

Stalked barnacle (*Pollicipes pollicipes*) harvesting in the Berlengas Nature Reserve, Portugal: temporal variation and validation of logbook data

David Jacinto, Teresa Cruz, Teresa Silva, and João J. Castro

Jacinto, D., Cruz, T., Silva, T., and Castro, J. J. 2010. Stalked barnacle (*Pollicipes pollicipes*) harvesting in the Berlengas Nature Reserve, Portugal: temporal variation and validation of logbook data. – ICES Journal of Marine Science, 67: 19–25.

Stalked barnacle (*Pollicipes pollicipes*) exploitation at the Berlengas Nature Reserve, Portugal, by professional harvesters has been subject to specific regulation since 2000. The only available information on barnacle exploitation there comes from catch reports (logbooks) provided by the harvesters. We evaluated the quality of the logbook information, described the temporal patterns of *P. pollicipes* fishing effort from 2000 to 2006 based on the logbook data, and modelled the daily fishing effort in relation to variability in oceanographic conditions. Results suggest different levels of reliability for the information contained in the logbooks: (i) information on the date of harvest seems to be reliable because 83% of the observed harvest dates were also declared; (ii) information on the quantity harvested shows a large discrepancy (mean = 31.8%) between declared and observed amounts, but we believe it can be used to analyse temporal patterns of exploitation, because there was no systematic bias (under- and overreporting was to the same extent). The total quantity of barnacles harvested between 2000 and 2006 ($\sim 16 \text{ t year}^{-1}$) was closely related to the effort applied. Daily harvesting effort was considered a function of two predictive variables (significant wave height and tidal range) and of their interaction. Neither the harvesting activity nor the resource itself seems to be at risk of collapse if such levels of pressure are maintained, but efforts should be made to increase surveillance and monitoring within the marine protected area.

Keywords: Berlengas, fishery, harvesting, marine reserve, *Pollicipes*, Portugal, stalked barnacle.

Received 24 March 2009; accepted 27 July 2009; advance access publication 15 September 2009.

D. Jacinto, T. Cruz, T. Silva, and J. J. Castro: Laboratório de Ciências do Mar (CIEMAR), Universidade de Évora, Apartado 190, 7520-903 Sines, Portugal, and Centro de Oceanografia, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal. T. Cruz and J. J. Castro: Departamento de Biologia, Universidade de Évora, 7002-554 Évora, Portugal. Correspondence to D. Jacinto: Tel: +351 269 634 250; fax: +351 269 862 057; e-mail: djacinto@uevora.pt.

Introduction

In the Iberian Peninsula, the stalked barnacle *Pollicipes pollicipes* is considered a delicacy and is heavily exploited for human consumption wherever it is abundant (Cruz, 2000; Molares and Freire, 2003; Bald *et al.*, 2006; Borja *et al.*, 2006b; Jesus, 2006). Owing to a strong market demand (Bernard, 1988; Lessard *et al.*, 2003), its distribution limited to very exposed shores (Barnes, 1996; Borja *et al.*, 2006a), and the difficulty and risk associated with the fishery (Molares and Freire, 2003), *P. pollicipes* (“percebes”) price can be $>€50 \text{ kg}^{-1}$ at first sale. Its commercial fishery is an important or exclusive income for local fishers in northwest Spain and western Portugal.

In Galicia, northwest Spain (Figure 1), barnacle harvesting is a very important activity, involving around 1650 persons from local communities, yielding $\sim 409 \text{ t}$ and $€11$ million annually (average 2001–2005; source: www.pescadegalicia.com). Since 1992, *P. pollicipes* exploitation in Galicia has been managed by a community-based cooperative system, responsibility for the exploitation of the resource being shared between fisher guilds (“cofradías”) and fishery authorities (Molares and Freire, 2003). According to those authors, such a management system is yielding excellent results in some cofradías at an organizational, social, and

economic level, whereas in other cofradías there are still problems to solve.

In the Basque Country (northern Spain), the Gaztelugatxe Marine Reserve was created in 1998 with the aim, *inter alia*, of protecting the stalked barnacle populations and repair the subsequent damage of the associated species communities caused by barnacle harvesting (Borja *et al.*, 2006b). Since 1998, barnacle harvesting has been forbidden there. According to the system dynamic model proposed by Bald *et al.* (2006), the harvesting prohibition in the reserve permits not only its own conservation, but also the maintenance of other exploited adjacent areas, because the protected populations may act as a spawning pool of larvae to nourish and sustain the exploited areas.

To our knowledge, no information has been published on exploitation of *P. pollicipes* in other areas of its distribution (e.g. France, Morocco). Published information on the exploitation and conservation of other species of *Pollicipes* is restricted to the situation in British Columbia, Canada (Jamieson *et al.*, 1999; Lauzier, 1999a, b; Lessard *et al.*, 2003). There, the fishery for *P. polymerus* was closed in 1999 because of concerns about the lack of biological and stock-assessment information on barnacles, information on the ecological impacts of harvesting to the rocky