

SHORT COMMUNICATION

SECOND REPORT OF THE OCCURRENCE OF GIANT TIGER PRAWN, *Penaeus monodon* FABRICIUS, 1798 (CRUSTACEA: DECAPODA), IN RIO GRANDE DO NORTE STATE, NORTHEAST BRAZIL

Segundo registro da ocorrência do camarão tigre gigante, *Penaeus monodon* Fabricius, 1798 (Crustacea: Decapoda), no Estado do Rio Grande do Norte, Nordeste do Brasil

Edivan Moraes de Souza Junior¹, José Garcia Júnior¹, Paulo Victor do Nascimento Araújo^{1*}, Carlos Eduardo Rocha Duarte Alencar², Fúlvio Aurélio de Moraes Freire²

ABSTRACT

*In April 2012, a specimen of giant tiger prawn, *Penaeus monodon*, was captured by an artisanal bottom trawlboat on the northern continental shelf of Rio Grande do Norte State, northeastern Brazil. This specimen, a female, was collected from a 4-meter depth, had a partial total length of 249.6 mm and weighted 173 g. This is the second report of *P. monodon* off the coast of Rio Grande do Norte, 11 years after the first record, which suggests an ongoing southward expansion of this species in northeastern Brazil.*

Keywords: *Penaeidae, *Penaeus monodon*, occurrence report, non-indigenous species, shrimp farming.*

RESUMO

*Em abril de 2012, um exemplar do camarão tigre gigante, *Penaeus monodon*, foi capturado por uma embarcação artesanal, utilizando rede de arrasto de fundo na região costeira da plataforma continental setentrional do Estado do Rio Grande do Norte, Nordeste do Brasil. O espécime, do sexo feminino, foi coletado a 4 metros de profundidade e possuía um comprimento total parcial de 249.6 mm e 173 g de peso total. Este é o segundo registro de *P. monodon* para o litoral do Rio Grande do Norte, 11 anos após o primeiro registro, o que sugere a expansão para o sul desta espécie no Nordeste do Brasil.*

Palavras-chaves: *Penaeidae, *Penaeus monodon*, registro de ocorrência, espécie exótica, carcinicultura.*

¹ Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte, Campus Macau. Rua das Margaridas, 300, Macau, RN 59500-000.

² Grupo de Estudos em Ecologia e Fisiologia de Animais Aquáticos, Universidade Federal do Rio Grande do Norte, Av. Senador Salgado Filho, 3000, Macau, RN 56078-970.

* Corresponding author: paulo.araujo@ifrn.edu.br

INTRODUCTION

Penaeus monodon Fabricius, 1798, is a prawn species belonging to the Penaeidae family. It is native from the western Indian Ocean and southeastern Pacific Ocean, and has been recorded in southern Japan, Korea, China, Taiwan, Philippines, Vietnam, Cambodia, Malaysia, Singapore, Indonesia, Papua New Guinea, Australia, Thailand, Myanmar, Bangladesh, Sri Lanka, India, Pakistan, Tanzania, Madagascar, South Africa and the Red Sea (Motoh, 1981; FAO, 2012; Fuller *et al.*, 2014). It is also known as giant tiger prawn, because of its great size and the presence of brown and yellow-colored stripes along its abdomen, carapace, flippers and appendices. According to Holthuis (1980), this species inhabits the continental shelf, up to 100 meters deep, in predominantly sandy or muddy bottoms. It also shows outstanding ontogenetic distribution, with juveniles inhabiting the estuary and adults migrating to the sea. When adults, the individuals may reach a total length of 330 mm, with the females being larger than males (FAO, 2012).

Giant tiger prawn has been widely cultivated out of its natural distribution area, for instance, in both sides of Atlantic, so that populations have already settled in many locations as made up of individuals having escaped from shrimp farming ponds, namely southeastern Atlantic (Sahel & West Africa Club, 2006; Global Biodiversity Information Facility, 2013), northwestern Atlantic and Gulf of Mexico (Fuller *et al.*, 2014), Caribbean (Gómez-Lemos & Campos 2008), and the southwestern Atlantic, from Colombia to Brazil (Coelho *et al.*, 2001; Silva *et al.*, 2002; Aguado & Sayegh, 2007; Cintra *et al.*, 2011; Aguirre-Pabón *et al.*, 2015).

According to Wakida-Kusunoki *et al.* (2013), ecological impacts by the giant tiger prawn in non-indigenous environments are poorly known. However, considering that the species is a predator of limp-bodied invertebrates, and behaves more aggressively than native prawns, it may produce negative ecological effects, including higher consumption of small crab species, bivalves and gastropods; transmission of pathogens; interspecific competition for space and food, interference with the behavior and/or reproductive success, and direct predation of native prawns (*e.g.*, Marte, 1980; De La Vega *et al.*, 2004; Molnar *et al.*, 2008; Knott *et al.*, 2012; Wakida-Kusunoki *et al.*, 2013).

In the early 1980s, *P. monodon* was introduced into Brazilian shrimp farms through the pioneer "Prawn Project", developed by the government of Rio Grande do Norte State, which was considered particularly relevant for the development of shrimp

farming in the country (Lopes *et al.*, 2009). Extensive cultivations of *P. monodon* had a promising start but soon several harvest failures occurred due to high cost of feeds so that its rearing was definitely dismissed as economically unfeasible. Later on, this species was replaced by *Litopenaeus vannamei* (Leão *et al.*, 2011), which presented more satisfactory qualities and productive results (Barbieri Júnior & Ostrensk Neto, 2001).

Several authors relate the pervasive presence of *P. monodon* off the Brazilian coast, from the states of Amapá to São Paulo (*e.g.*, Fausto-Filho, 1987; Rodrigues *et al.*, 2000; Coelho *et al.*, 2001; Santos & Coelho, 2002; Silva *et al.*, 2002; Migotto & Marques, 2003; Tavares & Mendonça, 2004; Santos & Coelho, 2007; Instituto Hórus, 2009; Cintra *et al.*, 2011; Silva & Barros, 2011; Leão *et al.*, 2011). In addition, there are three anecdotal records of *P. monodon* off the coast of Ceará State, in a westward position in relation to the one herein reported.

A project dealing with the occurrence of non-indigenous species on the continental shelf of Northeast Brazil reported the first specimen of *P. monodon* off Rio Grande do Norte State, caught by shrimp trawler at 10 - 20 meters depth in the period from April to July, 2001, but with no specific location given (Santos & Coelho, 2007).

Thus, the aim of this study was report the second time, after about 11 years of their first record, the confirmation of giant tiger prawns, *P. monodon*, invading the coast of Rio Grande do Norte, northeastern Brazil.

MATERIAL AND METHODS

In April 2012, a specimen of the giant tiger prawn, *P. monodon*, was captured by an artisanal craft, by using a bottom trawl at the coastal region of northern shelf of Rio Grande do Norte, Galinhos county, northeastern Brazil (Figure 1). At the time of capture, trawling was being made at 05°05'17.4"S - 36°15'17.4"W longitude, about 700 meters far from the Galinhos beach coastline, at 4-meters deep. The sex of the animal was identified by the presence of the thelycum, and the partial measurements of total length (PTL), carapace length (PCL), carapace width (CW) and carapace depth (CD) were performed with the aid of a digital caliper ruler; total weight (TW) was obtained by using a digital precision scale. The specimen was deposited in the scientific collection of the *Grupo de Estudos em Ecologia e Fisiologia de Animais Aquáticos* at Rio Grande do Norte Federal University, voucher number GEEFAA/UFRN-194.

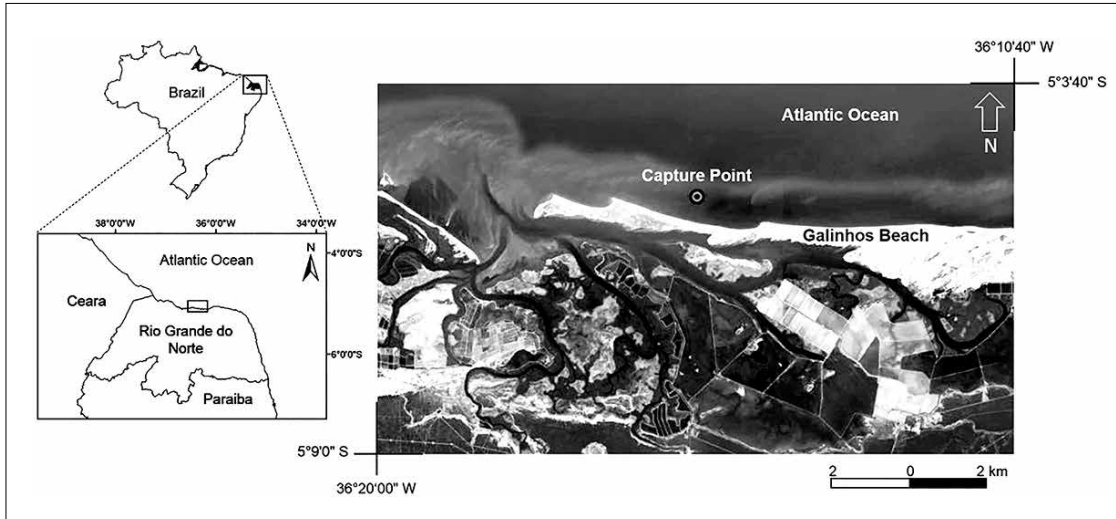


Figure 1 - Location of the capture point of *Penaeus monodon*, off northern Rio Grande do Norte State, Northeast Brazil.

RESULTS AND DISCUSSION

The female specimen of *P. monodon* was captured in April, 2012, and measured 249.59 mm PTL, 75.43 mm PCL and 173 g TW (Table I; Figure 2). The morphometric values obtained were close to average ones found in the literature (e.g., Santos & Coelho, 2002 e 2007; Cintra *et al.*, 2011; Natarajan *et al.*, 2011; Wakida-Kusunoki *et al.*, 2013; Fuller *et al.*, 2014). According to Motoh (1981), females of *P. monodon* with carapace length greater than 47 mm and a structurally complete thelycum are sexually mature and since the identified individual possessed these traits, it is possible that at least one spawning had already occurred.

Table I - Morphometric variables of a female specimen of *Penaeus monodon* collected off Rio Grande do Norte State, Northeast Brazil.

Variable (mm)	Value
PTL	249,59
PCL	75,43
CW	40,30
CD	46,49
TW (g)	17,00

This is the second confirmed report of *P. monodon* occurrence in the shore of Rio Grande do Norte, subsequent to its first occurrence, 11 years ago. Because both adult and juvenile individuals have been found on the coast of northeastern Brazil (Coelho *et al.*, 2001; Santos & Coelho, 2002) it is certain that this animal is

reproducing and completing its entire life cycle in Brazilian waters.

Considering the records gathered here, it might be inferred that the distribution of *P. monodon* in the southwestern Atlantic goes from Colombia to São

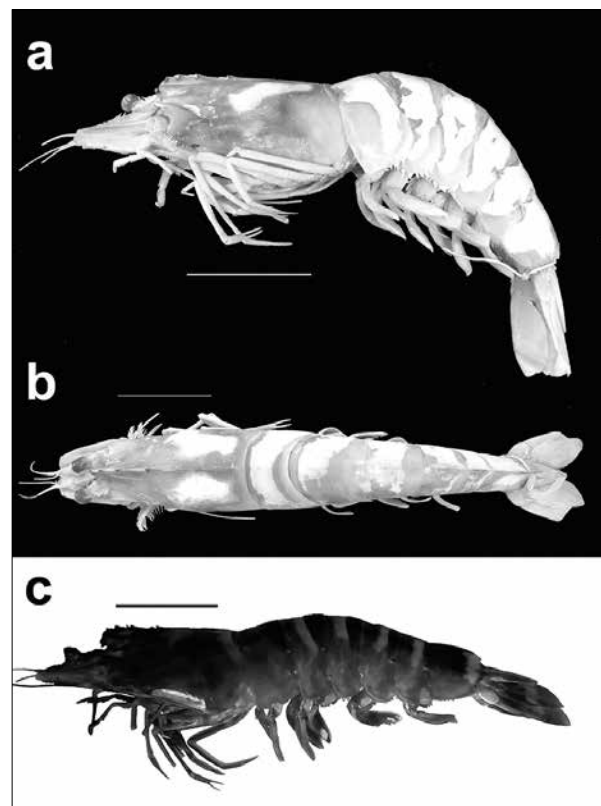


Figure 2 - (GEEFAA/UFRN - 194) *Penaeus monodon* collected off Rio Grande do Norte State, Northeast Brazil: (a) side view, (b) top view of the collected specimen and, (c) side view of the fresh specimen. Scale bar = 60 mm.

Paulo (Brazil), a coastline of approximately 10,000 km. This collection likely represents a southward expansion of the known Atlantic population, a fact which is not unexpected as larvae would be transported southward by the Brazil Current.

As of yet, there is no evidence of changing species composition in the biocensis caught by artisanal fisheries. There has been no effort to sample or gather occurrence records in Brazil that could be used to determine the population structure of the species on the Brazilian coast. A more effective sampling effort might reduce the current geographic gaps in existing records. Studies from the region to the south of São Paulo could reveal the southern limit of the species and track its expansion. Finally, more studies are needed in order to investigate the dynamic establishment of the Brazilian coast.

REFERENCES

- Abrunhosa, F.A. *Curso técnico em pesca e aquicultura: carcinicultura*. Instituto Federal de Educação, Ciência e Tecnologia do Pará. Sistema Escola Técnica Aberta do Brasil - e-Tec Brasil, 79 p. Acessado em Junho de 2014.
- Aguado, N.G. & Sayegh, J. Presencia del camarón tigre gigante *Penaeus monodon* (Crustacea, Penaeidae) en la costas del Estado Anzoátegui, Venezuela. *Bol. Inst. Oceanogr.*, v. 46, p.107-111, 2007.
- Aguirre-Pabón, J.C.; Berdugo Jr., G.O. & Barandica, J.C.N. Genetic status, source and establishment risk of the giant tiger shrimp (Penaeidae: *Penaeus monodon*), an invasive species in Colombian Caribbean waters. *Acta Biol. Colom.*, v.20, n.1, p.117-127, 2015.
- Barbieri Júnior, R.C. & Ostrensk Neto, A. *Camarões marinhos: reprodução, maturação e larvicultura*. Aprenda Fácil, Viçosa, 2001.
- Cintra, I.H.A.; Paiva K.S.; Botelho, M.N. & Silva, K.C.A. Presence of *Penaeus monodon* in the continental shelf of the State of Pará, Northern Brazil (Crustacea, Decapoda, Penaeidae). *Rev. Ciên. Agr.*, v.54, n.3, p.314-317, 2011.
- Coelho, P.A.; Santos, M.C.F. & Ramos-Porto, M. Ocorrência de *Penaeus monodon* Fabricius, 1798 no litoral dos estados de Pernambuco e Alagoas (Crustacea, Decapoda, Penaeidae). *Bol. Téc. Cient. CEPENE*, v.9, p.149-153, 2001.
- De La Vega, E.; Degnan, B.M.; Hall, M.R.; Cowley, J.A. & Wilson, J.K. Quantitative real time RT-PCR demonstrates that handling stress can lead to rapid increases of gill-associated virus (GAV) infection levels in *Penaeus monodon*. *Dis. Aquat. Organ.*, v.59, p.195-203, 2004.
- FAO. Species fact sheets: *Penaeus monodon* (Fabricius, 1798), in FAO Fisheries and Aquaculture Department, 2012. Accessed 09 Jun 2014.
- Fausto-Filho J. Registro da captura de *Penaeus monodon* Fabricius no litoral do estado do Maranhão, Brasil (Crustacea: Penaeidae). *Arq. Ciên. Mar*, Fortaleza, v.26, p.81-82, 1987.
- Fuller, P.L.; Knott, D.M.; Kingsley-Smith, P.R.; Morris, J.A.; Buckel, C.A.; Hunter, M.E. & Hartman L.D. Invasion of Asian tiger shrimp, *Penaeus monodon* Fabricius, 1798, in the western north Atlantic and Gulf of Mexico. *Aquatic Invasions*, v.9, n.1, p.59-70, 2014.
- Global Biodiversity Information Facility. *Biodiversity occurrence data published by: Senckenberg: Collection Crustacea - ZMB*, 2013. Accessed through Global Biodiversity Information Data Portal, 2014.
- Gómez-Lemos, L.A. & Campos, N.H. Presencia de *Penaeus monodon* Fabricius (Crustacea: Decapoda: Penaeidae) em aguas de la Guajira colombiana. *Bol. Invest. Marit.*, v.23, p.221-225, 2008.
- Holthuis, L.B. FAO species catalogue: shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, Rome, v.1, n.125, 1980.
- InstitutoHórus - InstitutoHórus de Desenvolvimento e Conservação Ambiental/The Nature Conservancy. *Base de dados sobre espécies exóticas invasoras em 13 N-Brasil*, 2013. Accessed 09 Jun 2014.
- Knott, D.M.; Fuller, P.L.; Benson, A.J. & Neilson M.E. *Penaeus monodon*. *USGS Nonindigenous Aquatic Species Database*, Gainesville F.L. Accessed 8 Jun 2012.
- Leão, T.C.C.; Almeida, W.R.; Dechoum, M. & Ziller S.R. *Espécies exóticas invasoras no Nordeste do Brasil: contextualização, manejo e políticas públicas*. Centro de Pesquisas Ambientais do Nordeste e Instituto Hórus de Desenvolvimento e Conservação Ambiental, 99 p., Recife, 2011.
- Lester, L.J. Developing a selective breeding program for penaeid shrimp mariculture. *Aquaculture*, v.33, p.41-50, 1983.
- Lopes, R.M.; Coradin, L.; Pombo, V.B. & Cunha, D.R. *Informe sobre as espécies exóticas invasoras marinhas no Brasil*. Ministério do Meio Ambiente, 440 p., Brasília, 2009.

- Marte, C.L. The food and feeding habit of *Penaeus monodon* Fabricius collected from Makato River, Aklan, Philippines (Decapoda, Natantia). *Crustaceana*, v.38, p.225-236, 1980.
- Migotto, A.E. & Marques, A.C. *Avaliação do estado do conhecimento da diversidade biológica do Brasil: invertebrados marinhos*. Ministério do Meio Ambiente, 2003. Acesso em 09/06/2014.
- Molnar, J.L.; Gamboa, R.L.; Revenga, C. & Spalding, M.D. Assessing the global threat of invasive species to marine biodiversity. *Front. Ecol. Environ.*, v.6, n.9, p.485-492, 2008.
- Motoh, H. *Studies on the fisheries biology of the giant tiger prawn, Penaeus monodon in the Philippines*. Technical Report n. 7, SEAFDEC, 128 p., 1981.
- Rodrigues, E.S.; Barreto, O.J.S. & Perroni R.W. *Penaeus monodon* Fabricius (Crustacea, Decapoda, Penaeidae) no estuário de Santos, in *Resumos do Congresso Brasileiro sobre Crustáceos*, 186 p., São Pedro, 2000.
- Sahel and West Africa Club. *Exploring economic opportunities in sustainable shrimp farming in West Africa: focus on South-South cooperation*. Meeting Report - 2006. Organization for Economic Co-operation and Development. Accessed 09 Jun 2014.
- Santos, M.C.F. & Coelho P.A. Espécies exóticas de camarões peneídeos (*Penaeus monodon* Fabricius, 1798 e *Litopenaeus vannamei* Boone, 1931) nos ambientes estuarino e marinho do Nordeste do Brasil. *Bol. Téc. Cient. CEPENE*, v.10, n.1, p.209-222, 2002.
- Santos, M.C.F. & Coelho P.A. Crustáceos exóticos reproduzindo em águas costeiras do Nordeste do Brasil. *Bol. Téc. Cient. CEPENE*, v.15, n.1, p.57-61, 2007.
- Silva, E.C.S. & Barros, F. Macrofauna bentônica introduzida no Brasil: Lista de espécies marinhas e dulcícolas e distribuição atual. *Oecologia Australis*, v.15, n.2, p.326-344, 2011.
- Silva, K.C.A.; Ramos-Porto, M. & Cintra, I.H.A. Registro de *Penaeus monodon* Fabricius, 1798, na plataforma continental do Estado do Amapá (Crustacea, Decapoda, Penaeidae). *Bol. Téc. Cient. CEPNOR*, v.2, n.1, p.75-80, 2002.
- Tavares, M. & Mendonça Jr., J.B. Introdução de crustáceos exóticos no Brasil: uma roleta ecológica, p.59-76, in Silva, J.S.V. & Souza, R.C.C.L. (orgs.), *Água de lastro e bioinvasão*. Interciência, 224 p., Rio de Janeiro, 2004.
- Wakida-Kusunoki, A.T.; Rojas-González, R.I.; Gomzález-Cruz, A.; Angel, L.E.A.; Sánchez-Cruz, J.L. & Tellez, N.A.L. Presence of giant tiger shrimp *Penaeus monodon* Fabricius, 1798 on the Mexican coast of the Gulf of México. *Bioinvasions Records*, v.2, n.4, p.325-328, 2013.