

HELMINTH PARASITES AND ASSOCIATED PATHOLOGY IN STRANDED FRASER'S DOLPHINS, *LAGENODELPHIS HOSEI* (FRASER, 1956)

K.A. McColl, *Department of Agriculture, Veterinary Research Institute, Parkville, Victoria, Australia, 3052.*

D.L. Obendorf, *Department of Agriculture, Mt Pleasant Laboratories, Launceston South, Tasmania, Australia, 7250.*

Introduction

In 1956 Fraser described *Lagenodelphis hosei* from a skeleton collected by E. Hose before 1895 on a beach in Sarawak (FRASER, 1956). In early 1971, the dolphin was rediscovered almost simultaneously in three widely separated areas of the world (PERRIN c.s., 1973). Subsequently *L. hosei* have been recorded from many other tropical locations in the Pacific and Indian Oceans (TOBAYAMA c.s., 1973; MITCHELL, 1975) including the coast of Australia (BRYDEN and BARRY, 1980).

In January 1978, two female and one male *L. hosei* (R. WARNEKE, pers. comm.) were stranded on the shores of Corio Bay, Victoria, Australia (38° 10' S, 144° 20' E). One female was found alive, but numerous attempts to return it to the sea were unsuccessful. It continually returned to the beach and eventually died. Four days later a dead female was found on the beach approximately 3.7 km N.E. of the first animal, and after a further 12 days, a dead male was also found on the beach 0.9 km S.W. of the original female.

In this short case report, the helminth parasites of the female dolphins are recorded, and the significance of the worms and their associated pathology are discussed in relation to the cause of the stranding.

Materials and Methods

The carcasses of the two female dolphins were frozen and sent to Melbourne for identification and post-mortem examination but autolysis precluded a similar examination of the male. Routine post-mortems on the females were carried out at the Veterinary Research Institute, Parkville, Victoria. Parasites from various sites were fixed in 10% formol-saline and submitted to the Department of Veterinary Paraclinical Sciences for identification. Representative samples of gross lesions and most tissues were fixed in 10% formol-saline, paraffin-embedded, sectioned at 5 µm and stained with haematoxylin and eosin for histopathological examination.

Nematodes were cleared in lactophenol whilst trematodes and cestodes were stained with Mayer's acid haemalum and mounted in Canada balsam. All helminths were then examined under a light microscope.

Results

Two nematodes, two cestodes and one trematode were recovered from two female *L. hosei*. A further apparent trematode was found in histological sections of the liver of one dolphin, but no parasites were recovered.

A large number of 5-6 cm roundworms identified as *Anisakis simplex* formed a plug at the opening into the pyloric stomach of one dolphin. Numerous ulcers, 0.5 to 2 cm in diameter, were observed grossly in the mucosa of the non-glandular forestomach of this animal. Histo-

pathological examination revealed chronic ulcerations of the mucosa with extensive fibroplasia in the lamina propria and submucosa, and acute foci of necrosis in this granulation tissue. These foci were composed primarily of granulocytes with an outer border of plasma cells, lymphocytes, and a few Langhans giant cells.

Grossly, this dolphin also had a discrete reddened focus about 1 cm in diameter in the mucosa of the fundic stomach. Histopathology revealed thrombosis of submucosal vessels with subsequent haemorrhage and heavy infiltration of neutrophils into the submucosa and mucosa. Chronic ulcers were also found in the non-glandular forestomach of the other dolphin, but neither helminths nor further gastric lesions were observed in this animal.

In both dolphins numerous yellow-orange, ovoid cysts approximately 1.5 cm x 1.0 cm were located in the musculature of the ventral abdominal wall, especially around the ano-genital openings. A number were also found in the mesentery of the colon. The cysts contained a single invaginated strobila approximately 25-30 cm in length, and were tentatively assigned as *Monorygma grimaldi*, the presumed metacestode stage of *Phyllobothrium chamissonii* (CANNON, 1977).

Large numbers of cestodes, about 3 cm long and belonging to the genus *Tetrabothrius*, were found in the pylorus and anterior duodenum of both dolphins. No gross or histological lesions were associated with these parasites.

Trematodes of the genus *Campula* were recovered from the pancreatic ducts of one dolphin. Specific identification of these flukes, which were 0.5-1 cm long, was precluded by their poor state of relaxation prior to fixation. Histopathological examination revealed only some minor haemorrhage into the pancreatic ducts.

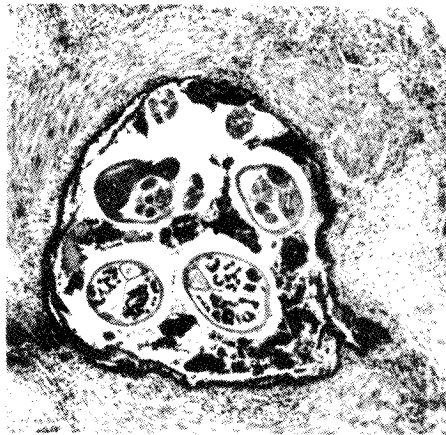


Fig. 1. Adult and larval nematodes (*Stenurus ovatus*) in a large airway, H and E x 37.5

Although the liver of this dolphin was normal, gross examination of the liver of the other animal revealed marked congestion and a fibrous, spherical nodule approximately 1 cm in diameter in the parenchyma. Histopathological examination revealed a generalized mild chronic cholangiohepatitis. The nodular lesion was a parasitic granuloma composed of many adult trematodes with a thorny cuticle, numerous trematode ova, and extremely hyperplastic bile duct. Although an extensive fibrotic reaction was enveloping the lesion, it was still active with acute foci of necrosis of hepatocytes peripheral to the main lesion. An inflammatory

infiltrate comprised mainly of eosinophils and macrophages characterized these foci. A lungworm, the pseudaliid metastrongyle *Stenurus ovatus* (P.W. ARNOLD, pers. comm.) was found in one dolphin. Grossly, the lungs of this animal were extremely congested and oedematous, with the fine-bodied worms located in the distal bronchi and bronchioles. Occasionally, airways were completely occluded by a plug of worms. Histopathological examination revealed a parasitic bronchopneumonia characterized by adult and larval nematodes in distal airways (Fig. 1), flooding of alveoli with an inflammatory exudate including fibrin, neutrophils and eosinophils, and some glandular hyperplasia with a mucous exudate in the airways. Nematodes were often embedded in inspissated mucopurulent plugs. Other features included either erosion or prominent squamous metaplasia of the airway epithelium, possibly associated with the thorny cuticle of the pulmonary parasites (Fig. 2), secondary bacterial invasion of the alveolar oedema fluid, and peribronchiolar lymphoid and smooth muscle hyperplasia and hypertrophy.

Examination of the brain and ear canals was not performed in either case as the heads were required for taxonomic study. Swabs of the blowhole from the pneumonia-free dolphin revealed numerous pigmented, thick-walled trematode ova.

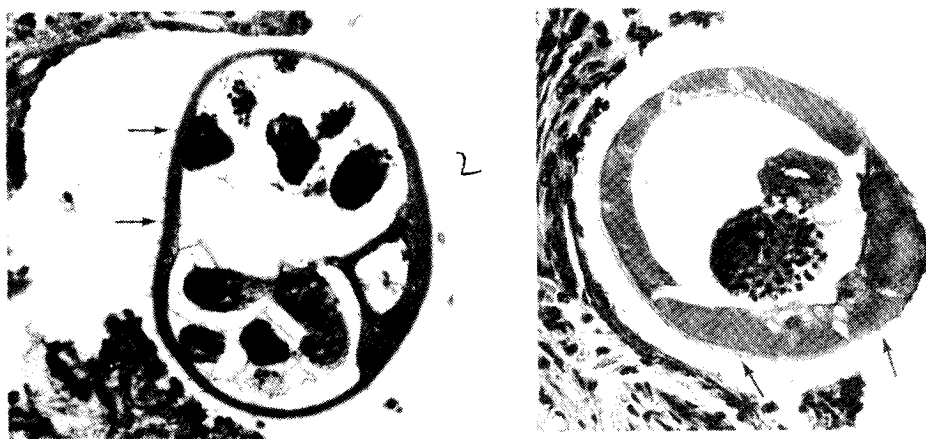


Fig. 2. Transverse sections of *Stenurus ovatus* showing the thorny cuticle (arrows). H and Ex250

Discussion

The only recorded parasites of *L. hosei* are *Tetrabothrius* sp. (Cestoda) from the pylorus, *Bolbosoma* sp. (Acanthocephala) from the small intestine, an unidentified nematode species from the stomach and numerous metacystode cysts in the blubber around the anus of several *L. hosei* stranded on a Japanese beach. The present study reports five species of helminth parasite.

The ascarid, *Anisakis simplex*, is known to be a common nematode of pinnipeds and odontocetes, (ARUNDEL, 1978). DAVEY (1971) in a complete revision of the genus *Anisakis*, substantially reduced the number of species in the genus, leaving *A. simplex* and *A. typica* as two valid species. *A. typica* has been more commonly recovered from hosts in warm temperate and tropical waters between 40° N and 36° S. There are few records of *A. simplex* from this

region. The presence of *A. simplex* in these dolphins that stranded in Corio Bay (38° 10'S) suggests the latter may actually inhabit and feed in these more extreme latitudes and are not merely vagrants from tropical waters.

Although no nematodes were found in association with ulcers in the forestomach of either dolphin, the gross and histopathological appearance of the ulcers was consistent with a parasitic aetiology.

The lesion in the fundic stomach of the dolphin resembled those described by GERACI and GERSTMANN (1966) in the fundic stomach of *Tursiops truncatus*. In both cases the underlying cause seemed to be vascular. However, whereas the lesion in *T. truncatus* was basically a physiological aberration, in the present case the primary lesion had an inflammatory basis, the cause of which was not determined.

The metacestode stages of the tetraphyllidean tapeworms are found in the blubber, musculature and mesentery of several cetaceans and pinnipeds within Australian waters (ARUNDEL, 1978; DAILEY and BROWNELL, 1972). The taxonomic classification of these metacestodes is in some doubt, two types being recognized on the basis of the length of the strobila (ARUNDEL, 1978; CANNON, 1977) and the location of the cysts in the host (DAILEY and BROWNELL, 1972). The type with the scolex at the end of a long strobila is termed *Monorygma grimaldi* whilst the type with the short strobila is termed *Phyllobothrium delphini*. WILLIAMS (1968) in an extensive revision of *Phyllobothrium* and some related genera assigned the metacestode stages of *Monorygma delphini*-type to the "grimaldi" group and allied them with the adult cestode, *Phyllobothrium chamissonii* (Linton 1905), the genus *Monorygma* having dubious validity and *delphini* being already occupied by *P. delphini*. The location of *Monorygma* metacestodes is invariably internal to the subcutaneous blubber whilst *P. delphini* is located in the blubber (DAILEY and BROWNELL, 1972). The adult tapeworms of these species and related genera are reported from elasmobranchs from southern oceans (JOHNSTON, 1937; ARUNDEL, 1978). The postulated life cycle of tetraphyllidean cestodes suggests a crustacean (possibly a planktonic copepod) as the initial intermediate host with fish and squid acting as the source of infection for sharks (MUDRY and DAILEY, 1971). It is postulated that odontocetes may be accidental accumulators of these metacestodes due to their diet being similar to sharks (CANNON, 1977).

Campula sp. are recorded in many cetaceans (DAILEY and BROWNELL, 1972) and their ova have also been incriminated as a cause of brain lesions in stranded dolphins (RIDGWAY and DAILEY, 1972). In the present study *Campula* were located in the pancreatic ducts of one dolphin and possibly the liver and bile ducts of another. The severity of the inflammatory response in the latter may indicate the parasite was in an aberrant site. The brains of the Fraser's dolphins in this study were not examined.

A severe bronchopneumonia was found in one *L. hosei* in association with *Stenurus ovatus*. This nematode has also been found in the bronchioles of *T. truncatus* (ARUNDEL, 1978). The lung lesions seen in the stranded Fraser's dolphin were certainly severe enough to markedly impair respiratory function.

The pigmented thick-walled ova found in the blow-hole exudate of one dolphin were very similar to the ova of the air sinus trematodes of the genus *Nasitrema*. These trematodes are implicated in foul-smelling blow-hole discharges in dolphins (SWEENEY and RIDGWAY, 1975), and brain lesions in association with adult *Nasitrema* are also reported in single stranded dolphins (DAILEY and WALKER, 1978).

In summary, of the two Fraser's dolphins which stranded in Corio Bay, one showed a severe bronchopneumonia associated with the lungworm *Stenurus ovatus*, and this probably played an important role in the stranding of this dolphin. In the other dolphin, trematode ova in the blowhole sinus suggested that examination of the host may have provided a cause for the stranding.

Acknowledgements

We wish to thank Mr. R. Warneke, Sir Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria who identified the dolphins and made them available for post-mortem examination. We also thank Dr. P.W. Arnold, School of Biological Sciences, James Cook University, Townsville, Queensland who identified the lungworms, Dr. J.H. Arundel, University of Melbourne, School of Veterinary Science, Werribee, Victoria for helpful comments on the manuscript, and Mrs Jane Hayes for preparation of photomicrographs.

References

- ARUNDEL, J.H., 1978. Parasites and parasitic diseases of Australian marine mammals. *In: Proceedings No. 36 Fauna-Part B. Post-graduate Committee in Veterinary Science, University of Sydney*, 323-333.
- BRYDEN, M.M. and D.H. BARRY, 1980. First record of Fraser's Dolphin, *Lagenodelphis hosei* (Cetacea:Delphinidae) in Queensland. *Proc. R. Soc. Qd.* 91:104.
- CANNON, L.R.G., 1977. Some aspects of the biology of *Peponocephala electra* (Cetacea: Delphinidae) II. Parasites. *Aust. J. Mar. Freshwater Res.* 28:717-722.
- DAILEY, M.D. and R. BROWNELL, 1972. A checklist of marine mammal parasites. *In: Mammals of the sea* (Ed. S.H. Ridgway). C.C. Thomas, Springfield, Illinois, 528-589.
- DAILEY, M.D. and W.A. WALKER, 1978. Parasitism as a factor (?) in single strandings of southern California cetaceans. *J. Parasitol.* 64:593-596.
- DAVEY, J.T., 1971. A revision of the genus *Anisakis* Dujardin, 1845 (Nematoda:Ascaridata). *J. Helminthol.* 45:51-72.
- FRASER, F.C., 1956. A new Sarawak dolphin. *Sarawak Mus. J., New Series.* 8:478-502.
- GERACI, J.R. and K.E. GERSTMANN, 1966. Relationship of dietary histamine to gastric ulcers in the dolphin. *J. Am. Vet. Med. Assoc.* 149:884-890.
- JOHNSTON, T.H., 1937. The cestoda of the Australian Antarctic expedition. *Austr. Antarct. Exp. Sci. Dep. Ser. C. Vol. 10.*
- MITCHELL, E.D., 1975. Report of the meeting on smaller cetaceans, Montreal, April 1-11, 1974. *J. Fish. Res. Board of Canada* 32:889-983.
- MUDRY, D.R. and M.D. DAILEY, 1971. Postembryonic development of certain tetraphyllidean and trypanorhynch cestodes with a possible alternative life cycle for the order Trypanorhynchida. *Can. J. Zool.* 49:1249-1253.
- PERRIN, W.F., P.B. BEST, W.H. DAWBIN, K.C. BALCOMB, R. GAMBELL and G.J.B. ROSE, 1973. Re-discovery of Fraser's dolphin, *Lagenodelphis hosei*. *Nature, Lond.* 241: 345-350.
- RIDGWAY, S.H. and M.D. DAILEY, 1972. Cerebral and cerebellar involvement of trematode parasites in dolphins and their possible role in stranding. *J. Wildl. Dis.* 8:33-43.
- SWEENEY, J.C. and S.H. RIDGWAY, 1975. Common diseases of small cetaceans. *J. Am. Vet. Med. Assoc.* 167:533-540.
- TOBAYAMA, T., M. NISHIWAKI, and H.C. YOUNG, 1973. Records of the Fraser's Sarawak dolphin (*Lagenodelphis hosei*) in the western North Pacific. *Sci. Rep. Whales Res. Inst., Tokyo* 25:251-263.
- WILLIAMS, H.H., 1968. The taxonomy, ecology and host specificity of some phyllobothriidae (Cestoda:Tetraphyllidea), a critical revision of *Phyllobothrium*, Beneden, 1849 and comments on some allied genera. *Phil. Trans. Royal Soc. London, Series B, Biol. Sci.*, 253: 231-307.