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Summary technical report for the UK National Reference Laboratory for Anisakis – April 2018 to March 2019

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Summary Technical Report for the UK National Reference Laboratory for Anisakis – April 2018 to March 2019

Final Report

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1. Introduction

The Centre for Environment, Fisheries and Aquaculture Science (Cefas), Weymouth, is designated as the UK National Reference Laboratory (NRL) for the foodborne and potentially zoonotic parasite *Anisakis*. This report summarises the interim activities carried out by the NRL between April 2018 and March 2019 per the requirements of Regulation (EC) No. 882/2004 and as defined in the Service Level Agreement between the Food Standards Agency (FSA) and Cefas.

The description of the activities included herein includes: the ongoing maintenance of general capacity; the participation in the 2019 proficiency test scheme; progress made against the contract objective to engage with and evaluate the practices of the food production industry, and a brief report on relevant peer reviewed literature published in 2018.

2. Ongoing capacity

Website

The NRL website (https://www.cefas.co.uk/anisakis) continues to deliver information on the responsibilities and function of the NRL to a public audience. During the period covered by this report we have added the updated SOPs relating to our molecular methods (see section on proficiency testing).

A website analytical report was run 31/03/2019. This determined that the NRL website has had 1632 visits to date (Figure 1.) from approximately 1028 unique users. The sections of the website which experienced the most traffic were the annual reports, methodology, and regulations sections. The highest number of page views in a calendar year was 2018, when there were 508.

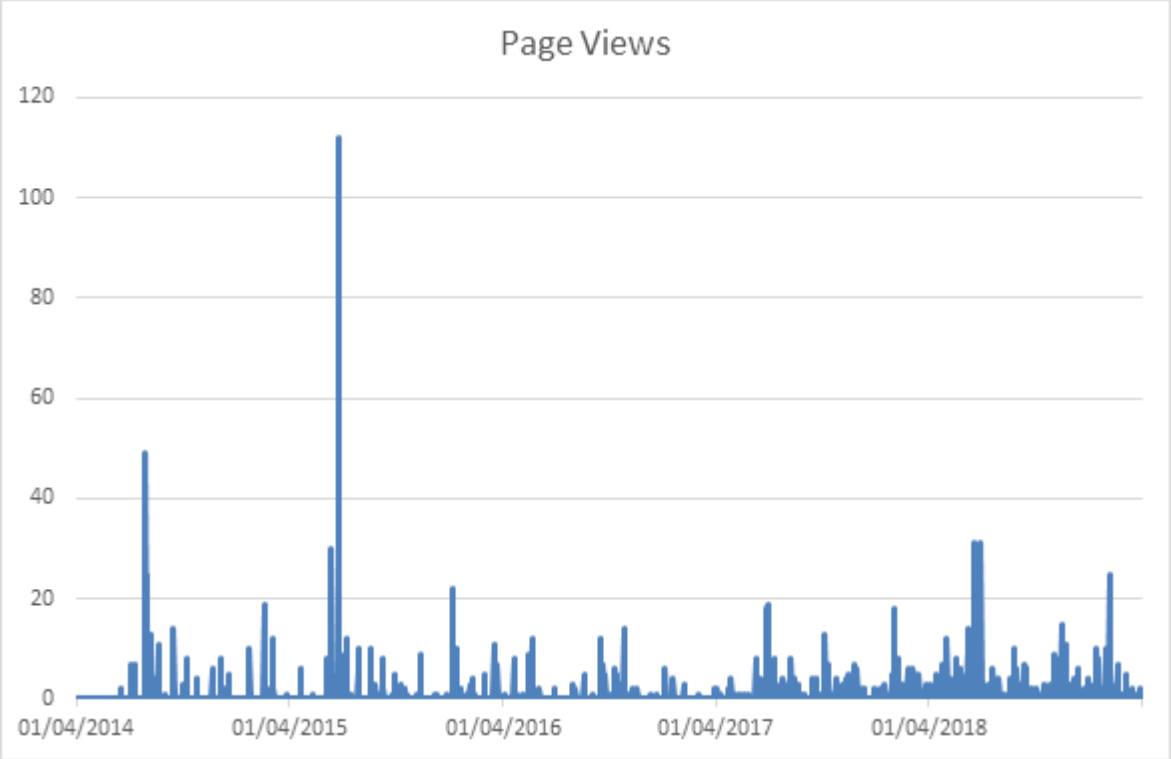

Figure 1 - NRL website visits

Several minor modifications were made to the website, such as the addition of a page relating to the industry survey and updates to the names of personnel involved.

Email enquiries

We have received no unsolicited email enquires in the period since the previous report. Contact has been made with seafood processor trade associations and SEAFISH as part of the industry engagement task.

Change of personnel

Mr Tom Hill, NRL Director, left Cefas in December 2018. Mr Alastair Cook was appointed as successor and was provided with a detailed briefing by Mr Hill before his departure. Dr Feist remains available in an advisory capacity.

3. Completion of 2019 EURLP proficiency test

Concerning the detection of larvae in fillets

Samples for the 2019 'Detection of Larvae in Fillets Proficiency Test' (PT) were received 13th March 2019 and screened using the ultraviolet transillumination system following internal SOP NRL001. Our results were returned to the EURLP 20th March 2019. We received our PT report from the EURLP 25th March which confirmed successful completion of the exercise with parasite counts in all three samples correct.

Concerning the molecular identification of larvae to the species level

Molecular samples were contained in the same package as the fillet samples received 13th March 2019. The revised protocol that was used successfully in 2018 and has been agreed with the EURL was used. Results were submitted to the EURL on the 25th March 2019. The PT report was received from the EURL on the 8th April 2019, and indicated that the test was successfully completed with all four parasites supplied identified as the correct species.

Future of proficiency testing

We contacted the EURL and asked specifically if PT could continue as a paid service if/when the UK leaves the EU. We are awaiting confirmation of the EURL position.

4. Official control lab (OCL) engagement

There are currently no official control laboratories in the UK, so there is nothing to report under this heading.

5. Reference material

A relatively small but varied collection of infected materials that were obtained during research cruises are in storage at Cefas. Specific pathogen free material is available through our aquarium facility. Further details of what is in storage are as reported in the 'Final technical report for the UK national reference laboratory for Anisakis April 2016 - March 2017'. These materials will allow the production

of larvae spiked fillet material for proficiency testing if needed, as detailed in protocol NRL007 (DOC 34 in Table 1).

6. EURLP Annual meeting (2018)

The NRL was represented by Tom Hill at the annual meeting held in May of 2018 in Rome. There were several items concerning Anisakis, but most of the presentations and discussions focussed on terrestrial parasites such as *Trichinella*. An agenda and all posters and presentations are available at https://eurlp.iss.it/2018/02/02/workshop/.

7. Representation on BSI Working Group 6

Tom Hill, the NRL director until December 2018 was a member of the Foodborne Parasites Working Group. He offered comments on the draft standards. Discussions will take place with the BSI working group to seek continuation of representation of the NRL.

8. Standard operating procedures

All standard operating procedures (SOPs) and the Code of Practice have been reviewed as required by our internal Quality Assurance processes and are listed in Table 1. Any changes have been recorded within the document management system. Three SOPs (DOC29, DOC30 and DOC31) which were developed for the first unsuccessful round of proficiency testing for molecular identification remain archived. A new SOP covering the entire revised process used successfully in 2018 and 2019 has been developed and is in the process of being formalised within the document management system after which it will be uploaded to the NRL website. The EURL has confirmed they are content for these revised procedures to be applied and indicated that other NRLs have also deviated from the one described by the EURLP.

Table 1: SOPs and Guidance Documents for Anasakis NRL

Name	Version	Title	Status
DOC26	1.0	Detection of Anisakidae larvae in fish fillets using ultraviolet transillumination (UVT)	Live
DOC27	1.0	Summary of detection methods for Anisakidae larvae in fish fillets	Live
DOC29	1.0	Determination of DNA concentration using the Quantus Fluorometer	Archived

DOC30	1.0	Amplification of the internal transcribed spacer ITS1 region of Anisakis nematode DNA using Polymerase Chain Reaction (PCR)	Archived
DOC31	1.0	Purification of DNA from TAE agarose gels using the Geneclean® II Kit	Archived
To be issued	1.0	DNA extraction and determination of species found within the family Anisakidae	Replaces DOC29, DOC30 and DOC31. *Awaiting incorporation into the document management system.*
DOC32	3.0	United Kingdom Anisakis Reference Laboratory: Code of Practice/Guidance Document	Live
DOC34	1.0	Production of Proficiency Testing (PT) material	Live

9. Industry engagement

All testing for *Anisakis* in the UK is undertaken by the food production and preparation industry with no involvement from the NRL or OCLs. As part of our commitments as the UK NRL and at the request of FSA, Cefas is aiming to establish how controls are implemented by industry and whether these are effective.

The requirements for the hygiene of foodstuffs, including fish, are addressed under Regulation (EC) No 853/2004 (EC, 2004), as amended by Regulation No 1276/2011 (EC, 2011):

> *'Laying Down Specific Hygiene Rules for on the Hygiene of Foodstuffs'*
>
> *Annex III, Section VIII, Chapter III: Requirements for Establishments, Including Vessels, Handling Fishery Products.*
>
> *Section D: Requirements Concerning Parasites (as amended by Commission regulation (EU) No 1276/2011).*
>
> *1. Food business operators placing on the market the following fishery products derived from finfish or cephalopod molluscs:*
>
> > *(a) fishery products intended to be consumed raw; or*
> >
> > *(b) marinated, salted and any other treated fishery products, if the treatment is insufficient to kill the viable parasite;*
> >
> > *must ensure that the raw material or finished product undergo a freezing treatment in order to kill viable parasites that may be a risk to the health of the consumer.*

2. For parasites other than trematodes the freezing treatment must consist of lowering the temperature in all parts of the product to at least:

(a) – 20 °C for not less than 24 hours; or

(b) – 35 °C for not less than 15 hours.

3. Food business operators need not carry out the freezing treatment set out in point 1 for fishery products:

(a) that have undergone or are intended to undergo before consumption a heat treatment that kills the viable parasite. In the case of parasites other than trematodes the product is heated to a core temperature of 60 °C or more for at least one minute;

(b) that have been preserved as frozen fishery products for a sufficiently long period to kill the viable parasites;

(c) from wild catches, provided that:

(i) there are epidemiological data available indicating that the fishing grounds of origin do not present a health hazard with regard to the presence of parasites; and

(ii) the competent authority so authorises;

(d) derived from fish farming, cultured from embryos and have been fed exclusively on a diet that cannot contain viable parasites that present a health hazard, and one of the following requirements is complied with:

(i) have been exclusively reared in an environment that is free from viable parasites; or

(ii) the food business operator verifies through procedures, approved by the competent authority, that the fishery products do not represent a health hazard with regard to the presence of viable parasites.

4. (a) When placing on the market, except when supplied to the final consumer, fishery products referred to in point 1 must be accompanied by a document issued by the food business operator performing the freezing treatment, stating the type of freezing treatment that the products have undergone.

(b) Before placing on the market fishery products referred to in points 3(c) and (d) which have not undergone the freezing treatment or which are not intended to undergo before consumption a treatment that kills viable parasites that present a health hazard, a food business operator must ensure that the fishery products originate from a fishing ground or fish farming which complies with the specific conditions referred to in one of those points. This provision may be met by information

in the commercial document or by any other information accompanying the fishery products.

Chapter V: Health and Safety Standards for Fisheries Products

Section D. Parasites

Food business operators must ensure that fishery products have been subjected to a visual examination for the purpose of detecting visible parasites before being placed on the market. They must not place fishery products that are obviously contaminated with parasites on the market for human consumption.

Actions undertaken

During 2018, a questionnaire was developed (Appendix 1). This was designed to capture key information, fit on one page, and allow respondents to add any further information they may wish to volunteer. It requests information on staff training, testing methods used, occurrence, source and fate of infected material, and suggestions for ways in which the NRL could provide useful support. It was accompanied by a statement on data protection and privacy (Appendix 2) indicating that the information collected would only be used in aggregate form and none of the respondents would be identified. In November 2018, this was circulated to all identified industry contacts. These included:

- Scottish Pelagic Processors Association (Membership includes all major Scottish pelagic fish processors)
- Scottish Seafood Association (Membership includes around 70 Scottish processors)
- Scottish Salmon Producers Association (Membership includes seven major Scottish salmon farming companies)
- National Federation of Fishmongers (represents about 50% of independent retailers)
- SeaFish Authority (A Defra sponsored public body which provides support and advice to all parts of the seafood industry)

Industry contacts either distributed copies of the questionnaire by email or by providing a link to where the questionnaire is hosted on the NRL website. No completed questionnaires were received in 2018, so a reminder was sent out in early February 2019. The reminder re-iterated that any responses would be treated in confidence. It also suggested that if any respondents did not wish to answer all of the questions they should answer only those that they are comfortable with, and that if

it would be more convenient a brief telephone interview could be arranged instead. This prompted the return of five questionnaires. Responses are summarised anonymously Table 2.

Table 2: Summary of questionnaire responses (n=5)

Country where processor is located	Scotland (4), England (1)
Fish species	All whitefish (1), Cod (2), Coley (2), Haddock (2), Hake (3), Ling (1), Mackerel (1), Megrim (1), Monkfish (2), Plaice (1), Pollock (2), Salmon (1)
Are any products consumed raw or cold smoked	No (4), Yes (1; Cod, Coley and Haddock).
Staff awareness	All respondents indicated that their staff are fully aware of health risks associated with parasitic worms.
Staff training	All respondents indicated that their staff are fully trained in recognising/identifying parasitic worms.
Detection methods employed	Light table/candling (4), visual checks (1)
Treatment of infected fish	In most cases (4) the worms may be removed or the fish rejected/disposed of/used for fishmeal depending on the level of infection. One respondent indicated that all infected material was disposed of.
Which species are affected?	All whitefish (1), Cod (2), Haddock (1), Hake (1), Monkfish (2), Megrim (1)
Which species are affected worst?	All whitefish (1), Cod (2), Hake (1), Monkfish (1)
Is the occurrence of infection increasing?	Increasing (3), no change (1), depends on fish origin (1)
Is there increasing demand for raw or smoked products?	No (3), Not applicable (2)
Do you receive advice on best practice from any overarching organisation? If not, would you find this useful?	None of the respondents indicated that they received this type of advice. Three indicated that this would be useful.
Were you previously aware of the NRL?	No (4), Yes (1)
How could the industry be assisted?	Training and guidance for processors, education of the fishing sector, investigations into limiting the disposal of fish guts to the sea or treating them before disposal.

It is reassuring that all respondents and their staff were fully aware and trained to recognise parasitic worms in fish, and that specific checks for parasitic worms are undertaken at all the respondents' businesses. The use of candling/light tables is generally more effective than visual examination, but not as effective as the destructive methods which would be used in any formal testing (digestion or UV press). When infections are present, worms may be removed or the batch may be rejected, depending on the severity of the infection. The worst affected species tend to be cod, hake or

monkfish, although all whitefish species may carry infections. Three of the five respondents believed that the incidence of infection is increasing, although none indicated that demand for smoked products or fish for raw consumption was increasing. Only one of the five respondents was previously aware of the NRL, and three suggested they may benefit from any advice the NRL has to offer. In terms of assistance to the industry, two respondents indicated that preventing the disposal of untreated fish guts onto fishing grounds requires consideration, and one suggested that some training/guidance for processors may be beneficial.

It must be noted that there were only five respondents whereas there are hundreds of processing establishments in the UK. There may be a bias in that those who replied were those who adopt a more robust approach to dealing with the issue. It is considered unlikely that further responses will be received. An initial distribution and a reminder have already been circulated. Further reminders could be undertaken but may not result in additional responses. Further discussions will be held with FSA to decide whether an alternative investigative route should be pursued.

There is little published information commercial practices regarding the detection and handling of fish parasites within the fish processing industry. The Food Standards Agency Scotland (FSAS) commissioned a study in 2005 in which a similar questionnaire to the one reported here was sent to processors in Aberdeenshire (Petrie et al, 2007). Of the 99 questionnaires sent out, only 19 were returned by processors. Of these, two processors only handled fish that had already been filleted. The remaining 17 were aware of the potential presence of nematodes in flesh and all but two examined fish for nematodes during processing. However, only one processor indicated that they used a candling table for nematode detection and suggested that it was of limited use for monkfish due to the thickness of the skin and the fillets. One other processor noted that although candling had been previously used, it been abandoned as it was 'not cost effective'. The remaining processors used only visual inspection for nematode detection. This study had more respondents but was undertaken over a decade ago. It confirmed that most processors did examine material for nematodes, but within this sample visual examination was the predominant method used rather than light tables/candling.

Milligan (2008) described the practices of one company importing cod from Iceland to Scotland for supply to a supermarket that had a 'zero tolerance' policy for parasitic worms. Each fillet was examined twice on candling tables in Iceland before export where any nematodes observed are removed by hand. On arrival in Scotland they were again examined on a candling table before and

after being cut into portions. During the winter about 15 nematodes were removed from the ~400Kg of cod processed daily, with 'much higher' numbers removed during the summer.

10. Literature review, calendar year 2018

In order to maintain awareness of any new developments in this field, formal but brief annual reviews of the peer-reviewed literature will now be undertaken. The search term 'anisakis' was entered into the Scopus search engine and all search results were extracted (including title and abstract) into a spreadsheet. The retrieved references were then briefly reviewed and categorised into the following categories:

- Presence of anisakis in European fish stocks and fishery products.
- European reports of illness due to anisakis.
- Detection methods (for parasites within fishery products).
- Any other papers of potential interest to the NRL.

Papers which were tagged as falling under one of these headings were reviewed in more detail, retrieving the full text as necessary and where possible. A synthesis of the findings of these various studies was then made. A total of 104 papers were retrieved by the search, of which 46 were deemed of relevance to the NRL. In 2018, a special edition of Fisheries Research (vol 202) was published which contained a selection of papers on various aspects of 'The fish nematode problem in major European fish stocks' deriving from a conference held at the conclusion of the EU FP7 PARASITE project. This included much material of direct relevance (14 papers). The most relevant papers for each heading are listed in Tables 3-6.

Presence of Anisakis in European fish stocks and fishery products

Table 3: Reported presence of anisakis in European stocks and fishery products

Species/ product	Area	Summary of findings	Reference
Anglerfish *(Lophius budegassa, Lophius piscatorius),* Hake *(Merluccius merluccius),* Red mullets *(Mullus*	Western Mediterranean	Nematode larvae found at a prevalence of 53% (mainly *Anisakis pegreffii*). Prevalence highest in *M. surmuletus*. Prevalence positively correlated with weight, length, condition factor, maturity and depth of fishing ground.	Barcala et al, 2018.

barbatus, Mullus surmuletus)			
Amberjacks *(Seriola dumerelii, Seriola rivoliana)*	Madeira	*Anisakis* sp. detected in *S. rivoliana*	Cavaleiro et al, 2018
Blue whiting *(Micromesistius poutassou)*	Western Mediterranean	Anisakis spp found at prevalence of 29% and mean intensity of 1.8. Prevalence higher in spring than autumn.	Molina_Fernandez at al., 2018
Fresh and canned cod (*Gadus morhua*) liver	Iceland and Greenland	High prevalence and abundance of the potentially zoonotic nematode species *Anisakis simplex* and *Pseudoterranova decipiens* were found in the fresh livers. Lower infection levels in canned livers. However, two heat stable allergens were verified from isolated nematode larvae from canned products.	Klapper et al, 2018
Farmed bass (*Dicentrarchus labrax*)	Fish markets in Southern Italy	Only two nematodes *(A. pegreffi*) found in one fish (of Greek origin) out of the 151 which were examined.	Cammilleri et al, 2018
Hake *(Merluccius merluccius)*	Mediterranean	Very high levels of *A pegreffi* in hake from Adriatic and Ionian Seas. Most were in viscera and liver.	Cipriani et al, 2018
Mackerel (*Scombrus scombrus*)	North East Atlantic and Mediterranean	Anisakids present throughout the range of this species. Highest prevalence off NW Spain and Portugal (87%). *A. simplex* dominates in Atlantic Waters and the North Sea, *A. pegreffi* dominates in the Mediterranean.	Levsen et al, 2018
Anchovy (*Engraulis encrasicolus*)	Mediterranean	Fish from the Central and South Adriatic Sea showed the highest levels of *A. pegreffi* infection, whereas anchovies from Southern Sicily, Ionian and Alboran Seas, were uninfected. The vast majority (95%) were in the body cavity rather than the flesh	Cipriani et al, 2018
Haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*)	North Sea, West of Scotland, Barents Sea	*A. simplex* was found in all stocks at a prevalence ranging from 0.43 to 1. Burdens were heaviest in Haddock from the Barents Sea.	Pierce et al, 2018
Cod (*Gadus morhua*)	Barents Sea, Baltic, North Sea	Prevalence of *Anisakis* in whole fish and in fillets in the different fishing areas varied from 16 to 100% and from 12 to 90% respectively. Within fillets nematodes were mainly in the ventral part.	Gay et al, 2018
Anchovy (*Engraulis encrasicolus*)	North East Atlantic	Overall mean prevalence for Anisakis and Hysterothylacium combined of 64% (15% in the flesh).	Rodriguez et al, 2018
Mackerel (*Scombrus scombrus, Scomber colias*), Herring (*Clupea harengus*), Sardine (*Sardinia pilchardus*), Anchovy (*Engraulis*	North East Atlantic and Mediterranean	*A. simplex* dominates in the Atlantic*, A pegreffi* dominates in the Mediterranean, with overlap in the Western Mediterranean and Bay of Biscay. Very high risk products were large hake from the Grand Sole Bank, untrimmed cod	Levsen et al, 2018

encrasicolus), Cod (*Gadus morhua*), Hake *(Merluccius merluccius)* and several others		fillets from the North and Barents Seas and whole ungutted anchovy from the Atlantic coast of Spain.	
Garfish (*Belone belone*)	Baltic Sea	*A. simplex* prevalence was 63%	Unger et al, 2018
Semi-preserved anchovy (*Engraulis encrasicolus*) products	Italian markets	This study showed that semi-preserved anchovy products heavily contaminated with (dead) *Anisakis* spp. larvae reach the market.	Guardone et al, 2018
European smelt (*Osmerus eperlanus*)	Baltic Sea	Anisakis simplex occurred in the intestine with a prevalence of 31%, 72% and 22% in consecutive years of the study.	Dziekońska-Rynko et al, 2018
European pilchard (*Sardina pilchardus*)	Mediterranean	Overall prevalence of *A. pegreffi* in pilchards was 12.2% (range 0–44.9% for different sampling points). Larger fish were more heavily infested.	Bušelić et al, 2018
John Dory (*Zeus faber*)	Ovaries sold in a Sicilian market	Massive infestations observed in some fresh ovaries.	Giarratana et al, 2018

These articles indicate the continuing presence of parasitic nematodes in a variety of fish species and fishery products. There were no reports of live worms in ready to eat products. There was one report of parasitic nematodes in farmed sea bass from Greece, albeit at a very low prevalence.

Reports of illness in Europe

Table 4: Studies reporting illness associated with parasitic nematodes in Europe

Area	Study description	Summary of findings	Reference
Global	Review of Anisakis sensitisation studies.	General asymptomatic population were sensitized to Anisakis in 0.4 to 27.4% of cases. Results highlighted that hypersensitivity prevalence estimates varied widely according to geographical area, characteristics of the population studied, diagnostic criteria and laboratory assays.	Mazzucco et al., 2018.
Italy	Review of Italian hospital discharge records, 2005-2015.	370 cases were identified. Around 40% of these presented allergic manifestations and half of them showed serious allergic reactions. Associations were found between allergic manifestations and living in southern regions and female gender, while anaphylactic episodes were associated only with female gender.	Cavallero et al, 2018
Europe	Review of epidemiology and management of foodborne nematodiasis in the EU, 2000-2016	1523 cases were identified, of which 236 were Anisakis spp. Most cases were reported in Spain (158) and Italy (67). Did not indicate how many occurred in the UK.	Serrano-Moliner et al., 2018
Italy	Case report	Infection identified in 50 year-old man by endoscopy, associated with consumption of uncooked anchovies.	Zullo et al., 2018
Spain	Occupational disease due to Anisakis simplex in fish handlers	Reports three cases of sensitisation to anisakis through occupational exposures (a fishmonger, a supermarket worker and a chef)	Uña-Gorospe et al., 2018
Italy	Investigated the origins of 74 cases of Anisakis infection	In most of the patients (65.7%), the source of infection was raw or undercooked anchovies, followed by "anchovies or sardines" (15.1%), generic "raw seafood" (15.1%), and sardines (1.4%). In only 2 cases the source was not available.	Guardone et al, 2018
France	Survey of anisakidosis, 2010-2014	A total of 37 cases of anisakidosis were notified by all French laboratories: 7 proven cases with evidence of a worm, 12 possible cases with abdominal pain after consumption of raw fish with detection of anti-Anisakis precipitins, and 18 allergic cases. Compared with previous surveys in France, this study indicates a decrease in clinical cases of anisakidosis and illustrates the emerging allergic potential of anisakids.	Yera et al., 2018

There continue to be reports of both infections and allergic reactions in Europe. Italy and Spain report the most cases.

Detection methods

Table 5: Studies on methods for detection of nematodes in fish products

Description of study	Reference
Describes an RT-PCR procedure for the identification of *Anisakis* spp., *Pseudoterranova* spp. and *Hysterothylacium aduncum* larvae in fish, even in co-infections	Paoletti et al., 2018
Compared a risk ranking system with visual examination and UV press/peptic digestion methods. The authors suggested that the risk ranking system, which is based on historic data on nematodes in different species and fishing grounds, should be applied by fish processors.	Rodriguez et al., 2018
Compared UV press and digestion methods. In a ring trial with experienced laboratories the UVP method showed higher (90%) level of agreement with the number of spiked L3 than the number of L3 detected by the AD method (83.3%). A second trial with industry participants using UV press found correctly identified the number of larvae in 75.6% of the samples	Gomez-Morales et al., 2018
Reviewed methods for detecting parasitic nematodes in fishery products. Full text not available	Kochanowski et al., 2018
Presented a method to assess viability of larvae using infra-red imaging as a more accurate alternative to simple assessment of motility.	Kroeger et al., 2018

Other studies of potential relevance

Table 6: Other peer reviewed studies of potential interest

Description of study	Reference
Examined consumers attitiudes to nematode infections in Spain. The results suggest that the presence of Anisakis in fish is an important health and aesthetic issue for consumers, and this is relevant for the fishing and food industries as well as for food safety authorities.	Boa et el., 2018
Describes a device (TEDEPAD) for inactivating nematodes in fish viscera before they are discarded at sea by fishing vessels. Suggests that use of this device would reduce infection on fishing grounds, although this was not actually demonstrated.	Gonzalez et al., 2018

11. Planned activities for 2019-2020

The following activities are planned for the forthcoming year:

- Further evaluation of processing industry practices, primarily through Environmental Health Officers responsible for assessing and approving
- Provision of advice and responding to enquiries as required.
- Undertake proficiency testing if this is still available to the UK through the EURL

- If the EURL can no longer offer proficiency testing develop other means to maintain competence and capacity will be investigated and adopted as appropriate.
- Liaison with Norwegian authorities on their approach to monitoring and control of nematode parasites in fish products.
- A review of peer reviewed literature published during 2019.

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Appendix 1: Industry questionnaire

All information received is done so in complete confidentiality *Please see revised Data Protection Act 2018 privacy notice provided*	
Company Information	
Name:	
Company name:	
Address:	
Email:	
Product Information	
What fish species do you process:	
Of these species are any processed for consumption raw or cold smoked:	

Procedural Information	
How aware are your processing staff of the risk posed to human health by the parasitic worms sometimes found in fish?	
Are your processing staff specifically trained/familiar with recognising worms in fish?	
Do you have routine procedures in place to examine fish for worms? If so, what methods of examination and equipment do you use?	
What happens to infected fish (e.g. excision of worms, disposal/rejection of heavily infected fish, exclusion from specific use etc.)?	
In what species do you find worms present?	
In what fish species do you see the most worms?	
From your experience, do you think the occurrence of worms is increasing, decreasing, or roughly the same?	

Have you seen an increase in the demand for raw or smoked products? If so, by roughly how much?	
Do you receive advice on best practice from any overarching organisation? If not, would you find this useful?	
Were you aware of the UK National Reference Laboratory (NRL) for Anisakis before receiving this awareness questionnaire?	
Is there anything you would like to see done for the industry to assist with worms in fish (training, support etc.)?	
Thank you for your time. Please return this awareness questionnaire to anisakis.nrl@cefas.co.uk If you require additional information please contact Tom Hill on 01305 206758 (until 14th December 2018), and/or Ian Tew on 01305 206765.	

Appendix 2: Industry questionnaire privacy statement

Revised Data Protection Act 2018 – Privacy Notice

The purpose of this Notice is to inform you of the use that will be made of your personal data, as required by the General Data Protection Regulation (GDPR) and revised Data Protection Act 2018.

Cefas is an Executive Agency of the Department for Environment, Food and Rural Affairs (Defra), we are committed to complying with the requirements of the revised Data Protection Act 2018 that govern the processing of personal data.

In accordance with the revised Data Protection Act 2018, any personal information provided will be stored securely, with restricted access to authorised Cefas staff only and will not be disclosed to any other person unlawfully.

As part of the *Anisakis National Reference Laboratory (NRL)* remit, we will be collecting some of your information – comprising your name, and the company/organisation you are representing in your questionnaire response. Your responses will be used to provide an anonymised summary of the procedures and practices currently being employed by the seafood processing sector. This summary will be provided to the Food Standard Agency and published on the NRL website.

Your name and the name of the company/organisation you are representing will only be used should we require to contact you to clarify any of your responses, and to send you a report on the findings of the study once it is concluded.

Your personal data will be kept by us until the end of March 2024. However, you have the right to withdraw consent to us holding your information. If you wish to do this contact: Tom Hill or Ian Tew, Cefas Weymouth Laboratory, Email: tom.hill@cefas.co.uk; Phone +44(0)1305 206758 or ian.tew@cefas.co.uk; Phone +44(0)1305 206765.

A list of your rights under GDPR/Data Protection Act 2018 is accessible at:
https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/individual-rights/

Printed copies are available from the Cefas Data Protection Coordinator, Cefas Laboratory, Pakefield Road, Lowestoft, Suffolk, NR33 0HT. Telephone 01502 524380.