Prevalence, abundance and species diversity of anisakid nematode larvae in Atlantic cod are correlated with geographic area and fish size

Mélanie GAY; Santiago PASCUAL; Kurt BUCHMANN; Simonetta MATTIUCCI; Odile BOURGEAU; Clémence COUVREUR; Lee C. HASTIE; Miguel BAO DOMINGUEZ; Ken MACKENZIE; Arne LEVSEN; Graham J. PIERCE

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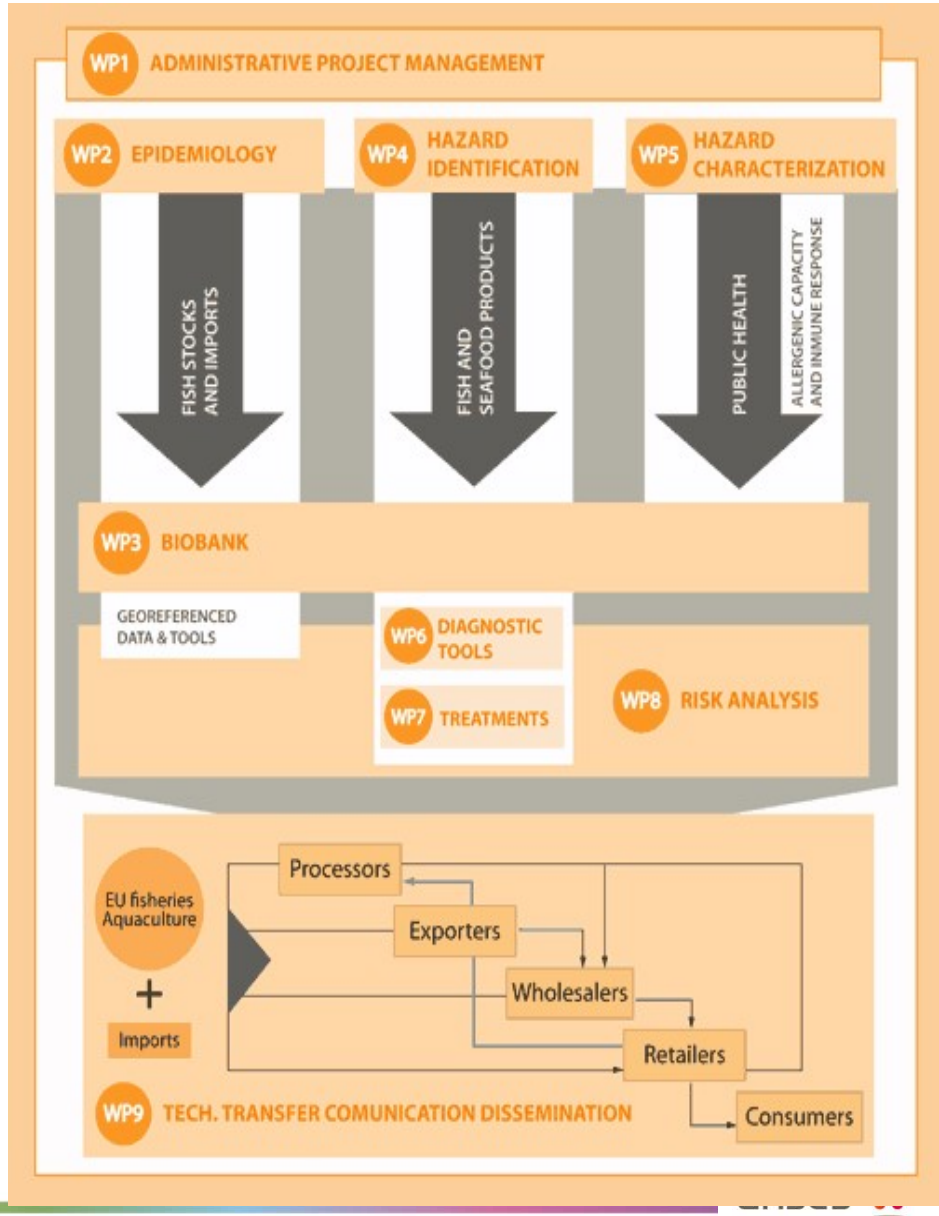
The PARASITE program

- Coordinateur : CSIC – IIM (Vigo, Spain)
- From Feb 2013 to Jan 2016
- 21 partners (15 RTDs; 6 SMEs)
- 13 countries (10 EU + 3 Asian Countries)
- Different backgrounds
- Aim: providing insight, upgraded know-how and new technologies in order to mitigate the impact, to industry and consumers, of zoonotic parasites present in fishery products in the European market.



Cod epidemiological study

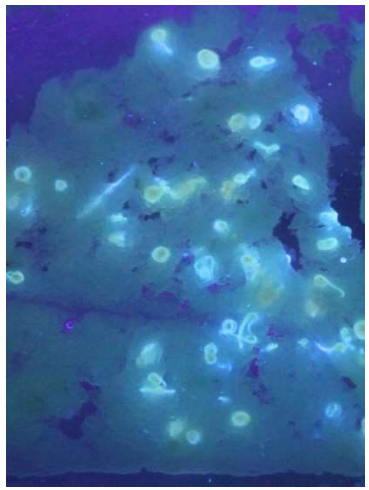
Barents Sea (I)
146 (46) fish

Northern North Sea (IVa)
130 fish

Central North Sea (IVb)
93 fish

Baltic Sea (III)
386 (188) fish

- 755 fish
- Biometric data
- Parasite detection by UV-press method
- Accurate localisation of parasites in filets
- Molecular identification of subsamples



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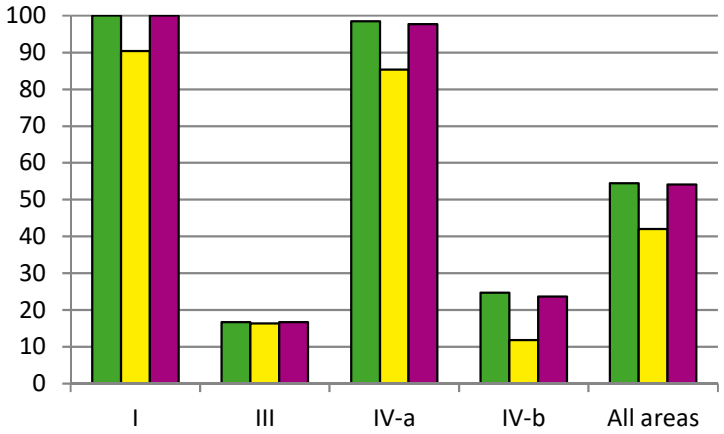
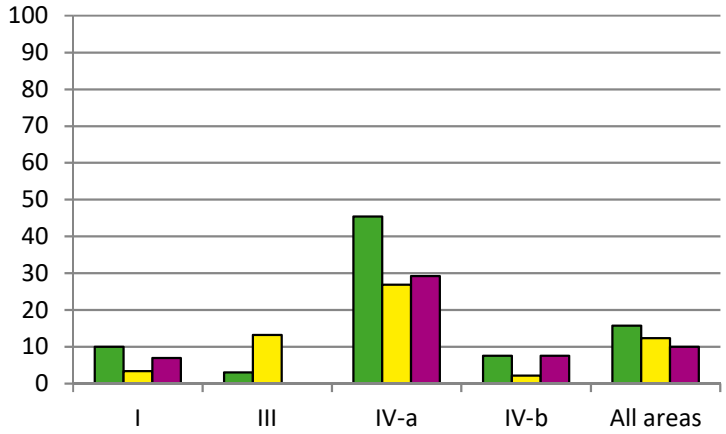
Ascaridoid prevalences

- Majority of fish co-infected by at least 2 genera (269 / 295)

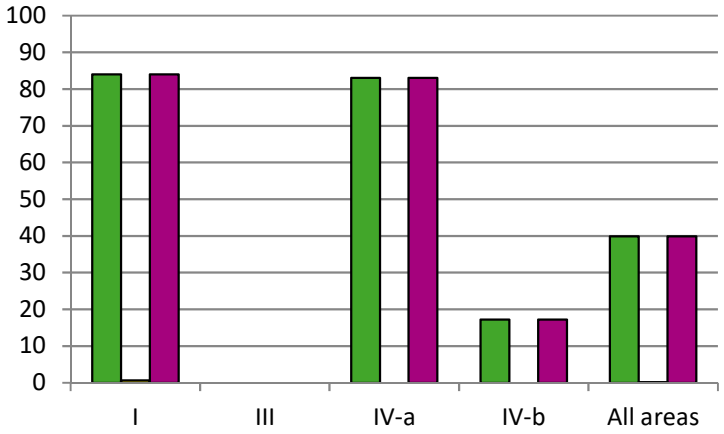


Anisakis

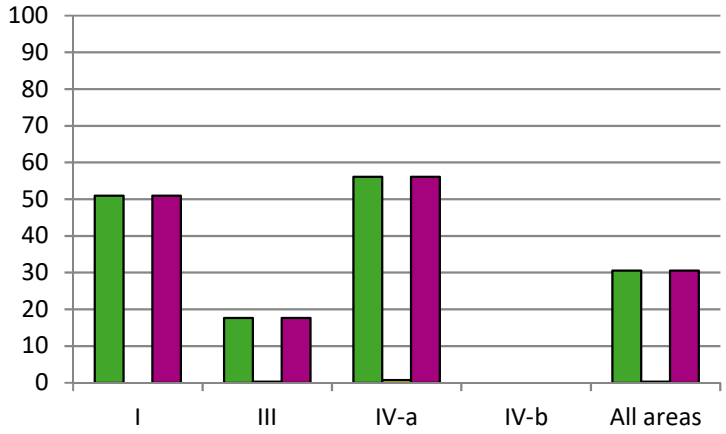


Pseudoterranova

Whole fish Fillets Viscera



Hysterothylacium



Contracaecum

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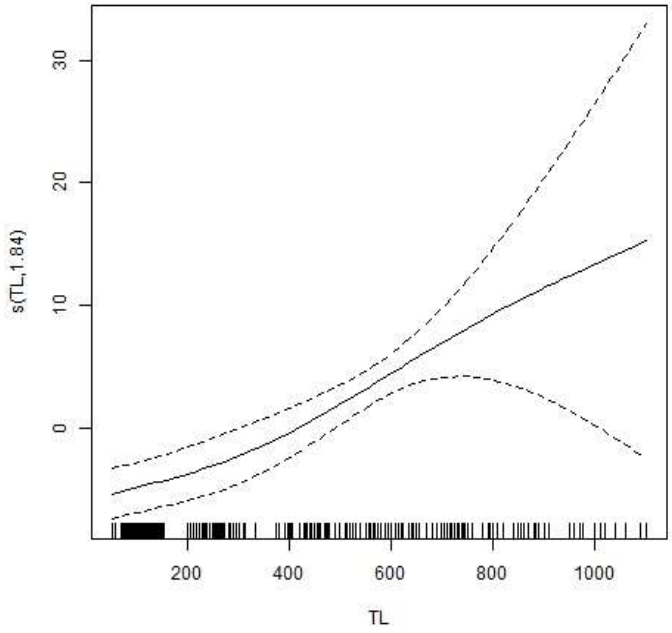
GAM analyses for *Anisakis* distribution modelling

- Variables:
  - Presence
  - Abundance
  - In fish or in fillets
- Factors analysed:
  - Fishing area
  - Season
  - Length of fish
  - Weigth of fish
- Sex excluded as often missing and non significant

Presence in fish

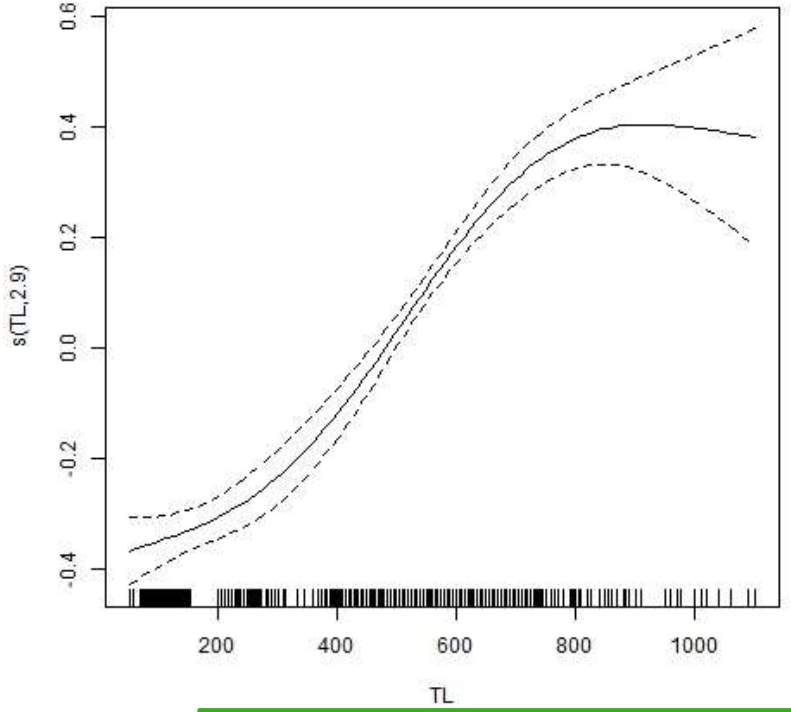
- Barents Sea excluded as 100% prevalence (413 fish)
- Total length or log(weight) and yearday significantly influence
- 80,1 or 81,1 % of deviance explained by these factors

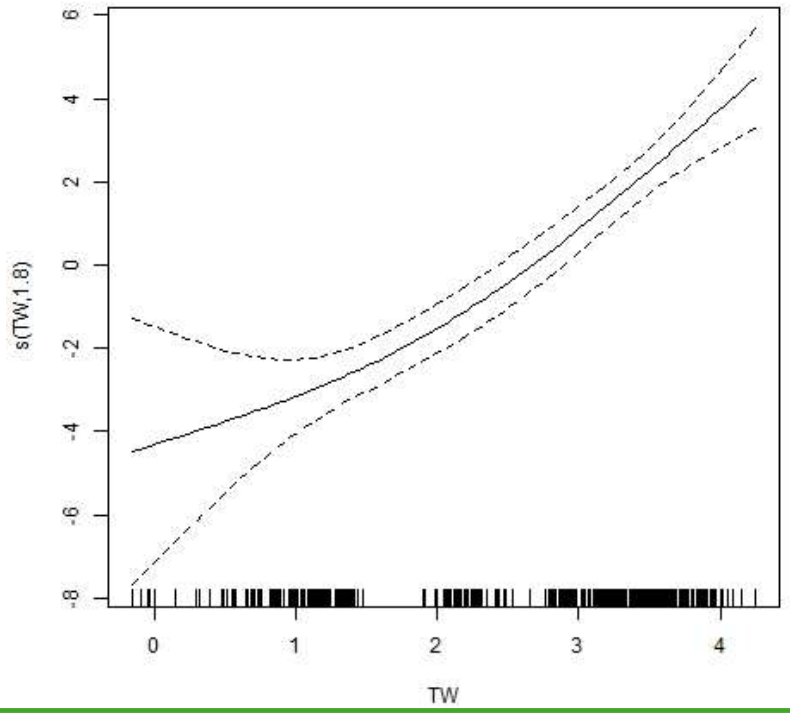


However, model better suited for smaller to medium size fish

Presence in muscle

- Includes eviscerated fish (total 747)
- Fishing area, total length or log(weight), yearday significantly influence
- 57,1 or 63,6 % of deviance explained by these factors

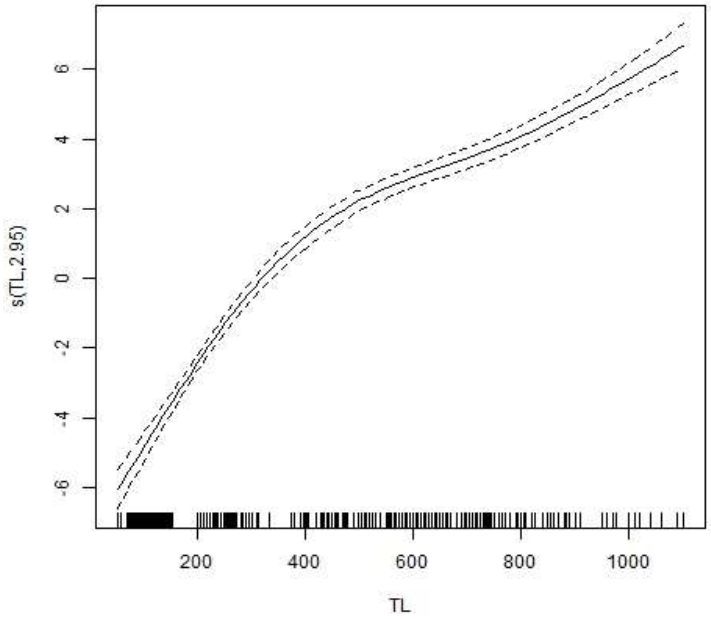




TL model better suited for smaller to medium size fish and log(weight) for bigger fish

Numbers of *Anisakis* in fish

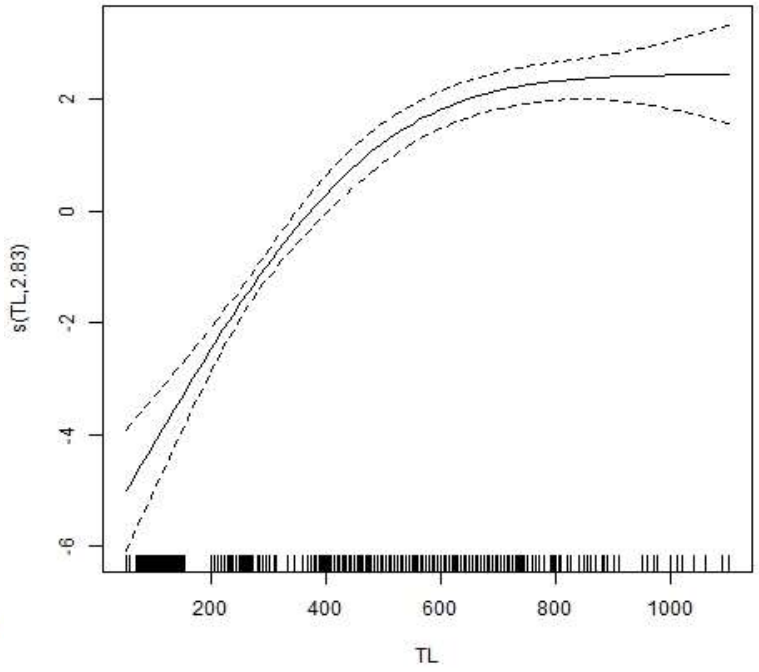
- Total 512
- Fishing area, total length or residual weight, yearday significantly influence
- Numbers higher in III than in I (opposite to prevalence trend)
- 85,6 % of deviance explained by these factors



Anisakis numbers increase with fish length
But non-linear fit

Numbers of *Anisakis* in muscle

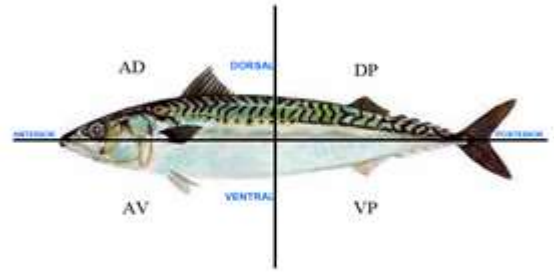
- Total 747
- Fishing area, total length, yearday significantly influence
- I > III but I and IV not significantly different
- 55,9 % of deviance explained by these factors
- 84,6 % of deviance explained with weight instead of length and residual weight

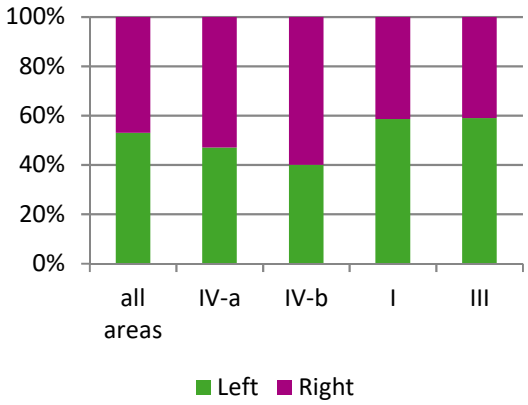


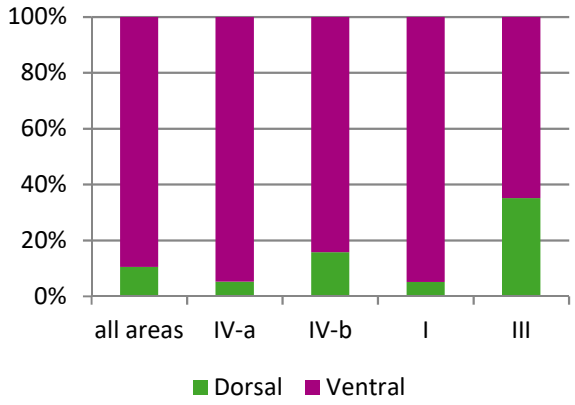
Anisakis numbers in muscle increase with fish length
But non-linear fit

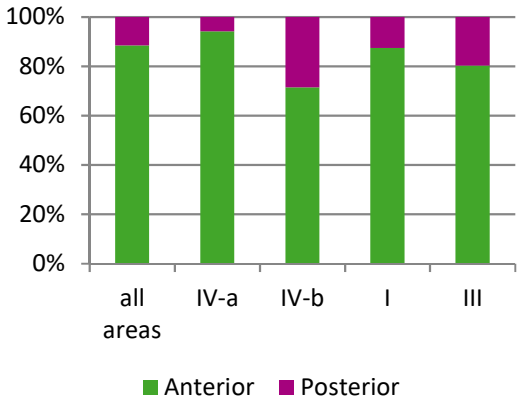
Localisation in muscle

- Number of *Anisakis* in the different muscle parts









No important difference between right and left
Strong differences between anterior and posterior and between ventral and dorsal

Molecular identification of Ascaridoid

- In the Baltic Sea
  - 148 worms analysed
  - 7 *A. simplex* s.s.
  - 37 *P. decipiens*
  - 103 *C. osculatum*
  - 1 *H. aduncum*
- In the Northern North Sea
  - 663 parasites from the fillets and 1 390 from the viscera analysed
  - 1 910 *A. simplex* s.s. from the whole fillets, the liver, the gonads and the visceral cavity
  - 3 *A. pegreffii* from the fillets
  - 16 *P. decipiens* from the whole fillets, the stomach and the liver
  - 72 *P. krabbei* from the whole fillets, the visceral cavity, the intestine and the liver
  - 42 *H. aduncum* were identified from the stomach, the intestine bowel and the visceral cavity
  - 10 *C. osculatum* from the liver

Conclusions

- Heterogeneity between fishing area in terms of presence, abundance and genera diversity
- Strong influence of length and/or weight on *Anisakis* presence and abundance both in whole fish and in fillets
- Models generally well fitted with between 55 and 86 % of deviance explained by selected factors
- Seafood safety considerations:
  - Vast majority of parasites located in belly flaps
  - Good concordance between presence in viscera and in fillets

→ Possible risk reduction with checking and trimming


Thank you for your attention
Thanks to the PARASITE partners!
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SEVENTH FRAMEWORK PROGRAMME