HUMPBACK WHALES OFF PERU: NEW RECORDS AND A RATIONALE FOR RENEWED RESEARCH

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ABSTRACT

New records indicate that some Area I humpback whales are present in coastal upwelling waters off Peru and Chile during the austral summer, and thus apparently fail to migrate to the Antarctic. Also, south of tropical breeding grounds of Area I (Gorgona Island, SW Ecuador, northern Peru) humpbacks may enter inshore waters more frequently than hitherto believed, possibly to feed. Such valuable incidental observations stress the need to resume systematic research on humpbacks and other large whales in Peru which ceased with the end of whaling in 1985. It is recommended that the recent access to a Peruvian oceanographic vessel, as platform of opportunity for cetacean sightings, be programmed for the long-term and cover all months and both neritic and pelagic habitats. Dedicated surveys with smaller vessels should be planned as investigations progress. Besides collecting distributional data, abundance estimation, monitoring of strandings and net entanglements, inventory of historical data and samples, biopsy tissue sampling for genetic analysis and photo-ID studies should be initiated.

INTRODUCTION

Ongoing studies on the seasonal distribution, movements, photo-identification and ecology of humpback whales *Megaptera novaeangliae* currently constitute the most active aspect of baleen whale research in Pacific South America. Unfortunately, the effort so far is limited to equatorial waters off Colombia (Stone *et al.,* 1990; FIorez-Gonzalez, 1991; Capella and FIorez-Gonzalez, 1993; Florez-Gonzalez *et al.,* 1994) and Ecuador (Haase and Felix, 1993).

Reference to humpback whales in Peru concentrate on numbers taken in whaling operations during the 20th century (eg Kostritzky, 1952; Grimwood, 1969; Clarke, 1980; and see below). We know of only two papers for Peru that specifically discuss biological parameters (Ramirez and Franco, 1982; Ramirez, 1988), and a few papers for Chile which document humpback whale sightings, including those from Drake and Bransfield Straits (Aguayo, 1974; Torres, 1982; Schlatter, 1987). Recently, there is a single published record of a humpback whale net entanglement in Peru, i.e. at Punta San Juan (15^{o} 20'S, 75^{o}0 09'W) in October 1988. The whale, of unreported sex and size, was released alive (Majluf and Reyes, 1989). Between then and the present there is a total lack of information.

New records of humpbacks in Peruvian waters and the late 1995 resumption of ship-based sighting effort from the *R/V Humboldt* as platform of opportunity and operated by the *Instituto del Mar del Peru* (IMARPE) (see document SC/48/0 3), urged us to briefly review present knowledge of *M.novaeangliae* for the study area and recommend lines of work that should receive special attention if emerging opportunities for research are consolidated in the months and years to come.

HUMPBACK WHALE RECORDS

A first attempt to locate the historical database on humpbacks and other baleen whales, including catch and sighting details as well as biological data collected by IMARPE personnel and the whaling companies which operated in Peruvian waters until 1985, remained without success. According to Dr. P .Ramirez (pers.comm. to MAS, Feb 1996), retired whale biologist of IMARPE, at least part of this information was kept by the now dissolved whaling companies. Whale scientist Obla Paliza, also retired from IMARPE, thought that data as well as samples are most likely still stored at IMARPE's headquarters in Callao (pers.comm. to KVW, 28 March 1996).

Published distributional information include undated positions *(N* = 121) of the 1965 captures marked on a map of northern Peru, and maps with the pooled number of animals observed in that area in the period 1976-1984, stratified by month and one degree coordinate squares (Ramirez, 1988).

We here present 12 new, confirmed records of humpback whales gathered from coastal Peru since 1990 (Table 1). Three sightings were collected during cetacean shipboard surveys by the Southwest Fisheries Science Center (NOAA, La Jolla, CA) since 1974, and were graciously provided by Dr. Tim Gerrodette.

DISCUSSION

Seasonality and migration

Humpback whales have been observed off northern Peru from May to December, but most frequently from September to November, in waters with mean SST of 19.0 ° C (range 15.2 ° C24.2°C) (Ramirez, 1988; Ramirez and Franco, 1982; Valdivia *et al.,* 1982, 1983). Under the abnormal thermic conditions (SST: 22.7-31.0 ° C) of the early *El Nino* event of November 1982-May 1983 no humpbacks were seen (Ramirez and Urquizo, 1985). Off central Peru (14 ° S) in 19251926, they were most numerous in September and October (Harmer, 1928).

Mackintosh (1942) inferred a migrational link for the 'Chilean group' of humpback whales with the Bellingshausen Sea, west of the Antarctic Peninsula. Slijper *et al.* (1964) stated that southern humpbacks migrating along the South American west coast may go as far north as about 100N. Stone *et al.* (1990) finally proved the connection between the Antarctic feeding grounds and a major breeding area around Colombian Gorgona Island (see FIorez-Gonz6lez, 1991) based on tail fluke photo-identification. It was the first time also that a humpback whale had been shown to cross the equator.

Supposedly the vast majority of southern hemisphere humpbacks migrate each year between breeding grounds and the Antarctic. Some remain in high latitudes over the winter for they have been taken at South Georgia in winter whaling (Matthews, 1937; Mackintosh, 1942). Also, the sex ratio off New Zealand and Australia is highly skewed towards males (Brown *et al.,* 1994), suggesting some females fail to migrate north. However, the sex ratio in the catch off northern Peru in 1961-66 was not skewed (124 males versus 122 females; Valdivia *et al.,* 1983).

Mackintosh (1942), not focusing on any particular region, suggested that some humpbacks, especially the immature whales, may remain in the lower latitudes over the summer. Collating information, we found mounting evidence to support this for western South America, and we doubt that it is limited to immature whales.

(i) Scammon (1874) provided the earliest cue: "In the years 1852 and 1853, large numbers of Humpbacks resorted to the Gulf of Guayaquil, coast of Peru, to calve, and the height of the season was during the months of July and August. The same may be said of the gulfs and bays situated near the corresponding latitudes north of the equator; still, instances are not unfrequent where cows and their calves have been seen at all other seasons of the year about the same coast".

(ii) On an unspecified day in January 1980 two humpbacks were sighted from a ship off Pimentel, ie 06°- 07°S, northern Peru (Ramirez, 1988).

(iii) From 17 till 20 February 1996, two humpback whales but not a mother/calf pair, were observed from the cliffs at San Juan de Marcona (15020'5) in south-central Peru (Carlos Zavalaga, pers.comm. to JAS, 26 March 1996). Aquiles Garcla-Godos of CEPEC took a series of photographs (seen by KVW) which positively identified the species. The whales stayed at least three days in the area, breached repeatedly and at times made fast gyrating and brusque movements on the spot, interpreted as feeding. Gulls circling above plunged to pick up apparently edible items (A. Garcla Godos, pers.comm. to KVW, 10 March 1996).

(iv) One humpback was observed by Prof.C.Guerra (University of Antofagasta) at 200-300m from shore from the southern part of the city of Antofagasta (23^{o}28'5), Bahia Jorge, on 14 March 1987; the animal left the area heading west (Guerra *et al.,* 1987).

(v) Oporto (1984) sighted a group of seven humpback whales inside Nelson Strait (51037'5, 75^{o} 00'W) in Magallanes, southern Chile, in waters 140-160m deep (SST 11 ^{o} C) on 30 January 1984.

Inshore occurrence

Ramirez (1988) stated that humpback whales off Peru tend to occur close to shore in the spring. The large majority of animals were taken off northern Peru in 1965 at less than 100 nmiles from shore, and many much closer (Ramirez, 1988). Other authors (Mackintosh, 1942; Clarke, 1957,1962; Winn and Reichley, 1985) contend, not necessarily in contradiction, that off western South America humpbacks are deep oceanic migrators, basically beyond the 200m depth line, "which could explain the paucity of inshore sightings, except for the tropical breeding grounds" (Winn and Reichley, 1985).

Recent opportunistic inshore sightings and net entanglements off western South America (Table 1; Majluf and Reyes, 1989; Guerra *et al.* 1989) indicate that humpback whales enter inshore waters also south of the known tropical breeding grounds (ie Gorgona Island, southwest Ecuador and northern Peru), although little can be said about the frequency. Perhaps these are predominantly the non-migrating specimens. The very low density of marine mammal scientists along these coasts may more readily explain paucity of records. That both the southern right whale and the minke whale were first recorded in Peru only in the past decade (Van Waerebeek *et al.,* 1992; Van Waerebeek and Reyes, 1994), should be sufficient warning about coverage.

The 242 humpback whales caught from a shore-based station in the Bay of Paracas, central Peru, in 1925-26 (Harmer, 1928; Clarke, 1962) further suggests an inshore habitat. Clarke (1962), explicitly admitting the incongruence, believed the explanation of that large inshore catch resides in the fact that this was an *El Nino* period. However, the latest records do not support *El Nino* as a necessary condition for the inshore occurrence of humpbacks. Older fishermen report that until the 60's unidentified 'whales' were regularly spotted inside the Paracas Bay.
The situation in Chile is little studied but humpback whales were also taken by shore-based stations such as Quintay, near Valparaiso, and at Talcahuano (Clarke, 1962).

Feeding

In high latitudes of the southern hemisphere humpbacks feed almost exclusively on euphausids, elsewhere they consume also small gregarious fish (for review, see Kawamura, 1980; Gaskin, 1982). No published information is available on feeding habits off Peru and Chile, but we presume the species feeds with some regularity in the cold waters of the Humboldt Current system given the high annual productivity at all trophic levels (Barber and Chavez, 1983), and the indication that some individuals may not migrate to the Antarctic each year. North Pacific humpbacks have recently been observed feeding in their breeding grounds off Baja California (Gendron and Urban, 1993).

Reproduction and growth

We are not aware of any published information on reproductive parameters of humpback whales in the eastern South Pacific. The average length of specimens taken in whaling operations off Peru was 12.0m for males and 12.4m for females. The largest specimens taken were two males which fell in the 17.0-17 .4m class (Ramirez, 1988; Valdivia *et al.,* 1983) close to the maximum known length for humpbacks (i.e. 18m; Tomilin, 1957).

Stock identity

Humpback whales from waters off western South America are traditionally grouped into a single stock, the Area I, Group I or Chilean Group (Mackintosh, 1942; IWC, 1976; Ramirez, 1988; Winn and Reichley, 1985), recently referred to as Group VI-I stock (IWC, 1995a; Stone *et al.,* 1990). At this point genetic homogeneity within Area I is basically inferred, no samples other than these for Gorgona Island are currently available for genetic analysis (IWC, 1995a).

Rosenbaum *et al.* (1995) showed that differences in distribution of pigmentation ranks are indicative of a lack of significant exchange between the Mexican and Colombian breeding grounds, lending further support for the latter as part of the Group VI-I stock. Nevertheless the presence of the North Pacific 'AE' clade of nucleotypes in Gorgona Island humpbacks (unique among Southern Hemisphere humpbacks) is evidence of historic gene flow from the North Pacific to the Southern Hemisphere estimated at 3,000-10,000 years ago (IWC, 1995b; Baker *et al.,* 1993).

The level of genetic heterogeneity, if any, should be examined between 1- Humpbacks wintering around Gorgona Island (FIorez-Gonzalez, 1991), and 2- Whales wintering off southwest Ecuador, centered around La Plata Island at 0° 16'S, 81 °06'W (Haase and Felix, 1993), and off Piura and Tumbes, northern Peru (Ramirez, 1988; this paper). While earlier reports based on photo ID work (Haase and Felix, 1993) suggested geographic segregation on the breeding grounds, Fl6rez-Gonzalez *et al.* (1995) reported several ID matches between humpbacks sighted in Colombia, Ecuador and northern Peru, and even one between Colombia and Panama.

Humpbacks were said to visit Ecuador from June to November (Clarke, 1962) but in recent years they occur there from May to October, with numbers rapidly approaching zero towards the end of September (Haase and Felix, 1993; B.Haase, *in litt.* to KVW, 11 Feb. 1996). Weirdly, off Gorgona Island, humpbacks are seen from June until November (FIorez-Gonzalez, 1991). If anything these facts call for further research before conclusions can be taken.

Abundance

There are no past or present abundance estimates available for humpback whales off Peru or Chile, only some anecdotal appreciations such as "frequently observed off northern Peru" (Schweigger, 1964) and "do not exceed a few hundred" (Northridge, 1984). Off Gorgona Island some 170-450 whales are estimated to occur (FIorez-Gonzalez, 1991).

Ramirez (1988) classified *M. novaeangliae* as "not abundant in our environment" but claimed a slight increase, from 1975 till 1984 (no data for 1982) based on number of observations per unit of effort (OPUE). We could not detect any significant trend (Runs test above and below median, Runs test up and down, both p >0.25; linear regression, r=0.58, F =3.55, p =0.10) but the series was short. However the last OPUE value available, for 1984, was more than twice as high as any earlier value, which if research had continued might have indicated a trend. Large whale research by government scientists ceased after April 1985 and at present we can state little more about density than that *M.novaeangliae* still occurs in Peruvian waters (Table 1).

Whaling

Nineteenth century humpback whaling off Ecuador and Colombia was conducted from June to September (Van Beneden, 1887; Townsend, 1935; Clarke, 1962) but no numbers are available. According to Mackintosh (1942) 1,726 humpbacks have been killed off Chile and Peru from 19091938. Clarke (1980) and Garrett (1980) offered the most detailed statistics on takes between 1908 and 1975. Floating factories killed 525 humpbacks off Chile, Peru and Ecuador in 1925-26. Later, pelagic whaling took 16 animals in 1936-1951 and another 89 in 1954. Shore-based whaling took 57 animals in 1951-56 and 225 animals in 1964-68. The last two humpbacks to be caught in Peru were landed in 1968 (Clarke, 1980), in contradiction with Grimwood (1969). In the southern hemisphere *M.novaeangliae* has been protected by the IWC since 1964.

Balaenopterid whales were not much hunted from shore-based stations in the early years following their establishment, because separate installations were necessary to keep the oil separate from that of sperm whales, in order to meet market requirements. By 1956, 37 humpback had been killed in various unsuccessful attempts to popularize whale meat on local markets. In 1964 the Paita company installed the necessary additional oil storage equipment and renewed the hunt, taking 37 humpbacks in that year (Grimwood, 1969).

CONCLUSION

From the available data and the above discussion we conclude that:
(i) At least some humpback whales are present in coastal waters off Peru and Chile during the austral summer, and thus do not seem to migrate to the Antarctic. It is hypothesized that feeding may take place in the inshore upwelling area. Perhaps minor migrations are undertaken in search of optimal prey concentrations.

(ii) Confirmed incidental records show that the inshore occurrence of humpback whales in Area I, south of their tropical breeding grounds (in Area I) is not uncommon, contrary to earlier beliefs.

(iii) We recommend that systematic research on humpbacks and other large whales be resumed in Peruvian waters; especially the activities indicated below deserve priority attention. Implementation would greatly benefit from cooperation by Peruvian institutions and researchers formerly involved in baleen whale research.

a- Locate and prepare an inventory of historical databases and biological samples of baleen whales collected during whaling operations in Peru. Analysis of pooled data might yield new insights. Older tissue samples, even those stored in ethanol and formalin, are useful for PCR-based genetic analysis (Baker, 1995).

b- Cetacean sighting effort on IMARPE oceanographic cruises be continued and expanded to cover all months of the year and both neritic and pelagic habitats. After an initial training period for observers, a standardized line transect protocol should be adopted for population abundance estimation, and dedicated surveys be programmed.

c- Initiation of photo-identification studies to compare with existing catalogues from Colombia, Ecuador and Antarctic waters (Capella and FIorez-Gonzalez, 1993; Haase and Felix, 1993).

d- Skin biop~y sampling for genetic analysis should be started. This could be combined with the photo-ID research, to be carried out from smaller vessels.

e- Monitoring of strandings and net entanglements along the coast and collection of biological data and samples.

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Latitude	Longitude	Locality	Date	Voucher data/ Source	Comments
03.30'S	80.25'W	Pta Malpelo, near Tumbes river	Aug or Sep 1995	Photo, Dr.Llanos, IMARPE Tumbes, northern Peru	Juvenile animal stranded
04.02'S	82.21'W	[neritic]	31 Oct 1990	T.Gerrodette (SWFSC, NOAA), in litt. to KVW, 20 Feb 1966	One whale sighted (shipboard) at 17:49h
04.05'S	81.04'W	Mancora [inshore]	31 Aug 1995	Positive description, A.Garcia Miro, pers.comm. to JAS, Nov 1996	One animal observed from shore at 07.50am
04.05'S	81.04'W	Mancora [inshore]	07 Sep 1995	Positive description, A.Garcia Miro, pers.comm. to JAS, Nov 1996	Two animals observed from shore at 08:00am
04.17'S	82.26'W	[neritic]	31 Oct 1990	T.Gerrodette (SWFSC, NOAA), in litt. to KVW, 20 Feb 1966	Two whales sighted (shipboard) at 15:39h
04.46'S	82.36'W	[neritic]	31 Oct 1990	T.Gerrodette (SWFSC, NOAA), in litt. to KVW, 20 Feb 1966	Four whales sighted (shipboard) at 11:25h
06.25'S	84.11'W	[offshore]	29 April 1995	Positive observation by MAS (IMARPE)	Two animals sighted (R/V Humboldt); SST 25.1 C
06.38'S	80.06'W	~30km north of San Jose	2 July 1992	Photos 'La Industria' newspaper, files IMARPE station San Jose	some 15m long
07.06'S	80.43'W	[neritic]	22 Nov 1995	Positive observation by JAS (CEPEC)	One whale sighted (R/V Humboldt)
11.32'S	77.25'W	beach of Chancay	__ Dec 1995	Photos, IMARPE (Callao); copies at CEPEC, Pucusana	Gillnet entanglement of juvenile (est. 5-6m)
11.33'S	77.38'W	[neritic]	21 Nov 1995	Positive observation by JAS (CEPEC)	One whale sighted (R/V Humboldt)
15.20'S	75.09'W	S.Juan de Marcona [inshore]	17-20 Feb 1996	A. Garcia-Godos, photos/pers.comm. to KVW, 9 Mar 1996	Close inshore, breaching

Table 1. New, confirmed records of humpback whales in Peruvian waters in 1990-1996. Positive description or observation imply unmistakable features and behaviour were observed.