

Further information on the migratory destination of humpback whales of the Magellan Strait feeding ground

JORGE ACEVEDO¹, KRISTIN RASMUSSEN², FERNANDO FÉLIX³, CRISTINA CASTRO⁴, ANELIO AGUAYO-LOBO^{1,5}, BEN HAASE³, MEIKE SCHEIDAT⁶, CARLOS OLAVARRÍA^{1,7}, PAUL FORESTELL^{4,8}, PAOLA ACUÑA^{1,9}, GREGORY KAUFMAN⁴ & LUIS A. PASTENE^{10,11}

¹*Centro de Estudios del Cuaternario Fuego-Patagonia y Antártica. (CEQUA) Avda. Bulnes 01855, Punta Arenas, Chile.*

²*Cascadia Research Collective, 218 ½ West 4th Ave Olympia, WA 98501, USA.*

³*Fundación Ecuatoriana para el Estudio de Mamíferos Marinos, PO Box 09-01-11905, Guayaquil, Ecuador.*

⁴*Pacific Whales Foundation-Ecuador, PO Box 1721872, Quito, Ecuador.*

⁵*Instituto Antártico Chileno, Plaza Muñoz Gamero 1055, Punta Arenas, Chile.*

⁶*Forschungs und Technologiezentrum Westkueste, Universidad Kiel, Busum, Alemania.*

⁷*School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand.*

⁸*Southampton College, Long Island, USA.*

⁹*Instituto de Biología, Universidad Nacional Autónoma de México, Ap. Postal 70-153, C.P. 04510, Coyoacán, México D.F. México.*

¹⁰*The Institute of Cetacean Research, Toyomi-cho 4-5, Chuo-ku, Tokyo 104-0055, Japan.*

¹¹*Scientific Adviser for the Marine Biology Group of CEQUA.*

ABSTRACT

The Eastern South Pacific humpback whale population winter primarily off Colombia and Ecuador, and migrate south to the Antarctic Area I feeding ground during the austral summer. In recent years humpback whales have been recorded feeding in the Patagonian channels of South America during the summer and fall seasons. Previously, a first migratory link was established between the Magellan Strait feeding area and the primarily wintering grounds off Ecuador and Colombia, but also with new wintering grounds of Panama and Costa Rica. Here we present further evidence of a migratory relationship between the Magellan Strait and Panama, as well as we inform on four new matches between Magellan Strait and Ecuador. In the latter locality the animals have been sighted once on a single occasion, suggesting that they possibly are travelling towards northern waters. We report a re-sighting between the Magellan Strait and Panama which remarkably corresponded to the same matched individual previously reported by us for the same area. This whale has been recorded in the austral summers of 2003, 2004 and 2005 in the Magellan Strait feeding area and off Panama during the austral winters of 2003 and 2004. This result suggests a strong site fidelity to the migratory destinations and reveals the importance of the Panama wintering area as the migratory destination for at least part of the humpback whales that feed on the Magellan Strait.

INTRODUCTION

Southern Hemisphere humpback whales of the breeding stock G winter primarily in low latitudes, off Ecuador and Colombia (Floréz-González *et al.* 1998; Scheidat *et al.* 2000; Félix & Haase 2001), and migrate south to the Antarctic management Area I (Mackintosh 1965; Stone *et al.* 1990; Stevick *et al.* 2004). However, other geographic areas are also occupied during the breeding and feeding seasons. Acevedo & Smultea (1995) and Rasmussen *et al.* (2001) reported new wintering areas off Panama and Costa Rica, which are also utilized by Northern Hemisphere humpback whales. Also new feeding areas have been recorded recently, within the Patagonian channels of South America, especially in the central portion of Magellan Strait (Gibbons *et al.* 2003; Acevedo *et al.* 2004a).

The migratory relationship between the Antarctic Peninsula feeding area and the Colombia/Ecuador breeding grounds has been supported by photo-ID (Stone *et al.* 1990; Garrigue *et al.* 2002; Stevick *et al.* 2004) and genetic analysis (Olavarría 1999; Caballero *et al.* 2000; Olavarría *et al.* 2000) while its migratory relationship with the Costa Rica wintering ground has been supported by photo-id (Rasmussen *et al.* 2003; 2004).

The migratory relationship between humpback whales that feed in Magellan Strait and those from Ecuador, Colombia, Panama and Costa Rica wintering grounds has been supported by photo-ID. Actually, one individual was photo-ID in the Magellan Strait feeding area on the summer of 2003, then in Panama on the

winter of the same year and then back again in the Magellan Strait during the next summer, showing a strong fidelity to the feeding area (Acevedo *et al.* 2004b).

In this report, we present a further evidence of a migratory relationship between the Magellan Strait and the Panama breeding ground. Also additional matches between Magellan Strait and Ecuador are reported and discussed in the context of migratory connections between feeding and breeding areas of the Southeastern Pacific humpback whale population.

MATERIALS AND METHODS

Cetacean surveys in the Magellan Strait area were undertaken between March 2003 and April 2005 by the Marine Biology Group of the Centre for the Studies of Quaternary Fuego-Patagonia (MBG/CEQUA.), on board of the vessel "Chonos". The study area encompasses principally the central part of the Magellan Strait (Figure 1).

A total of 74 humpback whales have been photo-identified, which were compiled in the catalogue of the MBG. This catalogue was compared with both catalogues of breeding grounds of Ecuador, Fundación Ecuatoriana para el Estudio de Mamíferos Marinos (FEMM) (n = 463 humpback whales) and Pacific Whales Foundation (n = 337 whales), as well as the catalogue of Southern humpback whales of the breeding grounds of Panama and Costa Rica, Cascadian Research Collective (n = 41 whales).

RESULTS AND DISCUSSION

Four new matches are reported between Magellan Strait and Ecuador. Humpback whales were photo identified first in Ecuador and then re-sighted in the Magellan Strait (Table 1 and Figure 2). In Ecuador whales were sighted only once while in the Magellan Strait three of these whales were sighted in two consecutive study seasons, and the last whale only in the present season. (Table1). The four whales were residents in the Magellan Strait by some time during the austral summer.

Because the previous matches between Magellan Strait and Ecuador (Acevedo *et al.* 2004b) were also recorded only in one opportunity in that wintering ground, we speculate that these animals in the Ecuador winter area are migrating to northernmost winter area, possibly to Colombia, Panama or Costa Rica grounds, or other area not studied.

A new match is reported between the Magellan Strait and Panama. Remarkably, this animal corresponds to the same individual (MBG/CEQUA #003 and CRC 1031) previously seen in both areas (Acevedo *et al.* 2004b). This adult whale, which was identified as male by molecular methods (Olavarria *et al.* unpublished data), was recorded in March 2003 in the Magellan Strait, then off Panama in September 2003, then back to the Magellan Strait in February 2004, then off Panama in September 2004 and finally back again to the Magellan Strait in February 2005 (Table 2 Figure 3). This finding reveals the importance of Panama wintering area as a migratory destination for a part of the humpback whales of the Magellan Strait feeding area. Given these results it is possible that the northernmost wintering area for the Eastern South Pacific population (08°N) is linked to the northernmost feeding area (Magellan Strait) (53°S.). A similar situation was described by Calambokidis *et al.* (2000) for the eastern North Pacific population relating the southernmost wintering area in Panama/Costa Rica with the southernmost feeding area of California.

Finally, results on photo-ID studies have not been consistent regarding sexual differences in site fidelity. Some studies suggest that the males show greater site fidelity than females (Craig & Herman 1997), but others are suggesting the opposite (Sladen *et al.* 1999, Garrigue *et al.* 2000). This finding of strong site fidelity of a male humpback whale is similar of the results informed by Calambokidis *et al.* (2000). These authors reported that known males from California were 2.2 times more likely to have been identified on a wintering ground than known females. A similar situation could be speculated for the Eastern South Pacific Population but this should be confirmed by further genetic analysis of the photo-identified whales.

ACKNOWLEDGEMENTS

We thank Nautilus & Sermars Ltd for providing the research vessel *Chonos* and for their support to our field activities. We would like to thank to students Richard Ritter, Francisco Sepúlveda and Sebastián Vásquez as well as the colleagues Med. Vet. Javier Cabellos and Biol. Mar. Jordi Plana, that participated in the different cruises from December 2004 until April 2005. We also thank the Director of CEQUA and the Director of the Chilean Antarctic Institute for their support. The work in Ecuador of Fundación Ecuatoriana para el Estudio de Mamíferos Marinos is supported by the Whale and Dolphin Conservation Society (WDCS).

REFERENCES

- Acevedo A, Smultea MA (1995) First records of humpback whales including calves at Golfo Dulce and Isla del Coco, Costa Rica, suggesting geographical overlap of Northern and Southern hemisphere population. *Marine Mammal Science* 11 (4): 554-560.
- Acevedo J, Acuña P, Olavarría C, Aguayo-Lobo A, Pastene L (2004a) Report of cetacean surveys in the Magellan Strait in the austral summer 2003/2004. Document SC/56/O7 submitted to the International Whaling Commission.
- Acevedo J, Aguayo-Lobo A, Rasmussen K, Félix F, Llano M, Allen J, Olavarría C, Acuña P, Pastene L (2004b) Migratory destination of humpback whales, *Megaptera novaeangliae* (Borowski, 1781), that feed in the Magellan Strait, Chile, in the Eastern Pacific Ocean. Document SC/56/SH22 submitted to the Scientific Committee of the International Whaling Commission.
- Caballero S., Hamilton H, Flórez-González L, Capella J, Olavarría C, Rosenbaum HC, Baker CS (2000) Stock identity and diversity of humpback whale mitochondrial DNA lineages on the Colombian winter breeding grounds. Document SC/52/IA14 submitted to the Scientific Committee of the International Whaling Commission.
- Calambokidis J, Steiger GH, Rasmussen K, Urbán J, Balcomb KC, Ladrón de Guevara P, Salinas M, Jacobsen JK, Baker CS, Herman LM, Cerchio S, Darling JD (2000) Migratory destinations of humpback whales that feed off California, Oregon and Washington. *Marine Ecology Progress Series*, 192: 295-304.
- Craig A, Herman LM (1997) Sex differences in site fidelity and migration of humpback whales (*Megaptera novaeangliae*) to the Hawaiian Islands. *Canadian Journal of Zoology* 75: 1923-1933.
- Félix F, Haase B (2001) The humpback whales off the coast of Ecuador, population parameters and behavior. *Revista de Biología Marina y Oceanografía* 36: 61-74.
- Flórez-González L., Capella J, Haase B, Bravo G, Félix F, Gerrodette T (1998) Changes in winter destinations and the northernmost record of southeastern Pacific humpback whales. *Marine Mammal Science* 14: 189-196.
- Garrigue C, Forestell PH, Greaves J, Gill P, Naessig P, Patenaude NM, Baker CS (2000) Migratory movements of humpback whales (*Megaptera novaeangliae*) between New Caledonia, East Australia and New Zealand. *Journal of Cetacean Research and Management* 2: 111-115.
- Garrigue C, Aguayo-Lobo A, Amante-Helweg VLU, Baker CS, Caballero S, Clapham PJ, Constantine R, Denking J, Donoghue M, Flórez-González L, Greaves J, Hauser N, Olavarría C, Pairoa C, Peckham H, Poole M (2002) Movements of humpback whales in Oceania, South Pacific. *Journal of Cetacean Research and Management* 4 (3): 255-260.
- Gibbons J, Capella J, Valladares C (2003) Rediscovery of a humpback whale (*Megaptera novaeangliae*) feeding ground in the Straits of Magellan, Chile. *Journal of Cetacean Research and Management* 5: 203-208.
- Mackintosh NA (1965) *The stocks of whales*. Fishing News (Books) Ltd. London.
- Olavarría C (1999) Identidad genética de las ballenas jorobadas (*Megaptera novaeangliae*, Borowski 1781) en las aguas adyacentes a la Península Antártica. Tesis para optar al Grado de Licenciado y al Título Profesional de Biólogo Marino. Facultad de Ciencias del Mar, Universidad de Valparaíso. 62 págs.
- Olavarría C, Baker CS, Medrano L, Aguayo-Lobo A, Caballero S, Flórez-González L, Capella J, Rosenbaum HC, Garrigue C, Graves J (2000) Stock identity of Antarctic Peninsula humpback whales inferred from mtADN variation. Document SC/52/IA15 submitted to the Scientific Committee of the International Whaling Commission.
- Olavarría C, Aguayo A, Acevedo J, Medrano L, Baker CS (2005) Genetic differentiation between two feeding areas of the Eastern South Pacific humpback whale population. Document SC/57/SH3 submitted to the Scientific Committee of the International Whaling Commission.
- Rasmussen K, Calambokidis J, Steiger GH, Saborío M, May L, Gerrodette T (2001) Extent of geographical overlap of North Pacific and South Pacific humpback whales on their Central American wintering grounds. Abstracts Fourteenth Biennial Conference on the Biology of Marine Mammals, Vancouver, British Columbia. 28 November – 03 December 2001. Society for Marine Mammalogy, Lawrence, KS.

- Rasmussen K, Calambokidis J, Steiger GH, Garita F, Saborío M (2003) Comparison of habitat use, migratory destinations, and song between northern and southern hemisphere humpback whale population on their Central American wintering ground. In: Abstracts Fifteenth Biennial Conference on the Biology of Marine Mammals, Greensboro, North Carolina. December 2003. Society for Marine Mammalogy, Lawrence, KS.
- Rasmussen K, Calambokidis J, Steiger GH (2004) Humpback whales and other marine mammals off Costa Rica and surrounding waters, 1996-2003. Unpublished report available from Cascadia Research, Olympia, Washington.
- Scheidat M, Castro C, Denkinger J, González J, Adelung D (2000) A breeding area for humpback whales (*Megaptera novaeangliae*) off Ecuador. *Journal of Cetacean Research and Management* 2(3): 165-172.
- Sladen DR, Herman LM, Yamaguchi M, Sato F (1999) Multiple visits of individual humpback whales (*Megaptera novaeangliae*) between the Hawaiian and Japanese winter grounds. *Canadian Journal of Zoology* 77: 504-508.
- Stevick PT, Aguayo A, Allen J, Avila IC, Capella J, Castro C, Chater K, Engel M, Felix F, Flórez-González L, Freitas A, Hasse B, Llano M, Lodi L, Munoz E, Olavarria C, Secchi E, Scheidat M, Siciliano S (2004) A note on the migrations of individually identified humpback whales between the Antarctic Peninsula and South America. *Journal of Cetacean Research and Management* 6(2): 109-113.
- Stone GS, Flórez-González L, Katona S (1990) Whale migration record. *Nature* 346 (6286): 705.

Table 1. Summary of new matchings between Ecuador and Magellan Strait waters, until April 2005.

Ecuador		Magellan Strait		
<i>ID</i>		<i>ID</i>	<i>Summer 03/04</i>	<i>Summer 04/05</i>
FEMM#278	17/08/2002	GBM#040	12/02/2004	14/01/2005
PWF-EC345	30/08/2003	GBM#028	09/01/2004	13/01/2005
PWF-EC267	09/09/2003	GBM#038	11/02/2004	06/02/2005
FEMM#415	12/07/2004	GBM#054	--	19/12/2004

Table 2. Re-sightings of a single humpback whale (MBG/CEQUA #003 and CRC 1031) in the Magellan Strait and Panama, until April 2005.

Magellan Strait		Panama	
<i>Date</i>	<i>Position</i>	<i>Date</i>	<i>Position</i>
21/03/2003	53°39'03 S.; 72°14'36 W.	03/09/2003	08°00 N.; 82°01 W.
12/02/2004	53°39'36 S.; 72°14'25 W.	07/09/2004	08°02.8 N.; 81°59.2 W.
10/02/2005	53°39'08 S.; 72°15'01 W.		

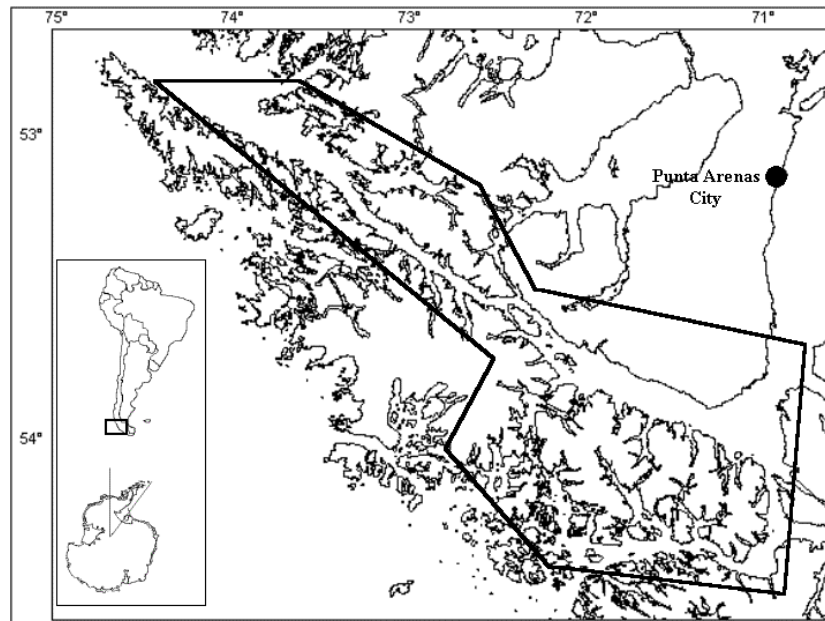


Figure 1. Map of the study area of the humpback whales in the fjord and channels of Chile.

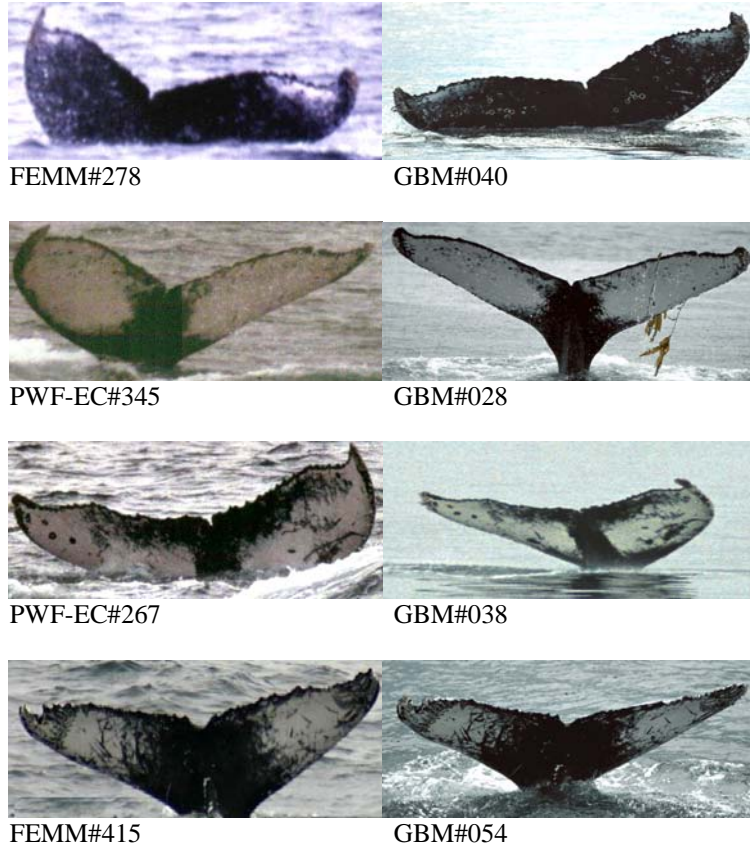


Figure 2. New humpback whales matched between Ecuador and Magellan Strait.

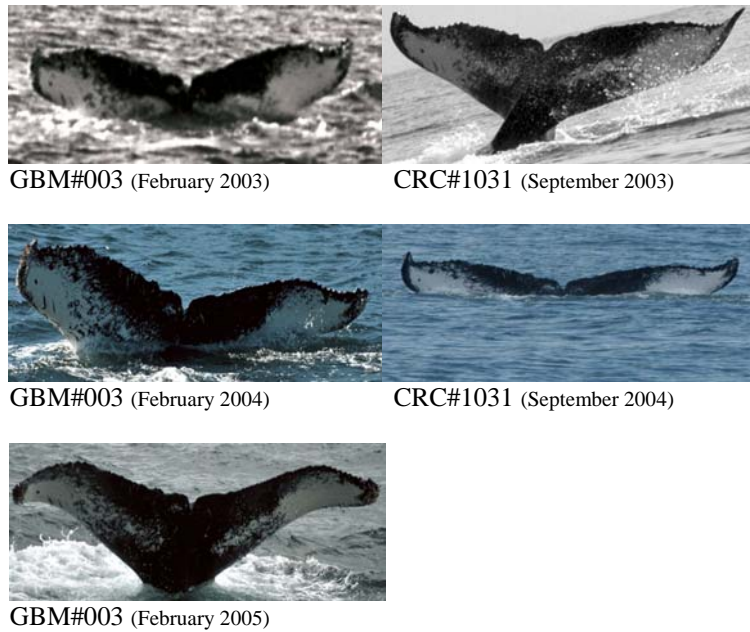


Figure 3. Re-sightings of a same humpback whale between the Magellan Strait and Panama.