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Characterization of a Freshwater Crab *Sudanonautes aubryi* (Potamonautidae, Brachyura Bott, 1955) of Ngamboulou River in Brazzaville

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ABSTRACT
Objective: Crustaceans, like all Congolese benthic macro invertebrates inland waters are poorly known. Bioindicators and intermediate hosts of trematodes, they are also an excellent food source. A preliminary characterization of a common species of freshwater crabs *Sudanonautes aubryi* (Bott, 1955) was conducted near the Ngamboulou River (tributary of Mfilou River) through the botanic test garden of University Marien Ngouabi from April 2005 to August 2008. This morphometric study was undertaken to describe this species. *Methodology and results:* The soil was handset at a depth of 15cm, crabs collected by hand, were cleaned in 10l and preserved in alcohol 70°. 186 specimens have been identified and measured, the results show that the sex ratio is equal to 1.62, and the average weight is 6.3g. The average weight of females (8.13g) is higher than that of males (5.03g). The average width of the carapace is 25.73 mm; the carapace of the female is larger (30.18mm) than males (22.99mm). The average length of the clip is 18.66mm. It also appears that females were greater (22.68mm) than males (17.42mm) clip. Ovigerous females were observed between July and September.
Conclusion and application of results: These results will provide a database for management of macro invertebrates' conservation of Brazzaville Department and of the right bank Congo Basin.
Keywords: Congo Brazzaville, Ngamboulou River, Brachyura, *Sudanonautes aubryi,* characterization

INTRODUCTION
Freshwater crabs are a strangely neglected component of the world's inland aquatic ecosystems. Despite their wide distribution throughout the tropical and warm temperate zones of the world, and their great diversity (Dobson, 2004), their role in the ecology of freshwaters is very poorly understood. Inland water ecosystems are of great importance for humanity; this importance is often detrimental to biodiversity. Apart from fish, other groups of animals subject to exploitation in inland waters are much less important in the world, however may be of great interest. Among these animals groups, can be cited freshwater macro invertebrates, particularly crabs, crawfishes and shrimps that are food sources. Crustaceans, like all Congolese freshwater benthic macro invertebrates are poorly known. Furthermore, crabs are recognized as intermediate hosts of trematodosis, specifically paragonimiasis, which is quite common in tropical pulmonary trematodosis (Duong, 2005). This disease has been reported in

several African countries in the equatorial belt, such as Liberia, Côte d' Ivoire, Burkina Faso, Nigeria, Cameroon and Gabon (WHO, 1995). Crabs, like all benthic macro invertebrates are very sensitive to environmental changes, bio indicators of water quality, they are also an excellent food source. They are highly sensitive to pollution and govern the disturbance in the physic-chemical parameters that in turn induce changes in immune system of crustaceans, by stressing them and resulting in a reduction of immune vigour. Among 4500 crabs species listed in the world, at least one species of freshwater crab tends to disappear of its habitat each year (ref). This loss will undoubtedly have an impact on the entire food chain. Several causes of extinction crabs are known: the pollution by chemicals, overfishing and illegal fishing industry development and urbanization that disturb their habitats (Vanier, 2005). In Congo Brazzaville, the crabs are less studied; however, Schneider (1992) identified the marine crabs of the Gulf of Guinea, which have a commercial importance. Recently, Cumberlidge and Reed (2004) described the freshwater crab genus Erimetopus of Congo basin. *Sudanonautes aubryi*, like all others edible crabs are also poorly understood. This preliminary study was undertaken to collect and realize a biometric characterization of this common freshwater crab of the right bank of Congo Basin. Results obtained could be compared with those of others African regions and will give information, which will be used by conservation managers

MATERIAL and METHODS

Presentation of the study area: The crabs were collected in Ngamboulou River, a tributary of the Mfilou River located in south-west of Brazzaville. This river is between 4.27851 - 04.28832 Southern latitude and between 15.23189 - 15.25099 Eastern longitude (Fig. 1).

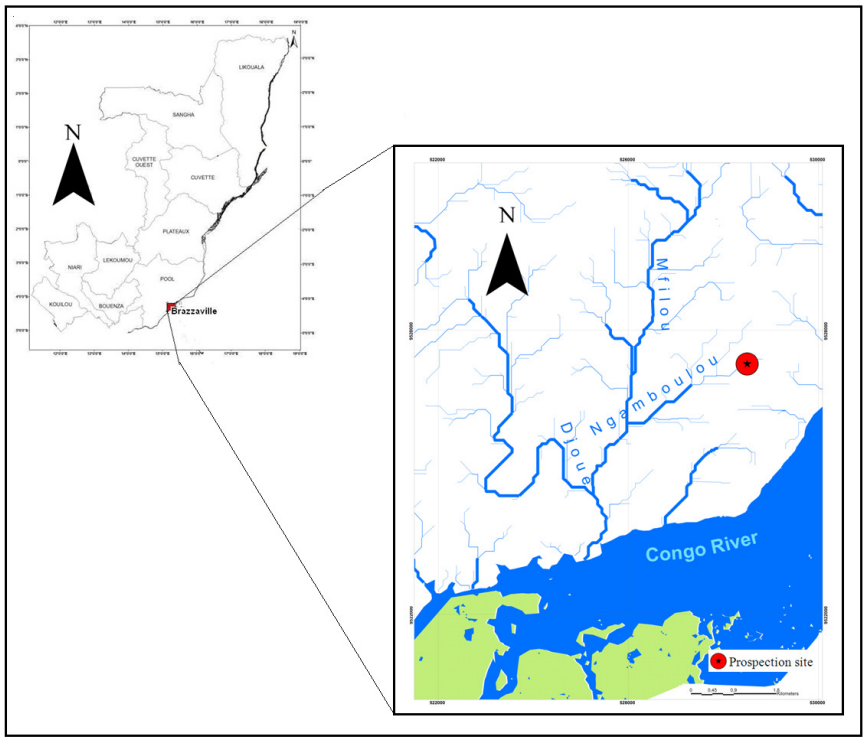

Fig. 1: Map of the study area

Sampling methods: The crabs were caught after hoeing space previously weeded in the muddy sandy soil near Ngamboulou River through the test garden of University Marien Ngouabi between April 2007 and August 2008. The soil was handset up to about 15 cm deep. The crabs were collected by hand, cleaned and preserved in alcohol 70 °.

Morphometric analysis: Each specimen was observed and identified using the identification key established by Monod (1980). Each specimen was weighed using an electronic balance (Oaus), measured using an electronic calliper brand Amig. The cephalothoraxes length was measured using a tape measure. The crabs were divided into size classes according to Sturge rule (Schereck & Moyle, 1990). Student's test was used to determine the differences observed between measurements (cephalothorax width and clip length) of males and females.

RESULTS

Sex ratio: Among 186 specimens collected (Fig. 2A, B, C), there are 115 males (or 61.83 %) and 71 females (or 38.17%). The global sex ratio is equal to 1.62 (Table 1), the young crabs had more males (83) than females, the sex ratio is 3.3. In contrary, the sex ratio of adult crabs is inverted, equal to 0.68, the females are more numerous (47) than males (32). The majority of male were caught to a depth of 15 cm. However, many adult females were captured to a depth of 40cm.

Fig. 2: **A:** The dorsal view of crab *S. aubryi*

Fig.2.B: The ventral view of the male crab *S. aubryi*

Fig.2.C: The ventral view of the female crab *S. aubryi*

Table 1: Sex Ratio of young and adults following the sex

	Total	Adult crabs	Young crabs
Males	115	32	83
Females	71	47	24
Total	186	79	107
Sex Ratio	1.62	0.68	3.3

Measurements of all crabs: Overall, the weight is between 0.19 and 19.95 g, width of the cephalothorax width that ranges from 8.71 to 42.35 mm and the clip length varies between 5.47 and 40.55 cm (Table 2).

Table 2: Morphometry of all crabs (N=186)

Characters	Minimum (mm)	Maximum (mm)	Means±SD
Weight	0.19	19.95	6.33± 4.87
Cephalothorax length	7.12	30.12	18.94±5.49
Cephalothorax width	8.71	42.35	25.73±8.11
Abdomen length	6	34	17.51±6.82
Telson height	1.04	8.31	4.50±1.66
Clip Length	5.47	40.55	18.66±8.57
Clip Height	1.71	14.13	6.94±3.15

SD= Standard deviation

Measurements of male crabs: The males have a weight between 0.19 and 17.78 g, width of the cephalothorax between 8.71 and 38.52 mm, and a length of the clip from 5.47 to 40.55 mm (Table 3).

Table 3: Morphometry of male crabs (N=115)

Characters	Minimum (mm)	Maximum (mm)	Means±SD
Weight	0.19	17.78	5.03±4.73
Cephalothorax length	7.12	27.13	16.92±5.32
Cephalothorax width	8.71	38.52	22.99±8.13
Abdomen length	6	23	14.03±4.62
Telson height	1.04	5.99	3.67±1.15
Clip Length	5.47	40.55	17.42±9.81
Clip Height	1.71	14.13	6.54 ±3.69

SD= Standard deviation

Measurements of female crabs: Females have a weight between 1.94 and 19.95 g, width of the cephalothorax between 18.56 and 42.35 mm, and a length of the clip from 10.21 to 32.63 mm (Table 4).

Table 4: Morphometry of female crabs (N=71)

Characters	Minimum (mm)	Maximum (mm)	Means±SD
Weight	1.94	19.95	8.13±4.35
Cephalothorax length	14.67	30.12	22.21±4.00
Cephalothorax width	18.56	42.35	30.18±5.82
Abdomen length	11	34	23.14±5.93
Telson height	2.78	8.31	5.86±1.45
Clip Length	10.21	32.63	20.68±5.51
Clip Height	4.31	11.98	7.60 ±1.84

SD= Standard deviation

T**able 5:** Comparison of measurement of crab body length

Characters	Male and Female cephalothorax width		Male and Female clip length	
Mean	22.99	30.18	17.42	20.68
SD	8.13	5.82	9.81	5.51
N	115	71	115	71
t observed	1.96		2.55	
t calculated	1.65		1.65	
Difference	Significant		Significant	

The student test showed that there is a significant difference between male and female cephalothorax width and clip length the threshold of 95%.

Distribution of all crabs following size class: Width measurements of the cephalothoraxes allowed the distribution of crabs in six classes size of interval 5 (Fig. 2). Extreme sizes observed are 8.71 and 42.35 mm. Most individuals are between 12.91 and 38.11 mm and the largest class is between 33.71 and 38.71 mm.

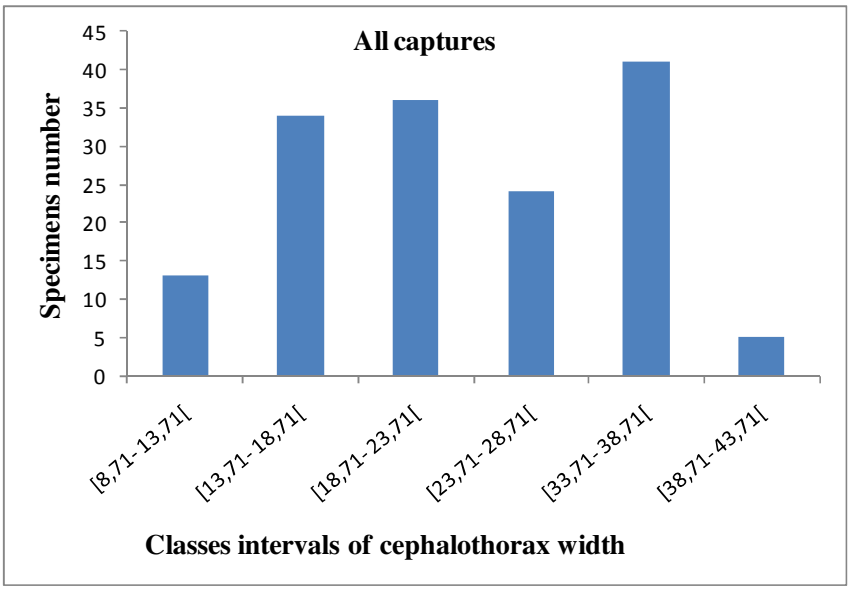

Fig. 2: Representation of all crabs following size class

Distribution of males following size class: Males are distributed in eight classes with an interval size 4. The observed extremes values are 8.71 and 38.52 mm. Most specimens are between 12.71 and 38.52 mm. The most important class size is 16.71 and 20.71 mm (Fig. 3).

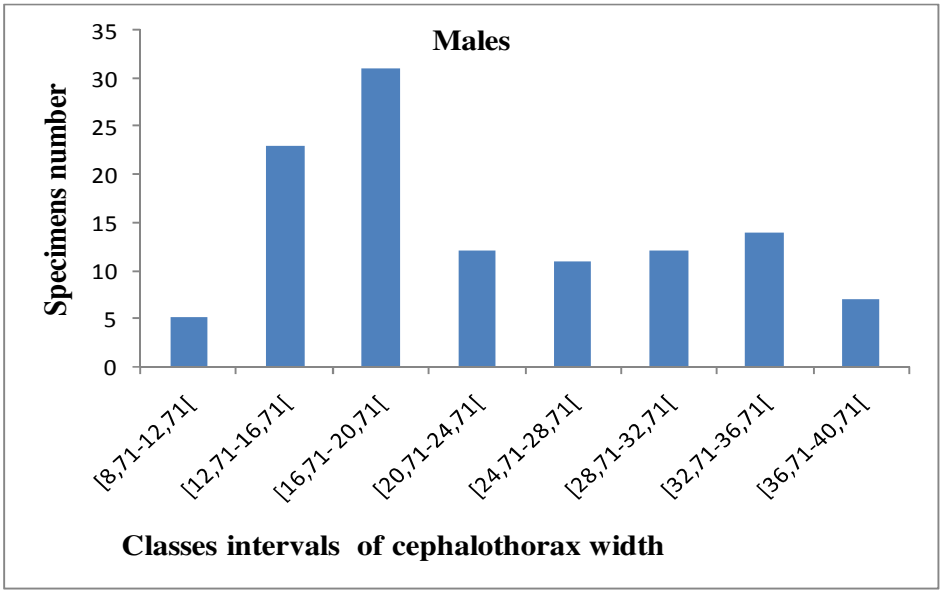

Fig. 3: Representation of males crabs following size class

Distribution of females following size class: For females (Fig. 4), 6 classes of interval size 4 were determined. Extreme size observed being 18.56 and 42.35 mm. The most important class is between 30.56 and 34.56 mm. Ovigerous females have a size between 28.76 and 38.96 mm.

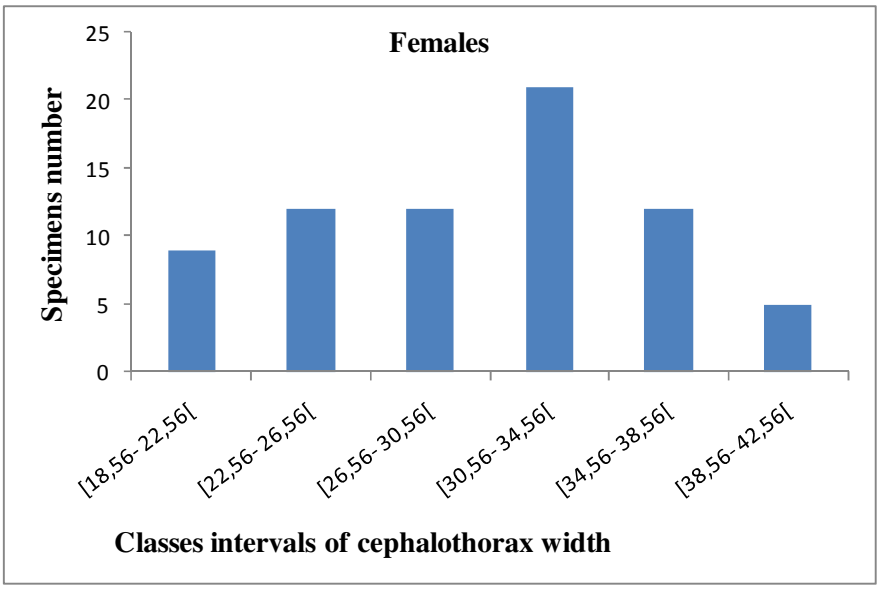

Fig. 4: Representation of females following the size class

Relationship between cephalothorax width and clip length of males: The relationship between the cephalothorax width and of the clip length has a coefficient of determination $r^2 = 0.949$ corresponding to correlation coefficient r = 0.97 (Fig. 5).

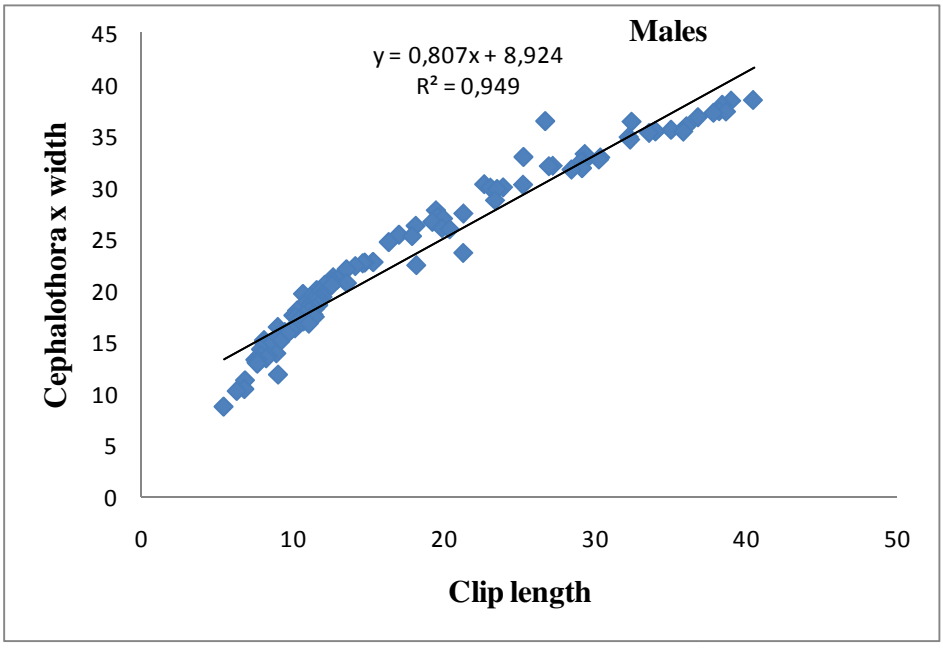

Fig. 5: Relationship between cephalothorax width and clip length of males

Relationship between cephalothorax width and clip length of females: The relationship of the cephalothorax width and clip length has a coefficient of determination r^2 = 0.949 that correspond with a correlation coefficient r = 0.97 (Fig. 6).

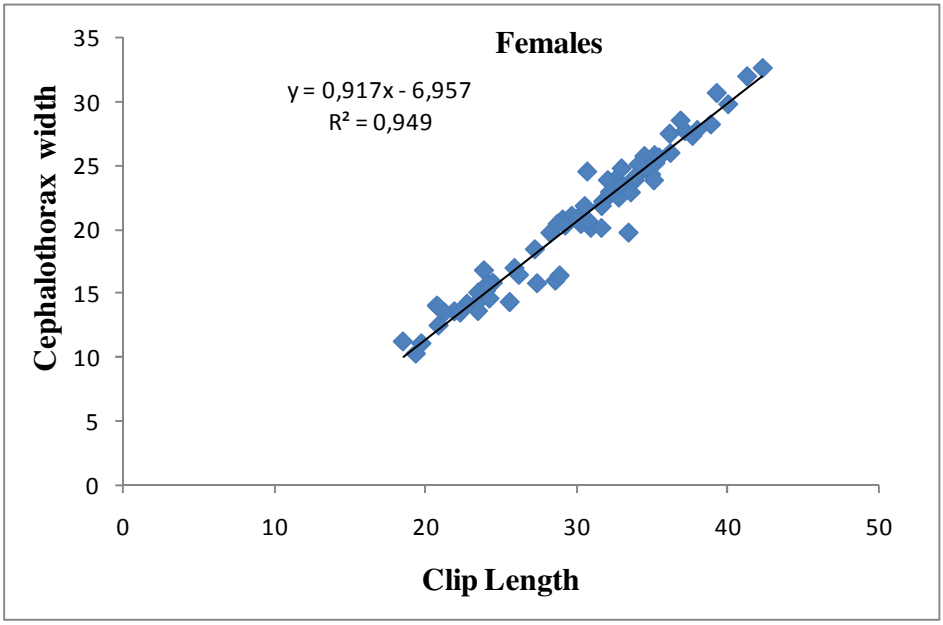

Fig. 6: Relationship between cephalothorax width and clip length of females

Some aspects of reproductive biology: Almost all ovigerous females were collected from July (dry season); very small crabs are observed in October (beginning of rainy season). The breeding season is between July and September. Among 71 female crabs collected, 61 (85.91 %) was non-ovigerous or and 10 (14.09%) ovigerous. However, a final levy will be a subsequent study, carried out collection of this study showed that the smallest size observed (cephalothorax width) for an ovigerous female was 13.5 mm. In gravid females, the number of eggs varied between 102 and 322

Fig.7a: Berried female crab showing the fertilized eggs

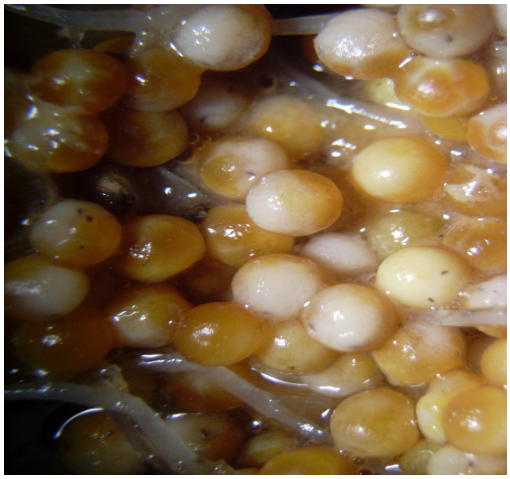

Fig. 7b: Fertilized eggs in brooding chamber

DISCUSSION

The studied population of adult crabs has a sex ratio (1.62) unbalanced in favour of males. This implies one female for three males, this result corroborated with those of Baron (1975) on *Portunus validus* and observations made in the field illustrates this situation, because we found one female and three males in a burrow of 40 cm depth. This result can be explained partly by the fact that captures were made in daytime, time during which females are less active and secondly, by the habits of females dig much deeper burrows. The adult size of *S. aubryi* range of Ngamboulou river is smaller (42,35mm) than the specimens found in the Congo River (Pool

Malebo) which had a cephalothorax width of 90mm and in Nigeria, where the adult size of *S. aubryi* range is 45-50mm (Cumberlidge, 1994). The cephalothorax width of females is higher than males, with a minimum of 18.56 mm while that of males is 8.71 mm. This size difference can be explained by the fact that at birth, the young females moult more often than younger males, which allows them to quickly reach the size of sexual maturity. The correlation coefficient r determined from regression respectively for males and females are 0.97. It shows that the growth of crab takes place in increments during moults. The slope of the curves representing the relationship between the cephalothorax width and the clip length that will be seen from the growth in clip length is faster in males than in females. The maximum length of 40.55 mm reached by the clip in males is greater than females with 33.63 mm. The right clip of *Sudanonautes aubryi* is more developed than the left clip, but some specimens have a greater development of the left clip (10, 7%).

CONCLUSION

Afrotropical freshwater crabs were less known, particularly in Congo Brazzaville, where few studies have been undertaken on the diversity of freshwater crabs. Characterization of *Sudanonautes aubryi* showed that there is a market sexual dimorphism, the maximum width of the cephalothorax is 42.35 mm and the minimum size is 8.71 mm with an average of 25.73 mm. This preliminary study of freshwater crabs must be thorough in order to study aspects of biology, ecology, parasitology and conservation of this species.

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