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## Relative density of *Istiblennius dussumieri* along some selected coastal sites of the Red Sea, Tabuk, Saudi Arabia

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### Abstract

Rock skippers (*Istiblennius dussumieri*) are important for their biological and ecological studies and used as potential indicator to investigate the ecological conditions of coastal waters. They are considered as an important tool for the environmental monitoring and assessments of coastal aquatic ecosystems. In this study we measured relative density of rock skipper at 3 sampling stations namely Haql, Sharmaa and Duba in varying environmental conditions of Tabuk during the year 2014. The results of this study showed a direct relation between relative densities of rock skipper in response to monthly variations in climatic conditions of Tabuk. Rock skippers are very sensitive to aquatic environmental conditions and their potential would help the researchers working on this species.

**Keywords:** Rockskipper; Relative density; Bio-indicator; Coastal waters

### 1. Introduction

Rock skippers are studied as a bio-indicator in environmental monitoring and impact assessments of various contaminants in coastal waters [1]. This potential would be beneficial for new researches on this species especially for its ecological importance in detecting pollution levels in coastal water ecosystems [2]. The behavioral, physiological, histological, and embryological changes in rockskippers are considered as strong indicators for the monitoring and assessment of coastal water quality. They are strongly capable to accumulate higher concentrations of water contaminants in their body tissues [3]. The species is limited to humid environment only and they have adopted amphibians like habits and habitats, as they respire through skin [4, 5]. Reproductive behavior and life cycle patterns of rock skippers have been studied by various workers [6, 7]. To evaluate the population and community structure of the rock skipper's different parameters like relative density, abundance, frequency, growth and mortality are used. Some of the species are now considered as endangered due to perturbation in their natural habitat and contamination of costal environments [8]. Human and rock skipper interact with each other due to their tolerance to organic pollution and habitats close to the coastal settlements of human population [9].

### 2. Materials and Methods

Three coastal stations of the Red Sea viz. Haql (29° 17' 9.9" N 34° 56' 18.9" E), Sharmaa (28° 1' 27.9" N 35° 16' 9.9" E) and Duba (27° 20' 57.3" N 35° 41' 46.2" E) were selected for this study (Fig.1). Relative density of *I. dussumieri* was studied on monthly basis (January 2014 to December 2014) to investigate the impact of varying environmental conditions on species structure. After every 300 meters five sampling sites from each station (Haql, Sharmaa and Duba) were selected starting from the residential area of the city near to the sea coast. Qualitative survey for the relative density of *I. dussumieri* along the selected coastal areas of the Red Sea was carried out using quadrates of 1m<sup>2</sup>. At each site five sampling quadrates were studied as replicates.

Relative density was calculated as:

$$\frac{\text{Total number of individuals of } I. \text{ dussumieri in all the sampling units}}{\text{Total number of sampling units studied}} \times 100$$

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Relative density was expressed in five qualitative density classes:

**% Density – Class**

0-20 = a

21-40 = b

41-60 = c

61-80 = d

81-100 = e

Negative (-) sign indicate non-occurrence of the species.

**3. Results and Discussion**

Table 1 showed the relative density of *I. dussumieri* studied on monthly basis (January to December 2014) along the selected coastal sites of the Red Sea. Among the different sites *I. dussumieri* showed higher relative density in most of the months at Duba station as compared to the other two stations at Sharmaa and Haql. All the three coastal station studied are the main attraction for tourists in this region. The stations are receiving hundreds of tourists everyday that is the major

anthropogenic factor for the perturbations in coastal ecosystems of the Red Sea. But among the three stations Duba is not much preferable site for tourists due to poorly maintained beaches. There is less human interference at the Duba site that established rock skippers as the dominating species. The species is very sensitive to ambient environment and respond very promptly to any environmental factor. More reasons behind the high relative density at Duba coast are yet to be investigated. Relative density at Haql station was higher in the month of January, September and November 2014 at all the selected sites (S1-S5). At Sharmaa coastal station of the Red Sea, the relative density of rock skippers was low as compared to the other coastal stations studied. But at this station maximum density was recorded in the month of August 2014 at all the selected sites (S1-S5) of Sharmaa. Relative density was significantly high at all the selected sites of Duba (S1-S5) in the month of January, March, April, September and November 2014. Highest occurrence and strong species structure of *I. dussumieri* was observed at Duba station as compared to other coastal sites studied (Table 1).

**Table 1:** Seasonal dynamics in relative density of *Istiblennius dussumieri* along the selected coastal sites of the Red Sea during 2014.

Haql												
Months/Sampling sites	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
S1	a	–	a	c	–	b	b	–	a	–	b	–
S2	a	a	b	–	b	c	–	a	b	–	b	–
S3	b	c	–	b	–	–	b	c	a	–	a	b
S4	c	c	c	b	–	b	b	a	b	c	c	–
S5	c	d	c	a	b	–	a	a	b	a	c	c
Sharmaa												
Months/Sampling sites	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
S1	–	–	–	a	b	–	c	a	–	–	a	–
S2	a	–	b	a	a	–	–	a	b	–	–	–
S3	a	b	b	–	a	a	–	b	a	b	–	–
S4	a	b	a	a	–	–	a	b	a	–	–	a
S5	b	c	a	a	b	–	c	a	b	–	a	–
Duba												
Months/Sampling sites	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
S1	a	b	a	c	–	a	b	–	a	–	b	–
S2	a	–	b	a	–	c	–	a	b	–	b	–
S3	b	c	b	b	c	–	b	c	a	–	a	b
S4	c	c	c	d	–	b	b	a	b	d	c	–
S5	c	d	c	e	b	–	a	d	b	a	c	c

Density classes: 0-20% = a, 21-40% = b, 41-60% = c, 61-80% = d, 81-100% = e

Coastal aquatic ecosystems have experienced rapid contamination during the 20<sup>th</sup> century resulting into an increase in algal blooming, violation of water quality standards, severe depletion of dissolved oxygen contents, loss of ecologically and economically important species [10, 11, 12]. Perturbations due to anthropogenic factors causing coastal pollution, an increase hypoxic and anoxic waters, alteration of food chain and webs and loss of coastal water biodiversity [13]. Density represents the numerical strength of a species in the community. The number of individuals of the species in a unit area is its density. Density gives an idea of degree of competition [14]. The seasonal variations of the flora and fauna in the different water sources in Saudi Arabia in the Red Sea have been studied by only few workers [15]. This is a preliminary study to investigate the correlation between dynamics of different environmental conditions and coastal biodiversity of the Red Sea, Saudi Arabia. Rock skippers have very less economic importance but they are important for biomonitoring of coastal water ecosystems. The impact of different environmental factors on coastal ecosystems can be determined by measuring the density, frequency and abundance of rock skippers. The reproduction, life cycle, some specific physiological and

behavioral changes of rock skippers made them important as ecological indicators of coastal aquatic environment.



**Fig 1:** View of rock skipper (*Istiblennius dussumieri*) selected for this study.



**Fig 2:** Three different stations of the Red Sea (Haql, Sharmaa and Duba) selected to study the seasonal dynamics in relative density of rock skippers.

#### 4. Acknowledgements

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