

# A note on strandings and entanglements of humpback whales (*Megaptera novaeangliae*) in Ecuador

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## ABSTRACT

Between June and September of each year, southeastern Pacific humpback whales, *Megaptera novaeangliae*, arrive on the Ecuadorian coast to reproduce. Between July 2001 and September 2002, seven new strandings of humpback whales were found at different places along the Ecuadorian coast. Three of them were related to incidental catches caused by fishing nets (gillnets) and one of them occurred outside of the humpback whales' reproductive season. Using non-proportional and proportional 95% confidence interval calculations, it is estimated that the average frequency of strandings of humpback whales is 1.55 individuals per year (95% CI: 0.27,2.83; range: 1-4) since 1994, principally in the central and southern parts of the Ecuadorian coast, and the proportion of strandings due to bycatch is estimated at 0.286 (95% CI: 0.105,0.533). A preliminary mortality rate of 0.035(95% CI: 0.019,0.055), including both unknown and anthropogenic causes is estimated for this stock. 50% of the strandings took place in August and most were registered in 2001 ( $n=4$ ). Six humpback whales with fishing nets embedded in their pectoral fins and tails were also observed in the marine area of the Machalilla National Park and the island of La Plata July-September. 67% of these entanglements occurred in July, and in one case a mother, accompanied by her calf, was observed with cables and a net on her head. These incidental catches are possibly related to the strandings occurring at the same time along the Ecuadorian shoreline. The fishery device most frequently linked to bycatch is the surface gillnet. Technological changes in fishing gear are vital for the conservation of marine mammals. It is imperative that the Ecuadorian coast be divided into zones and certain areas be delimited for the conservation of humpback whales through agreements with local users of the marine areas.

KEYWORDS: HUMPBACK WHALE; STRANDINGS; INCIDENTAL CATCHES; GILLNETS; MONITORING; SOUTHERN HEMISPHERE; PACIFIC OCEAN; SOUTH AMERICA; MORTALITY RATE; FISHERIES

## INTRODUCTION

From June to September of each year, a large number of humpback whales (*Megaptera novaeangliae*) arrive in Ecuadorian waters to breed (Haase and Félix, 1993; Scheidat *et al.*, 2000; Félix and Haase, 2001c). These whales are part of the southeast Pacific humpback whale population (Group 1 stock) that feeds in the Antarctic (Dawbin, 1966; Leatherwood *et al.*, 1983; IWC, 1999). Estimates of the number of animals using Ecuadorian waters range from 405 (95% CI: 221-531) (Scheidat *et al.*, 2000) to 2,683 (95% CI: 397-4,969) (Félix and Haase, 2001c) individuals. Félix *et al.* (1997) reported on the first recorded strandings of humpback whales along the Ecuadorian coast, with seven strandings occurring between August 1994 and October 1996, primarily along the southern coastline. At least one of the animals had been bycaught in industrial fishing nets (Félix *et al.*, 1997). In 1998, two humpback whale calves were captured in the nets of local fishermen near the island of La Plata (Scheidat *et al.*, 2000). Bycatches of cetaceans in fishing gear is one of the main threats to cetaceans (e.g. Perrin *et al.*, 1994; Reeves and Leatherwood, 1994; Carwardine, 1995; Reeves *et al.*, 2002). This note reports on new strandings of humpback whales along the Ecuadorian coast and provides the first observation of entanglements of this species observed at sea off Ecuador.

## METHODS

From June to September 2001, four non-governmental organisations (Fundación Natura, FEMM, Yagu Pacha and the Pacific Whale Foundation), collaborated to collect field

data and try to identify possible causes of reported stranding events. When possible, data on the length, age and sex of the stranded animals were collected. Stranding records are effectively opportunistic, although FEMM have been monitoring and investigating strandings of marine mammals along the Ecuadorian coast for ten years. Additionally, as part of an annual humpback whale population monitoring programme, two organisations (Yagu Pacha and Pacific Whale Foundation) have recorded observations of entangled individuals around La Plata Island and Machalilla National Park (1°23'S, 80°58'W). These areas are considered important breeding grounds for the Group I humpback whales stock (Scheidat *et al.*, 2000; Félix and Haase, 2001c) (Figs 1 and 2). From 4 July to 2 October 2001, daily at-sea monitoring was carried out from commercial whalewatching boats based in Puerto Lopez (1°25', 79°55'W; Fig. 2) following a route to and from La Plata Island (Fig. 1). The total effort comprised 240 hours (87 days and 149 trips). Observations were also made from land. Hand-held global positioning systems (GPSs) were used to record the locations of entangled whales.

## RESULTS

Seven new strandings of humpback whales were recorded during July/August 2001 and January-September 2002 (Table 1; Fig. 1). The first stranding (no. 1) was found at the coastal area of Libertador Simón Bolívar. The animal (*ca* 14m) was in an advanced state of decomposition and the sex could not be determined. It appeared that both flippers and the caudal peduncle had been cut (Fig. 3) as well as about

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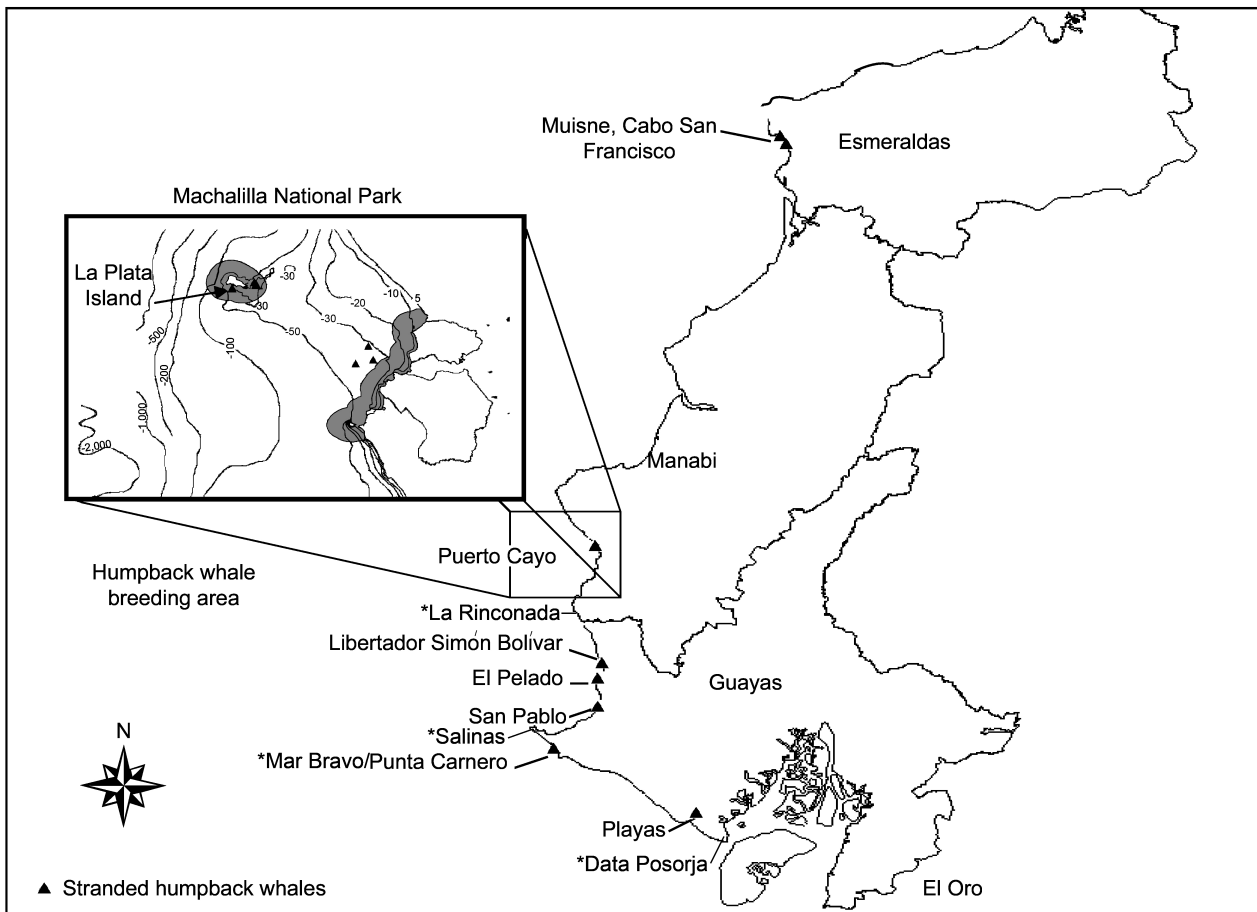


Fig. 1. Strandings of humpback whales on the Ecuadorian coast July 2001-September 2002 and locations of La Plata Island and Machalilla National Park. \*=2004 strandings.

one-third of the upper jaw. The most probable cause of death appeared to be entanglement in either commercial or artisanal fishing gear; the animal was probably cut free while at sea (Ben Haase, pers. comm). Félix *et al.* (1997) had also reported a stranded humpback whale on Manglaralto (approximately 1km from Libertador Simón Bolívar), that had similar deep cable cuts on its tail and pectoral fins.

The second stranding (no. 2) was found at Punta Carnero. It was a smaller (9.5m), fresh animal. From its length, it was a sexually immature subadult (sexual maturity occurs at around 11-12m, Leatherwood *et al.*, 1988). It had an artisanal multifilament gillnet with floats embedded in its tail flukes, as well as deep cuts in the throat grooves and a ruptured humerus of the right pectoral fin (Fig. 4). It may have been one of a number of whales observed entangled in the Machalilla National Park (Table 2). The third stranding (No. 3) was of an adult at Muisne; the cause of the death could not be determined.

Stranding no. 4, found at Puerto Cayo, near the Machalilla National Park, was a small (almost 8m and probably a yearling) individual in such an advanced state of decomposition that its sex could not be determined. Wounds and injuries, in the throat and ventral areas. Stranding no. 5 was a small (6.8m) yearling or late season calf. It was found on 31 January 2002 at San Pablo, Santa Elena Peninsula, outside the typical breeding season. This suggests that adults and calves are found in Ecuadorian waters later than previously reported. It had bite wounds on its body (Ben Haase, pers. comm.; Haase and Félix, 2002) and no

evidence of an encounter with fishing nets. The observed scars and wounds on these two individuals could have been caused by either scavengers post-mortem or predators pre-mortem. Killer whale (*Orcinus orca*) attacks in tropical South Pacific waters have been reported by Florez-Gonzalez *et al.* (1994). Transient killer whales around La Plata Island in the marine area of the Machalilla National Park (Carvajal and Gutierrez, 1995; Castro and González, 2002) and the Galapagos Islands (Merlen, 1999) have been documented.

The presence of killer whales in Ecuadorian waters is more common than previously thought. An attack of killer whales on humpback whales around La Plata Island was reported by Scheidat *et al.* (2000). Fourteen humpback whales were photo-identified (Félix and Haase, 2001a) with bite marks and mutilations presumably from killer whales (or more probably false killer whales, *Pseudorca crassidens*) in the same area. A stranded calf with signs of killer whale attack was recently found at Salinas (2°15'S, 80°40'W: Fernando Félix, pers. comm.). In 1992, 56 false killer whales beached at Chanduy (Félix, 1992) and more recently Castro (2004) reported large schools of pygmy killer whales (*Feresa attenuata*) around La Plata Island (1°34'S, 80°99'W).

The final two strandings occurred at the end of the season (September 2002, at the end of the breeding season. The first (no. 6), at the village of Playas, was an adult mature female (16.2m) that presented some evidence of fishery interaction (fishing nylon) whilst the other (no. 7), was a two week-old female calf (*ca* 5m) stranded on the beach at El Pelado (Table 1).

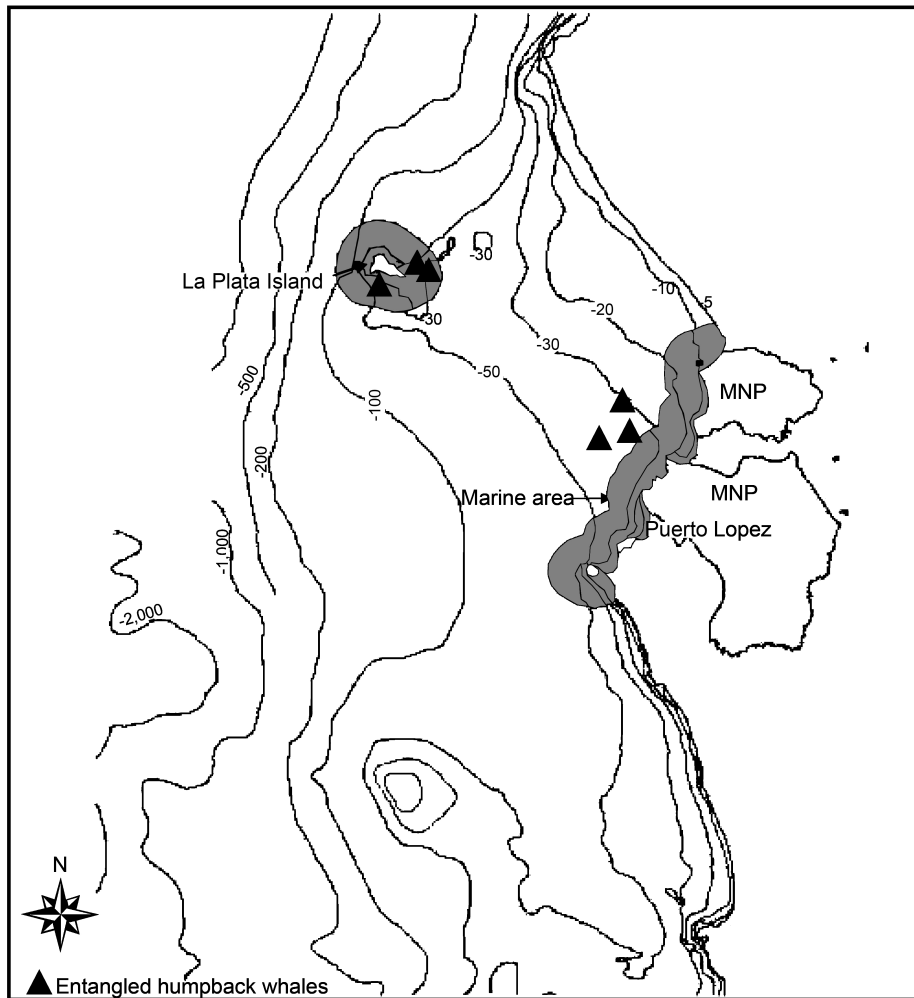


Fig. 2. Records of entangled humpback whales around La Plata Island and the Marine Area of Machalilla National Park July-September 2001.

Table 2 presents the sighting locations and details of the six reported humpback whale entanglements in the Machalilla National Park and La Plata Island during July-September 2001 (Fig. 2); four occurred in July ( $n=4$ ). These included a mother and calf, with green cables and a net on the head. The entanglements were recorded in waters 30-50m deep within 5km offshore (Fig. 2), showing that entangled humpback whales were commonly seen close to the coast.

**DISCUSSION**

Bycatch in commercial and artisanal fisheries is known to be one of the most serious anthropogenic threats to cetaceans and indeed many other large marine organisms (Hall *et al.*, 2000). In Ecuador, artisanal fleets comprised some 7,000 vessels in the early 1990's, operating from around 70 communities (Campbell *et al.*, 1991). By the late 1990's this number had risen to an estimated 15,000 artisanal vessels

Table 1  
Strandings of humpback whales on the Ecuadorian coast (July-August 2001 – January-September 2002). F = female.

No.	Location	Position	Date	Total length (m)	Sex	Remarks
1	Libertador Simón Bolívar	1°41'S, 80°50'W	24 Jul. 2001	~14	F*	Deep cuts in the caudal peduncle and both pectoral fins mutilated.
2	Punta Carnero-Mar Bravo	2°13'S, 80°59'W	01 Aug. 2001	9.5	F	Tail flukes embedded in a multifilament gillnet with floats.
3	Muisne, San Francisco	3°35'N, 79°59'W	Aug. 2001	-	-	Cause of death unknown.
4	Puerto Cayo, río Amargo	1°26'S, 80°50'W	20 Aug. 2001	7.7	-	Wounds and injuries present in the ventral side generated by bites.
5	San Pablo	1°41'S, 80°50'W	31 Jan. 2002	6.80	-	Wounds generated by bites.
6	Playas, General Villamil	2°37'S, 80°23'W	Sept. 2002	16.2	F	A cut in flukes and presence of fishing nylon on both caudal trunk and embedded within baleen in the upper jaw.
7	El Pelado	1°41'S, 80°50'W	Sept. 2002	5.43	F	Dismembered by people from the communities after stranding (cause of death unknown).

\*Because of the whale's size it was classified as female.



Fig. 3. Adult humpback whale stranded in Libertador Bolívar, Guayas Province, Ecuador. Note the lack of the left pectoral fin (26 July 2001). [Photo: Raúl Carvajal]

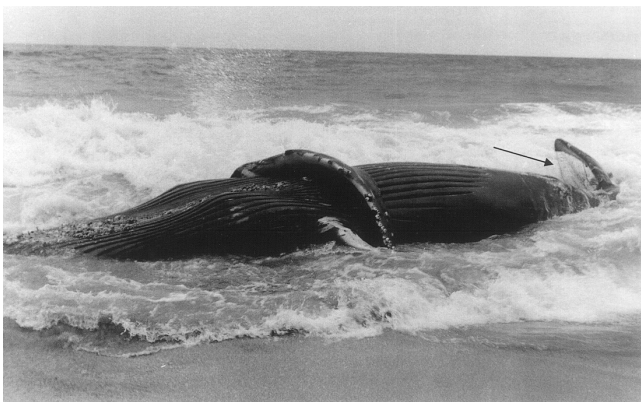


Fig. 4. Stranding of a juvenile humpback whale due to bycatch, Punta Carnero, Guayas Province, Ecuador. The arrow indicates the presence of a gillnet embedded around the tail flukes (1 August 2001). [Photo: Raúl Carvajal]

(Ormaza and Ochoa, 1999). The most common vessels are small (2-3 person) rafts with 20-50HP outboard motors, long wooden canoes for 3-4 fishermen and 10m wooden or fibreglass-open boats, with 75-100HP outboard motors (Massay, 1987). Fishing techniques include longlines (4-11.5km in length with about 100-1,500 hooks) and both surface (3km in length and 15m in depth) and deep (300-400m in length) gillnets (Cedeño, 1987; Martínez *et al.*, 1991). Humpback whales are protected by Ecuadorian law and also listed as vulnerable (Ministerial Decree No. 196 Official Register No. 458, June 1990).

The data from Félix *et al.* (1997) and this study ( $n=7$ ) (Fig. 5), imply a minimum stranding frequency of 1.55 ( $=14/9$ ) individuals  $\text{year}^{-1}$  (95% CI: 0.27, 2.83; range: 1-4), principally in the central and southern parts of the Ecuadorian coast. Four of the 14 individuals (*ca* 29%, 95% CI 11-53%) showed evidence of fishery interaction. The high occurrence during August and September is consistent with the study of Capella *et al.* (2001) for the coast of Colombia.

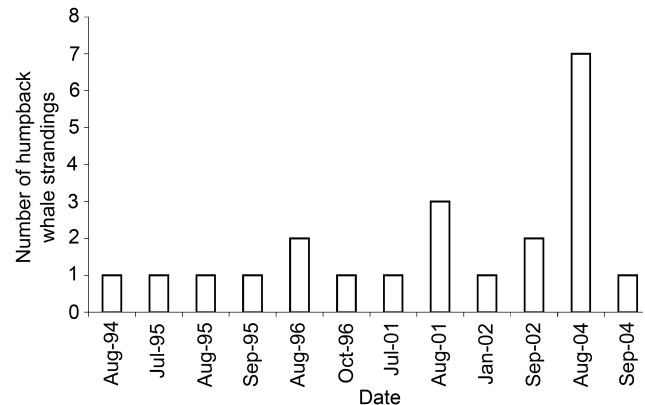


Fig. 5. Historical strandings data of humpback whales on the Ecuadorian Coast. Field data 1997-2001 and 2003 is not available because field data was not registered during that period. Data for 1994-1996 and 2004 were obtained from Félix *et al.* (1997) and Félix *et al.* (2004) respectively.

The potential effect of this mortality has yet to be determined and it is essential that better estimates of both anthropogenic mortality and abundance are obtained. However, depending on the assumptions made, the value could be in the region of 0.035, if the abundance estimate of 405 reported by Scheidat *et al.* (2000) is used. The estimates of bycaught animal mortality presented here may be underestimates; in 2001, the number of observed humpback whales entangled in fishing gear exceeded the number of stranded animals and the fate of these animals is unknown.

More recently, two and three adult humpback whales entangled in fishing gear were sighted at sea during whale watching and sightings surveys in the 2003 and 2005 breeding seasons (Fernando Félix, pers. comm.). No strandings were recorded in Ecuador for 2003. An unusually high number of strandings (three adults and five newborn calves) were recorded in 2004, but no cause of death was established (see Table 3; Félix *et al.*, 2004). Seven of these

Table 2  
Cases of incidental catches and entanglement of humpback whales near the island of La Plata\* in the Machalilla National Park (July-September 2001).

No.	Location	Date	Remarks
1	Coast of Machalilla, offshore	15 Jul. 2001	Adult humpback whale with fishing nets present in the pectoral fins. <sup>a</sup>
2	In front of Machalilla shoreline	20 Jul. 2001	Whale completely embedded in gillnets; tail flukes only free of the net; breathing with difficulty and abnormal swimming behaviour. <sup>a</sup>
3	Eastern sector of La Plata Island	26 Jul. 2001	Female with green ropes and net on its head and dorsal fin accompanied by a very small calf. <sup>b,e</sup>
4	La Plata Island, in front of Punta Escalera	30 Jul. 2001	Whale with pectoral fins encircled by net and fractured flukes (broken). <sup>c</sup>
5	In front of the Machalilla town coast	01 Aug. 2001	Whale with body surrounded by green and black net (probably a green and broken gillnet). <sup>b,d</sup>
6	Near the La Plata Island	10 Sept. 2001	Adult whale with green net in its mouth and 10 metres of rope and floats. <sup>d</sup>

\*01°23'S, 80°58'W (between the island and continental Ecuador, waters of the Pacific Ocean); <sup>a</sup>Mrs. María Moreno de los Ríos (pers. comm.); <sup>b</sup>María José Barragán (pers. comm.); <sup>c</sup>Mr. Julio Pin (Machalilla National Park ranger) (pers. comm.); <sup>d</sup>Cristina Castro (pers. comm.); <sup>e</sup>Daniela Rosero (pers. comm).

Table 3  
Strandings of humpback whales on the Ecuadorian coast during 2004.\*

No.	Location	Position	Date	Total length (m)	Sex
1	Playas	2°37'S, 80°23'W	5/08/04	>10	-
2	Playas	2°37'S, 80°23'W	5/08/04	4-5	-
3	La Rinconada	1°S, 80°W	13/08/04	14.3	M
4	Libertador Bolívar	1°41'S, 80°50'W	19/08/04	~5	-
5	Libertador Bolívar	1°41'S, 80°50'W	23/08/04	5	M
6	Data de Posorja	2°42'S, 80°14'W	24/08/04	14.5	F
7	Salinas	2°15'S, 80°40'W	31/08/04	~5	-
8	Mar Bravo	2°13'S, 80°59'W	14/09/04	~6	-

\*Source: Data obtained and adapted from Felix *et al.* (2004).

strandings were found in August, although some were in an advanced state of decomposition. In 2003, six humpbacks washed ashore in September and October over less than 120km of the northern coast of Perú (Goya *et al.*, 2004). The cause of these mortalities during the southward humpback migration is thought to have been due to the presence of biotoxins.

As is the case elsewhere, entanglement may pose a greater threat to calves, yearlings and immatures than adults (Castro *et al.*, 1999). The prevalence of entanglements in waters 20-60m deep coincides with the distribution of most of the humpback whales (48-57%) reported by Félix and Haase (2001b; 2005). In addition to studies to better estimate the potential effect of bycatches on the population, it is important that efforts be made to develop effective mitigation strategies with the fishery sector in Ecuador and in the context of better fishery management for both artisanal and industrial fisheries. It is also important to explain potential problems to fishermen and recently, an environmental education program has been developed to address the artisanal fishermen in five fishing communities, near the Machalilla National Park. These communities were selected because of the high rate of incidental catches by surface gillnets known to occur in this area (Alava, 2001). Changes to fishing gear and operational procedures are being proposed as sustainable alternatives for the fishing industry, that will reduce bycatch per unit of effort (Hall *et al.*, 2000). Given the seasonal occurrence of humpback whales in the region, fishing restrictions during July and August, the prime breeding months is also likely to reduce bycatches (Hall *et al.*, 2000). Finally, serious consideration must be given to dividing the Ecuadorian coast be divided into conservation zones for humpback whales through agreements with local users of the marine areas.

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## REFERENCES

- Alava, J.J. 2001. Capacitación sobre la ballena jorobada y delfines al sector pesquero artesanal. Informe Técnico presentado a la Subsecretaría de Recursos Pesqueros (SRP) – MICIP (unpublished). Available from the author. [In Spanish]
- Campbell, R.J., Fallows, I., Scott, J., Ortiz, T., Rodríguez, T. and Mora, T. 1991. Una revisión del sector pesquero artesanal en el Ecuador y los factores de consideración para su desarrollo. *Boletín Científico y Técnico* 11(8):89. [In Spanish].
- Capella, A.J., Flórez-González, L. and Falk-Fernández, P. 2001. Mortality and anthropogenic harassment of humpback whales along the Pacific coast of Colombia. *Mem. Queensl. Mus.* 47(2):547-53.
- Carvajal, R. and Gutierrez, M. 1995. Ocras cerca de la Isla de la Plata. El Observador Informativo (FEMM), Año 7, 3:8-9. [In Spanish].
- Carwardine, M. 1995. *Ballenas, delfines y marsopas, manuales de identificación*. Ediciones OMEGA S.A., Barcelona. [In Spanish].
- Castro, C. 2004. Encounter with a school of Pygmy killer whales (*Feresa attenuata*) in Ecuador, southeast tropical Pacific. *Aquat. Mamm.* 30(3):441-4.
- Castro, C. and González, J. 2002. Población de la ballena jorobada *Megaptera novaeangliae* Balaenopteridae, en el Parque Nacional Machalilla, Ecuador. Doctorate Thesis, Universidad Central del Ecuador.
- Castro, C., Gonzalez, J., Denking, J. and Scheidat, M. 1999. Historic presence of marine mammals on the Ecuadorian coast. *Eur. Res. Cetaceans* [Abstracts] 13:181.
- Cedeño, A. 1987. Características generales de las artes de pesca artesanal en el Ecuador. pp. 23-40. In: Espol, Ceplaes and Ildis (eds.) *La Pesca Artesanal en el Ecuador*. CEPLAES, Quito, Ecuador. 288pp [In Spanish].
- Dawbin, W.H. 1966. The seasonal migratory cycle of humpback whales. pp. 145-70. In: K.S. Norris (ed.) *Whales, Dolphins, and Porpoises*. University of California Press, Berkeley and Los Angeles. xv+789pp.
- Félix, F. 1992. Varamiento masivo de falsas orcas en Chanduy. *El Observador Informativo* 4(6):1-2. [Available from: FEMM, Guayaquil, Ecuador].
- Félix, F. and Haase, B. 2001a. The humpback whale off the coast of Ecuador, population parameters and behavior. *Rev. Biol. Mar. Oceanog.* 36(1):61-74.
- Félix, F. and Haase, B. 2001b. A note on humpback whales off the coast of Ecuador during the 1997 'El Niño' event. *J. Cetacean Res. Manage.* 3(1):59-64.
- Félix, F. and Haase, B. 2001c. Towards an estimate of the southeastern Pacific humpback whale stock. *J. Cetacean Res. Manage.* 3(1):55-8.
- Félix, F. and Haase, B. 2005. Distribution of humpback whales along the coast of Ecuador and management implications. *J. Cetacean Res. Manage.* 7(1):21-9.
- Félix, F., Haase, B., Chiluiza, D., Amador, P. and Davis, J.W. 1997. A note on recent strandings and bycatches of sperm whales (*Physeter macrocephalus*) and humpback whales (*Megaptera novaeangliae*) in Ecuador. *Rep. int. Whal. Commn* 47:917-9.
- Félix, F., Haase, B., Bearson, B., Torres, S. and Falconi, J. 2004. Scientific and educational activities in Ecuador during 2004. Report to the Whale and Dolphin Society, England, December 2004. 28pp. [Available from: [www.wdcs.org](http://www.wdcs.org)].
- Flórez-González, L., Capella, J.J. and Rosenbaum, H.C. 1994. Attack of killer whales (*Orcinus orca*) on humpback whales (*Megaptera novaeangliae*) on a South American Pacific breeding ground. *Mar. Mammal Sci.* 10(2):218-22.
- Goya, E., Marquez, J.C. and Garcia-Godos, A. 2004. Informe nacional del Perú sobre el estado actual de los mamíferos marinos y las medidas de protección adoptadas. Informe presentado a la III Reunión de Expertos para Revisar las Actividades del Plan de Acción

- para la Conservación de las Mamíferos Marinos del Pacífico Sudeste, Lima, Perú. 55pp.
- Haase, B. and Félix, F. 1993. Identification of the humpback whale population along the Ecuadorian coast. Project report presented to the Whale and Dolphin Conservation Society, Bath, England (unpublished). 5pp.
- Haase, B. and Félix, F. 2002. Record de permanencia de una cría de ballena jorobada en el Pacífico Sudeste. 10ma. Reunión de Trabajo de Especialistas en mamíferos Acuáticos de América de Sur y 4to Congreso de la Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos (SOLMAC). [In Spanish]
- Hall, M.A., Alverson, D.L. and Metzals, K.I. 2000. By-catch: problems and solutions. *Mar. Poll. Bull.* 41(1-6):204-19.
- International Whaling Commission. 1999. Report of the Scientific Committee. Annex E. Report of the Sub-Committee on Other Great Whales. *J. Cetacean Res. Manage. (Suppl.)* 1:117-55.
- Leatherwood, S., Reeves, R.R. and Foster, L. 1983. *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books, San Francisco. xvii+302pp.
- Leatherwood, S., Reeves, R., Perrin, W. and Evans, W. (1988): Ballenas, delfines y marsopas del Pacífico Nororiental y de las aguas árticas adyacentes. Una guía para identificación. Comisión Interamericana del Atún Tropical (CIAT), La Jolla, California. [In Spanish]
- Martínez, J., Coello, S. and Contreras, S. 1991. Evaluación de las pesquerías artesanales de la costa de Ecuador durante 1990. *Boletín Científico y Técnico* XI(4):1-42. [In Spanish].
- Massay, S. 1987. Notas sobre la pesca artesanal de peces en algunos puertos pesqueros de las provincias del Guayas y Manabí. pp. 9-15. In: J. Martínez, A. Ansaldo, M. Hurtado and R. Montano (eds.) *La Pesca Artesanal en el Ecuador*. Instituto Nacional de Pesca, Guayaquil, Ecuador. 44pp. [In Spanish].
- Merlen, G. 1999. The orca in Galapagos: 135 sightings. *Not. Galápagos* 60:2-8.
- Ormaza, F. and Ochoa, L.A. 1999. *Puertos pesqueros artesanales de la costa continental ecuatoriana*. Instituto Nacional de Pesca/Programa de Pesca VECEP.ALA 92/43, Guayaquil, Ecuador. 346pp. [In Spanish].
- Perrin, W.F., Donovan, G.P. and Barlow, J. (eds.). 1994. *Report of the International Whaling Commission (Special Issue 15). Gillnets and Cetaceans*. International Whaling Commission, Cambridge, UK. 629pp.
- Reeves, R.R. and Leatherwood, S. (eds.). 1994. *Dolphins, Porpoises, and Whales: 1994-1998 Action Plan for the Conservation of Cetaceans*. IUCN, Gland, Switzerland. 92pp.
- Reeves, R.R., Stewart, B.S., Clapham, P.J. and Powell, J.A. 2002. *Guide to Marine Mammals of the World*. National Audubon Society/Alfred A. Knopf, Inc, New York. 528pp.
- Scheidat, M., Castro, C., Denkinger, J., González, J. and Adelung, D. 2000. A breeding area for humpback whales (*Megaptera novaeangliae*) off Ecuador. *J. Cetacean Res. Manage.* 2(3):165-72.

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