

Original Research

The leaping behavior of the sally lightfoot crab *Grapsus grapsus* (Crustacea: Decapoda: Brachyura) at an oceanic archipelago

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ABSTRACT:

The genus *Grapsus* includes a total of nine recognized species of semi-terrestrial crabs. Among them, *Grapsus grapsus* (Linnaeus, 1758) stands popularly known as sally lightfoot crab. It is very abundant in Oceanic Islands, such as the Fernando de Noronha Archipelago, Brazil. The present study registered the behavior of jumping between the rocks by *G. grapsus* in the supralittoral of Fernando de Noronha Archipelago. Field observations were performed in May 2012, including video footage. The crabs, juveniles and adults, males and females, jump from a rock to another. This can be related to a defense habit, but it seems that the crabs also jump to avoid entering into the sea, or to escape from wave wash. Other registers on crabs jumping from literature are also discussed. However, more studies on this behavior are still necessary for understanding them completely.

Keywords:

Crab behavior, Fernando de Noronha Archipelago, Red rock crab, Semi-terrestrial crab.

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INTRODUCTION

The genus *Grapsus* Lamarck, 1801 (Grapsidae) includes a total of nine recognized species of semi-terrestrial crabs: *G. adscensionis* (Osbeck, 1765), *G. albolineatus* Latreille, in Milbert, 1812, *G. fourmanoiri* Crosnier, 1965, *G. granulatus* H. Milne Edwards, 1853, *G. grapsus* (Linnaeus, 1758), *G. huzardi* Desmarest, 1825, *G. intermedius* de Man, 1888, *G. longitarsis* Dana, 1851 and *G. tenuicrustatus* (Herbst, 1783) (WORMS, 2013; Ng *et al.*, 2008). Among these species, *G. grapsus*, stands out popularly and are known as red rock crab, sally lightfoot crab, "aratu" (in Portuguese) and "abuete negro" or "sayapa" (in Spanish). This species is found in the Pacific Ocean, from Baja California to Northern Chile, and Galapagos Islands, and in the Atlantic Ocean, from Bermudas, Florida, Gulf of Mexico, Antilles, Colombia, and from Venezuela to Brazil. In the Brazilian coast, this crab is found from the States of Ceará to Espírito Santo, but it is more abundant in the Oceanic islands (Fernando de Noronha Archipelago, Rocas Atoll and Saint Peter and Saint Paul Rocks) (Melo, 1996; Freire *et al.*, 2011). At Saint Peter and Saint Paul Rocks, (Ross 1847, *apud* Holthuis *et al.*, 1980) cited that this species is a predator of the eggs of birds that nest at the area, and Viana *et al.*, (2004) cited that this is one of the most abundant animal species on the rocks. Melo (1996) also signals the occurrence of this species at Trindade, a Brazilian volcanic island distant 1,167 km from the continent, but probably the species inhabiting this island is, in fact, *G. adscensionis* (Hartnoll, 2009). Ratti (2004) believed that the differences between *G. adscensionis* and *G. grapsus* were not enough to support two different species, but more recently, several authors such as Ng *et al.*, (2008) and Freire *et al.*, (2011), recognized the taxonomic validity of both species.

Among the oceanic island this species can be found, stands out the Fernando de Noronha Archipelago (FNA) (3°51'S, 32°25' W), a complex of volcanic islands

and rocks, which is found under jurisdiction of the State of Pernambuco, Northeast of Brazil. The benthic fauna of FNA was studied by Lopes and Alvarenga (1955) and Matthews and Kempf (1970) (Mollusca), Pires *et al.*, (1992) (Cnidaria), Mothes and Bastian (1993) and Muricy and Moraes (1998) (Porifera), among others. Several oceanographic expeditions explored the archipelago, such as H.M.S. Beagle Challenger Expedition, Hartt Expedition, Branner-Agassiz Expedition, Calypso, Canopus and Almirante Saldanha. The results of the Crustacea sampled on these expeditions can be found at several publications, such as Smith (1869), Miers (1886), Henderson (1888), Bate (1888), Rathbun (1900, 1918, 1925, among others), Forest and de Saint-Laurent (1967) and Coelho *et al.*, (2006, 2007, 2008). Fausto-Filho (1974) presented a list of the Decapoda and Stomatopoda collected by himself and based on some of the cited publications, which resulted in a total of 66 species (3 Stomatopoda and 63 Decapoda) for FNA. Included, there is *G. grapsus*. The species was considered very abundant, being found in all beaches. There is no doubt that the species inhabiting FNA is *G. grapsus*. They are commonly observed in the rocky shores of the islands that compose the archipelago, sharing the habitat with *Plagusia depressa* (Fabricius, 1775) (Plagusiidae). The present study aims to describe the jumping behavior of *Grapsus grapsus* at FNA during field observations.

MATERIAL AND METHODS

The archipelago is distant 545 km from the capital of Pernambuco, the Municipality of Recife, occupies an area of 26 km² and the main island, Fernando de Noronha, has an area of 17 km², being 6 miles long and 2 miles wide (Matthews and Kempf, 1970; Fausto-Filho, 1974). In May 2012, during three days, field observations and footages of this species were performed at Sueste Bay, FNA (Figure-1) (3°52'01" S; 32°25'19" W). At the bay, the Sueste Beach and the

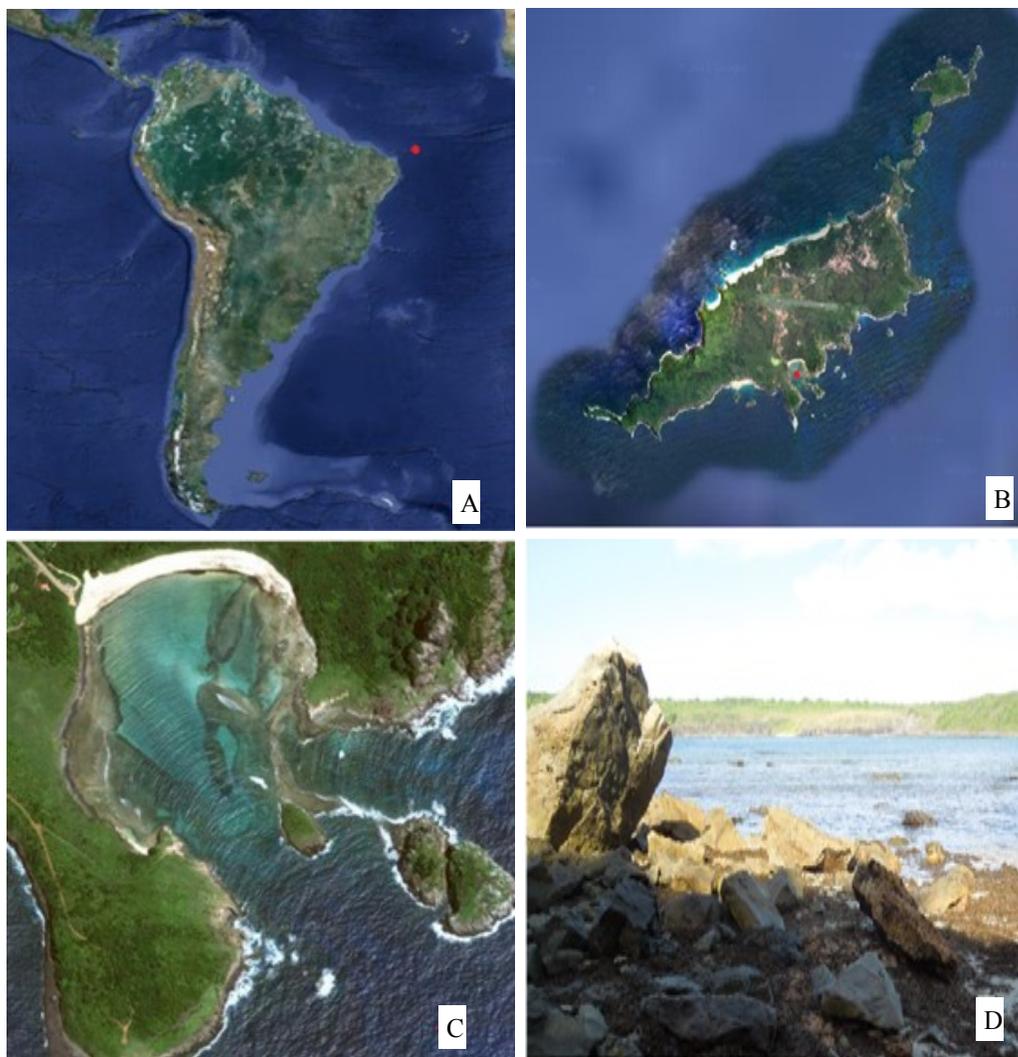


Figure 1. Brazilian coast with the location of the Fernando de Noronha Archipelago, FNA (A); FNA with the location of the Sueste Bay (B); Aerial view of the Sueste Bay (C); Rocky shore at Sueste Bay, where the field observations of *Grapsus grapsus* (Linnaeus, 1758) were performed (D).

Sueste Mangrove are included, the last one being considered the only oceanic mangrove of South Atlantic. In the seawater of the bay, there are several islets, such as Cabeluda, Chapéu, Ovos and Trinta-Réis.

The individuals of *Grapsus grapsus* were observed in the rocky shore of the bay. These rocks are mainly distributed in the extremities of the bay, and also serve as habitat for *Plagusia depressa*. The water was transparent and shallow, with a depth of 1m. The footage was performed with a Panasonic camera, DMC-FT10 model. After that, a bibliographic research was performed to seek possible registers of the jumping

behavior of crabs in the literature.

The air temperature and tidal heights for the dates of study were obtained through the Integrated System of Environmental Data (SINDA).

RESULTS AND DISCUSSION

The air temperature for the study period varied from 25.5 to 30°C (Figure-2), characterizing a tropical climate. The observations were performed during the dry period, equatorial summer. According to Ribeiro *et al.*, (2003, 2005), the FNA climate is of the type Aw of Köppen's classifications, i.e. tropical with semi-arid

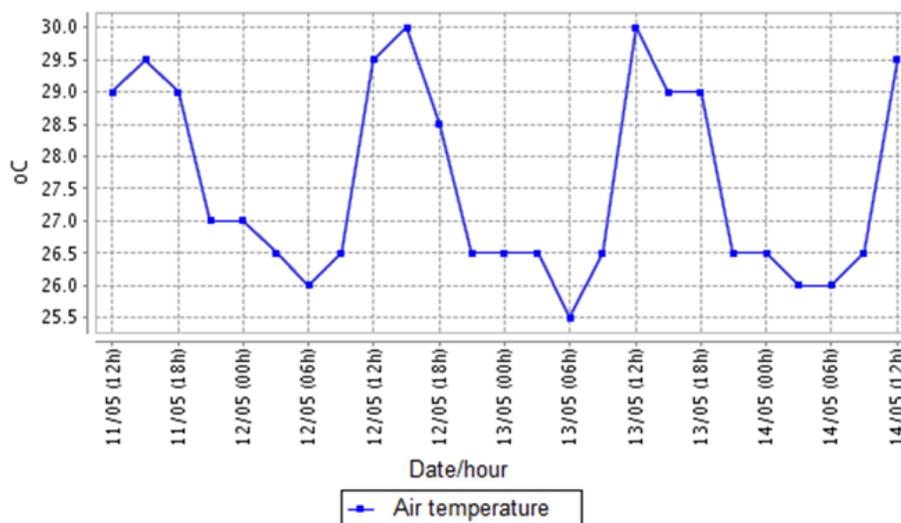


Figure 2. Air temperature by dates and hour during the study period, at Fernando de Noronha Archipelago.

characteristics, having well defined dry and rainy periods.

The tidal level for the study period varied from 1.25 to 2.75 m (Figure-3). The tidal regime can be characterized as semi-diurnal tide, since there are two high tides in each lunar day (Thurman, 1997). According to Souza (2011), the maximum height of the tide in FNA is 2.80 m, and the minimum, 0.0m. Thus, regarding its amplitude, the tide of FNA can be classified as mesotides.

The observed population consisted of *Grapsus grapsus* juveniles and adults of both sexes. They were found sharing the habitat with *Plagusia depressa*. Besides the size, adults and juveniles are also distinguished by the color of the carapace. Juveniles of *G. grapsus* are dark green, dark gray or almost black, which is important for their camouflage on the black volcanic rocks of oceanic islands, and with light yellow spots. On the other hand, adults are quite variable in color; some are dark red or bright red (especially

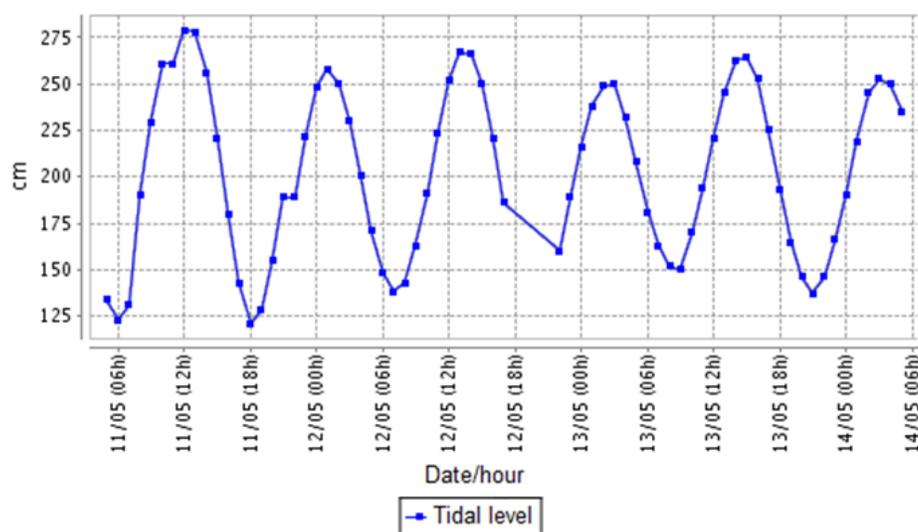


Figure 3. Tidal level by dates and hour during the study period, at Fernando de Noronha Archipelago.



Figure 4. Crabs of the species *Grapsus grapsus* (Linnaeus, 1758) from the rocky shore at Sueste Bay, Fernando de Noronha Archipelago.

males), others are dark green. Some lines and spots can be observed (Fausto-Filho, 1974; Freire *et al.*, 2011) (Figure-4).

During the field observations, an unusual behavior in Brachyura could be noticed: the sally lightfoot jumps from a rock to another. Two scenes of *G. grapsus* jumping were recorded (Videos 1, 2 and 3).

This behavior was observed for both males and females, and juveniles and adults. A total of 12 observations were performed. In a first moment, it can be an useful strategy to prevent predation, as described to the species which will be discussed below. Besides, this type of movement could be important to escape from the wave wash (Video 1) or to avoid entering into the water (Video 2), instead of walking through the water to reach another point of the rocks. They also seem to jump from a lower to a higher rock (Video 3). Kramer (1967) also observed this behavior in a population of *G. grapsus* from Galapagos. He noticed that the jumpy crabs had an average carapace width of 30 cm. The crabs from FNA were not measured, but it was clear that they did not reach 10 cm CW. Before jumping, the crab aligns the body by stretching the front running pairs of legs on (Kramer, 1967), which was also noticed in the present study.

Some other interesting information was found in the literature, regarding the locomotion of crabs. The species *Armases roberti* (H. Milne Edwards, 1853) (Sesarmidae) is found along river banks between rocks and stones, as well as on the vegetation (Chace and Hobbs, 1969). According to Schubart and Diesel (1998), when these crabs are disturbed, they jump from the trees into the water, and due to this behavior, they are know in the Caribbean as “jumpy crabs”. Thus, this behavior could be related to a defensive attitude. A similar behavior was also registered for *Percnon gibbesi* (H. Milne-Edwards, 1853) (Percnidae) by Deudero *et al.*, (2005); the specimens, observed in shallow waters, run and jump when threatened, seeking for shelter from predators.

The crabs *Sesarma trapezoideum* H. Milne Edwards, 1837 (Sesarmidae) occur preferentially in riverine cliffs near water streams (Jeng *et al.*, 2003). According to these authors, these crabs retreat into crevices or jump into the water below them when disturbed; few minutes after that, they climb back to the cliff. The species *Leptograpsus variegatus* (Fabricius, 1793) (Grapsidae), a supralittoral crab of rocky shores as *G. grapsus*, jump into tidal pools or into the sea to escape from predation (Greenaway *et al.*, 1992).

CONCLUSIONS

All these mechanisms described in literature are related to a fast escape from danger, such as predation, including jumping into the water. But during the field observations of *G. grapsus*, it could be noticed that the specimens also jump from a rock to another, which could be useful to escape from the wave wash or to avoid entering into the water. They also seem to jump to a higher rock. However, further studies on this feature are still necessary. For example, to test if there is difference in the jumping frequency between sexes and age classes, as well as or to correlate the distance or amplitude of the jumps with the body size of the crab.

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