



MARINE MAMMAL COMMISSION

9 January 2013

Mr. P. Michael Payne, Chief
Permits and Conservation Division
National Marine Fisheries Service
Office of Protected Resources
1315 East-West Highway, Room 13635
Silver Spring, MD 20910

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the 8 June 2012 application submitted by Apache Alaska Corporation (Apache) seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment incidental to a 3D seismic survey in Cook Inlet, Alaska. The Commission also has reviewed the National Marine Fisheries Service's 10 December 2012 notice (77 Fed. Reg. 73434) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions. The Commission reviewed a similar application from Apache in 2011 for an incidental harassment authorization associated with a proposed seismic survey in Cook Inlet (see the enclosed 21 October 2011 letter) and provided a number of recommendations, several of which are reiterated here.

RECOMMENDATIONS

Based on its review of the information provided, the Marine Mammal Commission recommends that the National Marine Fisheries Service defer issuance of the proposed incidental harassment authorization until such time as the Service can, with reasonable confidence, support a conclusion that the proposed activities would affect no more than a small number of Cook Inlet beluga whales and have no more than a negligible impact on the population.

However, if the National Marine Fisheries Service decides to consider further the requested authorization notwithstanding possible significant impacts to the Cook Inlet population of beluga whales, the Marine Mammal Commission recommends that the National Marine Fisheries Service—

- refrain from taking additional action on the proposed incidental harassment authorization until it has received and reviewed more specific information concerning the location and timing of the applicant's proposed activities;
- require that Apache (1) not conduct seismic activities in the inlet until after May and (2) use aerial surveys or other means to confirm that the majority of beluga whales have moved out of the proposed survey area before initiating those activities;

- explain how it accounted for the effects of the proposed surveys in the context of all the other risk factors that are or may be affecting this population and inhibiting its recovery;
- encourage Apache to use and expand data-sharing agreements with other entities to maximize the utility of seismic data and minimize the number and impacts of new seismic studies;
- correct the estimated distance to the 190-dB re 1 μ Pa threshold for the offshore surveys to 0.18 km;
- require that Apache either amend its application to seek authorization for the maximum numbers of marine mammals that may be taken or provide sufficient and consistent justification for requesting lesser numbers of takes, particularly of beluga whales, harbor porpoises, and harbor seals;
- include harbor porpoises as one of the species for which implementation of delay and shut-down procedures are required when observers detect aggregations of five or more animals approaching or within the 160-dB re 1 μ Pa disturbance zone;
- ensure that the monitoring measures included in the authorization are sufficient to account for all takes of marine mammals and require Apache to provide timely reports of the numbers of marine mammals taken so that, if necessary, surveys can be stopped before the authorized takes are exceeded—the measures used should account not only for the marine mammals observed, but also those animals that are present but not observed; and
- provide a 30-day public review and comment period that starts with the publication of notices in the printed edition of the *Federal Register*.

RATIONALE

Apache has oil and gas leases throughout Cook Inlet, Alaska, and proposes to conduct phased 3D seismic surveys during the next three to five years. It conducted a similar survey in the same general area within Cook Inlet in 2012. For the proposed survey, Apache would use two survey vessels, each equipped with a 2,400-in³ airgun array. Other survey equipment would include a 440-in³ airgun array, a 10-in³ airgun, a 33 to 55-kHz ultra-short baseline transceiver, and a 35 to 50-kHz lightweight release ultra-short baseline transponder. In addition, Apache plans to detonate 4 kg of Orica OSX pentolite explosives onshore to acquire additional data. It would use bottom-mounted, cableless hydrophones to collect all seismic data. Apache has not identified the specific sites (comprising 1,010 km²) it will survey within the project area (4,882 km²). The project area includes intertidal and offshore areas along the east coast of the inlet from just south of Anchor Point to Point Possession and along the west coast from the MacArthur River to the Beluga River. Water depths would range from zero to 128 m. Although Apache indicated it would begin conducting offshore/intertidal zone surveys in March 2013 and nearshore surveys in April, it may begin activities as early as January 2013. Apache estimated the survey would last a total of 160 days—100 survey days in offshore/intertidal waters and 60 survey days in nearshore waters.

The Service preliminarily has determined that the proposed activities could modify temporarily the behavior of small numbers of up to five species of marine mammals, but that the

total taking would have a negligible impact on the affected species or stocks. The Service does not anticipate any take of marine mammals by death or serious injury. It believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of Apache's proposed mitigation and monitoring measures, as well as additional measures proposed by the Service, which include—

- (1) using vessel- and shore-based observers to monitor the 190- and 180-dB re 1 μ Pa safety zones and the 160-dB re 1 μ Pa disturbance zone (a) during all daylight periods when airguns are operating, (b) for a minimum of 30 minutes prior to ramp-up of airguns, and (c) during most daylight periods when airguns are not operating;
- (2) using standard ramp-up, delay, power-down, and shut-down procedures to prevent takes of marine mammals within the safety zones;
- (3) prohibiting ramp-up of airguns during nighttime operations after an extended shut-down (i.e., when airguns are not operating for at least 10 minutes);
- (4) implementing additional delay and shut-down procedures when beluga whale cow-calf pairs or aggregations of five or more beluga or killer whales are observed approaching or within the disturbance zone;
- (5) using aerial observers to monitor the safety and disturbance zones for beluga whales prior to commencement of airgun operations near a river mouth;
- (6) limiting aerial surveys to an altitude of 305 m or greater at all times and to a radial distance of 457 m or greater when marine mammals are present (except during takeoff, landing, or an emergency situation);
- (7) using passive acoustic devices to monitor for marine mammals;
- (8) reducing vessel speed and avoiding multiple changes in direction and speed within 274 m of whales, altering course (if possible) to steer around groups of whales and to avoid separating members of a group, and adjusting speed and direction in poor visibility conditions to avoid the likelihood of injury to whales;
- (9) reporting injured and dead marine mammals to the Service and local stranding network using the Service's phased approach and suspending activities, if appropriate; and
- (10) submitting field and technical reports and a final comprehensive report to the Service.

Status of the Cook Inlet beluga whale population and its tolerance for additional disturbance

The Cook Inlet beluga whale population was listed as endangered under the Endangered Species Act in October 2008 (73 Fed. Reg. 62919) and was designated as depleted under the Marine Mammal Protection Act in 2000. The proposed seismic survey would occur within the home range of the Cook Inlet beluga whale (Hobbs et al. 2005) in an area that the Service designated as critical habitat in 2011 (76 Fed. Reg. 20180). Although harbor porpoises, harbor seals, killer whales, and Steller sea lions also occur in the project area, the Service has determined, and the Commission agrees, that any impact on those species from the proposed seismic surveys likely would be negligible. Therefore, the following recommendations and rationale focus primarily on Cook Inlet beluga whales.

Stock assessment reports indicate the Cook Inlet population of beluga whales is not recovering. The population declined precipitously during the 1990s, primarily from overharvesting, and was expected to rebound after subsistence hunting was brought under control. Since 1999, subsistence hunters reportedly have taken only five whales. However, the most recent abundance estimate from 2012 was 312 animals and the average abundance estimate from 2009 to 2012 was 314 animals.¹ Between 2001 and 2011 the population declined at an average rate of 1.1 percent per year (Hobbs et al. 2011), and Service projections indicate an 80 percent chance of continued decline (Hobbs and Sheldon 2008). A preliminary analysis of calving rates from 2006 to 2010 indicated that they are likely at or below the replacement rates needed for population growth (Hobbs et al. 2012). Information regarding this population's ecology, life history, and reproductive potential is limited and factors adversely affecting the population and its habitat have yet to be determined and their effects described. All things considered, the population is clearly endangered and its future precarious.

Even in cases such as this, the Marine Mammal Protection Act allows the authorization of incidental taking if it involves "small numbers of marine mammals of a species or population stock" and has no more than a negligible impact on such species or stock. The courts have ruled that "small numbers" and "negligible impact" are not synonymous and the former cannot be defined on the basis of the latter—that is, they are separate standards. Defining these terms is particularly difficult in a case like this because the population has been declining and is likely to continue declining even in the absence of any influence from the proposed activity. Thus, the population appears to have no tolerance for added impacts or losses.

In light of the continued decline of the Cook Inlet beluga whale population, the Commission believes that the proposed seismic activities, when added to the existing baseline, pose significant risks to the population. To avoid those risks, the Marine Mammal Commission recommends that the National Marine Fisheries Service defer issuance of the proposed incidental harassment authorization until such time as the Service can, with reasonable confidence, support a conclusion that the proposed activities would affect no more than a small number of Cook Inlet beluga whales and have no more than a negligible impact on the population. If the National Marine Fisheries Service decides to issue the requested authorization, notwithstanding the Commission's recommendation and the possible significant impacts on the Cook Inlet beluga population, then the Commission makes the following additional recommendations to highlight other concerns with Apache's application and the Service's analysis of it.

Time-area restrictions

Apache is proposing to conduct seismic activities at unspecified locations within about 4,882 km² of intertidal and offshore areas, much of which is part of the whales' designated critical habitat—an area much larger than originally proposed for its second year of seismic activities and well beyond the boundaries of the leases it currently holds (Figure 2 of the application). Although the application states that only 1,010 km² of this larger area will be surveyed, it does not provide further details regarding what specific sites within the proposed

¹ <http://alaskafisheries.noaa.gov/newsreleases/2013/cibelugapop2012.htm>

survey area will, in fact, be surveyed and when. Because beluga whales use different parts of the proposed survey area at different times of the year (Hobbs et al. 2005) and for different purposes, the potential impact of the proposed activities could vary, perhaps substantially, depending on their precise location and timing. To assess the potential impacts of Apache's activities on beluga whales more reliably and to enable it to make and support a negligible impact determination, the Service should insist on greater specificity from the applicant regarding where and when the proposed seismic activities will occur. As written, the application is too vague to allow the Service and other reviewers to assess accurately the likely impacts of the planned seismic surveys on beluga whales.

The Service considered time–area restrictions for the proposed activities but concluded that such restrictions were not necessary or practicable. The Commission disagrees. Section 101(a)(5)(D)(ii)(I) of the Marine Mammal Protection Act requires that the Service specify the permissible methods of taking and identify means of effecting the least practicable impact to marine mammal species and stocks. Clearly, one way to satisfy the Act's "least practicable impact" requirement would be to restrict the times and areas in which Apache is authorized to conduct its proposed seismic activities. Without more information, it is not clear that Apache would be conducting its activities with the least practicable impact. That being the case, the Marine Mammal Commission recommends that the National Marine Fisheries Service refrain from taking further action on the proposed incidental harassment authorization until it has received and reviewed more specific information concerning the location and timing of the applicant's proposed activities.

Although their range has contracted over time (Rugh et al. 2010), whales likely would use the proposed survey area throughout the duration of the survey, as documented by Apache's monitoring of the same general areas during its 2012 seismic survey (www.nmfs.noaa.gov/pr/permits/incidental.htm). That survey occurred from May through September, when the whales tend to concentrate in rivers and bays of the upper inlet. Initiating the survey earlier in February or March in the middle inlet raises concerns because that area provides winter habitat for the whales (76 Fed. Reg. 63084). Tagging studies by Hobbs et al. (2005) indicated that beluga whales tend to occur offshore but may be broadly distributed throughout the upper and middle inlet during winter months (October through March). Thus, conducting the survey during the late winter would increase the probability of interacting with beluga whales in the proposed survey area. Therefore, the Marine Mammal Commission recommends that, if it is to issue this authorization, the National Marine Fisheries Service require that Apache (1) not conduct seismic activities in the inlet until after May and (2) use aerial surveys or other means to confirm that the majority of beluga whales have moved out of the proposed survey area before initiating those activities.

Cumulative effects

Apache has requested and the Service has proposed to issue an authorization for taking by Level B harassment up to 30 beluga whales (about 10 percent of the population). The vulnerability of the whales to these takes will depend, in part, on the extent to which they are being affected by other human activities. The proposed seismic activities would occur largely

within the whales' designated critical habitat (76 Fed. Reg. 20180) and could displace animals from resting and foraging areas, especially in late winter and early spring. Repeated exposure of whales to seismic activities and continued avoidance of the project area could have long-term population-level effects on reproduction and survival. Those effects could be exacerbated by other risk factors in the inlet, such as vessel traffic, coastal development, contamination from industrial activities, introduction of other human-caused sound into the inlet, military operations, competition with fisheries for prey, habitat modification, discharge of municipal wastes, and urban runoff. The National Marine Fisheries Service (2003) concluded that "a significant part of the habitat for this species has been modified by municipal, industrial, and recreational activities in Cook Inlet." Furthermore, a number of oil and gas and construction activities are ongoing or are being planned for Cook Inlet during the period for which this incidental harassment authorization is being sought. Some of those activities have the potential to alter the whales' physical habitat in the inlet. Neither the application nor the Service's *Federal Register* notice provide a substantive discussion regarding the potential cumulative impacts of human activities on the beluga whale population. For that reason, the Commission is unable to determine if or how the Service considered those impacts in its analysis and proposed negligible impact determination. Therefore, the Marine Mammal Commission recommends that, if it is to issue this authorization, the National Marine Fisheries Service explain how it accounted for the effects of the proposed surveys in the context of all the other risk factors that are or may be affecting this population and inhibiting its recovery.

Data sharing

One additional measure for reducing total seismic activity—and thus, the impact of the proposed activities on marine mammals—is through expanded use of data sharing agreements. In its application, Apache notes that it may be able to limit the area that it will survey based on the "seismic imaging of leases held by other entities [*sic*] with whom Apache has agreements (e.g., data sharing)." If indeed Apache has, or can negotiate, data sharing agreements with other entities such that existing or new seismic data can be shared, the area that would be subject to additional seismic activity can be reduced, perhaps significantly. The Marine Mammal Commission therefore recommends that the National Marine Fisheries Service encourage Apache to use and expand data-sharing agreements with other entities to maximize the utility of seismic data and minimize the number and impacts of new seismic studies.

Estimated distance to the 190-dB re 1 μ Pa threshold

Table 2 of the Service's *Federal Register* notice estimates the maximum distance to the 190-dB re 1 μ Pa threshold for the channel (offshore) surveys to be 0.18 km. However, Table 4 of the notice estimated the distance to the 190-dB re 1 μ Pa threshold for the 2,400 in³ airgun in offshore waters to be 1.18 km. Presumably, the correct distance is 0.18 km, not 1.18 km. The Service made the same error in its final incidental harassment authorization issued for Apache's 2012 survey (Table 1, 77 Fed. Reg. 27720). The Marine Mammal Commission recommends that the National Marine Fisheries Service correct the estimated distance to the 190-dB re 1 μ Pa threshold for the offshore surveys to 0.18 km.

Uncertainty in the requested numbers of marine mammal takes

Apache estimated a maximum and average number of takes for beluga whales but requested a number of takes less than either of those (see Table 1 below). It stated that it would reduce the actual number of takes based on its visual and acoustic monitoring measures and the actual number of survey days at river mouths being much less than the 160 days used to estimate numbers of takes. Although that may be the case, Apache proposed beginning the 2013 survey in late winter when belugas are expected to be in offshore waters close to the proposed survey area.

Table 1. Estimated and requested numbers of takes for the five species expected to occur in the proposed survey area. (Summarized from Tables 6 and 7 of the *Federal Register* notice)

	Maximum estimated takes	Average estimated takes	Requested numbers of takes
Beluga whales	82.1	32.6	30
Harbor porpoises	115.2	4.0	20
Killer whales	7.2	1.0	10
Harbor seals	414	203.8	200
Steller sea lions	22.5	7.4	20

For the harbor porpoises and killer whale, Apache stated that the estimated numbers of takes were reasonable but that the actual numbers of takes would be less. However, it then requested takes exceeding both the maximum and average estimates for killer whales (10 takes vs. 7.2 and 1 takes, respectively; Table 1), and more takes than the average but fewer than the maximum for harbor porpoises (20 takes vs. 4 and 115, respectively). The basis for those inconsistencies is not clear. For pinnipeds, Apache indicated that the actual numbers of takes are expected to be much less than the average and maximum numbers of takes because (1) there are no known haul-out sites in the proposed survey area and (2) the estimated numbers of takes are skewed upwards because the density estimates are based on the numbers of animals observed at large haul-out sites outside of the proposed survey area. Accordingly, for harbor seals, Apache requested fewer takes than the maximum and average estimated numbers of takes, but for Steller sea lions it requested slightly less takes than the maximum and more than the average (20 takes vs. 22.5 and 7.4 takes, respectively; Table 1). Here, too, the Commission considers the approach used by Apache to be inconsistent and, therefore, questionable if not unreliable. Either a new approach is needed for estimating takes or the Service should require Apache to explain the inconsistencies.

In this regard, it is worth noting that both the estimated maximum and average numbers of takes for three species (beluga whales, harbor porpoises, and harbor seals) are greater for the 2013 season than they were for the 2012 season. In addition, monitoring reports for 2012 indicated that the numbers of animals sighted by protected species observers exceeded the estimated average numbers of takes for those same three species for 2013. Despite the greater number of estimated takes for 2013 and the large numbers of actual sightings during the 2012 survey, the Service has proposed to authorize the same numbers of takes for beluga whales and harbor porpoises in 2013 as were requested in 2012 and a greater number of takes for harbor

seals. To address these inconsistencies, the Marine Mammal Commission recommends that the National Marine Fisheries Service require that Apache either amend its application to seek authorization for the maximum numbers of marine mammals that may be taken or provide sufficient and consistent justification for requesting lesser numbers of takes, particularly of beluga whales, harbor porpoises, and harbor seals.

Mitigation and monitoring measures

The Service proposed, as an additional mitigation measure, that delay and shut-down procedures be implemented for the 2012 survey when beluga whale cow-calf pairs or aggregations of five or more beluga whales, killer whales, or harbor porpoises are observed approaching or within the 160-dB re 1 μ Pa disturbance zone (76 Fed. Reg. 58473). However, the Service excluded reference to such a requirement for harbor porpoise aggregations in the issuance of the final incidental harassment authorization for the 2012 survey and provided no rationale for that exclusion (77 Fed. Reg. 27720). For the proposed 2013 survey, the Service also did not include harbor porpoises as a species for which implementation of delay or shut-down procedures would be required. Harbor porpoises have been reported to be particularly sensitive to airgun sounds (Bain and Williams 2006; Lucke et al. 2009) and measures to minimize exposure of harbor porpoises to those sounds are warranted. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service include harbor porpoises as one of the species for which implementation of delay and shut-down procedures are required when observers detect aggregations of five or more animals approaching or within the 160-dB re 1 μ Pa disturbance zone.

The 2012 monitoring reports indicated that shutdowns occurred whenever an animal was within the 160-dB re 1 μ Pa disturbance zone, rather than within either the 190- or 180-dB re 1 μ Pa safety zone, as stipulated by the final incidental harassment authorization (77 Fed. Reg. 27720). That practice likely resulted in implementation of more shutdowns with fewer takes than would have occurred had observers implemented shutdowns only when animals were within or approaching the safety zones. In addition, the 160-dB re 1 μ Pa disturbance zone is estimated at 4.89 km for offshore surveys and 6.41 km for nearshore surveys. The proposed monitoring measures do not appear adequate to monitor such large disturbance zones and to determine whether the requested numbers of takes have been exceeded. For those reasons, the Marine Mammal Commission recommends that the National Marine Fisheries Service ensure that the monitoring measures included in the authorization are sufficient to account for all takes of marine mammals and require Apache to provide timely reports of the numbers of marine mammals taken so that, if necessary, surveys can be stopped before the authorized takes are exceeded. The measures used should account not only for the marine mammals observed, but also for animals that are present but not observed. For that purpose, the observers will need to implement reliable methods of extrapolating from numbers seen to numbers taken.

Timely review of application and adequate opportunity for public comment

Section 101(a)(5)(D)(iii) of the Marine Mammal Protection Act requires that the Service publish proposed incidental harassment authorizations in the *Federal Register* not later than 45

days after receiving an application and request public comment for a period of 30 days after publication. The *Federal Register* notice stated that the Service received this application from Apache on 15 June 2012. However, the Service did not send the notice of receipt and request for public comment to the *Federal Register* until nearly six months later. The Service did not describe the basis for the delay (e.g., the application was incomplete). Because of the delay in preparing the proposed authorization and the need to make a decision by January 2013, the Service sought to truncate the public comment period by requesting that the 30-day public comment period start on the date of filing at the *Federal Register* rather than on the day of publication. Doing so would provide the public only 25 days from the actual publication date to comment—an abbreviated timeframe for which the Service provided no rationale. As it turned out, the *Federal Register* listed 9 January 2013 as the date by which comments would be accepted, allowing the public a full 30-day comment period. This is consistent with the *Federal Register's* general practice of calculating time periods based on the appearance of a notice in the printed edition (www.federalregister.gov/blog/learn/public-inspection-desk-2/table-of-effective-dates-time-periods).

Although the *Federal Register* notice provided the public a full 30-day comment period in this instance, the Service appears to be developing the practice of cutting short the required comment periods for incidental harassment authorizations. In addition to this case, on 19 September 2012 the Service published a proposed incidental harassment authorization for activities to be conducted by Lamont-Doherty Earth Observatory and Pacific Gas and Electric Company (77 Fed. Reg. 58256), and that notice included a public comment period calculated from the filing date rather than the publication date. If continued, this practice would undermine the opportunity for public involvement, as required by the Marine Mammal Protection Act. Such a practice would be particularly unreasonable in those cases where the Service has exceeded the statutorily mandated timeframe for completing its review and is therefore seeking to compensate by shortening public comment periods. In this case, the Service's review took almost four times longer than the mandated 45 days, without an explanation for the delay. As described in the *Federal Register* notice, “[e]xcept for the location and size of the survey area, the activities proposed for the second survey season are essentially the same as those conducted during the first season.” For that reason, much of the required analysis presumably was patterned on the review conducted for the 2012 authorization. In the case of the Lamont-Doherty authorization, the Service's review took more than 2.5 times the mandated 45 days.

The Commission recognizes that staffing limitations, the growing number of incidental harassment authorization requests, and the complexity of some of those requests make it difficult, if not infeasible, for the Service to meet the 45-day deadline in all cases. However, the Commission does not believe that the Service should shorten public comment periods to offset longer agency review periods. To ensure full compliance with both the letter and the spirit of the Marine Mammal Protection Act, the Marine Mammal Commission recommends that the National Marine Fisheries Service provide a 30-day public review and comment period that starts with the publication of notices in the printed edition of the *Federal Register*.

The continued need for caution

The Commission previously has recommended that the Service defer issuing any incidental take authorizations for Cook Inlet beluga whales until it has a better understanding of the factor or factors that are causing or contributing to the observed population trend or until the population begins to demonstrate sustained growth. The Commission is particularly concerned about authorizations of additional activities that, in combination with current or ongoing activities, are likely to have detrimental cumulative impacts.

Indeed, the Service has made little (if any) progress in identifying and alleviating the factors causing the continued decline of this population. Based on the lack of progress, it appears that managers have repeatedly underestimated the vulnerability of the Cook Inlet beluga whale population to such risk factors. Despite the lack of progress, the Service issued the 2012 authorization to Apache and is proposing to issue another authorization in 2013 based on the assumption that, individually, those projects add only incrementally to the existing level of disturbance and therefore can be discounted. The Commission does not consider that assumption to be a reasonable basis for management. Clearly, this population requires precautionary protection and recovery measures if we are to have any confidence that activities such as those proposed here will not add substantially to its risk of extinction.

Please contact me if you have any questions concerning these recommendations and rationale.

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

cc: Jon Kurland, National Marine Fisheries Service, Alaska Regional Office
Brad Smith, National Marine Fisheries Service, Alaska Regional Office

Enclosure

References

- Bain, D.E., and R. Williams. 2006. Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance. International Whaling Commission Scientific Committee, International Whaling Commission Annual Meeting, 1-13 June, St. Kitts, Document SC/58/E35.
- Hobbs, R.C., K.L. Laidre, D.J. Vos, B.A. Mahoney, and M. Eagleton. 2005. Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic Alaskan estuary. *Arctic* 58:331–340.
- Hobbs, R.C., and K.E.W. Shelden. 2008. Supplemental status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*). Alaska Fisheries Science Center

- Processed Report 2008-08. Alaska Fisheries Science Center, NOAA, National Marine Fisheries Service, 7600 Sand Point Way NE, Seattle, Washington, 98115, 76 pages.
- Hobbs, R.C., C.L. Sims, and K.E.W. Shelden. 2011. Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2011. National Marine Fisheries Service, National Marine Mammal Laboratory Unpublished Report, seven pages.
- Hobbs, R., C. Sims, K. Shelden, L. Vate Brattström, and D. Rugh. 2012. Annual calf indices for beluga whales (*Delphinapterus leucas*) in Cook Inlet, Alaska, 2006–2010. Alaska Fisheries Science Center Processed Report 2012-05. Alaska Fisheries Science Center, NOAA, National Marine Fisheries Service, 7600 Sand Point Way NE, Seattle, Washington, 98115, 29 pages.
- Lucke, K., U. Siebert, P.A. Lepper, M. Blanchet. 2009. Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. *Journal of the Acoustical Society of America* 125(6):4060–4070.
- National Marine Fisheries Service. 2003. Subsistence harvest management of Cook Inlet beluga whales. Final Environmental Impact Statement. National Marine Fisheries Service, Anchorage, Alaska, 179 pages.
- Rugh, D.J., K.E.W. Shelden, and R.C. Hobbs. 2010. Range contraction in a beluga whale population. *Endangered Species Research* 12:69–75.