CORPUS PUBLISHERS

Environmental Sciences and Ecology: Current Research (ESECR)

ISSN: 2833-0811

Volume 4 Issue 1, 2023

Article Information

Received date : February 13, 2023

Published date: February 28, 2023

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DOI: 10.54026/ESECR/1085

Keywords

Capture; Crustaceans; Mexican Pacific

Research Article

Rock Crabs Grapsus Grapsus and Box Calappa Convexa (Crustacea: Brachyura): Potential Fishery Resources

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Abstract

In recent years, the demand for food resources of aquatic origen has increased considerably and this has allowed resorting to the exploration of alternative resources. Within these, some intertidal crustaceans such as the "rock crab" Grapsus grapsus and Calappa convexa "box crab" stand out due to their frequency and easy capture, which is frequently of the shrimp (Penaeus) by-catch and lobster (Panulirus) fishing. Both species of crabs, due to their sizes and abundance, represent an economic and nutritional interest for coastal fishermen in northwestern Mexico. At present, there is no fishing regulation on these resources and it is necessary and urgent to take regulatory measures of their population status of these crabs, which are constantly captured by fishermen but without biological or administrative control by te authorities responsable for their management fishing in this area.

Introduction

Crustaceans such as shrimp (Penaeus), lobsters (Panulirus) and crabs (Calappa, Callinectes) represent great nutritional and economic importance for coastal fishermen and marine or offshore. These fishing resources contibute a considerable amount of foreing currency to the country for export (Table 1). However, there are other species of crustaceans such as the "rock crab" or "rock shore crab" Grapsus grapsus (Figure 1a) and "box crab", "arched box crab" or "shame-faced crab" Calappa convexa (Figure 1b) which, due to their sizes and frequency of capture, are of economic interest for the fishermen family livelihood. In addition, these two species are part of the diet of other commercially important aquatic organisms (octopods and fish), and are also considered ecological regulators of the marine ecosystem.

Table 1: Catch information for the main decapod crustaceans fisheries in Mexico [1].

Fishing Resource	Volume (Tonnes)	Value (Thousands of pesos)	*Average Annual Growth Rate of Prodution (%)
Shrimp	227,929	17,707,310	1.67
Lobster	5,190	953,097	8.04
Crab	48,602	753,463	6.29

*Last 10 years

Most of the studies of G. grapsus and C. convexa are focused on their taxonomy and distribution. However, in the mexican Pacific there are very few investigations related to these crabs. In G. grapsus [2-4] analyzed the sizes and reproductive aspects. In C. convexa, [5] analyzed the main aspects of the biology and fishery of box crab, and [6], determined the allometry of C. convexa. The objetive is to disseminate the fishing importance of these crabs among coastal fishermen, society and the fishing auhorities.

a)

b)

Figure 1: Rock crab Grapsus grapsus (a) and box crab Calappa convexa (b).

Material and Methods

The present investigation was carried out on the coastline of Mazatlan (23°11´ and 23°20´N and 106°24´and 106°33´O) and Navachiste (25°42´ and 25°35´N and 108°42´and 108°56´O) bays, Sinaloa, Mexico (Figure 2). The samples for the collection of the rock crab were direct and nocturnal (habits). While the box crab collections were with gillnets. The organisms were measured (mm) for their morphological characteristics and their total weight (g) was obtained.

Figure 2: Coastal zone and crab capture.

Results and Discussion

According to some research, both species of crabs are inhabitants of the intertidal communities of the coastal ecosystems of the main bays of Sinaloa, southern Sonora and Nayarit, Mexico. For example, in Sinaloa, Topolobampo and Navachiste bays are located to the north, Santa Maria bay to the center, and Mazatlan bay to the south. In the south of Sonora, Yavaros bay and in Nayarit, the coastal lagoons that communicate with Marismas Nacionales stand out. All these bays represent a nutritional, economic and fishing interest for the great diversity of marine species such as fish (Lutjanus, Mugil and Centropomus), mollusks (Crassostrea, Chione, Megapitaria and Hexaplex) and crustaceans (Penaeus, Panulirus and Callinectes), which they are generally used by coastal fishermen. The rock crab is a highly coastal species, inhabits rocky soils and is distributed from Cedros Island, on the west coast of Baja California, the Alijos Rocks and the Revillagigedo Islands, Mexico to Talcahuano bay, Chile; including the Galapagos, Clipperton, Malpelo and Juan Fernandez islands [7]. Within the Atlanctic Ocean, the crab G. grapsus is very abundant on the Brazil northern oceanic islands of the Saint Peter and Saint Paul Archipelago (Freire et al., 2010). While the box crab has a wide geographical distribution in the mexican Pacific, ranging from Magdalena bay on the western coast of the Baja California peninsula and Punta Peñasco, Sonora, in the northern Gulf of California, Mexico, to Tumbes, Peru, including the Galapagos islands [7]. It is a preferential inhabitant to the sublittoral zone, that is, in coastal waters up to depths between 9 and 58 m, in muddy, sandy and rocky substrates [5]. In the rock crab, the maximun sizes recored were in width, length and height of the cephalothorax at 71.9, 63.6 and 33.6 mm, respectively, while the maximun weight recorded was 137.9 g (Table 2). The organisms were collected on top of the rock sor between cavities during the night, since they are from nocturnal hábitats. During the day, rock crabs locate under rocks and between tidal pools to avoid dehydration. They live between crevices where they seek refuge, especially when the waves are intense as seen in the bay of Mazatlan, although in Navachiste bay, the waves are very gentle and the rock crab population can be observed even above the rocks. The morphological characteristics of the box crab (Table 2), its cefalothorax is strong and convex, its cheliped are large and robust, the cefalothorax exhibits mostly reddish tones with yellow spots, the maximun known sizes range between 127 and 145 mm in width of the cephalothorax for males and females, respectively.

Table 2: Maximun morphological records for some species of rock and box crab [7-10].

Species	Location	Cephalothorax Length (mm)	Cephalothorax Width (mm)	Total Weight (g)
G. grapsus	Mazatlan, Mexico	71.9	63.6	137.9
G. grapsus1	Saint Peter, Saint Paul		14.2 a 69.5 ♂	
	Archipelago, Brazil		90.1 a 57.3 ♀	
C. convexa	Mazatlan, Mexico	37.8 a 92.8	48.8 a 137.6	24.3 a 388.2
C. granulata2	Umag, Croatia	75	96	234.5
C. karenae3	Island Guam, USA	82.3	100.3	245.7
C. galloides4	Islands Canarias, Spain	62	77.6	116

There are very few biological fisheries studies of rock and box crabs in such a way that the size structure can be considered as the first investigation for a future fishing regulation with the purpose of protecting the population of these crabs in northwestern Mexico. There is only general information on the taxonomy and distribution of rock and box crabs for the mexican Pacific and Gulf of California [7]. With the exception of the studies recently carried out by the group of researchers from the Laboratory of Invertebrates and Benthic Ecology of the Faculty of Marine Sciences of the Autonomous University of Sinaloa (LIEB-FACIMAR-UAS), who have contributed with various studies focosed on knowledge biology of these crab species. This situation is very different from that observed in this area in other commercial decapods crustaceans, in which various fishing biological aspects have been analysed, such as spiny lobster Panulirus [13,14], shrimp penaeid [6, 15, 16] and crabs Callinectes [17,18]. At present, in these areas fishermen have increased the capture and use of both species of crabs for self-consumption, which has coincided with the Food and Agriculture Organization of the United Nations (FAO), has indicated that these crabs can be used for family sustenance purposes.

Conclusions

It is necessary that the authorities responsable for their fisheries management of both species of crabs, immediately act on futher biological fisheries studies so that they have reliable tools for their fisheries management, since at this time both the rock crab and box crab, they are extracted arbitrarily and without any biological control in northwestern Mexico.

Acknowledgments

The authors acknowledge CONACYT for the scholarship awarded to the first (CVU 90357) and second authors (CVU 768717). They also acknowledge for the resources granted to the PROFAPI 2022 (PRO_A7_068) and the staff of the Consolidated Group on Fisheries Resources Management (UAS-CA-2104).

References

1. SAGARPA (2020) Anuario estadístico de acuacultura y pesca (2020) Comisión Nacional de Acuacultura y Pesca, Mazatlán, Sinaloa.
2. Gutiérrez-Rubio Y, R Pérez-González, E Campos, JF Arzola-González (2018) Estructura de tallas y relaciones biométricas del cangrejo roca Grapsus grapsus en las islas Lobos, Venados y Pájaros, Sinaloa, México. Hidrobiológica 28(1): 31-36.
3. Gutiérrez-Rubio Y, JF Arzola-González, JS Ramírez-Pérez, G Rodríguez-Domínguez, Pérez-González R, et al. (2020) Size composition and fecundity of the crab rock Grapsus grapsus in the islands of Navachiste bay, Sinaloa, México. Indian Journal of Fisheries 67(1): 129-134.
4. Gutiérrez-Rubio Y, JF Arzola-González, R Pérez-González, G Rodríguez-Domínguez, J Salgado-Barragán, et al. (2021) Reproductive aspects of Grapsus grapsus (Decapoda: Grapsidae) on islands of the southeastern Gulf of California. Journal MVZ Cordoba 26(1): e1953.
5. Ayón-Parente M, ME Hendrickx (2001) Biology and fishery of the arched box crab Calappa convexa (Crustacea, Brachyura, Calappidae) in the southeastern Gulf of California, Mexico. Ciencias Marinas 27(4): 521-541.
6. Arvizu Merín CA, JF Arzola González, JA Felix-Ortiz, G Rodríguez-Domínguez, E Marín-Enriquez, EA Aragón-Noriega (2021). Allometry in the Box Callapa convexa (Brachyura: Calappidae) in the southeastern Gulf of California. Crustaceana, 94(11-12): 1407-1427.
7. Freire AS, AA Pinheiro, H Karam-Silva, MM Teschima (2010) Biology of Grapsus grapsus (Decapoda: Brachyura) in the Saint Peter and Saint Paul Archipelago, Equatorial, Atlantic Ocean. Helgoland Marine Research.
8. Dulčić J, Tutman P (2012) Northernmost record of the shamefaced crab Calappa granulata (Brachyura, Calappidae) in the Mediterranean area. Crustaceana 85: 601-606.
9. Ng PK, JC Lai (2012) Calappa karenae, a new species of box crab from Guam (Crustacea: Decapoda: Brachyura: calappidae). Zootaxa 3393: 57-65.
10. González JA, JA Quiles, JI Santana (2000). The family Calappidae (Decapoda, Brachyura) around the Canary Islands. Crustaceana 73: 1007-1014.
11. Hendrickx M, R Brusca, LT Findley (2005) Listado y distribución de la macrofauna del Golfo de California, México. Parte I. Invertebrados. Arizona-Sonora Desiert Musseum.
12. Hendrickx M (1995) Guía FAO para la identificación de especies para los fines de la pesca. Pacífico centro oriental. Plantas e Invertebrados, I. FAO, Roma.
13. Arzola-González JF, LM Flores-Campaña, MA Ortiz-Arellano, Y Gutiérrez-Rubio (2007) Captura y aspectos reproductivos de la pesquería de las langostas Panulirus inflatus y P. gracilis (Crustacea: Decapoda) en el sur de Sinaloa, México. Rev. Ciencia y Mar 11(31): 15-22.
14. Arzola-González JF, R Pérez-González, I Muñoz-García, Y Gutiérrez-Rubio, LM Flores-Campaña (2011). Distribución detallas de langostas Panulirus inflatus y Panulirus gracilis en la pesquería del sur de Sinaloa, México. Revista Latinoamericana de Recursos Naturales 7(1): 15-20.
15. Aragón Noriega EA (2016) Crecimiento individual del camarón blanco Litopenaeus vannamei y camarón azul L. stylirostris (Decapoda: Penaeidae) con un enfoque multimodelo. Latin American Journal Aquatic Research 44(3): 480-486.
16. Leyva Vázquez Y, JF Arzola-González, G Rodríguez-Domínguez, EA Aragón-Noriega, G Ortega-Lizárraga, et al. (2021) Biometría y longitud de migración de Penaeus stylirostris (Crustacea: Penaeidae) en tres zonas de captura en la costa de Sinaloa, México. Revista CFCV-LUZ 31(1): 17-24.
17. Rodríguez Domínguez G, S Castillo Vargasmachuca, R Pérez-González, EA Aragón-Noriega (2012) Estimation of the individual growth parameters on the brown crab Callinectes bellicosus (Brachyura: Portunidae) using a multi-model approach. Crustaceana, 85(1): 55-69.
18. Rodríguez Domínguez GS, Castillo Vargasmachuca, R Pérez-González EA, Aragón-Noriega (2018) Allometry in Calinectes bellicosus (Decapoda: Brachyura: Portunidae): single-power model versus multi-model approach. Journal of Crustacean Biology 38(5): 574-578.
19. Arzola-González JF, LM Flores-Campaña, A Izabal-Ceja, Y Gutiérrez-Rubio (2008) Crecimiento de camarón blanco (Litopenaeus vannamei) en un estanque rústico a baja salinidad. Revista Aquatic 28: 8-15.
20. Dulčić J, P Tutman (2012) Northernmost record of the shamefaced crab Calappa granulata (Brachyura, Calappidae) in the Mediterranean area. Crustaceana 85: 601-606.