Journal of Helminthology (2003) **77**, 363–365 DOI: 10.1079/JOH2003193

Research Note

Larval anisakid infections of some tropical fish species from north-west Australia

R.G. Doupé*, A.J. Lymbery, S. Wong and R.P. Hobbs
Division of Veterinary and Biomedical Sciences,
Murdoch University, Western Australia 6150, Australia

Abstract

Despite the commercial and zoonotic importance of larval anisakid infestations of teleosts, their distribution among Australia's diverse marine fish fauna is poorly understood. A preliminary survey of Australia's tropical north-west revealed a generally high prevalence of larval anisakids representing four genera (*Anisakis*, *Terranova*, *Thynnascaris* and *Raphidascaris*) among only seven fish species. The potential impact of high larval anisakid infections on both the health of recreational fishermen and aquaculture environments is discussed.

Nematodes of the Ascaridoidea (families Anisakidae and Raphidascarididae) naturally parasitize fish, cephalopods, marine mammals and piscivorous birds, and humans can also become accidental hosts by ingesting fish infected with third stage larvae (Anderson, 1992; Szostakowksa *et al.*, 2002). Anisakids have a global distribution among a wide variety of marine fish species that serve as either secondary intermediate or paratenic hosts (Køie *et al.*, 1995), and their prevalences can be very high (Wharton *et al.*, 1999). The prevalence of larval anisakids in at least some northern hemisphere fisheries has increased in recent years (e.g. Abollo *et al.*, 2001), and heavy nematode infections of economically important fish species may have adverse financial effects on fisheries. For example, the presence of anisakid larvae on and in the viscera and flesh may impact upon visual aesthetics and the market value, and parasite removal only adds to product cost while further reducing its attraction to consumers.

Very little is known of the distribution of larval anisakid nematodes among Australian fish species. Cannon (1977a,b) found nine larval morphotypes of *Anisakis*, *Contracaecum*, *Terranova* and *Thynnascaris* among 47 marine species from Queensland, and Lymbery *et al.* (2002) found a single *Contracaecum* species (sp. nov.) among four of 17 important recreational and commercial fish species from inshore and estuarine habitats of southern Western Australia. Lymbery *et al.* (2002) found heavy infections in two species of mullet (*Mugil cephalus* and *Aldrichetta forsteri*), and the extent of visceral deterioration due to worm encapsulation caused them to raise concerns for the future welfare of the local mullet fishery. Lymbery *et al.* (2002) also tested for larval anisakid migration in 20 *M. cephalus* for up to 60 h post-mortem. They found 75 worms in the visceral organs, mesenteries, and peritoneum, but no evidence of movement into the musculature, and concluded that the zoonotic potential of this *Contracaecum* sp. was low. Despite the commercial and zoonotic importance of larval anisakid infections in teleosts, we still have a very poor understanding of their distributions among Australia's marine fish fauna, of which there are over 2000 species (Grant, 1999). The present study addresses this by reporting on anisakid infections in fish from the tropical north-west.

Viscera from 58 fish representing seven different species from north-western Australian waters were examined. The fish were derived from demographic surveys by the Western Australian Department of Fisheries, and from a fish wholesaler in Perth. The entrails were examined using methods described by Lymbery *et al.* (2002), and worms were identified using the keys of Cannon (1977a) and Hooper (1983).

Larval anisakids representing four genera (*Anisakis*, *Terranova*, *Thynnascaris* and *Raphidascaris*) were found in the fish species surveyed (table 1). Nearly every

*Fax: (618) 9310 4144
E-mail: R.Doupe@murdoch.edu.au

Table 1. Larval anisakid infections of selected tropical fish species from north-west Australian waters.

Fish species		n	Anisakid genus	Prevalence of infection (%)
Goldband snapper	*Pristipomoides multidens*	15	*Anisakis* sp.	100
			Terranova sp.	7
Mangrove jack	*Lutjanus argentimaculatus*	4	*Anisakis* sp.	100
			Raphidascaris sp.	25
Morgan's cod	*Epinephelus malabaricus*	4	*Terranova* sp.	75
Red emperor	*Lutjanus sebae*	17	*Anisakis* sp.	100
			Terranova sp.	6
			Thynnascaris sp.	6
Coral trout	*Plectropomus maculatus*	3	*Anisakis* sp.	67
			Terranova sp.	67
Estuary cod	*Epinephelus coioides*	13	*Anisakis* sp.	85
			Terranova sp.	38
Spangled emperor	*Lethrinus nebulosus*	2	*Anisakis* sp.	100

n = number of fish examined.

individual from each species was infected with *Anisakis* type I larvae (after Cannon, 1977a), while *Terranova* type II larvae (Cannon, 1977a), *Thynnascaris* type IV (Cannon, 1977a) and raphidascarid worms (either *Raphidascaris* or *Raphidascaroides* after Hooper, 1983) were less prevalent. Voucher specimens have been lodged with Dr L. Cannon at the Queensland Museum.

The present survey is very preliminary, but it provides a number of points of interest, especially the finding of a high diversity of anisakids from comparatively few fish species. Of particular interest is the high prevalence of *Anisakis* sp. (67–100%) in six of the seven species listed. *Anisakis* sp. is thought to occur typically in deeper waters (Cannon, 1977b; but see Sanmartín *et al.*, 2000), however mangrove jack is a characteristically near shore/estuarine species that also displayed a very high *Anisakis* prevalence.

Human health risks associated with anisakiasis seem to largely depend on post-capture handling conditions and the physiological characteristics of individual fish species (Roepstorff *et al.*, 1993). For the species mentioned here, further sampling and investigation of whole fish is required to assess infection levels and any zoonotic risks more accurately. Near shore fish species (e.g. mangrove jack and estuary cod) are more susceptible to fishing effort by recreational anglers, however, and fishers may be more susceptible to larval transfer by at least two methods. Firstly, if there has been limited preparation of fish flesh such as little or no refrigeration or freezing, or if there has been whole cooking of the fish, live worms may be inadvertently consumed (e.g. Bouree *et al.*, 1995). Secondly, continued exposure to highly contaminated fish may increase human sensitivity to symptoms associated with anisakiasis (Purello-D'Ambrosio *et al.*, 2000).

Many of the fish described here are candidate species for aquaculture. Fish stress is commonly associated with problems attributed to overcrowding and diet in the fish production system, and it is thought to be a major contributor to the pathogenic effects of parasitic worms in cultured fish (Álvarez *et al.*, 2002). It is necessary to understand the suites of parasite species associated with cultured fishes to reduce potentially adverse impacts associated with farm husbandry practices. For example, anisakid eggs and larvae are typically ingested by zooplankton, and these crustaceans form an important dietary component of post-larval fish species, suggesting that parasites could be readily and unknowingly transmitted within the culture fish system (e.g. Karlsbakk *et al.*, 2001).

Acknowledgements

The Western Australian Department of Fisheries kindly provided fish material for examination.

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(Accepted 24 April 2003)