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Mass stranding of pygmy killer whales (*Feresa attenuata*) in the British Virgin Islands

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The pygmy killer whale (*Feresa attenuata*) is an offshore, tropical and subtropical delphinid found in the Atlantic, Indian and Pacific Oceans. The species has only recently been studied, mostly from specimens collected from strandings. While over 52 reports exist for the Atlantic Ocean, only one record exists for the Caribbean Sea. A new record of a mass stranding of pygmy killer whales from the British Virgin Islands is documented and the pathology and life history of the specimens is described, associating the stranding process with the meteorological and oceanographic disturbance of Hurricane Marilyn, which devastated the Virgin Islands a day prior to the stranding. This stranding event constitutes the sixth known mass stranding for the species worldwide, the first record for pygmy killer whales for the northeastern Caribbean and the second for the entire Caribbean Sea.

The pygmy killer whale (*Feresa attenuata* Gray, 1874) is an offshore, tropical and subtropical delphinid found in the Atlantic, Indian and Pacific Oceans (Ross & Leatherwood, 1994). This species has only recently been studied, mostly from specimens collected from strandings. While over 52 reports exist for the Atlantic Ocean, including specimens from Argentina (Litcher et al., 1990), Brazil (Poulter, 1968; Caldwell & Caldwell, 1971; Zerbini & Santos, 1997), Senegal (Cadenat, 1958), south-west Africa (Bass, 1969) southern Africa (Best, 1970) and the USA (Alabama, Florida, Georgia, North Carolina, South Carolina, and Texas; Caldwell & Caldwell, 1975; Forrester et al., 1980; Hoberg, 1990; Ross & Leatherwood, 1994), only one record exists for the Caribbean Sea. Caldwell & Caldwell (1971, 1975), and Caldwell et al. (1971) reported the landing of a pygmy killer whale in St Vincent in 1969 as part of the Lesser Antilles shortfin pilot whale (*Globicephala macrorhynchus* Gray, 1846) commercial fisheries. A new record of a mass stranding of pygmy killer whales for the Caribbean and pathology and life history of the specimens studied is described here.

On 16 September 1995, five pygmy killer whales stranded alive on Conch Shell Point and in the western border of Trellis Bay, Beef Island (Tortola), in the British Virgin Islands (18°26.8′N 64°32.2′W). The rare event occurred the day after Hurricane Marilyn devastated the Virgin Islands in the north-eastern Caribbean. Four of the animals were found swimming parallel and close to the shore and docks. Attempts were made by locals and Caribbean Stranding Network (CSN) participants and volunteers to push the dolphins away from shore into deeper waters, but every time the dolphins returned to shallow water and refused to leave the bay.

On the morning of 17 September, three of the dolphins were found dead on the beach, and the remaining two were struggling in about 1-m of water. Volunteers assisted the two animals and kept them afloat. Heart rates of the two dolphins ranged from 84–98 beats per min in the large animal (236-cm male) and 58–64 beats per min in the smaller dolphin (218-cm female). The CSN participants decided to take the two live animals to open sea and release them. At midday, they were transported by boat in padded stretchers, 2.8 km north-west of Towing Point in Great Camanoe Island (18°31′N 64°34′W). Upon release, the male was able to swim without difficulties and began moving north, while the female stayed for a short period of time just surfacing to breathe. After a few dives, the female began swimming and breathing regularly, and slowly disappeared.

The three dead animals were stored overnight in a walk-in freezer for later necropsy. Upon examination on 18 September, the carcasses, all females, were found with no gross signs of autolysis (code 2: fresh state of decomposition). The larger carcass weighed 104.5 kg and measured 204 cm. The medium-sized animal and the smaller specimen measured 195 cm and 165 cm, respectively. Gross necropsy findings for all animals included hemorrhagic and congested lungs and froth in both trachea and bronchi, indicating agonal death. Digital pressure applied to both nipples of the larger female produced milk. The larger female was mildly infested with the acanthocephalan *Bolbosoma vasculosum* (Rudolphi, 1819) in the lumen of the intestine, the nematodes *Anisakis* sp. Dujardin 1845, *Terranova* sp. Leiper & Atkinson, 1914, and *Stenurus globicephalae* Baylis & Daubney 1925 in the stomach, and the cestodes *Trigonocotyle sexitesticulae* Hoberg, 1990 in the intestine and *Monorygma grimaldii* (Moniez, 1889) in the blubber (Mignucci-Giannoni et al., 1998). A few specimens of *Anisakis* sp. were found in the stomach of the smaller specimen. Unidentified squid beaks and fish otoliths were found in the stomach of both the larger and medium-sized females. Undigested milk was found in the stomach of the smaller female, indicating that it was a nursing calf.

During necropsy, tissues from lung, heart, liver, lymph node, spleen, kidney, adrenal gland, and ovaries of each animal were collected for histopathologic examination. For both the larger and medium-sized females, the most significant lesions were lymphocytolysis and loss in multiple lymphoid tissues, coupled with vacuolar degeneration in the liver and renal epithelial cells. Granulomata and granulomatous bronchopneumonia were also noted in the lungs of both animals, most likely secondary to lungworm disease, either by *Halocercus* spp. Baylis & Daubney, 1925 or *Pharurus* spp. Leukart, 1848. Lungworms are known to cause various health problems in cetaceans, ranging from verminous

pneumonia to chronic calcifying pulmonary granulomas (Boever & Wallach, 1983). Lymphocytolysis is related to acute release of endogenous corticosteriods, septicemia and/or viral infections. Vacuolar degeneration of the liver is usually secondary to mobilization of fat stores during periods of reduced food intake and/or inanition. The inflammatory lesions of pneumonia, congestion and haemorrhage noted in the lungs may have been significant as a predisposing factor associated with the demise of the larger and medium-sized females.

In the smaller animal, inflammatory lesions in the lungs, in the form of fibrinohemorrhagic and histiocytic pneumonia, were the most important finding, and were associated with the demise of the calf. Sideroconcretions were noted in the lung parenchyma, most probably as resolving parasitic lungworm granulomas. Associated with these were lesions noted in the myocardium (subacute congestion with minimal perivascular haemorrhage), hepatocytes (moderate and diffuse hyperpigmentation and mild, diffuse, midzonal vacuolar degeneration) and kidney interstitium (moderate, diffuse and subacute congestion). These findings suggest a severe impairment of the heart to function as a pump in this young animal, thus promoting vascular insufficiency and poor tissue perfusion.

Analyses of the findings were of great interest in gaining knowledge on the species' pathology and life history (in terms of morphometrics, parasitology and food habits). Ross & Leatherwood (1994) recorded a 207 cm sexually mature lactating female from Sri Lanka, but the present record of a lactating 204 cm specimen constitutes the smallest known sexually mature female for the species. Both helminths *S. globicephalae* and *T. sexitesticulae* have been reported to occur in the pygmy killer whale (Forrester et al., 1980; Hoberg 1990), but our specimens demonstrate that *F. attenuata* is a new host for *B. vasculosum*, *Anisakis* sp., *Terranova* sp. and *M. grimaldii* (Mignucci-Giannoni et al., 1998).

Ross (1984) reported cephalopod beaks in the stomach of animals from South Africa, and Leatherwood & Reeves (1989) reported both squid beaks and small otoliths from Sri Lankan pygmy killer whales, consistent with our findings. The age of the subadult individual was estimated by counting growth layer groups (GLGs) in the dentine and cementum of a tooth at five GLGs (one GLG equals one year of age in most delphinids). The dental formula for the medium-sized dolphin was 12UR, 12UL, 13LR, 13LL, consistent with that reported for the species (Ross & Leatherwood, 1994). The skulls and complete skeletons of the medium-sized and smaller dolphins were collected. The first is housed at the University of Puerto Rico's Marine Mammal Osteological Collection and the second one is at the H. Lavity Stoutt Community College in Tortola, British Virgin Islands (Mignucci-Giannoni et al., 1997).

In addition to the histopathological findings, it is highly suspected that the event, being a mass stranding, was associated with the meteorological and oceanographic disturbance caused by Hurricane Marilyn as it passed through the area, disorienting the otherwise offshore species when finding themselves nearshore. Surfacing to breathe during the storm and in powerful waves could have also been an additional insult to the already chronically compromised respiratory systems of the dolphins. Once in the stranding process and coupled with the stress of the oceanographic disturbance, the animals' health deteriorated causing their subsequent death.

Five mass strandings of three or more pygmy killer whales have been reported for south-eastern USA (Forrester et al., 1980; J.G. Mead, personal communication), but none were associated with the passing of a hurricane. No records or references were found of other cetacean species stranding because of meteorological disturbances such as hurricanes. The mass stranding event in the British Virgin Islands constitutes the sixth known mass stranding for pygmy killer whales, the first record for the species in the north-eastern Caribbean and the second record for the entire Caribbean Sea.

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REFERENCES

Bass, J., 1969. A rare whale stranded in Zululand. *Bulletin South African Association for Marine Biological Research*, **7**, 36.

Best, P.B., 1970. Records of the pygmy killer whale, *Feresa attenuata*, from southern Africa, with notes on behaviour in captivity. *Annals of the South African Museum*, **57**, 1–14.

Boever, J.D. & Wallach, W.J., 1983. *Diseases of exotic animals: medical and surgical management*. New York: W.B. Saunders Company.

Cadenat, J., 1958. Notes sur les delphinidés ouest-africaines. II. Un spécimen du genre *Feresa* capturé sur les cotes du Sénégal. *Bulletin de l'Institut Français d'Afrique Noire. Serie A*, **20**, 1486–1491.

Caldwell, D.K. & Caldwell, M.C., 1971. The pygmy killer whale in the western Atlantic with a summary of world records. *Journal of Mammalogy*, **52**, 206–209.

Caldwell, D.K. & Caldwell, M.C., 1975. Pygmy killer whales and short-snouted spinner dolphins in Florida. *Cetology*, **18**, 1–5.

Caldwell, D.K., Caldwell, M.C., Rathjen, W.F. & Sullivan, J.R., 1971. Cetaceans from the Lesser Antillean island of St. Vincent. *Fishery Bulletin*, **69**, 303–312.

Forrester, D.J., Odell, D.K., Thompson, N.P. & White, J.R., 1980. Morphometrics, parasites, and chlorinated residues of pigmy killer whales from Florida. *Journal of Mammalogy*, **61**, 356–360.

Hoberg, E.P., 1990. *Trigonocotyle sexitesticulae* sp. nov. Eucestoda: Tetrabothriidae. a parasite of pygmy killer whales (*Feresa attenuata*). *Canadian Journal of Zoology*, **68**, 1835–1838.

Leatherwood, S. & Reeves, R.R., 1989. Marine mammal research and conservation in Sri Lanka 1985–1986. *UNEP Marine Mammal Technical Report*, **1**, 1–138.

Litcher, A.A., Fraga, F. & Castello, H.P., 1990. First record of the pygmy killer whale, *Feresa attenuata*, in the southwest Atlantic. *Marine Mammal Science*, **6**, 85–86.

Mignucci-Giannoni, A.A., Hoberg, E.P., Siegel-Causey, D. & Williams, E.H., 1998. Metazoan parasites and other symbionts of cetaceans in the Caribbean. *Journal of Parasitology*, **84**, 939–946.

Mignucci-Giannoni, A.A., Toyos-González, G.M., Pérez-Padilla, J., Montoya-Ospina, R.A. & Williams, E.H., 1997. First osteological collection of marine mammals for Puerto Rico and the Virgin Islands. *Caribbean Journal of Science*, **33**, 288–292.

Poulter, T.C., 1968. Marine mammals. In *Animal communication* (ed. T.A. Sebeok), pp. 405–465. Bloomington: Indiana University Press.

Ross, G.J.B., 1984. The smaller cetaceans of the south east coast of southern Africa. *Annals of the Cape Provincial Museums (Natural History)*, **15**, 173–410.

Ross, G.J.B. & Leatherwood, S., 1994. Pygmy killer whale *Feresa attenuata* Gray, 1874. In *Handbook of marine mammals*. Vol. 5. *The first book of dolphins* (ed. S.H. Ridgway and R. Harrison), pp. 387–404. San Diego: Academic Press.

Zerbini, A.N. & Santos, M.C., 1997. First record of the pygmy killer whale *Feresa attenuata* (Gray, 1874) for the Brazilian coast. *Aquatic Mammals*, **23**, 105–109.

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