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Ascaridoid parasites infecting in the frequently consumed marine fishes in the coastal area of China: A preliminary investigation

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ABSTRACT

Marine fishes represent the important components of the diet in the coastal areas of China and they are also natural hosts of various parasites. However, to date, little is known about the occurrence of ascaridoid parasites in the frequently consumed marine fishes in China. In order to determine the presence of ascaridoid parasites in the frequently consumed marine fishes in the coastal town Huizhou, Guangdong Province, China, 211 fish representing 45 species caught from the South China Sea (off Daya Gulf) were examined. Five species of ascaridoid nematodes at different developmental stages were detected in the marine fishes examined herein, including third-stage larva of *Anisakis typica* (Diesing, 1860), third and fourth-stage larvae of *Hysterothylacium* sp. IV-A of Shamsi, Gasser & Beveridge, 2013, adult and third-stage larvae of *Hysterothylacium zhoushanense* Li, Liu & Zhang, 2014, adults and third-stage larvae of *Raphidascaris lophii* (Wu, 1949) and adults of *Raphidascaris longispicula* Li, Liu & Zhang, 2012. The overall prevalence of infection is 18.0%. Of them, *Hysterothylacium* sp. IV-A with the highest prevalence (17.5%) and intensity (mean = 14.6) of infection was the predominant species. The prevalence and intensity of *A. typica* were very low (1/211 of marine fish infected with an intensity of one parasite per fish). The morphological and molecular characterization of all nematode species was provided. A cladistic analysis based on ITS sequence was constructed in order to determine the phylogenetic relationships of these ascaridoid parasites obtained herein. The present study provided important information on the occurrence and diagnosis of ascaridoid nematodes in the commercially important marine fishes from the South China Sea. The low level of infection and the species composition of ascaridoid nematodes seem to indicate the presence of low risk of human anisakidosis when local population consumed these marine fishes examined herein.

1. Introduction

Ascaridoid nematodes are common parasites in various wild and domestic animals and many species are of veterinary, medical, and economic importance [1–3]. In the Northwest Pacific, ascaridoid nematodes, especially Anisakidae and Raphidascarididae, are considered as the most common nematode parasites in marine fishes [4–13]. Infection by the different developmental stages of ascaridoid nematodes can affect the growth rate and fecundity of the fish hosts, make them more vulnerable to diseases and reduce the commercial value of fish [14–16]. Furthermore, the third-stage larvae of some genera of Ascaridoidea parasitic in fishes, i.e. *Anisakis*, *Pseudoterranova*, *Contracaecum* and *Hysterothylacium*, are recognized as the parasites frequently associated with human anisakidosis [17–23]. Humans become infected by accidental ingestion of raw or undercooked fish infected with third-stage larvae [24–28]. In the coastal areas of China, marine fishes represent the important components of the diet and the consumption of raw or marinated fish is also very widespread. However, to date, there has been only one case of human anisakidosis reported in China [29]. The information on the occurrence and systematics of ascaridoid parasites in the frequently consumed marine fishes in China is still extremely limited, which is very valuable for the risk assessment of humans acquiring anisakidosis.

Although the accurate identification of parasites at any life cycle stage is of primary importance for understanding their phylogeny, ecology, epidemiology and for diagnosis and control [10,30–32], it is nearly impossible to exactly identify the different larval stages of ascaridoid nematodes to species level purely on the basis of conventional taxonomy. Recently, large numbers of studies have proved that molecular techniques, utilizing the internal transcribed spacer (ITS) of nuclear ribosomal DNA (rDNA) as a genetic marker, can solve the problem perfectly [10,12,13,33–39]. Consequently, in order to determine the occurrence and species diversity of ascaridoid nematodes in the frequently consumed marine fishes in the coastal town Huizhou, Guangdong Province, China, 211 fish belonging to 45 species, caught from the South China Sea (off Daya Gulf), were tested for ascaridoid nematodes. Molecular approaches including sequencing and phylogenetic analyses

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Table 1
Parasite–host distribution data. A—third-stage larva of *Anisakis typica* (Diesing, 1860), H3—third-stage larvae of *Hysterothylacium* sp. IV-A of Shamsi, Gasser & Beveridge, 2013, H4—fourth-stage larvae of *Hysterothylacium* sp. IV-A of Shamsi, Gasser & Beveridge, 2013, R3—third-stage larvae of *Raphidascaris lophii* (Wu, 1949), R1—adults of *Raphidascaris lophii* (Wu, 1949), L—adults of *Raphidascaris longispicula* Li, Liu & Zhang, 2012, Z1—adult of *Hysterothylacium zhoushanense* Li, Liu & Zhang, 2014; Z3—third-stage larvae of *Hysterothylacium zhoushanense* Li, Liu & Zhang, 2014.

Hosts	No. examined	Parasites	Prevalence (%)	Intensity (mean)
Perciformes				
Scombridae				
Scomberomorus commerson	8	H4	12.5	1
Scomberomorus niphonius	35	R3; H4; A	8.6; 2.9; 2.9	1–2 (1.3); 1; 1
Scomber japonicus	2	R3; H3	100; 100	2–9 (5.5); 27–71 (49)
Platycephalidae				
Parachaeturichthys polynema	1	–	0	0
Siganidae				
Siganus fuscescens	10	–	0	0
Trichiuridae				
Eupleurogrammus muticus	2	–	0	0
Apogonidae				
Taeniamia macroptera	1	–	0	0
Apogonichthyoides taeniatus	6	H3	16.7	1
Lutjanidae				
Pristipomoides filamentosus	1	H4	100	3
Menidae				
Mene maculata	3	R3	66.7	6–21 (13.5)
Mullidae				
Upeneus tragula	7	–	0	0
Pomacanthidae				
Chaetodontoplus septentrionalis	1	–	0	0
Gobiidae				
Parachaeturichthys polynema	3	–	0	0
Leiognathidae				
Leiognathus brevirostris	3	–	0	0
Sciaenidae				
Pennahia pawak	5	H4; H3	20; 20	6; 1
Serranidae				
Diploprion bifasciatum	2	–	0	0
Nemipteridae				
Scolopsis vosmeri	1	–	0	0
Nemipterus virgatus	3	–	0	0
Nemipterus peronii	2	–	0	0
Haemulidae				
Plectorhinchus flavomaculatus	2	–	0	0
Drepaneidae				
Drepane punctata	1	–	0	0
Terapontidae				
Terapon jarbua	2	–	0	0
Rhynchopelates oxyrhynchus	1	–	0	0
Centrolophidae				
Psenopsis anomala	1	–	0	0
Callionymidae				
Callionymus koreanus	18	–	0	0
Scorpaeniformes				
Scorpaenidae				
Pterois russelii	1	R3	100	1
Triglidae				
Lepidotrigla japonica	2	R3; H4; H3; Z3	100; 50; 50; 100	3–141 (72); 23; 57; 3–18 (10.5)
Beloniformes				
Hemiramphidae				
Hyporhamphus dussumieri	1	–	0	0
Anguilliformes				
Congridae				
Uroconger lepturus	2	L; R3; R1; H4; H3; Z1	50; 100; 50; 100; 100; 50	7; 4–20 (12); 1; 4–7 (5.5); 2–3 (2.5); 1
Rhynchoconger ectenurus	10	L; R1; R3; H4; Z3	10; 10; 90; 100; 70	1; 2; 2–13 (4.4); 2–39 (14.2); 1–4(1.9)
Muraenesocidae				
Congresox talabonoides	5	H4	20	1
Mugiliformes				
Polynemidae				
Polydactylus sextarius	15	H4; H3	53.3; 26.7	1–7 (3.9); 1–5 (3)
Mugilidae				
Mugil cephalus	15	–	0	0
Siluriformes				
Ariidae				
Netuma thalassina	3	H3	33.3	1
Aulopiformes				
Synodontidae				
Harpadon nehereus	3	–	0	0
Saurida tumbil	1	–	0	0