

Diversity and Adaptability of Fiddler Crabs at Different Habitat in Pulau Bai, Bengkulu

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Abstract—Fiddler crabs (*Uca spp.*) have abundant of species number currently identified. They live as detritivore at intertidal zone and distribute widely in tropical and subtropical areas in the world. We conducted study of fiddler crabs in Bengkulu, one of province in Indonesian located in Sumatra Island. Most of its area abut on Indian ocean. This study aimed to find species diversity, population density and adaptability of fiddler crabs in Pulau Bai of Bengkulu. The study was carried on for three months started from January to March 2015. Sampling locations were decided purposively on the three stations considered to variety of ecosystem distinction in Pulau Bai, Bengkulu where fiddler crabs were observed. The stations were mangrove vegetation area, fish pond and abut on fisherman community area. Samples of fiddler crabs were collected through digging and catching method from 1x1 m of sixty quadrants in three stations. The results found six species of fiddler crabs i.e. *U. perplexa*, *U. lactea*, *U. jocelynae*, *U. triangularis*, *U. rosea*, and *U. coaricata*. Over all stations, population density of fiddler crabs in Pulau Baii ordered from higher to lower were *U. perplexa* (19.19/m²), *U. jocelynae* (6.86/m²), *U. rosea* (1.30/m²), *U. triangularis* (0.93/m²), *U. lactea* (0.26/m²) and *U. coaricata* (0.20/m²), respectively. Of six fiddler crabs species, only two species i.e. *U. perplexa* and *U. jocelynae* were found at three distinct habitats at Pulau Bai. However, *U. perplexa* was a fiddler crab which possess higher adaptability to live at different habitats. They live at all three habitats at Pulau Bai and possess highest both in population number and density. Even, its population were raised at the habitat which abut on fisherman community area that relatively dirty due to many organic wastes.

Keywords: *adaptability, Bengkulu, diversity, fiddler crab, Uca.*

I. INTRODUCTION

Fiddler crabs belong to Ocypodidae family of Crustacea, currently more than one hundred species were identified worldwide [1,5,8]. Many species of fiddler crabs are endemic across tropical and subtropical areas such as *Uca formosensis*, *U. tangeri* and *Uca cumulanta* [2-4]. The name of fiddler crab refers to male's feeding behavior. It feed by moving small claw across another very quickly and repeatedly for supplying food to its mouth so that resembles motion as a musician moving a hand across a fiddle [8,9].

Adult fiddler crabs show distinct morphology between male and female. A character vigorously different is claw size. The claws shape of fiddler crabs has been used for species identification as one of alternative tools in crab's genus *Uca* classification [9]. Female has two claws with the same size, whereas male has one claw that extremely bigger (major claw) than another (minor claw) [5]. Major claw function as weapon in battle for depending its area [1]. Male also used major claw in waving signal as well as constructing sand burrow to attract female in part of mating behaviors [6].

Across subtropical and tropical areas, intertidal zone of coarse beach was more like location that fiddler crabs live. Fiddler crab life as detrivore that feeds on dead organic material, especially plant and small animal detritus. It created burrows as shelter that spread at sandy and muddy area of beach especially covered by mangrove vegetation. Feeding activity of fiddler crabs increase air circulation in the sediment of its habitat [11]. Those facts show that fiddler crabs contribute in ecological role in shore ecosystem. Burrows have cetral role of fiddler crab life, deliver a number of function that support them to exist in intertidal areas that always changes rapidly anytime. Burrow morphology are difference among species of fiddler crabs and affected by substrate type and vegetation that grow at its habitat [6].

Mangrove forest are a source of organic matter for primary producers, in which fiddler crab usually found abundantly [7]. Bengkulu, one of province in Indonesian located in Sumatra Island. Most of its area abut on Indian ocean. One of its area is Pulau Bai in which almost sorounded by Indian ocean. Pulau Bai possess mangrove forest, but in recent year, deforestation for palm oin plantation and daily life activity of fisherman around could damage the mangrove ecosystem. This study aimed to find species diversity, population density and adaptability of fiddler crabs at different habitats in Pulau Bai of Bengkulu

II. MATERIALS AND METHOD

A. Experiment Site

Experimnet was decided purposively at three stations possess different habitat in Pulau Baai, eastern part of Bengkulu district. Station one was located in mangrove habitat of mangrove forest. Station two was located at habitat directly abutted to sea water. There was not vegetation grow at this sampling station. Station three was located at the area that met and intervned by daily life fisherman activity. They used intertidal zone of this location for fish drying under sunlight. At this area some fish were fallen onto sandy land surface where fiddler crabs live.

B. Sample Collection

Fiddler crabs were collected at 9.00 AM to 3.00 PM every four week for three months started from January to March 2015 at three stations during low tide condition. Sampling method was excavated quadrat [Johnson, 2003]. Fifteen quadrats of 1 m² were randomly placed at each stations. Quadrat was surrounded by 0.5 m in high of multiplex wood to ease catching crabs. Fiddler crabs on the surface of quadrat were directly catch. Whereas fiddler crabs inside burrow were catch by digging the burrow up to 30 cm in deep. Collected samples were counted, photographed, recorded of sex type, thereafter released again except some of them were transported to laboratory for species identification and preservation procedure.

Species identification was conducted based on [9] and [8]. Recorded sample collection were used for counting of population density and analyzing of habitat adaptability. Population density was decided base on Brower, and Zar [12] as follow : $D = Ni/A$, whereas D for density; Ni for total collected samples; A for square area in m². Preservation of collected samples was condunted base on wet preservation procedure using ethanol 70%.

III. RESULT AND DISCUSSION

A. Fiddler Species at Pulau Bai, Bengkulu

We recorder 433 fiddler crabs from three stations of observation at Pulau Baii, Bengkulu. All of these samples were identified belong to six species of fiddler crabs i.e. *Uca perplexa* (Milne-Edwards, 1837), *Uca jocelynae* (Shih Hsi-Te, 2010), *Uca triangularis* (A.Milne-Edwards, 1873), *Uca rosea* (Tweedie, 1937), *Uca coaricata* (Milne-Edwards H, 1852), and *Uca lactea* (de Haan,1835). Front and back side of those species can be seen on figure 1.

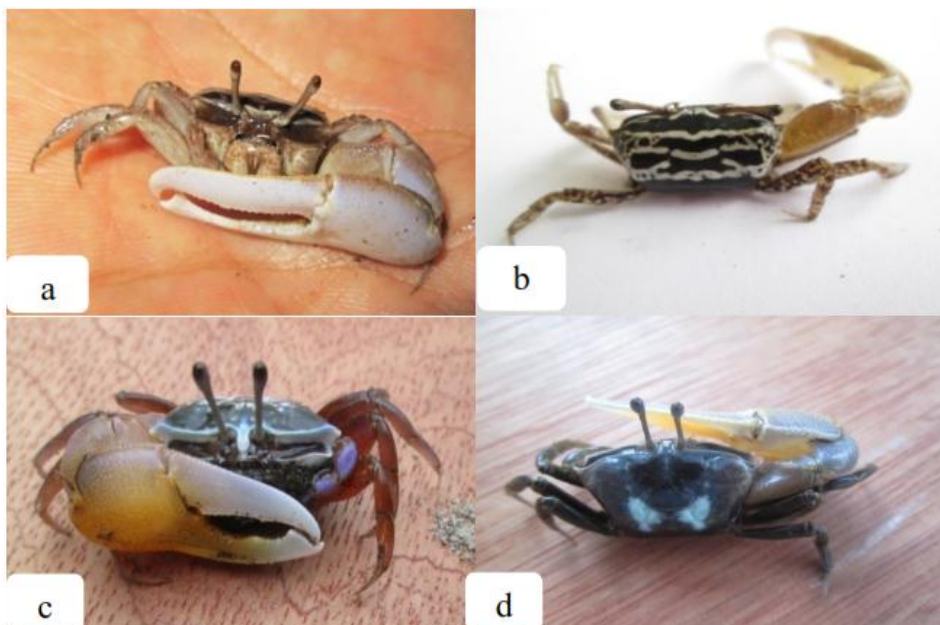




FIGURE 1. Frontal and carapac view of *U. perplexa* (a,b); *U. jocelynae* (c,d); *U. triangularis* (e,f); *U. rosea* (g,h); *U. coaricata* (I,j) and *U. lactea* (k,l).

Uca perplexa along with *U. jocelynae* were found at all stations. *Uca perplexa* was recorded in higher number compared to remaining five species. *U. jocelynae* at Pulau Bai possess three different color variation of its carapace, but carapace pattern was same. These difference could be caused by internal factor as genetic factor or external factor as ecological condition at those three stations. *Uca triangularis* was only found at station 1. It made burrow among mangrove root. This species differed easily to others species due to intense white carapace with grey spots and grey striped pleopods. *Uca rosea* also only found at station 1, possess black color carapace with small number of white spots at anterior body. Pleopods has same color with carapace and claw was bright red. *Uca coaricata* also only found at station 1. It lives at watered mud substrate. *Uca lactea* was found at station 1, possesses white color carapace and white claw.

B. Population Density of Fiddler Crabs

Of 433 fiddler crabs that were found, we recorded that among stations have different species, population density as well as total density of fiddler crabs. Table 1 shows number of fiddler crabs at each sampling station, species availability and total number of fiddler crabs for all stations. *U. perplexa* and *U. jocelynae* have higher population density compared to remaining species (Table 2)

Table 1. Species and number of recorded sample of fiddler crabs at Pulau Bai

Species	Stasiun 1	Number of crabs	Stasiun 2	Number of crabs	Stasiun 3	Number of crabs	Total
<i>Uca perplexa</i>	√	68	√	58	√	163	289
<i>Uca jocelynae</i>	√	58	√	33	√	12	103
<i>Uca triangularis</i>	√	14	–	–	–	–	14
<i>Uca rosea</i>	√	20	–	–	–	–	20
<i>Uca coaricata</i>	√	3	–	–	–	–	3
<i>Uca lactea</i>	√	4	–	–	–	–	4
Total		167		91		175	433

Table 2. Population density of fiddler crabs at Pulau Bai

Species	Stasiun 1 (ind/m ²)	Stasiun 2 (ind/m ²)	Stasiun 3 (ind/m ²)	Total (ind/m ²)
<i>Uca (celuca) perplexa</i>	4.53	3.86	10.80	19.19
<i>Uca (Gelasimus) jocelynae</i>	3.86	2.20	0.80	6.86
<i>Uca (Celuca) triangularis</i>	0.93	0	0	0.93
<i>Uca (Deltuca) rosea</i>	1.3	0	0	1.30
<i>Uca (Tubuca) coaricata</i>	0.20	0	0	0.20
<i>Uca (Celuca) lactea</i>	0.26	0	0	0.26
Total	11.08	6.06	11.6	28.74

Population density of *U. perplexa* was highest among six species that were recorded at Pulau Bai. There were 289 individuals with population density of 19.19 ind/m² over all station. *U. jocelynae* share its location with *U. perplexa* were 103 individuals with population density of 6.86 ind/m². Both species almost dominated every location at three stations. *U. triangularis*, *U. rosea*, *U. coaricata* and *U. lactea* were only found at station 1 with low population density. *U. coaricata* has lowest population density among six species with 0.2 ind/m². It is supposed that *U. coaricata* has very selective substrate type for its life. As stated in [4] that some species of fiddler crabs only like specific type of substrate for life.

C. Adaptability of Fiddle Crabs

Table 1 shows availability of each fiddler crab species at every station. At station 1 all six species were recorded. Whereas, at both station 2 and 3 only two species i.e. *Uca perplexa* and *Uca jocelynae* were recorded although population density between two species was different at every habitat. *Uca perplexa* possesses highest adaptability among six species of fiddler crabs at Pulau Bai as reflected by its highest population density and availability at three different habitats.

Uca perplexa was found at all stations in higher number compared to remaining five species. As well as *Uca jocelynae* was also located at three different stations. Each station has different habitat. Station 1 located at mangrove forest. Station 2 located at intertidal zone which has no vegetation. Station 3 located at the intertidal zone met with fisherman shelter and activity. These fiddler crab species show high capability for adaptation and high tolerance to different habitats although at the area in which activity of people was there [12]. Even though *Uca jocelynae* population was not as much as *Uca perplexa*, both species are capable to share their habitat and adapt to different habitat conditions. They live at all three habitats at Pulau Bai and possess the highest both in population number and density. Even, their populations were raised at the habitat which abut on fisherman community area that is relatively dirty due to many organic

wastes. Some species of fiddler crabs can live together at the same habitat, but they possess different behavior. [2,9].

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