Review of current knowledge on Hubbs' beaked whale, *Mesoplodon carlhubbsi,* from the seas around Japan and data from the North America.

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ABSTRACT

Mesoplodon carlhubbsi was just described about 50 years ago and little is known about it as less than 60 specimens have been studied from Japan and the west coast of North America. Also this species is rarely seen live at sea. It has been taken in fishing operations as bycatch, but there is little additional information on threats and no data on populations trends.

KEYWORDS: Hubbs' beaked whale, *Mesoplodon carlhubbsi*, Taxomony, North Pacific

- **INTRODUCTION**

The Hubbs' beaked whale, *Mesoplodon carlhubbsi,* is a North Pacifc endemic beaked whale found in the cold-temperate currents off Japan and the west coast of the United States and southern British Columbia, Canada. This species is poorly known from less than 60 records since the first one was collected in 1944 or about one per year. Most of the specimens were collected before 2000. This species has only once been observed alive at sea in small numbers. Here we review what is known about the species with an emphis on Japanese records.

Taxonomy and nomenclature

Carl Leavitt Hubbs, found a live *Mesoplodon* near his office, University of California San Diego, in, in 1945. Hubbs (1946) reported the specimen as an, *M. bowdoini,* but that species had never been reported before in the Northern Hemisphere. Joseph Curtis Moore at the Field Museum in Chicago, studied the specimen and described it as a new species, *Mesoplodon carlhubbsi*, in 1963, naming it after Hubbs (Moore 1963). The first specimen from Japan was collected in 1958 about 65 miles Southeast of Ayukawa (37°27'N, 142°30'E) by a small-type whaling vessel identiified as *M. stejnegeri* (Nishiwaki and Kamiya 1959), but Moore (1963) refered the Ayukawa specimen is *M. carlhubbsi*. Other than Hubbs' beaked whale in other languages there are no other common names.

- **SPECIES IDENTIFICATION**

Mead *et al* (1982) pointed out two characters to identify this species: (1) the area just anterior to the blow hole is elevated; and (2) this elevated area and the beak are in bright white, both of these are especially distinct in males. In the females, and probably in younger males, these characters are less prominent. As is well recognized, it is often extremely difficult for observers to make exact species identification, among the species of the genus *Mesolopdon*. There are at least two parameters, which make the external morphology different even among the individuals of the same species. When considering these characters, following two aspects should be considered:

Juvenile color —In *M. carlhubbsi*, neonates to juveniles are with a "juvenile color pattern" which exist in common among some of the *Mesopldon* species. Dorsal aspect of the body including the head is dark brown, whereas ventral side is yellowish white. The boundary between these dark and light areas is not clearly demarcated but changes gradually. Area around the eye, for example is surrounded by the dark area extended ventrally. This juvenile color pattern changes as the animal grows, and the body color in general becomes almost black in mature animals. In the adult males, the area just anterior to the blowhole and the rostrum become whitish and in males it becomes white, whereas in females, beak are often white but paler than the males, and top of the melon tends not to be clearly white.

Sexual dimorphisim — It is also well-known at least many of the *Mesoplodon* species has impressive sexual dimorphism mainly in the tooth, which causes morphological differences in the alveolar structure, and hence shape of the lower jaw and related upper jaw morphology. In the adult male the tooth (or tusk) grows dramatically to come out of the mandible and attain the adult shape of the tooth (or tusk). This tooth morphology differences among the adult males make species identification easier. However, in the females, the tooth remains un-erupted and the specific head (skull) morphology do not become evident in most of the species. This makes the species identification in females or immature males extremely difficult.

Recently (one of us TKY) experienced found another character that was useful to determine the species identification even in a highly decomposed carcass. This character was described in Mead (2007). The main stomach has a peculiar cellurated part portion and it can be used for species identification of *M. carlhubbsi* even in severely decomposed specimens.

- **DISTRIBUTION, POPULATION STRUCTURE AND MOVEMENTS**

Hubb's beaked whale is one of two *Mesoplodon* species, along with *M. stejnegeri*, ewhich is endemic in the cold-temperate waters of the North Pacific. However, Hubb's beaked whales found in the cold water of the Oyashio Current off northern Japan were considered disjunct from those living in the California Current (Mead *et al*. 1982 and USNM records). These two areas are considered to be parts of the Cold Temperate Northwest Pacific and Cold Temperate Northeast Pacific Provinces, respectively (Spalding *et al*. 2007). The southernmost stranding in Japan is from Numazu, Suruga Bay (35º01'N, 138º50'E) (Nakajima 1984) and the northernmost record (M35213) is from Nemuro, Hokkaido (43º19'N, 145º37'E). There are no stranding records for this species from the Aleutian Chain or the Hawaiian Islands (Mead *et al*. 1982). In the eastern North Pacific, the northernmost stranding (54º17'N, 130º22'W) is from Prince

Rupert, British Columbia (Pike and Macaskie 1969, Willis and Baird 1998) and the southernmost stranding (LACM 84018) is from San Diego, California (Mead *et al*. 1982, Danil *et al*. 2010). No records from Korea as strandings or bycatch from the Sea of Japan (Kim et al. 2000, Baker *et al*. 2006). MacLeod *et al*. (2006) speculated that the two North Pacific population might be continuous arcross the North Pacific around 30˚N and 45˚N. In support of this idea, a NMMLobserver collect a specimen known from this region (approximately 43˚N, 16˚3W) while on board one of the vessels operated in the High Seas Driftnet fishery (Japan, Korea and Taiwan) in the center North Pacific (Yatsu *et al*. 1994, Watanabe 1994).

There is nothing known about population structure between those animals found in Japanese waters and those off the western coast of North America. All 15 animals recorded from Japan, stranded and not the result of bycatch, including probably orphaned new born animal.

Nothing is known about movements within either parts of their range and nothing is known from the high seas. The only well documented sighting of this species off North America was two separate groups seen off Oregon on 26 July 1994 during the SWSFS/AIMMS cruise during excellent sea conditions. The two groups were seen approximately 1 hr apart. The first group was two animals, the 2nd group was five animals. Some of the animals initially looked like odd-shaped Ziphius, until the observers realized they were looking at white beanie-headed *Mesopodon carlhubbsi* (R. L. Pitman, pers. comm. to RLB). The only observation of live Hubbs' beaked whales in Japanese waters was one (O-471) in Suruga Bay, Shizuoka Japan in 1997 before it swam away (Nakajima *et al*. 2005).

- **LIFE HISTORY PARAMETERS**

Few specimens have been examined by biologist and therefore little is known about life history parameters and nothing about survivorship.

Total length maximum males — The largest male specimen (MVZ 115607) from Oakland, California, USA was 532 cm and it was physically mature (Mead *et al*. 1982). [sample of 13 MacLeod 2006] The largest Japanese specimen (RO-077) was also 530 cm (Nakajima 1984). MacLeod et al. (2006) reported the median total length of 472 cm from a sample of 13 specimens.

Total length maximum females – The largest female was 532 cm (WFP 482) and the specimen was physically mature (Mead *et al*. 1982). The two next largest females were a 526 cm and a 523 cm from Tofino, British Colombia, Canada and Oregon, USA [assumed to be mature based on size]– A photo of head of the Oregon specimen is in Jefferson *et al*. (2009, page 126 by Mike Graybill). The median total length of 485 cm, with sample of 12 was reported by MacLeod *et al*. (2006). In the western North Pacific the largest recorded female was 510 cm (NSMT M 35213, a severely decomposed pregnant female). MacLeod (2006) also reported that the median size of 12 female specimens was 485 cm and the females were larger than males because of the mistake with the 532 cm specimen.

Size at birth — Mead *et al*. (1982) estimated the size at birth to be <2.5 m based on two specimens. Eight newborn specimens (six were females, one male and one unknown) ranged in total length from 233 to 258 cm with a mean length of 249 cm. The smallest specimen had fresh milk in its stomach. Six of the calves were found between the middle of May and the mid-August. A 233 cm female calf had foetal folds and the umbilicus was not completely closed

(M32415). An almost full-term foetus of 230cm in body length (NSMT M36332) was collectedfrom a stranded specimen (NSMT M35213). Based of these two specimens, the size at birth can be as small as about 230 cm.

Maximum ages – No age data are available.

Food Habits – Remains of squid including the genera *Gonatus*, Onychoteuthis, *Octopateuthis*, *Histoteuthis*, and *Mastigoteuthis* and some deepwater fishes were collected from stranded North American specimens (Mead *et al*. 1982). In the three individuals recently examined from Japan (NSMT M34062 - adult male, M35103 - adult female and M36185 - adult male), squid remains (beaks and lenses) were found in all three and fish bones were found in one individual.

Foreign debris in the stomach –Only one adult male (M34062) out of three necropsied individuals noted under food habits had some plastic debris in its main stomach.

Knowledge gaps – As was stated above, we know too little about the species and as much data as possible should be collected from all future specimens.

- **ABUNDANCE AND TRENDS**

Abundance

Carretta *et al*. (2012) reportd that the minimum population estimate (defined as the log-normal 20th percentile of the abundance estimate) for mesoplodont beaked whales in California, Oregon, and Washington is 576 animals.

Trends

No qualitative or quantitative data exist to say anything about trends. However, at least on the North American coast the number of stranding animals appears to have decreased since the start of this century.

- **DIRECT REMOVALS**

Directed takes

Small numbers of these whales have been taken by small-type whaling operations in Japanese coastal waters (Nishiwaki and Kamiya 1959, Nishiwaki 1962, 1967). All 15 animals recorded from Japan, not captured, including probably orphaned new born, were observed as a solitary animal

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Incidental takes

This species is probably taken in the driftnet fishery for swordfish and sharks in Californian waters and specimens have been confirmed, using mtDNA (Henshaw *et al*. 1997). However, this fishery was closed in 1996. No bycatch of this species is known from the Mexican driftnet fishery but it operates south of the southernmost record of *M. carlhubbsi*.

Carretta *et al*. (2012) reported: "The California large mesh drift gillnet fishery has been the only fishery historically known to interact with *Mesoplodon* beaked whales in this region. Between 1990 and 1995, a total of eight *Mesoplodon* beaked whales (5 Hubb's beaked whales (*Mesoplodon carlhubbsi*), one Stejneger's beaked whale (*Mesoplodon stejnegeri*), and two unidentified whales of the genus *Mesoplodon* were observed entangled in approximately 3,300 sets (Julian and Beeson 1998, Carretta *et al*. 2008). Following the introduction of acoustic pingers into this fishery (Barlow and Cameron 2003), no beaked whales of any species have been observed entangled in over 4,000 observed sets (Carretta et al. 2008, Carretta and Enriquez 2009a, 2009b). Mean annual takes in Table 1 are based on 2004-2008 data. This results in an average estimated annual mortality of zero mesoplodont beaked whales."

Only a single specimen (O-986) taken as bycatch is known from Japanese waters (Noushi, Higashi-Dori-mura, Tsugaru Channel) and it was found dead in a set net and found dead.

Actual/ Potential Threat	**Anthropogenic activity/ies**	**Evidence[1]**	**Possible impact[2]**
Bycatch	*Commercial and recreational gillnets, wreck nets, tangle nets, bottom trawls*	*Strong. Based on observer programmes, stranded animals.*	*Potentially high especially in some areas*
Serious injury/death (not direct take or bycatch)	*Ship strikes from commercial and recreational vessels*	*Weak. Indications could be obtained from strandings programmes, photographs*	*Not believed to be high but possibly localised e.g. in calving areas*
Mechanical destruction of habitat	*Bottom trawls, infrastructure construction, oil and gas development*	*Unknown*	*Unknown*
Prey depletion	*Overfishing, habitat degradation due to pollution, climate change*	*Unknown*	*Unknown*
Acoustic pollution/harassment	*Fishing vessels, general maritime traffic, acoustic harassment devices at fish farms, pingers, military*		

	activities, infrastructure construction, oil and gas development (incl seismic surveys) recreational activities		
Chemical pollution	*Terrestrial industrial development, terrestrial run-off harbours, ships, aquaculture, sewer discharges, aerial transport.*	*Unknown*	*Unknown*

- **OTHER ACTUAL AND POTENTIAL THREATS**

Unknown, but as will other beaked whales, this species may be vulnerable to anthropogenic noise produced by military sonar and seismic research.

- **STATUS**

Japanese and United States west coast populations should be managed as separate units because of their apparent disjunct status. Based on sighting surveys off the west coast of North America by the Southwest Fisheries Science Center this species is presumed to be rare in the California Current.

Recommendations

Parasites especially of the external ones and scars caused by cookie-cutter sharks should be observed and recorded for the population identities. Molecular studies will also be useful for population identification.

Additional acoustics studies like those described by Baumann-Pickering et al (2012 – SC/64/SM21) may help to better determine the range of this species, but at the present time no known beaked whale call has been linked to this species.

Molecular studies will also be useful for population identification. In addition, external parasites, possibility internal one, and scars from cookie-cutter sharks should be observed and recorded, as they might be useful for population identity.

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