

Sealworm Nematode (Krabbe, 1878) Gibson, 1983 (Nematoda: Rhabditida: Anisakidae)¹

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

Anisakid nematodes are parasites of animal intestines and cause the disease anisakiasis in humans, usually involving only mild symptoms of abdominal pain, malnutrition, and vomiting. However, the larval form of these nematodes does not persist in humans, and infections usually resolve by themselves. Human infection from anisakid nematodes comes inadvertently through consumption of raw fish, as the causal agent, *Pseudoterranova decipiens*, infects marine life and generally takes up residence in the stomach of gray seals (*Halichoerus grypus*) or other large seals. However, the host distribution of *Pseudoterranova decipiens* is extraordinarily broad and many other marine animals can serve as hosts (e.g., crustaceans, other large invertebrates, and many fish species). *Pseudoterranova decipiens* is considered a species complex containing other named species with very similar characteristics (Marcogliese 2001; CDC 2019).

Synonymy

Reported synonyms for *Pseudoterranova decipiens* (Krabbe, 1878) Gibson, 1983 are *Ascaris decipiens* (Krabbe, 1878); *Phocanema decipiens* (Krabbe, 1878) Myers, 1959;

Porrocaecum decipiens (Krabbe, 1878) Baylis, 1920; and *Teranovna decipiens* (Krabbe, 1878) Mozgovoi, 1953 (Bezerra et al 2020).

Distribution

Pseudoterranova decipiens and related nematodes are widely distributed, occurring nearly anywhere where adequate populations of host marine animals can be found, such as cold-water coastal regions. This includes the eastern coast of Canada, the northeastern United States, Iceland, Greenland, Philippines, Japan, Northern European shores, and parts of South America (Mercado et al. 2001, McClelland 2002, Hernandez-Orts et al. 2013, Skrzypczak et al. 2014, Al Quraishy et al. 2019).

Description

Pseudoterranova decipiens is a relatively small nematode (10 to 12mm (~ $\frac{3}{8}$ to $\frac{1}{2}$ in)) with a prominently needle-shaped, piercing stylet; three lips are visible (Figure 1). The intestinal cecum (the pouch that connects small and large intestines) is visible and assists with diagnosis under light microscopy (Figure 2). In cross-section, *Pseudoterranova decipiens* displays a prominent shaped set of hypodermal chords (Figure 3). Laboratory and medical diagnosis of infection is done via gastroscopic examination in which worms are removed from the patient for identification. Also, worms that may be coughed up by the patient can be preserved for diagnostic examination (CDC 2019).

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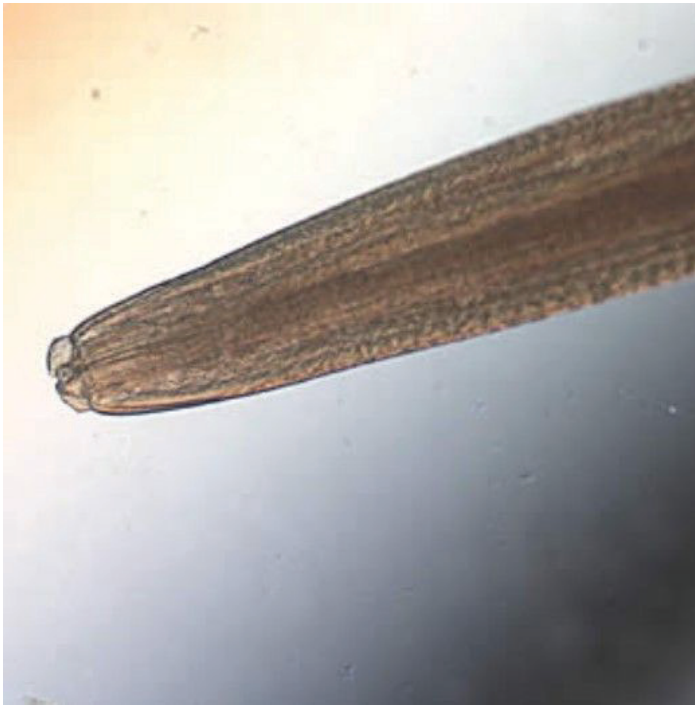


Figure 1. The piercing stylet of *Pseudoterranova decipiens* showing prominent lips.
Credits: Centers for Disease Control and Prevention, <https://www.cdc.gov/dpdx/anisakiasis/index.html>

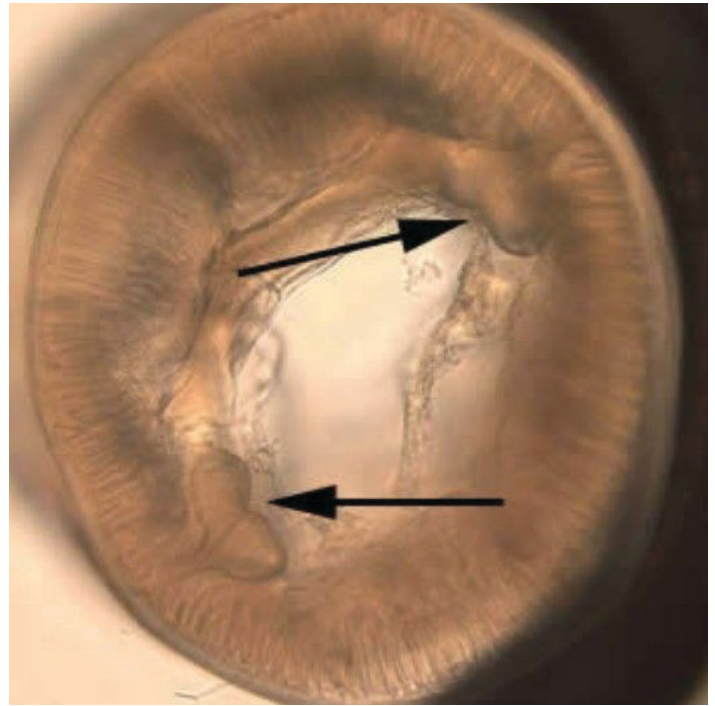


Figure 3. The prominent butterfly-shaped set of chords noticeable in cross-section of *Pseudoterranova decipiens*.
Credits: Centers for Disease Control and Prevention, <https://www.cdc.gov/dpdx/anisakiasis/index.html>

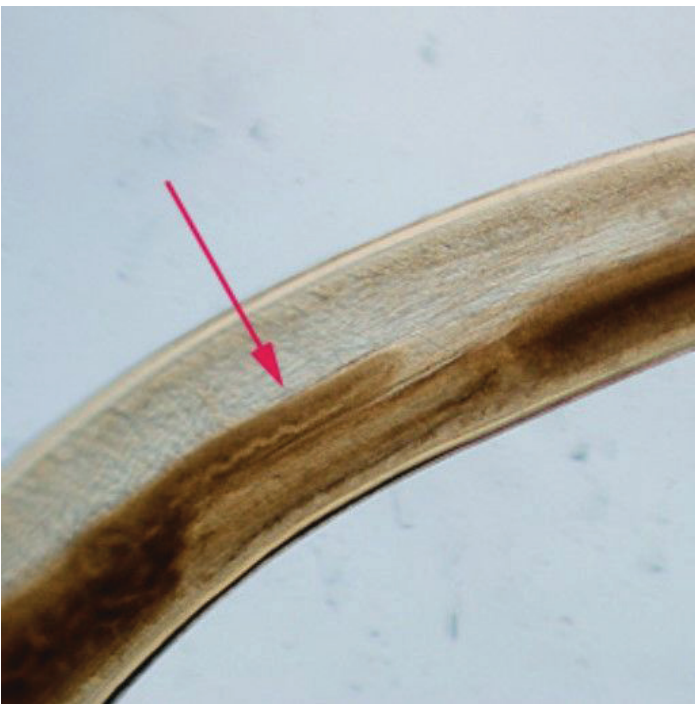


Figure 2. The intestinal cecum (the pouch that connects small and large intestines) of *Pseudoterranova decipiens*.
Credits: Centers for Disease Control and Prevention, <https://www.cdc.gov/dpdx/anisakiasis/index.html>

Life Cycle and Biology

Pseudoterranova decipiens are gonochoristic (distinct male and female individuals), with both sexes present in the host gut (Levsen et al. 2008). Eggs produced within the host are voided through excreta into the water. The first-stage and second-stage larva (L_1 and L_2) may form in the eggs and then embryonate (develop into an embryo) to form free-swimming third-stage larvae (L_3); alternatively, eggs may be ingested by small crustaceans such as amphipods and mysids, which are then eaten by small fish where the larvae develop (McClelland 2002). Prey fish then consume L_3 larvae or the small intermediate host fish through predation, and these larvae then migrate within the fish to muscle tissues where they will pass to other prey fish species of larger size until they finally reach the gut of their definitive mammal host where final molts occur in the gut prior to reproduction. However, should infected fish be caught and served to humans, L_3 larvae can cause demonstrable harm in the accidental host (CDC 2019). Note the transfer to the accidental host through ingestion of raw or undercooked fish, notably cod and other common sushi/sashimi fishes, highlighting the importance of appropriate management strategies (Figure 4).

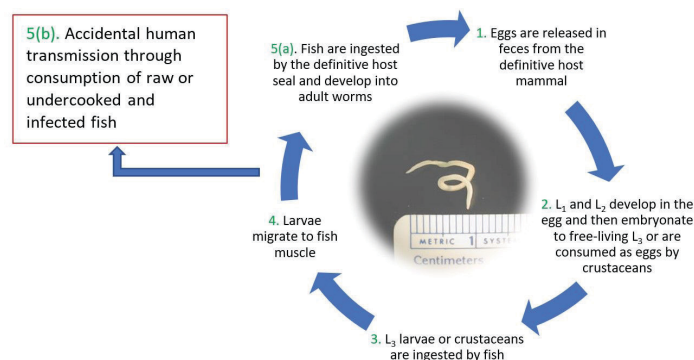


Figure 4. The general life cycle of the sealworm nematode (*Pseudoterranova decipiens*), with embedded photograph of the nematode. Immature larval stages are shown as larval stages 1-3 (L₁-L₃).

Credits: Centers for Disease Control and Prevention, <https://www.cdc.gov/dpdx/anisakiasis/index.html>

Hosts

Pseudoterranova decipiens generally takes up residence in the stomach of gray seals or other large marine pinnipeds (e.g., common seals, *Phoca vitulina*), as the preferred definitive host. However, there are several known intermediate and paratenic hosts (hosts that provide a home until a preferred host is found), including over 40 invertebrate species, and over 60 species of fish (Marcogliese 2001).

Medical Importance

Parasitic infection with members of the Anisakidae (including *Pseudoterranova decipiens* and related species) is termed anisakiasis, though this can refer to infection from any member of the family. Regardless of the classification of the disease, the symptoms are quite similar. Because the nematode is ingested, and it is naturally a gut parasite, most described symptoms are gastrointestinal, and most cases are mild and self-limiting. This pain has been described as “prickling epigastric pain” with rapid onset within two days of consuming raw fish (Yu et al. 2001). However, some clinical reports describe a variety of symptoms if the nematode migrates out of the gut, including coughing, pruritis (itching) of the nose and anus, and pharyngeal (throat) pain (Mercado et al. 2001). Additionally, there is a reported case of a male patient with suspected hepatic metastatic disease (liver cancer) who was, upon laparoscopic examination, found to have anisakiasis, resulting in a 20 mm ($\frac{3}{4}$ in) liver mass (Murata et al. 2018). Finally, *Pseudoterranova decipiens* proteins can cause a severe and medically dangerous allergic response in mice and is suspected to cause similar problems in humans with repeated exposure to this parasite (Ludovisi et al. 2017).

Economic Importance

Because *Pseudoterranova decipiens* is found in common fishes eaten by humans, there is the possibility of infestations causing a heavy economic toll. In fact, though recent estimates are not available, the annual cost to fish processors was estimated in 1986 as \$26.6 million annually (Malouf 1986) and as \$50 million annually in 1991 (Aryee and Poehlman 1991). These estimates are exclusive of the potential economic costs of healthcare to patients accidentally infected by these parasites and are generally attributed to the costs associated with handling, screening, inspecting, and removing nematode parasites from fish.

Management

As with any sound management strategy, simple solutions pay large dividends. Management through detection and removal is costly. However, though the sight of worms may be unpalatable, *Pseudoterranova decipiens* can be rendered harmless to human by either freezing fish meat before using it for sushi/sashimi preparations, or by cooking the flesh of the fish prior to consumption, as either temperature extreme kills the parasite (Goater et al. 2014). Medical management remains costly for those infected, as gastroscopic examinations can be expensive, removal of nematodes notwithstanding. Management of this species is likely to continue to be a priority for fisheries, as a recent meta-analysis suggests that populations of this nematode complex have increased 283-fold over 37 years (Fiorenza 2020). This could be the result of changes in host populations as well as long-term climate change.

Selected References

- Al Quraishy S, Abdel-Gaber R, Dkhil MAM. (2019). First record of *Pseudoterranova decipiens* (Nematoda, Anisakida) infecting the Red spot emperor *Lethrinus lentjan* in the Red Sea. *Brazilian Journal of Veterinary Parasitology* 28: 625-631. <https://doi.org/10.1590/s1984-29612019057>
- Aryee EB, Poehlman WFS. (1991). A neural-network-based system to recognize parasites/sealworms on cod fish images. *Engineering Applications of Artificial Intelligence* 4: 341-350. [https://doi.org/10.1016/0952-1976\(91\)90002-N](https://doi.org/10.1016/0952-1976(91)90002-N)

Bezerra TN, Decraemer W, Eisendle-Flöckner U, Hodda M, Holovachov O, Leduc D, Miljutin D, Mokievsky V, Peña Santiago R, Sharma J, Smol N, Tchesunov A, Venekey V, Zhao Z, Vanreusel A. (2020). Nemys: World Database of Nematodes. *Pseudoterranova decipiens* (Krabbe, 1878) Gibson, 1983. Accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=123078> on 19 March 2020.

Centers for Disease Control and Prevention [CDC]. (2019) Anisakiasis. Accessed through: DPDx—Laboratory Identification of Parasites of Public Health Concern at <https://www.cdc.gov/dpdx/anisakiasis/index.html> on 19 March 2020.

Fiorenza EA, Wendt CA, Dobkowski KA, King TL, Pappainou M, Rabinowitz P, Samhoury JF, Wood CL. (2020). It's a wormy world: Meta-analysis reveals several decades of change in the global abundance of the parasitic nematodes *Anisakis* spp. and *Pseudoterranova* spp. in marine fishes and invertebrates. *Global Change Biology* 26: 2854-2866. <https://doi.org/10.1111/gcb.15048>

Goater TM, Goater CP, Esch GW. (2014). *Parasitism: The diversity and ecology of animal parasites*. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/CBO9781139047876>

Hernández-Orts J, Aznar FJ, Blasco-Costa I, García NA, Villora-Montero M, Crespo EA, Raga JA, Montero FE. (2013). Description, microhabitat selection and infection patterns of sealworm larvae (*Pseudoterranova decipiens* species complex, nematoda: ascaridoidea) in fishes from Patagonia, Argentina. *Parasites & Vectors* 6: 1-15. <https://doi.org/10.1186/1756-3305-6-252>

Levsen A, Lunestad BT, Berland B. (2008). Parasites in farmed fish and fishery products. In L. Oyvind, ed. *Improving Farmed Fish Quality and Safety*, pp. 428-445. Boca Raton, FL: CRC Press. <https://doi.org/10.1533/9781845694920.2.428>

Ludovisi A, Di Felice G, Carballeda-Sandiao N, Barletta B, Butteroni C, Corinti S, Marucci G, González-Muñoz M, Pozio E, Gómez-Morales MA. (2017). Allergenic activity of *Pseudoterranova decipiens* (Nematode: Anisakidae) in BALB/c mice. *Parasites & Vectors* 10: 1-8. <https://doi.org/10.1186/s13071-017-2231-4>

Malouf AH. (1986). *Report of the Royal Commission on Seals and Sealing in Canada*. Vol. 3 Pt. 5. *Biological Issues*. Ottawa, Canada.

Marcogliese DJ. (2001). Review of experimental and natural invertebrate hosts of sealworm (*Pseudoterranova decipiens*) and its distribution and abundance in macroinvertebrates in eastern Canada. *NAMMCO Scientific Publications* 3: 27-37. <https://doi.org/10.7557/3.2954>

McClelland G. (2002). The trouble with sealworms (*Pseudoterranova decipiens* species complex, Nematoda): a review. *Parasitology* 124: S183-S203. <https://doi.org/10.1017/S0031182002001658>

Mercado R, Torres P, Muñoz V, Apt W. (2001). Human infection by *Pseudoterranova decipiens* (Nematoda, Anisakidae) in Chile: Report of seven cases. *Memórias do Instituto Oswaldo Cruz* 96: 653-655. <https://doi.org/10.1590/S0074-02762001000500010>

Murata Y, Ando K, Usui M, Sugiyama H, Hayashi A, Tanemura A, Kato H, Kuriyama N, Kishiwada M, Mizuno S, Saurai H, Isaji S. (2018). A case of hepatic anisakiasis caused by *Pseudoterranova decipiens* mimicking metastatic liver cancer. *BMC Infectious Diseases* 18: 1-7. <https://doi.org/10.1186/s12879-018-3540-8>

Skrzypczak M, Rokicki J, Pawliczka I, Najda K, Dzido J. (2014). Anisakids of seals found on the southern coast of Baltic Sea. *Acta Parasitologica* 59: 165-172. <https://doi.org/10.2478/s11686-014-0226-2>

Yu J-R, Seo M, Kim Y-W, Oh M-H, Sohn W-M. (2001). A human case of gastric infection by *Pseudoterranova decipiens* larva. *The Korean Journal of Parasitology* 39: 193-196. <https://doi.org/10.3347/kjp.2001.39.2.193>