



Biodiversity and occurrence of fresh water crabs in Sur Pul stream of District Harnai, Balochistan

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Abstract

The present study aims to explore scientific knowledge about biodiversity of fresh water crabs in Surpul stream of district Harnai. Collection of Crabs was started from March 2017 to February 2018. Specimen collected from altitude ranging from 288 to 719 MASL (meter above sea level) covering 5 spots. Overall, five species of Crabs were collected in the investigated area such as, *Himalaypotamon emphysetum*, *Himalaypotamon atkinsonianum*, *Trichopotamon sikkimense*, *Liotelphusa quadrata*, *Maydelliatelphusa lugubris*. A total of 142 crabs were collected among which *Maydelliatelphusa lugubris* is most dominant accounts to 64% followed by *Liotelphusa quadrata* accounts to 28.16% and *Himlayapotamon atkinson* with 2.11% of total collected. Statistical data indicates no significant difference in diversity among 5 spots. However considerable difference was observed in altitude range of sampling area. Due to lack of facilities traditional hand-picking method was used for collection of specimens.

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Introduction

Pakistan is one of the countries that are rich in biodiversity. It has unique flora and fauna that are endemic in the world (Allen *et al.*, 2010). It has diverse and unique floral and faunal community, and crustaceans are the integral part of macro benthic fauna especially the infra-order brachyuran (Shukla *et al.*, 2013). They are adapted to freshwater, semi-terrestrial and terrestrial mode of life with a tendency to complete their life cycle independent of marine environment (Pati and Sharma, 2011).

Freshwater crabs are good bio indicators of zoogeographic patterns. They are completely independent in ontogeny from the marine environment, and they are thought to be drainage basin specific (Daniels, 2003).

According to Yeo *et al.* (2008) there are 238 genera 1,476 types of realized freshwater crabs from 14 families (counting 1,306 genuine freshwater crab species in eight families: Pseudothelphusidae, Trichodactylidae, Potamonautidae, Deckeniidae, Platythelphusidae, Potamidae, Gecarcinucidae and Parathelphusidae).

Freshwater crabs are omnivorous and feed on leaves, fallen logs with connected green growth and bechnuts, and species that feed on sea-going creepy crawlies, gastropods, dead frogs, or snakes.

A few types of freshwater crabs are detritivores in feeding habit that assume a significant job in supplement cycling in tropical freshwater biological systems (Dobson *et al.*, 2007). There is difference in the number of crab's taxa being reported worldwide by different authors across the world (Trivedi *et al.*, 2012). The various freshwater habitats and ecosystem is present in Bangladesh. Most aquatic ecosystem contains Crabs. The rapidly important exportable and hidden and fishery item are crabs in Bangladesh (Ahmed, 1991).

In Pakistan species under family Potamidae, Parathelphusidae and Gecarcuinudae has been reported but the studies did not cover whole region of Pakistan and information on crabs of Pakistan is very insufficient. The current study aims to assess the diversity of fresh water crabs in Surpul stream of Harnai, Baluchistan, Pakistan, which will serve as baseline information for studies in future.

Materials and methods

Study area

Species diversity of fresh water crabs were studied at Surpul stream in Harnai district, Baluchistan. Harnai is situated in the north-east of Baluchistan region of Pakistan. Harnai is the key town of this locale and fills in as its capital. Harnai is encompassed by rocky reaches. The base and most extreme winter temperature of the territory is -2°C to 20°C . The late spring is extraordinary in the region and the base and greatest temperature falls between 20°C to 48°C .

Harnai has a prolific blustery season during rainstorm time. Harnai has a lovely climate in winter season. Harnai is one of the most excellent urban communities of the Baluchistan Province with the lot of water accessible in the streams.

It is the main zone of the generation of the fresh vegetables and organic products with fresh and clean water in the entire Balochistan. Surpul stream of Balochistan is very rich in biodiversity. It is very long and wide stream. Different spots were chosen for measuring biodiversity at Surpul stream and named as habitat 1, habitat 2, 3, 4 and 5 respectively.

The opportunistic hand-picking method and effort based of 60-90 minutes search effort (Lara *et al.*, 2013) within the stretch of 500m of stream will be adopted for collection crab's specimen (Male). The burrowing crabs will be collected by digging the burrows and lifting of rocks (Shukla *et al.*, 2013).

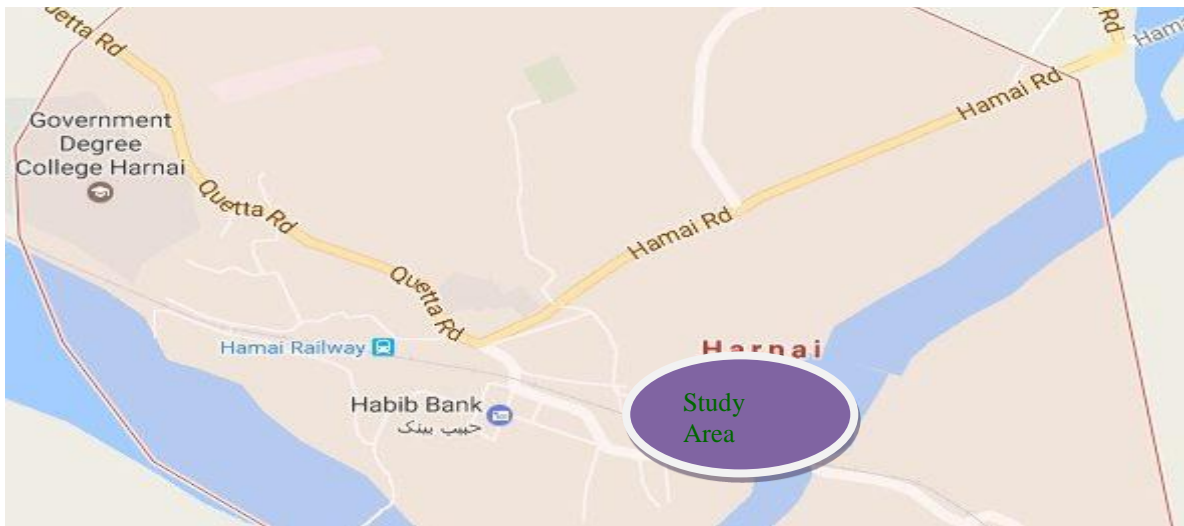


Fig. 1. Map of the study area and sampling site of collection.

Sampling method

Preservation and Identification

The male crabs were collected for the identification as male gonopods is taxonomically important for the crabs. Specimen collected were tagged with number for identification and for the preservation the solution of 10% formalin (Lara *et al.*, 2008) was used in the field and once it is brought to laboratory for identification it was preserved at 70 to 95% ethanol for long-term preservation (Shukla *et al.*, 2013). Since the morphological part is conservative in nature, the Gonopod, G1 and G2 were extracted and photograph under microscopic camera for the identification (Brandis & Sharma, 2005).

The identification were done using the identification key developed by Pati & Singh (2017), Ng, Guinot, & Davie, (2008), Bahir and Yeo (2007), Brandis and Sharma (2005), Naruse *et al.* (2004) and Allock, (1910; 1909). The crab specimen were brought to lab and tagged with the specimen code for every species and detail measurement of specimen like CL, CW and CH were done using Varner caliper 0.05mm.

The first gonopods (G1) of the specimen were photographed using the digital microscopic camera for identification of the crab’s species as the gonopods are the taxonomical feature for the species identification. The present crab’s species were identified using the following identification keys.

Key to identification of freshwater crabs species of Pakistan (Adapted from Brandis & Sharma, 2005; Alcock, 1910, 1909)

Key to the family of fresh water crabs of Pakistan (Adapted from Ng, 2008)

1. Mandibular palp with single terminal lobe, male abdomen distinctly triangular in shape.....POTAMIDAE....2.
- 1a. Mandibular palp with terminal part bilobed, male abdomen T-shaped in shape to varying degrees.....GECARCINUCIDAE...6.
2. Anterolateral margin projecting, distinctly serrated, second gonopod longer or as long as first gonopod, pleon broadly triangular in shape.....3.
- 2a. Anterolateral margin finely serrated, second gonopod with a distinctly laterally bent distal tube, first gonopod with outer overlapping margin medially slightly projecting, very small species.....*Potamiscussikkimensis*
3. Second gonopod distal tip not bent, straight, terminal joints of first gonopod with very long stiff setae.....4
- 3a. Distal tip of first gonopod bent with ventral medial margin overlapping the dorsomedial margin.....5

4. Distal tip of first gonopod without any overlapping terminal joint triangular in shape, flexible zone Vshaped.....

Himalayapotamon emphysetum

5. Terminal joints of first gonopod sinuous, flexible zone asymmetric, with themesial part elongated.....*Himalayapotamon atkinsonianum*.

6. Carapace is almost square; its length is seven-eighths its greatest breadth. The cervical groove is hard to make out. The outer orbital angle and the lateral epibranchial tooth are more prominent. The antero-lateral borders of the carapace are subcristiform. The epigastric crests are not so plainly continuous with the post-orbital crests, and the latter are sharper, especially in their outer half. Small species*Liotelphusa quadrata* (Alcock, 1909)

6a. Anterolateral margin smooth, without serration, male pleon narrow, sinuous, second gonopod distinctly shorter than first one, terminal joint very narrow triangular, dorsally with a proximal V-shaped elongation, flexible zone only a narrow groove. Spoon-like projection surrounds stem of second gonopod. Large species...*Maydelliatelphusa lugubris*.

Result and discussion

The study area covers Surpul stream of District Harnai, Balochistan. The sampled stream was dominated by families of Gecarcinucidae and Potamidae. The number of specimens collected comprises of three species from the family Potamidae and two species from the family Gecarcinucidae. A total of 142 number of fresh water crabs, *Maydelliatelphusa lugubris* was found to be the most abundant 64% (n= 91). They were found in all five spots within the altitude range of 142 to 780 meter above sea level which in line to the finding of Brandis and Sharma (2005). The species with least dominancy were recorded to be *Himalayapotamon atkinsonianum* and *Trichopotamon sikkimense* comprising 2.11% (n=2).

Crab Species Composition

The number of specimens collected comprises of three species from the family Potamidae and two

species from the family *Gecarcinucidae*. These 142 samples of fresh water crabs, *Maydelliatelphusa lugubris* was found to be the most abundant 64% (n= 91). The least dominant species were recorded to be *Himalayapotamon atkinsonianum* and *Trichopotamon sikkimense* comprising 2.11% (n=2).The five species under three genera of freshwater Crabs were identified in present study. *Maydelliatelphusa lugubris* and *Liotelphusa quadrata* were found to be distributed to a wider range of habitat. *Trichopotamon sikkimenses* was found at 456 MASL which is below the normal habitat range described by Brabdisand Sharma (2005). It could be a new habitat range for this species. However, detail study is required to confirm the habitat range of this species as the present study alone cannot prove the habitat range.

The reason behind the least occurrence of the Potamids crabs could be attributed to the habitat preferences, where they tend to be found mostly on higher elevation as they are Eurasian originated species (Alcock, 1910). However, Gecarcinucids crabs are found in lower elevation as they originated from Indian plates (Klaus *et al.*, 2014). Current study area doesn't have much higher elevation ranges and this could be the reason behind encountering the smaller number of Potamids fresh water crabs compared to Gecarcinucids.

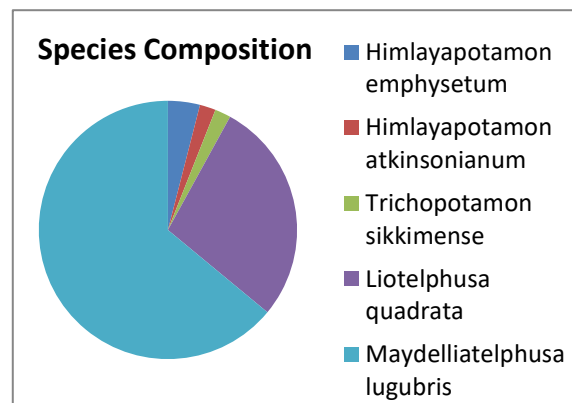


Fig. 1A. Species composition under study area.

Maydelliatelphusa lugubris and *Liotelphusa quadrata* are found to be most diverse in distribution as these two species were recorded in all spots under the study area.

Maydelliatelphusa lugugubris was recorded to be highest in spot 1 (n =7), spot 2 (n =18), spot 3 (n=15), spot 4 (n =41), spot 5 (n =10) followed by *Liotelphusa quadrata* in spot 1 (n =4), spot 2 (n =16), spot 3 (n =3), spot 4(n =14), spot 5 (n =3). *Himalayapotamon physetum* (n= 5) and *Trichopotamon sikimneses* (n=2) was recorded only at spot 1 during study period. Similarly, a lone male of *Himlayapotamon atkinsonium* (n=1) was recorded from spot 4. The overall diversity of fresh water crabs was found be highest in the spot 1 and lowest diversity was observed in spot 5 but statistical test shows no significant difference among the diversity and richness in the study area.

This study will also provide useful information to begin understanding about Fresh water crab's distribution. The distribution pattern of the fresh water crabs from this study clearly depicts that *Liotelphusa quadrata* and *Maydelliatelphusa lugubris* is under Gecarcinucidae family has a high habitat range compared to other fresh water crabs as these two species were found most abundant and recorded from almost all the stream sampled under the study area. Moreover, the result is in line with the findings of Brandis and Sharma (2005) that, the Gecarcinucids crabs are mostly dominated lowland species with wide range of distribution.

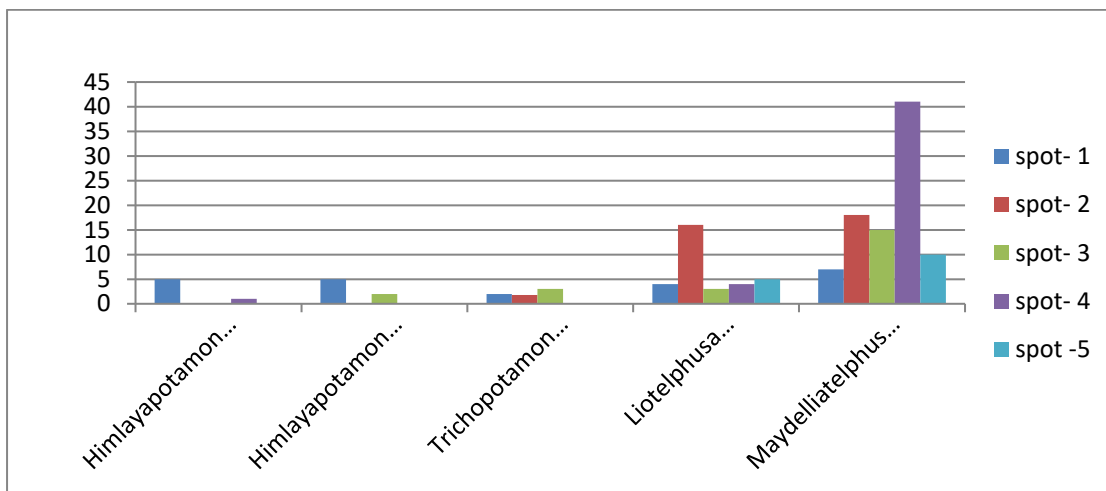


Fig. 1B. Species composition and distribution under five spots

Environmental variables are also important and necessary to see their association with different environmental factors since most of aquatic life of the particular water bodies is influenced by the environmental variables. Thus, the environmental variables like water pH, temperature, canopy coverage, depth and width of the stream were collected from stream under the study area and Species distribution of each spot is as shown in table 4.1.

Table 1 shows the difference in mean environmental variables of the different geogs under study area. The mean Ph was almost neutral throughout the sites with the mean pH range of 7.3–7.6 and mean temperature ranges from 18°C in Spot 1 to 21°C in spot 4 geog.

The canopy coverage was recorded to be the mean range of 6 to 40 percent. River depth and river widths were another physical factor considered during the study of crabs diversity and habitat use. The width of stream varies from mean range of 2.3 m to 3.2.

The environment variables like altitude, canopy coverage, water temperature, PH, stream width and stream depth were collected to determine the habitat use of fresh water crabs. The environmental variable was found to be in normal range without much variation in the study area as per statistical test. Environmental variable doesn't have significant correlation with species richness and abundance which shows that crabs does not specific habitat preference.

Table 1. Stacked bar showing mean range of environmental variables of stream.

	Spot 1	Spot 2	Spot 3	Spot 4	Spot 5
Altitude (m)	519	349.9	366	352.6	275
Stream Width (m)	3.2	2.5	2.6	2.4	2.3
Stream Depth (cm)	15	13.25	13	15.52	6
Temperature (°C)	18	19.3	21.8	20.23	19
pH	7.3	7.6	7.5	7.6	7.6
Canopy Coverage%	24	6	30	38	40

Table 2. Shows distribution of Species under different spots.

Species nomenclature	Spot 1	Spot 2	Spot 3	Spot 4	Spot 5
<i>Himalayapotamon emphysetum</i>	√	×	×	×	×
<i>Himalayapotamon atkinsonianum</i>	×	×	×	×	√
<i>Trichopotamon sikkimense</i>	√	×	×	√	×
<i>Liotelphusa quadrata</i>	√	√	√	√	√
<i>Maydelliatelphusa lugubris</i>	√	√	√	√	√
	√- presence	×- Absence			

Conclusion

This research was carried out with the intention of developing the baseline information for future studies on fresh water crabs of Pakistan. However, detail study is required to confirm the habitat range of this species as the present study alone cannot prove the habitat range. The overall diversity of fresh water crabs was found to be different at different spots but statistical test shows no significant difference among the diversity and richness in the study area. This study will also provide a useful information to begin understanding about Fresh water crabs distribution. Environmental variable doesn't have significant correlation with species richness and abundance which shows that crabs does not specific habitat preference.

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