

Anisakidae: Zoonotic parasites in commercial fish in our North Sea

Mercken Evelien, Van Damme Inge, Vangeenberghe Sandra, Serradell Anna, De Sterck Tom, Lumain John Philip Lou and Gabriël Sarah

Vakgroep Veterinaire Volksgezondheid & Voedselveiligheid, Universiteit Gent (UGent-VVV), Salisburylaan 133, 9820 Merelbeke, Belgium
E-mail: evelien.mercken@ugent.be

Anisakidae are marine nematodes with crustaceans as first intermediate host, fish and cephalopods as second intermediate host and marine mammals as definitive host. In fish, third stage larvae can migrate from the viscera to the muscles, both ante-mortem and post-mortem. Humans are accidental hosts and can acquire gastro-intestinal complaints after the consumption of a viable third stage larvae in raw or undercooked fish fillets. Adequate freezing or cooking kills the larvae, but allergic reactions against the (heat-resistant) antigens can still occur. Besides the human health impact, *Anisakidae* are also associated with socio-economic problems.

Our recent study in which we examined commercial fish from the Belgian market obtained via wholesalers, indicated the presence of *Anisakidae* in 23 different fish species. In the muscles, an overall prevalence of 27% [95%-CI: 23-32%] was found with an average of two larvae in 100g infected muscle [range: 0-28]. Highest prevalence (>78%) was observed in pollack, halibut, and gurnard, while species with the highest mean number of larvae per 100g muscle were the greater weaver (13 larvae/100g), followed by the common dab (8 larvae/100g), and gurnard (6 larvae/100g). In the fish samples originating from the North Sea, an overall prevalence of 41% [95%-CI: 30-53] and median intensity of 2 larvae [range: 1-36] was recorded. Triggered by these results, a study was conducted to investigate the prevalence of *Anisakidae* targeting specifically freshly caught fish from the North Sea.

On eight days throughout the year 2019, samples were collected in the Southern North Sea with the research vessel Simon Stevin. Fish were caught by bottom trawling and immediately gutted after catching to prevent post-mortem migration of the larvae. Viscera and filleted muscle samples were digested separately in an acid pepsin solution to recover all larvae. The prevalence, intensity, localisation of infection, and larvae species identification was determined.

A total of 365 fish samples were collected with *Anisakidae* larvae detected in 84 of these fish, giving an overall prevalence of 23% [95%-CI: 19-28%]. Variations between the fish species was observed with the highest prevalence in horse mackerel, whiting, greater weever, and seabass [33-80%], while the prevalence was lower in the flatfishes (plaice, sole, flounder, and common dab) [0-10%]. An overall median intensity of two larvae per infected fish [range: 1-127] was found with 95% of all larvae originating from the viscera. Only in 11 fish samples the muscles were infected, giving a median intensity of one larva [range: 1-5]. Taking into account the sometimes particularly small fish sizes, the number of larvae per 100g infected muscle was additionally calculated, resulting in five larvae/100g [range: 2-25]. A significant positive relation between the weight of the fish (g) and the number of larvae was observed ($r=0.20$; $P<0.001$). Factors such as season, water temperature, fishing location, fishing depth and fish length did not seem to have an effect on the presence or absence of *Anisakidae* infection. Lastly, larvae identification indicated *Hysterothylacium aduncum* as most abundant species, comprising 80% of all larvae recovered. Though the zoonotic *Anisakis* spp. was only found in six fish samples, the intensity of infection was high (5 larvae [range: 1-53]).

Our data shows a high occurrence of *Anisakidae* in the North Sea. A higher prevalence was noted for the North Sea in our previous study. This probably can be explained by the specific fish species caught using the bottom trawling rather than the fishing sea. In our previous research, around one third of the samples from the same fish species were infected with *Anisakidae*.

Immediate storage of the fish on ice or gutting after the catch is recommended to prevent post-mortem migration of the larvae towards to muscles. Nevertheless, 5% of the larvae in our samples migrated ante-mortem, resulting in a high number of five larvae/100g infected muscle which cannot be prevented.

Keywords: Seafood; Food safety; *Anisakidae*; Parasitology; Zoonoses; North Sea; Whiting; Weever; Plaice; Common dab