

Review of the Steller Sea Lion (*Eumetopias jubatus*) Recovery Plan for the Center of Independent Experts

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1. Executive Summary

The Steller Sea lion Recovery Plan provides a comprehensive background of the biology ecology and historical abundance of the species, factors potentially affecting its conservation status, an objective evaluation of threats and a range of action items designed to ensure delisting of the Western DPS over the next 30 year period.

The multi-jurisdictional distribution of the species and uncertainty regarding much detail of the species ecology and demography, and the broad range of views regarding the relative importance of a multitude of natural and anthropogenic factors impinging on the recovery of the species provide considerable challenges for managing the recovery of the species. I think the overall output is a very balanced and objective, and the Recovery Team should be congratulated for their efforts.

A number of key recommendations based on review of this document are provided. The most critical relate to recovery actions. The recovery team correctly identifies that the most critical recovery actions focus around baseline population and monitoring, as this will underpin assessment of the success of the Recovery Plan. Because this is so important, I strongly recommend that Team consider the merits of changing the proposed monitoring of pup production at key sites from biennial to annual surveys. This will ultimately double the power of detecting changes in population trajectories, and enhance the likelihood of success in determining the relative importance of natural and anthropogenic factors in affecting sea lion reproductive output, as proposed in the adaptive management program.

2. Description of the review

The following description of the review is subdivided, for ease, into the main sections of the Steller Sea lion Recovery Plan. Within each section I provide a summary of my appraisal of the section, followed by specific corrections or suggestion to the text within that section of the report.

Executive summary

General comments

The executive summary provides a concise overview of the Recovery Plan

Specific comments

In paragraph 1 on page 1, it is not clear to me to what the items in parentheses refer (55 FR 12645, 62 FR 24345, 62 FR 30772); these are also referred to later in the document (eg. p. 9). It would be helpful to provide some explanation. Are these documents, items of legislation or what? It is unclear.

I. Background

General comments

Overall the background of the Recovery Plan provides a good synthesis of the current knowledge of the biology and ecology of the Steller sea lion. There is clearly a lot of information to synthesize, and concisely present.

In Section B, there are a couple of issues to address. Firstly, the reference to “62 FR 24345” and their like (eg. 62 FR 24345 (p. 9, paragraph 3); 62 FR 24345, 62 FR 30772 (p. 10, paragraph 1); 58 FR 45269 (p.24, paragraph 4); 50 CFR 226.202 (Figures 1-9 and 1-10)). To what do these refer? No explanation is given anywhere.

Secondly, some sections split the western DPS into Russian and/or Asian regions, and the differentiation is unclear. There is some confusion/inconsistency with reference to Asian rookeries (p. 10, paragraph 3) and Asian populations (p. 10, paragraph 6). Fig 1-1 is unclear in delineating anything except eastern and western DPS. A clear and unambiguous figure detailing stocks is needed. Do Asian populations or rookeries occur, are these west of the Commander Islands, and are these Korean or Japanese? This seems contrary to the figures and tables. Figure 1-4 clearly states the western haul-outs and rookeries are Russian. Tables 1.3 and 1.4 are also clear in indicating these sites are in Russia. Under subheading 2 Russia and Asia (p.16), all references to the region in this section refer to Russia or Russian, with no reference to Asia. So, in paragraph 3 on page 22, when the Asian coast referred to, is this meant to be Russian? These inconsistencies need to be addressed.

Section C – Overview of population status. This is the most troubled section, principally because there are a lot of disparate data sets to synthesize. Some editorial improvement would help the reader significantly.

There needs to be care given in insuring that place-names referred to in the text are present in figures; e.g. Samalga Pass, Kenai-Kiska regions all appear to be significant place names or geographic regions, yet they are not readily discerned in the figures. This is especially so for the sections on status and trends where all geographic names in the text. These must be clearly identified in the figures.

Regarding marine habitat use (section F2), it is unclear how extensive the data set on foraging actually is (ie. numbers of seals tracked, what is the breakdown of gender, age and location). It would be helpful for the reader to have some indication on how representative the data sets are. It is apparent, here, although not stated, that there are limited data on the foraging behaviour of sub-adult and adult males. It would be helpful to be more explicit in this section.

In the section concerning pup versus non-pup surveys, there needs to be some background to the history of population surveys to the species given in the background. To the uninitiated, it is unclear why the non-pup surveys have been undertaken, given their highly qualitative nature.

Greater explanation is needed up-front, so that the reader understands why data are being presented.

Concerning marine area/aquatic foraging zones/critical habitat, there needs to be some clear and unambiguous description to what these areas are, why they were selected, when they were enacted, and what they were designed to achieve relative to conservation measures introduced to protect the species. There needs to be consistency in their naming, as well as having clear and informative figures that detail their location.

Specific comments

Page 9, paragraph 3. There is reference to 62 FR 24345 without any explanation as to what it means.

Page 10, paragraph 1. As before, there is a reference to 62 FR 24345, 62 FR 30772 without any explanation as to what it means.

Page 10, paragraphs 3 and 6. Reference to rookeries in Asia (see general comments above).

Page 10, paragraph 4, line 3. Suggest changing sentence from “There was not a clear separation.” to “There was no a clear separation.....”

Page 11, paragraph 1. Samalga Pass – reference to these geographic locations in the figures would be helpful.

Page 12, paragraph 3. Reference to 16,000 sea lions in Asia - is this west of Commander Islands or inclusive of them? Is this is meant to be Russian?

Page 15, paragraph 2. There are 2 pup multipliers used, 4.5 and 5.1. Here the 4.5 correction used, in other places both correction are listed. Check consistency.

Page 15, paragraph 4. Reference to Walrus Island includes pup count data from, 1960, 1982, 1991, 2001 and 2005. There should be reference to Table 1-2. Also, data referred to in the text is absent in Table 1-2 (eg. 2,866 pups in 1960, 50 pups in 1991). Also years 1985-89, 1994, and 1997 are missing in the text but are presented in Table. It is fine to summarize information from the table in the text, but there is a clear problem of data presented in the text that is not included in the table.

Page 16, paragraph 2. First and second sentence clearly indicate that of 77 haul-outs, 3 had been rookeries, 49 haul-outs active (20 abandoned), 5 uncertain and no breeding. However, the last sentence of the paragraph states that in 2005 sea lions numbered about 16,000 (including pups)? If there are no rookeries, how can there be pups? This also contradicts Tables 1-4 that list pups on Russian sites.

Page 18, section 3. British Columbia – there is no reference to Figure 1-7 indicated.

Page 19, sections 4, 5, and 6 there is no reference to Figures 1-7, 1-8.

Page 24, paragraph 1, line 4, I recommend changing “suggesting that sea lions do not...” to “suggesting that **they** do not...”

Page 24, paragraph 3. It is unclear how extensive the data set on foraging actually is (ie. numbers of seals tracked, what is the breakdown of gender, age and location). It would be helpful for the reader to have some indication on how representative the data sets are.

Page 25, paragraph 2. The reference to three “marine areas” being chosen is ambiguous for two reasons. First, I note in Figure 1-9 there is reference to “Aquatic foraging areas” – geographically these seem analogous to those mentioned in the text (p.25, paragraph 2). If so, the terminology should be made consistent. Are they also the same as the areas designated as “critical habitat” (p. 24, paragraph 4)? Second, the reference to these areas being chosen is unclear as there is no indication for what reason areas were chosen. Are these areas of marine reserves, fisheries closures, or other management designation?

Page 28, paragraph 3, line eight. Phrase “showed an erosion in natality ...”, - I suggest replacing “erosion” with “decline”.

Page 35, paragraph 2. “Forrester island” is missing a capital.

Page 35, paragraph 3. There is a reference to “..a SDR to determine locations” - what is an SDR (satellite-dive recorder?)

Page 47. Table 1-2. As indicated above, why not extend data in table back to 1960 for Walrus Island (see notes for p. 15 paragraph 4).

Page 49. Table 1-4. In the column “Sea of Okhotsk”, does it include just Iory Island? Looking at Figure 1-4, it is the only location, or does it include Yamsky Island?

Page 60. Figure 1-1. This is a poor quality figure. Based where it is referenced in the text, it appears it should clearly delineate the stocks. There is no reference to Russian stocks (Asian?). Also there is a large red E and T, and no indication in the caption what these refer to. The smaller trends figure has a separate trend line for Western and Asian stocks, yet it is not apparent in the figure or in the text (see general comments above) where the Asian (or if it is a Russian stock) is.

Page 61. Figure 1-2. There is no reference to Kenai-Kiska region. This would be helpful.

Page 62. Figure 1-3. There is a part polygon – does this delineate the EAI region or something else? This should be made clear in the caption.

Page 63. Figure 1-4. This figure is harder to read than 1-2, 1-3, 1-7 and 1-8, and there are style differences from these other figures. No trend data is presented, lettering is very hard to read, no location of trend sites marked, and the style for haul-out/rookeries is different (trend sites, principal rookeries in other figures). East Kamchatka region is not delineated (referred to in Table 1-4). All regions and sites mentioned in text and tables should be detailed clearly in Figures.

Page 65. Figure 1-6. Is this figure redundant? Otherwise a figure like this that includes the whole Western DPS would be useful (ie. replace Figure 1-1 with a figure like 1-6, with the latter being clearer).

Page 66. Figure 1-7. Note the different style in use of haul-out, major rookery and SE AK trend site.

Page 68. Figure 1-9 (Aquatic foraging area). Again (as above) there is no indication in the caption or in the general text as to what these regions are. Are they protected areas, fishery closures or what? Also see p. 25, paragraph 2 comments above. What is the reference in caption to “50 CFR 226.202”?

Page 89. Figure 1-10. What is the reference in caption to “50 CFR 226.202”?

II. Conservation measures

General comments

This section provides an overview of the conservation measures that have been undertaken to reduce threats to Steller sea lions. This includes sections detailing conservation measures relating to A) intentional and illegal killing, B) incidental takes in commercial fisheries, C) subsistence takes, D) research-related mortality, E) pollution, contaminants, and entanglements in marine debris, F) disturbance on terrestrial sites and critical habitat, and G) reduced prey availability due to fisheries.

All the sections provide useful and informative summaries, and provide some level of detail on the actual conservation measures introduced. The one exception is section G) reduced prey availability due to fisheries. On page 74, there is reference to NMFS implementing “a number of conservation measures intended to ensure that commercial harvests (of fish)....not limit the recovery of Steller sea lions” following the listing of the species in the early to mid-1990s. On page 75, there is reference to “additional conservation measures” being implemented following NMFS’ review of groundfish fishery management in the late 1990s and early 2000s. There is

also reference to a “suite of fishery conservation measures” being implemented in 2002, and an evaluation of conservation measures in 2003 after they had been implemented in 2002, and so forth. The key point is that unlike all the other sections where some detail of the conservation measures introduced to mitigate the threat is given, section G provides the reader with no indication as to the level and extent of commercial fishery conservation measures. Reference to documents detailing the measures introduced and a review of their effectiveness is given, but this is not very informative. All the reader is told is that the conservation measures “were intended to reduce fishing in near-shore critical habitat, reduce seasonal competition for prey during critical winter months, and disperse spatially and temporally to avoid local depletions of prey and increase the survival rates of juveniles” (p. 75).

It is very important that the critical conservation measures are presented, even in tabular form. Surely these conservation measures were some of the most difficult to implement from a socio-economic and political perspective, and (as indicated in the report) have probably been the most important in arresting the decline in western stocks. For these reasons, I believe some greater efforts are required to document what the critical conservation measures were. This would also help address some of the ambiguities in Section 1, especially with reference to “marine areas”, “aquatic foraging areas”, “critical habitat” and “20 nm zones” (Figure 1-9), which presumably all relate to the fishery conservation measures, but for which no detailed explanation is given.

Specific comments

Page 74, paragraph 5. Reference to Figures II-1, 2 and 3 in text simply state that “(f)ishery removals have the potential to reduce the availability of these species to sea lions at a variety of spatial and temporal scales”. These figures show some variation in catch rates over time at various locations. The main body of the text and the captions are not overly informative and do not help to demonstrate the point being made in the text (ie. three figures for one sentence of text). Also the figures make reference to “critical habitats”; these should be clearly indicated in figures in Section I. Are these the “aquatic foraging areas” demarcated in Fig 1-9, or are they within the 20nm around rookeries? Unless a greater explanation or use of these figures is given in the text, I would recommend deleting them. As they stand, they provide little to the document.

Also note that in Figure II-2 that the “nm” is missing from the legends in 2 of the graphs. Also there is no reference to what “0-10nm”, “Total CH” or “Total catch” refer too. I presume “total catch” refers to the total catch in the region, the 0-10nm refers to the portion of the total catch taken from within 0-10nm of rookeries (and maybe haul-out?), but I cannot discern what “total CH” refers to (“critical habitat” I presume from Figure II-1, but there is no reference to where this critical habitat is). Again, explanation in the text and figure captions could be improved significantly.

III. Factors potentially influencing the Western Population

General comments

This section provides an overview of the potential importance of a range of factors that may be influencing the western Steller sea lion population. It is broken into two main sections, A) Food Web Interactions (1. direct and indirect, 2. top-down and 3. bottom up), and B) Factors affecting Steller sea lions. The later covers a range of topics including 1) killer whale predation, 2) shark predation, 3) commercial harvest, 4) subsistence harvest, 5) incidental take by fisheries, 6) illegal shooting, 7) entanglement in marine debris, 8) disease and parasitism, 9) toxic

substances, 10) disturbance, 11) nutritional stress and 12) climate change. These present a large range of topics, and the section is generally well put together and covers the huge ground and material well.

There appears a reasonable “balance” in terms of the coverage given to each topic, although the killer whale section (7 plus pages) appears over-represented. The debunking of the “sequential megafaunal collapse hypothesis” could have been addressed more economically. I was surprised that in the section on “Direct impact of killer whales on Steller sea lions”, there was no reference to any trend estimates in killer whale abundance in the region. I would have thought that this would be important in determining the relative impact their predation may have caused during the recent past, and what the trends are telling us now about how their relative impact may change into the future. The section on data gaps should clearly emphasize under point 3 the need to determine trends in relative abundance of the three killer whale groups.

I note that some of the sections conclude with a subsection of “Data gaps” while others do not. The implication is that other sections that do not present data gaps have none, and I am sure this is not the case. It would be good to see consistency with a section on “Data gaps” at the end of each of the sections, even if it these state that at present data deficiencies are limited.

The section on disease (pages 94-96) would benefit from a reference to the several mortality events that have struck the New Zealand sea lion population at the Auckland Islands over the last decade or so. These incidents provide the most recent examples of mortality events that have affected sea lions globally.

Specific comments

Page 92, line 4. The full stop following “...on St. Paul Island. (Zavadil et al. 2006).” should be removed.

IV. Threats assessment for the Western Population

General comments

This section provides an appraisal of the factors that may represent a threat to the western population of Steller sea lions. A qualitative “weight of evidence approach” was used to assess the relative importance or impact of these factors (discussed in section III) because of the high level of uncertainty surrounding the relative impact of each threat on sea lion population dynamics. Generally I think this approach is appropriate, practical and pragmatic. Eleven threats are identified, including 1) environmental variability, 2) competition with fisheries, 3) predation by killer whales, 4) toxic substances, 5) incidental take by interaction with active fisheries, 6) subsistence harvests, 7) illegal shooting, 8) entanglement in marine debris, 9) disease and parasites, 10) disturbance from vessels and tourism, and 11) disturbance for research activities. Environmental variability and competition with fisheries were considered to be potential high threats, while predation with killer whales and toxic substance was considered to be of medium threat. All remaining factors were considered to be a low threat.

The main issue I picked up in this section was that the weigh of evidence approach for determining if a factor was ranked high or low, meant that evidence or appraisal in support of one point of view required contrary evidence to sustain a different perspective. This sometime clouds the relative positions of the report findings, especially for section III. For example in the section examining threats from environmental variability (A1), the case presented in support of a

high ranking (2nd paragraph) appears directly contrary to the conclusions reached on pages 100-102. Perhaps there can be greater reference between these sections where information may appear contrary, when it is not meant to. I understand that part of the challenge is that not all experts are in agreement on what the most important factors are, or on each factors relative importance. The weight of evidence approach is meant to synthesize and accommodate divergent perspective to reduce the risk that some factors, considered unimportant by some groups but not others, are actually examined in case they really are an important threat.

I was surprised to see that incidental take in active fishing gear was listed as a low threat. The information on the historic levels of incidental take are sparse in the background sections (although the Table 2 Appendix clearly indicates the magnitude of possible incidental take in the past), and because of the limited data /information presented on the specific fishery conservation measures introduced (see above), such as the level of independent observer coverage on vessels, it is difficult to develop an objective and informed appraisal on this factor. Is there a lot of confidence that incidental take is negligible because of the high level of independent observer coverage on fishing vessels, or because of other fishery conservation measures (not detailed) that have been introduced? I note that there are fisheries listed with limited or no observer coverage at all. Again, given that historic issues with fisheries interaction have been considered the most important factors contribution to declines in the stocks, this section's support for a low ranking is almost overtly casual. Given that some rookeries in the western population have still yet to show signs of recovery, the uncertainty of foraging information for many sites, and the issues of uncertainty of incidental take in Russian waters, there would seem to be a case for this factor to still have potentially high importance.

To me the support for a low category is weak given the uncertainty presented. I suggest that this section be improved to provide more compelling support for the low ranking. In its present form it is not overly convincing. If there is a contrary view it should be well articulated. I also note in for the recovery strategy (section V) that two of the four key action items recommended to be implemented relate to maintenance and evaluation of the fishery conservation measures (Actions 2.6.6 and 2.6.8).

Specific comments

Page 110/111 – there needs to be some reference to Table IV-1 here, it provides a synthesis of the threat assessment, and yet no reference is made to it in the section. Mention should also be made in the synthesis and discussion section of threats (pages 118-119) – or if the table is redundant, it can be deleted.

Page 114, last sentence. Is killer whale predation the single largest source of sea lion mortality? I would have thought starvation mortality of pups and yearlings as the single largest source of mortality.

Page 115 – See earlier comments above regarding incidental take in active fishing gear.

Page 116, second last line. Insert “many” – “potential for entanglement because **many** entangled animals may die..”.

V. Recovery Plan for the Western population

General comments

This section essentially follows the statutory requirements set forth in the ESA, that recovery plans provide 1) a description of site-specific management action required to achieve the plan's

goals of survival and conservation of the species, 2) objective measurable criteria which when met result in the species being de-listed and 3) estimates of the costs and time require to carry out the conservation measures.

The section has seven major sections, a) definition of recovery, b) goals, c) recovery strategy d) development of recovery criteria, e) delisting, f) recovery action outline and g) recovery action implementation and schedule. Note there are some serious section formatting errors here that need to be addressed. There are two section As and two section Es. The current order of sections is A,A,B,C,E,D,E. Under the development of recovery criteria section (currently section C, but I think it should be D), the numbered subsections are messed up (1,1,2,3,4,D,1,2,3).

The sections on defining recovery, the conservation goals (with the ultimate goal being sea lion removal from Federal list of Endangered Wildlife and Plants, intermediate goal, delisting from endangered to threatened), and the recovery strategy provide a useful background and framework.

In “developing the recovery criteria” section, the plan sets out a clear framework that recovery criteria must include biological and recovery factor criteria, with biological criteria requiring evidence that the population status has improved in response to the reduction of threats, while the recovery factor criteria require evidence that the threats have been eliminated or controlled and are not likely to recur. This section deals primarily with the use of PVA approaches to develop biological recovery criteria – there is reference to the PVA developed that is presented in the plan’s appendix (also see comments on the appendix, below). As stated, the team essentially rejected the quantitative PVA approach, given the significant uncertainty associated with many of the factors required to be estimated. As indicated, the process has helped advise the team on the importance of addressing many of the data deficiencies, that have become focal points for recovery actions in the new plan.

I was curious to read that although the recovery criteria are required to be measurable and objective, the ESA does not provide explicit standards of criteria beyond general descriptions, and that the selection of risk is a policy decision based on the acceptance of risk. There is no agency policy regarding extinction risks.

Following on from this it appears up to NMFS to determine what the appropriate risk or extinction standards should be. On page 127, it is mentioned that the NMFS held a workshop to consider recovery criteria for whales, and that the Quantitative Working Group proposed guidelines on ESA listing criteria. Based on these, a 1% probability of extinction over 100 years was considered of high risk (presumably endangered). I think it would be worthwhile providing some additional detail here. What is presented does not leave me feeling confident that the criteria developed are entirely appropriate. Generally, it is vague what the DeMaster et al. 2004 review used as the basis for determining appropriate extinction risk. For example, it is unclear whether the extinction risk is based just on whales (if so, is this really appropriate for sea lions?). Also, there should be at least some reference to other endangered pinnipeds, in term of the general approach to setting risk criteria. Moreover, how does the criteria set (ie. endangered, $\geq 1\%$ extinction probability in 100 years, threatened, $< 10\%$ probability of becoming endangered in 20 years) differ to IUCN criteria? Finally, what criteria would need to be met for delisting the species to not-threatened? While this question is addressed in the section on the eastern DPS, which is listed as threatened, the criteria for de-listing appear to be the same for the endangered western DPS (ie. de-list from threatened to not-threatened on the basis of a 3% growth over 30 years). Greater clarity and defense of the criteria set need to be demonstrated here.

A large part of this section is taken up with an outline of the Recovery Actions recommended for the Western DPS. Each is detailed in dot point under key headings (eg. baseline population monitoring, insure adequate habitat and range for recovery, protection from over-utilization, protections from disease, contaminants and predation and protection from other natural or anthropogenic factors). Short summaries of each of these then follows. I suppose that in general and by necessity these summaries are very brief and often short on detail, and I found that many of them raised more questions than answers provided. I was left wondering how you would best evaluate priorities/needs and value for money. I also had trouble evaluating which ones address real needs versus those that certainly provide interesting avenues for research, but which may be less critical to achieving the aims of the plan.

From my perspective, and it is clearly a view shared by the recovery team that the continuation and improved development of population monitoring methods underpins the entire recovery process. However, it is unclear to me why the team is sticking to biennial surveys at trend sites. I can see the justification for non-pup surveys, as these provide less quantitative information about population vital rates. However, for pup production trend sites, I question why the team has not consider annual counts, at least for some of the more critical monitoring locations. If biennial counts are done, then there will only be 15 data points over the next 30 years, and this will reduce the potential statistical power by half compared to annual surveys. I strongly recommend a re-evaluation of the survey design on this matter.

I applaud the team's insistence that a branding and re-sighting program should be maintained and in fact expanded to other regions, despite some imposing logistical constraints. As stated, the importance of obtaining estimates of vital demographic rates and the lack of alternate methods for obtaining these estimates justify these activities.

There seems some cross-over in methods and goals for some of the sections. For example, section 2.4.3 and section 2.6 deal a lot with ecosystem modeling, addressing data deficiencies and needs. There could some simplification (i.e. coalescing) of projects/needs focused under groupings of scientific disciplines.

With respect to section 2.6.8, "Design and implement an adaptive management program for fisheries, climate change and predation", It is good to see this listed here and discussed, but I question the feasibility of such an experiment that can tease apart the relative impacts of fisheries, climate change, and predation.

In section 3.1.1., "Monitor and evaluate incidental take in commercial and recreation fisheries through observer and self-reporting programs", to what extent can state of the art video monitoring systems be used to provide a better means of obtaining data across a greater proportion of the fleet? Also, what is being done to support the development of observer programs in the western stocks in Russian/Asian waters? Finally, are there any high-seas fisheries that need to be addressed in terms of implementing observer programs?

In section 3.2.2, "Reduce threats of illegal shootings", is there any chance of legislating no fire-arms on boats?

In section 5.6.2, "Publicize current conservation efforts and protective measures", I understand there have been some serious delays in implementing some of the research needed to underpin conservation measures, due to opposition from animal welfare groups. I think there is a clear challenge and need to better engage with these groups so that they understand the importance

of the research, such that these lobby groups do not in themselves become a threatening process, impacting the recovery of the species.

With respect to the final section, that concerning the recovery action implementation schedule, this is a table outlining actions, projected costs and responsible agencies. It is a very difficult task for the reviewer to evaluate these. Clearly many are estimates, and full costings have not been undertaken in detail. As such it is difficult to evaluate their appropriateness.

Specific comments

Page 123, paragraph 3 line 6. The line, "...protection of the ESA remands the agencies management responsibility ..." should read "...protection of the ESA **remains** the agencies management responsibility ...".

Page 130, paragraph 2 line 15. It is unclear what is meant by "Trites et al (2007) who **posited..**"?

Page 131, paragraph 3. Reading this section, it would be most helpful to determine at what point on a 3% annual growth curve the extinction risk falls below 1% in 100 years. This is critical because it will give a clearer term of reference to the anticipated time at which the species can be de-listed to threatened, based on continual current observed growth rates. I finally see this mentioned in last sentence on page 134, but I recommend that it would good to mention this earlier, on page 131.

Page 134. Population growth section, first 2 sentences. This is a critical observation and provides some capacity to improve PVAs for western stock, using the variance rates from eastern stocks.

Page 134. Population growth section, first paragraph, last 2 sentences. I guess the contrary observation here is that how did the population growth in the eastern stock vary before and after conservation measures were introduced? Has the eastern stock responded similarly since these measure compared to the western stock, If not why?

Page 136. Demographic criteria: threatened. Dot point one. Recovery is based on non-pup counts. This goes back to the Background section as well. Nowhere is it made clear why there is a focus on monitoring non-pup trends - is this to do with biological reasons, or for practical/logistical and historical reasons (ie. Is the counting of non-pup numbers continued because most historical trend data is based on these, and not pup counts)? If it is the case, then it would be worth while stating a sentence or two that although annual monitoring of pup numbers is the most reliable means for estimating change in population abundances, because earlier (historic) data sets are mainly counts of non-pups, there is value in maintaining these longitudinal data.

Page 138. Factor D point 1 and 2. To what do 50CFR part 679 and 50 CR parts 223 and 226 refer? A footnote is needed.

Page 138. Factor E. I think a point 7 needs to be added here stating that there needs to be evidence based on independent fishery observer data that incidental take of sea lions remains low, and is not likely to limit recovery.

Page 139. Delisting. It would be helpful to list the demographic criteria needed to demonstrate removal from the Federal list of Endangered Wildlife and Plants.

Page 140. Factor B point 1. It is questionable if PBR is really appropriate here, given the PVA models would be much better at determining by catch rates that do not limit risk of recovery. PBR is a very crude tool, and surely all the demographic data collected and the development of PVAs provide a much better approach than PBR.

Page 141. Point 4, bottom of page. Alaska stranding network. This was mentioned earlier but it is not stated what such a group would do? Would it be related to rescue and rehabilitation work?

Page 142 point 6. It states that "... the State will **comport** with the MMPA." Does this refer to **comply**?

Page 151, 3 lines up from bottom of page. Again a footnote or explanations to what 50CFR 226.202 refers is needed.

VI. Factors potentially influencing the Eastern Population

General comments

This section details briefly a number of factors that are or have the potential to affect the status of the eastern DPS. Given that the eastern DPS has shown a strong consistent recovery for some period, no threats to recovery have been identified. A range of potential threats are examined including a) predation from killer whales and sharks, b) harvest, killing and other human impacts, c) entanglement in debris, d) parasitism and disease, e) toxic substances, f) global climate change, g) reduced prey biomass and h) disturbance. I have no broad issues with this section.

Specific comments

Page 189, paragraph 3. Be consistent with use of "l" or "per".

Page 189, paragraph 4, line 4. The word "lion" should be "lions"

VII. Recovery Plan for the Eastern Population

General comments

This section details the recovery plan for the eastern DPS, to warrant their de-listing from threatened to not-threatened (ie. removal from the List of Endangered and Threatened Wildlife). Given the lack of threats to recovery, this section essentially provides support for ongoing monitoring of the population.

Specific comments

Page 193, last line. There is a typo – "delsiting" change to "delisting".

Page 194, paragraph 5, line 9. The sentence "...Alaska portion there is **not** data.." should be changed to "...**no** data".

Page 198. There are a couple of places (including here) where "de-listing" is used; elsewhere in document "delisting" is ubiquitous.

VIII. Literature cited

Specific comments

The order of references needs to be checked, as it is not always alphabetical. For example, Ban should be between Baker et al. and Baraff et al.; similarly, Call and Loughlin (2005) should be after Calkins et al. (2005).

Trites et al. 2006a-f are not in appropriate order. Also many are in press, yet they are designated by year. They should listed as "in press" throughout text.

Appendix

I did not go through the model of Goodman in detail. Given that the essential elements of the output of this model are reported in the text (in the main body and as well as a summary in the Appendix), I am unsure of the merit of retaining it in the final document. If the team wishes to keep it as an appendix, then the team should ensure that the formatting is consistent with the remainder of the document. Also, there are generally no captions for figure or tables in this section.

Page 231. Second subheading. The spelling of “estimate” is incorrect.

Other specific comments

Table of contents - Format corrections - Section III B 10-12 , and Section IV A 10-11 are indented. Section V in contents, two section As and section Es. Also, the order of sections is wrong (A,A,B,C,E,D,E).

Tables and figures should be formatted consistently throughout the entire document.

3. Summary of findings

This section addresses the main terms of reference with respect to the Recovery Plan.

1. Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?

The Plan provides a very comprehensive summary of what is known about the status, biology, and ecology of Steller sea lions, and the potential threats, past, present and future. There are no additional threats to the species that have not been addressed in the Plan, and the Plan provides adequate support for the threats assessment.

2. Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?

As indicated above, the synthesis of information presented on the ecology and biology of the species is generally of a high standard, comprehensive and scientifically defensible.

3. Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.

Overall I believe that the Plan sets out a scientifically defensible recovery strategy for the species.

4. Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other

recovery actions that have not been included in the Plan that should be included to achieve recovery?

Broadly the recovery actions described within the Plan are appropriate to meet the recovery goals. Perhaps the area of greatest concern to me is that the plan recommends pup production surveys for the key trend sites to be biennial. Whether the survey design is due to a historic hang-over or due to practical/logistical factors is not detailed; however, I strongly recommend that the survey design be revisited. There are many benefits to annual pup production surveys, not the least of which will be to double the statistical power to detect changes in pup abundances over the next 30 years. Much of the Plan is focused around assessing the role and importance of natural (oceanographic and climatic events) and anthropogenic factors (changing spatial and temporal commercial fisheries catch) on Steller sea lion populations. Given that the species operates reproductively on annual timescales, as does seasonal variability in oceanographic, climatic and fishery factors, it would seem logical if there is to be any hope in detecting correlates between a range of potential factors with sea lion reproductive output, that these must be measured at annual intervals. I think at least some of the key trend sites should be monitored annually. I cannot see the adaptive management program proposed (which I believe would be an excellent development) being able to be established as a feasible experiment, unless annual data are collected on the reproductive output of experiment rookeries.

5. Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?

I believe generally that the priority rankings on the implementation schedule are appropriate. The only exception would be Plan Tasks 3.1.1 and 3.1.2 that have to do with monitoring and evaluating incidental take through observer programs in commercial and non-commercial fisheries. I think at least for 3.1.1 (commercial fisheries), that its priority ranking should be up-listed to 2a or b. The Plan details extensively that the past rapid declines in the Western DPS were largely due to fishery interaction issues, with the biggest single contributor of mortality being through incidental take. Given this, it would seem to me to be a priority to ensure that observer programs are maintained to clearly demonstrate that incidental take is not a contributing factor into the future. I note that for many commercial fisheries detailed in the Plan, there has been limited or no observer coverage at all.

6. Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: "conservation" as defined in the ESA 16 USC § 1532 (3))?

The information in the Plan does appropriately support the recovery criteria. The recovery team has been faced with a challenge. The PVA results have provided a lot of insight and have informed the recovery plan actions required. They have also informed the population growth and time frame over which extinction probabilities are negligible, and sufficient for de-listing. However, the data deficiencies were such that the team essentially rejected the quantitative PVA approach, given the significant uncertainty associated with many of the factors required to be estimated. As a consequence the team have primarily used the "weight of evidence approach" to develop the recovery criteria. Given the data limitation, I believe this is the best approach and is consistent with meeting the requirements of the ESA to ensure the conservation of the species.

Conclusions and recommendations

My overall view of the Recovery Plan is that it provides a comprehensive background of the biology, ecology and historical abundance of the species, factors potentially affecting its conservations status, an objective evaluation of threats and a range of action items designed to ensure delisting of the Western DPS within a 30 year period. The Recovery Team should be congratulated on their efforts, considering the multi-jurisdictional distribution of the species, the uncertainty regarding aspects of the species ecology and demography, and the broad range of views regarding the relative importance of a multitude of natural and anthropogenic factors impinging on the recovery of the species. These documents must, by their very nature, accommodate the views of a range of experts and I think the overall output is a very balanced and object Recovery Plan.

I did find the Recovery Plan somewhat top-heavy, with a considerable portion of the documents relating to the species background and threat assessments, but comparably less on the justification of the recovery strategy and the recovery actions. Given the large number of recovery actions detailed, and the limited detail provided on each, it made for a challenging appraisal of the relative merits of each action item against others, and in some places their priority over others.

The Recovery Plan is also highly parochial in that it presents almost exclusively data just on Steller sea lions. I can understand this from the perspective that the Recovery Plan needs to synthesize an enormous volume of scientific information relevant to the background and threats to the species, but for some sections, such as factors potentially affecting populations, there could be a greater accommodation of relevant literature from other species, especially where data on Steller sea lions is more limited. There are other threatened or endangered pinniped species throughout the world, and some reference to these, especially where relevant to recovery actions for Steller sea lions, would seem appropriate.

The key recommendations for each section follow. Details on each are given in the previous sections.

I Background

- Resolve consistency over Russian vs. Asian populations.
- Place names and regions mentioned in the text or tables need to be clearly identified in the figures.
- Formatting and style of figures and tables needs to be improved.
- Pup versus non-pup surveys: There needs to be some background to the history of population surveys to the species.
- Marine area/aquatic foraging zones/critical habitat: There needs to be some clear and unambiguous description to what these areas are, why they were selected, when they were enacted, and what they were designed to achieve relative to conservation measures introduced to protect the species.

II Conservation measures

- Improve detail and explanation on fishery conservation measures and other relevant spatial management measures enacted.

III Factors affecting Western DPS

- Reduce detail on killer whales.

- Ensure that all sections conclude with a subsection detailing data gaps.

IV Threat assessments Western DPS

- Review the relative importance of incidental take in commercial fisheries.

V Recovery Plan Western DPS

- Resolve ambiguity of recovery criteria.
- Review survey design of pup production at trend sites (biennial to annual).
- Fix the formatting errors of sections.

Appendix 1: Background material

National Marine Fisheries Service 2007. Draft Revised Recovery Plan for the Steller sea lion (*Eumatopius jubatus*). National Marine Fisheries Service, Silver Spring, MD. 305pp

Appendix 2: Statement of Work

Subcontract between the University of Miami and South Australian Research & Development Institute (SARDI) (Dr. Simon Goldsworthy)

Statement of Work

June 14, 2007

The first Steller Sea Lion (SSL) Recovery Plan was completed in 1992 and provided recovery guidance to the National Marine Fisheries Service (NMFS) for the species, which at that time was listed range-wide as threatened.

NMFS organized a new SSL Recovery Team in January 2002, and charged the new Team with writing a revised Plan to reflect the current view of stock structure and the differences in stock status under the ESA (eastern Distinct Population Segment (DPS) listed as threatened, and western DPS listed as endangered). The Team completed its draft of the second Plan in February 2006, at which time the Team sought an external peer review from 5 highly qualified experts (see Attachment 1).

Upon receipt of the peer reviewer comments, the Team revised the Plan and submitted it to NMFS. NMFS released the Plan for public review in May 2006 and received detailed written comments from 18 parties or individuals. Based on these comments and those of the expert reviewers listed above, NMFS revised the Plan into the document being presented to the Center for Independent Experts (CIE) for an additional peer review (document dated May 2007).

The CIE experts' comments will assist NMFS in making recovery decisions for the Steller sea lion based upon the best scientific and commercial data available (as required by the Endangered Species Act of 1973, as amended).

Reviewer Requirements

The CIE shall provide three expert reviewers. Each reviewer's duties shall require a maximum of six days of effort, including time to read the relevant document and to produce an individual written report consisting of his/her comments and recommendations. No travel is required; each reviewer shall work from his/her home location. Each reviewer's report shall reflect his/her area(s) of expertise, and no consensus opinion (or report) will be required.

As a group, the panel of CIE reviewers must possess expertise in the areas listed below.

* Familiarity with relevant sections of the Endangered Species Act (http://www4.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_35.html), and as applicable, the Marine Mammal Protection Act, and related wildlife management legislation (e.g., NEPA).

In particular,

* Experience as a Recovery Team member, contributor, or reviewer of Recovery Plans developed for other listed species; as a current or recently retired employee of a federal or state agency holding a position implementing ESA regulations; or from an academic position that has focused on ESA statutes and implementation.

* In depth expertise in the biology and management of marine and/or other large mammals; specifically population dynamics, reproductive and foraging biology and physiological ecology.

At least two of the reviewers must have in-depth experience with the ESA and recovery plans, and one reviewer must have in-depth knowledge of marine mammals. Former reviewers and former SSL Recovery Team members and support staff shall be excluded from consideration as reviewers of this document. See Attachment 1, below.

Specific Reviewer Tasks and Schedule

The Alaska Region shall provide the CIE with copies of the May 2007 draft revised SSL Recovery Plan for the review, or a link to it, by May 31, 2007. Delay in meeting this schedule will result in a minimum of an equivalent delay in delivering the final CIE reviews. The document to be reviewed will be approximately 200 pages in length.

1. The CIE reviewers shall read and assess the May 2007 draft revised Steller Sea Lion (*Eumetopias jubatus*) Recovery Plan.
2. The CIE reviewers shall focus on and address the following questions in their review reports:
 - Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?
 - Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?
 - Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.
 - Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?
 - Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?
 - Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of

the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: “conservation” as defined in the ESA 16 USC § 1532 (3))?

3. No later than June 29, 2007 each CIE reviewer shall submit a written report¹ to the CIE that addresses the points in item 2 above. See Annex I for additional details on the report outline. Each report shall be sent to Dr. David Die, via email at ddie@rsmas.miami.edu, and to Mr. Manoj Shivlani, via email at mshivlani@rsmas.miami.edu

Submission and Acceptance of CIE Reports

The CIE shall provide the final individual reviewer reports for review for compliance with this Statement of Work and approval by NOAA Fisheries to the COTR, Dr. Stephen K. Brown (Stephen.K.Brown@noaa.gov), no later than July 13, 2007. The COTR shall notify the CIE via e-mail regarding acceptance of the reviewers’ reports. Following the COTR’s approval, the CIE shall provide pdf format copies of the reviewers’ reports to the COTR.

¹ Each written report will undergo an internal CIE review before it is considered final.

ATTACHMENT 1.

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ANNEX 1. Contents of CIE Reviewer's Report

1. The reviewer's report shall be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the reviewer's report shall consist of a background, description of the review, summary of findings, and conclusions/recommendations. The summary of findings shall address each Term of Reference.
3. The reviewer's report shall include as separate appendices the bibliography of materials provided for the review and a copy of the CIE Statement of Work.

Please refer to the following website for additional information on report generation:

<http://www.rsmas.miami.edu/groups/cie/cierevrep.htm>

Review of the

DRAFT REVISED STELLER SEA LION RECOVERY PLAN

Eastern and Western Distinct Population Segments

(Eumetopias jubatus)

Prepared by
Dr Mark A. Hindell

for
Center for Independent Experts

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Executive summary:

The Plan provides a comprehensive assessment of what is known about potential threats to both the eastern and western populations of Steller sea lion (SSL). I know of no other significant threats to the species. The evidence presented in the Recovery Plan has been well used by the team to develop their threats assessment. To me, the most important point to emerge from the preliminary sections was the high degree of uncertainty associated our knowledge of many key aspects of this species biology. The consequences that this uncertainty has on the ability of scientists and managers to make informed decisions are quite profound. The obvious course of action for the Plan is to act to reduce this uncertainty through targeted and carefully prioritized research.

As a general point, the Plan needs to encourage the adoption of modern and emerging techniques wherever possible. The recent research into SSL biology has been at the forefront of the development of some new technologies and techniques, but there are also many developments occurring in other studies and even other disciplines that are relevant to this species. The Plan should highlight the development on new techniques to deal with previously intractable problems as a high priority. This could be statistical or technological and I have tried to highlight areas where I think this may be particularly advantageous.

The ecological and biological information presented in the Plan is comprehensive, adequate, and scientifically defensible. Where there are divergent views within the scientific community, this is identified and a balanced account of all views presented. There were some areas that would have benefited from additional detail, but these were not common.

The team has designed a recovery strategy for the eastern and western populations of Steller sea lion that is ecologically and biologically defensible. The recovery strategy highlights the design and implementation of an adaptive management program to evaluate fishery conservation measures and key action. The large number of sea lion rookeries spread over their range sets the scene for some nice experimental designs. These could be done sensitively to ensure no long-term detriment to the overall recovery of the species, and therefore consistent with the aims of the recovery plan. I argue strongly for this as it is perhaps the only way to remove some of the uncertainty around some of the major causal factors.

The recovery actions described within the Plan are appropriate to meet the recovery goals, and the recovery actions are consistent with the SSL life history information and population dynamics. I have identified a few additional recovery actions primarily associated with survey design and interpretation the team might consider.

The recovery tasks in the Plan's Implementation Schedule are generally appropriately prioritized, but I recommend that the development of an adaptive management approach be elevated to Priority 1. I also have made a number of other suggestions for changes in priorities, but these are relatively minor.

Introduction and background:

I preface this review by commending the Steller Sea Lion Recovery Team on their production of this Draft Steller Sea Lion Recovery Plan (hereafter referred to as the Plan). Any review of a document of this size and complexity will inevitably identify omissions, errors of fact and difference of opinion. Happily, in this plan these were relatively few, and I endorse the plan's overall scope and direction. The review that follows focuses on those points that I hope will be constructive and help the Team refine the Plan.

Of the three areas of expertise requested for reviewers of this draft, I regard my self to best fit with "In depth expertise in the biology and management of marine and/or other large mammals; specifically population dynamics, reproductive and foraging biology and physiological ecology". I have also had some experience with the development of recovery plans, having been on the Recovery Team for the Southern Elephant seal and Sub-Antarctic Fur Seal Recovery Plan for The Australian Federal Government (Department of Environment and Heritage). I have relatively little experience with the US Endangered Species Act (ESA), and will confine my comments largely to the biological and scientific aspects of the Plan.

I have structured my report to address each of the six questions (Terms of Reference) identified by National Marine Fisheries Service (NMFS), specifically:

- Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?
- Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?
- Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.
- Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?
- Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?
- Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: "conservation" as defined in the ESA 16 USC § 1532 (3))?

Question 1: Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?

By and large, the Plan provided an excellent and comprehensive review of the current state of knowledge of Steller Seal Lion (SSL) biology population status, the factors influencing the historical population changes and potential future threats. There has been an enormous amount of research into these questions in the last 10 years, and the team has done well to bring it all together as lucidly as they have.

I found the summary tables and maps in the background section generally helpful, in particular the summaries of data gaps for each of the Potential Biological Effects. There were some minor mis-matches between the text and the tables, such as the Walrus Island counts, but these were relatively minor.

The Plan was generally presented in a logical and structured manner. There were a few instances where this was not the case, however. For example the description of the nutritional stress hypotheses at Point 11 in the “Factors Affecting Steller Sea Lions” section seemed a little odd (structure wise). To me this would more naturally sit in the food web section. Likewise, the killer whale material (trophic cascades) could also have logically been included there.

Some aspects received more emphasis than I thought was warranted (such as the debate on the role of killer whales), but I must also acknowledge that the data required to test many of the hypotheses are still lacking (despite the recent research activity) and that a large amount of controversy and divergent opinion exists regarding the underlying factors effecting the populations and the relative importance of those factors.

I would have liked to see some additional methodological background to the long-term census data. Why are non-pups the preferred object of these long-term counts? To most biologists this would seem a little odd, as counts of pups are generally more accurate. Is the long lactation period a problem in this regard? When they have been done concurrently, do the counts of pups and non-pups show the same trends, and does one have lower errors associated with the population trends? It is likely that there are good methodological reasons for the focus on non-pups but these were not clear from the information provided.

Throughout the document (e.g. p. 23), estimates of stocks and population sizes are presented without their associated errors. I was unsure if this was because none had been calculated, or whether they were left out for the sake of brevity. I always find the inclusion of error estimates to be immensely helpful however.

On a similar point I note that the trend analyses described in the background (p. 21) were conducted using linear regression of natural logs of the counts. There have been some recent improvements in the analysis of population trends using General Additive Models (GAMS) (De Little, Bradshaw et al. 2007; Van den Hoff, Burton et al. 2007) which should be explored.

On page 27 there is a P value of 0.302 provided, but I am not sure to what it refers.

On page 31 the importance of density dependant responses in the demographic parameters is identified as an important issue, with which I agree. Currently, few of the SSL models incorporate density dependence, even though they are likely to exist and they are very likely to influence estimates of extinction times from these models. I would rate this as a high research priority, but also note that these data can be difficult and time consuming to collect. However, this is an area that would benefit from some focus small scale experiments associated with the Adaptive Management Plan – see my comments in Question 5.

The management actions taken during the 1990s to reduce anthropogenic effects (*e.g.* shooting harassment and incidental take) may have had a significant effect on the rate of decline in the Western DPS. To me this suggests that these factors should be rated much more highly as potential causal agents. However, from the detail provided in the Plan it was difficult to determine what these measures actually were or how they implemented. This in turn made it difficult for me to assess how significant a role this played in reducing SSL mortalities.

On a similar point on page 81 when existing fisheries conservation measures are described, I would like to see some additional detail, specifically data on by catch (incidental take) in the two DPS relative to the PBR.

On page 75, the need for an assessment of the adequacy and effectiveness of the current fisheries regulations is highlighted. This is undoubtedly true, but as a reviewer I found the lack of information on what these regulations currently are to be quite problematic, particularly when assessing the future research and action priorities.

Conclusion:

The Plan provides a comprehensive assessment of what is known about potential threats to both the eastern and western populations of Steller sea lion. I know of no other significant threats to the species. The evidence presented in the Recovery Plan has been well used by the team to develop their threats assessment. To me, the most important point to emerge from the preliminary sections was the high degree of uncertainty associated with our knowledge of many key aspects of this species biology. The consequences that this uncertainty has on the ability of scientists and managers to make informed decisions are quite profound. The obvious course of action for the Plan is to act to reduce this uncertainty through targeted and carefully prioritized research. I will return to this point when addressing Questions 4 and 5.

As a general point, the Plan needs to encourage the adoption of modern and emerging techniques wherever possible. The recent research into SSL biology has been at the forefront of the development of some new technologies and techniques, but there are also many developments occurring in other studies and even other disciplines. The Plan should highlight the development on new techniques to deal with previously intractable problems as a high priority. This could be statistical or technical, and I have tried to highlight areas where I think this may be particularly advantageous below.

Question 2: Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?

The team has collated a great deal of data on a wide variety of aspects of the ecology and biology of SSL. In many instances there is no consensus about how these data are to be interpreted in terms of their significance to the population trends, and these areas of dispute are given a balanced and fair assessment, no doubt due in part to the diverse range of views held by members of the team. My one criticism of this aspect of the Plan is that it was very much centered on SSL and the North Pacific, which is quite understandable. However, I always find it helpful to look more widely, and in this instance a brief review of other declines was needed. In particular, the changes in populations of a number of Antarctic predators after a possible regime shift in the Southern Ocean seem quite pertinent.

On page 79, the Plan notes that unlike the direct take of a species, indirect take through competitive interactions is nearly impossible to either prove or disprove. This is a point well taken, and this is an area that should be highlighted in future research priorities. If these linkages cannot be elucidated in the Northern Pacific after all of the intense research conducted there at all levels of the ecosystem, there is little hope of doing it anywhere else! The Adaptive Management Approach will help to elucidate these factors, and under question 5, I outline my reasoning for making this a high research priority. If the magnitude of these indirect ecological interactions can be determined using this approach it will be a huge benefit for the management of the species.

In discussion of the top-down threats on page 81, it is noted that if these were an important factor impeding the recovery of the western DPS, low rates of juvenile and adult survival would be observed, with no changes in natality or condition. As this is not the case, the implication is that top-down factors are not likely to be important. Further, on P89, there is an analysis of the data gaps for assessing the role of top-down (specifically killer whale predation on the SSL populations. However, it seems to me that the demographic data go a long way to ruling out killer whales as a key factor. Although these gaps exist I wouldn't give them high priority in the research plan.

The analysis of toxic substances (p. 96) acknowledges that the primary knowledge gap is the understanding of what levels of contaminants affect seal lion health. I would argue that this is also true for any other marine mammal. This is a good example of potentially synergistic or value added research that will be of much potentially much wider relevance. I see the broader application of work focused on SSL as something that the Plan needs to foster, so that benefits of research can go beyond SSL and contribute to our broader understanding of a range of issues in the northern Pacific marine ecosystem.

On page 110, the Plan notes that the patterns and time series of fish abundance, fish recruitment, and sea lion food habits did not support the hypothesis that the 1976-77 regime shift triggered changes in the prey community that would have been deleterious to Steller sea lions. This is a fairly important conclusion, which is effectively saying that the regime shift was not solely

responsible for the decline. To me, it seems odd that it is buried away and not given greater credence. I will return to this point below.

I was surprised to read that “many of the areas fished by the Atka mackerel fishery in the Aleutian Islands and all of the Pacific cod fishery data analyzed by Fritz and Brown (2005) were collected within designated sea lion critical habitat” (p. 112). Why can they fish in critical habitat? Again the lack of detail, about the fisheries regulation and implementation, is hampering my understanding of some of these issues.

On page 114, the Plan discusses the importance of inter-specific competition as a potential threat under the nutritional stress section. This needs to be considered in the same way as fisheries, *i.e.* at appropriate spatial and temporal scales.

Conclusion:

The ecological and biological information presented in the Plan is comprehensive, adequate, and scientifically defensible. Where there are divergent views within the scientific community, these are identified and a balanced account of all views presented. There were some areas that would have benefited from additional detail, but these were not common.

Question 3: Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.

A key aspect of the Plan was the assessment of the relative impact of each threat or factor outlined in the preceding sections (*i.e.* up to page 118). I found that the approach was logical and took all of the available information into account. The inherent difficulties in this process are illustrated by the fact that the team could not reach agreement about the relative impact of two of the most prominent threats, environmental variability and competition with fisheries. The Plan therefore adopted a precautionary approach, and made the recommendation of conducting research which would reduce uncertainties and help resolve these problems in the future. This really highlighted how much needs to be learned about this species and the ecosystem that they inhabit if a Recovery Plan is to be successful.

It is important to note that a similar regime shift has also been proposed for the Southern Ocean at about the same time (1970s) (Weimerskirch, Inchausti et al. 2003), and it might have been helpful if the Team had been familiar with this hypothesis, as I think this highlights the global nature of some of the issues being considered. Considerable evidence suggests that similar regime shifts may be expected in the future. On-going monitoring of key demographic parameters that span future changes will be invaluable in assessing the importance of, and nature of, environmental variation on this and other species. Also I felt that this section needed to include anthropogenic climate change. This is a very real problem for high latitude ecosystems within the time frame of the recovery plan. At least it needs to be acknowledged and suitable monitoring needs to be put in place.

The recovery strategy highlights the design and implementation of an adaptive management program to evaluate fishery conservation measures and key action. The large number of sea lion rookeries spread over their range sets the scene for some nice experimental designs. These could be done sensitively to ensure no long-term detriment to the overall recovery of the species, and therefore consistent with the aims of the recovery plan. I'd argue strongly for this as it is perhaps the only way to remove some of the uncertainty around some of the major causal factors.

The Plan correctly identifies that much of the telemetry data collected to date is from juvenile sea lions less than two years of age, some of which will not be completely weaned. As these data play a key role in defining exclusion areas around breeding sites this is an area that needs urgent attention.

Conclusion:

The team has designed a recovery strategy for the eastern and western populations of Steller sea lion that is ecologically and biologically defensible. The recovery strategy highlights the design and implementation of an adaptive management program to evaluate fishery conservation measures and key action. The large number of sea lion rookeries spread over their range sets the scene for some nice experimental designs. These could be done sensitively to ensure no long-term detriment to the overall recovery of the species, and therefore consistent with the aims of

the recovery plan. I'd argue strongly for this as it is perhaps the only way to remove some of the uncertainty around some of the major causal factors.

Question 4: Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?

The Team made a considered definition of the term “recovery” and the criteria required to re-assess the level and possible de-listing or down-grading of the threat level. I did notice however that the criteria that were eventually settled on were relatively conservative when compared to generic criteria used by the IUCN (10% probability of extinction over 100 years for “Threatened” status and 20% probability of extinction in 10 generations for “Endangered” status). However, I am also conscious of the need to develop species (or population) specific criteria and was satisfied with the justifications provided.

When describing the demographic criteria for altering the list of SSL the Plan states “the trends in non-pups in at least 5 of the 7 sub-regions are consistent with the trend observed under criterion #1. The population trend in any two adjacent sub-regions can not be declining significantly” (p. 139). This seems reasonable enough, but I wonder if the requirement for no two adjacent sub-regions to be declining is too restrictive?

I add a final, slightly philosophical point regarding the criteria. A key part of this process is “eliminating or controlling the threats” (p. 139). However, I don't see how you can eliminate or control regime shifts or other natural process (or even if one should), but these are listed a threatening process. This raises the question of including natural processes as threatening agents. Is it even sensible? It implies that in the absence of humans a species might become extinct. Intervention would therefore be “unnatural”. My take on this is that the natural factors should be regarded as a baseline condition, and that the plan should act to minimize any anthropogenic factor acting in addition to it. Similar questions could be asked about killer whales - also a natural problem, although potentially exacerbated by human activity

The use of PVAs by a number of researchers, including the one specifically commissioned by NMFS has been a very important feature of the previous research effort. PVAs are an invaluable management tool that not only enable estimates of extinction probability under various scenarios, but also help identify weaknesses in the existing demographic data sets. To my mind the PVAs performed to date have been much more informative in the latter of these two functions. I think that NMFS needs to be careful to not discount the future use of PVAs to help guide their management decision, just because these early attempts were inconclusive. Population viability analysis is often an iterative process: developing models, identifying weaknesses or gaps in the knowledge, subsequent collection of data to rectify these shortcomings and then further development of the models. The PVAs done to date can provide very clear direction in terms of what improvements need to be made in the input demographic data, such as data concerning sub-populations.

A number of limitations to the PVA were identified, and all were reasonable. However, I'd be reluctant to see these used as a reason for abandoning the PVA approach. These limitations are

not terminal. For example although the importance of data on pup harvests and illegal shooting is unknown, performing suitable sensitivity analyses can help assess these issues.

Regarding the PVA in the appendix, I was unclear if the model was run on the historical data (*i.e.* hind-casting) to validate the model. If there are sufficient data this can be very valuable exercise. Also, given the known decadal scale of changes in the north Pacific it seems a pity that it wasn't a major feature of the PVA

Why are non-pups to be the primary census target? Commonly in other species, it is pups that are counted as they represent the production that year. I understand that historically non-pup counts have been used and that these therefore represent the longest time series. However, given the mobility and foraging habits of this group of animals there will be considerable error associated with any counts. Imprecision in the counts will reduce the power of any time series analysis to detect trends in the data. Given the importance of confidently detecting trends when making assessments regarding changes to the listings of this species, I recommend adopting a survey methodology that maximizes precision and statistical power. This would require starting pup counts, conducting surveys every year, and researching new emerging statistical approaches for the analysis of temporal trend data (such as Bayesian statistics). Given the importance of the existing time series data, I would also advocate maintaining the biennial non-pup counts, to maintain the integrity of this data set.

Specific action items:

1.1.1 Estimate trends for pups and non-pups via aerial surveys. I would like to see this considerably enhanced, as it really does underpin everything else. Some additional objectives such as 'evaluate survey methodology' would ensure the survey work was the best possible, and more importantly will deliver data that can better inform the management process. Development or adoption of alternative methods that allow annual monitoring would also be very important.

1.3.1. Examine the effects of season, age, and sex on body condition. I'm not clear on what "sampling" means here, or what is being measured to assess condition.

2.1. Maintain, and modify as needed, critical habitat designations. I worry that simply identifying core usage areas and setting these as exclusion zones is too naive. It assumes that prey are relatively static. However, it is possible that fisherman targeting areas outside the exclusion zones can still reduce fish inside them. This all depends on movement and dynamics of the prey. Shouldn't this also be identified as a research question?

Also, it is not clear how this has been used in the past in terms of legislation, or how it is implemented. Nor are there any clear indications of future implementation of regulations associated with these habitats. Will there be complete exclusion of fisheries?

2.3.2 Develop stable isotope and fatty acid methodologies to assess prey consumption. Include DNA techniques. These have been used in a number of laboratory based studies

(including some on SSL) where they have been shown to work (Jarman et al. 2004; Deagle et al. 2005; Casper et al. 2006). These new techniques need to be incorporated into the plan.

2.3.3. Deploy instruments to obtain fine scale data on sea lion foraging habitat. This should be more specific regarding the scale. Presumably this refers to sub kilometer resolution, so should there be specific mention of GPS technology?

2.3.4. Evaluate all information on sea lion foraging areas and develop a description of foraging needs. This is no trivial matter and will require dedicated staff appointments of people with specific database and statistical skills. Is this identified in the budget?

2.4.1. Assess the relationships between oceanographic profiles or features and sea lion foraging ecology. The aim here is to assess the relationships between oceanographic profiles or features and sea lion foraging ecology. To me, this research aspect needs to be broader as it is unrealistic to expect strong relationships between physical oceanography and higher predators, particularly at fine scales. Perhaps there should be more emphasis on more proximal factors such as prey and primary production. In order to address this question it would be sensible to use tags to collect oceanographic data on the seals (Lydersen et al. 2002; Lydersen et al. 2004). This will provide oceanographic data at the location and at scale of the seals feeding. These tags will also give data on the structure of water column, information that is unavailable from satellite images.

2.4.3. Distinguish how natural and anthropogenic factors influence marine ecosystem dynamics and subsequently sea lion population dynamics. There should be some mention of the adaptive management plan here. This will provide an invaluable opportunity to quantify some of these possibilities.

2.6.6 Evaluate and implement appropriate fishery regulations to protect foraging habitat and prey resources for sea lions. The Plan mentions “additional conservation measures were implemented to avoid jeopardy and adverse modification” (p. 75). It would be nice to know what these were, and how they would be implemented into the future.

3.2.2 Reduce threat of illegal shooting by developing and promoting use of non-lethal deterrents for commercial fisherman. This is the subject of a great deal of on-going research around the world. The Plan needs to identify the need (and ways of facilitating) of interactions with other nations to increase the rate of progress made in these issues.

4.1 Protect Steller sea lions from disease. Monitoring is not the same as protecting. I am not sure how one would actually protect wild animals from disease.

Conclusion:

The recovery actions described within the Plan are appropriate to meet the recovery goals, and the recovery actions are consistent with the SSL life history information and population dynamics. I have identified a few additional recovery actions primarily associated with survey design and interpretation the team might consider.

Question 5: Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?

Again I found the use of the summary tables very helpful when assessing this question. Table IV-1 (the threats, their relative importance to recovery and the feasibility to mitigation), was particularly informative about the team's decision making process. I thought that the analyses reflected in this section were very good. Identifying the cause of the decline will obviously play a large role in determining where recovery efforts need to be made. For example, if natural changes in prey distribution and abundance due to regime shifts are important, it will require a very different approach to a fisheries-based decline. At present the considerable uncertainties, highlighted by the PVA, mean that resolving these two factors remains impossible. Therefore, action which will reduce uncertainty will ultimately be money well spent.

There is a lot of discussion regarding the importance of ecological factors in the background material, but its real importance in the decline is unclear, as is demonstrated in the Teams inability to rank it as a threatening process. For what it is worth, I would say there is a lot of evidence, such as different rates of change in the eastern and western DSPs during the widespread oceanographic changes in the 1970s, which calls the whole regime shift idea into question. The seals have evolved their foraging and life history traits in an environment that apparently contains decadal-scale changes in climate and prey base. Further, the observed changes in population trajectories in the western stock since fisheries control measures have been implemented illustrate that these interactions were an important contributing factor. Admittedly, there may be fundamental differences in environmental factors between the western and eastern stocks, but to me this seems less likely than fisheries being the under-pinning causal factor in the decline. I believe that focusing on fisheries related factors will be the best value for money.

On page 31, the importance of density dependant responses in the demographic parameters is identified as a significant issue. I agree with this finding. Currently few of the SSL model incorporate density dependence, even though they are likely to exist and are very likely to influence estimates of extinction times from these models. I would rate this as a high research priority, but also note that these data can be difficult and time consuming to collect. However, this is another area that would benefit from some focus small scale experiments associated with an adaptive management plan

Specific Action Items:

1.3.2 Develop improved indices of health, body condition, and reproductive status using chemical methods (e.g., hematology serum chemistries, and endocrine monitoring). I rate this as a low priority unless animals are being caught anyway. This is because the large number of captures required to do this properly may be quite prohibitive in terms of disturbance and resources. Awareness of the importance of emergent wildlife disease is increasing, but for now there is little evidence that this represents a problem for this species.

1.4.1. Develop improved live capture techniques for general research needs. This should be given a very high priority as it will enable access to key components of the population, thereby reducing one of the key sources of uncertainty.

1.4.2 Develop improved non-lethal sampling techniques to assess health. Chemical immobilization is something that is quite fundamental to many of the field procedures identified in the Plan. These techniques need to be made as safe as possible, so perhaps development of safe chemical sedation techniques could be identified as a priority.

2.3.2. Develop stable isotope and fatty acid methodologies to assess prey consumption. I agree with the incorporation of fatty acid signature analysis (FASA) techniques, but there are still many unresolved issues with FASA. I would like to see an effort to improve this situation as a part of this study. This is another effort that will have synergistic spin-offs for studies around the world.

2.4.2. Examine the influence of ecosystem variability on non-commercial prey species as an index to sea lion carrying capacity. I would have rated this as a high priority as it is the important link between oceanography and seals feeding. Again this is about reducing uncertainty in existing data and is a key part of the information required to develop better PVAs.

2.5.1. Determine the physiological diving capabilities and evaluate how this limits the ability to forage successfully. This action seems a little odd at one level. Steller sea lion diving ability has evolved over many generations and presumably is well suited to their foraging needs, even when these changes are due to regime shifts. I would imagine that diving capability would only be a problem if anthropogenic issues radically alter prey distribution and behavior. I would give this a low priority.

2.6.4 Assess effectiveness of sea lion closure zones around rookeries and haul-outs using small-scale experiments. See my comments below on the importance of an adaptive management approach. This work should part of that framework and given a high priority.

2.6.8 Design and implement an adaptive management program for fisheries, climate. To my mind this is the highest priority after the baseline monitoring. Without an experimental approach to understand these key issues we will not be much better off in five years time than we are now. At present only one of all the plan tasks has been given a Priority 1. Given the wide-ranging benefits that an adaptive management program would have in terms of our understanding of the key threatening processes, I would like to see this also elevated to a Priority 1. I also admit that such a plan would be very difficult, technically, logistically and politically, but really do see this as a powerful way forward.

3.5.1 Coordinate research efforts to reduce potential for unnecessary or duplicative research-related takes. The plan should have some specific studies to assess effects of handling, branding, carrying TDRs etc. Where these studies have been done elsewhere (see SES work) there are generally few or no adverse effects (Engelhard et al. 2001; Engelhard et al. 2002; Field et al. 2002; McMahan et al. 2005). But being able to say this with a sound scientific

grounding is invaluable. I do not think the importance of this work in today's climate of external scrutiny can be emphasized enough. I think this should also be given elevated priority.

4.2 Protect sea lions from contaminants. At present all four actions under this heading are given a 2a rating – second only to on-going monitoring. While undoubtedly important, my view is that the ultimate sources of contaminants are from factors well outside the direct influence of this Plan, and therefore the Plan has a very low expectation of bringing about a change. I would downgrade them to 2b.

5.7.2 Support Alaska Native subsistence use information programs. These could also be down-graded. Even though the successful outcomes of these actions have a very high probability of success, at present none of these activities really affects the SSL populations.

5.8 Improve the effectiveness of research for Steller sea lion recovery by instituting a “fast track” process for expediting NMFS research permits for Steller sea lions. This is a really nice idea if adequate oversight and transparency of process can be assured. Again, given the high degree of public scrutiny of this and other wildlife programs, we need to ensure that there is no room for criticism.

Conclusions:

The recovery tasks in the Plan's Implementation Schedule are generally appropriately prioritized, but I recommend that the development of an adaptive management approach be elevated to Priority 1. I also have made a number of other suggestions for changes in priorities, but these are relatively minor.

Question 6: Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: “conservation” as defined in the ESA 16 USC § 1532 (3))?

The decision of whether or not to keep the eastern DPS on the threatened species list depends entirely on when one begins to monitor the population. If the data from the 1970s are used the population has recovered sufficiently to be de-listed (according to the criteria listed), i.e. increased at 3% per year for 30 years. It is nice however, to see de-listing of the eastern DPS discussed as a real possibility.

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Appendix 1: Background material

National Marine Fisheries Service 2007. Draft Revised Recovery Plan for the Steller sea lion (*Eumatopius jubatus*). National Marine Fisheries Service, Silver Spring, MD. 305pp

Appendix 2: Statement of Work

Consulting Agreement between the University of Miami and Dr. Mark Hindell

Statement of Work

June 14, 2007

The first Steller Sea Lion (SSL) Recovery Plan was completed in 1992 and provided recovery guidance to the National Marine Fisheries Service (NMFS) for the species, which at that time was listed range-wide as threatened.

NMFS organized a new SSL Recovery Team in January 2002, and charged the new Team with writing a revised Plan to reflect the current view of stock structure and the differences in stock status under the ESA (eastern Distinct Population Segment (DPS) listed as threatened, and western DPS listed as endangered). The Team completed its draft of the second Plan in February 2006, at which time the Team sought an external peer review from 5 highly qualified experts (see Attachment 1).

Upon receipt of the peer reviewer comments, the Team revised the Plan and submitted it to NMFS. NMFS released the Plan for public review in May 2006 and received detailed written comments from 18 parties or individuals. Based on these comments and those of the expert reviewers listed above, NMFS revised the Plan into the document being presented to the Center for Independent Experts (CIE) for an additional peer review (document dated May 2007).

The CIE experts' comments will assist NMFS in making recovery decisions for the Steller sea lion based upon the best scientific and commercial data available (as required by the Endangered Species Act of 1973, as amended).

Reviewer Requirements

The CIE shall provide three expert reviewers. Each reviewer's duties shall require a maximum of six days of effort, including time to read the relevant document and to produce an individual written report consisting of his/her comments and recommendations. No travel is required; each reviewer shall work from his/her home location. Each reviewer's report shall reflect his/her area(s) of expertise, and no consensus opinion (or report) will be required.

As a group, the panel of CIE reviewers must possess expertise in the areas listed below.

* Familiarity with relevant sections of the Endangered Species Act (http://www4.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_35.html), and as applicable, the Marine Mammal Protection Act, and related wildlife management legislation (e.g, NEPA).

In particular,

* Experience as a Recovery Team member, contributor, or reviewer of Recovery Plans developed for other listed species; as a current or recently retired employee of a federal or state agency holding a position implementing ESA regulations; or from an academic position that has focused on ESA statutes and implementation.

* In depth expertise in the biology and management of marine and/or other large mammals; specifically population dynamics, reproductive and foraging biology and physiological ecology.

At least two of the reviewers must have in-depth experience with the ESA and recovery plans, and one reviewer must have in-depth knowledge of marine mammals. Former reviewers and former SSL Recovery Team members and support staff shall be excluded from consideration as reviewers of this document. See Attachment 1, below.

Specific Reviewer Tasks and Schedule

The Alaska Region shall provide the CIE with copies of the May 2007 draft revised SSL Recovery Plan for the review, or a link to it, by May 31, 2007. Delay in meeting this schedule will result in a minimum of an equivalent delay in delivering the final CIE reviews. The document to be reviewed will be approximately 200 pages in length.

1. The CIE reviewers shall read and assess the May 2007 draft revised Steller Sea Lion (*Eumetopias jubatus*) Recovery Plan.
2. The CIE reviewers shall focus on and address the following questions in their review reports:
 - Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?
 - Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?
 - Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.
 - Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?
 - Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?
 - Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of

the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: “conservation” as defined in the ESA 16 USC § 1532 (3))?

3. No later than June 29, 2007 each CIE reviewer shall submit a written report¹ to the CIE that addresses the points in item 2 above. See Annex I for additional details on the report outline. Each report shall be sent to Dr. David Die, via email at ddie@rsmas.miami.edu, and to Mr. Manoj Shivlani, via email at mshivlani@rsmas.miami.edu

Submission and Acceptance of CIE Reports

The CIE shall provide the final individual reviewer reports for review for compliance with this Statement of Work and approval by NOAA Fisheries to the COTR, Dr. Stephen K. Brown (Stephen.K.Brown@noaa.gov), no later than July 13, 2007. The COTR shall notify the CIE via e-mail regarding acceptance of the reviewers’ reports. Following the COTR’s approval, the CIE shall provide pdf format copies of the reviewers’ reports to the COTR.

¹ Each written report will undergo an internal CIE review before it is considered final.

ATTACHMENT 1.

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ANNEX 1. Contents of CIE Reviewer's Report

1. The reviewer's report shall be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the reviewer's report shall consist of a background, description of the review, summary of findings, and conclusions/recommendations. The summary of findings shall address each Term of Reference.
3. The reviewer's report shall include as separate appendices the bibliography of materials provided for the review and a copy of the CIE Statement of Work.

Please refer to the following website for additional information on report generation:

<http://www.rsmas.miami.edu/groups/cie/cierevrep.htm>

**A Review of the May 2007
Draft Revised Recovery Plan for the Steller sea lion
(*Eumatopus jubatus*)
conducted for the Center for Independent Experts**

by

Professor John Harwood

29 June 2007

1. Executive Summary

1a. Impetus and goals for the review

The first Steller sea lion (SSL) Recovery Plan was completed in 1992 and provided recovery guidance to the National Marine Fisheries Service (NMFS) for the species. NMFS organized a new SSL Recovery Team in January 2002, and charged this Team with writing a revised Plan to reflect the current view of stock structure and the differences in stock status under the ESA. The Team completed its draft of the second Plan in February 2006. NMFS has since revised the Plan, and a new document, dated May 2007, was presented to the Center for Independent Experts (CIE) for an additional peer review. This report forms part of that peer review process.

1b. Main conclusions and recommendations

- Does the Plan thoroughly describe what is known about the potential threats to both the eastern and western populations of Steller sea lion? It does provide a thorough description of what is known about the potential threats to both populations. However, the way this part of the document has been written makes it hard to assess the weight of available evidence relating to each threat.
- Is the ecological and biological information presented in the Plan adequate, thorough and scientifically defensible? Yes, but more discussion of the current distinction between the two populations would be desirable.
- Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lions? Not for the western population, because the factors involved in the recent decline have not been identified. Although only two of the four threats (Competition with Fisheries and Toxic Chemicals) identified as potentially high or medium in the Plan can be affected by management, the likely effectiveness of current and proposed conservation measures can only be evaluated if the relative importance of all four threats is known.
- Are the recovery actions appropriate to meet recovery goals? Not for the western population, for the reasons given above.

- Are the recovery tasks appropriately prioritized? Not for the western population, where the proposed recovery tasks seem to represent little more than a continuation of research activities that have been conducted for the last decade.
- Does the information in the Plan appropriately support the recovery criteria described in the Plan? Not for the western population. There is clear evidence in the Plan that this population may still have a relatively high probability of falling below the threshold identified by the Recovery Team, even when the criteria for a revised listing have been met. The Demographic Criteria for downlisting to threatened status for this population should to be rewritten in unambiguous language. The criteria for delisting of the eastern population are supported by the information in the Plan. The available data indicate that this population will probably meet these criteria in the near future.

2. Introduction

2a. Background

The first Steller sea lion Recovery Plan was completed in 1992 and provided recovery guidance to the National Marine Fisheries Service for the species, which at that time was listed range-wide as *threatened* under the Endangered Species Act. In 1997, NMFS recognized two Distinct Population Segments (DPS) of SSL on the basis of genetic evidence and population trends. The **western DPS** was relisted as *endangered*, whereas the **eastern DPS** retained the original listing of *threatened*.

NMFS organized a new SSL Recovery Team in January 2002, and charged this Team with writing a revised Plan to reflect the current view of stock structure and the differences in stock status under the ESA. The Team completed its draft of the second Plan in February 2006, when it was reviewed by five highly qualified experts. A revised Plan was submitted to NMFS and for public review in May 2006. Detailed comments were received from 18 parties or individuals. NMFS revised the Plan again, and a new document (NMFS 2007), dated May 2007, was presented to the Center for Independent Experts (CIE) for an additional peer review. This report forms part of that peer review process.

2b. Terms of Reference

The CIE reviewers were asked to focus on and address the following questions in their reports:

- Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?
- Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?
- Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.

- Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the Steller sea lion life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?
- Are the recovery tasks in the Plan’s Implementation Schedule appropriately prioritized to facilitate recovery?
- Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: “conservation” as defined in the ESA 16 USC § 1532 (3))?

It is not easy to address these Terms of Reference (ToR) using the standard headings for CIE reports (Summary of Available Information, Review of Information used in the Assessment, Review of the Assessment Results, Review of Scientific Advice, Recommendations, Implications), and I have therefore adapted those headings to correspond more closely with the ToR. Their relevance to the ToR is indicated in brackets after each section heading.

3. Summary and Review of Available Information (Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?)

3a. Overview of Recovery Plan

The Recovery Plan is divided into seven chapters:

- I. A general review of the ecology and biology of SSL. Under Feeding Ecology it includes a review of some of the evidence relating to one of the potential threats for SSL (Nutritional Stress) and, rather strangely (because critical reviews of other hypotheses are not found in this chapter), a section headed “Rejection of the Junk Food Hypothesis”. Finally there is a short section headed “Ecosystem Interactions” which contains brief paragraphs about the physical characteristics of the North Pacific, and some short statements about the potential complexity of the relationship between SSL and the other components of their ecosystem
- II. A short review of the conservation methods that have been undertaken to reduce already identified threats to SSL.
- III. A section entitled “Factors potentially influencing the population” which is essentially a description of potential threats.
- IV. The Recovery Team’s evaluation of the perceived importance of the threats identified in section III.
- V. A Recovery Plan for the western DPS.
- VI. The equivalent of Section IV for the eastern DPS.
- VII. A Recovery Plan for the eastern DPS.

In addition, there is an extensive Appendix that describes Population Viability Analyses for both the western and eastern DPS commissioned from Professor Dan

Goodman, and a valuable additional Appendix (also prepared by Professor Goodman) that deals with the concepts of density dependence and carrying capacity in the context of SSL population dynamics.

The style of the Recovery Plan is highly variable. This makes it rather difficult to read, because arguments and discussions are presented in many different ways. As a result, it is often impossible to understand how the Recovery Team arrived at a consensus view, or if such a consensus actually existed. In addition, many of the key references are not included in section VIII (LITERATURE CITED). This is a particular problem for papers relating to the effects of toxic substances (at least 10 of the papers cited on pp. 97-98 are not included in Chapter VIII), but also for the section on nutritional stress (Frid et al (2006), Rea et al (2003), Fay & Punt (2006) cited on p. 38 and p. 40), and even killer whale predation, where the key reference (Maniscalco et al (cited as “in press”, but published in April 2007)) is not included in Chapter VIII. This has also made it difficult to understand the basis for some of the Recovery Team’s conclusions. Finally, technical scientific terms are often used rather carelessly. This is particularly true of the terms “carrying capacity” and “density dependence”, as discussed in more detail in section 4a. Another example is the statement on p. 81 that there are “refuting studies” of the “Sequential Megafaunal Collapse” hypothesis. I’m no fan of this hypothesis, but it can’t be “refuted” on the basis of the available evidence. There have been no “studies” relating to this hypothesis. Rather, a series of papers have suggested that, when the available evidence is considered in detail, it provides less support for the hypothesis than its proponents have suggested.

3b. The ecological and biological information presented in the Plan
In this part of my report I focus on Chapter I.

The Plan does provide a comprehensive review of what is currently known about the ecology of SSL in both the western and eastern DPS. However, the way in which the available information is presented and reviewed is highly variable. I think readers are likely to be confused by the combination of fact, hypothesis and opinion that characterizes some subsections of this chapter. This is particularly true of the section on nutritional stress, which seems to be more appropriate for Chapter III. It includes a “rejection” of the junk food hypothesis. The junk food hypothesis suggests that the dominant role of pollock in the Bering Sea and Gulf of Alaska in recent decades has played a role in the decline of SSL because the nutritional value of this fish is lower than some other prey species. To my mind, this section actually makes a rather strong case that 1 year-old SSL may find it difficult to consume the quantities of pollock that are required for growth. This may result in an extended lactation period for their mothers, with consequent effects for natality rates in the local population.

I would also have liked to have seen more discussion about the current divisions between the two DPSs. Although the genetic evidence for historical separation is strong, the fact that females from the western DPS have been observed breeding in the eastern DPS suggests that some introgression is now occurring. In addition, I am surprised that the Recovery Team did not comment on the different ratio of pup counts to non-pup counts in the two DPSs. In the western DPS non-pup counts are 2-2.5x higher than pup counts, indicating that a significant proportion of the population is inaccessible to counting at the time of the survey (indeed this proportion is estimated by Holmes et al (in press)). The same is true in California.

But in Alaska and British Columbia, non-pup counts are 3-4x the pup counts, and total counts (pups + non-pups) are very close to the available estimates of total population size. One explanation of this is that all members of the eastern are hauled out at the time of survey, but this is unheard of for any pinniped. A more likely explanation is that a significant number of non-pups from the western DPS are using haulouts and rookeries in the eastern DPS. I would suggest that the proposed review of the listing of the eastern DPS includes a thorough analysis of the current distinction between the two DPSs.

3c. Effectiveness of current conservation measures

In this section, I will focus on Chapter II of NMFS (2007).

In general, current measures appear to have been successful in reducing many of the threats to the conservation status of the western DPS. However, I am not convinced by the arguments assembled here to show that conservation measures implemented since the late 1990's have provided greater protection for areas of critical habitat. Chapter II (p. 76) states that "The implementation of conservation measures in the 1990s and early 2000s are **correlated** (my bold text) with a reduction in the rate of decline of the western DPS", and this view is reiterated in the Executive Summary ("conservation measures implemented since 1990 are positively affecting the recovery ..."). However, there is no time series of conservation measures that can be correlated, in a statistical sense, with the rate of change of the western DPS. I think what the Team should have said is the introduction of additional conservation measures **coincided** with changes in the rate of change of the western DPS, because there is no evidence that these conservation measures actually altered the impacts of commercial fishing on the availability of prey to SSL. Indeed, both NMFS (2003) and the figures at the end of Chapter III indicate that these measures have had a rather small impact on the proportion of total fisheries catch that is taken within SSL critical habitat. Both NRC (2003) and NMFS (2003) note that the changes in counts that have been observed since 1999 are not entirely consistent with those that would be predicted if the main threat was Competition with Fisheries, because the largest changes have been in the counts of non-pups rather than pups. It is surprising that the Recovery Team did not comment on this.

I am also unconvinced by the methods that NMFS has used to identify critical habitat from telemetry data. These are described in detail in NMFS (2003), but have been criticized elsewhere. For example, both Bowen et al (2001), and the three reviews prepared for the CIE (Boyd 2004, Hindell 2004, McConnell 2004) are critical of the use of 6-hour dive summaries provided by the telemetry devices to identify foraging areas and therefore critical habitat. Again, I am surprised that the Recovery Plan does not comment on this. At least some of the satellite transmitters that have been deployed since 2003 do not suffer from this problem, and it would be highly informative to compare estimates of habitat use from these devices with those obtained up to 2003.

4. Review of Threat Assessment (Does the Plan thoroughly describe and identify the potential threats to SSL? Does the evidence presented in the Recovery Plan support the threats assessment?)

This section of my report focuses on Chapters III, IV and VI of the Recovery Plan.

4a. *Threat identification*

Chapter III is primarily concerned with threat identification. It does provide a thorough description of what is known about the potential threats to both DPS. However, the way this part of the document has been written makes it hard to assess the weight of available evidence relating to each threat. This may be because the Recovery Team included proponents and opponents of most of the major hypotheses for the decline of the western DPS. As a result, most of the sections consist of a statement in favor of the relevant hypothesis followed by a series of comments that appear to contradict the opening statement. There seems to have been little success in achieving a consensus within the Team on each of these issues, and the reader is left to evaluate a series of contradictory opinions.

This chapter frequently refers to fluctuations in “the carrying capacity of the North Pacific” (p. 82, p. 89, repeated on p. 119). However, as Goodman points out in Appendix B, carrying capacity is not a simple property of the environment, rather it is a consequence of the interaction between habitat quality, resource availability and predation pressure. In this section, however, it appears to be used to mean resource availability. Appendix B makes it clear that the population consequences of such changes cannot be evaluated in isolation from the other factors involved in determining equilibrium population size.

I was expecting to find some justification in this Chapter for the statement in the Executive Summary that “During this period (the 1980s), mortality incidental to commercial fishing was thought to contribute to perhaps as much as 25% of the observed decline” (p. 1), but I could not. The only potential source for this figure appears to be in the Appendix, where Table 2 lists estimates of incidental catch and entanglement, but these amount to less than 17,000 animals over the entire period 1977-1989. During this time the population declined by over 100,000 individuals.

4b. *Threat assessment*

Chapter IV describes the Recovery Team’s conclusions about the relative importance of the different threats identified in Chapter III. The total disagreement within the Team about the classification of the importance of Environmental Variability and Competition with Fisheries is clearly described. But an apparent difference of opinion about the ranking of Predation by Killer Whales is not well documented. The current version of the Recovery Plan says “The team had also ranked killer whale predation as a “potentially high” threat. However, after public review and comment, and as additional scientific information became available (e.g. Maniscalco et al in press), **NMFS concluded** (my bold text) that ... a Medium ranking was warranted” (p. 111). This seems extraordinary given the claim in the Executive Summary that the Plan was unanimously endorsed, and the fact that there is extensive discussion of the Maniscalco et al manuscript on p. 85 and p. 89 (unless these paragraphs have also been added in the revision to the report since February 2006). Given that the Maniscalco et al manuscript was received by the journal in which it has now been published on 13 April 2006, and that one of its authors (Atkinson) was a member of the Recovery Team, it seems extraordinarily unlikely that the information in this ms was not available to the Team when it decided to classify this threat as potentially high.

I could also find absolutely no justification for classifying Toxic Substances as a Medium threat (over Infectious diseases, for example). The Plan concludes that levels of these substances in SSL are relatively low, and provides no evidence of their

effects. The statement that “toxic substances may have indirect effects on ... vital rates” (p. 115) is true for any marine mammal population anywhere in the world.

The final pages of this Chapter imply that the Team agreed that bottom-up threats are now more important to the western DPS than top-down ones (p. 119). However, this could not have been true when some members of the Team wanted Killer Whale Predation classified as a high threat.

In addition, this same section correctly states that these conclusions are “in contrast to ... NRC (2003) which favored top-down controls as the primary factor”, but it goes on to say that “Much of the evidence considered here was not available to the NRC in 2002 ...” (p. 119). This statement does not bear close examination. The main “new” evidence in support of the bottom-up approach comes from Holmes et al (in press). However, this manuscript is essentially an extension of the analysis in Holmes & York (2003), with broadly similar conclusions (that natality rates in the central Gulf of Alaska have continued to decline). York made a presentation of her work to the NRC and the manuscript version of Holmes & York (2003) is cited by Bowen et al (2001). So, their work must have been known to the NRC panel. Although the analyses reported in Holmes & York (2003) and Holmes et al (in press) are excellent pieces of work, they are based on data from only one set of trend counts and their conclusions do not necessarily apply across the western DPS (although Holmes et al. do suggest that “declining birth rate may be problem across the Gulf of Alaska”). In addition, Holmes et al. admit that there is considerable statistical debate about the most appropriate way to compare the performance of complex demographic models such as theirs. They admit that their approach favors models with relatively large numbers of parameters. A different approach might result in different conclusions about trends in natality in the Gulf of Alaska. Thus, I think it is premature to assume that their conclusions apply to the entire western DPS.

By contrast, evidence in support of the Killer Whale Predation hypothesis seems to have accumulated since the NRC report, particularly the new data on the abundance of transient killer whales and their potential removals (Williams et al 2004). The fact that Maniscalco et al. (2007) observed lower than expected mortality around a small number of SSL sites in the northern Gulf of Alaska does not seem to me to provide critical evidence for or against this hypothesis. The fact that current estimates of killer whale predation “are lower than the 20% predation rate” (p. 89) is irrelevant. The important question is: has the mortality imposed by killer whales on SSL in the western DPS changed over the last two decades (i.e. could it have contributed to the continuing decline after 1990)? The evidence for or against this is still lacking.

5. Review of Scientific Advice (Does the Plan provide a defensible recovery strategy for both DPS of SSL? Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery tasks appropriately prioritized to facilitate recovery? Does the information in the Plan appropriately support the recovery criteria described in the Plan and do these meet the requirement of the ESA?)

In this section, I focus on Sections V and VII of the Recovery Plan.

5a. *Recovery criteria for the western DPS*

Initially, the Team used a PVA approach to assess extinction risks for the western DPS. As part of the specification for this analysis, the Team had to define the threshold level of risk that would trigger transition from endangered to threatened status under the ESA. They decided on a 1% chance of quasi-extinction in the next 100 years, where quasi-extinction was defined as the population falling below 4,743 animals (equivalent to an effective population size of 1,000). The source for this threshold is a review of genetic criteria by Allendorf & Ryman (2002) – a reference that is also missing from Chapter VIII. The Recovery Plan claims that this is “a conservative estimate beyond which a significant additional genetic variation is not expected” (p. 129). However, the appropriate section in Allendorf & Ryman (2002) indicates that “there is current disagreement among geneticists regarding how large a population must be to maintain ‘normal’ amounts of additive genetic variation for quantitative traits ... suggestions for the effective sizes needed to retain evolutionary potential range from 500 to 5,000”. So, 1,000 individuals are hardly conservative. In the end, Goodman found that the western DPS was only likely to meet this criterion in the next 30 or so years if the extrinsic factors involved in the decline observed between 1985 and 1989 would never recur.

The Plan states that the Team “decided not to develop criteria based exclusively on the model. Numerous limitations ... and issues pointed out during public and peer review cast doubt on the utility of the PVA alone” (p. 132). The only public and peer reviews mentioned in NMFS (2007) occurred after February 2006 and, as far as I know, the entire Team has not met since then. I hope the PVA process was reviewed before this; otherwise it casts some doubt on the claim in the Executive Summary that the Plan had unanimous support. It should be noted that, rather than being pessimistic, as the Plan implies, Goodman’s calculation may present an optimistic view of the future of the western DPS. He was requested by the subgroup responsible for the PVA to include “a relative schedule of prey-competition fishery effects, expressed as instantaneous per capita mortality” (Recovery Plan Appendix) for the period 1968-2000. These equate to an additional mortality of up to 6% in some years. This is a substantial additional mortality for a population whose dynamics are known to be particularly sensitive to changes in mortality (see NRC 2003, for example). However, I can find no justification for these precise levels (or, indeed, any **quantified** fishery effects) anywhere in the Recovery Plan. If these mortalities were not included in Goodman’s calculations, the variations in population growth rate would have been even greater, and the risks of extinction would have been higher.

Following (?) its decision about the PVA, the Recovery Team used a “weight of evidence” (p. 133) approach to develop the demographic criterion that should be used to decide that the western DPS could be considered for reclassification as threatened. This is if “the population for the US region has increased (statistically significant) for 15 years on average, based on counts of non-pups” (p. 136). I do not understand what this definition actually means, but I suspect that the criterion is that the population should show an average annual rate of increase that is statistically different from zero over a 15 year period. It is worth noting that a population that showed a rapid rate of increase for the first 10 years but was declining in the later part of the 15 year period would satisfy this criterion, and would not necessarily have shown its ability to cope with environmental fluctuations (as the Plan implies). The Executive Summary suggests that a non-pup count of approximately 55,000 animals in 2015 would meet this criterion, but Goodman’s analysis suggests that a population

of more than 60,000 in 2014 would have a 25% risk of quasi-extinction. This was reduced to 2.55% if the 1985-89 decline were ignored, but the Recovery Plan provides strong arguments why this decline should not be ignored. It is therefore hard to reconcile the proposed criterion for reclassification with the Teams own definition of endangered status.

The criterion for delisting from the ESA is a 3% increase maintained over 30 years (equivalent to 107,000 animals in 2030). Goodman's analysis suggests that the risk of quasi-extinction for such a population is 9.7%. Again, it seems hard to justify that such a population is no longer threatened with extinction, since it does not even meet the Team's criterion for downlisting from endangered to threatened.

Although the Team was unable to decide whether the threat posed by competition with fisheries was high or low, the Recovery Factor Criteria relate almost entirely to the potential impact of fisheries (all of Factors A and B, most of Factor D). I understand that this threat, if real, could be reduced by effective management, whereas those from environmental variation and predation cannot. However, a much greater emphasis needs to be placed on the research required to assess the nature and magnitude of the threat from fisheries, and the impact of conservation measures on it, before there can be any confidence that the proposed Recovery Plan will actually have any effect on the risks of extinction for the western DPS..

5b. Recovery criteria for the eastern DPS

The criterion for delisting the eastern DPS is exactly the same as that for the western one: A consistent increase of 3% for 30 years. This appears uncontroversial because this DPS has shown none of the large variations in annual growth rate that have been observed in the western DPS. Given that the eastern DPS has shown a 3% increase since 1985, it is obviously time to reconsider its classification, as proposed by the Recovery Team. However, as noted in section 3b of this review, the current status of the two DPSs needs to be carefully considered.

5c. Recovery plan for the western DPS

Again, this seems entirely uncontroversial.

5d. Prioritization of recovery tasks for the western DPS

The Recovery Plan lists "78 actions that are needed to achieve recovery of the western DPS" (p. 4). Thirty-five of these are identified as essential (Priority 1), or of primary importance (Priority 2a) on the basis of "the descriptions and approach required in the NMFS interim Recovery Planning Guidance" (p. 176). However, the reader is given no guidance about how this was done or exactly what the relevant criteria were. There is certainly no indication as to how the extensive and expensive research programs relating to medium or low threats will contribute to recovery. I am particularly concerned that experimental research on the effectiveness of conservation measures in critical habitat (Plan Task 2.6.8), which was recommended by Bowen et al (2001) and by NRC (2003), and whose importance is heavily stressed in other parts of the Plan (especially on p. 75), does not have "essential" priority. Instead, it will not actually be implemented for at least 3 years and has a rather modest budget of around \$2 million over the next 5 years. This research is absolutely critical for distinguishing the two preferred hypotheses for the post-1990 decline of the western DPS and must, surely, have priority over all other Plan Tasks except population monitoring.

- 5e. *Recovery plan for the eastern DPS*
Again, this seems entirely uncontroversial.

6. Recommendations and Implications

The decision to convene a Recovery Team whose members held such diametrically opposite views on the main causes for the reduction in abundance of the western DPS of SSL was a bold, but high risk one. Although I applaud this risk-taking, I am not entirely convinced that the Team has succeeded in developing an ecologically and biologically defensible recovery strategy for the western DPS. The criteria for revisions to the listing of this DPS under the ESA appear to be too weak, by the Recovery Team's own standards. The Executive Summary clearly states "the primary factors associated with the decline during this period (from the 1990s onward) have not been identified" (p. 2). Until these factors have been identified, there is no guarantee that the proposed recovery actions will meet the recovery goals. The proposed recovery tasks do not appear to be particularly well designed to distinguish between the factors that the Recovery Team (and other review panels) have identified as likely to be most important. Rather, they resemble very closely the research projects that have been funded since 2000 and which have signally failed to quantify the relative importance of these factors. In my opinion, a much more focused approach is required.

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Appendix 1
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Appendix 2
Consulting Agreement between the University of Miami and Dr. John Harwood
STATEMENT OF WORK
June 14, 2007

The first Steller Sea Lion (SSL) Recovery Plan was completed in 1992 and provided recovery guidance to the National Marine Fisheries Service (NMFS) for the species, which at that time was listed range-wide as threatened.

NMFS organized a new SSL Recovery Team in January 2002, and charged the new Team with writing a revised Plan to reflect the current view of stock structure and the differences in stock status under the ESA (eastern Distinct Population Segment (DPS) listed as threatened, and western DPS listed as endangered). The Team completed its draft of the second Plan in February 2006, at which time the Team sought an external peer review from 5 highly qualified experts (see Attachment 1).

Upon receipt of the peer reviewer comments, the Team revised the Plan and submitted it to NMFS. NMFS released the Plan for public review in May 2006 and received detailed written comments from 18 parties or individuals. Based on these comments and those of the expert reviewers listed above, NMFS revised the Plan into the document being presented to the Center for Independent Experts (CIE) for an additional peer review (document dated May 2007).

The CIE experts' comments will assist NMFS in making recovery decisions for the Steller sea lion based upon the best scientific and commercial data available (as required by the Endangered Species Act of 1973, as amended).

Reviewer Requirements

The CIE shall provide three expert reviewers. Each reviewer's duties shall require a maximum of six days of effort, including time to read the relevant document and to produce an individual written report consisting of his/her comments and recommendations. No travel is required; each reviewer shall work from his/her home location. Each reviewer's report shall reflect his/her area(s) of expertise, and no consensus opinion (or report) will be required.

As a group, the panel of CIE reviewers must possess expertise in the areas listed below.

* Familiarity with relevant sections of the Endangered Species Act (http://www4.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_35.html), and as applicable, the Marine Mammal Protection Act, and related wildlife management legislation (e.g., NEPA).

In particular,

* Experience as a Recovery Team member, contributor, or reviewer of Recovery Plans developed for other listed species; as a current or recently retired employee of a federal or state agency holding a position implementing ESA regulations; or from an academic position that has focused on ESA statutes and implementation.

* In depth expertise in the biology and management of marine and/or other large mammals; specifically population dynamics, reproductive and foraging biology and physiological ecology.

At least two of the reviewers must have in-depth experience with the ESA and recovery plans, and one reviewer must have in-depth knowledge of marine mammals. Former reviewers and former SSL Recovery Team members and support staff shall be excluded from consideration as reviewers of this document. See Attachment 1, below.

Specific Reviewer Tasks and Schedule

The Alaska Region shall provide the CIE with copies of the May 2007 draft revised SSL Recovery Plan for the review, or a link to it, by May 31, 2007. Delay in meeting this schedule will result in a minimum of an equivalent delay in delivering the final CIE reviews. The document to be reviewed will be approximately 200 pages in length.

1. The CIE reviewers shall read and assess the May 2007 draft revised Steller Sea Lion (*Eumetopias jubatus*) Recovery Plan.
2. The CIE reviewers shall focus on and address the following questions in their review reports:
 - Does the Plan thoroughly describe what is known about potential threats to both the eastern and western populations of Steller sea lion? Are there additional significant threats to the species? Does the evidence presented in the Recovery Plan support the threats assessment?
 - Is the ecological and biological information presented in the Plan adequate, thorough, and scientifically defensible?
 - Does the Plan adequately present an ecologically and biologically defensible recovery strategy for the eastern and western populations of Steller sea lion? Describe any shortcomings in the recovery strategy.
 - Are the recovery actions described within the Plan appropriate to meet recovery goals? Are the recovery actions consistent with the SSL life history information, population dynamics and threats assessment presented in the Plan? Are there other recovery actions that have not been included in the Plan that should be included to achieve recovery?
 - Are the recovery tasks in the Plan's Implementation Schedule appropriately prioritized to facilitate recovery?
 - Does the information in the Plan appropriately support the recovery criteria described in the Plan? Are the recovery criteria consistent with and do they meet the requirement of the ESA to ensure the conservation of the species (i.e., recovery and ultimate delisting: "conservation" as defined in the ESA 16 USC § 1532 (3))?
3. No later than June 29, 2007 each CIE reviewer shall submit a written report¹ to the CIE that addresses the points in item 2 above. See Annex I for additional details on

¹ Each written report will undergo an internal CIE review before it is considered final.

the report outline. Each report shall be sent to Dr. David Die, via email at ddie@rsmas.miami.edu, and to Mr. Manoj Shivilani, via email at mshivilani@rsmas.miami.edu

Submission and Acceptance of CIE Reports

The CIE shall provide the final individual reviewer reports for review for compliance with this Statement of Work and approval by NOAA Fisheries to the COTR, Dr. Stephen K. Brown (Stephen.K.Brown@noaa.gov), no later than July 13, 2007. The COTR shall notify the CIE via e-mail regarding acceptance of the reviewers' reports. Following the COTR's approval, the CIE shall provide pdf format copies of the reviewers' reports to the COTR.