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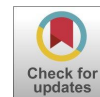
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# Identification of *Anisakis* sp. larvae in jack mackerel fish sold in the city of Cajamarca

## Identificación de larvas de *Anisakis* sp. en pescado jurel expendido en la ciudad Cajamarca

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### Abstract

The objective of the research was to identify the presence of larvae of the parasite *Anisakis* sp. in muscle of jack mackerel fish (*Trachurus symmetricus murphyi*) marketed in the city of Cajamarca - Peru. A total of 120 samples of different sizes and weights were collected from three main markets in the city of Cajamarca between May and July 2016, which were transported to the Laboratorio de Parasitología Veterinaria y Enfermedades Parasitarias de la FCV-UNC. Of the 120 samples analyzed, one larva (L<sub>3</sub>) of the nematode parasite (0.83%) was found in one sample, which according to its morphological characteristics identified by microscopy corresponded to *Anisakis* sp. Therefore, we can conclude that positivity to *Anisakis* sp larvae is relatively low in jack mackerel fish marketed in the city of Cajamarca.

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### Resumen

La investigación tuvo como objetivo identificar la presencia de larvas del parásito *Anisakis* sp. en músculo de jurel (*Trachurus symmetricus murphyi*) comercializados en la ciudad de Cajamarca - Perú. Se colectaron 120 muestras de diferentes tamaños y pesos de tres principales mercados de la ciudad de Cajamarca entre los meses de mayo y julio del año 2016, se transportaron al laboratorio de Parasitología Veterinaria y Enfermedades Parasitarias de la FCV-UNC. De las 120 muestras analizadas, en una se encontró una larva (L<sub>3</sub>) del nematodo (0.83 %), la que según sus características morfológicas identificada mediante microscopía correspondió a *Anisakis* sp. Por lo que podemos concluir que la positividad a larvas de *Anisakis* sp. fue relativamente baja en jurel comercializado en la ciudad de Cajamarca.

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## Introduction

The *Anisakis*, a parasite of worldwide distribution, whose larva (L<sub>3</sub>) of white-pinkish filiform appearance, approximately 2 to 3 cm long, can be detected with the naked eye forming tangles in the visceral bundle or encysted in the muscle closest to the abdominal cavity of many marine fish<sup>1-2</sup> and even freshwater fish<sup>3</sup>. Its definitive host is cetaceans and pinnipeds, with hake, cod, anchovy, mackerel, salmon, horse mackerel, and others as intermediate hosts. Humans become infected by consuming undercooked dishes such as sushi, ceviche, smoked foods, semi-preserved foods, etc., which contain the larva L<sub>3</sub><sup>4-6</sup>.

The human is an accidental host, it does not develop, however, a single larva can generate intense abdominal pain, vomiting, diarrhea, fever, allergic diseases, perforating the gastrointestinal mucosa, and may invade other organs (lung, pancreas, liver), generating gastritis, enteritis, etc<sup>1,4,7-9</sup>. Although the reported cases indicate that this is a rare disease, its true incidence could potentially be higher since this condition may go undiagnosed.

The consumption of raw or semi-cooked fish in a traditional dish called ceviche is widespread in Cajamarca and throughout Peru. In places far from fishing ports, due to a lack of knowledge, bromatological controls of seafood are not important for the responsible entities, so there is no real and reliable information on the public health risks posed by the consumption of semi-cooked fish meat with parasite larvae embedded in the muscles; for this reason, the objective of this study was to identify larvae (L<sub>3</sub>) of

*Anisakis* sp. in jack mackerel muscle marketed in the city of Cajamarca.

## Materials and methods

The research was carried out between May and July 2016, in the city of Cajamarca. A total of 120 jack mackerel fish (*T. s. murphyi*) identified by their morphological characteristics (10 samples per week) of different sizes and weights were collected from the various stalls of the Modelo, San Sebastian, and Santa Rosa markets of this city, which vendors are supplied from the port of Santa Rosa - Chiclayo - Lambayeque - Peru. Once the samples were obtained, they were transported to the Laboratorio de Parasitología Veterinaria y Enfermedades Parasitarias (LPV-EP) of the Facultad de Ciencias Veterinarias from the Universidad Nacional de Cajamarca (FCV-UNC) for study. With the established biosecurity measures, each fish was eviscerated and carefully washed with clean water, proceeding with transverse cuts of the dorsal musculature (epaxial and hypaxial) using a scalpel and acute observation with the aid of a magnifying glass for the presence of parasite larvae.

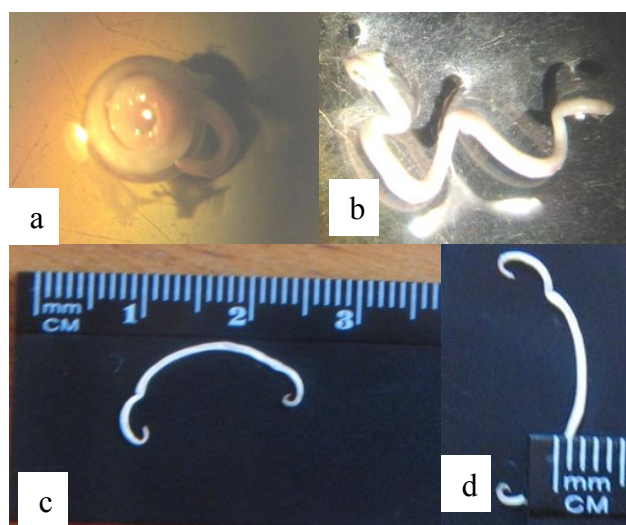
The larvae were identified by microscopy (Leitz WETZLAR at 50 and 100 X) based on their morphological characteristics (color, shape, and size)<sup>1,11-14</sup>. Since this was a study that did not involve live animals, it was not necessary to obtain the approval of an ethics committee; however, the present research

was approved by the Comité Científico of the FCV-UNC, Peru.

**Table 1 Morphological characteristics of the larvae found**

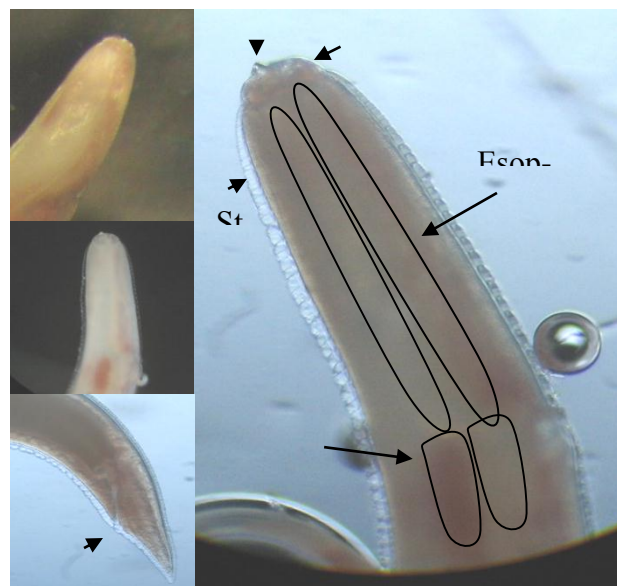
n	Positive (%)	Variable	Characteristic
120	1 (0.83%)	Color	Off-white
		Form	Rounded and elongated body, with pointed ends.
		Size	2.5 cm length x 1.0 mm width

**Figure 1 Photographs of the L<sub>3</sub> larvae found, shown coiled (a), without membrane (b), length (c) and width (d)**



**Figure 2 Photomicrographs of the structures of the L<sub>3</sub> larva found. Anterior end (a) viewed at 50X, and structures (b, c); posterior end (d), both views at 100X**

## Results



## Discussion

Positivity to *Anisakis* sp. larvae was extremely low (0.83 %), due to climatic conditions, so it does not yet represent a public health problem<sup>9</sup>. In addition, most of its commercialization comes from the main ports of the northern coast of the country (Peru), so the probability of containing parasites is very low, so the risk of infection is negligible; however, the results are not a reason for carelessness since in cases of anisakiasis there are no vaccines or effective pharmacotherapy, resorting to endoscopy, colonoscopy or surgical intervention as the effective methods<sup>10</sup>. In several places, people have reported illnesses compatible with anisakiasis after consuming dishes based on insufficiently cooked fish<sup>15,19</sup>, however, this should not be a limiting factor for the consumption

of any kind of fish purchased with sanitary guarantees and cooked at the recommended temperature and time. On the other hand, it is necessary to take into account the risky dishes and avoid ingestion of those prepared with raw fish that was not previously frozen; in addition to having biosecurity measures in their preparation<sup>1,4</sup>.

In contrast to our results, two studies have reported the presence of *Anisakis* sp. larvae such as *A. pegreffii* and *A. physeteris* in three types of fish from the Peruvian coast<sup>20,21</sup>. Also in various regions around the world, prevalences much higher than those found have been reported in Australia<sup>22</sup>, Albania<sup>23</sup>, Egypt<sup>24</sup>, Chile<sup>25</sup>, and many other countries, so it is recommended not to relax biosecurity measures throughout the process that culminates with the consumption of prepared fish.

The results suggest that, although it is true that *Anisakis* sp. is not a common parasite, if surveillance measures are not taken, it could constitute a public health problem in the fish-consuming population.

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### Conflicts of interest

The authors declare that they have no conflicts of interest affecting this research.

The authors declare that they have no conflicts of interest to declare.

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### Ethical considerations

Not applicable, since no live animals were used.

### Authors' contribution to the article

Judith Burga León and Severino Torrel Pajares, conceptualized, designed the methodology, supervised, and directed the research. Luis Vargas-Rocha, Juan Rojas-Moncada, and Ruth Alicia Díaz-Tello, contributed to the software, validation, data curation, writing and preparation of the original drafts, visualization, drafting-revision, and editing of the manuscript. All authors approved the final manuscript.

### Research limitations

The economic value of jack mackerel limits a study in a larger area, with larger sample and uniform sampling.

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