

Cleaners remove ectoparasitic Digeneans (Phylum Platyhelminthes) from infected pelagic thresher sharks (*Alopias pelagicus*).

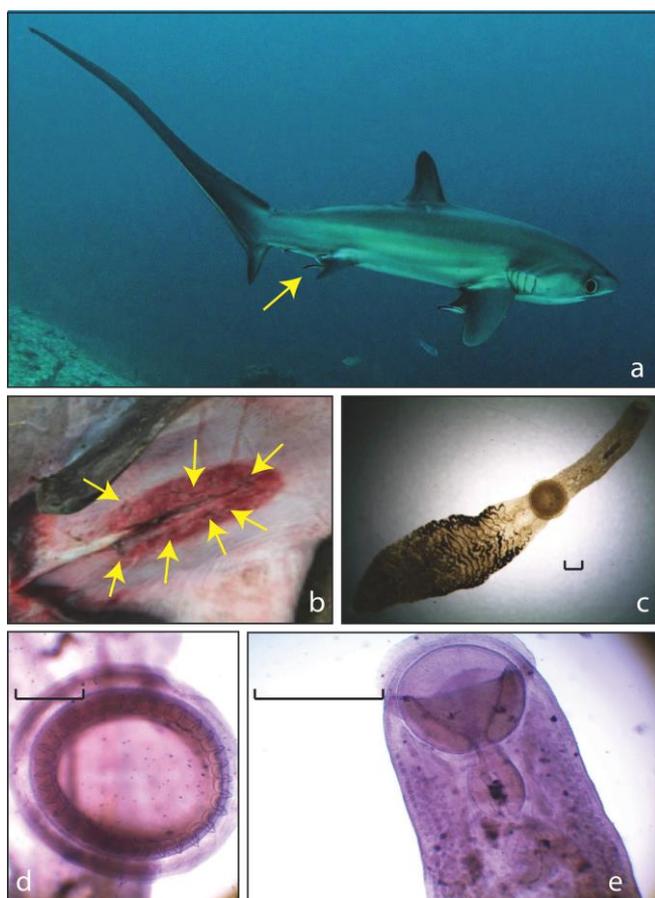


Fig. 1 Digenean ectoparasites taken from pelagic thresher shark specimens. **a** A cleaner wrasse (*Labroides dimidiatus*) forages in the pelvic region of a pelagic thresher shark (*Alopias pelagicus*). **b** The cloaca of a dead thresher shark that is infected with Digenean flatworms (*Paronatrema* spp.). **c, d, e** Microscope imagery of ectoparasite specimens. Scale bars represent 1 mm.

The cleaning system is a classic model for cooperative behaviour among species in which cleaner fish or shrimps remove parasites and/or dead tissue from clients that pose at stations to solicit services from them (Côté 2000). Sharks including pelagic thresher sharks host a variety of ectoparasites that may affect their health and fitness (Oliver et al. 2011). While ectoparasitic Digeneans have been observed to infect thresher sharks (Curran and Overstreet 2002), their association with cleaner fish diet has not been previously documented.

In August 2013, light microscopy was used to examine ectoparasite specimens that were taken from the cloacas of dead pelagic thresher sharks caught in the central Visayas of the Philippines (N 11° 19', E 124° 11'), near a cleaning station that they are known to frequent (Oliver et al. 2011) (Fig. 1). The morphology of the parasites, and measurements carried out revealed that the samples belonged to the genus *Paronatrema* (Dollfus 1937) (Family: Syncoeliidae).

Previous observations made at this site showed that cleaner wrasse (*Labroides dimidiatus* and *Thalassoma lunare*) preferentially forage in the pelvic region of thresher sharks (Oliver et al. 2011). Since no other species of parasite was found in this area of the dead thresher sharks, it appears likely that Digeneans comprise an important part of cleaner fish diet. While the inclusion of helminths in the diet of cleaners is well documented (Côté 2000), this is the first instance in which Digenea have been observed to contribute to the cleaner-client system.

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H. F. Cadwallader · J. R. Turner
School of Ocean Sciences, Bangor University, Menai Bridge, Anglesey, Wales, United Kingdom

S. P. Oliver (✉)
Department of Biological Sciences, University of Chester, Chester, CH1 4BJ, United Kingdom
e-mail: s.oliver@chester.ac.uk