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A spiny-headed worm, *Plagiorhynchus cylindraceus* (Acanthocephala), in hedgehog faeces in southwest Scotland

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While examining faeces of hedgehog (*Erinaceus europaeus* (L.)) from a garden in Kirkcudbright, Dumfries and Galloway, Scotland (NX675486) on 26th July 2020, the author found a small white worm-like organism. To the naked eye it seemed it might be an fly (Diptera) larva but closer examination quickly revealed a spiny- or thorny-headed worm, phylum Acanthocephala (Fig. 1). This prompted an investigation into its identity and an attempt to understand the possible circumstances leading to its occurrence. The diet of a hedgehog can sometimes be revealed from fragments of material if they can be identified in their faeces but an entire food item would not normally be found undamaged after mastication, ingestion and digestion. The good condition of the specimen can be attributed to acanthocephalans being internal parasites usually within the lower alimentary canal of their hosts.

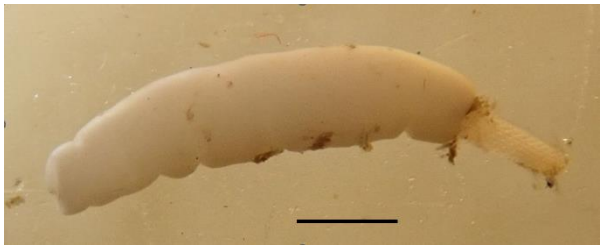

Fig. 1. *Plagiorhynchus cylindraceus*. Whole animal, 4.1 mm long, from hedgehog faeces in Kirkcudbright, Scotland, July 2020. Hunterian Museum, Acc. No. 167076. The proboscis is in the right. Scalebar: 1 mm. (Photo: E.G. Hancock)

The example from Kirkcudbright can be identified as a member of the family Plagiorhynchidae based on the host species and external morphological characters, and using the key by Amin (1987). Being 4.1 mm in length, including the proboscis, it is typical of acanthocephalan adults in terms of size. The widespread species *Plagiorhynchus cylindraceus* (Goeze, 1782) has been recorded from European hedgehogs in western Europe (Pfäffle, 2015; Skuballa, *et al*., 2010). The proboscis of the Kirkcudbright specimen (Figs. 1 and 2) closely resembles that illustrated in Garcia-Salguero *et al.* (2019) and Lisitsyna (2019) as in Fig. 3. Absolute certainty on identification would require clearing to reveal internal organs, which has not been attempted. The specimen has been added to the collection of the Hunterian Museum, Glasgow, accession number GLAHM: 167076.

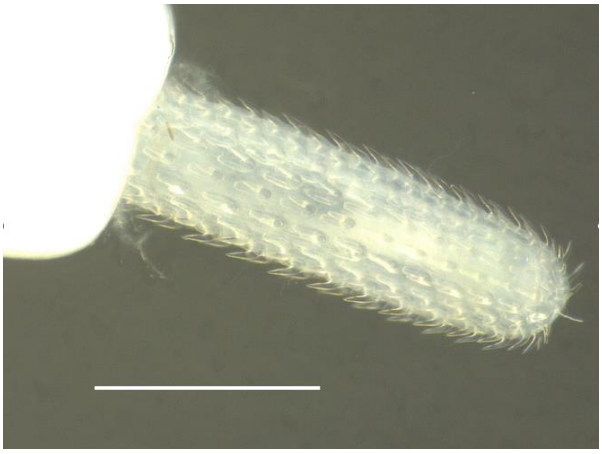

Fig. 2. Proboscis of *Plagiorhynchus cylindraceus* from Kirkcudbright, July 2020. Scalebar: 0.5 mm. (Photo: E.G. Hancock)

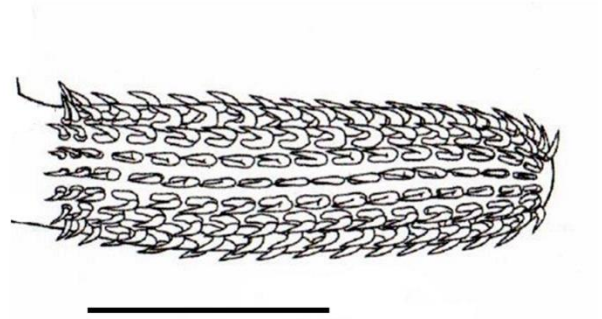

Fig. 3. Proboscis of *Plagiorhynchus cylindraceus*. Adapted from Lisitsyna (2019). Scalebar: 0.5 mm.

There are two parts to the life cycle of the majority of spiny-headed worms. Male and female adults mature within the definitive host, a vertebrate animal, and, after mating, eggs are released and pass out through the gut in the host's faeces. When these are consumed by an intermediate invertebrate host they proceed to grow in a series of stages. If an infested invertebrate is eaten by a subsequent vertebrate host, this dual life cycle can be completed. Spiny-headed worms are divided into three classes. The Archiacanthocephala use terrestrial mammals and birds as definitive hosts, whereas the Eoacanthocephala have aquatic hosts, which can be fish, reptiles or amphibians, and can occur in both freshwater and marine environments. Representatives of the third class, Palaeacanthocephala (to which the Plagiorhynchidae belong) can be found in vertebrates in all the above groups and their habitats. In aquatic systems, parasitisation occurs after consuming infected crustaceans. Terrestrial mammals and birds acquire them from eating woodlice, millipedes, centipedes or insects such as cockroaches (Morris & Crompton,

1982). With a substantially insectivorous diet, hedgehogs would seem to be susceptible to acanthocephalans finding a home in their gut.

An investigation by Skuballa *et al*. (2010) sampled hedgehogs post-mortem from casualties in animal rescue centres. From the U.K. portion of this study nearly half the sample size of 21 had spiny-headed worms. Some of these were found inside the alimentary canal, in which case the worms could be passed out of the body whole. Others were located within the peritoneal cavity where they remain trapped and can cause ulceration damage to the area by cyst formation and subsequent infection. This induces general weakness and loss of condition, and is believed to be a factor in the demise of young hedgehogs (Skuballa *et al*., 2010). The latter authors acknowledged that animals in poor health are likely to be over-represented in animal hospitals and that in the wild the level of infestation would be much less. The true hosts for the adult *P. cylindraceus* are passerine birds, frequently starling (*Sturnus vulgaris*) and blackbird (*Turdus merula*).

When a cystacanth, the infective stage, is ingested by a mammal such as a hedgehog rather than a bird, they can develop to adulthood but are said to be unable to reproduce (Pfäffle, 2015). However, Skuballa *et al.* (2010) suggested that hedgehogs may act as paratenic or transport hosts. This is a third strategy for spiny-headed worms by which a different species of vertebrate host that has become infected is then consumed by the definitive one. For this to apply to hedgehogs, they conjecture that a bird might consume the infected part of a road-killed hedgehog, for example, and could, theoretically at least, acquire the parasite by this intermediate process. *P. cylindraceus* has been recorded from predatory birds and crows on occasion. A comprehensive account of acanthocephalan biology is provided by Nickol (1985).

This Kirkcudbright observation is thought worthy of comment as, apart from the work of Skuballa *et al*. (2010), which mentions animal hospitals in Jersey and Wiltshire, few references have been found for the occurrence or distribution of *P. cylindraceus* in the U.K. James (1954) described examples of spiny-headed worms, identified as *Echinorhynchus rosai* Porta, 1910, from three specimens encysted in the liver and mesentery of a hedgehog. This name is now regarded as a synonym of *P. cylindraceus* (Golvan, 1956). There are specimens (labelled as *E. rosai*) accessioned in 1926 into the Natural History Museum, London collection from Vandelbury, Cambridgeshire, England.

Intermediate hosts *Armadillidium vulgare* (Latreille, 1804), the common pill woodlouse, and *Porcellio scaber* Latreille, 1804, the common rough woodlouse, both occur in the Kirkcudbright garden. In a natural history context, finding this example by examining faeces is serendipitous and not a feasible methodology for finding more. To have any expectation of success for recording hedgehog endoparasites, an investigation would have to be conducted by dissecting fresh road casualties or carcases obtained from deaths in animal sanctuaries. Some broader studies on internal parasites of hedgehogs have revealed much information on helminths (a general term for internal "worms" from different phyla such as tape-worms (phylum Platyhelminthes, class Cestoda), flukes (phylum Platyhelminthes, class Trematoda) and round-worms (phylum Nematoda)), though these lack information on spiny-headed worms (e.g. Boag & Fowler, 1988, and references therein). This paucity of records of Acanthocephala generally and an apparent complete lack of mention of this entire phylum on naturalists' internet recording sites or as part of any mapping schemes is probably because such a pursuit is beyond the inclinations of most wildlife enthusiasts.

Dr Omar Amin of Arizona, U.S.A., kindly responded to my query about identification and sent copies of some relevant papers. Dr Matthew Wayland, University of Cambridge, suggested in his valuable review the inclusion of more background information on the biology of spiny-headed worms. Dr Peter Olsen (Natural History Museum, London) very kindly spent some time searching for and finding specimens. Dr Fiona Ware (National Museums Scotland) and Jennifer Gallichan (National Museum of Wales) are also thanked but could find no relevant specimens of acanthocephalans in those collections.

REFERENCES

Amin, O.M. (1987). Key to the families and subfamilies of Acanthocephala with the erection of a new Class (Polyacanthocephala) and a new Order (Polyacanthorhynchida). *Journal of Parasitology* 73, 1216-1219. https://doi.org/10.2307/3282307

Boag, B. & Fowler, P.A. (1988). The prevalence of helminth parasites from the hedgehog *Erinaceus europaeus* in Great Britain. *Journal of Zoology* 215, 379-382. https://doi.org/10.1111/j.1469-7998.1988.tb04908.x

Garcia-Salguero, A., Delgado-Serra, S., Sola, J., Negre, N., Miranda, N.A. & Paredes-Esquivel, C. (2019). Combined morphology and DNA-barcoding to identify *Plagiorhynchus cylindraceus* cystacanths in *Atelerix algirus*. *Parasitology Research* 118, 1473-1478. https://doi.org/10.1007/s00436-019-06299-6

James, P.M. (1954). On some helminths from British small mammals, with a re-description of *Echinorhynchus rosai* Porta, 1910. *Journal of Helminthology* 28, 183-188. https://doi.org/10.1017/S0022149X00032855

Golvan, Y.J. (1956). Acanthocéphales d'oiseaux. Troisiéme note. Revision des espèces européennes de la sous-famille des Plagiorhynchinae A. Meyer, 1931 (Polymorphidae). *Annales de Parasitologie Humaine et Comparée* 31, 350-384. https://doi.org/10.1051/parasite/1956314350

Lisitsyna, O. (2019). Acanthocephala. *Fauna of Ukraine* 31, 1-223.

Morris, S.C. & Crompton, D.W.T. (1982). The origins and evolution of the Acanthocephala. *Biological Reviews* 57, 85-115. https://doi.org/10.1111/j.1469-185X.1982.tb00365.x

Nickol, B.B. (1985). *Biology of the Acanthocephala*. Faculty Publications from the Harold W. Manter Laboratory of Parasitology, University of Nebraska, U.S.A. https://digitalcommons.unl.edu/parasitologyfacpubs/505

Pfäffle, M. (2015). *Influence of Parasites on Fitness Parameters of the European Hedgehog (*Erinaceus europaeus*)*. Ph.D. thesis, Karlsruher Institut für Technologie, Germany.

Skuballa, J., Taraschewski, H., Petney, T.N., Pfäffle, M. & Smales, L.R. (2010). The avian acanthocephalan *Plagiorhynchus cylindraceus* (Palaeacanthocephala) parasitizing the European hedgehog (*Erinaceus europaeus*) in Europe and New Zealand. *Parasitology Research* 106**,** 431-7. https://doi.org/10.1007/s00436-009-1681-9