



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

JOSÉ E. DE ASSIS^{1*}, THELMA L. P. DIAS² & MARTIN L. CHRISTOFFERSEN¹

¹ Laboratório e Coleção de Invertebrados Paulo Young, Departamento de Sistemática e Ecologia, Centro de Ciências Exatas e da Natureza, Universidade Federal da Paraíba, 58059-900, João Pessoa, Paraíba, Brasil.

² Laboratório de Biologia Marinha – LBMar, Universidade Estadual da Paraíba/UEPB, Departamento de Biologia - Campus I. Av. das Baraúnas, 351, Bodocongó, Campina Grande/PB - Cep: 58429-500

*Corresponding author: eri.assis@gmail.com

Abstract. The fireworm *Hermodice carunculata* is an active predator of many benthic organisms from coral reefs. We present a first record for the South America of the predation by this polychaete on a colony of *Palythoa caribaeorum*, in Maracajaú reefs, Rio Grande do Norte, Brazil.

Key words: Annelida, Coral reefs, Zoanthids, bristleworm.

Resumen. Nuevo registro para América del Sur de un ataque del gusano de fuego *Hermodice carunculata* (Polychaeta, Amphinomidae) en la colonia de *Palythoa caribaeorum* (Sphenopidae, Hexacorallia) en Maracajaú, Rio Grande do Norte, Brasil. El gusano del fuego *Hermodice carunculata* es un depredador activo de muchos organismos bentónicos de los arrecifes de coral. Presentamos un primer registro en América del Sur de la depredación de este poliqueto de una colonia de *Palythoa caribaeorum*, en arrecifes de Maracajaú, Rio Grande do Norte, Brasil.

Palabras clave: Annelida, Arrecifes coralinos, Zoantoides, gusano del fuego.

Polychaetes belonging to the family Amphinomidae are most commonly distributed in shallow tropical and subtropical waters, and they have also been reported from abyssal depths and polar habitats (Kudenov 1995). The bearded fireworm amphinomids are common in intertidal zones, and abundant on coral reefs and in rocky areas (Kudenov 1993, Hutchings 2000, Sun & Li 2016). Some species have been reported as corallivorous and voracious of hard and soft corals, in particular, *Hermodice carunculata*.

Hermodice carunculata (Pallas 1776) is a widespread resident of coral reefs and littoral areas of the Caribbean and Western Atlantic Ocean (Lizama & Blanquet 1975, Suchanek & Green 1981, Sebens 1982, Gleibs *et al.* 1995). In Brazil, this

species has been reported along to the coast as a voracious predator of several types of hard and soft corals (Table I) (Pérez & Gomes 2012; Sampaio *et al.* 2012, Souza *et al.* 2007). The fireworm *H. carunculata* is regarded as an important predator of coral reefs, and preys zoanthids, anemones, gorgonids, hydrocorals, scleractinians, and octocorals (Lewis & Crooks 1996, Lizama & Blanquet 1975, Souza *et al.* 2007). The record of preying the zoanthid *Palythoa mammillosa* was reported by Marsden (1968). Recently, a group of about six species of *H. carunculata* was reported preying a jellyfish (Stoner & Lyman 2015). Recent field experiments revealed that *H. carunculata* was attracted more strongly to decaying coral and fish than to live coral (Wolf *et al.* 2014). This worm also

Table I. Table shows prey affected by attacks of the fireworm *Hermodice carunculata* in Brazil. Asterisks indicate invasive as recorded by Sampaio *et al.* (2012).

Predator	Prey	References
<i>Hermodice carunculata</i> Pallas, 1766	<i>Carijoa riisei</i> (Duchassaing & Michelotti, 1860)	Souza <i>et al.</i> , 2007
	<i>Millepora alcicornis</i> Linnaeus, 1758 * <i>Tubastraea tagusensis</i> Wells, 1982 * <i>Tubastraea coccinea</i> Lesson, 1829	Pérez & Gomes, 2012 Sampaio <i>et al.</i> , 2012 Sampaio <i>et al.</i> , 2012
	<i>Palythoa caribaeorum</i> (Duchassaing & Michelotti, 1860)	New record for South America, Brazil. This paper

was recorded as a vector of the coral bleaching pathogen *Vibrio shiloi* in Spring-Summer during the warming of the sea water, while in winter this worm serves as a reservoir of the pathogen agent (Sussman *et al.* 2003). This paper describes, for the first time, the predation of a colony of *Palythoa caribaeorum* by the bearded species of the fireworm *H. carunculata* on a coral reef from South America, in Maracajaú (5°24'09"S, 35°17'48"W), Rio Grande do Norte, northeastern Brazil.

This species is the first to come to mind when someone refers to a "fireworm". While indeed a coral eater, it is a very specialized one. They feed mostly on gorgonians, and in quite a graphic manner. They find a branch tip and essentially deep throat it, chewing and digesting the tissue before extracting the skeleton and moving on. A gorgonian with dead white tips that is otherwise healthy may be an indication of fireworm activity (Vreeland & Lasker 1989). The species can be found alone, but it is common to find several specimens together. More than 50 individuals of *Hermodice* have been found in enclosures for fish fattening and mariculture in the Canary Islands (Monterroso *et al.* 2004). Although this worm can be considered a predator of sessile organisms (Fauchald & Jumars 1979), some authors have also referred that this fireworm is attracted to decaying coral and fish more than to live coral (Jumars *et al.* 2015). It also has scavenging and sedimentivorous habits (Hutchings 2000, Marsden 1963a, b).

Lindsay (2009) emphasized the predominance of gustation over olfaction during the foraging processes of amphinomid. Experiments prove that *H. carunculata* possesses excellent olfactory organs and is able to detect food sources within a relatively short period of time. The fireworm captures its prey by one eversible muscular pharynx and begins digestion outside its body (Figures 1A-C), because it immediately releases enzymes from the anterior digestive tract, the main digestion site (Marsden 1963a, Ward *et al.* 2003). Pre-digestion of

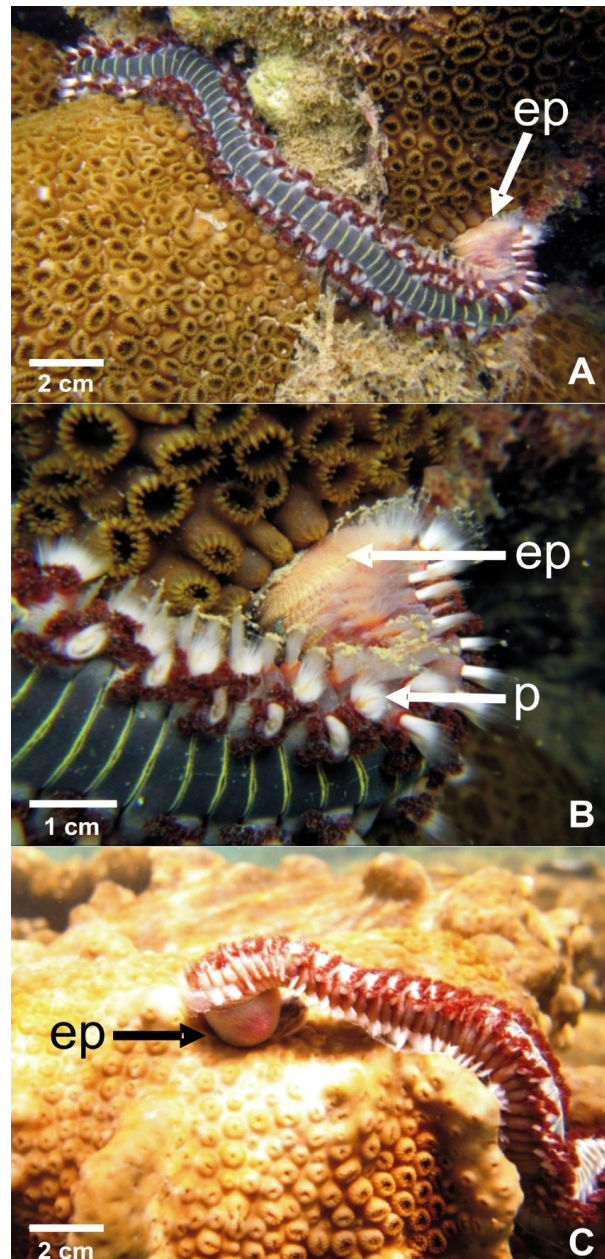


Figure 1. *Hermodice carunculata* devouring a colony of *Palythoa caribaeorum* in Maracajaú, Rio Grande do Norte, Brazil. A-B: Complete animal devouring the colony of zoanths; C: Everted proboscis showing a piece ripped out from colony; ep- everted proboscis; p- parapodium. Photos by Luis Carlos.

the coral polyps apparently results from the liberation of digestive enzymes from the buccal cells, as extracts of this region possess lipolytic and proteolytic activity (Marsden 1963a). Otto & Lewis (1972) concluded that this fireworm polychaete did not cause extensive damage to coral reefs, because the predator is not the primary cause of dead areas in affected corals. Despite this conclusion, excessive damage by predators may affect the general health of reefs or alter the composition of reef communities (Witman 1988).

In this case, the monitoring of this species is imperative, to ensure the protection of the coral reefs. An increase in population densities of fireworms could conceivably bring future trouble to the health of coral ecosystems, although strangely Sebens (1982) has not reported the presence of preying on *Palythoa* along the Caribbean coast of Panama, this was reported in detail by Gleibs *et al.* (1995).

The conservation value for coral reefs should be followed, as mentioned by Edinger & Risk (2000). The increase of predators such *H. carunculata* may cause several losses of sessile organisms by predation. The survival of these reefs will depend upon an appropriate understanding of all processes involved in the functioning and maintenance of the reef ecosystem, and on the effective management and sustainable use of these resources (Leão *et al.* 2010).

Acknowledgements

We acknowledge CNPq and FACEPE for a post-doctoral scholarship to J.E. De Assis, and a productivity grant to M.L. Christoffersen.

References

- Edinger, E. N. & Risk, M. J. 2000. Reef classification by coral morphology predicts coral reef conservation value. **Biological Conservation**, 92: 1-13.
- Fauchald, K. & Jumars, P. A. 1979. The diet of worms: a study of polychaete feeding guilds. **Oceanography and Marine Biology, An Annual Review**, 17: 193-284.
- Gleibs S., Mebs, D. & Werding, B. 1995. Studies on the origin and distribution of palytoxin in a Caribbean coral reef. **Toxicon**, 33: 1531-1537.
- Hutchings, P. A. 2000. Family Amphinomidae. Pp. 107-110. *In*: Beesley, P. L., Ross, G. J. B & Glasby, C. J. (Eds). Polychaetes & Allies: **The Southern Synthesis Fauna of Australia 4A Polychaeta, Myzostomida, Pogonophora, Echiura, Sipuncula**. CSIRO Publishing Melbourne, 235p.
- Jumars, P. A., Dorgan, K. M. & Lindsay, S. M. 2015. Diet of Worms Emended: An Update of Polychaete Feeding Guilds. **Annual Review of Marine Science**, 7(1): 497-520. <https://doi.org/10.1146/annurev-marine-010814-020007>.
- Kudenov, J. D. 1993. Amphinomidae and Euphrosinidae (Annelida: Polychaeta) Principally from Antarctica, the Southern Ocean, and Subantarctic Regions. Pp. 93-150. *In*: Cairns, S. D. (Ed). **Biology of the Antarctic Seas XXII**, American Geophysical Union, Washington, D.C. doi: 10.1029/AR058p0093
- Kudenov, J. D. 1995. Family Amphinomidae Lamarck, 1818. Pp. 207-215. *In*: Blake, J. A., Hilbig, B. & Scott, P. H. (Eds). **Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel, Vol. 5: The Annelida. Part 2. Polychaeta: Phyllodocida (Sylliae and Scale-bearing Families), Amphinomida and Eunicida**. Santa Barbara Museum, Santa Barbara, 379p.
- Leão, Z. M. A. N., Kikuchi, R. K. O., Oliveira, M. D. M. & Vasconcelos, V. 2010. Status of Eastern Brazilian coral reefs in time of climate changes. **Pan-American Journal of Aquatic Science**, 5(2): 224-235.
- Lindsay, S. M. 2009. Ecology and biology of chemoreception in polychaetes. **Proceedings of the 9th International Polychaete Conference**. Magnolia Press, Auckland, 339-367.
- Lewis, J. B. & Crooks, R. E. 1996. Foraging cycles of the amphinomid polychaete *Hermodice carunculata* preying on the calcareous hydrozoan *Millepora complanata*. **Bulletin of Marine Science**, 58: 853-857.
- Lizama, J. & Blanquet, R. S. 1975. Predation on sea anemones by the amphinomid polychaete, *Hermodice carunculata*. **Bulletin of Marine Science**, 25(3): 442-443.
- Marsden, J. R. 1963a. A preliminary report on digestive enzymes of *Hermodice carunculata*. **Canadian Journal of Zoology**, 41: 159-164.
- Marsden, J. R. 1963b. The digestive tract of *Hermodice carunculata* (Pallas), Polychaeta: Amphinomidae. **Canadian Journal of Zoology**, 41: 165-184.

- Marsden, J. R. 1968. Routes of excretion of particulate waste in the polychaete, *Hermodice carunculata*. **Canadian Journal of Zoology**, 46: 619-624. <http://dx.doi.org/10.1139/z68-088>
- Monterroso, O., Nuñez, J. & Riera, R. 2004. Macrofauna de fondos blandos en las concesiones de acuicultura de la Bahía de Igueste de San Andrés Tenerife. **Revista de la Academia Canaria de Ciencias**, 15: 77-86.
- Pérez, C. D. & Gomes, P. B. 2012. First record of the fireworm *Hermodice carunculata* (Annelida, Polychaeta) preying on colonies of the fire coral *Millepora alcicornis* (Cnidaria, Hydrozoa). **Biota Neotropica**, 12(2): 217-219. <http://dx.doi.org/10.1590/S1676-06032012000200022>
- Ott, B. & Lewis, J. B. 1972. The importance of the gastropod *Coralliophila abbreviata* (Lamarck) and the polychaete *Hermodice carunculata* (Pallas) as coral reef predators. **Canadian Journal of Zoology**, 50: 1651-1656. <http://dx.doi.org/10.1139/z72-217>
- Sampaio, C. L. S., Miranda, Maia-Nogueira R. J. & Nunes, J. A. C. C. 2012. New occurrences of the nonindigenous orange cup corals *Tubastraea coccinea* and *T. tagusensis* (Scleractinia: Dendrophylliidae) in Southwestern Atlantic. **Check List**, 8(3): 528-530.
- Sebens, K. P. 1982. Intertidal distribution of zoanthids on the Caribbean coast of Panama: effects of predation and desiccation. **Bulletin Marine Science**, 32: 316-335.
- Souza, J. R. B., Rodrigues, H. A., Neves, B. M. & Perez, C. D. 2007. First report of bristleworm predator of the reef octocoral *Carijoa riisei*. **Coral Reefs**, 26(4): 1033. doi: 10.1007/s00338-007-0290-2.
- Stoner, L. W. & Layman, C. A. 2015. Bristle worms attack: benthic jellyfish are not trophic dead ends. **Frontiers Ecology and Environment**, 13: 226-227.
- Suchanek, T. H. & Green, D. J. 1981. Interspecific competition between *Palythoa caribaeorum* and other sessile invertebrates on St. Croix reefs, U.S. Virgin Islands. **Proceedings of the Fourth International Coral Reef Symposium v. 2**, Manila, Philippines, 679-684.
- Sun, Y. & Li, X. 2016. A new species of *Linopherus* (Annelida, Amphinomididae) from Beibu Gulf, South China Sea. **ZooKeys**, 640: 37-43. <https://doi.org/10.3897/zookeys.640.9619>
- Sussman, M., Loya, Y., Fine, M. & Rosenberg, E. 2003. The marine fireworm *Hermodice carunculata* is a winter reservoir and spring-summer vector for the coral-bleaching pathogen *Vibrio shiloi*. **Environmental Microbiology**, 5(4): 250-255. doi: 10.1046/j.1462-2920.2003.00424.x
- Vreeland, H. V. & Lasker, H. R. 1989. Selective feeding of the polychaete *Hermodice carunculata* Pallas on Caribbean gorgonians. **Journal of Experimental of Marine Biology and Ecology**, 129: 265-277. doi: [10.1016/0022-0981\(89\)90108-1](https://doi.org/10.1016/0022-0981(89)90108-1).
- Ward, M. E., Jenkins, C. D., Dover, C. L. M. 2003. Functional morphology and feeding strategy of the hydrothermal-vent polychaete *Archinome rosacea* (family Archinomidae). **Canadian Journal of Zoology**, 81: 582-90.
- Witman, J. D. 1988. Effects of predation by the fireworm *Hermodice carunculata* on Milleporid hydrocorals. **Bulletin of Marine Science**, 42: 446-458.
- Wolf, A. T., Nugues, M. M. & Wild, C. 2014. Distribution, food preference, and trophic position of the corallivorous fireworm *Hermodice carunculata* in a Caribbean coral reef. **Coral Reefs**, 33: 1153-1163.

Received: May 2017

Accepted: August 2017

Published: September 2017