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Internal bioerosion in dead and live hard corals in intertidal zone of Hormuz Island (Persian Gulf)

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ABSTRACT

Internal macrobioeroders and their erosion rate in three live and dead coral genera (*Favia*, *Platygyra* and *Porites*) from the intertidal zone of the Hormuz Island were studied by collecting five live and five dead colonies from each genus, from which 4 mm cross-sections were cut and photographed. Photos were analyzed using the Coral Point Count with Excel extensions. Totally, 9 taxa were identified: four bivalve species, one sponge, three polychaetes, and one barnacle. Bioerosion rate did not significantly differ among the three live corals, but among the dead ones only *Porites* was significantly more eroded than *Favia*. Sponge had the highest role in the erosion of the dead *Platygyra*, while barnacles were the most effective eroding organism in the live *Platygyra*. Polychaetes, followed by bivalves, were the most destructive bioeroders on the dead and live *Porites*. Further, none of the bioeroding organisms had selectively chosen either the dead or live *Favia*.

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1. Introduction

Bioerosion, defined as degradation of calcium carbonate by an organism (Numann, 1966), is one of the most important destructive processes affecting the balance between coral reef construction and destruction (Hutchings, 1986; Risk et al., 1995). Scleractinian corals are dynamic and fragile ecosystems that provide habitats for a large number of macro- and microorganisms (Hutchings et al., 2005; Rotjan and Lewis, 2005; Scaps and Denis, 2008; Santos et al., 2012). Internal bioeroders burrow into live and dead coral carbonate skeletons and carbonate rocks for places to live, which make the corals more susceptible to physical erosion (Moran and Reaka, 1988; Fonseca et al., 2006; LeGrand and Fabricius, 2001). The five major internal macrobioeroding groups are sponges, bivalves, barnacles, polychaetes and sipunculans (Hutchings, 1986; Glynn, 1997; LeGrand and Fabricius, 2001). Boring organisms erode calcareous substrates mechanically, chemically or by a combination of both that influence reef morphology (Hutchings, 1986; Hutchings et al., 2005; Fonseca et al., 2006; Zundelevich et al., 2007). Bioerosion rate may vary considerably between sites, depending on borer species, coral density, and several other factors (Hallock and Schlager, 1986; Hallock, 1988; Rose and Risk, 1985; Holmes et al., 2000; Hutchings et al., 2005; Fonseca et al., 2006).

The Persian Gulf is a shallow semi-enclosed water body that is connected to the subtropical north-west of the Indian Ocean via the Strait of Hormuz (Coles and Fadlallah, 1991; Sheppard, 1993). Coral reefs in the Persian Gulf grow under harsh natural and anthropogenic conditions, which make them more susceptible to boring organisms (Ditlev, 1978; Addessi, 1992). The harsh environmental conditions of this water body have also limited the distribution and diversity of hard corals (Coles, 1988; Sheppard and Sheppard, 1991; Sheppard et al., 1992; Price, 1993). Although several works have been conducted on various aspects of hard corals in the northern part of the P. Gulf (Shokri et al., 2000; Fatemi and Shokri, 2001; Wilson et al., 2002; Ghavam Mostafavi et al., 2007; Kavousi et al., 2011; Seyfabadi et al., 2011), studies on bioeroders in the area are very limited; for instance, the relationship between the type of bioeroders and inland influx of nutrients in Nayband Bay (Dab et al., 2012), and the type of bioeroders in the intertidal and sublittoral zones of the Hengam Island (Ghanbari et al., 2012).

The present study aims to (1) make an inventory list of the internal macro-bioeroding species in dead and live hard corals in the intertidal zone of the Hormuz Island in the Strait of Hormuz, (2) to test whether the scale of bioerosion differs among the dead and live hard corals, and (3) to find out whether the host is selected by the bioeroders or not.

2. Material and methods

2.1. Study area

The study was conducted in the Hormuz Island (27° 06′ N, 56° 46′ E), located at the entrance to the Persian Gulf (i.e. Hormuz

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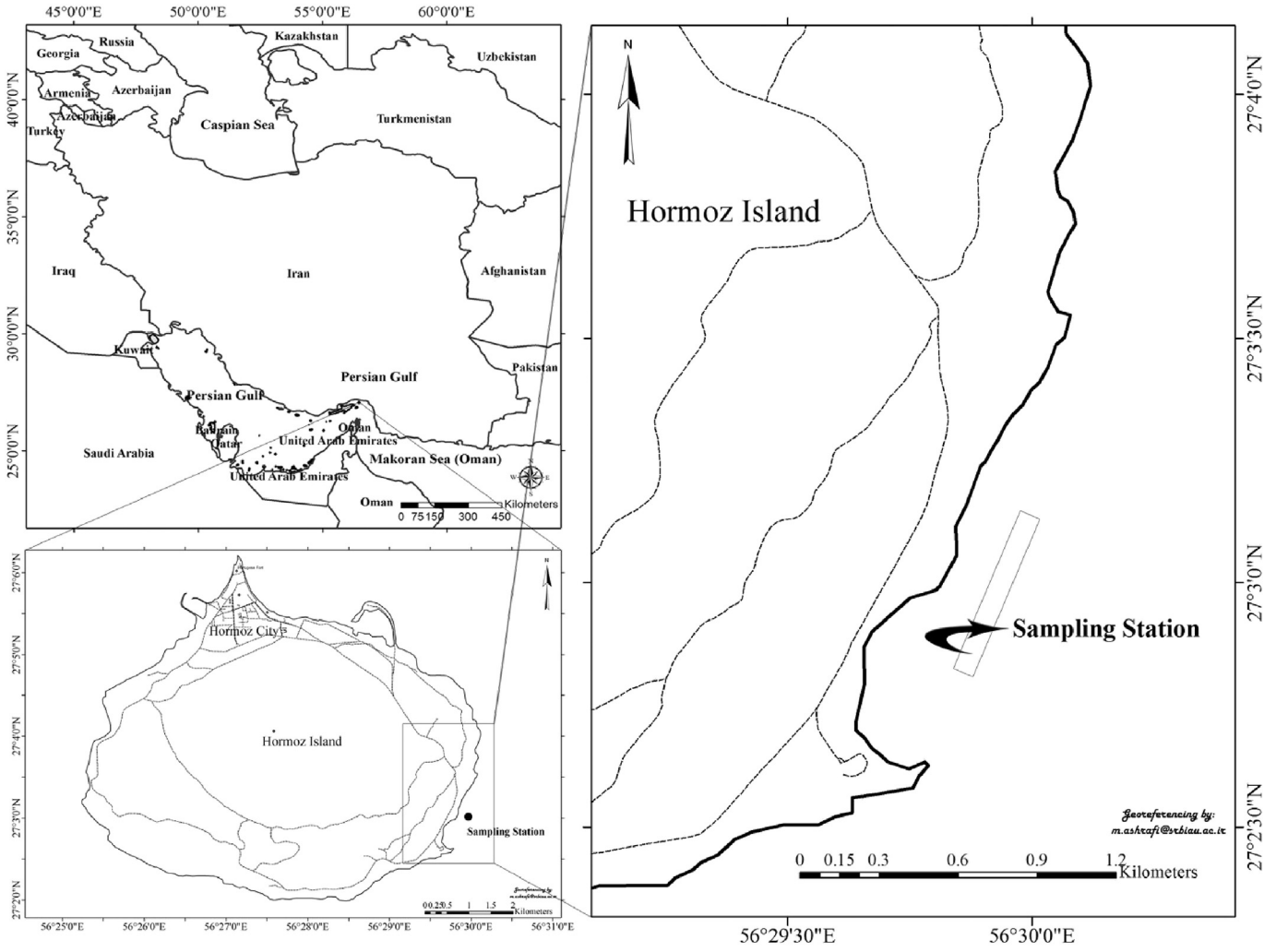

Fig. 1. Map showing the position of Hormuz Island and sampling station.

Strait) (Fig. 1). Sampling was restricted to an intertidal rocky area along the southeastern shorelines, where all the three genera of scleractinian corals (*Favia*, *Platygyra* and *Porites*) were existing along its 783 m stretch.

2.2. Field and laboratory surveys

Sampling was carried out during 2012. Five dead and five live specimens (almost 100 cm^2 in area, each) from the three dominant colonies

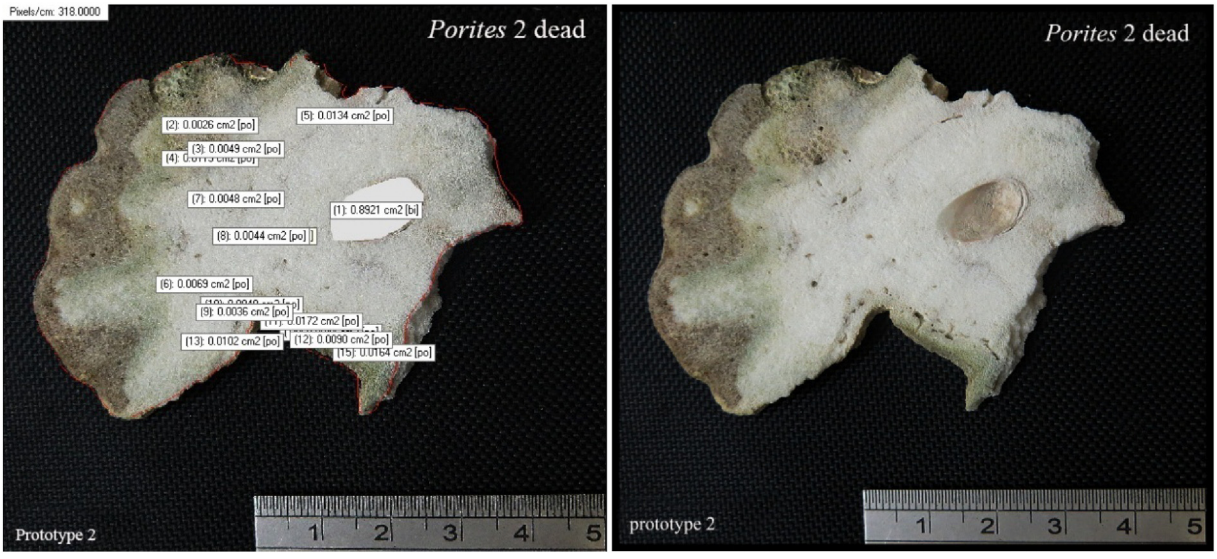

Fig. 2. An example of calculating the eroded area by internal bioeroders on coral segments using CPCe software.

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