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# Occurrence and distribution of anisakid nematodes in Grey gurnard (*Eutrigla gurnardus* L.) from the North Sea

Horst Karl [a,*], Arne Levsen [b]

[a] Max Rubner-Institute, Federal Research Institute of Nutrition and Food, Department of Safety and Quality of Milk and Fish Products, Palmaille 9, 22767 Hamburg, Germany
[b] National Institute of Nutrition and Seafood Research (NIFES), P.O. Box 2029, Nordnes, 5817 Bergen, Norway

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ABSTRACT

Grey gurnard (*Eutrigla gurnardus* L.) is an abundant and widely distributed demersal fish in the North Sea. It is currently considered a sustainable stock, thus permitting future increased utilisation as a food resource. In order to address both consumer safety and aesthetical product quality, the occurrence and distribution of anisakid nematode larvae in Grey gurnard from two localities in the North Sea were investigated. Two anisakid species were recorded, i.e. *Hysterothylacium aduncum* in the viscera, and *Anisakis simplex* in both the viscera and flesh of the fish. Virtually all gurnards were infected with nematode larvae. However, *H. aduncum* was significantly less abundant than *A. simplex* in the fish from both localities. Only for the gurnards from the northernmost sampling locality there was a significantly positive correlation between host body weight and total *A. simplex* abundance. No such correlation was found for *H. aduncum* in either locality. Separate analyses of the *Anisakis* infection data in gurnards of marketable size (≥250 g) and pooled for both localities, revealed 83% prevalence of *A. simplex* larvae in the fish flesh, ranging 1–16 in intensity. The relative larval distribution between the viscera and flesh was 89 and 11%, respectively. Moreover, a significantly positive correlation was found between *A. simplex* occurring in the viscera and the flesh of this particular host size group, i.e. the number of larvae in the flesh appeared to increase with increasing infection level in the viscera. In general, Grey gurnard from the North Sea can be considered as heavily infected with nematode larvae. Especially the comparatively high abundance of *A. simplex* larvae in the flesh is of concern regarding the possible intensified utilization of Grey gurnard as a food resource.



## 1. Introduction

Grey gurnard (*Eutrigla gurnardus*) is by far the most common gurnard species of the North Sea. It is a widely distributed demersal fish and occurs throughout the North Sea basin (ICES, 2009; Ehrich, Stelzenmüller, & Adlerstein, 2009). Its abundance has increased since the late 1980s and grey gurnard has been ranked among the 10 dominant fish species in the area (Floeter, Kempf, Vinther, Schrum, &Temming, 2005). Smaller gurnards (<25 cm) feed on brown shrimps and other crustaceans while larger specimens feed on a variety of fish including sandeel as well as juvenile cod and whiting. It is caught as by-catch of the bottom trawl fishery and is presently only of limited commercial importance. North Sea Grey gurnard is rated as a sustainable stock and is recommended for human consumption by the Marine Conservation Society, UK (www.fishonline.org). The fish can be served as whole, gutted and grilled, or as fried fillets.

The parasitic fauna of the Grey gurnard from fishing grounds off the Shetland Islands was investigated by Duniec (1980) who found 14 species of parasites among which the larvae of *Hysterothylacium aduncum* (reported as *Thynnascaris adunca*) and *Anisakis simplex* appeared to be most prevalent and abundant. However, no information was given regarding the distribution of *A. simplex* larvae between the viscera and the flesh of the host, and the larval abundance in the flesh. This could be of great interest, however, considering the major potential of this fish species to be increasingly utilized for consumption purposes. Thus, data on the occurrence of *Anisakis* larvae in the edible parts of the fish are important due to the larvae's potentially consumer health hazardous property (Thiel, Kuipers, & Roskam, 1960). Hence, if not processed properly, live *Anisakis* larvae may result in human anisakiasis which – in its acute phase – can cause epicastric pain, nausea, vomiting and diarrhoea (Bouree, Paugam, & Petithory, 1995; Sakanari & McKerrow, 1989). For example, approximately 2000 cases of anisakiasis are recorded annually in Japan due to consumption of raw or only lightly processed

* Corresponding author. Tel.: +49 40 38905 114; fax: +49 40 38905 262.
*E-mail addresses:* horst.karl@mri.bund.de (H. Karl), arne.levsen@nifes.no (A. Levsen).

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fish (sushi and sashimi) (Chai, Murell, & Lymberry, 2005). Moreover, various studies imply that *A. simplex* larvae – both dead and alive – may induce allergic reactions after consumption of infected fish products (Audicana et al., 1995; Audicana, Ansotegui, Corres, & Kennedy, 2002; Valls, Pascual, & Esteban, 2005; Moneo, Caballero, Rodriguez-Perez, Rodriguez-Mahillo, & Gonzalez-Munoz, 2007). Besides the consumer health implications, anisakid nematodes have a considerable quality reducing effect as well due to their most unappealing appearance in fish intended for consumption.

The aim of the present study was to examine the occurrence of anisakid nematodes in the viscera and flesh of Grey gurnard from two fishing grounds in the North Sea.

## 2. Materials and methods

Grey gurnards from the Dogger Bank area ($n = 50$) in the central North Sea (56°50′N–55°47′N and 003°53′E–003°15′E) and the eastern Fair Isle Bank area ($n = 39$) in the northern North Sea (61°51′N–59°20′N and 000°32′W–001°55′E) were collected in April 2009 by several bottom trawls during the 321st cruise of the German research vessel Walter Herwig III. The approximate sampling areas are shown in Fig. 1. Immediately after catch, length and weight of each fish were recorded followed by gutting in order to prevent any possible post mortem migration of nematode larvae. The fish host size data are shown in Table 1.

After removal of the viscera, the body cavity and peritoneal linings of each fish were visually inspected for remaining nematode larvae while the visceral organs including the mesenteries were artificially digested in a pepsin-HCL solution as described in the Codex standard for salted Atlantic herring and salted sprat in Annex I a (Codex STAN 244, 2004). After complete degradation of the visceral organs of each fish in 250 ml sealed plastic flasks placed in a 36 °C shaking water bath, the hydrolysate of each flask was strained and the sieve content subsequently examined for nematode larvae following Levsen, Lunestad, and Berland (2005).

The manually produced skinless fillets including the belly flaps were analysed for nematodes by applying the UV-Press method as described by Karl and Leinemann (1993). In brief, the fillets of each fish were put in separate plastic bags and pressed to 1–2 mm thin layers in a hydraulic pressing device (holding time 20 s at 8 bar). The bags were then deep frozen over night in a blast freezer at −40 °C and examined under UV light (366 nm) after thawing. Deep frozen anisakid larvae emerge as more or less brightly fluorescent spots under UV light and are thus easily detected (Pippy, 1970).

The anisakid larvae found were identified and differentiated by light microscopy following the morphological criteria proposed by Berland (2003) and Køie (1993). However, before morphological identification, the larvae were grossly separated at genus level, i.e. either *Hysterothylacium* or *Anisakis*, due to their different properties when applying artificial digestion.

### 2.1. Data analysis

A *t*-test was run to check for differences in fish body weight between the samples of both localities. The relationships between fish host weight and both abundance and intensity of *Anisakis* and *Hysterothylacium* larvae were analysed, separately for each locality, by Spearman rank tests. To test for any differences regarding the abundance and intensity means between *A. simplex* and *H. aduncum* for each locality, bootstrap *t*-tests (two-sided, *N* bootstrap replications = 2000) were applied. Since the present study emphasises the food safety aspects inferred from the possible presence of nematode larvae in the fish flesh, only gurnards of marketable size (≥250 g), pooled for both localities ($n = 57$), were considered for further analyses of the larval *Anisakis* infection data. Thus, the Spearman rank test was used to check for possible correlations between fish body weight and abundance of *Anisakis* larvae in the flesh, and between *Anisakis* larval abundance and intensity in the viscera and flesh, in this particular host size group. The significance level was set at 0.05.

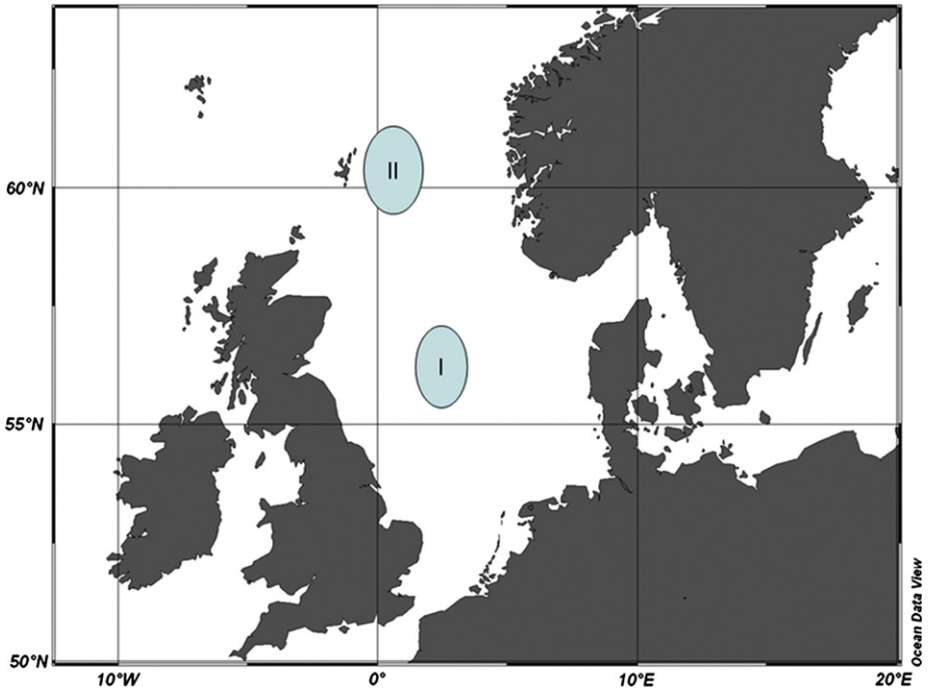


**Fig. 1.** North Sea sampling localities of Grey gurnard in April 2009. (I) Dogger Bank area; and (II) eastern Fair Isle Bank.