Minutes: Tenth Meeting of the Alaska Scientific Review Group (6 - 8 October, 1999)

1.1 Introduction

The tenth meeting of the Alaska Scientific Review Group (AKSRG) was held at the National Marine Fisheries Service (NMFS), Alaska Regional Office, Juneau, Alaska from 6 - 8 October, 1999. The purposes of the meeting included: 1) initial review of the revised 2000 Stock Assessment Reports (SARs) for NMFS stocks in Alaska, 2) update on Cook Inlet belugas, and 3) review NMFS and Fish and Wildlife Service (FWS) plans for marine mammal research and management. Appendix 1 contains the list of AKSRG, NMFS and FWS participants. Appendix 2 presents the agenda. Appendix 3 contains a list of the background papers and AKSRG documents that were distributed prior to, and during the meeting. Appendix 4 summarizes recent NMFS marine mammal population assessment activities. Appendix 5 (A-C) contains details of FWS issues related to walrus, sea otter and polar bears. The meeting was chaired by Lloyd Lowry. Richard Ferrero served as rapporteur.

1.2 Review and Approval of Agenda

The agenda was adopted as shown in Appendix 2. Two items were added to the original draft: a) a report from Sue Hills on the recent marine mammal Recover Protected Species (RPS) proposal and funding review meeting in Silver Spring, and b) a report from Brendan Kelly on Pacific walrus research in conjunction with the FWS presentations.

1.3 Other Business

Lowry was re-elected AKSRG chair for the 1999/2000.

2. Presentation and Discussion of Methods for Collecting and Analyzing Data on Small Cetaceans

Lowry clarified that the objective of this topic was to provide an opportunity for the SRG to focus on the underlying science behind the information presented in the SAR. This approach allows the SRG to apply its collective expertise and avoid more constrained technical or editorial reviews of the SAR chapters themselves. Kelly noted that when the SRG had taken this approach with the NMFS assessments in the past, the agency responded by either revising the SAR or modifying the approach used to estimate any of the parameters involved in calculating PBRs.

2.1 Aerial surveys

Doug DeMaster provided an overview of the National Marine Mammal Lab (NMML) small cetacean aerial survey program in Alaska. The state is broken into 3 regions (southeast, Gulf of Alaska, and Bristol Bay) and one area is surveyed each summer. He described the general approach to aerial line transect methods that uses teams of three observers to cover right, left and center zones relative to the transect line. The sightings are used to estimate a density

function for the effective area searched, or a strip, bracketing the transect line. The effective strip width for harbor porpoise, for example, is about 200m (given the other characteristics of the aerial survey). The survey density is then extrapolated over the study area, generally defined as the area within a line connecting the outermost points of adjacent transect endpoints. DeMaster went on to explain that the middle observer provided a means of assessing animals missed on the transect line by the side observers. This comparison provided a means of generating a "perception" correction factor. A second type of correction factor is also required for animals not at the surface at the time of the survey (*i.e.*, to address the "availability" bias).

Kelly asked how animals seen from the air that are below the surface are handled with reference to the application of an availability correction factor. DeMaster responded that the application of the availability correction factor to data containing both surface and subsurface sightings would "over correct", in other words result in a positively biased estimate of abundance. The severity of the bias would be dependent on the amount of time the animals spend in the upper subsurface zone (*i.e.*, 1-2 m depth) but still visible from the air. Several members of the SRG expressed concern about the potential magnitude of the problem. DeMaster indicated that Rod Hobbs would be asked to address the issue in a short report prepared for the next meeting of the SRG.

Lowry asked for comment on the reliability of estimates based on small numbers of sightings. In particular, the Gulf of Alaska harbor porpoise surveys resulted in only 114 animals sighted which extrapolated to a population of over 20,000 animals. DeMaster responded by reiterating that the density estimates are probably pretty good, with CVs in the 0.2 range. The scale of the extrapolation stems from the very narrow strip actually surveyed, compared to the much larger study area bounded by the outermost points of adjacent transect legs. Given the low encounter rate inherent with these animals, more survey effort is unlikely to improve the CV of the estimate significantly.

Kelly brought up the issue of stratification, where the differences in density across different habitats are not being considered in the estimate. As a case in point, Cook Inlet was dropped from the most recent survey for harbor porpoise because of the low numbers of harbor porpoise encountered there last time, whereas more bays and inlets were included which tend to have greater densities of animals. DeMaster reiterated that the point of a survey designed to estimate minimum abundance is to estimate density, such that the resulting estimate is representative of the area surveyed.

Kate Wynne questioned whether alternative survey platforms could be used to supplement the aerial coverage (*i.e.*, small boats in bays and inlets). DeMaster noted that a sufficient sample of sightings per platform type is still required, along with (ideally) a method to calibrate the survey methods. Craig Matkin suggested that it may be more informative to use alternative platforms for comparison of abundance estimates rather than as individual components of a composite survey approach.

Lowry remarked that he was unable to judge the appropriateness of the small cetacean

survey methods with the information currently available to the SRG, particularly how to stratify or what methods to suggest for different habitats. Likewise, the size of bias introduced by the concerns just discussed were unknown. DeMaster noted that information on the potential magnitude of this bias would be made available to the SRG at the next meeting.

With regard to the question of collecting additional or different information to improve the small cetacean estimates, the SRG noted that the present estimates are probably inadequate to detect any trends in population, but are likely to be adequate for determining Nmin. In addition, the precision of the available estimate has to be considered relative to the magnitude of incidental mortality incurred, which, for the Alaskan small cetacean stocks, is thought to be low.

2.2 Life history parameters

Richard Ferrero summarized the Dall's porpoise growth and reproductive paper (Ferrero and Walker 1999) which was based on samples from the biological sampling program in the Japanese high seas salmon mothership fishery adjacent to the western Aleutian Islands during the 1980's. Lowry asked how the life history information could be used in the status of stocks reports. Ferrero indicated that the overall life history strategy that emerged from these analyses suggested an instance where the default value for Rmax may not be appropriate. Rather, strong evidence for a) an annual reproductive interval, b) early onset of sexual maturity, c) rapid pre- and post-natal growth, d) short life span, and e) a highly modal and consistent calving season, point to a higher net reproductive rate compared to species with delphinid-like life history, on which the default values were based.

Milo Adkison asked if age structure data were available for the sample, to which Ferrero said it was. Adkison then asked why NMFS did not calculate an Rmax value for Dall's specifically rather than using the default value. DeMaster explained that while the reproductive patterns were clear from these analyses, survivorship data were not available. Lowry and others countered by asking what the default value was based on. DeMaster described the original Barlow and Reilly analysis briefly, but again Lowry suggested that the survivorship assumptions in those analyses were not any better than that which could be applied to the very large life history data set available for Dall's porpoise. Lowry suggested that the SRG may want to make a recommendation to NMFS to use the Dall's porpoise life history information presented in Ferrero and Walker to at least explore estimation of a revised Rmax value for the North Pacific stock of Dall's porpoise. DeMaster indicated that such an analysis could take the form of an extension of Barlow and Bovengs' publication on estimating growth rates by using the Dall's porpoise reproductive characteristics and available data on longevity.

The Dall's porpoise case prompted Lowry and several other members of the SRG to question when a data-driven estimate of Rmax would be used instead of the default value. The Dall's porpoise age and reproductive sample is very large, and if it can not be used as the basis for investigating an alternative to the default Rmax, then what would? DeMaster noted that Rmax could only be estimated using life history parameters from populations that were severely

depleted. Again, the SRG argued that the assumptions associated with survivorship would probably not be any worse than those in the Barlow and Boveng model and applied to Dall's porpoise.

In addition, the issue of why to collect life history data at all, if it can not be used, arose. DeMaster mentioned the IWC precedent where if a direct estimate of net production was available for a population recovering from a severely depleted state, then life history collections in support of management contributed relatively little. Ferrero added, however, that life history studies can supply a wide range of information pertinent to assessing impacts rather than simply providing input to models used for management. For example, the Dall's porpoise life history investigations indicated that the fishery was occurring throughout the peak calving season and that parturient and lactating females comprised a large part of the take (*i.e.*, segregation of animals by age and sex class made harvest non-random).

After completing discussions of Dall's porpoise life history, the SRG turned to the Pacific white-sided dolphin paper by Ferrero and Walker (1996). Ferrero described the data origin, and highlighted the contrasting life history strategy compared to Dall's porpoise. Unlike Dall's, Pacific white-sided dolphins have a later onset of sexual maturation, at least biennial reproduction and relatively long life span. In short, and not surprisingly, Pacific white-sided dolphins fit the delphinid life history pattern for which the default value for Rmax is most appropriate.

3. Initial review of draft 2000 SAR chapters for small cetaceans

3.1 Harbor porpoise

Kelly noted that the rationale for the separation of the three stocks of harbor porpoise was not well explained in the introductory section. Two points were made. First, the separation between SE and GOA was based on differences in density but that the degree to which density varied between the two stocks was not specified. Second, no rationale was provided for the line between GOA and BS. It was agreed that some language would be added to qualify the first point, while the second was more arbitrary. DeMaster indicated that he would refer to the '97 minutes where these boundaries were agreed to by the SRG and the appropriate changes to the text would follow. Lowry added that if the stock boundary question was sufficiently important to the SRG, then it might warrant closer attention in a future meeting.

In general the SRG felt that the stock issue was not likely to be resolved with the information available. Division into management units, like the three for harbor porpoise, was a reasonable approach in some cases even though decisions on the borders may not be based on scientific data.

Several members of the group expressed confusion over the text that described the availability of fisher self-reported mortality data and the statements about its unreliability since 1995. It was agreed that the text should be clarified and some of the background information on

mortality data sources appearing in the SAR Appendix 4 would be brought forward into the chapters. More importantly, there appears to be some inconsistency in which of these data (since the beginning of the logbook program) should be used to estimate annual mortality. Likewise, other sources of mortality data also exist which are not cited in the SAR (*e.g.*, incidental mortality in nets used by fishery biologists to assess the stock status of various fish species). The SRG will consider recommending that NMFS develop the means to get reports of all mortality sources.

Several minor editorial changes to the chapter were suggested which will be incorporated in the next draft.

3.2 Dall's porpoise

The validity of the correction factor for vessel attraction was questioned by several members of the SRG. No members were familiar with the analysis by Turnock and Quinn (1991), therefore, copies of the paper were requested for all members to review and a sub-committee (Matkin, Adkison and Mathews) will coordinate comments.

As noted in earlier discussions, the SRG expressed interest in resolving whether a value for Rmax, other than the cetacean default, could be estimated for Dall's porpoise. Even if the results of this analysis indicate that a value more appropriate than the default can not be determined, the exercise should be undertaken and reported in the SAR.

Kookesh also noted that other sources of Dall's mortality should be noted in the SAR. In particular he mentioned mortality incidental to trolling and recreational fishing. It was not clear, however, how the Alaska Regional Office would obtain such data as its reporting (at least in recreational fisheries) would be voluntary.

3.3 Pacific white-sided dolphin

Discussion initially focused on the comments in the SAR chapter that the abundance estimates may be biased upward because of vessel attraction. No correction factor has been developed for this species. Adkison asked about the appropriateness of using the uncorrected abundance estimate in calculations of Nmin, recognizing that it was biased upward. Ferrero indicated that NMML staff could review the literature and speak with analysts at NMML to determine if any more information on the magnitude of a correction factor could be incorporated into the SAR.

Lowry noted that the source of the abundance data was well offshore, from the central North Pacific, well south of the area outlined in the SAR as the geographic range of the stock. Furthermore, the data on which this estimate was based were dated, having been collected in 1990/91. The SRG questioned whether the abundance estimate in the SAR was relevant to the Pacific white-sided dolphins off Alaska, realizing that the distribution and movements for this stock are largely unknown. Lowry proposed that the SAR be modified to describe the current

estimate and the limited sample of more recent data, then go on to explain that the SRG does not recommend using the Buckland *et. al.* (1993) estimate in the calculation of the PBR for this stock.

The SRG then reflected back on the Dall's porpoise abundance estimate, specifically the location of sightings used to generate it. Unlike the Pacific white-sided case, however, the survey area and the boundaries of the stock overlap, so the estimate as presented should stand. However, Ferrero pointed out that the stock boundaries as currently set do not discriminate between the Bering Sea and the area south of the Aleutian Islands, which is not consistent with indications of stock differences, particularly the genetics work in Winans and Jones (1988) and parasite incidence in Walker and Hacker (1990). It was agreed that the available literature would be reviewed and made available to the SRG for future consideration.

4. Presentation and discussion of methods for collecting and analyzing data on Eastern North Pacific gray whale

DeMaster described the gray whale survey methods wherein data from the southbound survey was used to estimate abundance and data from the northbound survey was used to estimate calf production. Unlike most species, an Rmax value, based on the observed rate of population increase, has been calculated. Lowry noted that the work on this species should be familiar to the SRG by now and that it is well documented. In addition, the CVs on the abundance estimate are low, and the methods are sound.

The SRG discussed a variety of unusual observations of gray whales over the last year including low estimates of calf production, and higher than normal mortality. Kelly also reported seeing lower than expected numbers of animals between Nome and the Bering Strait in July, while Wynne reported large numbers of gray whales feeding in the Kodiak area in mid-summer. Lowry and others pointed out that such events may not be unexpected for a population approaching K. As such these events do not suggest an immediate conservation priority to the SRG. DeMaster noted, however, that scientists from Southwest Fisheries Science Center (SWC) and NMML had proposed conducting another calf count in 2000 (given the low calf production in 1999) and both an adult and calf count in 2001.

5. Initial Review of draft 2000 SAR Eastern North Pacific gray whale

In the draft gray whale SAR, the default value for Rmax was used instead of the calculated value of .053. As in the earlier discussion on Dall's porpoise, the question arose as to why the default value was used instead of one based on data. DeMaster replied that the difference between the calculated value and the default was not significant according to the guidelines in Wade and Angliss (1997). None-the-less the SRG expressed a preference to use calculated values rather than defaults. After polling all members of the SRG, Lowry summarized: clearly, the SRG would prefer to use data driven estimates, regardless of the magnitude of their difference from a default value, but in this particular instance, they were not sufficiently familiar with the analysis that resulted in the .053 value to endorse it at this time.

Instead, it was recommended that NMFS and the SRG need to consider criteria for deciding when to change from defaults to data-based values for Rmax.

6. Comments on Draft Year 2000 NMFS SARs for ESA-Listed Strategic Stocks

The SRG briefly reviewed the strategic stock chapters and suggested additions or revisions as described below. Ferrero noted that updated mortality and abundance data available through summer 1999 will be incorporated in the next draft.

Bowhead whale - Straley presented recent information on observations of scarring and entanglements in lines (possibly pot gear). The concern was based on Craig George's re-examination of bowhead harvest data which suggested that the number of such entanglements may be greater than previously thought. More complete information on bowhead interactions with fishing gear will be incorporated in the next SAR revision as available.

Fin whale - Insufficient sightings have been recorded to update the abundance estimate, however, a new analysis may be possible by 2001.

Humpback whale - Straley asked if further consideration would be given to separation of the central stocks on the basis of feeding areas. Lowry indicated that this would make a good feature topic for a future meeting, recognizing that the SRG has not been comfortable with the present approach.

Northern right whale - A new abundance estimate was not currently available, but an update may be available by 2001.

Northern fur seal - A revised estimate will be available for the 2001 SAR, following completion of pup counts in summer 2000.

Sperm whale - An survey of sperm whales in the Gulf of Alaska using acoustic receivers is currently underway. A revised abundance estimate may be available for the 2001 SAR.

Steller sea lion - A revised abundance estimate will be available for the 2001 SAR following an all-Alaska survey in June 2000.

7. Update on Current Issues

A collection of current issues were discussed by SRG members and NMFS staff. Note that the order of topics was rearranged slightly but the order of presentation herein follows the agenda.

7.1 Cook Inlet beluga whales

DeMaster reported on the aerial survey and tagging project completed in June. The index

count from the surveys (217 whales) is similar to last years number (193). The total abundance estimate will be available after the video analyses are completed this fall. One satellite tag was placed on 31 May and transmitted for a total of 112 days. Dive and surfacing data will be analyzed this winter. Michael Payne reported on the September beluga stranding event in Turnagain Arm where up to 60 animals were beached. Six animals were found dead, two of which were fresh enough for muktuk from the stranded whales to be distributed to the local Native community.

In subsequent discussions of the draft 2000 SAR, Lowry asked why a recovery factor of 0.3 was still used, despite previous recommendations from the SRG to use 0.1. Lowry further pointed to a letter in which the Alaska Regional Administrator had concurred with the SRG's recommendation. DeMaster explained that the agency position, at this time, was consistent with the decision to list this stock as depleted under the MMPA . He noted that a 0.1 recovery factor would have been required had the agency decided to do an emergency listing of endangered under the ESA. However, because the agency has not finalized a decision on ESA listing to date, a middle ground value of 0.3 was preferred. After considerable discussion, the SRG strongly reiterated its concern that the status of the Cook Inlet beluga stock warranted the more conservative approach and that 0.1 should be used. DeMaster indicated that the 2000 SAR would reflect the SRGs concerns and recommendations even if NMFS decides to take a different approach.

Highlights on the Cook Inlet beluga issue since the last SRG meeting were also discussed. Of note, sealing regulations requiring all harvested whales to be reported and a jaw sample to be turned over to NMFS were recently instituted. The SRG agreed that this was a major success and addressed their previous recommendation. Second, a legislative action restricting the Native harvest was also put into effect in May of 1999. In the absence of a co-management agreement, a moratorium on beluga hunting in Cook Inlet will be in place through September 2000. As of this meeting, no beluga hunting was known to have occurred during 1999.

Payne reported on NMFS activities relative to listing Cook Inlet belugas as depleted under the MMPA as well as efforts toward co-management. The proposed rule for the depleted listing is expected to be completed by mid to late September to allow publication of a final rule by February or March. The final rule will not include language related to the harvest. Rather an EIS on the harvest issue will be developed. Over the coming months, public hearings will be held to solicit input on the contents of a co-management agreement with completion expected by March. Once the agreement is in place, a rule to manage the beluga harvest would then be proposed.

Adkison and Kelly raised the issue of an SRG review of the beluga EIS, suggesting that the group might provide useful guidance. Lowry noted that the SRG has already been commenting on the science and may not necessarily need to formally review the document. The members agreed that they should all review the document individually, then decide whether to meet again as a group to comment formally.

DeMaster noted that NMFS was also petitioned to list Cook Inlet belugas under the ESA but that the agency had decided to use the full year allowed it under the mandates of the ESA. Both Payne and DeMaster described the underlying differences between the listing alternatives. Kelly asked if the SRG should comment on the alternative listing approaches. However, the SRG agreed to restrict comments to the underlying science and not address the issue of classification.

Lowry raised two further issues for the SRG to consider. First, what will happen when the legislative fix expires, and second, what level of illegal harvest may have occurred this summer? With regard to the former, it was hoped that restrictions under a co-management agreement would be in place by the end of the moratorium period as well as a regulation authorizing the agency to restrict Native harvest of belugas in Cook Inlet, as necessary. As for the latter, Payne indicated that while NMFS enforcement had been active in 1999, it did not have sufficient resources to detect violations reliably. The SRG discussed possible recommendations to increase enforcement capabilities. Kookesh and others strongly emphasized cooperation with hunters as the preferred step before considering additional enforcement measures. Following additional discussion, the SRG agreed to draft a letter supporting implementation of the sealing regulations and endorsement of expanded education and enforcement roles for information gathering.

7.2 Steller sea lions

Tim Ragen recapped the events over the last year involving Steller sea lion/commercial groundfish fisheries litigation. He provided an overview of recent events centered on NMFS progress toward responding to Judge Zilly's Reasonable and Prudent Alternatives (RPA) remand order. In particular, NMFS is reviewing the package of RPAs previously developed but found to be arbitrary and capricious by the Court. A revised package of actions including spatial and temporal redistribution of the pollock fisheries and establishment of additional buffer zones will be completed and filed by October 18. A more complete explanation of how the RPAs will avoid jeopardy remains the focus of the effort.

7.3 Humpbacks in southeast Alaska

Straley lead a discussion of anthropogenic interactions with humpbacks in SE Alaska, noting that not all observed interactions appear in stranding records maintained by the Region. She showed slides of a boat hit by a humpback (presumably) which left a chunk of baleen behind. This represented a case where the whale would not have been reported as a stranding (unlike a whale hit by a boat). Reporting of entanglements in fishing gear was also thought to be somewhat inconsistent. For instance, whales transiting (unharmed) through gear are not reported as strandings. Kaja Brix clarified the Region's approach to recording these events, recognizing that reports of non-lethal interactions are fragmentary. The SRG agreed that all incidents should be recorded (to the extent possible given poor reporting) in order to better characterize the extent of possible interactions and that consistent definitions of terms used to describe strandings and fishing interactions should be used in all of the AK Region programs.

7.4 Contaminants in transient killer whales

Matkin presented information on contaminant loads (PCBs and DDTs primarily) found in biopsy samples from transient killer whales. The levels of contamination were considerably higher than found in resident killer whales. Furthermore, the levels were in a range high enough to be considered a potential health risk. The SRG briefly discussed possible sources of contamination and comparisons with other locations but did not suggest specific actions.

8.0 NMFS marine mammal program activities

The SRG discussed the following topics at various points in the day as time allowed.

8.1 Ringed seal incidental harassment authorizations

Kelly led a discussion of concerns about NMFS issuance of ringed seal incidental harassment authorizations associated with on ice oil/gas exploration and development activity. NMML personnel had assembled records of IHA applications, survey plans and annual reports as requested by the SRG to aid the discussion. Kelly described the methods used (and approved by NMFS) to estimate numbers of seals harassed by on-ice seismic activities as "dubious". Probing, infrared detection, and aerial survey methods were among the methods employed. Kelly noted that he had detected seal holes as well as a dead pup using dogs in an area previously deemed "clear". He noted that the oil company consultants and native observers have consistently considered dogs unnecessary. Kelly and others in the group expressed frustration that in spite of the problems with the adopted methodology, LOAs and IHAs have been consistently approved by NMFS. DeMaster noted that a letter from Dalton to Lowry on this issue indicates that NMFS believes that the process needs to be improved. Furthermore, the issue will be discussed at length on 14-15 October 1999 at a special workshop in Seattle convened by NMML. Lowry indicated that the issue should be tabled for now and revisited after the workshop is completed.

8.2 NMFS subsistence harvest monitoring strategy

Payne provided a brief overview of NMFS activities associated with the harbor seal and Steller sea lion harvest monitoring issue. In short, he had little progress to report, instead noting that they were still at the stage of determining whether to move ahead with a state contract or to develop a new program under a co-management agreement. The choice presents a management conundrum as the state contract option is inconsistent with an opportunity to work through co-management, while the co-management option would require assembly of an infrastructure (a feature already in place with the state option). Kookesh noted that at least the Alaska Native Harbor Seal Commission endorsed an approach that uses the existing state program, which could be continued under the new co-management agreement between NMFS and ANHSC.

Charlie Johnson provided an update on ice seal harvest monitoring where 1 yr co-management agreements have just been signed between Kawerak, the Alaska Native Nanuuq Commission, the North Slope Borough, and NMFS. Three activities are planned, the first as an

ongoing feature, the other two as funding allows: 1) household survey during the winter to determine what species were harvested over the past year, 2) real-time monitoring (including collection of sex and age composition data from all species of ice seals), and 3) biological sampling.

Lowry indicated that this information represented a start on what the SRG had previously requested, but had hoped that NMFS could have had more to report. The SRG agreed that they would like the Region to develop a document that describes how NMFS will address harvest monitoring, statewide, by species. The product should feature a decision matrix or monitoring cycle supported by a prioritization of concerns and identification of the tools available (or that could be made available) to collect the requisite data. Further discussion of this issue was later included in the list of items to be discussed at the March 2000 AKSRG meeting.

Bob Wolfe (ADF&G Subsistence Division) described the existing harvest monitoring program of the Alaska Dept. of Fish and Game, which has been in place for 7 years. During that time, they have developed a robust program that included 62 communities. Formal agreements with tribal entities as technical advisors have been developed, hunters have been identified, and a working data base detailing harvest x month x species x age x sex x community has been assembled. He noted that there was no funding currently available to collect information on the 1999 harvest and expressed concern about transition from the state system to a co-management system. The SRG expressed similar concerns and agreed that it would be in the best interest of the program to make any transitions as smooth as possible to avoid loss of important contacts. Lowry added, however, that the SRG did not have sufficient information at this time to offer a more specific recommendation on how best to implement a new program.

8.3 Incidental take monitoring programs

Fadely summarized NMFS incidental take monitoring programs in Category II fisheries during 1999. A contract was awarded to Data Contractors, Incorporated (DCI) on June 7, 1999 for a one-year period (with a second-year option) to observe Cook Inlet salmon drift and set gillnet fisheries. Training of 20 observers and five lead observers was conducted by the University of Alaska Observer Training Center and an independent contractor, and observers were deployed on the first drift gillnet opening of June 28. Limited set gillnet fisheries had been operating in the Upper Cook Inlet since June 7, but observers were not placed until June 28. Observers were based in the ports of Homer and Kenai for the drift gillnet fishery, and based in the towns or villages of Homer, Kenai, Anchorage, and Tyonek for the set gillnet fishery. Drift gillnet observers were placed on vessels by prior direct arrangement with vessel owners, or through boarding at processing plants. Set gillnet observers were distributed to sites using four-wheel drive vehicles, all-terrain vehicles, or aircraft. Overflights of set gillnet fishery areas, combined with Department of Natural Resource listings of set net site property easements were used as the framework for randomly selecting sites to observe.

Observers were placed on drift vessels during each of the 7 regular and 9 corridor-only fishing periods, and during emergency order extended fishing periods. Coverage level data were

preliminary, but as of August 6, 88 net-days (in which a net is fished at least 6 hours in a 24 hour period) were observed of a target 180 net-days coverage of the drift gillnet fishery, and 154 net-days observed of a target 180 net-days coverage of the set gillnet fishery. Estimates of fishing effort and coverage levels will change as the data are analyzed and fishing effort definitions are refined.

There were no observed marine mammal mortalities or injuries in the drift gillnet fishery, and only two entanglement observations. Both entanglement events were of harbor porpoise, one instance of 2 porpoises, and one of a single porpoise. All three porpoise were released unharmed. However, 3 common Murres and 1 common loon were observed drowned by net entanglement. A program observer found, and sampled, a dead stranded beluga whale on the west-side of Cook Inlet (no external injuries), and an observer was directed to sample another reported dead stranded beluga whale near Fire Island (also no obvious external cause of death), both events apparently unrelated to the fisheries. Two reports of entanglements were received from sources other than the observer program. The first, which occurred prior to the observer program, was of a harbor seal pup entangled near the lead line of a set gillnet on the western side of Cook Inlet. The pup was pulled to the surface and given to NMFS for rehabilitation. The second report was of a beluga whale seen to be entangled in a set gillnet running line near Nikiski by an oil platform helicopter pilot. The net was not deployed along the running line as the fishery was in a closed period. The pilot returned to the site within 10 minutes, and the beluga had evidently self-released.

The drift gillnet fishery ended Monday, August 9, and the majority of the Cook Inlet east-side set gillnet fishery ended on August 12. A smaller set gillnet fishery continued in the northern districts of Cook Inlet until September 9, but most nets were pulled out of the water by August 16th. Final observations were conducted on August 19th, when the few fishing sites remaining had already been observed. A very small set gillnet effort lasted until September 30 in the Lower Cook Inlet.

DCI, with NMFS assistance, is conducting final data input and error checking analysis for the 1999 season. Modifications to the sampling methods or data collection forms, as appropriate, will be made prior to observer training to be conducted in May 2000. Fiscal year 1999 funding will carry the project through June 7, 2000. Thus, trained observers will be in place for the start of the year 2000 fishery season. AKR is examining the possibility of deploying more observers than were used during the 1999 fishery, and will also be developing a Request for Proposals to observe Kodiak Island and Yakutat set gillnet fisheries in 2001/2002, per SRG recommendations to focus on northern Gulf of Alaska/Cook Inlet fisheries as a priority for the observer program.

The SRG focused their discussion on prioritization of observer program locations in coming years. They agreed that the 1999 Cook Inlet program should be repeated for one more year, then move on to north Gulf sites (Kodiak and Yakutat). Lowry noted that there are tradeoffs in the decision where to go next but that data quality would probably be better in the Kodiak and Yakutat fisheries. Funding should also be requested to observe the Southeast Alaska drift gillnet and purse seine fisheries as well.

Fadely also provided a description of the Marine Mammal Authorization Permit/Fisher Self-reporting Program, indicating that about 5500 permits had been issued in 1999 authorizing the injury or mortality of marine mammals coincident to commercial fishing operations by State fishery permit holders in Category II Alaska fisheries. The number of reports of marine mammal injury or mortality incidental to commercial fishing from fisher self-reports remain substantially less than numbers received during the logbook reporting program. In 1998, nine fisher self-reports of injury or mortality were received (4 cetaceans, 5 pinnipeds). As of mid-August, four reports had been received for 1999 (3 cetaceans, 1 pinniped).

8.4 Other fishery management issues

Fadely reported that AKR has received reports of an increasing frequency of sperm whale/longline and killer whale/ longline interactions. Proposals from NMML (1998) and AKR (1999) to examine this issue in detail and provide a basis to develop effective deterrent methods were submitted for consideration of national NMFS marine mammal research program funds, but did not receive funding. Associated requests from fishermen and the U.S. Coast Guard for guidance regarding effective and legal deterrence methods and devices have also increased. NMFS has not yet published a list of effective deterrent measures, and recommends that whatever technique is used, it can not injure or kill the marine mammal.

Gauvin described his observations of killer whale predation on Greenland turbot and halibut during a recent experimental fishing cruise in the eastern Aleutian Islands near Akutan Bay. Predation rates were very high and efforts to elude the killer whales failed. These interactions could have serious implications for survival of halibut, confounding the objectives of onboard "careful release" practices.

8.5 Co-management with Alaska Natives

See 8.2 for topics, as discussed, relating to co-management.

8.6 Population assessments

DeMaster quickly summarized the current and near future assessment projects currently planned by NMML. A brief description of the items appears in Appendix 4. The SRG noted that they would like to see the Steller sea lion buffer zone efficacy plan.

Hills provided a brief report on her observations of the NMFS Recover Protected Species (RPS) proposal review process in Silver Spring (Sept. 1999). She described how the aggregate total available for marine mammal projects (approximately 10 million) was predominantly committed in 1999, and therefore, the actual amount available for new RPS proposals was only about $700,000. Her observations were noted as instructive for the SRG although formal comment to NMFS on the process was considered outside the purview of the group.

8.7 Other research

No specific issues were discussed under this agenda item.

9.0 FWS and U.S. Geological Survey, Biological Research Division (USGS-BRD) marine mammal program activities

Rosa Meehan provided an overview of the topics to be discussed and introduced staff who would be giving summaries on specific species. For each species discussed, details were provided in writing, and appear in Appendix 5 (A-C). Both research and management issues were discussed by species, as opposed to separate topics as listed in the agenda.

9.1 Pacific walrus

Meehan lead the discussion of Pacific walrus. Details of this presentation are contained in Appendix 5A. Highlighted topics included the size of the estimated 1999 harvest which so far includes 2,195 animals, not counting all harvest locations or an accounting of animals struck and lost. The harvest level appeared to be similar in size to those in the 1980's. Possible changes in population abundance stood as one of two major concerns, the other being "wanton waste". A workshop on methods for estimating population size is scheduled for next spring. The goals of the workshop will be to identify census methods (or at least determine if such methods can be identified) and to begin developing survey indices. Kelly reported on results from age/sex composition studies done in the Chuckchi Sea in summer 1998-1999 which suggest low calf production and survival. He also described ongoing genetic and morphological investigations that are focusing on walrus systematics worldwide. The study combines results from Bud Fay's unpublished cranial morphometric studies with more recent genetics studies.

9.2 Sea otter

Jim Bodkin summarized USGS-BRD sea otter work; refer to Appendix 5B for details. The presentation highlighted the apparent population decline in the Aleutians and the interest in conducting surveys there, and assessing the role of killer whale predation. Meehan described recent agreements with the Alaska Sea Otter and Steller Sea Lion Commission (TASSC) to review background information for stock assessments and obtain genetic samples. With respect to the sea otter SAR, completion is expected by spring, assuming that the current stock boundaries are used. A stock boundaries paper is in press which does suggest confidence in the currently used stock boundaries, although more samples at the margins of the two areas are still needed. If new information suggests different boundaries, then a revision would be targeted for fall 2000.

9.3 Polar bear

Meehan and Chad Jay provided an overview of polar bear assessment and harvest monitoring; details are contained in Appendix 5C. The SRG discussed whether they should

more closely review the polar bear stock assessment and the other FWS species as well. Lowry noted that the current presentation format may not be particularly valuable for FWS as it focuses on presentation of results or overviews rather than an interactive review of methods and foundation analyses. Kelly suggested that a focused review on one species at a time, more similar to the approach taken with NMFS species, would be useful. Meehan further noted that she advocated incorporation of the FWS SARs with the NMFS SAR.

10.0 SRG recommendations

1. NMFS should use available data on life history characteristics of Dall's porpoise to do an analysis of the likely best estimate of Rmax for Dall's and for other small cetaceans with similar biological traits.

2. NMFS should develop and implement a standardized system for recording marine mammal serious injuries and mortalities that result from all types of human interactions (*e.g.*, takes resulting from commercial fisheries, scientific research projects, subsistence fishing, hatchery structures, etc.). This system should establish standard and consistent definitions for the types of human interactions and effects of takes that should be used in all observer programs, databases, and reports.

3. NMFS, in consultation with the SRGs, should develop criteria for determining when to change from use of default values for Rmax to values based on data collected from the species or stock in question.

4. NMFS should work with the Alaska Native Harbor Seal Commission and the Alaska Sea Otter and Steller Sea Lion Commission to develop and implement subsistence harvest monitoring programs through co-management agreements. Of particular concern is the need to create a smooth and efficient transition from the harvest monitoring program that was previously conducted by the Alaska Department of Fish and Game Subsistence Division.

5. NMFS should continue the Alaska observer program to gather data on incidental take of marine mammals in commercial fisheries. The SRG recommends that Cook Inlet salmon set and driftnet fisheries be observed for a second year in 2000. The priority order for fisheries to be observed in subsequent years is: 1) Kodiak and Yakutat salmon setnet fisheries; 2) Southeast Alaska salmon driftnet and purse seine fisheries; and 3) Bristol Bay salmon set and driftnet fisheries.

11.0 Schedule/location for future AKSRG meetings

The next meeting of the AKSRG will be March 29-30, 2000 in Anchorage. It was agreed that the meeting will follow a 2 day format for the first time. The following meeting will be held November 1-2, 2000 in Juneau. The SRG agreed that more consistency in the timing of meetings would help long range planning, therefore, a basic schedule as follows was adopted:

Spring meeting: last Wed/Thurs. in March, Anchorage
Fall meeting: first Wed/Thurs. in November, Juneau

Modifications to the schedule, including potential meetings in Seattle will be considered on a case by case basis.

As a new feature of the spring meeting, the SRG will conduct a preliminary review of the SAR chapters slated for revision in the current cycle. This process is intended to identify background papers and other information needed for thorough review by the SRG in the fall. All such materials will be made available to the SRG well in advance of the November meeting. In addition, a library of SRG documents, including all previous SARs, meeting minutes etc. will be assembled as a reference and brought to all future meetings.

12.0 Potential topics for next meeting

1. Preliminary review of SARs to be revised in 2000, and identification of background information needed

2. Review of FWS/USGS-BRD walrus population monitoring program (Hills and Kelly to provide list of relevant literature by 1 January)

3. Assessment of Alaskan humpback whales stocks based on summer feeding areas (background document to be provided by Straley)

4. Discuss NMFS strategy for monitoring Alaska Native subsistence harvests (draft strategy to be provided by NMFS AKR)

5. Progress report on issuance of Letters of Authorization and Incidental Harassment Authorizations for ringed seals

6. Discussion of Rmax values for small cetaceans - use of defaults versus data-based values (background document to be provided by NMFS NMML)

7. Discussion of attraction factor used in Dall's porpoise population estimate (Matkin, Adkison, Mathews)

Appendix 1. List of AKSRG, NMFS and FWS participants.

AKSRG
M. Adkison
J. Gauvin
C. Hild
S. Hills
C. Johnson
B. Kelly
M. Kookesh
D. Lloyd
L. Lowry (Chair)
B. Mathews
C. Matkin
J. Straley
K. Wynne

NMFS
K. Brix
D. DeMaster
B. Fadely
R. Ferrero
A. Lopez
M. Payne
T. Ragen

FWS
J. Bodkin
C. Jay
R. Meehan

ADFG
B. Wolfe

Appendix 2. Agenda for the tenth meeting of the Alaska Scientific Review Group 6-8 October, 1999.

Alaska Scientific Review Group Meeting 6-8 October, 1999
National Marine Fisheries Service, Alaska Regional Office
Federal Building, Juneau, AK

Purpose:

1. Initial review of revised 2000 Stock Assessment Reports for NMFS stocks
2. Update on Cook Inlet belugas
3. Review NMFS and FWS plans for marine mammal research and management

Materials needed:

1. Initial drafts of 2000 NMFS Stock Assessment Reports
2. Background documents supplied by NMFS, FWS, and USGS BRD

6 October 1999-Wednesday

9:00 am Introductory business

1. Introductions
2. Review and approve agenda
3. AKSRG Chair for 1999-2000
4. Other business (*e.g.*, travel vouchers)

9:30 am Small cetaceans

1. Presentation and discussion of methods for collecting and analyzing data
    a. Aerial surveys
    b. Life history parameters
    c. Other
2. Initial review of draft year 2000 SARs
    a. Harbor porpoise
    b. Dall's porpoise
    c. Pacific white-sided dolphin

12:15 pm Break for lunch

1:30 pm Eastern North Pacific gray whale

1. Presentation and discussion of methods for collecting and analyzing data
    a. Migration counts
    b. Life history parameters
    c. Other
2. Initial review of draft year 2000 SAR

3:30 pm Comments on draft year 2000 NMFS SARs for ESA-listed strategic stocks

5:00 pm Adjourn

7 October 1999--Thursday

8:30 am Update on current issues
1. Cook Inlet beluga whales
    a. Scientific results
    b. Co-management
2. Steller sea lions
3. Humpbacks in southeast Alaska
    a. Vessel collisions
    b. Entanglements
4. Contaminants in transient killer whales

10:00 am NMFS marine mammal program activities
1. Ringed seal incidental harassment authorizations
2. NMFS subsistence harvest monitoring strategy
3. Incidental take monitoring programs
4. Other fishery management issues
5. Co-management with Alaska Natives
6. Population assessments
7. Other research

12:15 pm Break for lunch

1:30 pm Complete discussion of plans for NMFS marine mammal program activities

2:30 pm FWS and USGS-BRD marine mammal program activities
1. Pacific walrus research
2. Subsistence harvest monitoring
3. Co-management with Alaska Natives
4. Population assessments
5. Aleutian Island sea otter situation
6. Other research

5:00 pm Adjourn

8 October 1999-Friday

9:00 am SRG discussion and recommendations

10:00 am Schedule/location for future AKSRG meetings

11:00 am Topics for next meeting

11:30 am Adjourn

Appendix 3. Background papers and AKSRG documents distributed prior to, and during the meeting.

Ferrero, R.C. and W.A. Walker.1996. Age, growth and reproductive patterns of the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) taken in high seas drift nets in the central North Pacific Ocean. Can. J. Zool. 74(9):1673-1687.

Ferrero, R.C. and W.A. Walker. 1999. Age, growth and reproductive patterns of Dall's porpoise (*Phocoenoides dalli*) in the central North Pacific Ocean. Marine Mammal Science 15(2):273-313.

Ferrero, R.C., D.P. DeMaster and P.S. Hill. In prep. Alaska marine mammal stock assessments 2000 (Draft). NMML, AFSC, 7600 Sand Point Way, NE, Seattle, WA 98115. 169p.

Ferrero, R.C. 1999. 1999 Cook Inlet beluga tagging project - field report. NMFS, AFSC, NMML. 7600 Sand Point Way, NE, Bldg 4, Seattle, WA 98115. 25p.

Hobbs, R.C. and J.M. Waite. 1999. Small cetacean aerial survey in Prince William Sound and the western Gulf of Alaska in 1998 and preliminary harbor porpoise abundance estimates for Southeast Alaska and the Gulf of Alaska stocks. NMFS, AFSC, NMML. 7600 Sand Point Way, NE, Bldg 4, Seattle, WA 98115. 12p.

Link, M.R., T.L. Olson, and M.T. Williams. 1999. Ringed seal distribution and abundance near potential oil development sites in the central Alaskan Beaufort Sea, spring 1998. LGL Alaska research Associates, Inc. 4175 Tudor Centre Drive, Suite 202, Anchorage, AK 99508.

LGL Alaska Research Assoc., Inc. (Anchorage), LGL Ltd. environmental research associates (Ontario), and Greenridge Sciences Inc. 1999. Technical plan for marine mammal and acoustic monitoring during construction of BP's Northstar oil development in the Alaskan Beaufort Sea, 2000. BP Exploration (Alaska) Inc. Dept Health, Safety and Environment, 900 E. Bensen Rd., POB 196612, Anchorage, AK 99519-6612.

MacLean, S.A. 1998. Marine mammal monitoring of an on-ice seismic program in the eastern Alaskan Beaufort Sea, April 1998. Final Report prepared for BP Exploration (Alaska) Inc. and NMFS. LGL Alaska Research Associates, Inc. 4175 Tudor Centre Drive, Suite 202, Anchorage, AK 99508. 17 p.

Richardson, W.J. and M.T. Williams. 1999. Monitoring of ringed seals during construction of ice roads for BP's Northstar oil development, Alaskan Beaufort Sea, 1999; 90-day report. Report prepared for BP Exploration (Alaska) Inc. and NMFS. LGL Alaska Research Associates Inc., 4175 Tudor Centre Dr., Suite 202, Anchorage, AK 99508. 74p.

Rugh, D.J., R.C. Hobbs, K.E.W. Shelden, B.A. Mahoney and L.K. Litzky. 1999. Aerial surveys of beluga whales in Cook Inlet, Alaska, June 1998. NMFS, AFSC, NMML. 7600 Sand Point Way, NE, Bldg 4, Seattle, WA 98115. 11p.

Rugh, D.J., R.C. Hobbs, R.P. Angliss, L.S. Baraff, C. D'Vincent, S. Hill, M.M. Muto, M.A. Scillia, K.E.W. Shelden, and J.M. Waite. 1999. Field report of the 1997/98 study of gray whales during their southbound migration. NMFS, AFSC, NMML. 7600 Sand Point Way, NE, Bldg 4, Seattle, WA 98115. 15p.

Rugh, D.J., M.M. Muto, S.E. Moore, and D.P. DeMaster. 1999. Status review of the eastern North Pacific stock of gray whales. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-103, 96p.

Other Documents:

1. Western Geophysical - Package of final reports submitted to NMFS F/PR for years 1994-1998
2. Letter from P.D. Dalton to L.P. Lowry regarding ice seal IHAs and LOAs
3. Background summary on LOAs/IHAs, list of LOAs/IHAs, and list of materials provided to the SRG
4. Summary of NMFS marine mammal program activities
5. Summary of FWS/USGS marine mammal program activities

Appendix 4. Summary of current NMFS marine mammal population assessment activities.

Steller sea lions

To increase information available on winter distribution, an aerial survey was conducted in March 1999 from the Kenai Penninsula to Attu. All sites form Outer Island to Attu were covered, in addition to a few in Southeast Alaska. The information will not be used for population assessment, rather it will allow comparisons with the summer season rookery and haulout use patterns. These data should also provide a additional basis for suggesting site-specific protection of winter haulouts. In early July, pup counts were conducted on Adak, Akun, Akutan, Ugamak and Sea llon Rocks (Amak). In addition, both pups and non-pups were counted at Marmot. In 2000, Steller sea lion assessments will include both the aerial survey of Alaska during June breeding season for non-pups and pup counts using beach counts and aerial surveys at selected rookeries throughout state.

Northern Fur Seals

During summer (July) 1999, bull counts were conducted on the Priblof Islands. Pup counts were not completed this year, therefore, new abundance estimates are not available. In 2000, both pup estimation (August) and bull counts (July) are planned for both the Pribilof Islands and San Miguel.

Cook Inlet Belugas

Cook Inlet belugas were surveyed during early June, consistent with the timing of previous surveys. Results are not yet available, but are expected by mid-November. Capture and satellite tagging efforts in late may and early June were successful for the first time. A SLTDR was placed on an adult male, with data transmissions continuing for 112 days. The satellite-based surfacing data will be used this fall for further development of a correction factor for animals not at the surface at the time of survey. In 2000 a June survey of Cook Inlet will be completed once again. Efforts to tag additional belugas are planned for May/June as well.

Ice Seals

In 1999 NMML conducted an aerial survey of ice seals in the Chukchi Sea and western Beaufort Sea. In addition, the first of a 2 year harvest monitoring program was initiated through contractual arrangements with Alaskan Native organizations. In 2000, the second and final year of aerial surveys in the Chukchi and western Beaufort Seas will be conducted. Traps and capture techniques for ringed seals basking on the ice also will be investigated. Finally, satellite tags will be deployed for estimation of the proportion of ringed seals not hauled out during aerial surveys.

Harbor Seals

Continuing the annual rotation among five Alaskan survey areas in 2000, the NMML will conduct aerial surveys for harbor seals along the north side of the Alaska Peninsula, including Bristol Bay. With the restoration in FY 2000 of funding that fell short in FY 1999, it will be possible to resume estimation of the proportion of harbor seals that are not hauled out, and therefore are missed, during the aerial surveys.

Appendix 5. Details supplementing presentations of FWS and USGS-BRD marine mammal program activities: 5A pertains to walrus, 5B to sea otters and 5C to polar bears (In order on the following pages).

ALASKA SCIENTIFIC REVIEW GROUP
OCTOBER 7, 1999
USFWS – MARINE MAMMALS MANAGEMENT
USGS - BRD

Walrus Harvest Monitoring
USFWS
In 1999, the Service continued its Walrus Harvest Monitoring Project which monitors the size and structure of the subsistence walrus harvest in the primary walrus hunting villages in Alaska. Results of the WHMP this spring indicated a total harvest of 2195 walrus at four villages. Of these, 1253 were adult females, 617 were adult males and the rest were primarily calves and subadults. A report summarizing the results of harvest monitoring in 1999 is in preparation.

For the past four years, the Service, and the Alaska Department of Fish and Game have cooperated in monitoring a limited fall hunt that occurs on Round Island. In 1999, the hunt season runs from September 20 to October 20, with a total allocation of 20 walrus. This year, the Bristol Bay Native Association has taken the lead in monitoring the Round Island hunt.

While the size and composition of the annual subsistence harvest in Alaska is fairly well documented, an economic crisis in Russia has resulted in the deterioration of harvest monitoring programs to the point where Russian harvest estimates can no longer be considered accurate. In March of 1999, the Service entered into a cooperative agreement with the North Slope Borough and Chukotka Native organizations to monitor the walrus harvest in the six primary walrus hunting villages in Chukotka. Chukotka walrus harvest monitors received training and supplies in May, during the spring hunt in Gambell. Harvest monitoring will continue through October 1999. Financial Support for the project was provided by the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game.

Walrus Haulout Monitoring in Bristol Bay
USFWS - Monitoring
Each summer, Bristol Bay, Alaska provides critical feeding and resting habitat for thousands of male Pacific walrus. From May through October, walrus congregate in the Bay and rest at terrestrial haulouts at Round Island, Cape Peirce, Cape Newenham, and Cape Seniavin. In 1999, the Service continued to participate in a cooperative program with the Alaska Department of Fish and Game to monitor the numbers of walrus using haulouts in Bristol Bay and to assess human impacts which might affect the use of these important haulout sites.

1999 marked the second year of haulout monitoring at Cape Seniavin located along the south shore of Bristol Bay on the Alaska Peninsula. This site has been surveyed infrequently and information on the number of walrus using the site has been limited. The haulout was monitored for 3 weeks in July by a Service biologist and a student intern sponsored by the Bristol Bay Native Association. As many as 1, 800 animals hauled out at the Cape during the monitoring period. The haulout at Cape Seniavin does not have the protection that the haulouts at Round Island and on the Togiak National Wildlife Refuge do, and the monitors observed several instances of human caused disturbances which flushed animals from the haulout. A report summarizing the results of haulout monitoring at Cape Seniavin is available upon request (write

to: U.S. Fish and Wildlife Service, Marine Mammals Management, 1011 East Tudor Road, Anchorage, AK 99503).

USGS - Analysis
Walruses in Bristol Bay have been counted daily during summer months at Round Island and Cape Peirce by USFWS and ADFG since early 1980's. A detailed analysis of these data to estimate the annual mean and variance in herd sizes at these haulouts has not been conducted. Initial efforts at modeling these data to determine an appropriate estimator was completed recently by USGS (Udevitz 1999). Simulations suggest that an index derived from mean annual counts is a more sensitive index of trend than a simple parametric model-based index or the currently used index based on maximum annual counts. When electronic files are available for the entire Bristol Bay data set, a more detailed analysis can be conducted with trends analysis and recommendations for future monitoring design.

Although these data are useful to monitor male walrus occupation in Bristol Bay during summer, it is unknown whether observed trends in Bristol Bay reflect trends in the overall population due to unknown interannual movement patterns of male walruses between haulouts in Russia and the U.S., and unknown relationships between the status of male summering populations and the status of the overall population. It is unlikely that these patterns and relationships will be known in the near future, so presently these monitoring efforts should be viewed as a means of detecting inter-annual changes in the occupation of the main haulouts in the Bristol Bay region only.

Completion date: yearend 2000.

Telemetry studies
USGS
Over the past five years, transmitters of various designs (both satellite and VHF) have been deployed on more than 50 male walruses in Bristol Bay. In addition, time-depth-recorders (TDRs) were deployed and recovered from 5 animals in 1997. These efforts were aimed at investigating movement patterns, site fidelity, and diving behavior of walrus in the Bristol Bay area with the anticipation that telemetry studies will be extended to female walruses occupying ice habitats. Telemetry will be a necessary component of population surveys and disturbance studies.

During this work, animals were tracked for periods of usually several months. Transmitter failures precluded tracking for longer periods, however beginning in 1998, 2 animals were tracked for over a year. TDR data have been used to estimate the proportion of time spent in water for several male walrus. Although TDR data have provided valuable information on the dive behavior of male walruses in Bristol Bay, the ability to recover similar devices from female walruses in ice habitats will be much more challenging.

The chemical immobilization of walruses is necessary to deploy telemetry devices and collect biological samples from live animals. Past methods of walrus immobilization have been sub-optimal and continues to be a significant impediment. We are making a concerted effort to improve these methods but progress is slow because of a lack of understanding of marine

mammal pharmacology, particularly walrus.

Completion of Bristol Bay telemetry analysis: yearend 2000.
Female walrus telemetry studies: initiate summer 2000 (?).
Chemical immobilization investigations: ongoing through 2001.

Aerial Survey of Pacific Walrus Population (Workshop proposal)

USGS and USFWS

USGS and USFWS are attempting to re-vitalize efforts to obtain estimates of the size of the Pacific walrus population. The most recent abundance estimate is almost 10 years old. There are indications that the population began to decline from its most recent peak in the 1980's (Fay et al. 1998) and we recognize the need to obtain updated abundance information. The lack of sufficient precision and reliability in the estimates from fall surveys conducted in the past (1975, 1980, 1985, and 1990; Hills and Gilbert 1994, Gilbert 1999) has prompted us to re-visit the question of how best to obtain point estimates and track trends in walrus abundance.

Surveying the walrus population is a difficult task largely because of the animal's contagious distribution over vast areas of ice and shoreline. Considerations for conducting a survey include determining the best time of year to survey, making simultaneous counts of animals on land and ice, determining correction factors for animals in water, and accurately counting walruses in large groups. We propose to convene a workshop to openly discuss the options and merits of different survey scenarios. The purpose of the workshop will be to recommend whether an aerial survey should be undertaken, and if so, at what time of year and what pilot studies should be considered.

Before convening the workshop, we will provide background information on the distribution of walrus during previous fall and spring surveys, and ice and weather conditions over the past 15-20 years. Walrus survey data are available from four fall surveys conducted in the Chukchi Sea between 1975 and 1990, and two spring surveys conducted in the Bering Sea in 1976 and 1987. These data will be used to estimate means and variances of number of individuals per transect unit, number of groups per transect unit, and number of individuals per group. These variance estimates will be used as a basis for power analyses to estimate the amount of effort (length of transects) required to estimate walrus density with varying degrees of precision in each season. Data from the National Ice Center will be used to estimate the mean and variance of the potential study area (unconsolidated ice). Data from the National Weather Service will be used to estimate the number of suitable periods, and number of days per suitable period, with acceptable flying conditions during potential survey periods.

Summary of data and convene workshop: winter 2000.

Walrus Productivity and Survivorship

USFWS

In July 1999, researchers from the University of Alaska led a scientific cruise through the pack ice of the Chukchi Sea on board the GreenPeace vessel *Arctic Sunrise*. The objective of the

study was to visually sample the age-sex composition of free ranging walrus herds to investigate productivity and juvenile survival rates. Preliminary results indicated a lower than expected number of calves of the year. Only 16% of the adult females encountered were accompanied by calves of the year. The number of yearling and two year old animals encountered was also lower than expected, suggesting that productivity and/or juvenile survivorship has been low for the past several years. This is consistent with anecdotal reports from walrus hunters who have observed fewer calves over the past few years. The Service has contacted the U.S. Coast Guard Arctic Icebreaker Coordinating Committee to express interest in doing similar walrus surveys from the *USCGC Healy* in the year 2001.

Genetic and Morphological Investigations of Pacific Walrus (Cooperative Study)
USGS
Stock boundaries defined previously by historical distributions and morphology of walrus may not accurately reflect current boundaries because of past cycles in population reduction, recovery, and radiation. Furthermore, the premise for previously defined sub-populations were based on a small sample size and inadequate methods.

The University of Alaska Southeast and USGS have begun a cooperative study to identify discrete sub-populations of walrus based on cranial morphology and microsatellite DNA recovered from tissue, bones, and teeth. This study will provide current information on stock boundaries. It begins with a study of the Pacific walrus with the anticipation that similar work will be extended to regions of walrus distribution throughout the remaining Arctic Basin.

Completion date for Pacific walrus segment: yearend 2000.

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Alaska Scientific Review Group Meeting - ~~September~~ Oct 1999

SEA OTTER PROGRAM

USFWS, Marine Mammals Management
and
USGS, Biological Resources Division

CURRENT ISSUES:

Stock Assessment - Sea Otters

We have developed a memorandum of agreement with the Alaska Sea Otter and Steller Sea Lion Commission (TASSC) to review the information that formed the basis for the Service's proposed stock assessment and to obtain additional genetic information on the sea otter population. Based on this agreement, TASSC withdrew their formal request for an administrative review and it was agreed that a final determination on stock structure will be made by 1 March 2000. We are proceeding jointly with additional genetic analyses using nuclear DNA to supplement the existing mitochondrial DNA data. This study will include DNA samples from over 300 sea otters collected statewide, as well as existing DNA from previous work.

Results of previous research on sea otter stocks demonstrates population structuring within and among sub-species and populations of sea otters. Current differences likely reflect effects of limited gene flow both prior and subsequent to over exploitation. This prior research points to at least three stocks of sea otters in Alaska. Products include:

Bodkin, J. L., B.E. Ballachey and M. Cronin. 1992. Mitochondrial DNA and the conservation and management of sea otters. Research Information Bulletin No. 37. US Fish and Wildlife Service, Office of Information Transfer

Cronin, M.A., J.L. Bodkin, B.E. Ballachey, J.A. Estes, and J.C. Patton. 1996. Mitochondrial DNA variation among subspecies and populations of sea otters (Enhydra lutris). J. Mammalogy. 77(2):547-557.

Scribner, K.T., J.L. Bodkin, B.E. Ballachey, S.R. Fain, M.A. Cronin and M. Sanchez. 1997. Population and genetic studies of sea otter (*Enhydra lutris*): A review and interpretation of available data. Pages 197-208 *in* A.E. Dizon, S.J. Chivers, and W.F. Perrin, eds. Molecular genetics of marine mammals. Special Publication 3 by the Society for Marine Mammalogy. Allen Press

Bodkin, J.L., B.E. Ballachey, M.A. Cronin and K.T. Scribner. in press. Population demographics and genetic diversity in remnant and re-established populations of sea otters. Conservation Biology.

C. Gorbics and J.L. Bodkin. Stock identity of sea otters in Alaska. in press. Marine Mammal Science.

Population Declines in the Aleutian Archipelago

1. Need for a Survey of the Aleutian Archipelago

The Aleutian sea otter population has been experiencing severe declines in the central portion of the range and the magnitude and extent of this decline is unknown. This decline has been documented through various studies which are summarized below.

Twenty five islands on the Aleutian chain were surveyed in 1993/1994 for sea otter population numbers and subtidal community structure (Estes unpubl. data). At that time, most of the islands had long established otter populations which were at or near carrying capacity for sea otters (Estes and Duggins 1995). These islands had high numbers of otters, low urchin densities and dense, species rich kelp forests. At islands not at sea otter carrying capacity, Alaid, Nizki and Shemya, much of the subtidal community was still urchin barrens. At that time, it appeared that the sea otter population was rapidly growing and that the nearshore community structure would soon be changing to a kelp dominated system.

In 1997, seven of the 25 surveyed in 1993/94 islands were resurveyed (Estes 1997, Estes et al. 1998, Konar 1998); four for sea otter, sea urchin and algal community structure (Table 1) and three for only sea otter population size. At islands at carrying capacity, sea otter population size should have remained constant since they were at equilibrium. However, the populations declined between 65% and 70% since their initial survey. At islands not at carrying capacity, the sea otter populations were expected to increase because of the unlimited supply of urchins. However, otter populations crashed here also. Between 1994 and 1997, the decline at Alaid, Nizki, and Shemya averaged 66%. This decline in the sea otters populations has been attributed to predation by the killer whale, Orcinus orca (Estes et al. 1998).

Table 1. Sea otter population size for various years at the Semichi and Adak Island (*these numbers do not include dependent pups)

	YEAR		
	1987	**1994**	**1997**
Otter population size			
Alaid	0	201	61
Nizki	0	80	28
Shemya	0	109	39
Adak*	2240 (1980)	929 (1995)	688

Skiff surveys in 1999 at Adak and Amchitka suggest continued declines in sea otter abundance at these two islands. Concurrent, large scale declines in kelp abundance and increases in sea urchin densities are apparent. The magnitude and geographic extent of the decline are unknown.

The last survey of the entire archipelago for sea otters was completed in 1992. A current abundance estimate for sea otters is needed to assess the extent of the recent population decline and to develop management strategies to restore the population where feasible, while providing for continued subsistence uses of sea otters. *Funds for an aerial survey of the Aleutian archipelago are being provided by BRD to MMM, FWS. Additional support is necessary to expand the geographic scope of survey.*

Killer Whale Predation on Sea Otters/Lagoon Surveys:

A current theory on the sea otter population declines involves increased predation on sea otters by transient killer whales. On Adak Island, researchers noted that sea otter densities were relatively high in Clam Lagoon and had decreased precipitously outside the lagoon. Clam Lagoon is a shallow basin which killer whales cannot enter, therefore, the lagoon may serve as a refuge for sea otters, supporting the killer whale predation theory.

We collaborated with the Izembek National Wildlife Refuge this past summer to conduct an aerial survey of sea otter abundance in Izembek Lagoon. Historically, large numbers of sea otters have inhabited the lagoon with some seasonal variation pending sea ice coverage. This was a first step in assessing potential changes in sea otter abundance on the north Aleutian basin and to examine a lagoon that may serve as a refuge from orca predation.

SUBSISTENCE HARVEST MONITORING

According to the USFWS Marking, Tagging and Reporting Program, a total of 358 sea otters have been tagged thus far in 1999. This total includes 201 adult males; 50 adult females; and 72 adults of unknown sex. This also includes 5 male pups and 14 male subadults; 0 female pups and 15 female subadults; and 1 pup of unknown sex. Locations were otters were tagged include Cordova (54); Craig (76); Hydaburg (29); Juneau (3); Ketchikan (14); King Salmon (1); Klawock (4); Kodiak (10); Nelson Lagoon (1); Pelican (23); Sitka (40); Valdez (65); and Anchorage (38).

CO-MANAGEMENT: CURRENT PROJECTS

1. Sea Otter Biosampling Program (SOBP):

To date, approximately 55 Alaska native biosamplers throughout coastal villages have been trained in sea otter necropsy procedures. Tissue samples have been collected from over 300 animals statewide. The program has enabled the Service to monitor sea otter health throughout the state and has increased the local awareness of sea otter biology. Highlights of this program include:

Contaminants - A total of 56 otters from various locations throughout the state are being analyzed for organochlorines, including PCBs, and heavy metals. Analysis should be completed by the end of this year. In addition, liver samples from six sea otters have been analyzed for

butyltin residues. Preliminary information indicates elevated butyltin levels in otters from both Seward and Valdez, compared with those from more remote locations. We are currently seeking funding sources for additional sample analyses.

Diet analyses - Preliminary analyses of the stomach contents of over 300 sea otters collected state wide has been done. Processing was done with the help of a TASSC student intern. Detailed analyses of the food contents is forthcoming.

Parasites - Through examination of the intestinal tracts of sea otters sampled, we have assembled an inventory of common parasites in Alaska sea otters. Interesting results of sea otter mortalities found this winter in the Cordova and Seward harbor was the appearance of the anisakid nematode, *Pseudoterranova decipiens*. This parasite is not commonly found in the sea otters in Alaska, however, was most recently found among the otters involved in the winter of 1995/96 mortality event in Cordova. Having the biosampling program in place provided an increased opportunity to monitor such events.

Population Structure of the Harvest - We are still compiling information on the ages of sea otters through the collection of the premolar tooth. We have age estimations for approximately 4,000 sea otters whose teeth were collected through the SOBP and MTRP (Marking, Tagging and Reporting) Programs.

2. Beach-cast Carcass Surveys:

In several communities, annual sea otter carcass surveys are being done by local native residents to assess seasonal mortality. The communities of False Pass, Cordova and Sitka have had ongoing survey programs since 1997. The communities of Port Heiden and Unalaska have started their programs this year.

3. Small Boat Surveys:

Alaska native residents of several coastal communities have been trained in methods for doing local sea otter population surveys. To date, the communities of Port Graham, Nanwalek, Larsen Bay, False Pass, Cordova, Yakutat, Sitka, and Unalaska have participated in the program. This program provides an opportunity to accumulate local population trend information.

4. Traditional Knowledge:

An important information source is the traditional knowledge of residents throughout the Alaska native communities. The Sitka Marine Mammal Commission recently published a local knowledge survey on sea otter distribution in Southeast Alaska. A second effort has recently been initiated in False Pass, Alaska and involves documentation of the observations of local residents regarding past and current interactions between killer whales and sea otters.

5. Killer Whale Photo Identification:

In an effort to explore the theory of killer whale predation on the sea otter population in the Aleutian Islands, training in photo identification methods of killer whale identification was initiated. The objective of this training is to have local residents help in the documentation of transient killer whales in areas of potential sea otter conflict. Although training efforts got off to a slow start due to the absence of killer whales, interaction in the community was beneficial in developing local participation for information exchanges.

POPULATION ASSESSMENTS:

1. Aleutian Archipelago (see summary under Current Issues)

2. Prince William Sound (USGS/BRD)

An increase of > 800 sea otters was observed in WPWS between 1993 and 1998. However, in the area of northern Knight Island, where oil exposure and sea otter mortality in 1989 was high, approaching 90% in some areas, no increase has been observed since 1993. Sea otter reproduction between 1996 and 1998 did not appear to be impaired. Based on 1997-1999 recaptures of previously marked animals, retention of marked animals at Knight is lower than at an unoiled site at Montague Island, suggesting either higher mortality and/or emigration. At northern Knight Island we captured more males, which is consistent with immigration contributing to recruitment, and more younger animals of both sexes than at Montague, which is consistent with intrinsic reproduction and immigration contributing to recruitment. We studied continued oil exposure and food limitation as potential causes for the lack of increase in abundance of sea otters at Knight. We measured significantly higher levels of cytochrome P4501A, a biomarker of oil exposure, in sea otters from Knight Island compared to Montague, although levels at Knight declined during the period of study. Sea otters foraged more successfully at Knight and young female sea otters were in better condition than otters at Montague. We detected significant increases in sea otter abundance at Montague, while food availability was not significantly different between areas, a finding inconsistent with food as the factor limiting recovery. We conclude that sea otters in Western Prince William Sound overall are recovering, but that recovery processes in areas where initial oil effects were greatest may be constrained by residual spill effects Additional constraints to recovery likely include forms of predation, that may be independent of the oil spill. It also appears that recovery of depleted sea otter populations occurs more from intrinsic mechanisms, such as reproduction and juvenile dispersal, as opposed to broad scale redistribution of animals from outside affected areas.

It is evident from both the genetic assessment studies and studies in PWS that harvest models should consider stock specific population models and further that growth rates observed in recovering populations where resources are not limiting may not be appropriate for populations where resources are limiting. Products include:

Bodkin, J.L., A.M. Burdin and D.A. Ryzanov. in press. Age and sex specific mortality and population structure in sea otters. Marine Mammal Science.

Bodkin, J.L.,B.E.Ballachey, T.A. Dean, A. K. Fukuyama, S. C. Jewett, L. McDonald, D. H. Monson, C. O'Clair, G. R. VanBlaricom. Sea otter population recovery in Prince William Sound following the *Exxon Valdez* oil spill: progress, process and constraints.

OTHER RESEARCH:

Time activity budgets of sea otters estimated from time-depth-recorders - Ongoing (Copies of products available from J.L Bodkin, USG/BRD)

In 1999, 14 of 20 available implanted TDR's were recovered from otters in SE AK. Preliminary data analysis indicates relatively unbiased measures of activity budgets are provided by this technology that will be valuable in real-time or recent population assessment.

A model integrating foraging observations (success, prey type and size), measures of prey energy content and sea otter energy requirements has been developed to estimate foraging activity budgets. The model has been tested with empirical time budgets at Amchitka with similar outputs.

FUTURE NEEDS:

1. Aleutian Archipelago: Need for a Comprehensive Survey (see Current Issues)

2. Southeast Alaska: Need for a Current Abundance Estimate

Since translocation of sea otters, the population has grown at a rapid rate (estimated to be as high as 20% per year between years 1975 and 1988). Although native subsistence harvest is higher in Southeast Alaska than elsewhere, the expanding population offers competition for subsistence and commercial shell fisheries. The last survey conducted specifically for sea otters in Southeast Alaska was completed 1986-88. Information gaps include: a description of the age/sex composition of the population; age specific reproductive and mortality rates; and an accurate description of the sex and age of the harvested.

3. Monitoring of Population Recovery in Areas Affected by the Exxon Valdez Oil Spill

The current status of sea otter populations affected by the Exxon Valdez Oil Spill outside Prince William Sound are unknown. Although sea otter mortality was widespread along the Kenai Peninsula and Kodiak Archipelago, the current status of the sea otter populations in these areas are unknown. The Kenai Peninsula was last surveyed in 1989 (DeGange et al. 1994) using line and strip protocols from a helicopter. The Kodiak Archipelago was also surveyed in 1989 using the same helicopter method, and again in 1994 using the fixed wing method developed by Bodkin and Udevitz (the surveys were comparable, however, since both corrected for undetected otters). A survey of these areas is necessary to update information on the current distribution and abundance of sea otters, and to determine if recovery has in fact occurred.

4. Population Assessment of Sea Otters in Lower Cook Inlet

Sea otters were surveyed in conjunction with marine birds of Lower Cook Inlet during the summer of 1993 and the winter of 1994 (OCS Study MMS 94-0063). These were small boat surveys of randomly placed transects throughout the Inlet. Although useful information on sea otters was obtained, a comprehensive aerial survey of the area using current sea otter survey

methodologies is needed. Prior to 1993, an assessment of the distribution and abundance of sea otters along the Kenai Peninsula, Kamishak Bay and the Kodiak Archipelago was done in 1976 (Schneider, 1976). In light of oil and gas exploration activities occurring in Lower Cook Inlet, a survey of this area is overdue.

10/7/99

ALASKA SCIENTIFIC REVIEW GROUP
US FISH AND WILDLIFE SERVICE
MARINE MAMMAL MANAGEMENT
OCTOBER 1999

POLAR BEARS

2. **Subsistence harvest monitoring:**

Statewide Harvest Program

The Marking, Tagging, and Reporting Program of the U.S. Fish and Wildlife Service (Service) continued to collected information from polar bears taken by Native hunters for subsistence purposes during the past year. Skulls and hides of polar bears harvested for subsistence purposes are tagged and basic biological information on the sex, age, date of kill, location of kill, hunter, and a variety of specimens are collected. The 1997/98 Alaska harvest was 57 bears comprised of 27 males, 21 females, and 9 sex unknown. The harvest was the second lowest since monitoring began in 1980. The relatively low harvest may be due in part to the late arrival of the pack ice near shore reducing the availability of bears to hunters.

Harvest occurred in 10 months of the year with approximately 50% of the kill occurring during December, January, and February. A reduced fall harvest was notable (8%) compared to 30% killed during the same period in 1996/97. The sex ratio of known-sex bears during the 1997/98 harvest season was 56% males and 43% females which reflects a slightly higher proportion of females harvested compared to the long-term average of 66% males to 34% females ratio.

Ages were obtained from 70% of the bears harvested during the 1996/97 season, an improvement from the 47% in 1995/96 season. The mean age for females (8.0 years, n=14) and males (5.1 years, n=14) in the harvest for the 1996/97 season was close to the long term average of 7.2 and 6.4 years, respectively. During 1996/97 adults comprised 47% of the harvest, subadults (18%), and cubs (36%). Manuscripts were developed on the genetic verification of sex of harvested polar bears (submitted to Wildlife Society Bulletin) and the comparison of sex and age characteristics of harvested polar bears to the population as known through mark and recapture programs (in prep).

Polar Bear Management Agreement, Southern Beaufort Sea

In 1997/98 Alaska villages of the North Slope party to the management agreement with the Inuvialuit harvested 24 polar bears; 13 males, 6 females and 5 of unknown sex. The harvest was substantially below the sustainable harvest guideline of 40 bears. The harvest represented 42% (24/57) of the total statewide harvest. The months of September (17%) and December (38%) accounted for the majority of the harvest. The harvest occurred during the prescribed season which extends from September 1 to May 31. A number of hunters took multiple bears: five hunters harvested two bears; and two individual hunters harvested 3 and 5 bears, respectively.

The sex composition of known-sex animals harvested was 67% male and 33% female. The mean age for females (n=6) and males (n=6) harvested during the 1996/97 season was 9.3 years and 5.67 years respectively (aging teeth requires ~ 1 year hence the delay in reporting). The ages of harvested female and male polar bears have remained relatively stable since 1980. The age class composition was 42% adults, 52% subadults, and 5% cubs. Complete sex and age information was obtained for 81% of the kill, an improvement over previous reporting rates. A manuscript regarding the effectiveness of the Inupiat-Inuvialuit polar bear agreement on conservation of polar bears in Alaska is in preparation.

The North Slope Borough and Inuvialuit Game Council meeting of Joint Commissioners and Technical Advisors was held on March 16-17, 1999 in Nome, Alaska. The Agreement was reviewed and revised and awaits public review in affected villages in both jurisdictions.

Polar Bear Bio-monitoring Program

The polar bear bio-monitoring program was conducted for the third year during the fall/winter 1998-99. In October, 1998 U.S. Fish and Wildlife biologists visited North Slope Borough villages to: 1) review the biological sampling protocol with polar bear hunters and MTRP taggers; 2) encourage participation in the contaminant sampling program; 3) assist in the collection; and 4) explain the need and rationale for collecting polar bear samples. Regular contact with residents assisting in the specimen collection and hunters is ongoing. Last fall, the pack ice remained far offshore in the Beaufort Sea until early November and thus fewer bears were present and available to hunters near shore. This is the third winter out of the last four years which the fall movement of the pack ice to the northern Alaskan coast has been delayed. However, numerous bears (45 on a single survey) were present during the fall 1998 along barrier islands and shoreline between Prudhoe Bay and the Canadian border.

Contaminant specimens from six adult males, 1 sub-adult male, and 2 adult females taken during the 1997/98 subsistence harvest have been analyzed for organochlorines and PCBs. In addition we have received results of analysis of trace heavy metals in liver, kidney, and muscle tissues from 10 males collected during the 1996/97 season. Organochlorine analysis has been conducted for 16 adult males, eight each from the Beaufort Sea population and the Chukchi/Bering seas population. Specimen material from an additional 10 animals is currently being analyzed.

Total PCBs (S-PCB ppm. wet weight) averaged 2.45 ppm (range 0.90-7.55 ppm). These levels were lower compared to Hudson Bay, Canada, and Svalbard, Norway, two areas which have some of the highest documented levels. The highest levels of S-PCB were found in one subadult from Point Lay (7.55 ppm) and two adults from Barrow (5.05 ppm and 5.01 ppm). Congeners 99, 153, 138, 180, 170, and 194 constituted approximately 92% of the S-PCB in the sample.

Mean levels of total HCH (S-HCH ppm wet weight) for the 16 bears recently analyzed was 0.79 which is similar to the high levels reported for the Chukchi and Bering Seas by Norstrom et al. 1996. Beta-HCH, the most persistent HCH isomer, constituted about 92% of the sum HCHs. The levels of S-HCH in the Chukchi and Bering Seas have some of the highest reported levels within the Arctic region. Suspected sources are from Asia, carried north via the Japanese current, and from Russian rivers to the north.

Analysis of methyl mercury will be done in January 1999 for specimens collected during 1996/97 and 1997/98 harvest seasons. We examined 19 trace elements in the muscle, livers, and kidneys of 16 adult male polar bears taken in northern and western Alaska. Several elements (Al, As, B, Ba, Be, Mo, Pb) were near the detection limit in all tissues. The preliminary results (n=11) indicate that Hg levels in Alaska polar bear livers (both population stocks combined) are lower than those reported for western Canada in 1986 and levels of Cd and Cu are somewhat higher.

3. Co-management

Alaska Nanuuq Commission

The Service provided Section 119 MMPA funds to the Alaska Nanuuq Commission (ANC) to support the following activities: conduct meetings of the Commission and Executive Committee; enhance communication between the Commission and Native villages; participate in meetings at the local/state/national/international level; development of a long-range strategic plan; coordinate with the Service regarding public information on the conservation and subsistence use of polar bears including school presentations on the cultural importance of polar bears and marine mammals; assist the Service in collecting harvest data and specimens; support development of a bilateral polar bear conservation agreement between the U.S. and Russia; and develop a polar bear conservation implementation agreement with Chukotka Natives. The Service is also providing technical assistance to the ANC in a study to collect traditional ecological knowledge of polar bear habitat use in Chukotka. This study is funded by the National Park Service.

The level of funding for co-operative work with the Alaska Nanuuq Commission has been below the Congressionally-authorized level and is insufficient to fully implement section 119 activities. (This is also true for Pacific walrus and sea otters.) Considerable interest from local and regional Native organizations exists for section 119 funding. Dividing the limited amount of funding among a greater number of organizations effectively hampers the ability to conduct useful and meaningful projects. The Service is considering recommending that Section 119 funds be permanently appropriated to the species commissions.

Bilateral Agreement

The U.S. and Russia have been working to develop a unified management and conservation program for the shared stock of polar bears occupying the Bering/Chukchi Seas. To this end, the U.S. and Russia signed the *U.S.-Russia Bilateral Agreement on the Conservation and Management of the Alaska-Chukotka Polar Bear Population* in February 1998. Final ratification of this Agreement is pending. Also a review by the Parties to the 1973 *Agreement on the Conservation of Polar Bears* will be necessary prior to ratification which is expected in the year 2000. Successful implementation of the Bilateral Agreement will require Native participation and completion of the Native-to-Native agreement.

Issues on the Horizon

Oil and Gas Development on the North Slope, Alaska

The increase in production facilities and exploration activities raises concerns about the cumulative impacts on polar bear habitat on the North Slope. New proposed production sites include several offshore units which increases the possibility of an oil spill in the marine environment. This concern may affect our ability to issue future incidental take regulations.

The level of development and lack of details concerning cumulative impacts and offshore operations in the arctic marine environment have added complexity to management decisions and evaluations of Environmental Impact Statements.

4. Population Assessment

The Service is responsible for development of sustainable harvest limits, monitoring the population, and preventing depletion of the population stocks. The U.S. Geological Survey (USGS) is responsible for research and development of techniques useful for application in management situations. Increasing expansion of oil and gas activities, global warming, contaminants, and hunting are potential threats to populations. Accurate population estimates are essential to meet these management goals. As such, population information is both a current issue and a future need.

Chukchi Sea

Our greatest need is for a statistically valid population estimate for the Chukchi/Bering seas population stock. This information is essential for the implementation of the U.S./Russia Bilateral Agreement as well as developing independent management prescriptions domestically. The population survey design that provides the most promise is helicopter surveys based from an ice breaker. Polar bear den surveys also offer promise in monitoring population trend. This winter, we will host a workshop with our Russian colleagues to finalize aerial den survey protocols, publish proceedings, and evaluate future efforts to census this population. Concurrently we are in contact with the US Coast Guard in efforts to participate and conduct aerial surveys from polar class icebreakers conducting operations in the Chukchi Sea region.

Southern Beaufort Sea

The last population estimate for the Beaufort Sea is based on mark/recapture data that is

over 10 years old. Enhanced understanding of factors effecting mark and recapture population data described below in points 1) and 3) point to the need for a new mark/recapture survey to be undertaken to update the status of this population.

Research

Ongoing USGS activities related to the stock assessment process for polar bears include: 1) efforts to improve population estimates in the southern Beaufort Sea region using new log-linear modeling of past mark and recapture data, 2) development of a matrix model to assess population growth, and 3) a new approach to defining stocks of polar bears occurring in Alaskan and adjacent waters. These ongoing projects emphasize that future work must focus on collection of new data to feed analytical procedures for estimation of population size. Descriptions of these projects follow.

1) Knowledge of population size and trend is necessary to manage anthropogenic risk factors such as hunting and development. Estimate numbers of Beaufort Sea polar bears by mark and recapture procedures have been conducted since 1967. Despite the capture of 1007 females over a period of 30 years, estimates of the size of this population have been unreliable-apparently because of heterogeneity with regard to the probability of capture. Although a principal assumption of traditional mark and recapture methods is that all animals in the population are homogeneous with regard to the probability of capture; our capture effort was not evenly distributed over the area occupied by this population. Sources of heterogeneity and their influence on estimates either were not known or uncontrollable. Whatever the case, the resulting capture heterogeneity among years, seasons, and individual bears led to previous estimates of $\hat{N}$ that fluctuated wildly among years (Figure 1), and previous estimates of $\hat{S}$ that ranged from levels too low to sustain populations to >1. In this study we are testing whether we can "model" those sources of heterogeneity. We have built logistic models incorporating a variety of covariates recorded in our data to explain the observed capture histories of each bear. Our first attempts at modeling variation showed significant promise. However, modeled trends still suggested impossibly large fluctuations in some years. By digging deeper into the unintuitive behavior of covariates we learned about characteristics of the data, which in combination with new insights derived from radio-telemetry data helped us create better covariates.

Attempts to estimate the size of the SBS population have been based upon the assumption that this population extended from west of Barrow to Amundsen Gulf (Amstrup et al., 1986; Amstrup and McDonald, in prep.). Radio telemetry data confirm that members of the SBS population do travel over this range (Amstrup et al., 1986; Amstrup, 1995, in press). However new analyses of movements (see 3 below) confirm that the probability of encounters with SBS bears in northwestern Alaska, relative to bears from other populations, is low. These analyses revealed a strong geographic component to variation in our model results. We anticipate completion of this model building process and submission of results for publication within the next year.

2) In a cooperative effort between USGS and USFWS biologists, we are modeling the female portion of the Southern Beaufort Sea polar bear stock with a Leslie transformation matrix using the best available life history and harvest data. Age-specific rates of reproduction and mean litter sizes were based on capture data. Age-specific survival rates were based on radio-telemetry. Harvest records from Alaska and Canada provided estimates of the size and composition of the harvest. We used the stable age population structure to start the model. We incorporated the annual variation and the measurement error inherent in the life history and harvest parameters by using bootstrapping and Monte Carlo methods to generate a set of parameters for each model year. In early runs of the model we ran 500 iterations of the stochastic model for 30 model years. We modeled perturbations to the population by removing

bears from the population in year zero. We also modeled latent population effects of a perturbation by depressing cub production and survival over a number of years following the initial perturbation. Preliminary runs indicated great potential for this model to help with stock management questions. This model has great flexibility to incorporate the range of existing data to allow prediction of growth rates and time necessary for recovery from major perturbations such as an oil spill. The ability of the model, however, like the mark and recovery analyses (see 1 above) and the movements analyses (see 3 below) is limited by available data on the population. Considerable development of this model is still necessary. We anticipate completion of said development, to the extent possible with existing data, during the next year.

3) Recognition that polar bears are shared by Canada and Alaska prompted development of the "Polar Bear Management Agreement for the Southern Beaufort Sea." Under the Agreement, the sustainable harvest of polar bears from the southern Beaufort Sea (SBS) region is shared between Inupiat hunters of Alaska and Inuvialuit hunters of Canada. The quota for each jurisdiction is reviewed annually, making use of the best available scientific information. In this paper, we introduce new radio-telemetry data on female polar bears and new analytical procedures we believe will improve the efficacy of the agreement. With a cluster analysis of radio-relocation data, we identified 4 relatively discrete groups, that we called populations: SBS, eastern and western Chukchi Sea (ECS and WCS) and northern Beaufort Sea (NBS)(Table 4). We constructed a grid over the study area that extended from Wrangel Island in Russia to Banks Island in Canada, and used kernel smoothing to estimate the probability that bears from each population occurred in each cell of the grid. Then we calculated relative probabilities of occurrence for members of each population in each cell. Standard errors of the relative probabilities were computed using bootstrap methods. We found that availability of polar bears from each population varied greatly across the coast of Alaska and northwest Canada. This discovery allowed us to develop better covariates in our population models (see 1 above), and points out how takes and other impacts on polar bear populations might be better managed in the future. For example, harvests in the vicinity of Barrow are comprised of 12-20% SBS bears with most of the remainder being ECS bears. Kaktovik hunters have access to 95-97% SBS bears. Bears taken near Baillie Island are 21%-25% SBS with most of the remaining harvest apparently coming from the NBS population. This new analytical approach is more objective than previous presentations of animal movements data, and is providing previously unavailable insights into the distribution patterns of polar bears. These analyses also highlight two important deficiencies in our data. First, it is clear that small sample sizes, particularly in the eastern portion of the study area, limit our ability to predict proportional availability there. Second, the weaknesses in our estimates of population size limit our ability to convert calculated probabilities of occurrence into numerical management targets.

Future Needs

The need to understand movements and distribution patterns of polar bears in Alaska resulted in major radio-telemetry efforts during the last decade and a half. These efforts have provided critical insights into the nature of polar bear populations in this part of the world. Those telemetry efforts, however, diluted efforts to collect population dynamics data. Our subsequent attempts to estimate size and trend of populations as well as our attempts to model growth and recovery rates are critically limited by the dearth of necessary population data. Hence, it is increasingly clear that we need better population data for Alaska's polar bears. Although there is currently no formal proposal for new projects on population size estimation, we firmly believe that is what is necessary to adequately address questions related to status of our stocks of polar bears.

Any such effort will require international cooperation. Also, because of differing logistical constraints in different parts of the polar bear range, a combination of mark and recapture and aerial survey approaches will likely be necessary to meet our needs.

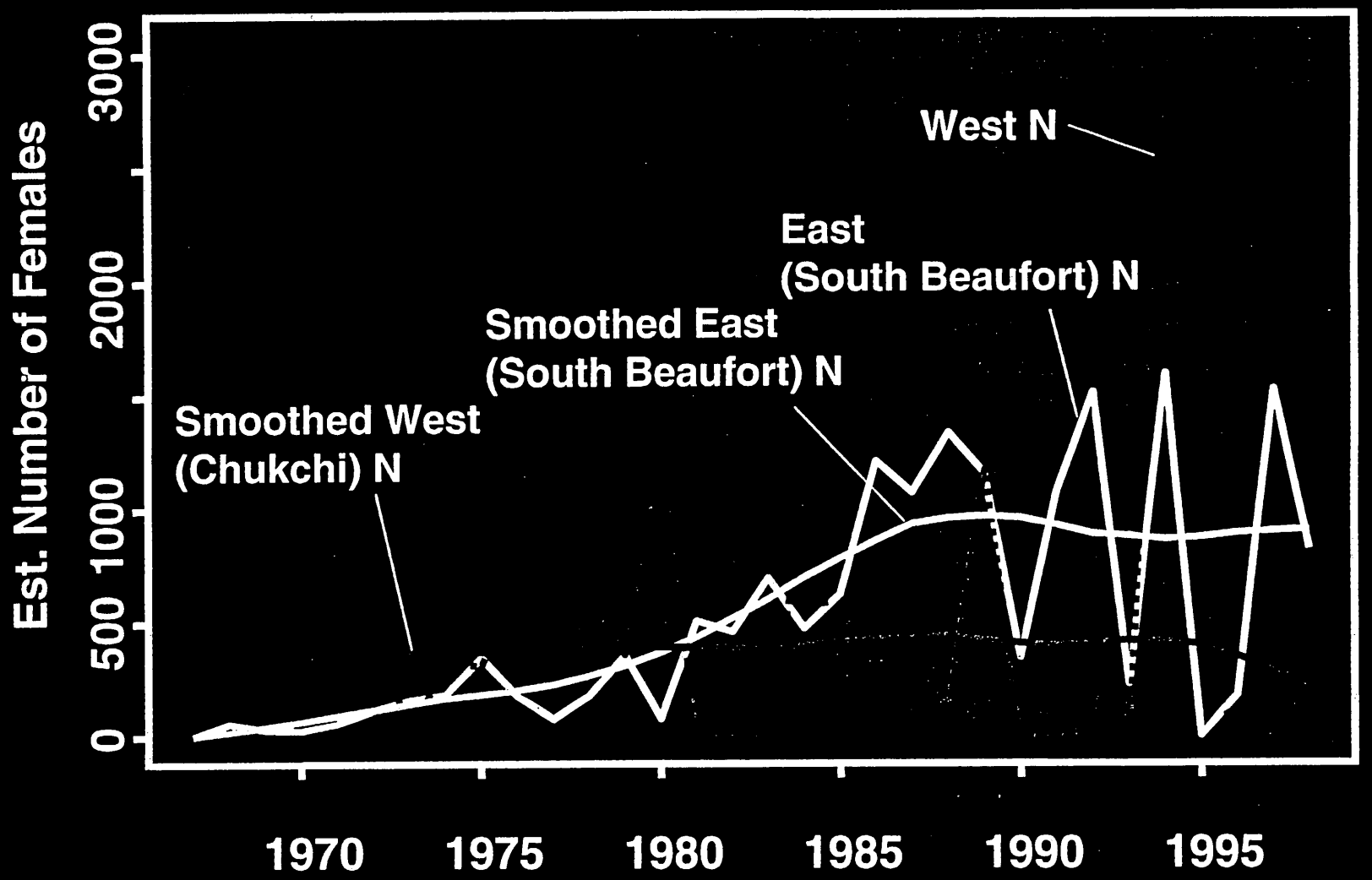

Figure 1. Numbers of female polar bears estimated for the southern Beaufort Sea region. Note that irregular capture effort in the western, Chukchi Sea, portion of the study area in most years after 1980 resulted in widely fluctuating estimates for that component of the population. Also note that low estimates in 1990, 93, 95 and 96 were due to lack of field efforts in those years.

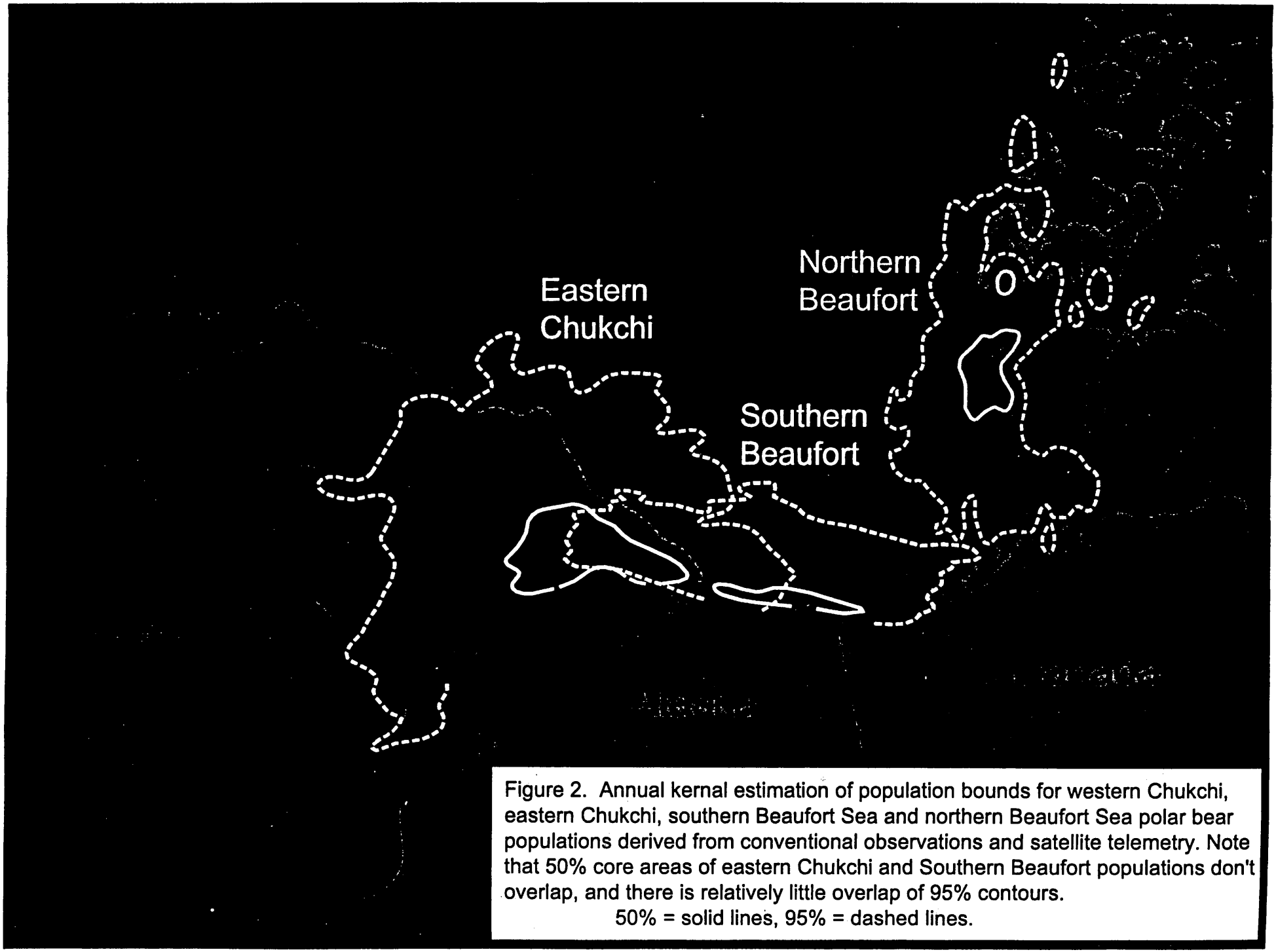

Figure 2. Annual kernal estimation of population bounds for western Chukchi, eastern Chukchi, southern Beaufort Sea and northern Beaufort Sea polar bear populations derived from conventional observations and satellite telemetry. Note that 50% core areas of eastern Chukchi and Southern Beaufort populations don't overlap, and there is relatively little overlap of 95% contours.

50% = solid lines, 95% = dashed lines.