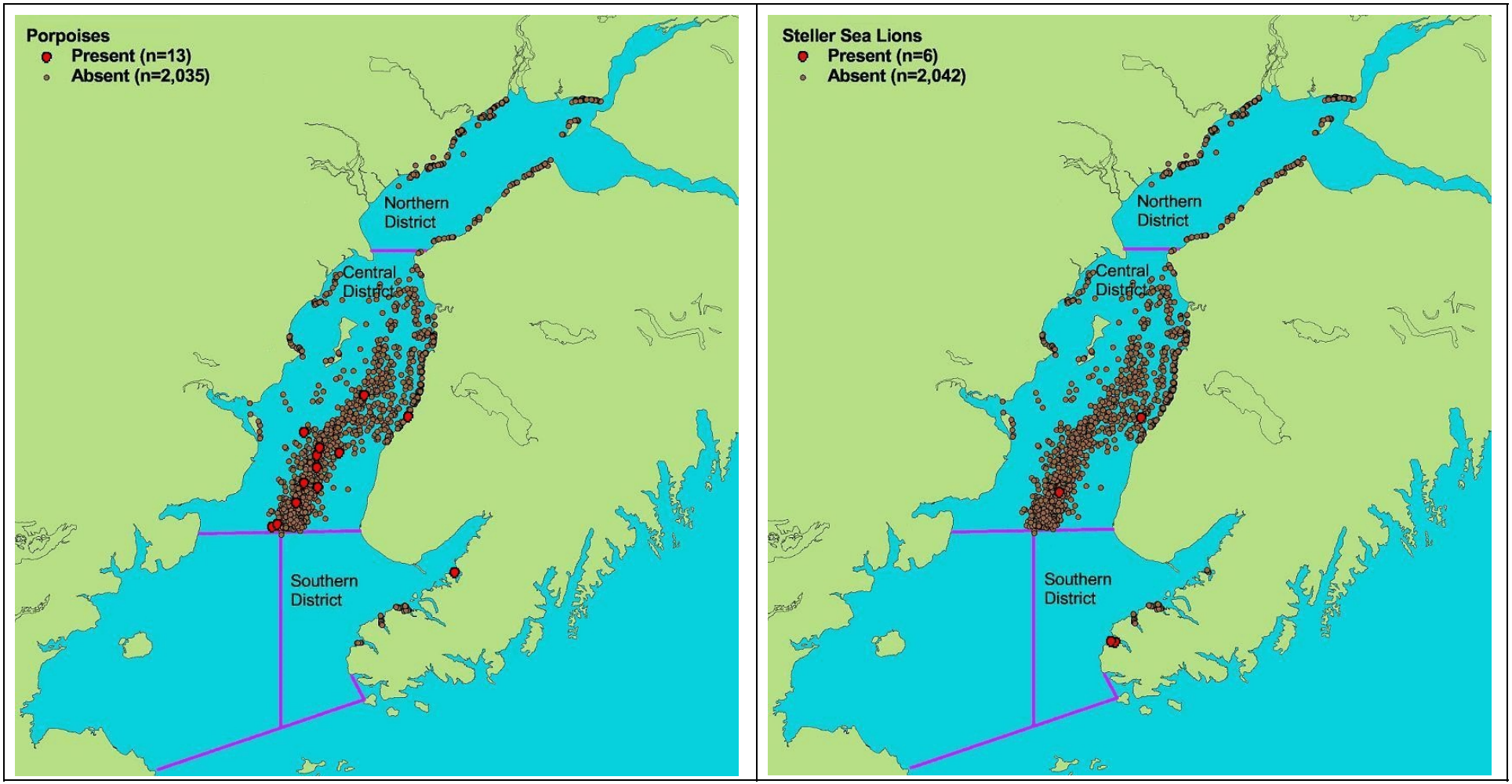


Figure 11 Sightings of marine mammals from 10 to 300m from nets in 2000. The positions of all hauls are shown and present means one or more animal sightings.



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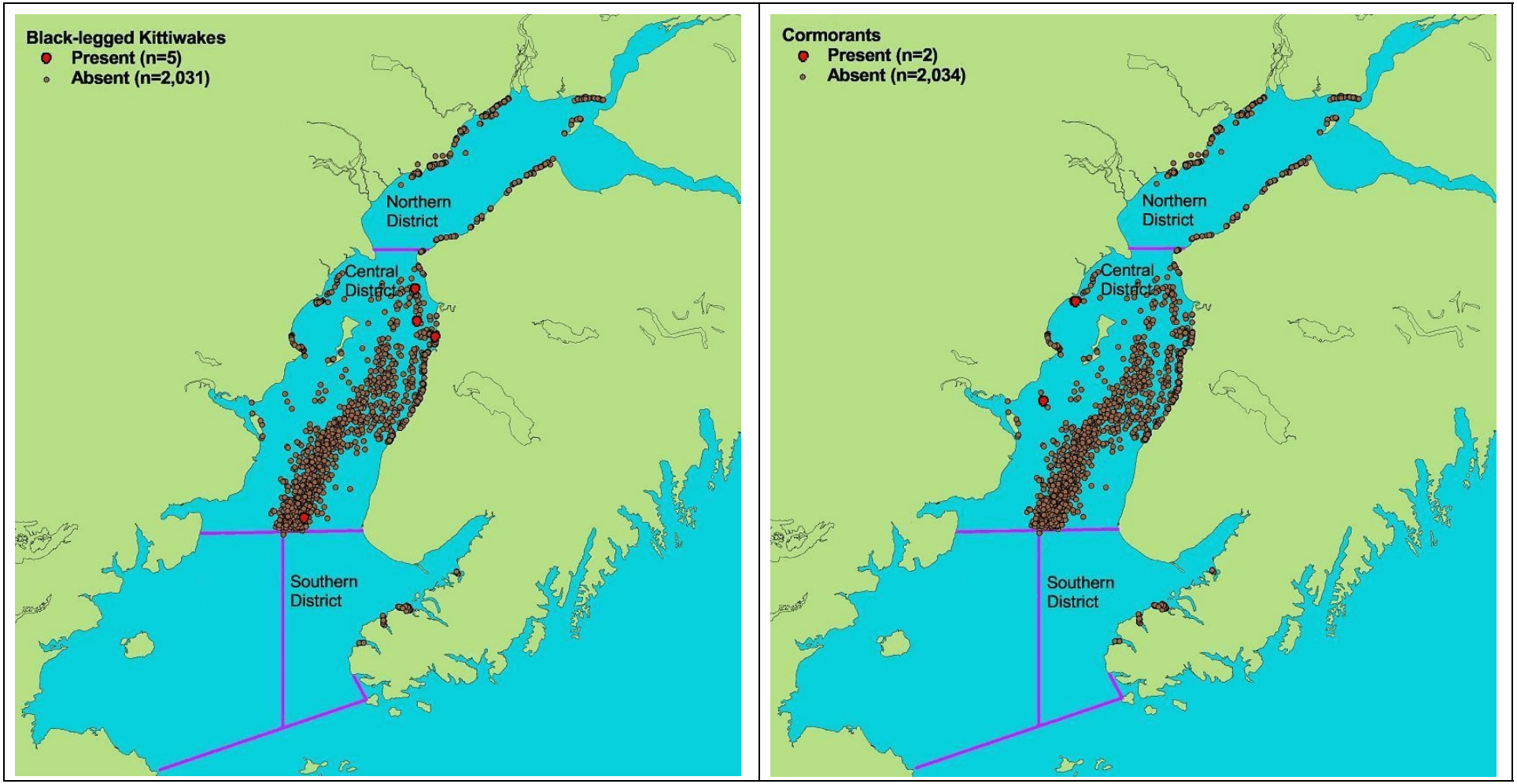
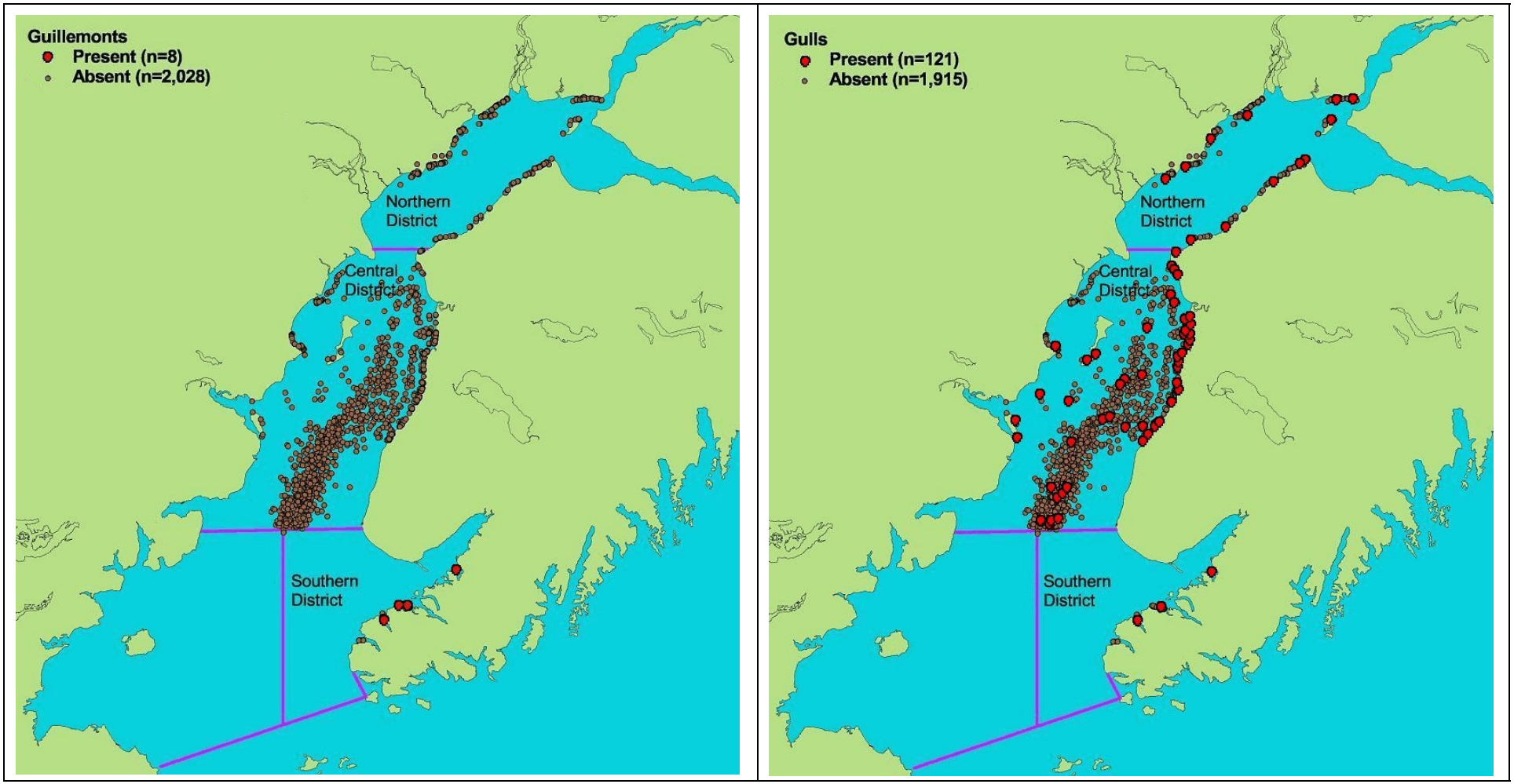


Figure 12 Sightings of marine birds closer than 10m to nets in 2000. The positions of all hauls are shown, and present means one or more bird sightings.



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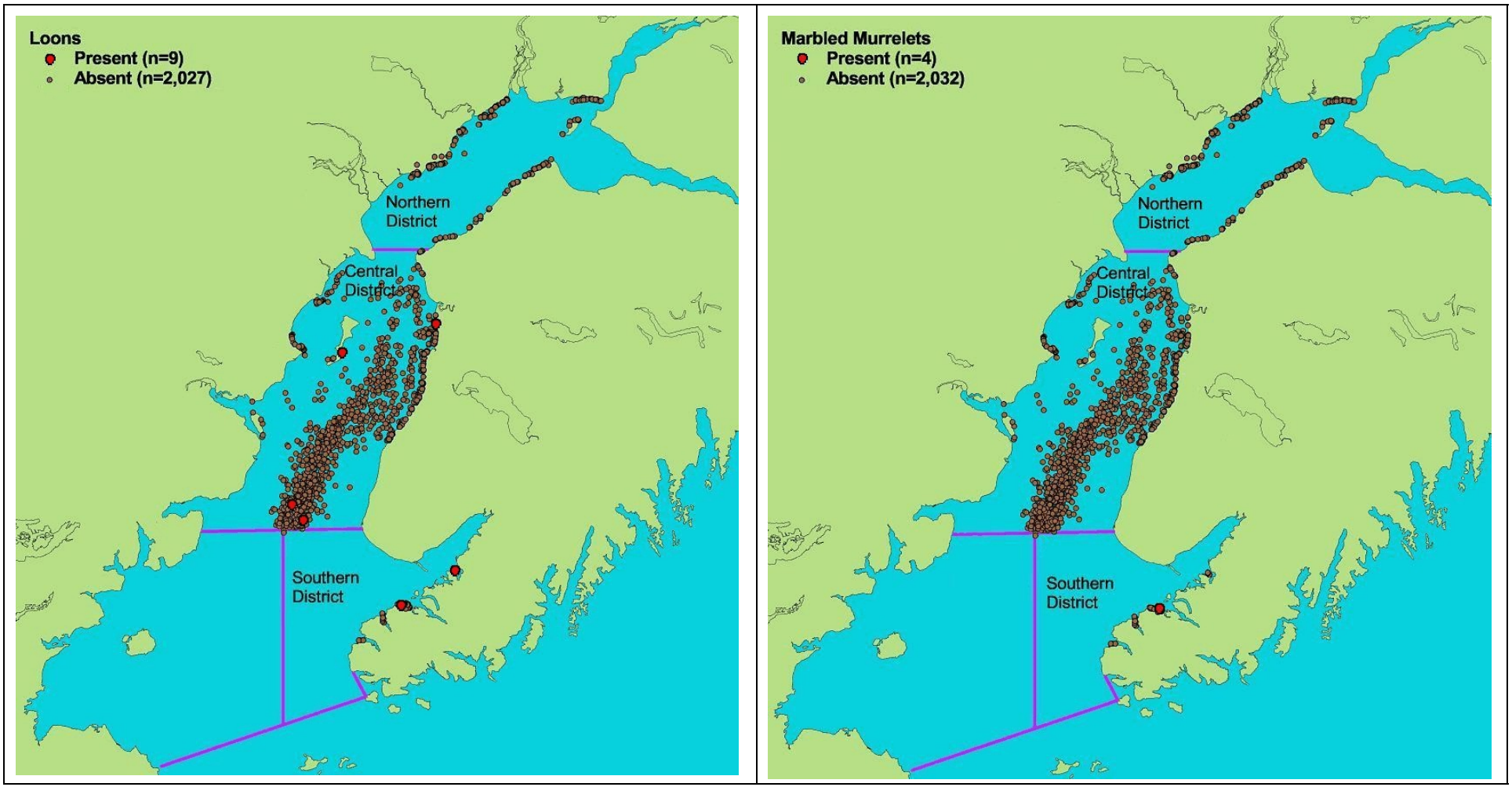

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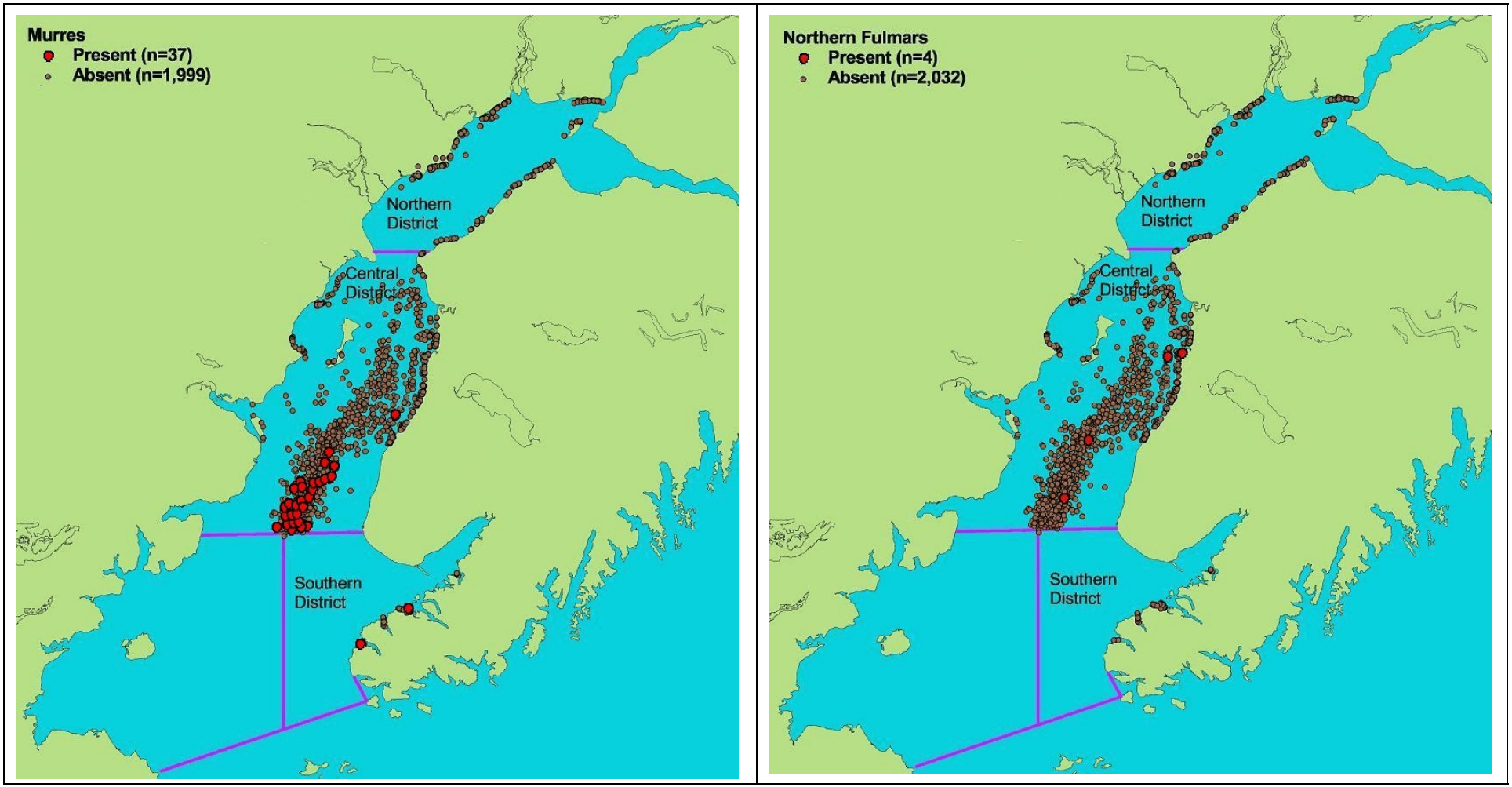

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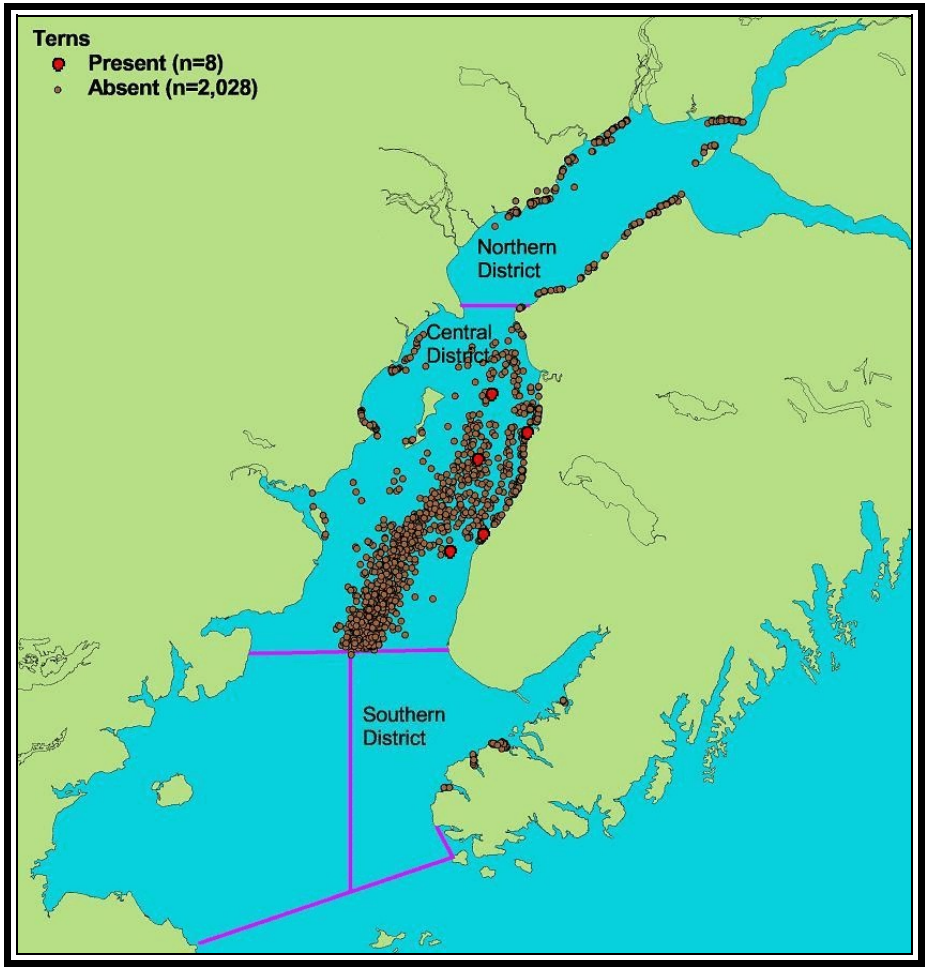

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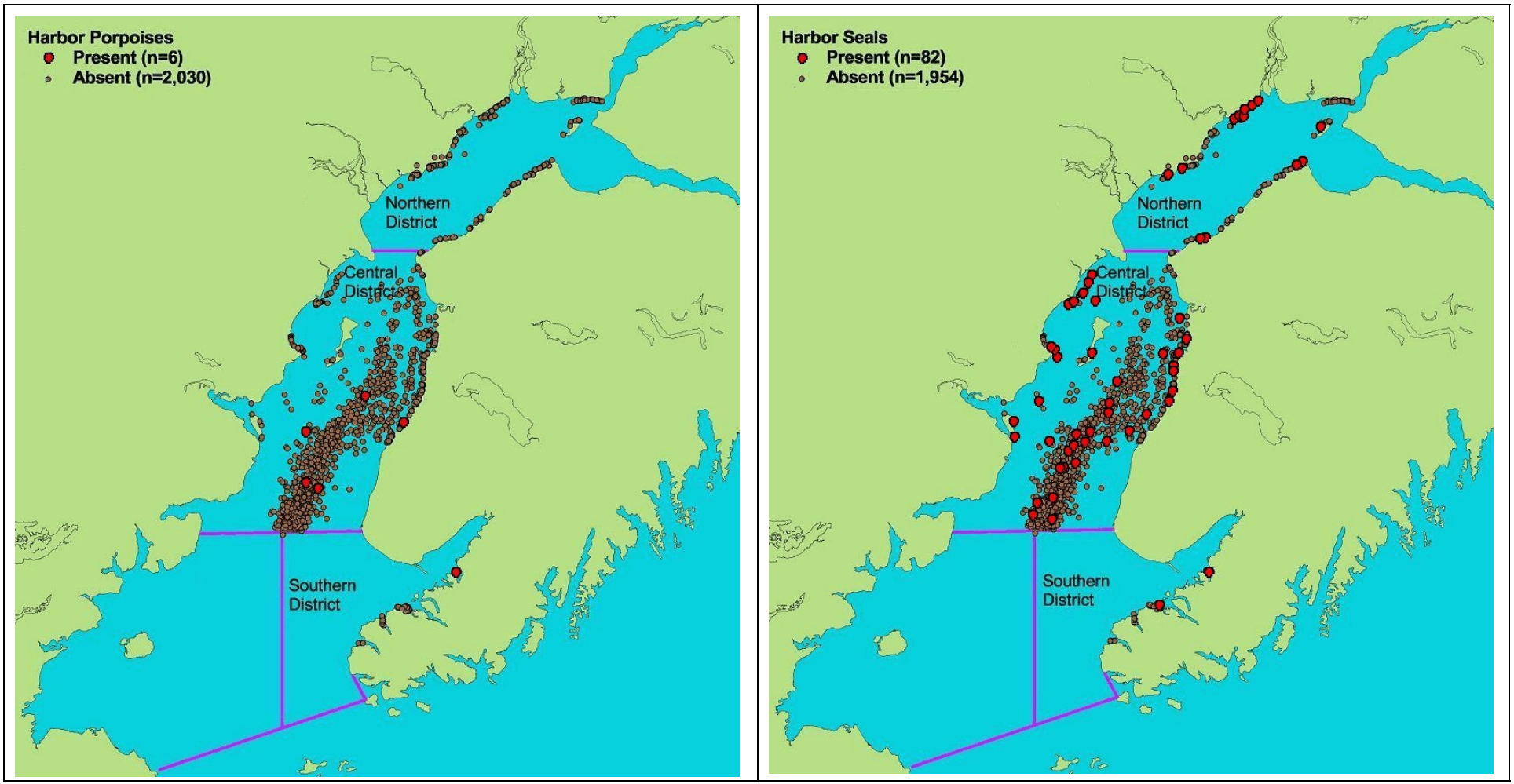

Figure 13 Sightings of marine mammals closer than 10m from nets in 2000. The positions of all hauls are shown, and present means one or more bird sightings.

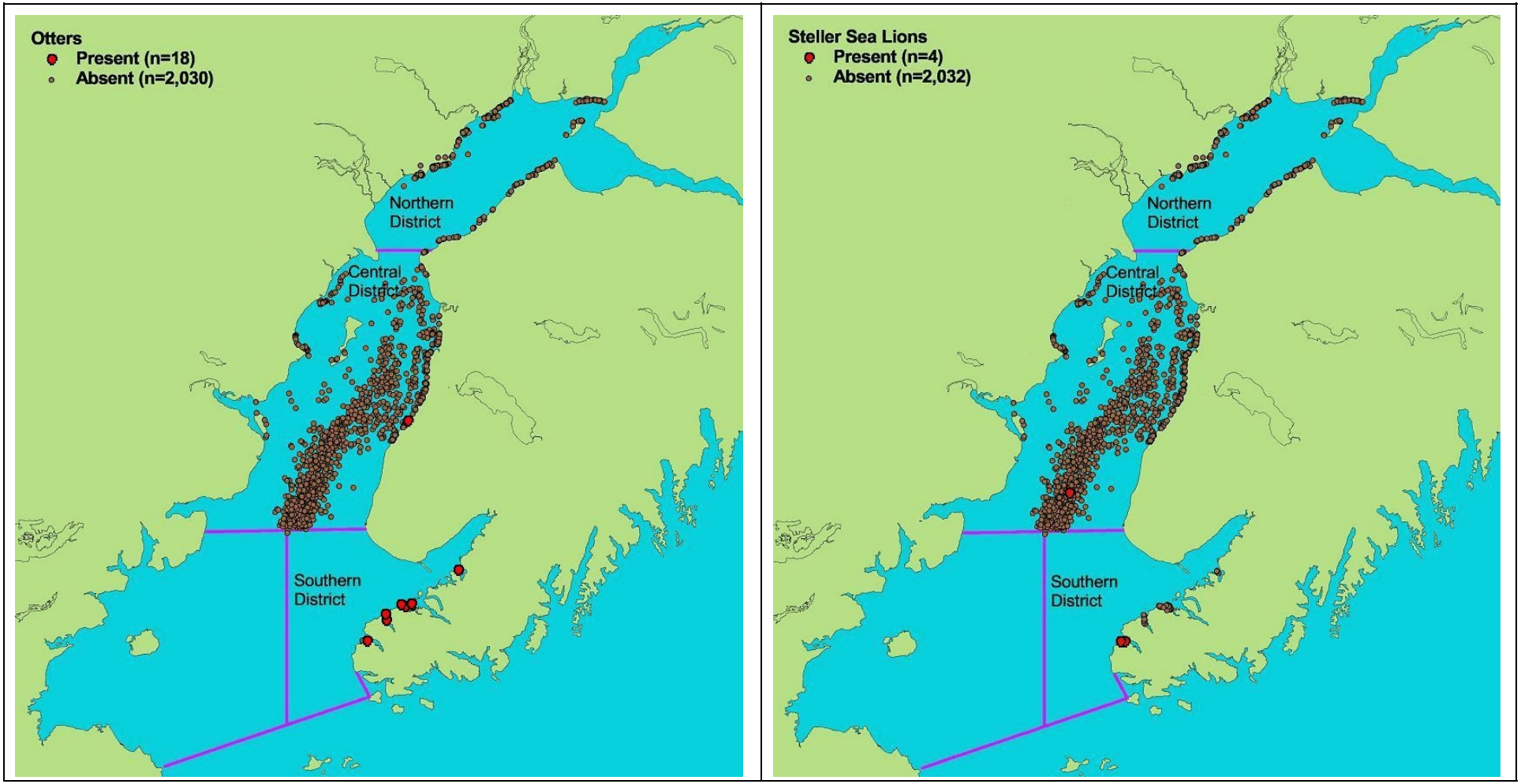

Figure 13, continued.

6. Analysis of Factors that May Affect Incidental take Rates

Because of the different nature of driftnet and setnet fishing, it seems likely that any factors that influence incidental take rates will operate differently for these two fisheries. They are therefore considered separately in this section

The Upper Cook Inlet Driftnet Fishery

In 1999 the incidental take for the Upper Cook Inlet driftnet fishery consisted of five birds (three common murre released dead, and two gulls released alive, without serious injuries), and two harbor porpoises (released alive, without serious injuries). In 2000 the incidental take consisted of one bird (a common murre released alive, without serious injuries), two harbor porpoises (one released alive without serious injuries, and one released dead), and a minke whale (released alive, without serious injuries). The total incidental take was therefore not great, consisting of six birds and five marine mammals.

Given this low amount of incidental take it is unreasonable to expect to be able to establish any clear relationship between incidental take and the fishing conditions. Therefore, rather than attempting to carry out any detailed analyses, a purely graphical approach has been adopted here. This involves plotting the incidental take per hour against the values for 26 variables that are available for describing the fishing conditions. The idea then is that the plots may indicate some relationships that might be investigated further with more data.

The 26 variables describing the fishing conditions are as follows:

1	Year	The fishing year 1999 or 2000 (coded 1 and 2).
2	Month	The month of the year (6, 7 or 8).
3	PlatCd	The platform code: the fishing vessel, a research vessel or the shore (coded 2, 3 and 4, respectively).
4	NetLth	The net length in fathoms.
5	NetDth	The net depth in meshes.
6	MshSz	The mesh size in inches.
7	Current	Whether the net orientation was unknown, with the current, against the current, or both with and against the current (coded 0, 1, 2 and 3, respectively).
8	Shore	Whether the net orientation relative to the shore was unknown, parallel to the shore, perpendicular to the shore, at an angle to the shore, or more than 300m offshore (coded 0, 1, 2, 3 and 4, respectively).
9	NLT800	Number of fishing nets within 800m of the observed net.

10	TdCd	The tide code: unknown, ebb, flood or slack (coded 0, 1, 2 or 3, respectively).
11	StCd	The stage code: unknown, mid, high or low (coded 0, 1, 2 and 3, respectively).
12	DShr	The distance to shore from the net code: unknown, 0, 0-10m, 11-70m, 71-200m, 201-300m, 301-400m, 401-800m, 801-1600m, 1-2 miles, 2-5 miles, and more than 5 miles (coded as 0, 1, 2, ..., 11, respectively).
13	DNet	The distance of the observer from the net code, with the same coding as used for DShr.
14	ObsHD	the distance of the observer to the haul in feet.
15	HabCd	The habitat code: unknown, sandy/mud, gravel or rocky/hard (coded as 0, 1, 2 and 3, respectively).
16	ZoneCd	The zone code: unknown, open beach, peninsula, bay/inlet, river mouth, bar/reef, surf, rip tide or offshore (coded as 0, 1, 2, ..., 8, respectively).
17	Taunt	Whether the net was taunt: unknown, no or yes (coded 0, 1 and 2, respectively).
18	Hook	Whether the net was hook shaped: unknown, no or yes (coded 0, 1 and 2, respectively).
19	Curved	Whether the net was curved: unknown, no or yes (coded 0, 1 and 2, respectively).
20	Tangled	Whether the net was tangled: unknown, no or yes (coded 0, 1 and 2, respectively).
21	Debris	Whether the net had debris: unknown, no or yes (coded 0, 1 and 2, respectively).
22	Damage	Whether the net was damaged: unknown, no or yes (coded 0, 1 and 2, respectively).
23	SeaSt	The Beaufort sea state during the haul (0 to 7).
24	WthCd	The weather code: unknown, clear, glare, part cloudy, overcast, drizzle, fog/mist or rain (coded 0, 1, 2, ..., 7).
25	VisCd	Visibility code: unknown, excellent, good, fair, poor, twilight, dark, none and obstructed (coded 0, 1, 2, ..., 8, respectively).
26	RnGr	Whether the gear was run: unknown, no and yes (coded 0, 1 and 2, respectively).

A value for each of these variables was obtained for each observed set, as far as possible. There were many missing values in some cases, and these were where possible replaced with the known values from the set immediately before or after the one in

question. When this was not possible, the unknown code was used. Data were then available for 1731 observed sets.

Figure 14 shows the plots of the bird and mammal incidental take rates (the incidental take per observed hour) for the sets plotted against the corresponding values for the 26 variables. From these plots the following points can be noted:

Year	There was more bird incidental take in year 1 than in year 2, but more mammal incidental take in year 2 than in year 1.
Month	There was no incidental take in month 8 (August), but this is possibly because the fishing effort was lower than in June and July.
PlatCd	All of the incidental take was observed from platform code 2 (the fishing vessel). This is perhaps not surprising. Platform code 4 is the shore and it is not clear how drift fishing could in fact have been properly observed from the shore.
NetLth	All of the incidental take was with the longest net length of 150 fathoms. This was the length almost always used, so this is not surprising.
NetDth	All of the incidental take was with nets with 45 meshes. This was the depth almost always used, so this is not surprising.
MshSz	All incidental take was with mesh sizes in the middle of the observed range. This may just reflect the fact that the mesh size was usually equal or close to the average size of 5.13 inches.
Current	All of the incidental take was with the net orientation against the current. Again this may just reflect the fact that this was the most common situation.
Shore	All of the incidental take was when the net was perpendicular to the shore or the shore was further than 300m. Again this may just reflect the fact that this was the most common situation.
NLT800	All of the incidental take was when the number of fishing nets within 800m was low. This occurred even though high values of this variable were common. Possibly this is due to a higher probability of incidental take in a net when there is little competition from other nets for this incidental take.
TdCd	There was no bird incidental take with tide code 2 (flood), and no mammal incidental take with tide code 3 (slack). Given the low incidental take numbers it is not clear whether this is just due to chance, but it seems that the tide may influence the incidental take rate.
St Cd	There was no bird incidental take with stage code 2 (high), and all of the mammal incidental take was with stage code 1 (mid). As with the tide code, due to the low incidental take numbers it is not clear whether this is just due to chance, but it seems that the tide stage during hauls may influence the incidental take rate.

DShr All of the incidental take was when the distance from shore code was 11 (more than 5 miles). This may just reflect the fact that most driftnet fishing was far from the shore.

DNet All of the incidental take was at moderate distances from the observer to the net. This may just reflect the fact that this was the situation for most of the time. It seems strange that there are numerous cases where the recorded distance from the observer to the net has the codes 9 to 11 which are all greater than one mile.

ObsHD Incidental take occurred at all distances between the observer and the haul.

HabCd All incidental take occurred with unknown or sandy/muddy habitats, but this may just reflect the fact that these were the usual conditions.

ZoneCd All incidental take occurred with surf, riptide or offshore, but this may just reflect the fact that these are the usual conditions.

Taunt Incidental take occurred when the net was or was not taunt.

Hook All the incidental take occurred when the net was not hook shaped. This may just reflect the fact that this was the usual situation.

Curved Incidental take occurred when the net was curved or not.

Tangled No incidental take occurred with tangled nets, but tangling was a rare occurrence.

Debris No incidental take occurred in nets with debris, but debris was a rare occurrence.

Damage No incidental take occurred with damaged nets, but damage was a rare occurrence.

SeaSt All incidental take occurred with low to moderate sea states, but this may just reflect the fact that these were the usual conditions.

WthCd All incidental take occurred with low to moderate weather codes, but this may just reflect the fact that these were the usual conditions.

VisCd All incidental take occurred with low visibility codes, but this may just reflect the fact that these were the usual conditions.

RnGr Incidental take occurred whether or not the gear was run.

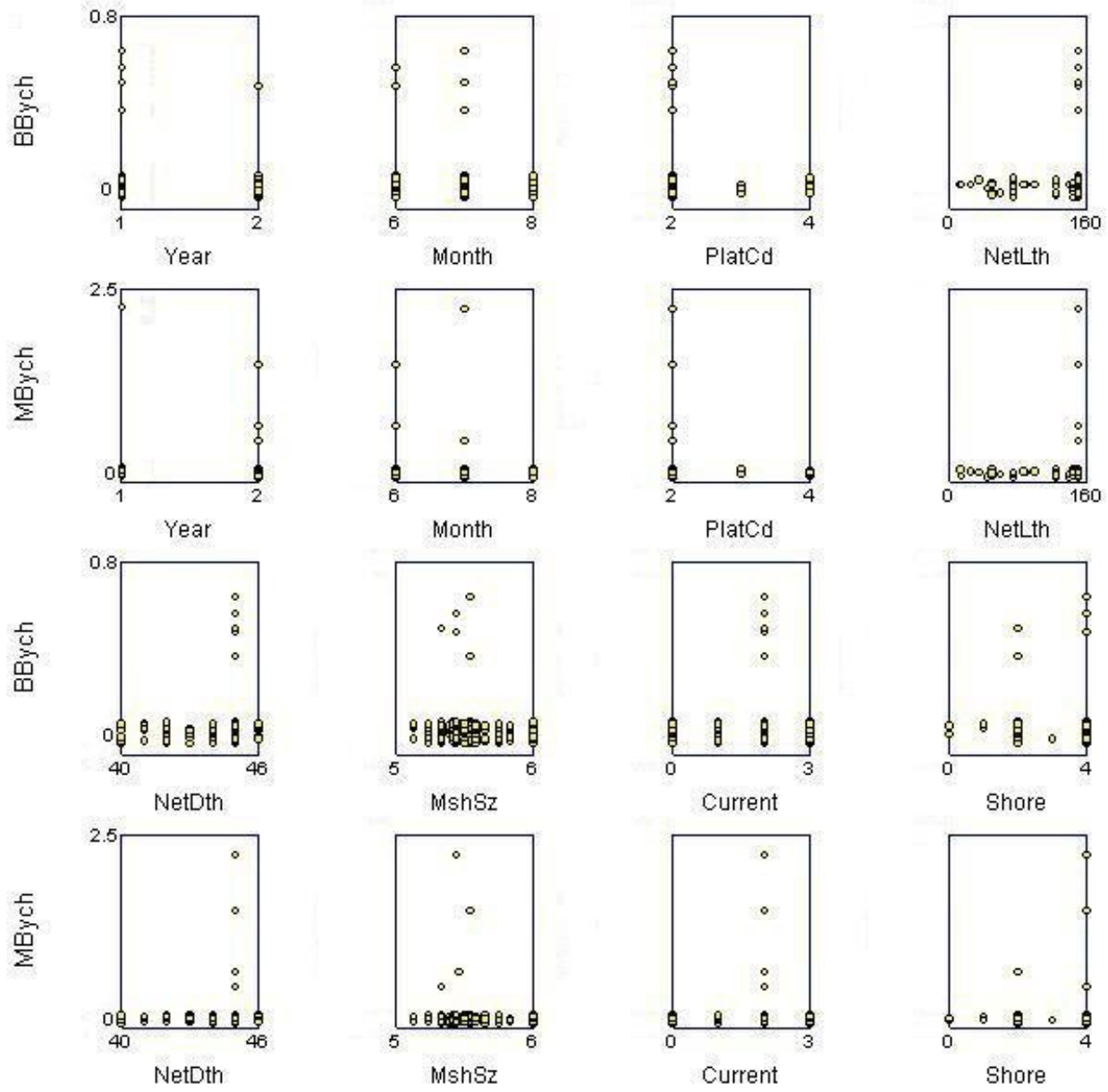

Figure 14 Plots of incidental take rates against 26 variables describing the driftnet fishing conditions. The vertical variables are the number of marine birds entangled per hour of observation (BBych), and the number of marine mammals entangled per hour of observation. The zero incidental take rate values have been jiggered vertically slightly so that they do not all fall at exactly the same place on some of the plots.

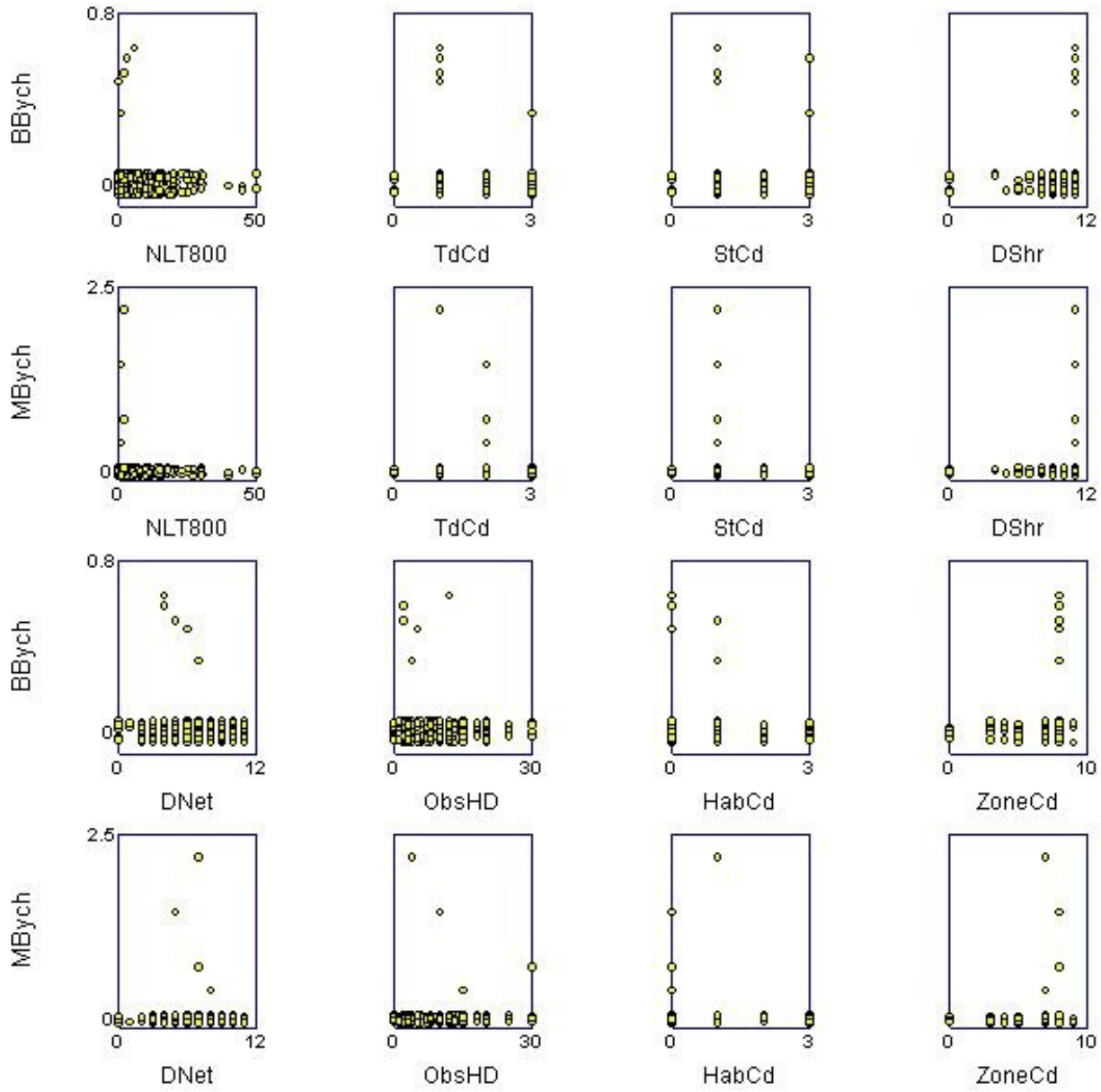

Figure 14 Continued.

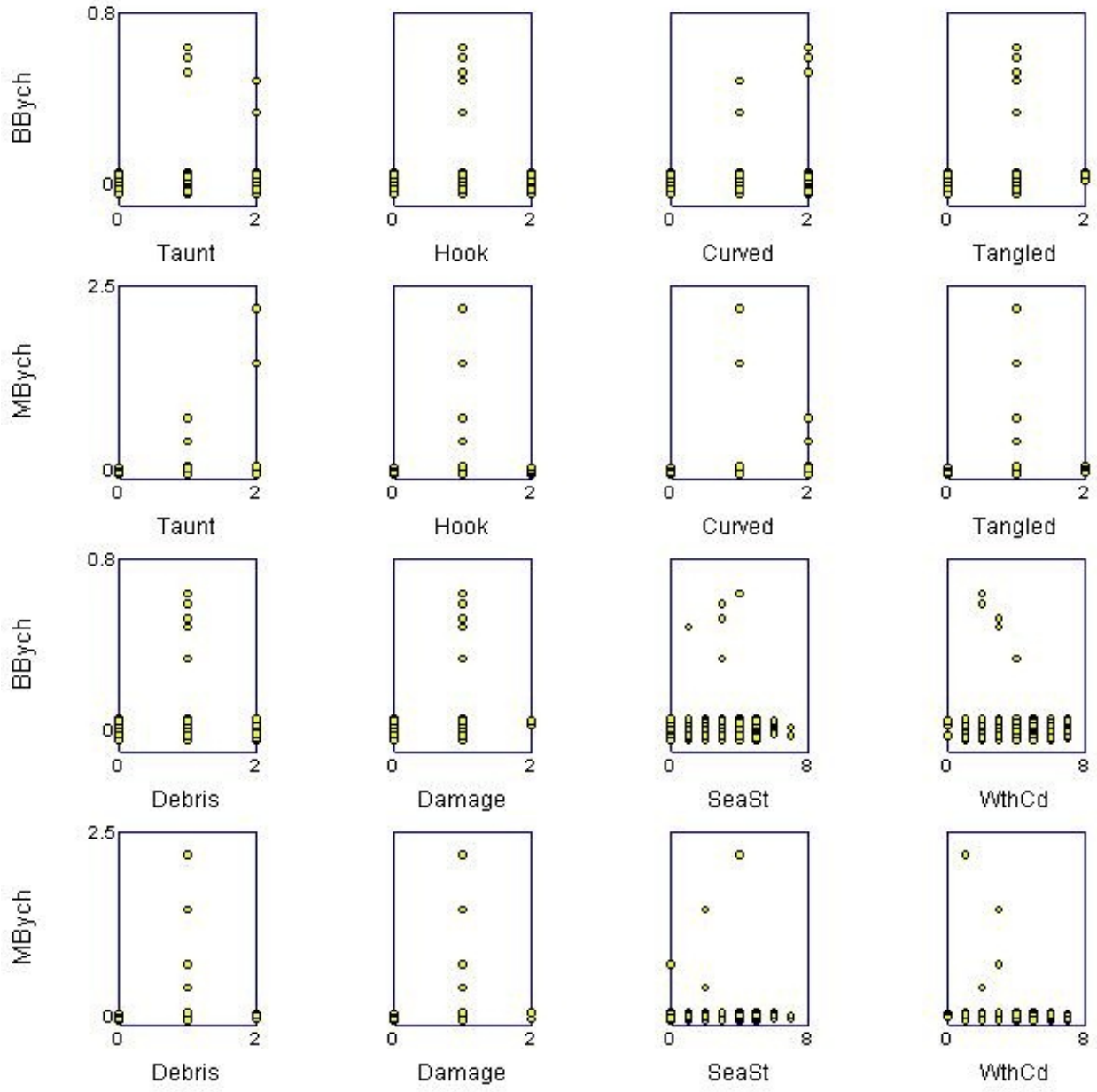

Figure 14 Continued.

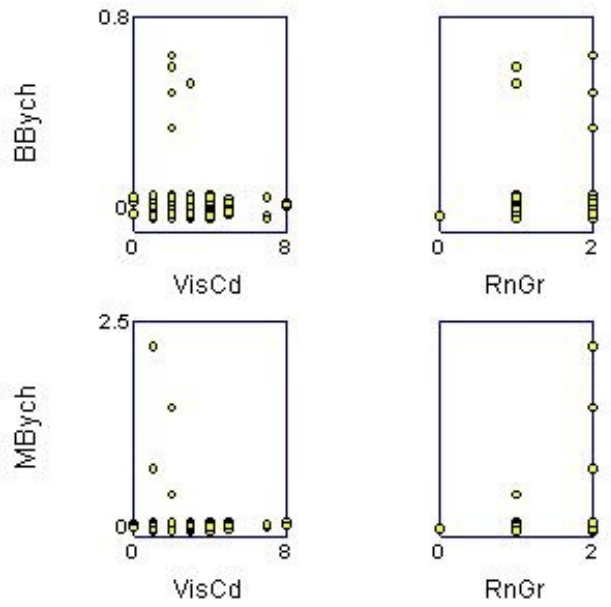

Figure 14 Continued.

The Cook Inlet Setnet Fisheries

In 1999 the incidental take for the Upper Cook Inlet setnet fishery consisted of two birds (one gull released alive, without serious injuries, and one common loon released dead). There was no marine mammal incidental take. In the same year in the Lower Cook Inlet setnet fishery the incidental take consisted of two birds (a white-winged scoter and a common loon, both released alive, without serious injuries), and one marine mammal (a harbor porpoise released alive, without serious injuries). In 2000 the Upper Cook Inlet incidental take consisted of two birds (a marbled murrelet and a white-winged scoter, both released dead), and one marine mammal (a harbor seal released alive, without serious injuries). In the same year there was no incidental take in the Lower Cook Inlet setnet fishery. The total incidental take for both years was therefore six birds and two marine mammals.

With the very low observed incidental take for marine mammals there seems little point in even plotting the incidental take against factors that may influence incidental take. Nevertheless, plots have been produced for both bird and mammal incidental take. There are 31 variables available to describe the setnet fishing conditions, many of which are the same as the variables used for driftnet fishing. These variables are as follows:

1	Year	The fishing year 1999 or 2000 (coded 1 and 2).
2	Month	The month of the year (6, 7 or 8).
3	Fishery	This is 2 for the Upper Cook Inlet fishery and 3 for the Lower Cook Inlet fishery.

4	Skiff	Whether the observer used a skiff: unknown, no or yes (coded 0, 1 and 2, respectively).
5	FshVs	Whether the observer used a fishing vessel: unknown, no or yes (coded 0, 1 and 2, respectively).
6	ResVs	Whether the observer used a research vessel: unknown, no or yes (coded 0, 1 and 2, respectively).
7	Shore	Whether the observer was on the shore: unknown, no or yes (coded 0, 1 and 2, respectively).
8	RemSk	Whether the observer used a remote skiff: unknown, no or yes (coded 0, 1 and 2, respectively).
9	NetLth	The net length in fathoms.
10	NetDth	The net depth in meshes.
11	MshSz	The mesh size in inches.
12	Current	Whether the net orientation was unknown, with the current, against the current, or both with and against the current (coded 0, 1, 2 and 3, respectively).
13	Shore1	Whether the net orientation relative to the shore was unknown, parallel to the shore, perpendicular to the shore, at an angle to the shore, or more than 300m offshore (coded 0, 1, 2, 3 and 4, respectively).
14	NLT800	Number of fishing nets within 800m of the observed net.
15	TdCd	The tide code: unknown, ebb, flood or slack (coded 0, 1, 2 or 3, respectively).
16	StCd	The stage code: unknown, mid, high or low (coded 0, 1, 2 and 3, respectively).
17	DShr	The distance to shore from the net code: unknown, 0, 0-10m, 11-70m, 71-200m, 201-300m, 301-400m, 401-800m, 801-1600m, 1-2 miles, 2-5 miles, and more than 5 miles (coded as 0, 1, 2, ..., 11, respectively).
18	DNet	The distance of the observer from the net code, with the same coding as used for DShr
19	ObsHD	The distance of the observer to the haul code, with the same coding as used for DShr.
20	HabCd	The habitat code: unknown, sandy/mud, gravel or rocky/hard (coded as 0, 1, 2 and 3, respectively).
21	ZoneCd	The zone code: unknown, open beach, peninsula, bay/inlet, river mouth, bar/reef, surf, rip tide or offshore (coded as 0, 1, 2, ..., 8, respectively).
22	Taunt	Whether the net was taunt: unknown, no or yes (coded 0, 1 and 2, respectively).
23	Hook	Whether the net was hook shaped: unknown, no or yes (coded 0, 1 and 2, respectively).

24	Curved	Whether the net was curved: unknown, no or yes (coded 0, 1 and 2, respectively).
25	Tangled	Whether the net was tangled: unknown, no or yes (coded 0, 1 and 2, respectively).
26	Debris	Whether the net had debris: unknown, no or yes (coded 0, 1 and 2, respectively).
27	Damage	Whether the net was damaged: unknown, no or yes (coded 0, 1 and 2, respectively).
28	SeaSt	The Beaufort sea state during the haul (0 to 7).
29	WthCd	The weather code: unknown, clear, glare, part cloudy, overcast, drizzle, fog/mist or rain (coded 0, 1, 2, ..., 7).
30	VisCd	Visibility code: unknown, excellent, good, fair, poor, twilight, dark, none and obstructed (coded 0, 1, 2, ..., 8, respectively).
31	RnGr	Whether the gear was run: unknown, no and yes (coded 0, 1 and 2, respectively).

A value for each of these variables was obtained for each set, as far as possible. There were many missing values in some cases, and these were where possible replaced with the known values from the set immediately before or after the one in question. When this was not possible, the unknown code was used. Data were available for 2579 observed sets.

Figure 15 shows plots of the marine bird incidental take rate per hour (BBych) and the marine mammal incidental take rate per hour (MBych), against each of these 31 variables. From these plots it can be noted that:

Year	There was some observed incidental take in each year.
Month	There was no incidental take observed in June.
Fishery	There was incidental take observed in both the Upper and Lower Cook Inlet fisheries.
Skiff	Bird incidental take was only observed from a skiff.
FshVs	No incidental take was observed from a fishing vessel.
ResVs	No incidental take was observed from a research vessel.
Shore	No bird incidental take was observed from the shore.
RemSk	No incidental take was observed from a remote skiff.
NetLth	Incidental take was only observed with a net length of 35 fathoms, but this is not surprising because this was the usual length.
NetDth	Incidental take was observed for the full range of net depths.

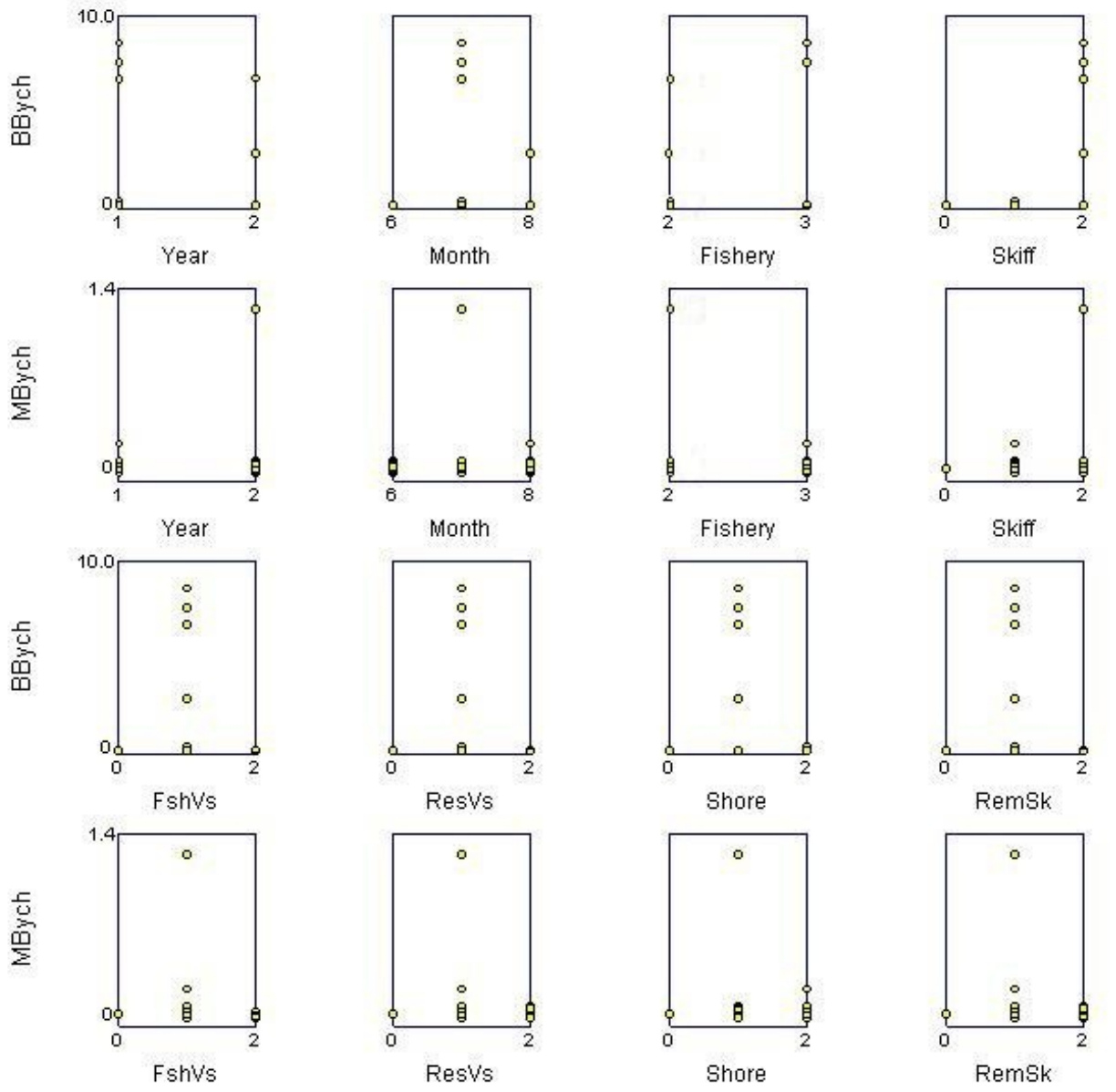

Figure 15 Plots of incidental take rates against 31 variables describing the setnet fishing conditions. The vertical variables are the number of marine birds entangled per hour of observation (BBych), and the number of marine mammals entangled per hour of observation. The zero incidental take rate values have been jiggered vertically slightly so that they do not all fall at exactly the same place on some of the plots.

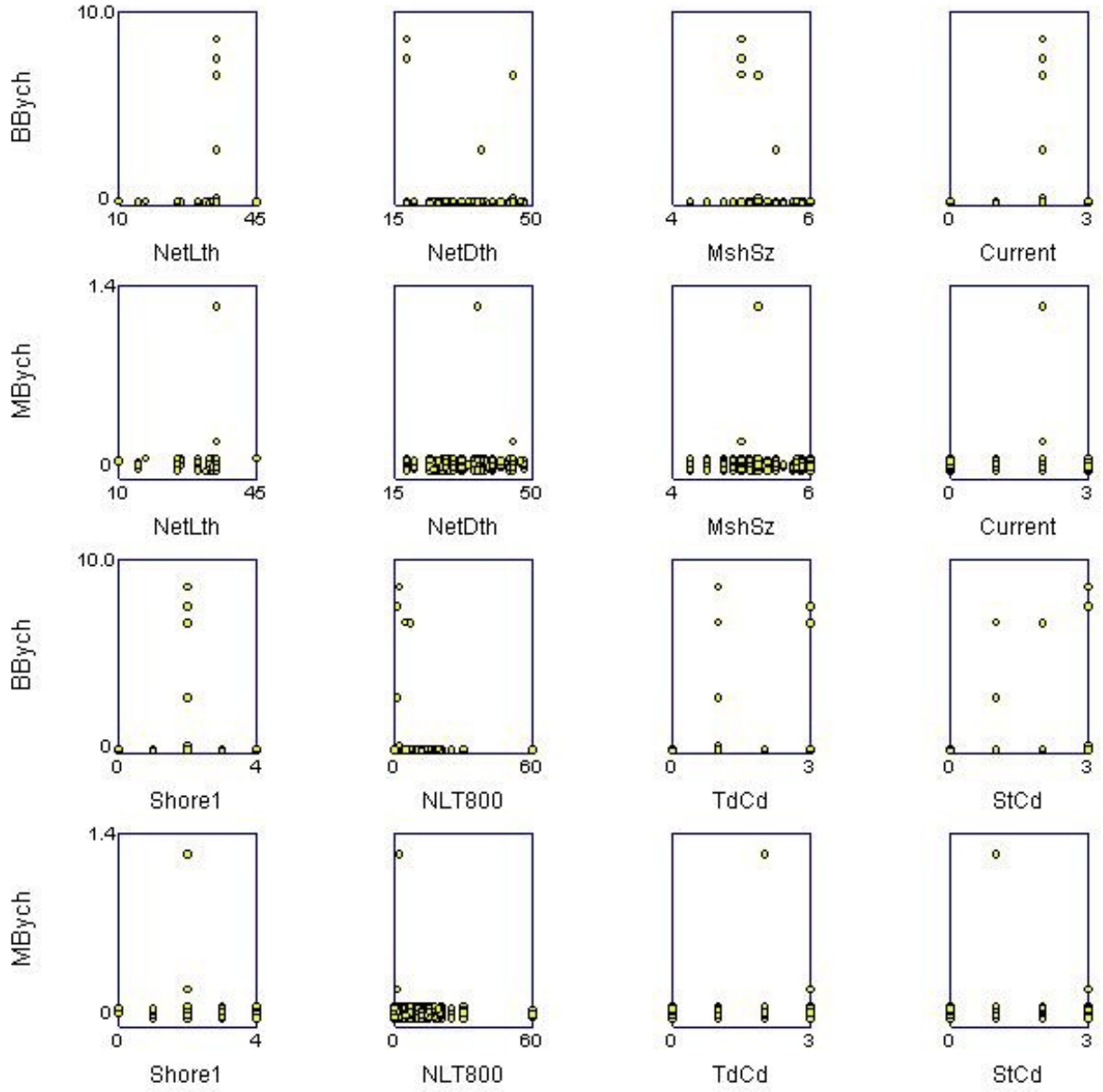

Figure 15 Continued.

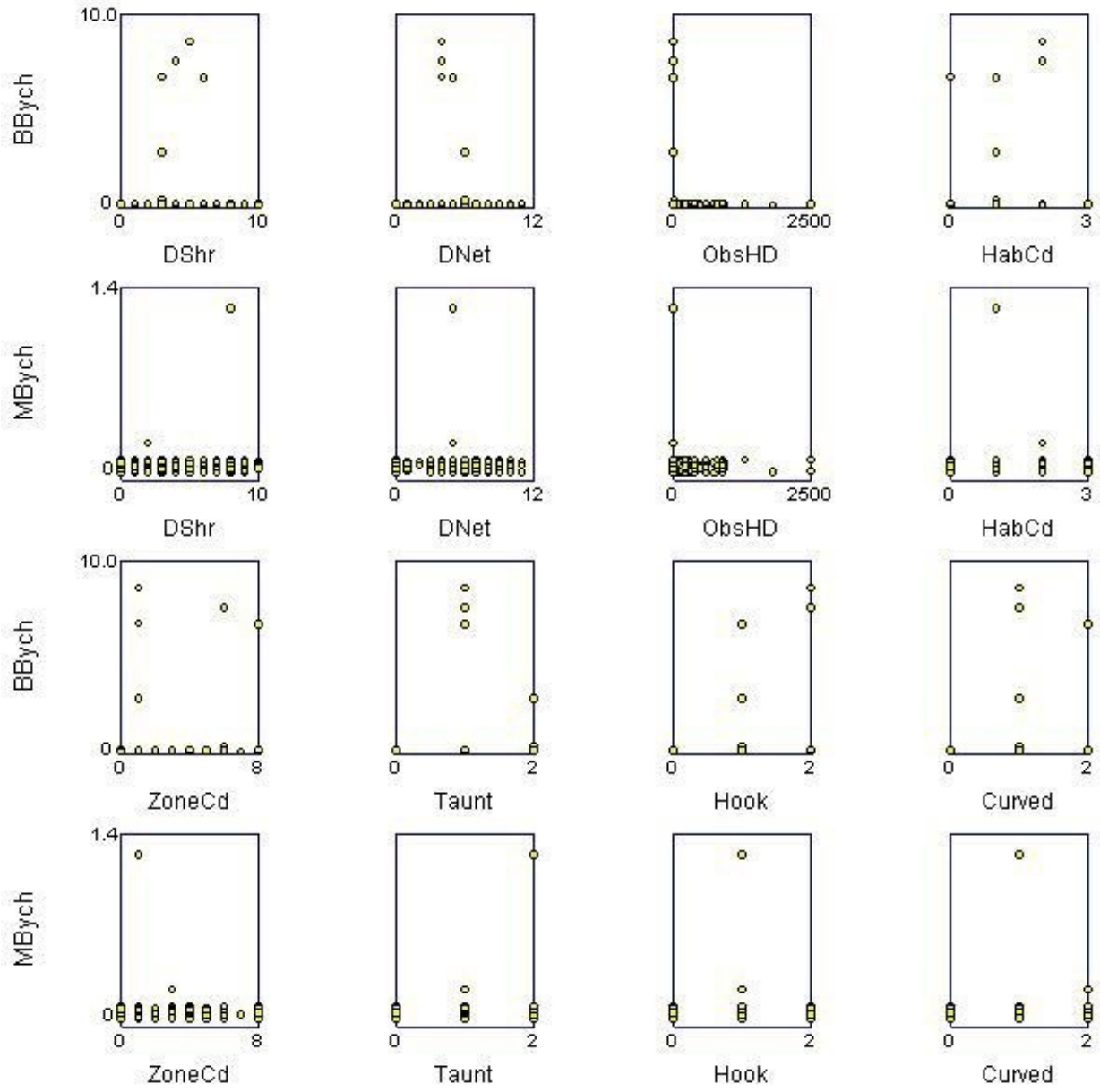

Figure 15 Continued.

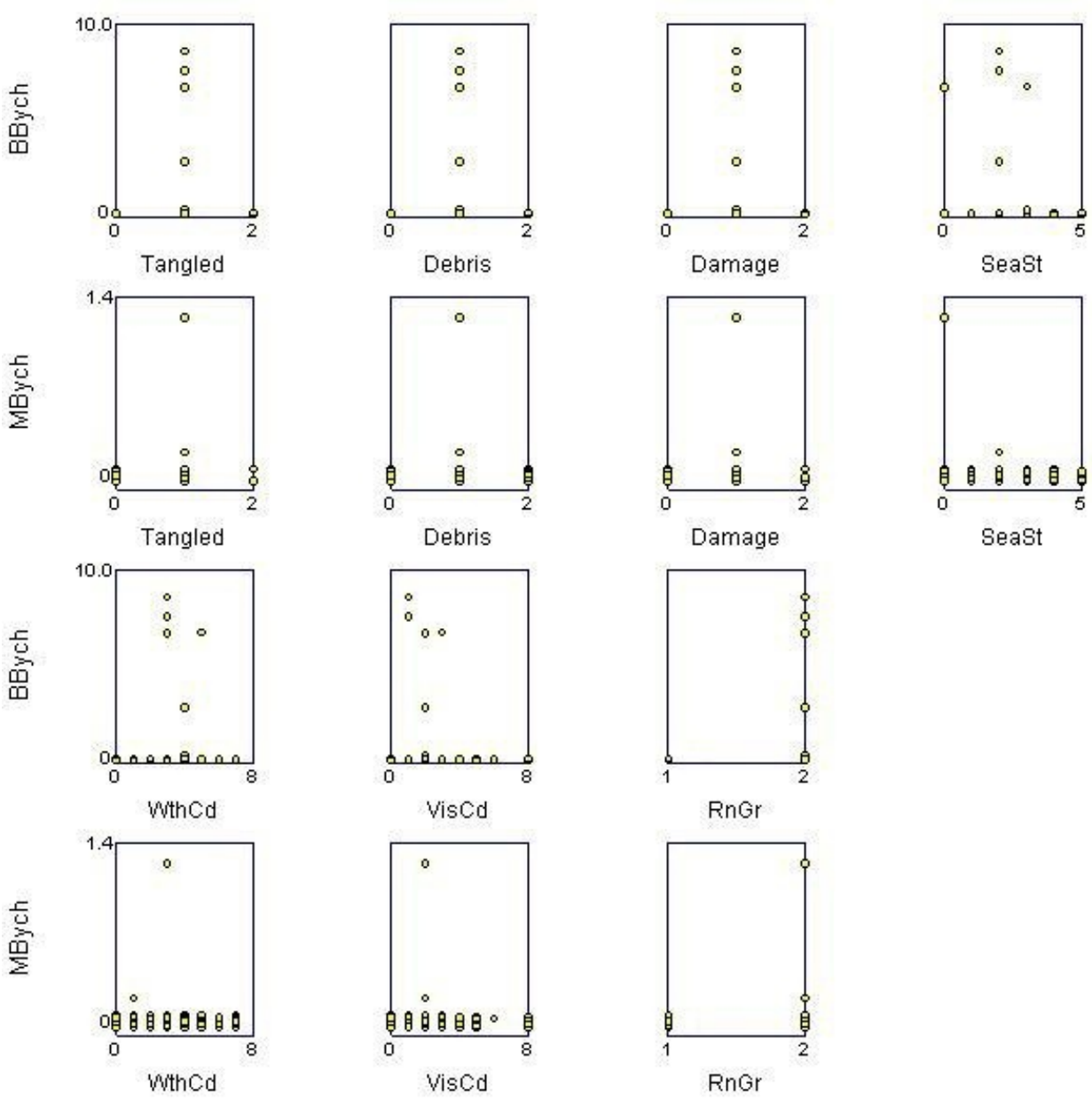

Figure 15 Continued.

MshSz	Incidental take was only observed with a mesh size of about 5 inches, but this was the usual situation so this is not surprising.
Current	Incidental take was only observed when the net orientation was against the current, but this was the usual situation so this is not surprising.
Shore1	Incidental take was only observed when the net orientation relative to the shore was perpendicular to the shore, but this was the usual situation so this is not surprising.
NLT800	Incidental take was observed only when the number of fishing nets within 800m of the observed net was low. As noted above with the driftnet fishery, possibly this is due to a higher probability of incidental take in a net when there is little competition from other nets for this incidental take.
TdCd	Incidental take was observed at all tides.
StCd	Incidental take was observed at all tide stages.
DShr	Incidental take was observed at most distances to shore from the net.
DNet	Incidental take was only observed in a narrow range of distances of the observer from the net, from 200 to 800m.
ObsHD	Incidental take was only observed when the distance of the observer to the haul was unknown.
HabCd	Incidental take was only observed when the habitat was unknown, sandy/mud or gravel, but as these were the usual conditions this is not surprising.
ZoneCd	Incidental take was observed on open beaches, bays and inlets, in surf, and offshore.
Taunt	Incidental take was observed whether the net was taunt or not.
Hook	Incidental take was observed whether the net was hook shaped or not.
Curved	Incidental take was observed whether the net was curved or not.
Tangled	No incidental take was observed when the net was tangled.
Debris	No incidental take was observed whether the net contained debris.
Damage	No incidental take was observed whether the net was damaged.
SeaSt	Incidental take was only observed when the Beaufort sea state was unknown or less than 4, but this was the usual situation.
WthCd	Incidental take was only observed when the weather code was unknown or less than 6, but this was the usual situation.
VisCd	Incidental take was only observed when the visibility was fair or better, but this was the usual situation.

RnGr Incidental take was only observed when the gear was run, but this was the usual situation.

7. Discussion

The only mortality or serious injury of a marine mammal observed in the Cook Inlet fisheries observer program in 1999 and 2000 was the mortality of a harbor porpoise in the Upper Cook Inlet driftnet fishery in 2000. If the PBR for the harbor porpoise had remained at 71 and the target observer coverage level for the driftnet fishery had been reached this would mean that there would not be 95% confidence that the PBR was not exceeded for this species, i.e. it could be concluded that the PBR may have been exceeded in this fishery during the years 1999 and 2000. However this conclusion is not justified because the PBR for harbor porpoises was raised from 71 to 166 in 2000, and then further raised to 255 in 2003, and the observer coverage of the driftnet fishery for 1999 and 2000 was 241 days rather than the targeted 360 days.

The estimated total number of mortalities or serious injuries for harbor porpoise is zero for 1999 and 31 for 2000, giving a yearly average of 15 animals. This is 5.9% of the current annual PBR of 255 for the harbor porpoise, which therefore falls within the range from 1% to 10% of the PBR in terms of classifying the fishery as described in Section 2 of this report. This is the basis for retaining the Upper Cook Inlet driftnet fishery as a Category II fishery (Department of Commerce, 2003, p. 41729).

The target observer coverage levels determined using the Wade (1999) method are not sufficient to estimate total mortality rates with reasonable accuracy, and therefore are not altogether satisfactory for the purpose of categorizing fisheries. In the case of the harbor porpoise in the driftnet fishery, the standard error associated with the mortality or serious injury estimate of 31 in 2000 is 55. Very roughly this suggests that the total number of serious injuries or mortalities in 2000 might have been anywhere from 1 (the observed death) to 141 (the estimated number plus two standard errors). As the estimated number of deaths in 1999 is zero, the upper limit of 141 deaths represents 70.5 deaths per year, which is 27.6% of the PBR. Therefore, although the best estimate of the yearly serious injury and mortality rate for harbor porpoise is 5.9% it is possible that it is four or five times as high as this.

Questions concerning the observer coverage levels required to determine whether a PBR is exceeded, to estimate total serious injury and mortality rates, and to categorize fisheries are discussed in more detail in another report (Manly, 2006).

There were no observed serious injuries or mortalities for marine mammals in the Upper and Lower Cook Inlet setnet fisheries. These fisheries have therefore been

reclassified from Category II to Category III fisheries (Department of Commerce, 2003, p. 41729).

In the Upper Cook Inlet driftnet fishery three common murres were observed to be entangled in nets in 1999 and released dead, while one common murre was entangled and released alive in 2000. The only other bird incidental take in this fishery was of two gulls released without serious injuries. The dead murres in 1999 translates into an estimated total of 183 common murres for the whole driftnet fishery, with this estimate being subject to a large potential sampling error. Incidental take of common murres is of concern because most (74%) of the oiled bird carcasses picked up after the *Exxon Valdez* oil spill were common murres and the species may also adversely affected by the regime change in the oceanic conditions in the early 1980's.

In the setnet fisheries the bird incidental take involving death or serious injury consisted of one common loon (in the Upper Cook Inlet in 1999), one marbled murrelet and one white-winged scoter (both in the Upper Cook Inlet in 2000). These incidental takes of single birds translate into estimates of the whole fishery of 89 common loons in 1999, 37 marbled murrelets in 2000, and 37 white-winger scoters in 2000. Sea ducks such as white-winged scoters and common loons are a group that is becoming of concern to the U.S. Fish and Wildlife Service, so that the incidental take of these birds is important. Incidental take of marbled murrelets is also important because of the adverse effects of the *Exxon Valdez* oil spill and the oceanic regime change in the early 1980's.

Although Kittlitz's murrelet (*Branchyramphus brevirostris*) was not observed as fisheries incidental take, it is in the area and incidental take could occur. As this species is a candidate for listing under the Endangered Species Act, any such incidental take would be of major concern.

Acknowledgments

Mary Sternfield (NMFS) helped enormously with the production of this report by producing the data in the required formats, checking inconsistencies and definitions, and pointing out places where the text needed changes. The report also relied heavily on information from many ADFG and NMFS staff, and I am particularly thankful to help and comments from Robyn Angliss (NMFS), Bryan Belay (Marine Resources Assessment Group Americas Inc.), Brian Fadely (NMFS), Lee Hammarstrom (ADFG), Kathy Kuletz (USFWS), Bridget Mansfield (NMFS), Mandy Merklein (ROAN Inc., Seattle), and Pat Shields (ADFG).

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Appendix A: Forms Used to Record Data

The forms reproduced here are the ones used in 2000. There are some differences between these forms and the ones used in 1999. The differences are shown in the following table.

Form	Name	Differences Between Years
1	Gear and Set data Form.	There are minor differences in the layout, with the 1999 form having a blank back page for comments. Some codes for variables are not the same in both years.
2	Marine Mammal and Bird Encounter Data Form.	There are minor differences in the layout. Some of the codes used are quite different between the years.
3	Marine Mammal and Bird Entanglement Data Form.	There are minor differences in the layout and some minor code differences.
4	Biological Sample Collection.	There are differences in the layout and data collected relative to the set involved. Codes are quite different in some cases.
5	Opener Summary Form.	This form was not used in 1999.

In addition to these forms, observers were also required to fill out a *Marine Mammal Sighting Form 11US* for the National Marine Mammal Laboratory for all of their sightings of marine mammals.

Form 1

FORM 1	Gear and Set Data Form	Fishery *(check)*	Set:	Debrief ID	Entry ID	Check ID	Final ID	Page of
			Drift:					Obs. code:

SET DATA:

Vessel or site name:_____ Permit #:_____ Net ID *(if >1 net/permit)*:____|____ # of nets fished:___

District:_____ Date *(mm/dd)*:_____2000 Platform code's):_____ Full opener. obs.*(y/n)*:_____ Observed set:____

GEAR:

Net length (fath.):_____ Net depth *(meshes)*:_____ Mesh size *(inch.)*:____.____ If leader length*(fath.)*_____ If weedline *(inch)*____

Orientation :___|___ Relt. to nets*(circle)*: Outside Inside Overlap (y/n):____ # nets< 800m_____

POSITION AND CONDITIONS:		(At the beginning)			Distance		(Most predominate state while fishing)					Obs.vis.	
	Latitude (N)	Longitude (W)	Tide	Stage	Shore	Next net	Obs.	Depth *(ft.)*	Habitat	Zone	Net codes	Sea state	W	V
Soak		1												
Haul		1					ft.							

FISHING EFFORT		If partial haul (time)		OBSERVER EFFORT:		FISHING OPERATIONS			
FISHING EFFORT	Time	Start	End	Start obs.	End obs.	Whole net fished (y / n)		Run gear ? (y / n)	
Begin (set/last haul)	:	:		:	:	**(Only if "no" fill in below)**		Pulled gear ? (y / n)	
Begin/soak	:	:		:	:	% time whole net fished:		% time tended gear :	
Begin haul	:	:		:	:	min % of net fished:		Est.sq.ft. gear damage:	
End haul	:	:		:	:	**Other forms:**		Circle other forms for this set: 2 3 4 11us	

CATCH DATA:					COMMENTS: Reference comments	MM/MB presence within 300m		
Species name	Code	# caught	(e/a	# damaged	*For more info. See back of form(circle one) : Y N*	Species	Code	#
					Log book #:_____ page #_____.			

Note codes: Do not leave data fields blank ! "U" = unknown/undetermined" "Z"="other" code. Draw an "X" through fields that don't apply to this set.

Outside	Platform	Orientation	Tides	Distance Code	Habitat	Net Code	Sea State	Observer **Vis**ibility		% code
no net w/in	*a=sn skiff*	*a= with current*	*E= ebb*	*a= 0 b= 0-10m*	*a=sandy/mud*	*a= taut*	*0= <1knt/ <1/4ft.*	**W**eather	**V**isibility	*a=100 %*
300m of at	*b=fishing v.*	*b=against current*	*F= flood*	*c=11-70m (35 fathoms)*	*b=gravel*	*b= hook*	*1= 1-3knt/ 1/4ft.*	*a= clear*	*a= excellent*	*b=76-100*
least 1 side	*c=research v.*	*c=changed (both)*	*S=slack*	*d=71-200m(100 fathoms)*	*c=rocky/hard*	*c= curved*	*2= 4-6knt/ 1/2ft.*	*b= glare*	*b= good*	*c=51-75%*
of obs.net	*d=shore*	*a=parallel to shr.*		*e= 201-300m(150 fathoms)*	Zone	*d= tangled*	*3= 7-10knt/ 2ft.*	*c= pt.cloudy*	*c= fair*	*d=26-50%*
Inside	*e=remote fv*	*b=perpn.to shr.*	Stage	*f= 301-400m(<1/4mile)*	*a=open beach*	*f= debris*	*4= 11-16knt/ 4ft.*	*d= overcast*	*d= poor*	*e=1-25%*
nets on both	*f=remote sk.*	*c=at angle to shr.*	*M= mid*	*g= 401-800m(<1/2 mile)*	*b=peninsula*	*g= damage*	*5= 17-21knt/ 6ft.*	*e= drizzle*	*e= twilight*	*f=0*
sides<300m	*g=tender*	*d=off shore>300m*	*H= high*	*h= 801-1600m(<1mile)*	*c=bay,inlet*	*f=surf*	*6= >28knt/ 10ft.*	*f=fog/mist*	*f= dark*	
of obs.net			*L= low*	*i=1-< 2 miles*	*d=river mouth*	*g=rip tide*	*7=28-34kn./14ft.*	*g=rain*	*g= no*	
shore=net				*j=2-5 miles k=>5 miles*	*e=bar,reefs*	*h=off shore*	*8=>34 kn./14 ft.*		*h= obstructed*	

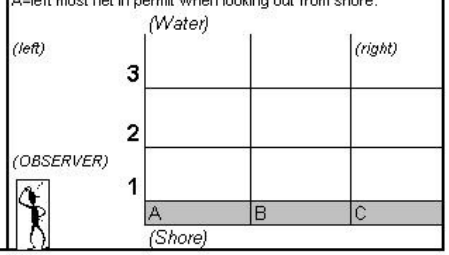
COMMENTS FROM FRONT PAGE: Reference Comments to Associated Data Field's on the front of the Form.

For set net: Draw (from an aerial view) the lay out of the set net site and the relationship (and Net ID) of each net in the permit and other associated nets near by. Include the shore line and any coastal formations that may be influencing the net. Do this on the back of the first page for a Form 1 for each new permit and suite of nets.
For drift net and set net: Draw and describe any unusual/interesting or useful information about the gear and how it is fished. If there are other nets near by or if the net is set close to shore. Include this in the drawings and description.

Important note for all: Write questions for debriefing.
If photos forhis set: Roll #____Frams#____to____. Record on Form 5.
"u" and "z" codes need to be referenced sequentially by number.
Clarify inconstancies or unusual events.
Add additional species, times etc. if not enough room on form
Enter comments into database so that the data users can understand what happened and why. They may not have access to this form.

Net ID Grid

A=left most net in permit when looking out from shore.



Form 2

FORM 2	Marine Mammal and Bird Encounter Data Form		Set:	Debrief ID	Entry ID	Check ID	Final ID	Page of
		Fishery (check):	Drift:					Obs. Code:

Set Data:

Vessel or site name:_____ Permit code:_____ Net id code (set net):_____

Date*(mm/dd)*:_____2000 Associated forms *(circle)*: 3 4 11us Comments/log *(y/n)*:___ *(see back if y)* Observed set #_____

ENCOUNTERS (<10m)				Group				Time <10m		Behavior		at net <2m		DETERRENTS						Impact	React.
ID#	Species name	Code	#	A	S	G#	C	1st	total	b4 net	to net	at net	where	Time	N	P	Method	Distance	# times	code	code
								:						:							
								:						:							
								:						:							
								:						:							
								:						:							
								:						:							
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								:						:							
								:						:							

Note: Do not leave data fields blank ! "U" = unknown/undetermined" "Z"="other" code. Draw an "X" through fields that don't apply.

MM Codes	ID #	Time	**Primary** behavior (comment on back)			Deterrents		Physical Impact
pv=*harbor seal*	*The unique*	**1st**= first sighted	Before net **(b4 net)**	**to net**	Behavior **at net**<2m	**N**otice to fisher		*a=no apparent impact*
ej=*steller s. lion*	*animal(s)*	<10 m of net (24hr)	*a=stationary*	*a=stationary (drifting)*	*a= stationary*	*a=no notice*		*b=possible injury**
cu=*n.fur seal*	*identifier*	**Total** time <10m	*b=meandering around*	*b=miss(parallel/outside)*	*b= feeding near net*	*b=uninten. notice*		*c=injured**
pp=*harbor porp.*	Age	*a=< 1 min.*	*c=directional*	*c=avoid (went around)*	*c= feeding on net*	*c=intend notice*		*d=died**
pd=*Dall's porp.*	*a=adult*	*b=1-5 min.*	*d=bow riding*	*d=avoid(u turn at net)*	*d=swam over net*	**P**rovided Info.		*(injured = comments)**
dl=*beluga whl.*	*b=sub adult*	*c=6-15 min*	*e= feeding*	*e= approached*	*e=mostly diving*	*d=no comment*		Reaction
oo=*killer whale*	*c=pup/calf*	*d=16min.-30min*	*f= at another net*	*f= unintended deterrence*	*f=in/out of 2m area*	*e=comnt.*		*a=no apparent reaction*
el=*sea otter*	Sex	*e=31min-1 hr.*	*g=on land near by*	*g=enticed (lured)*	*g=outside of 2m*	Method		*b= temporarily retreated*
See code list for more	*f=female*	*f=<1hr.*	*h=(bird) flew in& landed*	*h=flew in (landed)*	*h= travel along*	*a=seal bomb*		*c=successfully deterred*
# Note :	*m=male*	*g=on/off whole set*	*i=flew away*	*i=flew away*	**Where** most time	*b=run gear*		*d=approached net*
Number of individuals	Composition	*h=present all time*	*j=dove*	*J=dove under*	*a= far end*	*c=gun shot*		*e=into net (entangled)*
that share all the same	*a=alone.*		*k=surfaced (poped up)*	*k=surfaced (poped up)*	*b= tended end*	*d=moved gear*		*f= marked chg. behavior*
fields on this line.	*b=with juv.*				*c= mid net*	Distance		*(if "f comment)*
Group # Note:	*c=with adult*				*d= all along net*	*1=hit*	*4=>10m*	
Total # of animals	*d= w/adult& jv.*				*e= outside;10m of net*	*2=<5m*	*5=undt*	
in the group. Alone= 1.	*e=mix species*				*f =both sides of net*	*3=<10m*	*6=unobs.*	

COMMENTS FROM FRONT PAGE: Reference Comments to Associated Data Field(s) on the Front of the Form.	
Describe all relevant information, especially behavior and injuries. Draw marine mammal/bird in relation to net/vessel. Describe any unusual marks, damage, debris, fishing gear, tags, etc.. Draw in location of any wounds, scars, net marks, debris:	Reference all "U" and "Z" codes with numbers for comments. Photo reference: (if yes): roll #_____ and frame #____ Log book #_____ page _____ to _____ Write down any questions you may have about how to fill out this form.

Form 3

FORM 3	Marine Mammal and Bird Entanglement Data Form			Set:	Debrief ID	Entry ID	Check ID	Final ID	Page of
			Fishery *(check)*	Drift:					Obs. Code:

Set Data:

Vessel or site name:_____ Permit code:_____ Net id code (if >1 net/permit):____

Date (mm/dd):_____2000 Circle associated forr 2 4 11us Log #____ Pg. #_____ Observed set #_____

Entanglements				Time	Obs.eft.		Release	Time	Condition/Injur.		Position in net			Sex	Age	Length		Sample
(I /U)	ID #	Species name	Code	(24 hr.)	N	R	Code	(24hr.)	Cond	Injur. *	Along	S	Depth	*(m,f,u)*	*(a,s,j)*	*cm/mm*	*(e/a,*	sp.code#
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										
				:				:										

Note: Do not leave data fields blank ! "U" = unknown/undetermined" "Z"="other" code. Draw an "X" through fields that don't apply.

MM Codes	(I/U) ID # (note)	Released Codes	Along Net Codes	COMMENTS: Reference to associated data field.
pv=*harbor seal*	The unique animal ID #	*a=momentary contact*	*a= tended end*	***Injuries** must be described in comments. If injured or dead enter*
ej=*steller s. lion*	If sure it is the same indiv	*b=self-release*	*b=mid net*	*all codes that best reflect the injuries and describe further*
cu=*n.fur seal*	animal as on from 2	*c=self-rel w/net damag*	*c=last quarter pulled*	*in comments. Enter "x" if there are no injuries observed.*
pp=*harbor porp.*	enter in "I" for identified	*d=human-release*	*d=anchor line*	Injury codes *
pd=*Dall's porp.*	and form 2 ID #. If not	*e=human-rel w/net dama*	*e=lead*	*a=penetrating*
dl=*beluga whl.*	certain enter in "U" and	*z=other (comment)*	*S= if <300m shore*	*b=gashes, slits*
oo=*killer whale*	a sequential number for	Condition Codes	*a=end close to shore*	*c=net marks*
el=*sea otter*	each new animal on 3.	*a= alive unknown conditi*	*b=end furthest/shore*	*d=blood evident*
N= Observer effect (obs. eft.)		*b= alive uninjured*	Depth Codes	*e=head trauma*
a=fisher aware of entanglement		*c=alive trailing gear* (se*	*a=float line d=bottom*	*f=fishing gear*
b=obs. notified fisher immediately		*d= alive injured**	*b=top msh. u=unkn.*	*g=entangle debris*
c=obs. notified fisher later(>5 minutes.)		*e=alv. injur.due to human*	*c=mid msh.*	*h=oiled*
d=obs. did not notify fisher		*f=dead; due to entanglem*	Age Codes	*I=behavioral trauma;*
R=If human assist in release (obs. eft)		*g=dead;due to release**	*a=adult*	*(unsteady/disoriented/*
a=fishermen released		*h=frsh dead; caused unk*	*s=subadult*	*exhausted/gasping)*
b= observer assisted in released		*i=previously dead**	*j=(pup/calf)*	*z=other*

More comments on back (y/n)___

COMMENTS FROM FRONT PAGE: Reference Comments to Associated Data Field(s) on the Front of the Form.	
Describe and/or draw all relevant information. Especially behavior/injuries/cause of death. Draw marine mammal/bird in relation to entanglement in ne Describe any unusual marks, damage, debris, fishing gear, Draw in location of any wounds, scars, net marks, debris.	Be generous with your comments and enter them in the data base. Photo reference (circle): Y N (if yes): roll #_____ and shot #____ Photo: Associated forms and data field:_____. Write down any questions you may have about how to fill out this form. Enter detailed comments into the data base.

Form 4

FORM 4	BIOLOGICAL SAMPLE COLLECTION				Debrief ID	Entry ID	Check ID	Final ID	Page of
									Obs. Code:

SAMPLE SOURCE									
Date *(mm/dd)*:	00	Vessel or site:			Permit code:			Sample #	
Sample from observed permit *(circle)*:		**Y**	**N**		**Unobs. set info. continued Fill below (draw line though if unknown)**				
Observed set information		**Fill below**			Time of entanglement:	:	Distance to shore *(m)*		
There should be a Form 1	Observed set #:				Time of death:	:	Dist. to net if <300m:		
Circle other forms filled for this set:		2	3	11us 4	Platform code:		# fishing < 800m:		
Unobserved set information		**Check below**			Latitude (N)		Habitat/zone *(codes)*.		
Form 1 filled in for this permit on this day		y	n		Longitude(W)	1	MM with in 300m(y/n) ?		
Sample taken from a fi/sn site with no observer:		y	n		District		MB with in 300m(y/n) ?		
Sample not from a fishing site/boat:		y	n		Depth *(ft)*		Other dead MM/MB near by(y/n) ?		
If unobserved set fill in info. to right					Tide*(2codes)*		Circle associated forms	11us	other from 4's

SPECIES IDENTIFICATION *(fill in or circle)*					MM measurements		Bird measurements		Tags and brands		
Species					Standard length(cm):		Bill length (mm)		Type	#/description	
Species code					Curviliner length (cm):				Tags		
Sex *(circle)*	F	M	U		Axillary girth(cm):				Brand		
Age *(circle)*	Adult	subadult	pub/calf	unkn.	Fluke width (cm):				Bird bands		
Beluga color *(c)*	White	gray/white	gray	dark gray	Blubber thickness:				Other		

CARCASS CONDITION		USE BACK OF FORM TO DRAW LOCATION OF MARKS AND ADD COMMENTS							
Condition	Check below	Wounds Present	Check below	Body location (codes)	Extent (code)	Photos(y/n)	roll	frame	
Darely alive *(see cautions)*		Penetrating							
Dead; recently		Gashes, slits							
Dead partly decomposed		Net marks							
Dead very decomposed		Blood evident							
Skeleton only		Head trauma							
Scavenger damage		Fishing gear(keep!)							
Human damage *(comment)*		Oiled							
Other *(see comments)*		Other							

Samples type	Check all taken	Time collected (24hr.)	frozen date(99)	Time (24hr.)	Where stored
Whole carcass		:		:	
Whole head		:		:	
Jaw / not head		:		:	
Teeth		:		:	
Skin		:		:	
Stomach		:		:	
Other:		:		:	

CODES u=unknown z=other x=not applicable					
Platform	Habitat/Zone	Tides	Extent		
a=sn skiff	*a=sandy/mud*	*E= ebb*	*a=slight(<10%)*		
b=fishing vessel	*b=gravel*	*F= flood*	*b=modrat.(<50%)*		
c=research vesse	*c=rocky/hard*	*M= mid*	*c=very (>50%)*		
d=shore	*e=penisula*	*H= high*	Body location		
e=remote fish v	*b=bay,inlet*	*L= low*	*a=head*	*e=fin*	
f=remote skiff	*c=river mouth*	*R= rip*	*b=body*	*f=fluke*	
t=tender	*d=bar,reets*	*t=surf*	*c=front flipper*		
	e=off shore	*g=rip tide*	*d= back flipper*		

Sample tracking				
Date	Name	Organization	Contact Address	Contact number

COMMENTS FROM FRONT PAGE: Reference Comments to Associated Data Field(s) on the Front of the Form.

Note: Do not leave data fields blank ! "U" = unknown/undetermined" "Z"="other" code. Draw an "X" through fields that don't apply.

Draw the sampled animal.

Describe any unusual marks, damage, debris, fishing gear, tags, etc..)

Draw in location of any wounds, scars, net marks, debris:

Draw location of samples taken:

Retain fishing gear sample.

Photo reference (circle): Y N (if yes): roll #_____ and shot #____

Photo: Associated forms and data field:_____.

Write down any questions you may have about how to fill out this form.

Form 5

FORM 5	Opener Summary Form					Debrief ID	Entry ID	Check ID	Final ID	Page of
										Obs. code:

Legal Opener Date and Times		Start		End		Observer at site	Start		End		Total time off site for opener in hours
	Code	Day	Time	Day	Time		Day	Time	Day	Time	
Opener 1						opener 1					
Opener 2						opener 2					

				Fishing Effort						Observer presence					Salmon	Marine mammals and birds			
Date	Fishery			Total	Total	Fishing time				Time	Time	# Hauls	# Hauls		caught	Injured killed obs. sets			
2000	S/D	District	Permit #	# nets	Fathoms	Began	A/E	Ended	A/E	Started	End	Obs.	Not Obs.	A/E	#	Species	Code	#	M/ I

Note: Do not leave data fields blank ! "U" = unknown/undetermined" "Z"="other" code. Draw an "X" through fields that don't apply.

Instructions For Form 5 are in the manual section 3. Please refer to them !

Logbook entries (include all pages)

Logbook#: page # to

# of Forms			Photos	
Form	opener 1	open. 2	Roll #	Frame #
Form 1 #				
From 2 #				
Form 3 #				
Form 4 #				
Form 5 #				
11 US #				

COMMENTS FROM FRONT PAGE: Reference Comments to Associated Data Field's on the front of the Form.

Be generous with comments. Write safety concerns, suggestion and comments about this opener. If any permit holder or fishermen refuses to allow you to observe their net document this here: Record the permit #, holder/fishers name. Describe: When, where, and how this refusal occurred. Explain why if you know or record if a reason is given. Make sure log book notes are refurenced. This is not a citation but a record/explanation to the program, documenting DCI's attempt to cover perm Draw and describe any unusual/interesting or useful information about the opener.	Write down any question you have about how to fill out this form. "U" and "Z" codes need to be referenced sequentially by number. Clarify inconstancies or unusual events. Add additional species, times etc. if not enough room on form Enter comments into database so that the data users can know what happened and why. They may not have access to this form.

Refusals (use more space if necessary). Enter this information into the data base.

Permit #name	date	time	Where	how /why

Contacts

contact date	Name	permit	phone	when will take observer	where / how details

Notes:

Appendix B: Details of Incidental Take of Marine Mammals and Birds

Fishery	Date	Animal	Condition	Notes
Drift	12/07/1999	Unidentified Gull	Alive, uninjured	The gull was tangled at the float-line depth, mid-net, at the end closest to shore. The net was <300m from shore. The gull self-released, alive and uninjured.
Drift	12/07/1999	Unidentified Gull	Alive, uninjured	The gull was tangled at the float-line depth, in the last quarter of the net pulled, at the end closest to shore. The gull self-released, alive and uninjured.
Drift	11/07/1999	Common Murre	Dead, due to entanglement	The murre was tangled in the last quarter pulled, at the end furthest from shore, at mid-mesh depth. The net was <300m from shore. The fisher released the bird, but it was dead, due to the entanglement.
Drift	11/07/1999	Harbor Porpoise	One alive, uninjured and one alive, injured	Two porpoises were entangled at the float line depth, in the tended end of the net. Both appeared to be adults (with 122 cm estimated length). The two animals collided with the net. The net was set in a rip tide. The tide was ebbing and they were entangled traveling north, against the current. Once into to the net, they did not seem to be badly entangled, but were trying to swim through the net rather than backing out or turning and swimming parallel to the net. The crew noticed the entanglement and began net retrieval. The animals were about 40-50 fathoms from the vessel. Upon tightening of the net during retrieval the first porpoise became disentangled with no apparent injury or impairments. The other porpoise made it to within 12 ft of the vessel. As the fishers spread the net by hand it became disentangled. It quickly swam away with a deep dive with no obvious impairments although while entangled some blood was visible coming from a laceration on the posterior of the dorsal fin. The extent of the laceration was not seen, but it was definitely was not severe and probably no more than a few inches (3-4 in.).
Drift	15/07/1999	Common Murre	Dead, due to entanglement	The murre was tangled in the last quarter of net pulled, at the top mesh depth. The fisher released the murre dead. The murre was an adult, length 49 cm, and sex unknown.
Drift	28/06/1999	Common Murre	Dead, due to entanglement	Observer recorded entanglement at 11:03 hrs. Murre was entangled mid-net at an unknown depth. Fisher was aware of tangle and released the murre dead, due to entanglement at 11:19 hrs. The observed noted "neck through net." The murre's length was not recorded; the adult murre was collected.

Set	29/07/1999	Common Loon	Alive, uninjured	Loon was entangled mid-net at end closest to shore at top mesh depth. Net was <300m from shore. The observer assisted in the release of the loon alive, uninjured but with damage to the net. The loon, which had an estimated length of 55 cm. The sex and age were unknown.
Set	29/07/1999	White-winged Scoter	Alive, uninjured	Scoter was entangled mid-net at end furthest from shore at top mesh depth. Net was <300m from shore. The observer participated in the release of the loon, alive and uninjured. The bird was an adult male, 45 cm in length.
Set	14/07/1999	Unidentified Loon	Dead, due to entanglement	The loon was found in net at the time the haul-soak was watched. It was entangled mid-net at an unknown depth, and was released dead, due to the entanglement. The loon was an adult with the sex unknown, and a length of 7.6 cm.
Set	31/08/1999	Harbor porpoise	Alive, condition unknown	The entanglement occurred mid-net, at the end close to shore at top mesh depth. The net was <300m from shore. The porpoise self-released, alive and uninjured. The age, sex, and length were unknown.
Set	08/07/1999	Unidentified Gull	Alive, condition unknown	The gull self-released alive with the condition unknown. The entanglement occurred in the in last quarter pulled, in the end furthest from shore at the float line depth. The net was <300m from shore. The sex and age were unknown, no length was recorded, and no samples were collected.
Drift	26/06/2000	Harbor porpoise	Alive, injured due to human release	The porpoise was entangled mid net at the top mesh depth. The fisher released the animal alive, but it was injured due to the release, with damage to the net. The age and sex could not be determined. The estimated length was 100 cm. The dorsal fin was nicked up and bleeding, with wounds about 1/2 cm deep. No other wounds were present. When it was released it vigorously swam away and disappeared
Drift	26/06/2000	Harbor porpoise	Alive, condition unknown	The fisher released the animal in an unknown condition unknown from the net in the last quarter pulled at mid-mesh depth. It was an adult male with length 131 cm. No injuries were observed, but the observer commented that it was barely alive, probably due to drowning. On release it sank and was not seen again. It is assumed to have died.
Drift	03/07/2000	Common Murre	Alive, injured	The murre was entangled mid-net, at the bottom depth. The observer assisted in the release, and the murre was alive but injured. The observer noted that the bird was released in good condition but the webbing on it's left

				foot was cut by the drift net. The murre was an adult of unknown sex and length.
Drift	26/06/2000	Minke Whale	Alive, condition unknown	The minke was in the tended end of the net, in end furthest from shore. The net was <300 m from shore. The fisher released the minke alive, but in unknown condition. The sex and age were unknown.
Set	24/07/2000	Harbor Seal	Alive, uninjured	The observer noted that the seal popped up with the net over it's head and a fish in it's mouth. The seal self-released, alive and uninjured.
Set	03/08/2000	White Winged Scoter	Fresh dead, cause unknown	The observer recorded a scoter found entangled and dead in the bottom of the net while pulling the net in. The adult, male scoter was freshly dead by an unknown cause. The length was 24 cm. No injuries were observed. It was found in the tended end, in the end furthest from shore. The net was <300 m from shore.
Set	21/07/2000	Unidentified Gull	Previously dead	Observer recorded that the subadult seagull had a wing missing and its body was torn apart. There were seagull nests on the shore, and eagles eat the gulls.
Set	21/07/2000	Marbled Murrelet	Dead, due to entanglement	The fisher released the murrelet dead, due to the entanglement. The entanglement occurred mid-net, in the end furthest from shore at the top mesh depth. The net was <300m from shore. The murrelet was of unknown sex and age, and the length was not measured.

Appendix C: Detailed Fishing Effort in the Upper Cook Inlet Setnet Fishery

	Effort in 1999				Effort in 2000			
Area	Date	Permits	Open Hours	Permit Hours	Date	Permits	Open Hours	Permit Hours
24421	01-Jul	39	12	468	03-Jul	46	12	552
	03-Jul	46	15	690	06-Jul	18	12	216
	05-Jul	48	12	576	10-Jul	48	12	576
	08-Jul	41	17	697	12-Jul	49	13	637
	09-Jul	48	15	720	13-Jul	56	16	896
	11-Jul	23	13	299	15-Jul	37	14	518
	12-Jul	59	12	708	16-Jul	44	12	528
	14-Jul	26	19	494	17-Jul	43	17	731
	15-Jul	49	19	931	18-Jul	37	14	518
	17-Jul	53	18	954	20-Jul	41	12	492
	18-Jul	45	10	450	24-Jul	41	12	492
	19-Jul	52	12	624	31-Jul	25	12	300
	22-Jul	52	12	624	07-Aug	20	12	240
	24-Jul	41	14	574				
	25-Jul	41	12	492				
	27-Jul	37	19	703				
	28-Jul	35	12	420				
	29-Jul	38	17	646				
	30-Jul	43	24	1032				
	31-Jul	18	24	432				
	01-Aug	31	24	744				
	02-Aug	38	24	912				
	03-Aug	37	24	888				
	04-Aug	26	24	624				
	05-Aug	34	19	646				
	09-Aug	22	12	264				
	12-Aug	14	12	168				
	Total	1036	447	16780	Total	505	170	6696
24422	01-Jul	42	12	504	03-Jul	38	12	456
	03-Jul	35	15	525	06-Jul	34	12	408
	05-Jul	42	12	504	10-Jul	41	12	492
	08-Jul	38	17	646	12-Jul	41	13	533
	09-Jul	40	15	600	13-Jul	38	16	608
	11-Jul	34	13	442	15-Jul	42	14	588
	12-Jul	39	12	468	16-Jul	35	12	420
	14-Jul	29	19	551	17-Jul	40	17	680
	15-Jul	39	19	741	18-Jul	45	14	630
	17-Jul	39	18	702	20-Jul	43	12	516
	18-Jul	40	10	400	24-Jul	33	12	396
	19-Jul	47	12	564	31-Jul	25	12	300
	22-Jul	54	12	648	07-Aug	19	12	228
	24-Jul	33	14	462				
	25-Jul	42	12	504				
	27-Jul	39	19	741				
	28-Jul	35	12	420				
	29-Jul	38	17	646				
	30-Jul	35	24	840				
	31-Jul	31	24	744				
	01-Aug	30	24	720				
	02-Aug	24	24	576				
	03-Aug	27	24	648				
	04-Aug	24	24	576				

	05-Aug	30	19	570				
	09-Aug	22	12	264				
	12-Aug	13	12	156				
	Total	941	447	15162	Total	474	170	6255
24431	01-Jul	34	12	408	03-Jul	44	12	528
	03-Jul	35	15	525	06-Jul	35	12	420
	05-Jul	31	12	372	10-Jul	53	12	636
	08-Jul	49	17	833	12-Jul	44	13	572
	09-Jul	28	15	420	13-Jul	48	16	768
	11-Jul	17	13	221	15-Jul	45	14	630
	12-Jul	43	12	516	16-Jul	44	12	528
	14-Jul	16	19	304	17-Jul	45	17	765
	15-Jul	41	19	779	18-Jul	35	14	490
	17-Jul	29	18	522	20-Jul	46	12	552
	18-Jul	27	10	270	24-Jul	26	12	312
	19-Jul	42	12	504	31-Jul	27	12	324
	22-Jul	47	12	564	07-Aug	15	12	180
	24-Jul	27	14	378				
	25-Jul	30	12	360				
	27-Jul	47	19	893				
	28-Jul	46	12	552				
	29-Jul	41	17	697				
	30-Jul	45	24	1080				
	31-Jul	32	24	768				
	01-Aug	28	24	672				
	02-Aug	47	24	1128				
	03-Aug	39	24	936				
	04-Aug	42	24	1008				
	05-Aug	36	19	684				
	09-Aug	28	12	336				
	12-Aug	10	12	120				
	Total	937	447	15850	Total	507	170	6705
24432	08-Jul	18	12	216	10-Jul	22	12	264
	12-Jul	41	12	492	13-Jul	34	16	544
	15-Jul	38	12	456	17-Jul	34	17	578
	19-Jul	48	12	576	18-Jul	29	14	406
	22-Jul	50	12	600	20-Jul	35	12	420
	27-Jul	43	14	602				
	29-Jul	47	17	799				
	30-Jul	39	13	507				
	01-Aug	40	19	760				
	02-Aug	42	24	1008				
	03-Aug	41	24	984				
	04-Aug	36	24	864				
	05-Aug	36	19	684				
	09-Aug	19	12	228				
	12-Aug	8	12	96				
	Total	546	238	8872	Total	154	71	2212
24441	08-Jul	22	12	264	10-Jul	26	12	312
	12-Jul	21	12	252	13-Jul	33	16	528
	15-Jul	28	12	336	17-Jul	33	17	561
	19-Jul	34	12	408	18-Jul	21	14	294
	22-Jul	38	12	456	20-Jul	34	12	408
	27-Jul	39	14	546				
	29-Jul	36	17	612				
	30-Jul	35	13	455				

	01-Aug	28	19	532				
	02-Aug	30	24	720				
	03-Aug	21	24	504				
	04-Aug	28	24	672				
	05-Aug	25	19	475				
	09-Aug	20	12	240				
	12-Aug	18	12	216				
	Total	423	238	6688	Total	147	71	2103
24442	08-Jul	12	12	144	10-Jul	13	12	156
	12-Jul	11	12	132	13-Jul	31	16	496
	15-Jul	16	12	192	17-Jul	17	17	289
	19-Jul	21	12	252	18-Jul	4	14	56
	22-Jul	17	12	204	20-Jul	14	12	168
	27-Jul	23	14	322				
	29-Jul	22	17	374				
	30-Jul	14	13	182				
	01-Aug	15	19	285				
	02-Aug	16	24	384				
	03-Aug	13	24	312				
	04-Aug	15	24	360				
	05-Aug	15	19	285				
	09-Aug	11	12	132				
	12-Aug	7	12	84				
	Total	228	238	3644	Total	79	71	1165
24510	01-Jul	1	12	12				
	12-Jul	1	12	12				
	15-Jul	1	12	12				
	22-Jul	1	12	12				
	23-Jul	1	12	12				
	24-Jul	1	12	12				
	30-Jul	1	12	12				
	Total	7	84	84				
24520	28-Jun	1	12	12				
	01-Jul	2	12	24				
	05-Jul	2	12	24				
	08-Jul	1	12	12				
	12-Jul	1	12	12				
	14-Jul	1	24	24				
	15-Jul	2	24	48				
	16-Jul	2	24	48				
	17-Jul	2	24	48				
	19-Jul	2	24	48				
	21-Jul	3	24	72				
	22-Jul	3	24	72				
	23-Jul	3	24	72				
	24-Jul	2	24	48				
	29-Jul	2	24	48				
	31-Jul	2	21	42				
	05-Aug	2	12	24				
	23-Aug	2	12	24				
	Total	35	345	702				
24530	21-Jun	1	12	12	22-Jun	10	12	120
	24-Jun	3	12	36	26-Jun	13	12	156
	28-Jun	11	12	132	29-Jun	13	12	156
	01-Jul	9	12	108	03-Jul	14	12	168

	05-Jul	11	12	132	05-Jul	12	18	216
	08-Jul	11	12	132	06-Jul	12	24	288
	12-Jul	11	19	209	07-Jul	13	24	312
	13-Jul	9	24	216	08-Jul	10	24	240
	14-Jul	8	24	192	09-Jul	14	24	336
	15-Jul	7	24	168	10-Jul	12	24	288
	16-Jul	6	24	144	11-Jul	14	24	336
	17-Jul	7	24	168	12-Jul	17	24	408
	18-Jul	11	24	264	13-Jul	13	24	312
	19-Jul	8	24	192	14-Jul	12	24	288
	20-Jul	10	24	240	15-Jul	12	24	288
	21-Jul	6	24	144	16-Jul	5	24	120
	22-Jul	12	24	288	17-Jul	14	24	336
	24-Jul	11	24	264	18-Jul	15	24	360
	25-Jul	6	24	144	19-Jul	11	24	264
	26-Jul	9	24	216	20-Jul	13	24	312
	27-Jul	4	24	96	21-Jul	14	24	336
	28-Jul	10	24	240	22-Jul	13	24	312
	29-Jul	12	24	288	23-Jul	10	24	240
	31-Jul	8	21	168	24-Jul	13	24	312
	02-Aug	8	12	96	25-Jul	14	23	322
	05-Aug	7	12	84	27-Jul	10	12	120
	09-Aug	9	12	108	31-Jul	10	12	120
	12-Aug	6	12	72	03-Aug	6	12	72
	16-Aug	2	12	24	07-Aug	8	12	96
	23-Aug	2	12	24	10-Aug	6	12	72
	26-Aug	2	12	24	14-Aug	4	12	48
	30-Aug	1	12	12	17-Aug	1	12	12
	Total	238	592	4637	Total	358	629	7366
24540	24-Jun	1	12	12	17-Jul	1	12	12
	28-Jun	1	12	12	03-Aug	1	12	12
	01-Jul	1	12	12	14-Aug	1	12	12
	05-Jul	2	12	24				
	08-Jul	1	12	12				
	12-Jul	1	19	19				
	13-Jul	1	24	24				
	14-Jul	1	24	24				
	15-Jul	1	24	24				
	18-Jul	2	24	48				
	20-Jul	1	24	24				
	22-Jul	1	24	24				
	26-Jul	5	24	120				
	28-Jul	1	24	24				
	29-Jul	1	24	24				
	31-Jul	1	21	21				
	Total	22	316	448	Total	3	36	36
24550	12-Jul	3	12	36	10-Jul	3	12	36
	15-Jul	3	12	36	13-Jul	3	12	36
	19-Jul	3	12	36	17-Jul	3	12	36
	22-Jul	3	12	36	20-Jul	3	12	36
	29-Jul	4	12	48	24-Jul	3	12	36
	02-Aug	4	12	48	27-Jul	3	12	36
	05-Aug	2	12	24	31-Jul	3	12	36
	09-Aug	3	12	36	03-Aug	2	12	24
	12-Aug	3	12	36	07-Aug	2	12	24
	16-Aug	2	12	24	17-Aug	1	12	12
	Total	30	120	360	Total	26	120	312

24555	02-Jun	4	12	48	02-Jun	8	12	96
	04-Jun	6	12	72	05-Jun	8	12	96
	07-Jun	6	12	72	07-Jun	5	12	60
	09-Jun	6	12	72	09-Jun	7	12	84
	11-Jun	6	12	72	12-Jun	7	12	84
	14-Jun	4	12	48	14-Jun	3	12	36
	16-Jun	4	12	48	16-Jun	6	12	72
	18-Jun	1	12	12	19-Jun	1	12	12
	21-Jun	1	12	12	07-Aug	1	12	12
	23-Jun	1	12	12	10-Aug	1	12	12
	05-Jul	1	12	12				
	Total	40	132	480	Total	47	120	564
24560	28-Jun	1	12	12	29-Jun	1	12	12
	01-Jul	1	12	12	03-Jul	1	12	12
	05-Jul	1	12	12	06-Jul	1	12	12
	12-Jul	1	12	12	10-Jul	2	12	24
	15-Jul	1	12	12				
	19-Jul	1	12	12				
	22-Jul	3	12	36				
	26-Jul	1	12	12				
	29-Jul	1	12	12				
	02-Aug	1	12	12				
	05-Aug	1	12	12				
	09-Aug	1	12	12				
	16-Aug	1	12	12				
	23-Aug	1	12	12				
	Total	16	168	192	Total	5	48	60
24610	28-Jun	8	12	96	26-Jun	9	12	108
	01-Jul	9	12	108	29-Jun	10	12	120
	05-Jul	8	12	96	03-Jul	9	12	108
	08-Jul	10	12	120	06-Jul	9	12	108
	12-Jul	12	12	144	10-Jul	9	12	108
	15-Jul	12	12	144	13-Jul	9	12	108
	19-Jul	12	12	144	17-Jul	10	12	120
	22-Jul	12	12	144	20-Jul	10	12	120
	26-Jul	10	12	120	24-Jul	10	12	120
	29-Jul	13	12	156	27-Jul	10	12	120
	02-Aug	11	12	132	31-Jul	10	12	120
	05-Aug	10	12	120	03-Aug	10	12	120
	09-Aug	12	12	144	07-Aug	10	12	120
	12-Aug	11	12	132	10-Aug	10	12	120
	16-Aug	11	12	132	14-Aug	8	12	96
	19-Aug	4	12	48	17-Aug	5	12	60
	23-Aug	3	12	36	21-Aug	2	12	24
	26-Aug	1	12	12	24-Aug	2	12	24
	30-Aug	2	12	24	28-Aug	2	12	24
	02-Sep	2	12	24	04-Sep	2	12	24
	06-Sep	1	12	12	07-Sep	1	12	12
	Total	174	252	2088	Total	157	252	1884
24620	28-Jun	3	12	36	26-Jun	3	12	36
	01-Jul	2	12	24	29-Jun	2	12	24
	05-Jul	2	12	24	03-Jul	2	12	24
	08-Jul	1	12	12	06-Jul	2	12	24
	12-Jul	2	12	24	10-Jul	2	12	24
	15-Jul	3	12	36	13-Jul	2	12	24

	19-Jul	3	12	36	17-Jul	2	12	24
	22-Jul	3	12	36	20-Jul	3	12	36
	26-Jul	3	12	36	24-Jul	4	12	48
	29-Jul	2	12	24	27-Jul	3	12	36
	02-Aug	3	12	36	31-Jul	3	12	36
	05-Aug	2	12	24	03-Aug	2	12	24
	09-Aug	3	12	36	07-Aug	1	12	12
	12-Aug	1	12	12	10-Aug	1	12	12
	16-Aug	3	12	36	14-Aug	1	12	12
	19-Aug	1	12	12				
	23-Aug	1	12	12				
	26-Aug	3	12	36				
	Total	41	216	492	Total	33	180	396
24710	07-Jun	6	12	72	05-Jun	7	12	84
	14-Jun	1	12	12	12-Jun	7	12	84
	08-Jul	1	12	12	19-Jun	3	12	36
	12-Jul	1	12	12	10-Jul	2	12	24
	15-Jul	5	12	60	13-Jul	1	12	12
	19-Jul	2	12	24	17-Jul	1	12	12
	26-Jul	1	12	12	20-Jul	4	16	64
	02-Aug	3	12	36	24-Jul	8	12	96
	05-Aug	3	12	36	27-Jul	6	12	72
					31-Jul	2	12	24
					03-Aug	2	12	24
					07-Aug	2	12	24
					10-Aug	1	12	12
	Total	23	108	276	Total	46	160	568
24720	07-Jun	15	12	180	05-Jun	11	12	132
	14-Jun	15	12	180	12-Jun	14	12	168
	28-Jun	13	12	156	19-Jun	11	12	132
	01-Jul	17	12	204	26-Jun	13	12	156
	05-Jul	14	12	168	29-Jun	10	12	120
	08-Jul	6	12	72	03-Jul	8	12	96
	12-Jul	13	12	156	06-Jul	9	12	108
	15-Jul	16	12	192	10-Jul	12	12	144
	19-Jul	17	12	204	13-Jul	16	12	192
	26-Jul	19	12	228	17-Jul	5	12	60
	02-Aug	20	12	240	20-Jul	19	16	304
	05-Aug	12	12	144	24-Jul	13	12	156
	09-Aug	16	12	192	27-Jul	14	12	168
	12-Aug	8	12	96	31-Jul	8	12	96
	16-Aug	10	12	120	03-Aug	7	12	84
	19-Aug	2	12	24	07-Aug	10	12	120
	23-Aug	9	12	108	10-Aug	5	12	60
	26-Aug	6	12	72	14-Aug	5	12	60
	30-Aug	4	12	48	24-Aug	4	12	48
	Total	232	228	2784	Total	194	232	2404
24730	07-Jun	6	12	72	05-Jun	6	12	72
	08-Jul	3	12	36	12-Jun	3	12	36
	12-Jul	12	12	144	06-Jul	1	12	12
	15-Jul	16	12	192	10-Jul	10	12	120
	19-Jul	17	12	204	13-Jul	18	12	216
	26-Jul	16	12	192	17-Jul	11	12	132
	02-Aug	18	12	216	20-Jul	14	16	224
	05-Aug	10	12	120	24-Jul	13	12	156
	09-Aug	2	12	24	27-Jul	12	12	144

					31-Jul	8	12	96
	Total	100	108	1200	Total	96	124	1208
24741	07-Jun	2	12	24	05-Jun	3	12	36
	14-Jun	3	12	36	12-Jun	3	12	36
	28-Jun	2	12	24	03-Jul	1	12	12
	08-Jul	1	12	12	06-Jul	2	12	24
	12-Jul	1	12	12	10-Jul	2	12	24
	15-Jul	4	12	48	13-Jul	2	12	24
	19-Jul	8	12	96	17-Jul	2	12	24
	26-Jul	4	12	48	20-Jul	4	16	64
	02-Aug	4	12	48	24-Jul	4	12	48
	05-Aug	6	12	72	27-Jul	5	12	60
	09-Aug	2	12	24	31-Jul	2	12	24
	12-Aug	2	12	24	03-Aug	1	12	12
	16-Aug	1	12	12	07-Aug	3	12	36
					10-Aug	2	12	24
					14-Aug	1	12	12
					17-Aug	1	12	12
					21-Aug	1	12	12
					24-Aug	1	12	12
					28-Aug	1	12	12
	Total	40	156	480	Total	41	232	508
24742	07-Jun	4	12	48	05-Jun	4	12	48
	14-Jun	4	12	48	12-Jun	2	12	24
	28-Jun	1	12	12	19-Jun	1	12	12
	05-Jul	1	12	12	29-Jun	1	12	12
	12-Jul	6	12	72	03-Jul	1	12	12
	15-Jul	2	12	24	06-Jul	2	12	24
	19-Jul	4	12	48	10-Jul	1	12	12
	26-Jul	4	12	48	13-Jul	2	12	24
	02-Aug	3	12	36	17-Jul	2	12	24
	05-Aug	2	12	24	20-Jul	8	16	128
	09-Aug	3	12	36	24-Jul	7	12	84
	12-Aug	2	12	24	27-Jul	6	12	72
	16-Aug	1	12	12	31-Jul	5	12	60
					03-Aug	3	12	36
					07-Aug	4	12	48
					10-Aug	3	12	36
					14-Aug	4	12	48
					17-Aug	2	12	24
					21-Aug	4	12	48
					24-Aug	1	12	12
					28-Aug	1	12	12
					31-Aug	1	12	12
					04-Sep	1	12	12
					07-Sep	1	12	12
					11-Sep	1	12	12
	Total	37	156	444	Total	68	304	848
24743	07-Jun	4	12	48	05-Jun	3	12	36
	12-Jul	2	12	24	12-Jun	1	12	12
	15-Jul	3	12	36	19-Jun	1	12	12
	19-Jul	3	12	36	03-Jul	1	12	12
	26-Jul	4	12	48	10-Jul	3	12	36
	02-Aug	4	12	48	13-Jul	2	12	24
	05-Aug	2	12	24	17-Jul	6	12	72
	09-Aug	5	12	60	20-Jul	5	16	80

	12-Aug	3	12	36	24-Jul	4	12	48
					27-Jul	4	12	48
					31-Jul	1	12	12
					07-Aug	3	12	36
					10-Aug	2	12	24
					14-Aug	2	12	24
					04-Sep	1	12	12
					07-Sep	1	12	12
	Total	30	108	360	Total	40	196	500
24770	07-Jun	8	12	96	05-Jun	4	12	48
	14-Jun	7	12	84	12-Jun	2	12	24
	28-Jun	4	12	48	19-Jun	2	12	24
	01-Jul	8	12	96	26-Jun	4	12	48
	05-Jul	6	12	72	29-Jun	6	12	72
	08-Jul	10	12	120	03-Jul	6	12	72
	12-Jul	11	12	132	06-Jul	4	12	48
	15-Jul	9	12	108	10-Jul	10	12	120
	19-Jul	13	12	156	13-Jul	4	12	48
	26-Jul	11	12	132	15-Jul	2	12	24
	02-Aug	13	12	156	17-Jul	10	12	120
	05-Aug	5	12	60	20-Jul	9	16	144
	09-Aug	4	12	48	24-Jul	15	12	180
	12-Aug	5	12	60	27-Jul	4	12	48
	16-Aug	3	12	36	31-Jul	10	12	120
	19-Aug	3	12	36	03-Aug	6	12	72
	23-Aug	3	12	36	07-Aug	6	12	72
	26-Aug	3	12	36	10-Aug	5	12	60
	30-Aug	3	12	36	14-Aug	5	12	60
	02-Sep	2	12	24	17-Aug	4	12	48
	06-Sep	2	12	24	21-Aug	5	12	60
	09-Sep	2	12	24	24-Aug	5	12	60
	13-Sep	2	12	24	28-Aug	3	12	36
	16-Sep	2	12	24	04-Sep	2	12	24
					07-Sep	3	12	36
					11-Sep	1	12	12
	Total	139	288	1668	Total	137	316	1680
24780	07-Jun	5	12	60	05-Jun	1	12	12
	28-Jun	3	12	36	19-Jun	2	12	24
	01-Jul	4	12	48	26-Jun	3	12	36
	05-Jul	3	12	36	29-Jun	3	12	36
	08-Jul	4	12	48	03-Jul	1	12	12
	12-Jul	4	12	48	06-Jul	4	12	48
	15-Jul	6	12	72	10-Jul	2	12	24
	19-Jul	5	12	60	13-Jul	1	12	12
	26-Jul	7	12	84	17-Jul	2	12	24
	02-Aug	4	12	48	20-Jul	3	16	48
	05-Aug	4	12	48	24-Jul	3	12	36
	09-Aug	3	12	36	03-Aug	2	12	24
	12-Aug	2	12	24	07-Aug	4	12	48
	16-Aug	3	12	36	10-Aug	2	12	24
	19-Aug	4	12	48	14-Aug	2	12	24
	23-Aug	6	12	72	17-Aug	2	12	24
	26-Aug	3	12	36	21-Aug	2	12	24
	30-Aug	4	12	48	24-Aug	3	12	36
	02-Sep	3	12	36	28-Aug	1	12	12
	06-Sep	2	12	24				
	09-Sep	1	12	12				

	Total	80	252	960	Total	43	232	528
24790	07-Jun	3	12	36	05-Jun	3	12	36
	14-Jun	3	12	36	12-Jun	2	12	24
	28-Jun	3	12	36	19-Jun	2	12	24
	01-Jul	2	12	24	26-Jun	3	12	36
	05-Jul	3	12	36	29-Jun	2	12	24
	08-Jul	1	12	12	03-Jul	2	12	24
	12-Jul	1	12	12	06-Jul	2	12	24
	15-Jul	4	12	48	10-Jul	4	12	48
	19-Jul	3	12	36	13-Jul	4	12	48
	26-Jul	6	12	72	17-Jul	3	12	36
	02-Aug	3	12	36	20-Jul	5	16	80
	05-Aug	2	12	24	24-Jul	6	12	72
	09-Aug	5	12	60	31-Jul	4	12	48
	12-Aug	3	12	36	03-Aug	4	12	48
	16-Aug	3	12	36	07-Aug	2	12	24
	19-Aug	3	12	36	10-Aug	5	12	60
	23-Aug	3	12	36	14-Aug	4	12	48
	26-Aug	2	12	24	17-Aug	5	12	60
	30-Aug	2	12	24	21-Aug	4	12	48
	02-Sep	2	12	24	24-Aug	1	12	12
	06-Sep	2	12	24	28-Aug	3	12	36
	09-Sep	1	12	12	31-Aug	3	12	36
					04-Sep	3	12	36
					07-Sep	3	12	36
	Total	60	264	720	Total	79	292	968