NATUREZA & CONSERVAÇÃO XXX (2016) XXX–XXX

ABECO
ASSOCIAÇÃO BRASILEIRA DE CIÊNCIA ECOLÓGICA E CONSERVAÇÃO

Natureza & Conservação
Brazilian Journal of Nature Conservation
Supported by Boticário Group Foundation for Nature Protection
http://www.naturezaeconservacao.com.br

Policy Forums

Environmental licensing on rhodolith beds: insights from a worm

Cinthya Simone Gomes Santos[a], *Jaqueline Barreto Lino*[b], *Priscila de Cerqueira Veras*[b,c], *Gilberto Menezes Amado-Filho*[d], *Ronaldo Bastos Francini-Filho*[e], *Fabio Santos Motta*[b], *Rodrigo Leão de Moura*[f], *Guilherme Henrique Pereira-Filho*[b,*]

[a] *Department of Marine Biology, Institute of Biology, Universidade Federal Fluminense, Niterói, RJ, Brazil*
[b] *Instituto do Mar, Laboratório de Ecologia e Conservação Marinha, Universidade Federal de São Paulo, Santos, SP, Brazil*
[c] *Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, São Bernardo do Campo, SP, Brazil*
[d] *Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, RJ, Brazil*
[e] *Department of Engineering and Environment, Universidade Federal da Paraíba, Rio Tinto, PB, Brazil*
[f] *Instituto de Biologia and SAGE-COPPE, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil*

ARTICLE INFO

Article history:
Received 12 January 2016
Accepted 7 June 2016
Available online xxx

Keywords:
Marine diversity
Maerl
Mesophotic reefs
Crustose coralline algae

ABSTRACT

Rhodoliths are free-living nodules formed by crustose coralline algae that promote multi-dimensional microhabitats for a highly diverse community. Because their $CaCO_3$ production, rhodolith beds constitute areas of interest for mining activities. On the other hand, other goods and services provided by these environments such as nurseries habitats, fishing and climate regulation remain undersized. Besides directly $CaCO_3$ exploitation, these diverse ecosystems within the Brazilian economic exclusive zone are often covering potentially sites for oil and gas extraction. The IBAMA (Environmental Agency of the Brazilian government) have been applying the precautionary principle to deny requests for oil/gas drilling activities where rhodolith beds occur. Here, we discuss recent data about diversity associated with rhodoliths and also record the "rare" worm *Nuchalosyllis* cf. *maiteae*. More than the distribution of one only species, our finding is an emblematic example of our infancy knowledge state about diversity associated with rhodolith beds in southwestern Atlantic. We argue that these knowledge is still insufficient to subside any attempt in classify priorities areas for oil wells drilling. In addition, we claim that the precautionary principle adopted by IBAMA must prevalence until we have robust data allowing predictions concerning higher or lower biodiversity associated with rhodolith beds.

* *Corresponding author*.
E-mail address: pereira.filho@unifesp.br (G.H. Pereira-Filho).
http://dx.doi.org/10.1016/j.ncon.2016.06.002

Please cite this article in press as: Santos, C.S., et al., Environmental licensing on rhodolith beds: insights from a worm. Nat Conservacao. 2016. http://dx.doi.org/10.1016/j.ncon.2016.06.002

Rhodoliths are free-living calcareous nodules built mainly by crustose coralline algae. They occur worldwide and may form large beds that cover huge expanse of tropical, temperate, and even polar shelves, providing multi-dimensional hard microhabitats for diverse biological communities (Foster et al., 2013). Because of their huge $CaCO_3$ accumulation, rhodolith beds constitute areas of great interest for carbonates' mining that supplies agricultural and industrial applications (Amado-Filho et al., 2012a; Moura et al., 2013). While rhodolith beds are largely and mistakenly seen as mineral resources, the ecosystem services they provide, such as fishing and climate regulation, are grossly underrated in environmental impact assessments (Amado-Filho and Pereira-Filho, 2012). In Brazil, the country with the world's largest rhodolith beds, extraction of up to 18 t/company year^{-1} may be regularly licensed by IBAMA, the Federal Environmental Licensing Agency (Instrução Normativa 89, Feb. 02, 2006). Although sub-surface rhodoliths are often alive and definitely harbor high marine biodiversity, the Brazilian law refers to them as non-living marine resources, with exploratory regulations established by the National Mining Department (Departamento Nacional de Produção Mineral – DNPDM). Moreover, rhodolith beds overlap with several oil and gas fields within the Brazilian Economic Exclusive Zone (EEZ). The building of new infrastructure in such areas has been recently restricted by IBAMA, based on the Precautionary Principle – a fundamental tool for countering the chronic overlook of scientific uncertainties in an unscientific manner (Cooney, 2004).

Despite recent progress (e.g., Riul et al., 2009; Amado-Filho et al., 2010; Bahia et al., 2010; Brasileiro et al., 2015), knowledge about the distribution and biodiversity associated with rhodolith beds in Brazil is still fragmented and incomplete, impeding thorough environmental impact assessments of the steadily growing industrial activities. Paradoxically, uncertainties in predicting environmental impacts have been evoqued by economic groups as a reason for the approval of mining licenses (Cooney, 2004). Once rhodolith beds cover extensive areas of the Brazilian EEZ (Fig. 1A), large-scale mining and hydrocarbon's exploitation are indeed an imminent threat with yet unpredictable consequences. Here, while recording the occurrence of the "rare genus" *Nuchalosyllis* (Polychaeta) in the Fernando de Noronha Archipelago (FNA), we emphasize the major knowledge gaps about the biodiversity associated to Brazilian rhodolith beds, and the consequences for environmental licensing.

Before our find (Fig. 1) (specimen deposited in MNRJP785), *Nuchalosyllis maiteae* was only known for the holotype (MZUSP 01016) collected at 75 m depth offshore Rio de Janeiro State (Fukuda and Nogueira, 2012). Such as other known specie of the same genus, *N. maiteae* was initially obtained by ship-based dredging and grabbing. Despite being the tools used to provide most of the currently available biological data about rhodolith-associated biodiversity (Foster et al., 2013), dredging and grabbing are limited for sampling small invertebrates within rhodoliths' microhabitats, especially the soft bodied, cryptic and infaunal species that can have

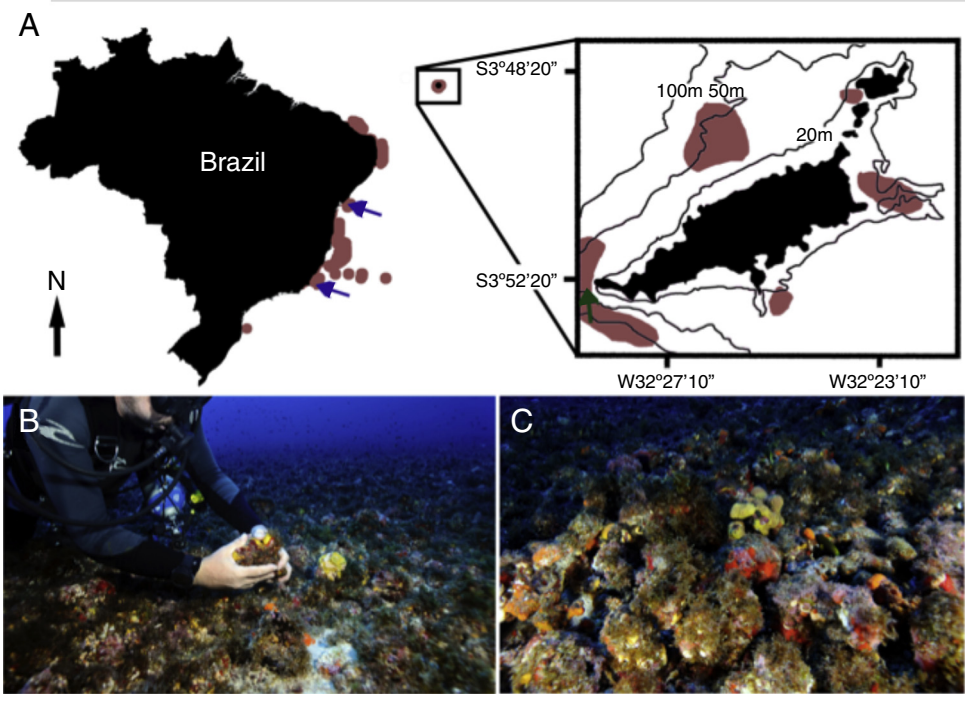

Fig. 1 – Sampling localities for all known specimens of *Nuchalosyllis*. (A) Fernando de Noronha Archipelago (detail). Light brown patches indicate areas where rhodolith beds have been mapped (Gherardi, 2004; Pascelli et al., 2013; Amado-Filho et al., 2007; Amado-Filho et al., 2010; Villas-Boas et al., 2013; Pereira-Filho et al., 2012; Amado-Filho et al., 2012a; Bahia et al., 2010; Riul et al., 2009; Testa and Bosence, 1999; Amado-Filho et al., 2012b, respectively from south to north). Blue arrows indicate localities of the two known *Nuchalosyllis* species, (Fukuda and Nogueira, 2012; Rullier and Amoureux, 1979). Dark green arrow indicates the site where we sampled *Nuchalosyllis* at 40 m depth. (B and C) Detail of rhodolith bed (Photos: Zaira Matheus).

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