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Extending the southern range of four shrimps (Crustacea: Decapoda: Stenopodidae, Hippolytidae and Alpheidae) in southwestern Atlantic (27° S) and confirming the presence of Mediterranean *Stenopus spinosus* Risso, 1827 in Brazil

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Abstract

In subtidal zones, certain shrimp species with cryptic behaviour represent a gap in the biodiversity description in many places in the world. This study extends the southern limit of *Stenopus hispidus* (Oliver, 1811), *Alpheus formosus* Gibbes, 1850, *Alpheus* cf. *packardii* Kingsley, 1880 and *Lysmata ankeri* Rhyne & Lin, 2006 to Santa Catarina State—Brazil, 27°S. The results also confirm the new occurrence of *Stenopus spinosus* Risso, 1827 in Brazilian waters. All specimens were collected by scuba diving from rocky islands between 3 and 25 meters depth. We present for each species certain taxonomic features in colour images that will help to identify these decapods *in situ* in further monitoring programs.

Key words: new occurrence, scuba dive, cryptic habit, rocky shore, marine bioinvasion, underwater monitoring

Introduction

Crustacean decapods are one of the most remarkable taxa in marine ecosystems with high diversity and importance in fisheries and trophic dynamics. However, due to cryptic habits they usually live hidden during daylight in fissures, cavities, caves and under soft bottoms and are rarely observed by marine scientists in their natural habitats (Williams 1984; Denitto *et al.* 2009; Stier & Leray 2013; Poupin & Starmer 2013; Giraldes *et al.* 2014). This cryptic behaviour is the main reason marine scientists capture these crustaceans with indirect sampling methods. For example, using nets, traps or cores involving a removal of the whole substrate for further sorting in the laboratory and only decapods from intertidal and supratidal zones are manually captured in natural habitat (Coelho & Ramos-Porto 1998; Masunari & Dubiaski-Silva 1998; Coelho-Filho 2006; Giraldes *et al.* 2014).

Scuba diving has been a revolutionary tool in research and discovery for the marine sciences (Lang *et al.* 2013). It allows scientists to capture rare decapods inside deep cavities from hard substrates as well as decapods associated with sessile benthic organisms. These areas were previously inaccessible using traditional sampling methods. As evident from several new decapod occurrences having been reported in Brazil by Gregati *et al.* (2006), Bouzon & Freire (2007), Teschima *et al.* (2012), and Giraldes *et al.* (2012b), also in other parts of the world by Lee & Ko (2011), Oliveira *et al.* (2011) and Poupin & Starmer (2013).

Current biodiversity research using scuba diving in shallow rocky reefs in the southern coast of Brazil has yielded new information about decapods with cryptic habits. In agreement with this, here we present the southern limit extension in the southwestern Atlantic ocean (27°S) for *Stenopus hispidus* (Olivier, 1811), *Alpheus formosus* Gibbes, 1850, *Alpheus* cf. *packardii* Kingsley, 1880 and *Lysmata ankeri* Rhyne & Lin, 2006 and report the new occurrence of *Stenopus spinosus* Risso, 1827 in Brazil, confirming its presence previously commented by Calado (2008).