



New records of the deep-sea fireworm *Chloeia kudenovi* Barroso & Paiva, 2011 (Polychaeta: Amphinomidae) from Southwestern Atlantic

NYKON CRAVEIRO*, FLAVIO DE ALMEIDA ALVES-JÚNIOR & JOSÉ SOUTO ROSA FILHO
Laboratório de Bentos, Universidade Federal de Pernambuco (UFPE). Av. Arquitetura, s/n, Cidade Universitária, Recife – PE.

*Corresponding author: nykoncraveiro@gmail.com

Abstract: The specimens of *Chloeia kudenovi* were collected in mud bottom at a depth of 180 m on the continental slope in the State of Rio Grande do Norte (Potiguar Basin) in Northeastern Brazil. This record expands the northern distribution of *C. kudenovi* in Brazilian waters, which this species has been recorded only in the coast of Rio de Janeiro.

Key words: Second find, endemic species, geographical distribution, Northeastern Brazil.

Resumo: Novos registros da poliqueta de fogo de águas profundas *Chloeia kudenovi* Barroso & Paiva, 2011 (Polychaeta: Amphinomidae) para o Sudoeste do Atlântico. Os espécimes de *Chloeia kudenovi* foram coletados em fundos de lama a profundidade de 180 m no talude continental no Estado do Rio Grande do Norte (Bacia Potiguar) Nordeste do Brasil. Este registro amplia para o norte a distribuição de *C. kudenovi* em águas Brasileiras, uma vez que a espécie foi registrada anteriormente apenas na costa do Rio de Janeiro.

Palavras-chave: Segundo achado, espécie endêmica, distribuição geográfica, Nordeste do Brasil.

Polychaeta of the family Amphinomidae Lamarck, 1818 are commonly known as fireworms due to the burning sensation and irritation they cause upon contact with their calcareous chaetae (de León-González *et al.* 2009) that have a complex mixture of defense toxins (e.g. proteolytic enzymes, protease inhibitors and neurotoxins) (Verdes *et al.* 2017). Amphinomidae has 180 species belonging to 22 genera (Borda *et al.* 2012; Sun & Li 2016; Barroso *et al.* 2017), with a widespread distribution, occurring from intertidal zones (coral reef) to deep waters in mud and gravel bottom (Kudenov 1993; Barroso & Paiva 2011; Sun & Li 2016; Assis *et al.* 2017). Most amphinomids are predators with some species showing carnivorous and opportunistic feeding habit (Fauchald & Jumars 1979).

The genus *Chloeia* Lamarck, 1818 is composed by 20 species occurring in the Indian, Pacific and Atlantic oceans (Hartman 1959; Barroso & Paiva 2011). In the Brazilian coast three species have been recorded: *Chloeia viridis* occurring from

Amazonas to Rio de Janeiro (Amaral & Nonato 1994; Amaral *et al.* 2012), *Chloeia pinnata* in Paraíba (Assis *et al.* 2012) and *Chloeia kudenovi*, 2011 in Rio de Janeiro (Barroso & Paiva 2011). Here, we report the second record of *C. kudenovi* from Brazilian coast, expanding the geographic and bathymetric distribution of the species.

The samples were collected as part of the monitoring program "Avaliação da Biota Bentônica e Planctônica da Bacia Potiguar e Ceará (Bpot)", developed by the Brazilian Oil Company "Petróleo Brasileiro S/A (Petrobras)", on board of R/V Seward Johnson in May 2011, off the coast of the States of Ceará (CE) and Rio Grande do Norte (RN) (Potiguar Basin). Samples were taken along the continental slope, using a box core (50x50 cm) at depths ranging from 150 to 2068 m. After collection samples were fixed in saline formalin 4% and thereafter the polychaetes were identified to species level. The specimens were measured with a digital caliper (0.01 mm) at Total length (TL) and Total width (TW

- width of segment 13). After measurements all specimens were deposited in the "Museu de Oceanografia Prof. Petrônio Alves Coelho (MOUFPE)" at Federal University of Pernambuco, Recife, Brazil.

Three specimens of *Chloeia kudenovi* (Fig. 1 A – D) were collected at station MT# 52 (04°44'S; 036°25'W) at depth of 180 m in mud bottom (voucher number MOUFPE: 002). The specimens have: 25 mm TL and 7 mm TW, 28 chaetigers; 23 mm TL and 6 mm TW, 28 chaetigers; 22 mm TL and 6 mm TW, 27 chaetigers.

All specimens agree with the diagnosis provided by Barroso & Paiva (2011) for *C. kudenovi*: Absence of dorsal pigmentation pattern (Fig. 1A). Prostomium with two lateral cirriform antennae (Fig. 1D).

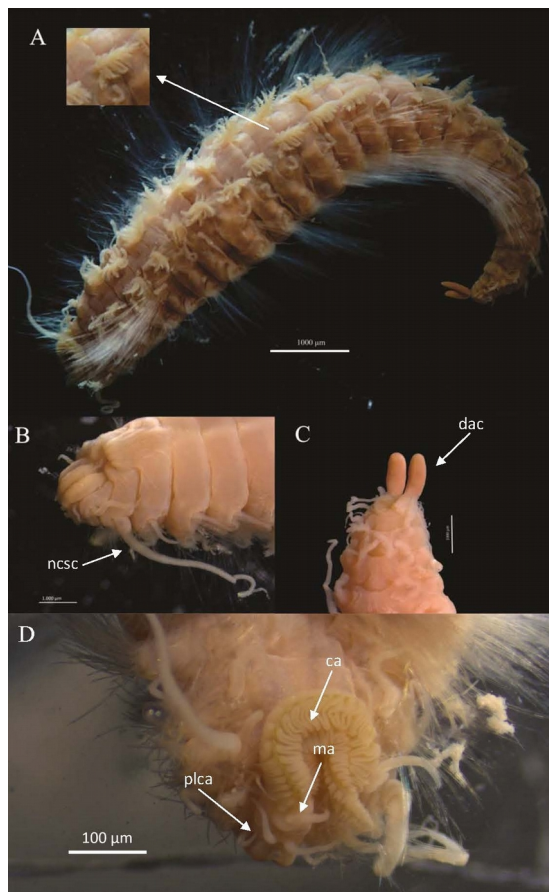


Figure 1. *Chloeia kudenovi* Barroso & Paiva, 2011. (A) Dorsal view of the body, detail of branchiae bipinnated; (B) Long neuropodial cirri of the 2nd chaetiger; (C) Pygidium terminal with digitiform anal cirri; (D) Detail of prostomium. Collected in continental slope (Potiguar Basin) (MOUFPE: 002), Northeastern Brazil. ncsn: neuropodial cirri of the 2nd chaetiger; dac: digitiform anal cirri; ca: caruncle; ma: median antennae; plca: prostomium with two lateral cirriform antennae.

Two pairs of eyes, median antennae arising from anterior margin of caruncle (Fig. 1D).

Palps fused, caruncle extended posteriorly to end of chaetiger 3 fused to dorsum on chaetigers 1–2 and free thereafter (Fig. 1D), branchiae bipinnated present from chaetiger 4 to the end of body (Fig. 1A), parapodia well developed with widely separated rami in all chaetigers, parapodial cirri present in all chaetigers, notopodial and neuropodial cirri of similar size throughout the body, except for neuropodial cirri of the 2nd chaetiger, which are three times longer than dorsal (Fig. 1C), pygidium terminal opening between a pair of thick, digitiform anal cirri (Fig. 1C). Notopodial chaetae of five types: bifurcate chaetae (Fig. 2C, 2E and 2F), bifurcate harpoon chaetae with denticulations offset from small prong in all fascicles posterior to first

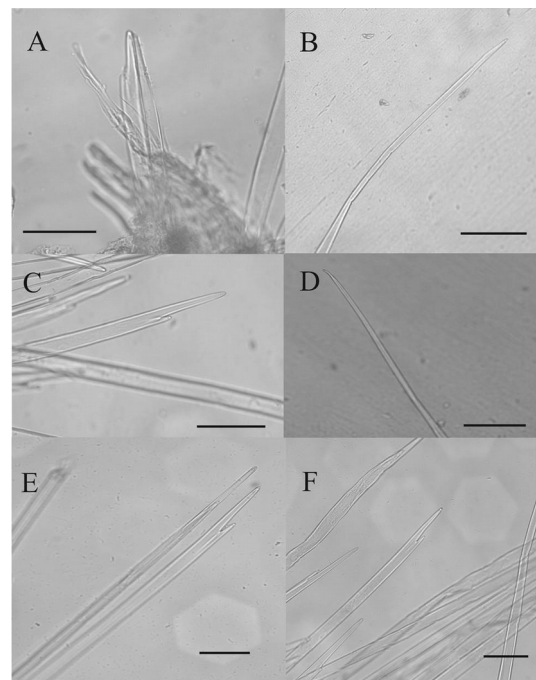


Figure 2. Chaetae of *Chloeia kudenovi* Barroso & Paiva, 2011, (A) bifurcate neurochaetae; (B) neuroaciculae; (C, E, F) Bifurcate notochaetae and (D) notoacicula. A – F scale bar: 50 µm.

third of body, harpoon notochaetae, spinose notochaetae and spinose notoaciculae (Fig. 2D); and neurochaetae being of two types: bifurcate chaetae (Fig. 2A) and spinose neuroaciculae (Fig. 2B).

Despite of the general agreement with the description of Barroso & Paiva (2011) clay *C. kudenovi* clove, our specimens generally had more segments than the specimens examined by these authors (17-24 chaetigers in the original description and 27-28 chaetigers in our specimens). This

difference in the number of chaetigers may be due to the fact that the specimens from Potiguar basin are larger than those from Rio de Janeiro. Some polychaetes have a fixed number of segments, with cessation of post-embryonic segment addition (e.g. *Arenicola marina* and *Harmothoe imbricate*), but in most species segments continue to be added throughout the life (Glasby 2000; Bely 2006). New segments are derived during growth along the anterior edge of the pigydium (Schroeder & Hermans, 1975). In some species the number of chaetigers have a strong correlation with the length (number of segments) of the animal, as observed for *Paramphinome posterobranchiata* (Barroso & Paiva, 2008), *Eurythoe complanata* (Yáñez-river & Brown, 2015) and *Timarete punctata* (Çinar, 2007).

The closest species of *C. kudenovi* is *Chloeia violacea* Horst, 1910, however, these species differ from each other in the following way: the median and lateral antennae shorter (not reaching the end of the caruncle) and do not present a specific pattern of body pigmentation, both characteristics are present only in *C. kudenovi* (Barroso & Paiva 2011). In Brazil *Chloeia kudenovi* was recorded only in Rio de Janeiro (type locality) at depths ranging from 750 to 1045 m (Barroso & Paiva 2011), herein, our specimens were collected in Rio Grande do Norte at depth of 180 m, thereby, we increase the bathymetric distribution (toward shallow water) and expand the geographic distribution of the species on the Brazilian coast (Potiguar Basin - Northeastern Brazil).

Acknowledgements

The authors are grateful to Petroleo Brasileiro S.A. (Petrobras) for making the material used in this study available, and Claudeilton Santana for the help in obtaining the photographs. The authors would like to thank Dr. Pablo Muniz for his support and the anonymous reviewers for their precious comments on this paper.

References

- Amaral, A. C. Z. & Nonato, E. F. 1994. Anelídeos poliquetos da costa brasileira. 5. Pisionidae, Chrysopetalidae, Amphinomidae e Euphosinidae. **Revista Brasileira de Zoologia**, 11(2): 361–390.
- Amaral, A. C. Z., Nallin, S. A. H., Steiner, T. M., Forroni, T. O. & Gomes, D. F. 2012. **Catálogo das espécies de Annelida Polychaeta do Brasil**. http://www.ib.unicamp.br/museu_zoologia/fil/es/lab_museu_zoologia/Catalogo_Polychaeta_Amaral_et_al_2012.pdf (Accessed in 15 Feb 2018).
- Assis, J. E., Alonso, C., Brito, R., Santos, A. & Christoffersen, M. L. 2012. Polychaetous annelids from the coast of Paraíba state, Brazil. **Revista Nordestina de Biologia**, 21(1): 3–45.
- Assis, J. E., Dias, T. L. P. & Christoffersen, M. L. 2017. New record for South America of an attack of the fireworm *Hermodice carunculata* (Polychaeta, Amphinomidae) on a colony of *Palythoa caribaeorum* (Sphenopidae, Hexacorallia), in Maracajaú, Rio Grande do Norte, Brazil. **Pan-American Journal of Aquatic Sciences**, 12: 259–262.
- Barroso, R. & Paiva, P. 2008. A new deep sea species of *Paramphinome* (Polychaeta: Amphinomidae) from southern Brazil. **Journal of the Marine Biological Association of the United Kingdom**, 88(4), 743–746.
- Barroso R, & Paiva, P. C. 2011. A new deep-sea species of *Chloeia* (Polychaeta: Amphinomidae) from southern Brazil. **Journal of the Marine Biological Association of the United Kingdom**, 91: 419–423.
- Barroso, R. Ranauro, N. & Kudenov, J. D. 2017. A new species of *Branchamphinome* (Annelida: Amphinomidae) from the South-western Atlantic, with an emendation of the genus. **Journal of the Marine Biological Association of the United Kingdom**, 97(5): 835–842.
- Bely, A. E. 2006. Distribution of segment regeneration ability in the Annelida, **Integrative and Comparative Biology**, Volume 46, Issue 4, Pages 508–518.
- Borda, E. Kudenov, J. D., Bienhold, C. & Rouse, G. W. 2012. Towards a revised Amphinomidae (Annelida, Amphinomida): description and affinities of a new genus and species from the Nile Deep-sea Fan, Mediterranean Sea. **Zoologica Scripta**, 41: 307–325.
- Çinar, M. E. 2007. Re-description of *Timarete punctata* (Polychaeta: Cirratulidae) and its occurrence in the Mediterranean Sea. **Scientia Marina** 71: 755–764.
- Fauchald, K. & Jumars, P. A. 1979. The diet of worms: A study of polychaete feeding guilds. **Oceanography and Marine Biology Annual Review**, 17: 193–284.

- Glasby, C. J. 2000. In Beesely, P. L., Ross, G. J. B. and Glasby, C. J. (eds). **Polychaetes & Allies: The southern synthesis. Fauna of Australia. Vol. 4A Polychaeta, Myzostomida, Pogonophora, Echiura, Sipuncula.** Pp 161-167. CSIRO Publishing: Melbourne
- Hartman, O. 1959. Catalogue of the polychaetous annelids of the world. Part I. **Allan Hancock Foundation Occasional Paper**, 23: 1–353.
- Kudenov, J. D. 1993. Amphinomidae and Euphrosinidae (Annelida: Polychaeta) principally from Antarctica, the Southern Ocean, and Subantarctic regions. **Biology of Antarctic Series 22, Antarctic Research Series**, 58: 93–150.
- Lamarck, J. B. 1818. **Histoire naturelle des Animaux sans Vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédés d'une Introduction offrant la détermination des caractères essentiels de l'Animal, sa distinction du végétal et des autres corps naturels, enfin, l'Exposition des Principes fondamentaux de la Zoologie.** Paris, Deterville, 612 p.
- León-González, J. R. Bastida-Zavala, L. F. Carrera-Parva, M. E. García-Garza, A. Peña-Rivera, S. I. Salazar Vallejo, & V. Solís-Weiss (Eds.). 2009. **Poliquetos (Annelida: Polychaeta) de Mexico y America Tropical.** Universidad Autónoma de Nuevo León, Monterrey, México, 737 p.
- Schroeder, P. C. & Hermans, C. O. 1975. Annelida: Polychaeta. Pp 1-213 in Giese, A.C. & Pearse, J.S. (eds) **Reproduction of Marine Invertebrates. Vol. III. Annelids and Echiurans.** Academic Press: New York 342 pp.
- Sun, Y. & Li, X. 2016. A new species of *Linopherus* (Annelida, Amphinomidae) from Beibu Gulf, South China Sea. **ZooKeys**, 640: 37–43.
- Verdes, A., Simpson, D. & Holford, M. 2017. Are fireworms venomous? Evidence for the convergent evolution of toxin homologs in three species of fireworms (Annelida, Amphinomidae). **Genome Biology and Evolution**, 10(1): 249–268.
- Yáñez-Rivera, B., & Brown, J. 2015. Fireworms (Amphinomidae: Annelida) from Ascension and Saint Helena Island, Central South Atlantic Ocean. **Marine Biodiversity Records**, 8, E149.

Received: April 2018

Accepted: July 2018

Published: January 2019