

First record of cestode cysts of *Phyllobothrium delphini* (Phyllobothriidae) from dusky dolphins (*Lagenorhynchus obscurus*) off Argentine coast

Primer registro de quistes de céstodos en delfines oscuros (*Lagenorhynchus obscurus*) en la costa de Argentina

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Loizaga de Castro R., D. G. Vales, M. Degradi, N. García, M. Fernández and E. A. Crespo. 2014. First record of cestode cysts of *Phyllobothrium delphini* (Phyllobothriidae) from the dusky dolphins (*Lagenorhynchus obscurus*) off Argentine coast. *Hidrobiológica* 24 (3) : 307-310.

ABSTRACT

The dusky dolphin, *Lagenorhynchus obscurus*, is a coastal small cetacean widespread in the southern hemisphere. Here, we present the first record of cestode parasites present in the blubber of dusky dolphin off Argentine coast. The host examined, corresponded to a 15 years old mature female and measured 171 cm long. Cysts of helminths belonging to Cestoda were found on the subcutaneous blubber of the ventral surface; parasites were determined as *Phyllobothrium delphini* (Phyllobothriidae). Probably the presence of this parasite is related to deep pelagic foraging habitats where the most important prey are the squids. In the stomach contents 25 Type II larvae of *Anisakis* were found and 12 cephalopod beaks, belonging to argentine shortfin squid, *Illex argentinus*. Nematodes were found in the intestines, Type II larvae of *Anisakis*, and another from the genus *Stenurus* (family, Pseudaliidae). Here a new record of cestodes cysts is described, enriching the parasite-host record for dusky dolphins, enlarging the scarce parasitological information for cetaceans of Argentina.

Key words: Argentina, cestodes, dusky dolphins, *Phyllobothrium delphini*.

RESUMEN

El delfín oscuro, *Lagenorhynchus obscurus*, es un cetáceo pequeño de hábitos costeros que se distribuye ampliamente en el Hemisferio Sur. En este trabajo, se presenta el primer registro de

cestodes parásitos presentes en el tejido adiposo del delfín oscuro en las costas de Argentina. El hospedero examinado correspondió a una hembra madura de aprox. 15 años de edad y 171 cm de longitud. Se encontraron quistes de helmintos pertenecientes a la clase Cestoda: *Phyllobothrium delphini* (Phyllobothriidae), en la grasa subcutánea de la superficie ventral del animal. Es probable que la presencia de este parásito se relacione con los hábitos de alimentación pelágicos del delfín y con la profundidad que habita, donde las presas más importantes son los cefalópodos. En el contenido estomacal se encontraron 25 larvas de *Anisakis* Tipo II y 12 picos de cefalópodos, pertenecientes al calamar, *Illex argentinus*. Los nemátodos fueron encontrados en los intestinos, larvas Tipo II de *Anisakis*, y del género *Stenurus* (familia, Pseudaliidae). En el presente estudio se presenta un nuevo registro de quistes de cestodos, enriqueciendo el registro parásito-hospedero para delfines oscuros. Además el trabajo contribuye y amplía la información parasitológica sobre los cetáceos de Argentina.

Palabras claves: Argentina, céstodos, delfín oscuro, *Phyllobothrium delphini*.

Dusky dolphins (*Lagenorhynchus obscurus* Gray, 1828) are pelagic small pelagic cetacean with primary distribution in temperate and cold-temperate waters in the Southern Hemisphere (Leatherwood & Reeves, 1983). In the Patagonian coast of Argentina these dusky

dolphins represent the most common species of cetaceans. Several aspects of its biology have been previously studied (Crespo *et al.*, 1997; Dans *et al.*, 1997; Degradi *et al.*, 2008; Garaffo *et al.*, 2010; Würsig & Würsig, 1980; Degradi *et al.*, 2012). Nevertheless, very little is known about its parasite fauna from Southwestern Atlantic Ocean (Dans *et al.*, 1999; Berón-Vera *et al.*, 2008). The parasites of marine mammals can provide data on the population ecology of their hosts; especially can help to identify foraging habitats, diet and distribution. Parasitism is an ecological concept dealing with one kind of the wide range of relationships between organisms and their environment. The way of looking at parasitism and finding its place among ecological interactions is based on trophic relationships (Bush *et al.*, 2001). They have been successfully used as biological stock indicators of host populations, under the assumption that different parasite communities would indicate that the host populations are isolated (Perrin & Powers, 1980; Dailey & Vogelbein, 1991; Berón-Vera *et al.*, 2001; Fernández *et al.*, 2003). On 24th January 2012, a dead female dusky dolphin was found stranded in Playa Bonita (43°21'S, 65°03'W), Chubut Province, Argentina. Fortunately, the specimen was in fresh condition in order to perform parasitological and diet studies. A complete necropsy of the specimen was carried out in the Marine Mammal Laboratory (LAMAMA-CONICET). Dusky dolphin specimen was deposited and is now available from Marine Mammals Scientific Collection at Centro Nacional Patagónico (CENPAT-CONICET): MM-LO082; parasite specimens have been deposited in the helminth collection of the Natural History Museum, London (NHM; accession nos.: *Phyllobothrium delphini* (Bosc, 1802), NHMUK 2013.7.4.1-3. Stomach, intestines, skull, teeth, postcranial skeleton, and samples of skin, blubber, kidney and liver of the animal were taken and preserved. Age was determined counting the Growth layer groups (GLGs) in dentine, assuming annual deposition (Perrin & Myrick, 1980). Age was determined independently by two observers in order to minimize counting errors. The animal age was 15 years old. Standard measurements of the specimen were taken to the nearest centimeter (Norris, 1961) giving a total length of 171 cm. The animal corresponded to a mature female; ovaries were measured and weighed, the individual had signs of pregnancy (*i.e.*, enlarge uterine horns). Dans *et al.* (1997) found the youngest sexually mature female and the oldest immature female were 6 and 7 yr old, respectively, also that the smallest sexually mature female and the largest immature female were 161 and 172 cm long. All stomach chambers were observed separately to assess parasite distribution. Parasites were isolated from food contents and recovered them with a 0.5-mm mesh sieve. Intestines were divided into 20 sections of equal length and washed the contents of each section through a 0.5-mm mesh sieve. All parasites found were fixed in 70% ethanol and identified according to conventional methods, also a sample of parasites were fixed in 100% ethanol for molecular analysis. In the stomach we found 12 cephalopod beaks, belonging to Argentine shortfin squid, *Illex argentinus* (Castellanos, 1960); the beaks were identified by means

of the reference collection of the LAMAMA. The prey found in this study is consistent with previous studies that reported comprehensively the prey items for dusky dolphins (Koen Alonso *et al.*, 1998; Romero *et al.*, 2012). The gastrointestinal helminth community in this species has been showed to be depauperate, with low species richness (Dans *et al.*, 2010). Nematodes found in the intestines corresponded to the Type II larvae of *Anisakis*, sensu Berland (1961) and another from the genus *Stenurus* (family, Pseudaliidae). In the stomach contents 25 Type II larvae of *Anisakis* were found. Also, liver and lungs were examined for parasites but none were found. Helminths belonging to Cestoda were found: plerocercoids of *Phyllobothrium delphini* (Bosc, 1802) (Phyllobothriidae), from the subcutaneous blubber around the abdominal surface (Fig. 1). Larvae were measured as follows: cyst length: CL, cyst width: CW, neck length: NL, neck width: NW, scolex length: SL, scolex width: SW; all parasitological measurements in *P. delphini* are expressed in mm. Basic descriptive statistics were calculated: mean values on 5 cyst measured for size shown in Table 1. The great scattering of our data suggest the existence of high morphological and size variability in larval development, as Failla and Le Bas (2003) reported before; also there is great variation because of shrinkage depends on the state of the cyst upon fixation. However the morphology of the tetraphyllidean plerocercoids presented here agrees well with the available descriptions of *P. delphini* (see for more detail Agustí *et al.*, 2005). In Argentina, cestodes cysts have not been reported for dusky dolphins before. However, cysts of cestodes have been reported in New Zealand dusky dolphins (presumably *Phyllobothrium* spp.) (Cipriano, 1992) and dusky dolphins from Peru (*P. delphini*) (Van Waerebeek, 1992; Van Waerebeek *et al.*, 1993). Both of them are pelagic foragers, the former relying mainly on myctophid fish and the latter preying upon anchoveta (Van Waerebeek, 1992). In Argentine waters, cysts of cestodes were recorded in several pelagic and deep feeder cetaceans such as striped dolphin (*Stenella coeruleo-*

Table 1. Mean values (mm) of the cyst of *Phyllobothrium delphini* (Bosc, 1802), from the subcutaneous blubber of coastal dusky dolphin (*Lagenorhynchus obscurus*) off Argentina. CL: cyst length, CW: cyst width, NL: neck length, NW: neck width, SL and SW: scolex length and width respectively.

	CL	CW	NL	NW	SL	SW
Mean	6.70	5.25	3.74	1.61	1.47	1.61
Median	6	5.25	3.64	1.56	1.63	1.69
Standard deviation	1.60	0.98	0.66	0.50	0.54	0.35
Variance	2.56	0.96	0.43	0.25	0.29	0.12
Minimum	4.88	3.88	3.08	0.96	0.77	1.08
Maximum	8.63	6.5	4.75	2.31	2.15	2
N	5	5	5	5	5	5

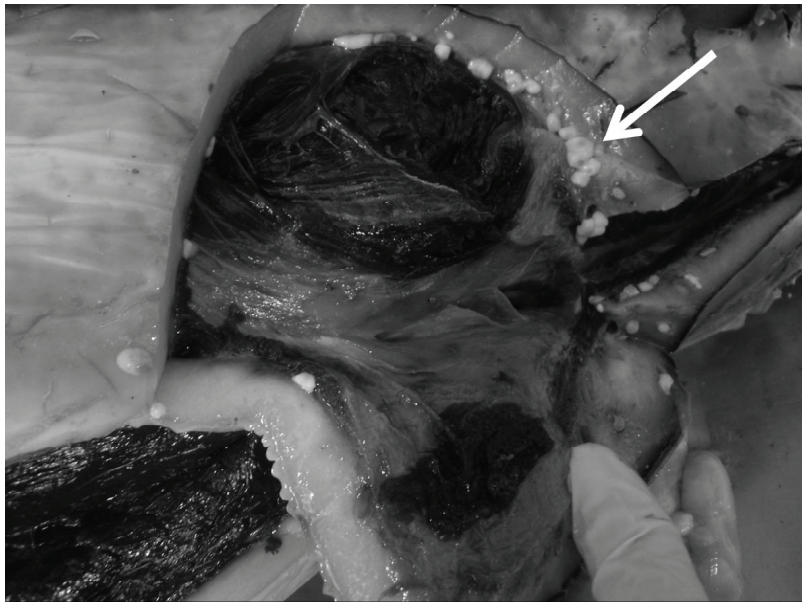


Figure 1: Cestodes cysts, *Phyllobothrium delphini* (Bosc, 1802), from the subcutaneous blubber around the abdominal surface of coastal dusky dolphin (*Lagenorhynchus obscurus*) off Argentina. White arrow indicates cestodes cyst.

alba (Mellen, 1833); Loizaga de Castro *et al.*, 2011), sperm whales (*Physeter macrocephalus* Linnaeus, 1758), Gray's beaked whales (*Mesoplodon grayi* von Haast, 1876), Risso's dolphins (*Grampus griseus*, (Cuvier, 1812)) and long-finned pilot whales (*Globicephala melas*, Trail, 1809), where the most important prey in this environment are the squids, *Kondakovia longimana* Filippova, 1972, *Mesonychotheutis hamiltoni* Robson, 1925 and *Megalochranchia* sp. (Berón-Vera *et al.*, 2008). The absence of recording this parasite, so far, to dusky dolphins off Argentine coast was discussed in accordance with a feeding strategy based on inshore preys (Dans *et al.*, 2010). Although we examine a single individual, the occurrence of *P. delphini* in dusky dolphins may suggest the exploitation of more pelagic grounds. In these scenario, dusky dolphins could probably be exploiting different ecological systems as part of individual foraging strategies or may indicate the existence of dusky dolphins' ecotypes (*i.e.*, inshore and offshore), in Argentine waters. An alternative hypothesis that we cannot discard is that the host examined in the present work is a migrant individual from another stock population. There is evidence of migration among stocks (Cassens *et al.*, 2005). Additional data on the host's habitat and trophic ecology and parasite faunas are needed to enhance the knowledge about the foraging areas or ecotypes of dusky dolphins in Southwestern Atlantic Ocean, as potentially indicated by cestodes parasites. This study is the first record for cestodes in a coastal cetacean and enlarges the parasitological information which is scarce, particularly for cetaceans of Argentina.

ACKNOWLEDGEMENTS

The authors are indebted to Centro Nacional Patagónico (National Research Council of Argentina) especially the Marine Mammal Laboratory for logistic and institutional support. Collection of samples was approved by Dirección de Fauna y Flora Silvestre de la Provincia del Chubut (Research permit No 009-STyAP/12.-). Thanks are due to grant CGL2009-07465 (Ministerio de Economía y Competitividad, Spain). Funds were received from Mohamed bin Zayed Species Conservation Fund. Also we like to thank to PhD Ross Barnett who kindly reviewed the manuscript. At the time this manuscript was written, R. L. C., D. G. V. and M. D. were supported by a Fellowships from National Research Council of Argentina (CONICET).

REFERENCES

- AGUSTÍ C., F. J. AZNAR, P. D. OLSON, D. T. J. LITTLEWOOD, A. KOSTADINOVA & J. A. RAGA. 2005. Morphological and molecular characterization of tetraphyllidean merocercoids (Platyhelminthes: Cestoda) of striped dolphins (*Stenella coeruleoalba*) from the Western Mediterranean. *Parasitology* 130: 461-474.
- BERLAND B. 1961. Nematodes from some Norwegian marine fishes. *Sarsia* 2: 1-50.
- BERÓN-VERA, B., S. N. PEDRAZA, J. A. RAGA, A. GIL, E. A. CRESPO, M. KOEN ALONSO & R. N. P. GOODALL. 2001. Gastrointestinal helminths of Commerson's

- dolphins *Cephalorhynchus commersonii* from Central Patagonia and Tierra del Fuego. *Diseases of Aquatic Organisms* 47: 201-208.
- BERLAND B. 1961. Nematodes from some Norwegian marine fishes. *Sarsia* 2: 1-50.
- BERÓN-VERA, B., E. A. CRESPO & J. A. RAGA. 2008. Parasites in Stranded Cetaceans of Patagonia. *The Journal of Parasitology* 94: 946-948.
- BUSH, A. O., J. C. FERNÁNDEZ, G. W. ESCH & J. R. SEED. 2001. Parasitism: The diversity and ecology of animal parasites. Cambridge University Press, Cambridge, UK. 531 p.
- CASSENS, I., K. VAN WAEREBEEK, P. B. BEST, A. TZIKA, A. L. VAN HELDEN, E. A. CRESPO & M. C. MILINKOVITCH. 2005 Evidence for male dispersal along the coasts but no migration in pelagic waters in dusky dolphins (*Lagenorhynchus obscurus*). *Molecular Ecology* 14: 107-121.
- CIPRIANO, F. W. 1992. Behavior and occurrence patterns, feeding ecology and life history of dusky dolphins (*Lagenorhynchus obscurus*) off Kaikura, New Zeland. Ph.D. thesis, University of Arizona. 216 p.
- CRESPO, E. A., S. N. PEDRAZA, M. COSCARELLA, N. A. GARCÍA, S. L. DANS, M. IÑIGUEZ, L. M. REYES, M. KOEN ALONSO, A. C. M. SCHIAVINI & D. R. GONZÁLEZ. 1997. Distribution of dusky dolphins, *Lagenorhynchus obscurus* (Gray, 1828), in the Southwestern South Atlantic Ocean with notes on herd size. *Report of the International Whaling Commission* 47: 693-697.
- DAILEY, M. D. & W. K. VOGELBEIN. 1991. Parasite fauna of three species of Antarctic whales with reference to their use as potential stock indicators. *Fishery Bulletin* 89: 355-65.
- DANS, S. L., E. A. CRESPO, S. N. PEDRAZA & M. KOEN ALONSO. 1997. Notes on the reproductive biology of female dusky dolphins (*Lagenorhynchus obscurus*) off the Patagonian coast. *Marine Mammal Science* 13: 303-307.
- DANS, S. L., L. M. REYES, S. N. PEDRAZA, J. A. RAGA & E. A. CRESPO. 1999. Gastrointestinal helminths of the dusky dolphin, *Lagenorhynchus obscurus* (Gray, 1828), off Patagonia, in the Southwestern Atlantic. *Marine Mammal Science* 15: 649-660.
- DANS, S. L., E. A. CRESPO, M. KOEN-ALONSO, T. M. MARKOWITZ, B. BERÓN VERA & A. D. DAHOOD. 2010. Dusky Dolphin Trophic Ecology: Their role in the food web. In: Würsing, B. & M. Würsing (Eds.). *The dusky dolphin: Master acrobats off different shores*. Academic Press, New York, pp 49-74.
- DEGRATI, M., S. L. DANS, S. N. PEDRAZA, E. A. CRESPO & G. V. GARAFFO. 2008. Diurnal behaviour of dusky dolphins, *Lagenorhynchus obscurus*, in Golfo Nuevo. *Journal of Mammalogy* 89: 1241-1247.
- DEGRATI M., S. L. DANS, G. V. GARAFFO, E. A. CRESPO. 2012. Diving for food: a switch of foraging strategy of dusky dolphins in Argentina. *Journal of Ethology* 30: 361-367.
- FAILLA SIQUIER G. & A. E. LE BAS. 2003. Morphometrical categorization of *Phyllobothrium delphini* (Cestoidea, Tetrathyllidae) cyst from Fraser's dolphin, *Lagenodelphis hosei* (Cetacea, Delphinidae). *Latin American Journal of Aquatic Mammals* 2: 95-100.
- FERNÁNDEZ, M., B. BERÓN-VERA, E. A. CRESPO, N. A. GARCÍA & J. A. RAGA. 2003. First record of Hourglass Dolphin, *Lagenorhynchus cruciger*, (Quoy & Gaimard, 1824) off Patagonian waters: Parasites and comments on the food items. *Marine Mammal Science* 19: 832-836.
- GARAFFO G. V., S. L. DANS, E. A. CRESPO, M. DEGRATI, P. GIUDICI & D. A. GAGLIARDINI. 2010. Dusky dolphin: modeling habitat selection. *Journal of Mammalogy* 91:54-65.
- KOEN ALONSO, M., E. A. CRESPO, N. A. GARCÍA, S. N. PEDRAZA & M. A. COSCARELLA. 1998. Diet of dusky dolphin, *Lagenorhynchus obscurus*, in waters off Patagonia, Argentina. *Fishery Bulletin* 96: 366-374.
- LEATHERWOOD S. & R. R. REEVES. 1983. *The Sierra Club handbook of whales and dolphins*. Sierra Club Books, San Francisco, California. 320 p.
- LOIZAGA DE CASTRO, R., M. S. LEONARDI, M. F. GRANDI, N. A. GARCÍA & E. A. CRESPO. 2011. Far from home: Record of a vagrant striped dolphin in Patagonia with notes on diet, parasites and age determination. *Mammalian Biology* 76: 521-524.
- NORRIS, K. S. 1961. Standardized methods for measuring and recording data on the smaller cetaceans. *Journal of Mammalogy* 42: 471-476.
- PERRIN, W. & J. E. POWERS. 1980. Role of a nematode in natural mortality of spotted dolphins. *Journal of Wildlife Management* 44: 960-963.
- PERRIN, W. F. & A. C. MYRICK JR. 1980. Age determination of Toothed Whales and Sirenians; problem in age determination, in Proceedings of the International Conference on Determining Age of Odontocetes Cetaceans (and Sirenians). Report of the International Whaling Commission, Cambridge, UK Special issue 3, 229 p..
- ROMERO, M. A., S. L. DANS, N. A. GARCÍA, G. SVENDSEN, R. GONZÁLEZ & E. A. CRESPO. 2012. Feeding habits of two sympatric dolphin species off North Patagonia, Argentina. *Marine Mammal Science* 28: 364-377.
- VAN WAEREBEEK, K. 1992. Population identity and general biology of the dusky dolphin *Lagenorhynchus obscurus* (Gray, 1828) in the south-eastern Pacific, Ph.D. thesis, University of Amsterdam. 159 p.
- VAN WAEREBEEK, K., J. C. REYES, J. ALFARO. 1993. Helminth parasites and phoronts of dusky dolphins *Lagenorhynchus obscurus* (Gray, 1828) from Peru. *Aquatic Mammal* 19: 59-169.
- WÜRSIG B., M. WÜRSIG. 1980. Behaviour and ecology of dusky dolphins, *Lagenorhynchus obscurus*, in the South Atlantic. *Fishery Bulletin* 77: 871-890.

Recibido: 19 de octubre de 2012.

Aceptado: 10 de diciembre de 2013.