

**A NEW SPECIES OF *PARADONEIS* HARTMAN, 1965  
(ANNELIDA: PARAONIDAE) FROM THE NE IBERIAN PENINSULA  
(SE BAY OF BISCAY, NE ATLANTIC OCEAN)**

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**ABSTRACT**

A new species of the genus *Paradoneis* Hartman, 1965 (Annelida, Paraonidae) has been identified from circalittoral soft bottoms of Basque Country (NE Iberian Peninsula, SE Bay of Biscay). The new species is mainly characterized by having small size, three prebranchial chaetigers, five (exceptionally, six) pairs of thin apinnate branchiae, modified notochaetae lyriform, and pygidial region with seven cirri. In the present paper, the new species is described, illustrated and discussed. Some notes on its ecology and distribution in the area is also included. In addition, an identification key is provided for all known *Paradoneis* species. The Type Material has been deposited in the Museo Nacional de Ciencias Naturales, Madrid.

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**Keywords:** New species; Annelida; Paraonidae; *Paradoneis idoiae*; Iberian Peninsula; Bay of Biscay; Atlantic.

**RESUMEN**

**Una nueva especie de *Paradoneis* Hartman, 1965 (Annelida: Paraonidae) procedente del NE de la península Ibérica (SE del golfo de Vizcaya, NE del océano Atlántico)**

Una especie nueva del género *Paradoneis* Hartman, 1965 (Annelida, Paraonidae) ha sido identificada en fondos blandos del País Vasco (NE de la península Ibérica, SE del golfo de Vizcaya). La nueva especie se caracteriza principalmente por su pequeña talla, tres segmentos setíferos prebranquiales, cinco (excepcionalmente seis) pares de delgadas branquias simples, notosedas modificadas liriformes, y una región pigidial con siete cirros. En el presente artículo se realiza una descripción, ilustración y discusión de la nueva especie, aportándose también información sobre su ecología y distribución. Complementariamente, se aporta una clave de identificación de todas las especies conocidas de *Paradoneis*. El Material Tipo ha sido depositado en el Museo Nacional de Ciencias Naturales, Madrid.

**Palabras clave:** Nueva especie; Annelida; Paraonidae; *Paradoneis idoiae*; península Ibérica; golfo de Vizcaya; Atlántico.

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## Introduction

The paraonids represent a family of elongate, small polychaetes (up to 40 mm long) with numerous segments. They are deposit-feeders and can be found from the littoral zone to abyssal depths (Glasby, 2000), not having been found in fresh water.

Nowadays, this family includes about 156 species distributed in eight genera: *Aparaonis* Hartman, 1965, *Aricidea* Webster, 1879, *Cirrophorus* Ehlers, 1908, *Levinsenia* Mesnil, 1897, *Paradoneis* Hartman, 1965, *Paraonides* Cerruti, 1909, *Paraonis* Grube, 1873 and *Sabidius* Strelzov, 1973. The genus *Paradoneis* was composed of 21 species and 2 subspecies, seven of which have been reported in the Bay of Biscay (North Atlantic): *P. lyra* (Southern, 1914), *P. armata* Glémarec, 1966, *P. bathyilvana* Aguirrezabalaga & Gil, 2009, *P. drachi* Laubier & Ramos, 1974, *P. eliasoni* Mackie, 1991, *P. ilvana* Castelli, 1985 and *P. mikeli* Aguirrezabalaga & Gil, 2009.

During two sampling campaigns recently carried out on the continental shelf of the Basque coast (SE Bay of Biscay), a new species of *Paradoneis* is described, illustrated and compared with the currently known species of the genus.

## Material and methods

### STUDY AREA

The Basque Country is located in the NE of the Iberian Peninsula, straddling the border between France and Spain. The two specimens were collected on soft bottoms of the continental shelf of the provinces of Gipuzkoa and Bizkaia (Fig. 1).

## SAMPLE COLLECTION AND ANALYSIS

Samples were taken in 2018 by AZTI-TECNALIA. Three benthic replicates were collected at each station using a Smith-McIntyre dredge (0.1 m<sup>2</sup>). The sediments were washed through a 1 mm mesh sieve and fixed with a 4 % formalin solution. In the laboratory the samples were sorted and transferred to 70 % ethanol. Afterwards, the fauna was identified to species or lowest possible taxon under an Olympus stereomicroscope and a Zeiss microscope. Specimens were measured using an ocular micrometer. Photographs were taken with a Nikon D7200 digital camera adapted to an Olympus stereomicroscope and a Zeiss microscope. The Types were deposited in the collections of the Museo Nacional de Ciencias Naturales of Madrid, Spain (Codes MNCN 16.01/18236, MNCN 16.01/18237 and MNCN 16.01/18238).

## Systematics

Phylum Annelida

Familia Paraonidae Cerruti, 1909

Genus *Paradoneis* Hartman, 1965

### *Paradoneis idoiae* n. sp.

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TYPE MATERIAL. Holotype (MNCN 16.01/18236), one complete specimen, collected outside of Abra de Bilbao (Bizkaia), station S-50 (43°23.415'N, 03°07.274'W), sand, 51 m depth, 01.05.2018.

Paratypes (MNCN 16.01/18237), three complete specimens, collected at the same time than the holotype. Paratype (MNCN 16.01/18238), one incomplete specimen, collected in Deba (Gipuzkoa), station

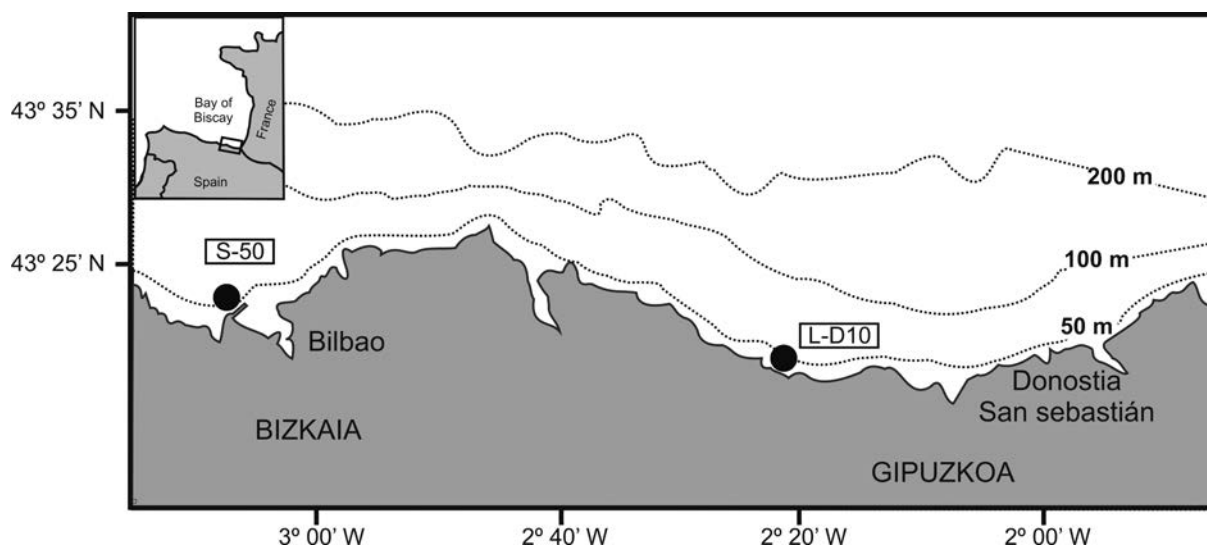


Fig. 1.— Study area and locations of sampling stations.

Fig. 1.— Área de estudio y localización de las estaciones de muestreo.

L-D10 (43°19.594'N, 02°21.147'W), coarse sand, 42 m depth, 24.04.2018).

ADDITIONAL MATERIAL. Three complete specimens, collected at the same time than the holotype.

DESCRIPTION. Holotype longest complete specimen, measuring 8.62 mm long, 0.22 mm wide in branchial region for 84 chaetigers. Body relatively small, thin, circular in cross section with numerous chaetigerous segments (Fig. 2A, 3A). Colour in alcohol white to

light tan, with numerous small pigment granules on the dorsal and ventral surfaces (Fig. 2B).

Prostomium elongated, slightly longer than wide (1.2-1.4 times), oval to conical, slightly compressed laterally, lacking median antenna. An apical sensorial organ present, in some specimens retracted and not visible. Eyes not visible. A pair of nuchal grooves on postero-lateral part of prostomium. Two dorsal ciliated bands present, one located on anteriormost region of the prostomium, and another posterior, visible at the level of nuchal slits (Fig. 3B). Posterior buccal lip

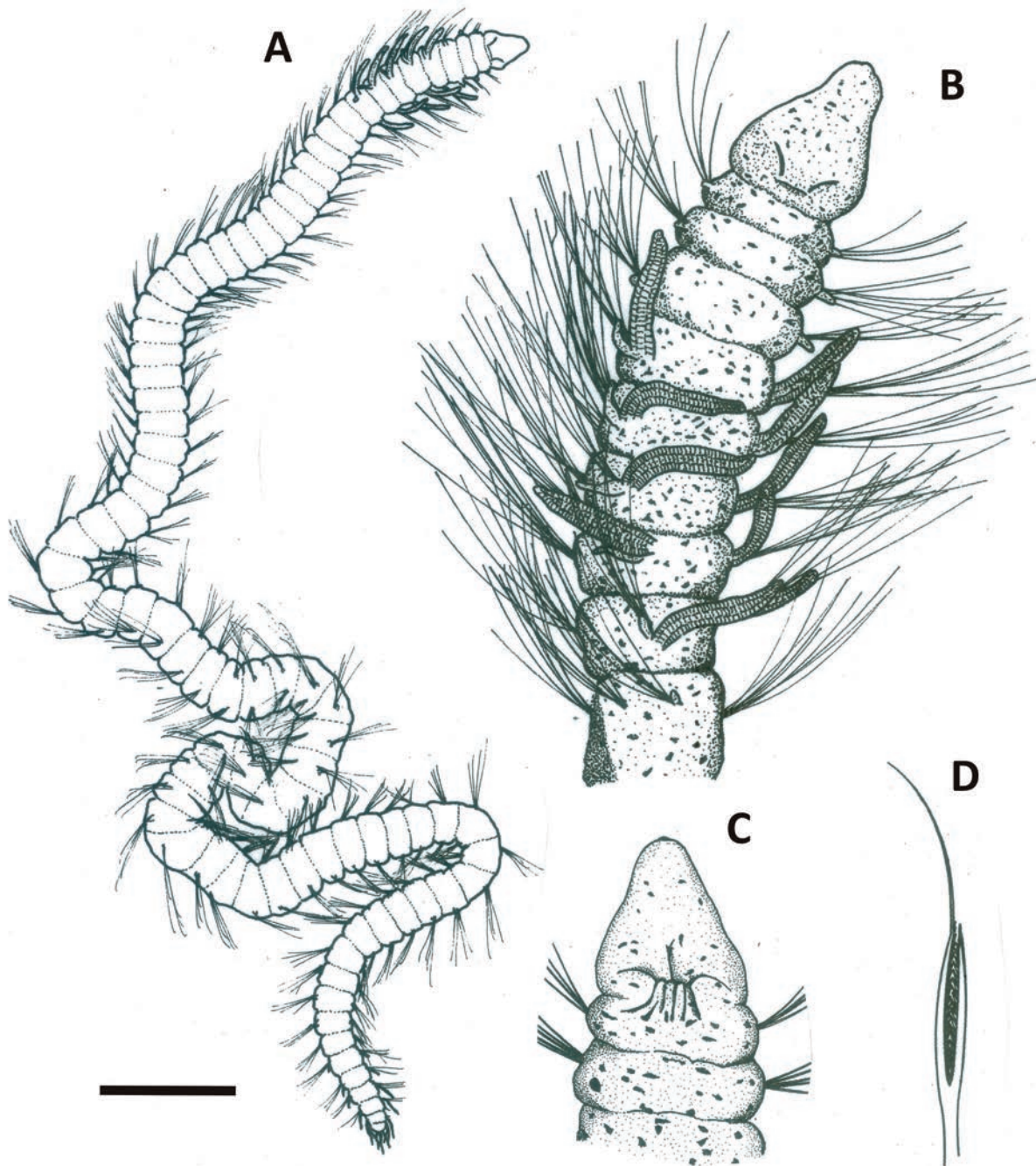


Fig. 2.— *Paradoneis idoiae* n. sp. Holotype (MNCN 16.01/18236). A. General appearance. B. Anterior end, dorsal view. C. Prostomium, ventral view. D. Modified lyriform chaeta. Scale bar: A: 640  $\mu$ m; B: 200  $\mu$ m; C: 135  $\mu$ m; D: 12  $\mu$ m.

Fig. 2.— *Paradoneis idoiae* n. sp. Holotipo (MNCN 16.01/18236). A. Aspecto general. B. Región anterior, vista dorsal. C. Prostomio, vista ventral. D. Seda modificada liriforme. Escalas: A: 640  $\mu$ m; B: 200  $\mu$ m; C: 135  $\mu$ m; D: 12  $\mu$ m.



with 3-4 longitudinal folds starting from anterior part of chaetiger 1 (Fig. 2C).

Notopodial postchaetal lobes present in all parapodia throughout body; on most anterior three chaetigers short, tuberculate to conical, progressively increasing in length through prebranchial region (Fig. 3C); 2-3 times longer, digitiform, distally rounded in branchial region (Fig. 3D, 3E); becoming short, globular to conical in postbranchial region (Fig. 3F); clearly

longer, filiform in posteriormost segments (Fig. 4A). Neuropodial postchaetal lobes absent.

Branchiae beginning from chaetiger 4 in number of 5-6 pairs, elongated, cylindrical, distally rounded with lateral margins ciliated; each equal or slightly longer than segment width (Fig. 4B).

Simple limbate capillary chaetae in both rami from chaetiger 1, continuing throughout body. 1-2 modified lyriform chaetae in lower part of notopodial chaetal fascicle from

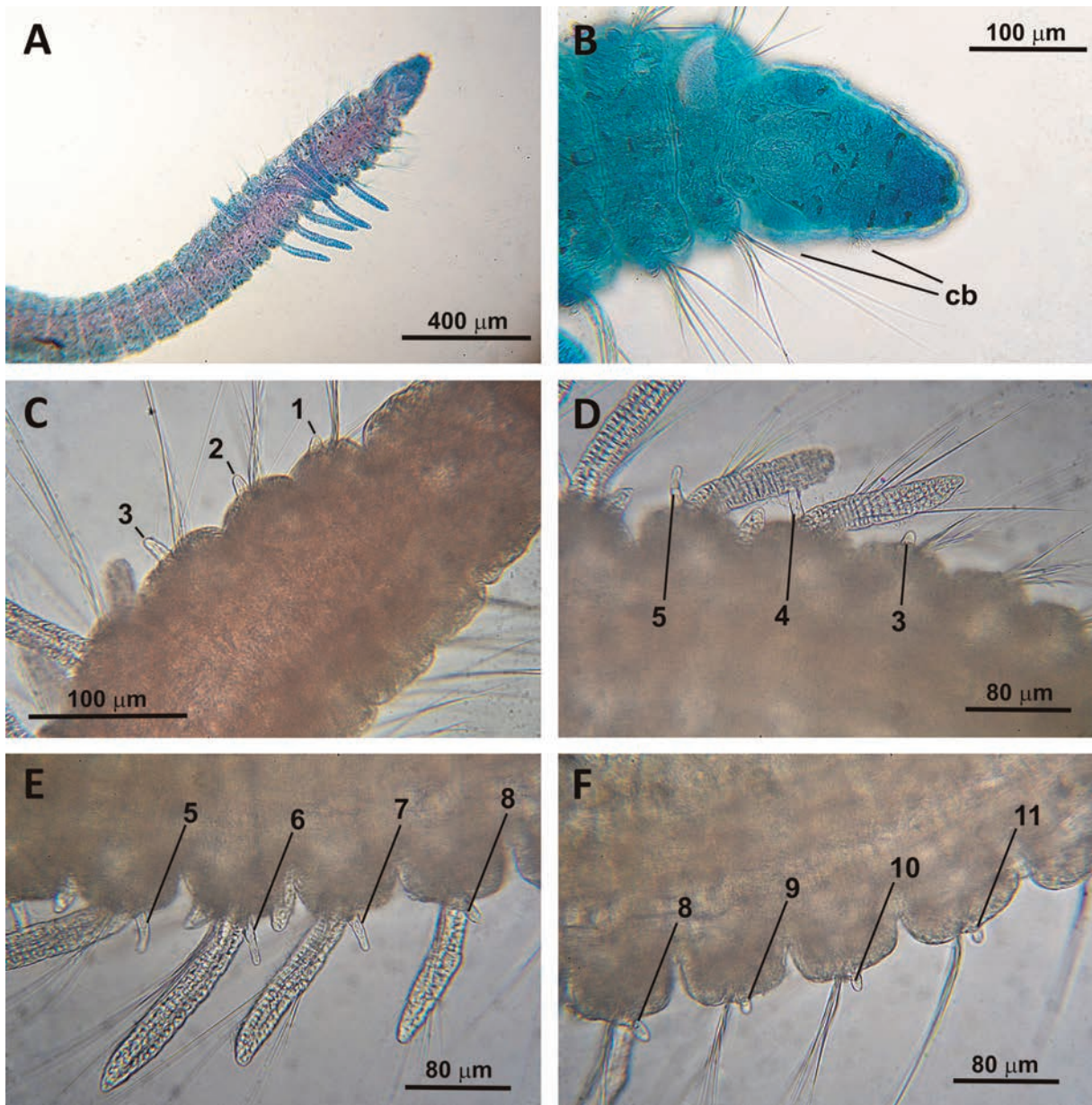


Fig. 3.— *Paradoneis idoiae* n. sp. A. Paratype (MNCN 16.01/18238). Anterior end, dorsolateral view. B-F. Paratype (MNCN 16.01/18237). B. Prostomium, dorsal view. C. Prebranchial region, detail of notopodial postchaetal lobes of chaetigers 1-3 (arrows). D. Prebranchial-branchial region, detail of notopodial postchaetal lobes of chaetigers 3-5 (arrows). E. Branchial region, detail of notopodial postchaetal lobes of chaetigers 5-8 (arrows). F. Branchial-postbranchial region, detail of notopodial postchaetal lobes of chaetigers 8-11 (arrows). Abbreviations: cb: ciliated bands.

Fig. 3.— *Paradoneis idoiae* n. sp. A. Paratipo (MNCN 16.01/18238). Región anterior, vista dorsolateral. B-F. Paratipo (MNCN 16.01/18237). B. Prostomio, vista dorsal. C. Región prebranquial, detalle de los lóbulos notopodiales postsetales de los setígeros 1-3 (flechas). D. Región prebranquial-branquial, detalle de los lóbulos notopodiales postsetales de los setígeros 3-5 (flechas). E. Región branquial, detalle de los lóbulos notopodiales postsetales de los setígeros 5-8 (flechas). F. Región branquial-postbranquial, detalle de los lóbulos notopodiales postsetales de los setígeros 8-11 (flechas). Abreviaturas: cb: bandas ciliadas.



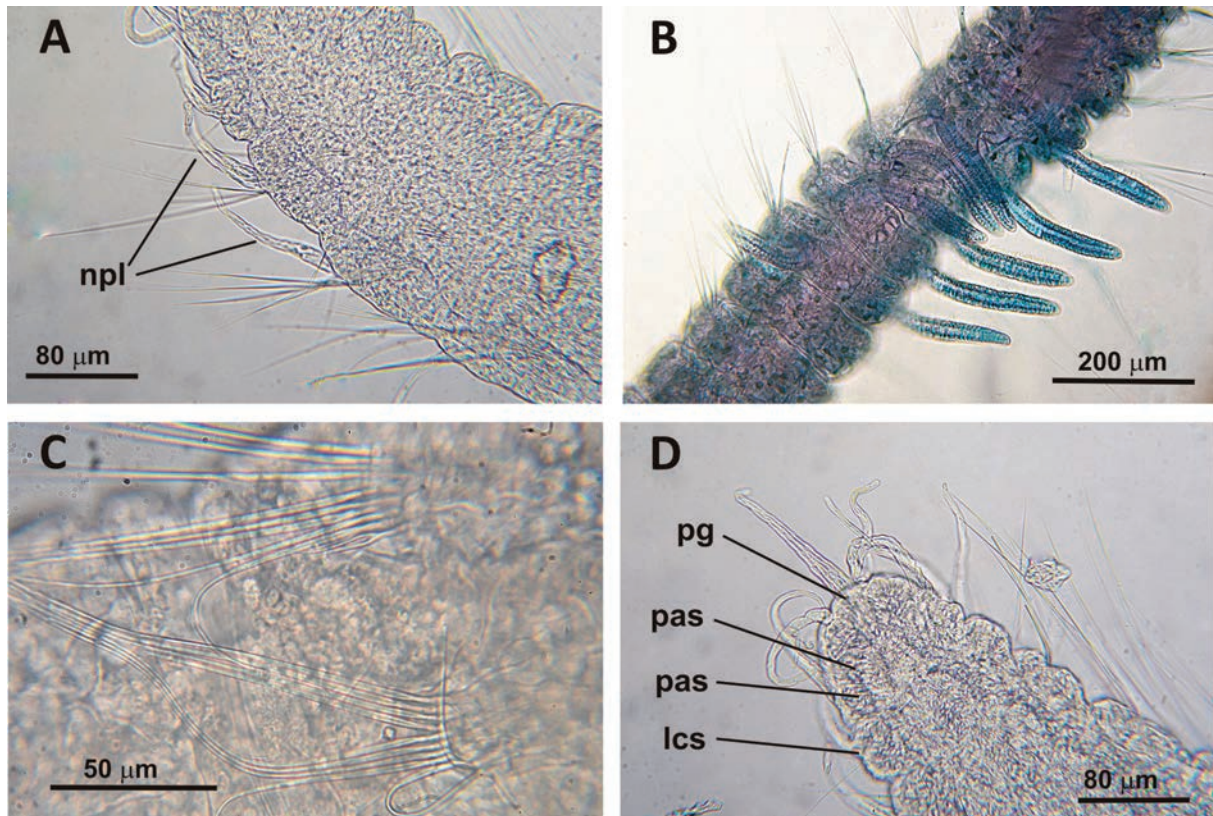


Fig. 4.— *Paradoneis idoiae* n. sp. A, C-D. Paratype (MNCN 16.01/18237). B. Paratype (MNCN 16.01/18238). A. Posterior region, detail of notopodial postchaetal lobes of posteriormost chaetigers (arrows). B. Branchial region, dorsolateral view. C. Right parapodium of chaetiger 53. D. Pygidial region, ventral view. Abbreviations: npl: notopodial postchaetal lobes; lcs: last chaetiger segment; pas: pre-anal segment; pg: pygidium.

Fig. 4.— *Paradoneis idoiae* n. sp. A, C-D. Paratipo (MNCN 16.01/18237). B. Paratipo (MNCN 16.01/18238). A. Región posterior, detalle de los lóbulos notopodiales postsetales de los últimos setígeros (flechas). B. Región branquial, vista dorsolateral. C. Parápodo derecho del setígero 53. D. Región pigidal, vista ventral. Abreviaturas: npl: lóbulos notopodiales postsetales; lcs: último segmento setígero; pas: segmento pre-anal; pg: pigidio.

chaetiger 2-3 (Fig. 4C). Each has two unequally long tines; both tines similarly thick with inner sides spinous (Fig. 2D).

Pygidial region with 7 cirri, 2 pairs corresponding to notopodial postchaetal lobes of two reduced segments, and 3 anal cirri, with the mid-ventral one more robust and thicker than the two lateral ones, all long, filiform, similar in length (Fig. 4D).

**REMARKS.** *Paradoneis idoiae* n. sp. is most closely related to *P. perdidoensis* (McLelland & Gaston, 1994), a meiofaunal species from the coast of the Northern Gulf of Mexico, in having a reduced number of branchiae, three prebranchial chaetigers, modified notochaetae exclusively lyriform and a pygidial region with some pre-anal segments without chaetae. However, according to McLelland & Gaston (1994), adults of both species can be differentiated by the number of branchiae [3 (rarely 4) pairs in *P. perdidoensis*, vs. 5-6 pairs in *P. idoiae* n. sp.]; presence of eyespots on prostomium (present in *P. perdidoensis*, vs. absent in *P. idoiae* n. sp.); size of notopodial postchaetal lobes [prominent and uniform in length in all branchial chaetigers and first ones

of the postbranchial region in *P. perdidoensis*, vs. unequal, relatively long and digitiform in all branchial chaetigers (except in the last, clearly shorter) and shorter in the adjacent postbranchial region in *P. idoiae* n. sp.]; shape of three anal cirri (all similar in *P. perdidoensis*, vs. one mid-ventral more robust and thicker than the two lateral ones in *P. idoiae* n. sp.); number of pre-anal segments (3 in *P. perdidoensis*, vs. 2 in *P. idoiae* n. sp.); and bathymetry [*P. perdidoensis* found in shallow waters (1-7 m depth), vs. *P. idoiae* n. sp. has been collected in circalittoral bottoms (42-51 m depth)].

*Paradoneis idoiae* n. sp. is also similar to *P. lyra*, which was originally described from the coast of Ireland (N Atlantic Ocean). However, both species differ by the number of branchiae (5-6 pairs in *P. idoiae* n. sp., vs. up to 16 pairs in *P. lyra*); the morphology of branchiae (proportionally thin with same width throughout in *P. idoiae* n. sp., vs. proportionally more robust, basally wider in *P. lyra*); the size of branchiae (equal or slightly longer than segment width in *P. idoiae* n. sp., vs. shorter, equal to distance between branchial bases in *P. lyra*); and the size of

anal cirri (long in *P. idoiae* n. sp., vs. relatively short in *P. lyra*).

HABITAT. In the Basque Contry, *P. idoiae* n. sp. found in sand and coarse sand sediment with moderate to low percentage of organic matter content, between 42 and 51 m depth. The biocenosis where this species was collected is characterized by the abundance of the polychaetes *Pisione remota* (Southern, 1914), *Hesionura elongata* Southern, 1914, *Sphaerosyllis bulbosa* Southern, 1914, *Glycera lapidum* Quatrefages, 1866, and *Polygordius appendiculatus* Fraipont, 1887, the oligochaeta *Grania* sp, the molluscs *Limatula subauriculata* (Montagu, 1808) and *Asbjornsenia pygmaea* (Lovén, 1846), the sea cucumber *Leptosynapta minuta* (Becher, 1906), nemertean and nematoda indeterminate.

DISTRIBUTION. Basque Country (NE Iberian Peninsula, SE Bay of Biscay), between 42 and 51 m depth.

ETYMOLOGY. This species is dedicated to Idoia Adarraga Marrodán, wife of the author.

#### Key to all known *Paradoneis* species

The following dichotomous key has been elaborated based on the information included in Southern (1914), Day (1955), Hartman (1965), Glémarec (1966), Storch (1967), Hobson (1972), Imajima (1973), Strelzov (1973), Hartmann-Schröder (1974), Laubier & Ramos (1974), Amoureux (1985), Castelli (1985), Hartmann-Schröder & Rosenfeldt (1988), Mackie (1991), McLelland & Gaston (1994), De León-González *et al.* (2006), Aguirrezabalaga & Gil (2009), Sardá *et al.* (2009), Arriaga-Hernández *et al.* (2013) and López & Sikorski (2017).

- 1 Branchiae present..... 2
  - Branchiae absent.....  
.....*Paradoneis abranchiata* Hartman, 1965
- 2 1 pair of branchiae.....  
.....*Paradoneis juvenalis* (Hartmann-Schröder, 1974)
  - 3 or more pairs of branchiae ..... 3
- 3 Modified notochaetae of one kind ..... 4
  - Modified notochaetae of two kinds, lyriform in anterior chaetigers, acicular on median and posterior ones ... 24
- 4 Modified notochaetae acicular, spinelike ..... 5
  - Modified notochaetae lyriform ..... 8
- 5 Modified notochaetae smooth acicular spines..... 6
  - Modified notochaetae acicular whit subterminal spine ..... 7
- 6 Acicular spines straight, distally pointed; 6 prebranchial chaetigers; 8-10 pairs of branchiae .....  
.....*Paradoneis drachi* Laubier & Ramos, 1974

- Acicular spines curved, distally rounded; 4-5 prebranchial chaetigers; 12-20 pairs of branchiae .....  
.....*Paradoneis spinifera* (Hobson, 1972)
- 7 Acicular spines beginning in prebranchial chaetigers, 3 prebranchial chaetigers; 3-4 pairs of branchiae .....  
.....*Paradoneis perkinsi* (McLelland & Gaston, 1994)
  - Acicular spines beginning in postbranchial chaetigers, 4 prebranchial chaetigers; 10 pairs of branchiae .....  
.....*Paradoneis magdalenaensis* (León-González, Hernández-Guevara & Rodríguez-Valencia, 2006)
- 8 Posterior chaetigers whit spinelike neurochaetae ..... 9
  - All neuropodia whit capillary chaetae ..... 11
- 9 Up to 19 pairs of branchiae; notopodial postchaetal lobes on prebranchial region papiliform; pygidium whit 4 anal cirri .....  
.....*Paradoneis andreae* López & Sikorski, 2017
  - Up to 12 pairs of branchiae; notopodial postchaetal lobes on prebranchial region tuberculate or triangular; pygidium whit 3 anal cirri..... 10
- 10 Up to 12 pairs of branchiae, marginally ciliated; notopodial postchaetal lobes on prebranchial region tuberculate; 3 long anal cirri, two ventrolateral and one midventral shorter .....  
.....*Paradoneis eliasoni* Mackie, 1991
  - Up to 7 pairs of smooth branchiae; notopodial postchaetal lobes on prebranchial region distinctly triangular; 3 short, subequal anal cirri.....*Paradoneis strelzovi* De León-González & Díaz-Castañeda, 2011
- 11 3 prebranchial chaetigers ..... 12
  - 4 prebranchial chaetigers ..... 22
- 12 Modified notochaetae starting on prebranchial region ..... 13
  - Modified notochaetae starting on branchial region..... 17
- 13 More than 6 pairs of branchiae ..... 14
  - Up to 6 pairs of branchiae..... 21
- 14 More than 20 pairs of branchiae .....  
.....*Paradoneis nipponica* Imajima, 1973
  - Fewer pairs of branchiae..... 15
- 15 Up to 17 pairs of branchiae, longer than segment width; notopodial postchaetal lobes on branchial and postbranchial region (except in the last 4-5 chaetigers) similar in size ...  
.....*Paradoneis lyra guadalupensis* Amoureux, 1985
  - Up to 12 pairs of branchiae, shorter than segment width; notopodial postchaetal lobes on postbranchial region (except in the last chaetigers) shorter than branchial ones ..... 16
- 16 Notopodial postchaetal lobes on prebranchial region digitiform .....*Paradoneis lyra* (Southern, 1914)
  - Notopodial postchaetal lobes on prebranchial region small, oval.....*Paradoneis brunnea* Hartmann-Schröder & Rosenfeldt, 1988
- 17 Postbranchial lyriform notochaetae whit tines of similar thickness ..... 18



- Postbranchial lyriform notochaetae whit tines of unequal thickness ..... *Paradoneis ilvana* Castelli, 1985
- 18 Notopodial postchaetal lobes on prebranchial region not visible..... *Paradoneis lyra capensis* Day, 1955
- Notopodial postchaetal lobes on prebranchial region conspicuous..... 19
- 19 Notopodial postchaetal lobes on prebranchial region massive; 15-17 pairs of branchiae in adult specimens, slightly shorter than segment width.....  
..... *Paradoneis forticirrata* (Strelzov, 1973)
- Notopodial postchaetal lobes on prebranchial region not massive; up to 14 pairs of branchiae..... 20
- 20 Notopodial postchaetal lobes on prebranchial region digitiform; branchiae shorter than segment width.....  
..... *Paradoneis lyra* (Southern, 1914)
- Notopodial postchaetal lobes on prebranchial region short, conical-triangular; branchiae longer than segment width ..... *Paradoneis carmelitensis* Arriaga-Hernández, Hernández-Alcántara & Solís-Weiss, 2013
- 21 3 (rarely 4) pairs of branchiae; all notopodial postchaetal lobes on branchial region uniform in length.....  
..... *Paradoneis perdidensis* (McLelland & Gaston, 1994)
- 5-6 pairs of branchiae; last notopodial postchaetal lobe on branchial region clearly shorter than de rest ones ...  
..... *Paradoneis idoiae* n. sp.
- 22 Postbranchial lyriform notochaetae whit tines of similar thickness ..... 23
- Postbranchial lyriform notochaetae whit tines of unequal thickness .....  
..... *Paradoneis bathyilvana* Aguirrezabalaga & Gil, 2009
- 23 Up to 7 pairs of branchiae; postbranchial lyriform notochaetae whit long hairs basally.....  
..... *Paradoneis hirsuta* Sardá, Gil, Taboada & Gili, 2009
- Up to 12 pairs of branchiae; postbranchial lyriform notochaetae whit the shaft smooth.....  
..... *Paradoneis mikeli* Aguirrezabalaga & Gil, 2009
- 24 Up to 19 pairs of branchiae, blunt distally; modified notochaetae lyriform in anterior chaetigers, acicular whit subterminal spine on median and posterior ones .....  
..... *Paradoneis armata* Glémarec, 1966
- Up to 10 pairs of branchiae, rounded distally; modified notochaetae lyriform in anterior chaetigers, harpoon-like in posterior ones.....  
..... \* *Paradoneis harpagonea* Storch, 1967

Note: Some authors like López-Jamar *et al.* (1987) and Lowell (2002) consider *Paradoneis harpagonea* as a junior synonym of *Paradoneis armata*.

## Discussion

This discovery confirms the high presence of the Paraonidae family in the NE Iberian Peninsula. Around 40 species of this family have been reported on the Iberian coasts, of which 80% inhabit the Basque coast

and adjacent areas. This percentage is even higher in the case of the *Paradoneis* genus. Including *P. idoiae* n. sp., eight of the nine Iberian *Paradoneis* species have been collected in this geographical area.

The identification of this new paraonid species on a common and relatively well studied sediment type on the Basque coast could be explained by possible misidentifications in the past. The foreign introduction via ballast water, although possible, seems less likely. The two stations where the specimens have been collected (S-50 and L-D10) are separated by 63 km, and more than 3 km away from the coast.

Among all species of the genus *Paradoneis* described to date in the SE Bay of Biscay, *P. lyra* is the best represented species. Their records range from shallow waters to 1772 m depth, showing preference for muddy and fine sands (Aguirrezabalaga, 2012). For many years, in the Bay of Biscay all those specimens of the genus *Paradoneis* without prostomial median antenna and having lyriform chaetae have been assigned to this species; however recent studies carried out by Aguirrezabalaga & Gil (2009) and Aguirrezabalaga (2012) suggest that other different species have also been included, such as *P. ilvana*, *P. bathyilvana* and *P. mikeli*. The same could have happened with *P. idoiae* n. sp. It is possible that previous identifications of *P. lyra* in circalittoral samples from medium and coarse sands (Aguirrezabalaga, 1984; Martínez & Adarraga, 2001; Martínez *et al.*, 2007), correspond actually to the new species.

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