Late-Feeding Season Movements of a Western North Pacific Gray Whale off Sakhalin Island, Russia and Subsequent Migration into the Eastern North Pacific

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ABSTRACT

The western population of North Pacific gray whales (WGW), once thought extinct, is now estimated at 130 individuals and feeds primarily off northeastern Sakhalin Island, Russia, during summer. The population is critically endangered, facing anthropogenic threats throughout its range from nets, ships, and oil development, but present migration routes and wintering areas remain unknown. On 4 October 2010, a subcutaneous Argos tag was applied following protocols established by the International Whaling Commission to a 13-year-old male (named "Flex") in good body condition off Piltun Lagoon, northeastern Sakhalin Island. Flex was first seen as a calf off Sakhalin in 1997. State-space modeling of fall near-shore movements for 68 days post-tagging identified a small home range foraging area within 45km of the tagging site. These data are unique as local weather conditions during this time generally prevent other forms of whale observation. On 11 December, Flex departed Sakhalin and began migrating across the Okhotsk Sea, Bering Sea, and Gulf of Alaska. By 5 February, Flex was within 20 km of the central Oregon coast, overlapping spatially and temporally with the last few weeks of the usual eastern gray whale southbound migration. Flex's migration segments were linear, high speed (averaging 6.5 km/h), and included deep water far offshore, suggesting open-water navigation skills not previously attributed to gray whales, who are considered coastal and shallow-water oriented. State-space modeling (considering directionality and speed) identified the basin-wide movements as "migration" rather than "wanderings" associated with foraging behavior. Flex's movements do not preclude other migration routes or winter destinations for WGWs. Additional WGW tagging is needed to identify other areas of use. The resulting data will have high conservation value and be useful in potential mitigation of anthropogenic activities.

BACKGROUND

The western population of North Pacific gray whales (Eschrichtius robustus, WGW) once thought to be extinct was re-discovery off northeastern Sakhalin Island, Russia and is critically endangered (IUCN, 2008). The population is estimated to contain about 130 individuals age one or older, of which only about 25 are reproductive females (Cooke et al., 2008), and it faces a number of anthropogenic threats throughout its range, including fatal interactions with coastal net fisheries off Japan (Weller et al., 2008; Bradford et al., 2009) along its presumed migration route(s) and oil development in and near its principal summer feeding area (IUCN, 2009). The wintering area of the present population is unknown but, based on the limited available information, has been suggested as south of Honshu, Japan, off the coast of southern China in the South China Sea and the Gulf of Tonkin (Weller et al., 2002), or possibly off North America (Ilyashenko, 2009).

Satellite telemetry has been proposed repeatedly as an efficient way to investigate the migratory routes and wintering grounds of western gray whales and scientists have been cautious about tagging because of the population's very low numbers. After considerable discussion by the IWC Scientific Committee from 2006-10 and various panels convened under the auspices of IUCN from 2006-8 (summarized for the U.S. Marine Mammal Commission and IUCN by Weller, 2008), the research tagging effort reported here was undertaken to tag and track up to 12 of whales during the late summer of 2010 to ascertain winter migration route(s) and reproductive area(s).

METHODS

We used Wildlife Computers Spot-5 Argos transmitters epoxy-cast in Stainless steel cylinders for nearly complete implantation. Insertion blades and attachments for WGWs were similar to those used on 18 eastern NP gray whales (EGW) in 2009/10 (Mate, 2010). The latter field study was an efficacy test prior to using the tags on WGWs. The tags were applied by using a modified air-powered ARTS applicator and specialty pushrods (Mate et al. 2007).

The research was based from the 50 m M/V Igor Maximov, which was at sea from 3 September to 7 October 2010. Although we encountered technical difficulties with the supplied small tagging vessel and significant weather problems (including remnants of two typhoons and two gales), we tagged a whale on the last field-operational day of the extended cruise.

We followed the protocols established by the IWC special steering committee on western North Pacific Gray whale telemetry, which required tagging only known adult males in good body condition. On 4 October 2011, we tagged a13 year old male known as Flex off the northeast coast of Sakhalin Island, Russia (Figure 1 inset), where the whale had first been seen as a calf in 1997. Although the tag was not completely deployed, it provided location data for 124 days.

RESULTS

Flex stayed along the Sakhalin Island coast within 45 km of the tagging site and within 5 km of shore for 68 days (Figure 1). These near shore movements suggest foraging behavior. In mid-December Flex crossed the Sea of Okhotsk to the west side of the Kamchatka Peninsula, went around the southern end of the peninsula and departed the east coast in early January. The tagged whale crossed the western and central Bering Sea in one week to arrive at the shallow shelf break near a major canyon and then proceeded south passed the Pribilof Islands and through the eastern Aleutian Islands before crossing the Gulf of Alaska and heading south 20-25 Km off the Washington and Oregon Coasts (Figure 2). He was last located by satellite 20 Km off Siletz Bay, Oregon (~45*N) on 5 February, which over-lapped with the last few weeks of the usual ENP gray whale southbound migration through this same area.

Despite ambiguities in the accuracy of many Argos location classes, the course heading across the western Bering Sea varied within just a few degrees for a week. Such linearity in the Argos track makes significant errors in the actual distance traveled unlikely compared to the Argos-derived path. The Argos track length may actually be a conservative estimate, but still resulted in sustained swimming speed estimates for various segments of travel (Table1) substantially higher than those normally observed for EGWs during their southbound migration (Herzing and Mate, 1989; Granite Canyon ref).

CONCLUSIONS AND DISCUSSIONS

The very liner movement of Flex so far from shore suggests good open water navigation skills not previously attributed to gray whales. ENP gray whales have been considered more coastal or shallow-water oriented. State-space modeling suggests the long-range movements of Flex across the Sea of Okhotsk, Bering Sea, and Gulf of Alaska are directed migration movements rather than “wanderings", usually indicative of foraging behavior. During the Bering Sea and North Pacific travel segments, the whale's average speeds were >6.5 km/h, 50% higher than average speeds observed for six 2009-tagged EGWs migrating south in 2010 (Mate, 2010).

Flex has previously visited the eastern North Pacific, confirmed by photo matching (Weller et al., IWC/SC63/BRG6) and two other WGWs have been genetically matched to southern California (Lang et al., IWC/S63/BRG10). The results demonstrated by this whale do not preclude other migratory destinations for other WGWs or even this whale during other winters. The possibilities identified from the tagging, genetics, and the photo-ID papers suggest additional WGW taggings would be useful to identify other possible winter migratory routes and/or destinations. We took 13 tags to Russia in anticipation of tagging 12 whales in 2010. The remaining 12 tags are still in Russia. We suggest tagging 12 more WG whales to increase the total sample size to 10% of the estimated population. The use of a mother ship would help assure our ability to move more widely if necessary to find adequate candidate whales for tagging. An improved tagging boat would increase the probability of success. An earlier tagging season would avoid seasonally predictable bad weather. Being able to tag both males and females would dramatically improve the probability of successfully deploying additional tags and develop information about possible sexual differences in: winter migratory routes; foraging area departure timings; reproductive destinations; wintering area arrival timings; the amount of time spent in wintering areas; turnover rates in wintering areas, and spring migration re-entry routes and timing back into the summer feeding areas. All of these issues might identify areas or specific anthropogenic activities that could be risks to WGWs, as well as mitigation possibilities.

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LITERATURE CITED

Bradford, A.L., Weller, D.W., Ivashchenko, Y.V., Burdin, A.M. and Brownell, R.L., Jr. 2009. Anthropogenic scarring of western gray whales (Eschrichtius robustus). Mar. Mamm. Sci. 25(1):161-175

Cooke, J., Weller, D.W., Bradford, A.L., Burdin, A.M. and Brownell, R.L, Jr. 2008. Population assessment of western gray whales in 2008. Paper SC/60/BRG11 presented to the IWC Scientific Committee. 10pp.

Ilyashenko, V.Yu. 2009. How Isolated is the “Western” Gray Whale Population? SC/61/BRG22 presented to the International Whaling Commission Scientific Committee. 3 pp.

IUCN. 2008. IUCN Red List of Threatened Species. A Global Species Assessment. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN. 2009. Western gray whales: status, threats and the potential for recovery. Report from a workshop in Tokyo, Japan, 21-24 September 2008. Global Marine Programme, IUCN, Gland, Switzerland.

International Whaling Commission. 2006. Report of the Scientific Committee. Annex F. Report of the Sub-Committee on Bowhead, Right and Gray Whales. J. Cetacean Res. Manage. (Supplement) 8: 111-23.

International Whaling Commission. 2007. Report of the Scientific Committee. Annex F. Report of the Sub-Committee on Bowhead, Right and Gray Whales. J. Cetacean Res. Manage. (Supplement) 9:142-155.

International Whaling Commission. 2008. Report of the Scientific Committee. Annex F. Report of the Sub-Committee on Bowhead, Right and Gray Whales. J. Cetacean Res. Manage. (Supplement) 10:150-166.

International Whaling Commission. 2009. Report of the Scientific Committee. Annex F. Report of the Sub-Committee on Bowhead, Right and Gray Whales. J. Cetacean Res. Manage. (Supplement) 11.

Mate, B., R. Mesecar, and B. Lagerquist. 2007. The evolution of satellite-monitored radio tags for large whales: One laboratory's experience. Deep-Sea Research II. 54:224-247.

Weller, D.W., Burdin, A.M., Würsig, B., Taylor, B.L. and Brownell, R.L., Jr. 2002a. The western Pacific gray whale: a review of past exploitation, current status and potential threats. J. Cetacean Res. Manage. 4(1):7-12.

Weller, D.W. 2008. Report of the large whale tagging workshop. Final contract report to the U.S. Marine Mammal Commission and International Union for Conservation of Nature. 32pp.

Weller, D.W., Bradford, A.L., Kato, H., Bando, T., Ohtani, S., Burdin, A.M. and Brownell, R.L., Jr. 2008. Photographic match of a western gray whale between Sakhalin Island, Russia, and Honshu, Japan: First link between feeding ground and migratory corridor. J. Cetacean Res. Manage. 10(1):89-91.

WGWAP. 2006. Report of the Western Gray Whale Advisory Panel at its first meeting. Unpublished report, http://www.iucn.org/themes/marine/sakhalin/, Prangins, Switzerland 42 pp.

WGWAP. 2007. Report of the Western Gray Whale Advisory Panel at its second meeting. Unpublished report, http://www.iucn.org/themes/marine/sakhalin/, St. Petersburg, Russia 52 pp.

WGWAP. 2008. Report of the Western Gray Whale Advisory Panel at its fourth meeting. Unpublished report, http://www.iucn.org/themes/marine/sakhalin/, Lausanne, Switerland 58 pp.

Table 1. The durations, estimated distances, and speeds of Flex, a western gray whale, during the late summer and early fall feeding season near Sakhalin Island, Russia and subsequent migratory movements to the eastern North Pacific.

Waypoint	Date	Distance-km	Days	Avg. Speed				
Deploy	10/4/2010 0:22:00				Cumulative			
Depart Sakhalin	12/11/2010 21:44:00	1018	68.9	0.6	Distance-km	Days	Avg. Speed	
Arrival W Kamchatka	12/16/2010 23:59:00	899	6.0	6.2	899	6.0	6.2	
Depart E Kamchatka	1/2/2011 6:04:00	1185	16.4	3.0	2084	22.4	3.9	
Arrival Bering Shelf	1/9/2011 21:28:00	1324	7.7	7.1	3408	30.1	4.7	
Arrival Shumagin Islands	1/18/2011 21:44:00	1540	10.0	6.4	4948	40.1	5.1	
Arrival west coast U.S.	2/2/2011 23:33:23	2520	14.9	7.1	7468	55.0	5.7	

Figure 1. The study area at the northeast end of Sakhalin Island in the southern Sea of Okhotsk (inset), showing the near shore movements of “Flex” for 69 days within the traditional summer feeding area (4 October to 11 December 2010) just east of Piltun Lagoon.

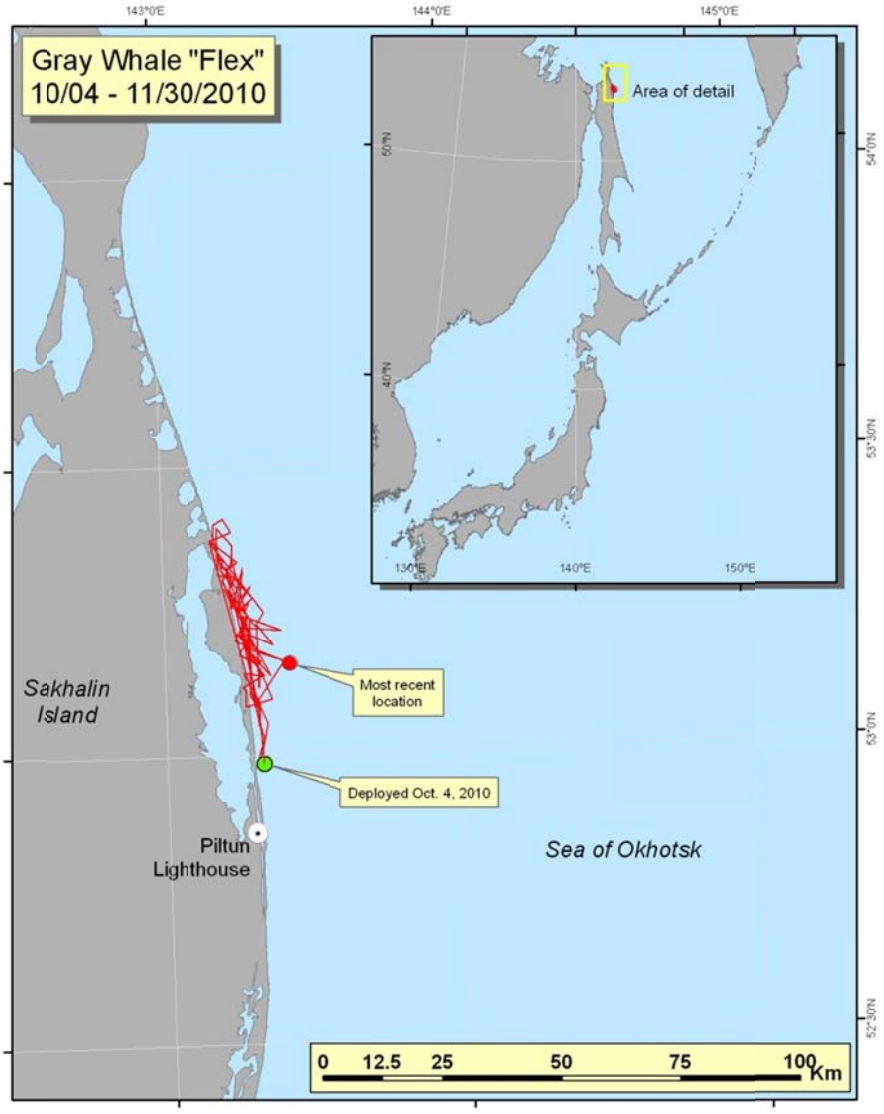

Figure 2. The 124 day movements of a 14 year old male western North Pacific gray whale “Flex” from 4 October 2010 to 5 February 2011.