Document presented to International Whaling Commission, Shimonoseki, Japan, May 2002.

SC/54/SM10

Fisheries related mortality of small cetaceans in neritic waters of Peru in 1999-2001

K. VAN WAEREBEEK, J. ALFARO-SHIGUETO, D. MONTES, K. ONTON,

L. SANTILLAN, M.-F. VAN BRESSEM AND D. VEGA

PERUVIAN CENTRE FOR CETACEAN RESEARCH (CEPEC),

JORGE CHAVEZ 302, PUCUSANA, PERU

ABSTRACT

Fifteen fishing centres on the northern and central coasts of Peru, including large industrial fishing ports and smaller fish landing sites were surveyed for cetacean landings periodically over 29 months, from January 1999-May 2001. Monitoring effort, measured in port-days (pd), was for northern Peru 61pd (1999), 73pd (2000) and 19pd (2001); for the central coast, 24pd (1999), 7pd (2000) and 2pd (2001). Effort was largely opportunistic to other shore-based studies, but some was dedicated to cetaceans. We here document evidence for a minimum of 471 small cetaceans (310 identified to species) encountered in and around ports and landing beaches. Species composition of identifiable specimens include (% in triennium sample): Burmeister's porpoise *Phocoena spinipinnis* (42.6%), long-snouted common dolphin *Delphinus capensis* (24.2%), dusky dolphin *Lagenorhynchus obscurus* (20.6%) and bottlenose dolphin *Tursiops truncatus* (12.6%). The number of specimens tallied often were a composition of the visible fraction of animals landed that day plus remains of other animals butchered on earlier days, whence no per diem landing rates can be deduced. Moreover a dramatic change was noted in landing procedures contrasting with 1980s-90s. Depending on the port, entire cetacean carcasses were rarely landed for being illegal. New practices include butchering captured specimens at sea and landing concealed, filleted meat. Uses are still predominantly human consumption and bait for elasmobranch fisheries (both longline and gillnet). Important numbers of specimens were encountered in the form of meat and identification requires molecular genetic analysis. From now onwards, direct shipboard monitoring will be essential to estimate total mortality. Three Burmeister's porpoises (and 12 green turtles) were incidentally taken in artisanal bottom gillnets (10-18cm mesh size) in 10 supervised overnight fishing trips off northern Peru. Gillnets were set for a total duration of 163 hrs. Porpoise catch rate per hour of net soaking was 0.018 or 0.3 porpoises/boat/night. Data suggest that the predicted (Van Waerebeek, 1994) long-term relative decline of *L. obscurus* in catch composition continues, the cause for which is unknown.

INTRODUCTION

Researchers associated with the Peruvian Centre for Cetacean Research have gathered and published statistics on by-catches and directed takes of small cetaceans in Peru, occasionally Chile and southern Ecuador, at irregular intervals since 1985 (Alfaro-Shigueto and Van Waerebeek, 2001; García-Godos, 1992; Guerra *et al.*, 1987; Read *et al.*, 1988; Van Waerebeek *et al.*, 1988, 1997, 1999; Van Waerebeek, 1994; Van Waerebeek and Reyes, 1990a, 1990b, 1994a, 1994b, 1994c). Maximum reliability was ensured by the fact that data collection was done by specialized scientists, typically as part of various dedicated biological research projects. We here present, in a preliminary form, recent information on dolphin and porpoise captures in Peru gathered mostly opportunistically between 1999 and early 2001.

Since 1997 the *Instituto del Mar del Perú* (Imarpe), the research branch of the Peruvian Ministry of Fisheries, has resumed publishing some weights of commercialized meat of small cetaceans for a limited number of ports (Estrella and Guevara-Carrasco, 1997, 1998; Estrella *et al.*, 1998, 1999a,b, 2000), information which although hard to interpret without tissue sampling to allow species identification, is still greatly welcomed.

MATERIAL AND METHODS

Fifteen centres of fishing activity on the northern and central coasts of Peru, including large industrial fishing ports and smaller fish landing sites, were surveyed periodically over 29 months from January 1999- May 2001. Monitoring effort expressed in port-days (pd) was for northern Peru 61pd (1999), 73pd (2000) and 19pd (2001) and for the central coast, 24pd (1999), 7pd (2000) and 2pd (2001). Fishing centres surveyed, to variable extent included (from ca. 05°30'S north to 14°10'S south): Constante, Matacaballo, Puerto Rico, San José, Salaverry, Tortugas, Besique, Coishco, Chimbote, Los Chimus, Chancay, Ancón, Pucusana, Cerro Azul and Laguna Grande (Rancherio). Effort was largely opportunistic to other investigative activities in ports and contiguous areas including sea turtle research and monitoring of all fish landings, but some effort *in situ* was dedicated to cetaceans. Monitoring concentrated in the important fishing ports of Salaverry and Chimbote.

Ports, wharves, fish stalls at markets and fish offal dumps were visited by incognito observers who mingled with the public and discreetly perused locales. Fishermen, fishmongers and other fish market workers were queried informally about cetacean landings, not different from what any interested customer or visitor would do. Shores and contiguous areas at ports and landing beaches were searched on foot and any biological remains of cetaceans and sea turtles encountered were noted, often backed-up with photographic evidence. From experience we know that the quasi-totality of cetacean remains on these particular sites are for all practical purposes fisheries-caused mortality. All specimens that were sufficiently fresh exhibited cutmarks or marks caused by nets, ropes or were accompanied by other evidence of human interference or usage. An important number of specimens were seen as fresh meat only, for sale at market stalls or as butcher remains, and could not be identified to species. Circumstances permitting, small tissue samples were obtained and kept in 20%DMSO saline solution or 70% ETOH for later species identification by molecular genetic methods. The freshness condition of carcasses and other specimens was rated from I to V, following Geraci and Lounsbury (1993). Only heads or skulls, some of which retained as voucher specimens, were considered valid for tallying purposes, except in the absence of cranial evidence or where postcranials and skinned blubbers could not possibly be assigned (e.g. different species or freshness condition) to cranial bones found at the same locality.

Field work was carried out by biologists and a research veterinarian. On-site sampling was *ad libitum*, but timing and duration of survey trips (typically departing from Lima) were determined by circumstantial factors unrelated to fisheries, specifically the availability of observers and limited funds which introduced an important (and welcome) randomizing effect on sampling, but also impeded the implementation of a pre-determined sampling design. No monitoring effort occurred on days that are not tabled.

The number of specimens tallied on a particular day often were a composition of a (visible) fraction of the animals landed that day plus remains of other animals butchered on earlier days, whence no reliable per diem landing rate can be deduced from this information. In order to determine total fisheries-caused mortality, future investigations will need to estimate catch rates through direct shipboard observations and extrapolate to total fishing effort stratified by fishing art. One of us (JAS) executed an experimental boat-based observer scheme from the port of Constante, from November 2000 till April 2001, with the aim to determine CPUE of cetaceans and sea turtles in an artisanal gillnet fishery. A total of 11 fishing trips were directly monitored, nine with bottom gillnets, one with driftnets and one coastal shrimp trawl.

RESULTS AND DISCUSSION

Evidence of catches for a minimum of 471 small cetaceans (310 of which identified to species), documented in and around ports and landing beaches over the triennium 1999-2000, is summarized in Table 1. Species composition for subsamples by year and area are presented in Table 2. Identifiable species encountered include (% of triennium sample) Burmeister's porpoise *Phocoena spinipinnis* (42.6%) long-snouted common dolphin *Delphinus capensis* (24.2%), dusky dolphin *Lagenorhynchus obscurus* (20.6%) and bottlenose dolphin *Tursiops truncatus* (12.6%). Three fluke samples of 'cachalotillo' (pilot whales) were provided by a friendly fisherman. It is possible that genetic analysis of these and other unidentified tissue samples will confirm the presence of larger species such as pilot whales and beaked whales, as in the past (e.g. Van Waerebeek and Reyes, 1994a). Large animals likely are processed offshore and brought to land in small, 'manageable' pieces of meat.

A dramatic change was noted in landing procedures contrasting with the situation in the 1980s-90s. Depending on the port, entire cetacean carcasses were very rarely (Cerro Azul, Pucusana) or somewhat infrequently landed due to conservation regulations (e.g. Anonymous, 1996). New standard practices consist in butchering captured specimens on the boats, or possibly on an inaccessible beach, to subsequently land the filleted meat hidden in plastic bags, cases or buckets. As before, uses are predominantly for human consumption (but mostly in fresh form) and as bait in fisheries for large elasmobranch (sharks and rays) both by longline and gillnets.

Fisheries that are known to affect small cetaceans in neritic waters of Peru include (in descending importance) small-scale drift and set gillnets, industrial purse-seining (anchovy & sardines), long-lines and beach-seining. Incidence of harpooning (illegal) cannot be determined. In earlier years, the large majority of freshly captured small cetaceans were landed openly and could be tallied by a land-based observer (see e.g. Van Waerebeek and Reyes, 1994a). Numbers reported here are absolute minima, i.e. specimens which observers happen to discover, and the full extent of current mortality is unknown. Our data serve to estimate species composition but cannot be extrapolated into monthly or annual mortality rates.

Table. 2. Percentage composition (% of N) for the four predominant cetacean species taken in coastal fisheries off Peru. Port samples are pooled by area and year. N = number of individuals identified to species; N^{total} = total number of individuals including unidentified.

	N (N^{total})	% *L.obscurus*	% *D.capensis*	% *T. truncatus*	% *P.spinipinnis*
1999 northern coast	138 (190)	14.5	23.9	11.6	50.0
1999 central coast	71 (86)	42.3	21.1	22.5	14.1
2000 northern coast	55 (133)	9.1	36.4	9.1	45.5
2000 central coast	22 (26)	31.8	0	4.5	63.6
1999 PERU	209 (276)	23.9	23.0	15.3	37.8
2000 PERU	77 (159)	15.6	26.0	7.8	50.6
2001 PERU	24 (36)	8.3	29.2	4.2	58.3
1999-2001 PERU	310 (471)	20.6	24.2	12.6	42.6

Findings indicate that overall landings, and thus captures, of small cetaceans in neritic waters of Peru are still commonplace. In addition, all available evidence points to the fact that products like cetacean meat still find their way to the consumer, especially in popular markets whose customers are predominantly members of the lower income classes for whom the cheap meat (e.g. 1.0 USD/kg on 15 July 2000) may be particularly welcome.

However, the question whether the utilization of this variety of 'marine bushmeat', including sea turtle and cetacean meat (Alfaro-Shigueto and Van Waerebeek, 2001), is truly a dietary and economic necessity or rather a culinary attractive (red meat) and conveniently cheap alternative to other available low-price protein sources, is complex and needs to be carefully evaluated. In Peru, prices for raised poultry (chicken), for instance, have continued to drop and as of March 2002 were retailed in some supermarkets for as little as USD 0.80/kg. Several

fish species in popular markets are sold for less than USD 1.0 /kg as well as (by cooked weight) the numerous varieties of Peruvian legumes recognized for their high-quality protein (i.e. containing essential amino acids).

National legislation introduced in 1996 which confers protection to seven species of small cetaceans (the above cited plus *Delphinus delphis, Inia geoffrensis* and *Sotalia fluviatilis*) appears to have hardly influenced incidental captures, predictably so, as long no adjustments in fishing techniques are established to mitigate net entanglements. It is inconceivable that fishermen would auto-impose fishing restrictions to avoid mortality of a marine resource which, if captured still provides non-negligible monetary income or is a free source of high-quality bait. However it is strongly recommended that before any regulatory adjustments are defined and in order to effectively address the high by-catch problem, that an ad hoc technical feasibility study be carried out to assess in-depth all contributing aspects (biological, technical, socio-economic), as well as identify and account for idiosyncracies of Peruvian fisheries compared to global conditions and only then endeavour to draft an Action Plan.

Circumstantial evidence also indicates that intentional captures still occur with regularity (see Table 1), many of these targeted for bait purposes; but nonetheless dolphin harpooning may not longer be as generalized a practice as in the 1985-94 period. Inshore bottlenose dolphins in 'normal' group sizes are seen again with regularity off beaches south of Lima (CEPEC, unpublished data), a stock that suffered highly being easy harpoon targets in earlier years.

Three (1+2) Burmeister's porpoises and 12 green turtles were incidentally taken in the course of 10 fully supervised overnight fishing trips (soaking duration 12-22 hrs) with artisanal bottom gillnets of 10-18cm mesh size, in an area delineated by roughly 05°36'N - 06°23'N and 80°45'W - 81°00'W. Gillnets were soaked for a total of 163 hrs. The porpoise catch rate per soaking hour was 0.018 and the catch rate per average overnight fishing effort was 0.3 porpoises/boat/night. Direct monitoring effort like this needs to be expanded to cover all fishing arts and ideally should be stratified for different areas to account for unequal abundance of species. Combined with reasonable approximation of total fishing effort, total cetacean and sea turtle mortality could be estimated. No observational method however can handle approximation of illegal direct catches.

Van Waerebeek (1994) warned for a statistically significant long-term decline of *L. obscurus* in the catch composition for the central coast, from 77.5% in 1985-90 down to 52.8% in 1991-93. While it seemed to stabilize in 1995-98 with 56.8%, the decline has resumed and a mere 40.2% (39 of 97 identified) of central coast cetaceans captured in 1999-2001 were *L. obscurus*. After completing the preliminary database (Table 1) a trend analysis should be applied. The cause is unknown but prognosis is of a significant trend in either a changing environment or a lesser resilience of *L. obscurus* (relative to other species) in the face of sustained fisheries mortality.

ACKNOWLEDGEMENTS

Field research on cetaceans and sea turtles was supported by the Chicago Zoological Society (via IUCN/CSG), Columbus Zoo, Gesellschaft zum Schutz der Meeressäugetiere, IdeaWild, National Fish and Wildlife Foundation, National Marine Fisheries Service (NOAA) and New England Aquarium. We greatly acknowledge support from these organisations. We thank also unpublished data contributions by D.S. and A.S.

REFERENCES

Alfaro-Shigueto, J and Van Waerebeek, K. 2001. Drowning in the sea of silence: the bushmeat concept applied for marine fauna. Zoos and Aquariums: Commiting to Conservation.. 28 November –2 December, 2001. Orlando, Florida (abstract).

Anonymous, 1996. Reglamento para la protección y conservación de los cetáceos menores. *El Peruano* no. 5827, 15 de junio de 1996: 140323-4.

Estrella, C. and Guevara-Carrasco, R. 1997. Informe estadístico anual de los recursos hidrobiologicos de la pesca artesanal por especies, artes, caletas y meses durante 1996. Instituto del Mar del Perú, informe no.131, Marzo 1998. 222p.

Estrella, C. and Guevara-Carrasco, R. 1998. Informe estadístico anual de los recursos hidrobiologicos de la pesca artesanal por especies, artes, caletas y meses durante 1997. Instituto del Mar del Perú. Informe no.132, Marzo 1998. 422p.

Estrella, C., Guevara-Carrasco, R. and Palacios, J. 1998. Informe estadístico de los recursos hidrobiologicos de la pesca artesanal por especies, artes, caletas y meses durante el primer semestre de 1998. Instituto del Mar del Perú. Informe no.139, Octubre 1998. 229p.

Estrella, C., Guevara-Carrasco, R. and Palacios, J. 1999a. Informe estadístico de los recursos hidrobiológicos de la pesca artesanal por especies, artes, caletas y meses durante el segundo semestre de 1998. Instituto del Mar del Perú. Informe no.143, Febrero 1999. 226p.

Estrella, C., Guevara-Carrasco, R., Palacios, J., Avila, W. and Cruz, A. 1999b. Informe estadístico de los recursos hidrobiologicos de la pesca artesanal por especies, artes, meses y caletas durante el primer semestre de 1999. Instituto del Mar del Peru. Informe no. 148, Agosto 1999. 214p.

Estrella, C., Guevara-Carrasco, R., Avila, W., Palacios, J. and Cruz, A. 2000. Informe estadístico de los recursos hidrobiologicos de la pesca artesanal por especies, artes, meses y caletas durante el segundo semestre de 1999. Instituto del Mar del Peru. Informe no. 151, Enero 2000. 194p.

García-Godos, A. 1992. Captura estacional de cetáceos menores en la caleta de Ancón. Memoria X Congreso Nacional de Biología 02-07 agosto 1992, Lima : 273-279.

Geraci, J.R. and Lounsbury, V.J. 1993. Marine Mammals Ashore, a Field Guide for strandings. Texas A&M University Sea Grant College Program. 305pp.

Guerra C, Van Waerebeek, K., Portflitt, G. and Luna, G. 1987. Presencia de cetáceos frente a la segúnda región de Chile. *Estudios Oceanológicos* 6:87-96.

Read, A.J., Van Waerebeek, K., Reyes, J.C., McKinnon, J.S. and Lehman, L.C. 1988. The exploitation of small cetaceans in coastal Peru. *Biological Conservation* 46:53-70.

Van Waerebeek, K. 1994. A note on the status of the dusky dolphin in Peru. *Reports of the International Whaling Commission* (Special Issue 15): 525-528.

Van Waerebeek, K. and Reyes, J.C. 1990a. Incidental catch and sightings of Burmeister's porpoise in Peru, 1988-1989. Paper SC/42/SM5 presented to the IWC Scientific Committee, June 1990. 13pp.

Van Waerebeek, K. and Reyes, J.C. 1990b. Catch of small cetaceans at Pucusana port central Peru during 1987. *Biological Conservation* 51(1): 15-22.

Van Waerebeek, K and Reyes, J.C. 1994a. Post-ban small cetacean takes off Peru: a review. *Reports of the International Whaling Commission* (Special Issue 15): 503-520.

Van Waerebeek, K and Reyes, J.C. 1994b. A note on incidental mortality of southern minke whales off western South America. *Reports of the International Whaling Commission* (Special Issue 15): 521-523.

Van Waerebeek, K. and Reyes, J.C. 1994c. Interaction between small cetaceans and Peruvian fisheries in 1988-1989 and analysis of trends. *Reports of the International Whaling Commission* (Special Issue 15): 495-502.

Van Waerebeek, K, Reyes, J.C., Luscombe, B.E. 1988. Revisión de la distribución de pequeños cetáceos frente al Perú. *pp. 345-51. In*: H Salzwedel, A Landa (eds.). Recursos y Dinámica del Ecosistema de Afloramiento Peruano. *Boletín del Instituto del Mar del Perú*, Callao, Vol. extraordinario.

Van Waerebeek, K., Van Bressem, M.F., Félix, F., Alfaro, J., García-Godos, A., Chávez, L., Ontón, K., Montes, D. and Bello, R. 1997. Mortality of dolphins and porpoises in coastal fisheries off Peru and southern Ecuador in 1994. *Biological Conservation* 81: 43-49.

Van Waerebeek, K., Van Bressem, M.F., Alfaro-Shigueto, J., Sanino, G.P., Montes, D., Ontón, K. 1999. A preliminary analysis of recent captures of small cetaceans in Peru and Chile. Paper SC/51/SM17, 51st Annual Meeting of the IWC Scientific Committee, May 1999, Grenada.