Comparing Reproductive Characteristics Of Two Catfish Species Clarias Gariepinus And Clarias Jaensis In The Natural Environment Of The Western Region Of Cameroon

Zango Paul[1]
Tomedi Tabi Eyango M[1]
Oben Mbeng L[1*]
Institute of Fisheries and Aquatic Sciences at Yabassi
The University of Douala,
Douala, Cameroon

Tchoumboue J[2]
Efole Ewounkem T[2]
Faculty of Agronomy and Agricultural Sciences
The University of Dschang
Dschang, Cameroon

Pouomogne V[3] **,Nguenga D**[3]
IRAD Foumban
Foumban, Cameroon

Mikolasek O[4]
CIRAD, France

* Corresponding author, Phone. (237) 670036224
Email: b23obenmbeng@yahoo.fr

***Abstract*— This research work compares the reproductive characteristics of two catfish species *Clarias gariepinus* and *Clarias jaensis* in the Mbô lowland in the Western Region of Cameroon. A total of 816 fish of both sexes (26 – 92cm total length and 175 – 6600g of body weight) were used. The reproductive parameters (Gonado Somatic Index (GSI), fecundity, sexual maturity stages and oocytes diameter) were determined. The results were as follows: The GSI of *C. gariepinus* males (0,217 ± 0,101) was significantly higher than that of *C. jaensis* (0,174 ± 0,113). Stages III and IV of the sexual maturity were observed between May and July for the males and between February and August for the females. The Fecundity of *C. gariepinus* (61279 ± 38667) was higher than that of *C. jaensis* (6383 ± 5065). The oocytes diameter was higher in *C. jaensis* (2, 10 ± 0,35mm) than those of *C. gariepinus* (1, 17 ± 0,36mm). The results of this study provided us with a better understanding of the biology of aquatic resources and the amelioration of its production and productivity.**

Keywords*— *reproductive characteristics;* Clarias gariepinus*;* Clarias jaensis*; natural environment.

Today catfish represent an important group of specific diversity representing more than thrice fresh water fishes known in the world with 34 families, 437 genus and more than 2700 species [1]. *Clarias gariepinus* is considered as fish for the future due to its omnivorous feeding habits, fast growth rate and its capacity to limit the proliferation of non desired fingerlings of Tilapia and as a well appreciated fish meal [2]. However, breeding of *Clarias gariepinus* is faced with difficulties such as the management of its breeding larvae, feeding and the risks of genetic depreciation [3,4]. There exists in the natural environment of Cameroon many catfish's species such as *Clarias jaensis* which is now used in aquaculture from wild captures in rivers and is overexploited due to the increase of population and environmental damage.

The biology of C*. gariepinus* is known since 1980 [5]. It is on this basis that development in the production of these species recommends control of breeding conditions. For now, knowledge of its artificial reproduction is essential to conceive a technique of breeding.

This study has been carried out to better understand the biology of aquatic resources and the amelioration of its production and productivity. It has been done specifically to determine the monthly gonadosomatic variations, the ovum diameter and the sexual maturity stage of the two species.

I. MATERIAL AND METHODS

The study was carried out between January and December 2012, in the Mbo plain (LN: 5°10' - 5°20' and LE: 10°20' - 10°21'). Fishing takes place in the Menoua and Nkam rivers and in lakes or inundated lowlands located between 40 – 50m apart. 816 fishes of *Clarias gariepinus* and *Clarias jaensis* species measuring 26 – 92 cm in length, weighing 175 – 6600g were collected monthly from fishermen.

For each one, the size was measured with the aid of an ichtyometer. The total body weight was evaluated with a balance of mark OHAUS DIAL-O-GRAM with precision of 0,1g. The male fish were scarified and dissected to remove the testes; and the females scarified to check the gonad development and maturation of eggs with the matured ovaries analyzed for fecundity. Total weight of ovaries and testes were also recorded. Prior to weighing, the eggs were separated and kept on blotting paper until all adhering water absorbed, which was ensured by using the binocular loop. 1g sample of ovaries with eggs was counted on a Petri dish; 20mls of saline water was poured over the eggs and spread out for easy counting. The absolute fecundity was calculated by multiplying the total number of oocytes in 1g of the total weight of the gonads. The relationship between absolute fecundity and size was established by exponential regression, the linear regression was found between total body weight and the gonad weight. After determining the fecundity, the testes and ovaries were preserved in Gilson's liquid to maintain their normal size, shape and color. The identification of gonad maturity stages was done and the GSI was calculated using the formula:

GSI = weight of gonads (g) /total body weight (g) X 100

II. RESULTS

III.I. Monthly evolution of GSI of the two species

The evolution was decreasing and increasing with time in the males (Fig.1) for *C. jaensis* with a high value (0,429) in June, while *C. gariepinus* had reduced phases in June and October. On the other hand, in comparison with the female (Fig. 2), a high value *(*9,691) was obtained in April for C*. gariepinus* and in June (8, 921) for *C. jaensis*.

With regards to the two species, the GSI of the females was significantly different (p>0, 05) than the males during these months.

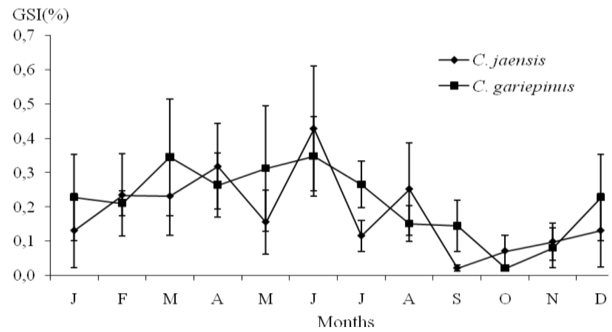


Figure 1: Monthly evolution of the GSI of males *C. jeansis and C. gariepinus*

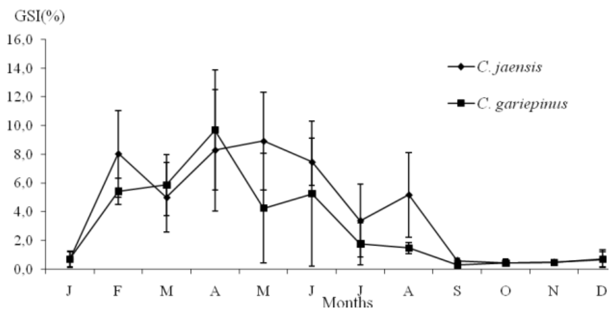


Figure 2: Monthly evolution of the GSI of female *C. jaensis* and *C. gariepinus*

III.2. Evolution of fecundity as a function of size and weight of the gonads

The evolution of absolute fecundity as a function of the size is illustrated in figures 3a&b . It shows that the absolute fecundity increases exponentially for the two species with a significant difference (P>0, 05). However, from the equation involving fecundity and size for *C. gariepinus* (b) it was statistically significant and high (P<0.05) while for *C. jaensis* (a) the correlation coefficient for C. *jaensis* was statistically significant and high for *C. gariepinus*.

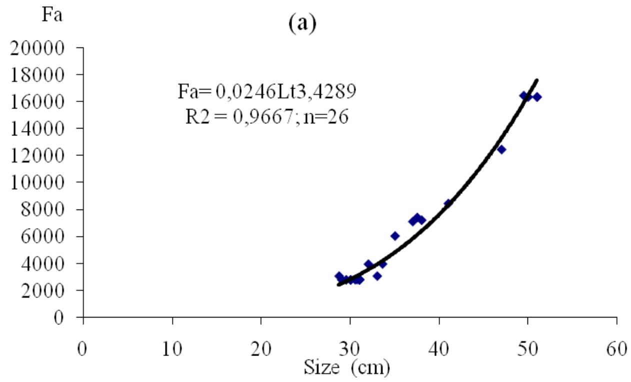


Figure 3a: Evolution of fecundity as a function of size for C*. jaensis* (a) and *C. gariepinus* (b)

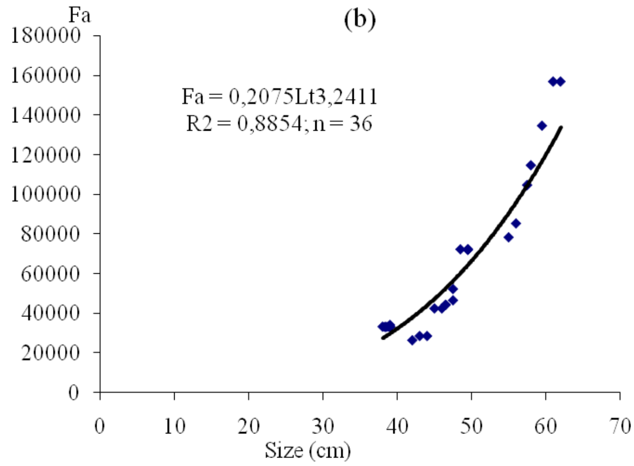


Figure 3b: Evolution of fecundity as a function of size for C*. jaensis* (a) and *C. gariepinus* (b)

A high significant linear relationship (p<0,001) was obtained between the fecundity and the total body weight of the two species (Fig. 4). The correlation coefficient (0, 84 and 0, 85) was comparable. In this case the inclinations and the coordinates at the origin were significantly different (p >0.05).

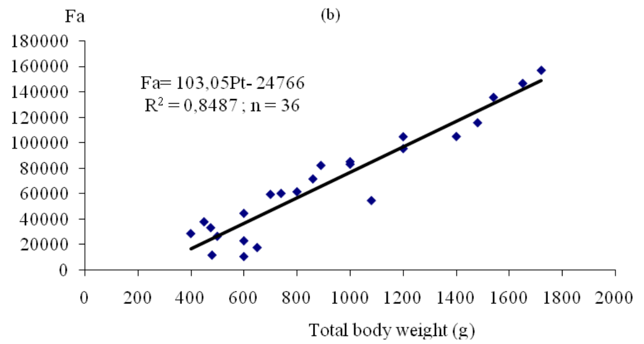


Figure 4: Evolution of fecundity as a function of total body weight for *C. jaensis* (a) and *C. gariepinus* (b)

Figures 5a&b shows a linear relationship between fecundity and the weight of gonads. The inclinations and the coordinates at the origin were statistically different ($p > 0.05$); hence the correlation coefficient (0, 85 and 0, 89) was comparable

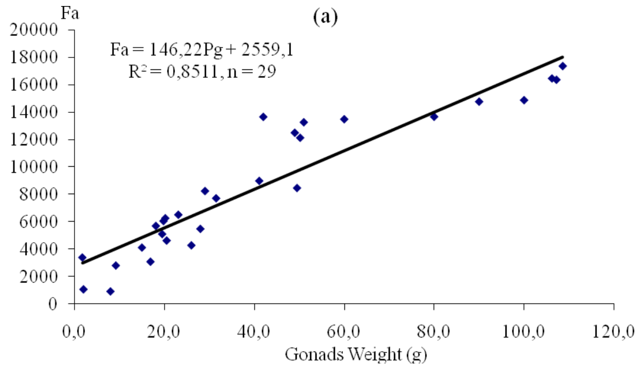


Figure 5a: Evolution of the fecundity as a function of the weight of the gonads for *C. jaensis* (a) and *C. gariepinus* (b)

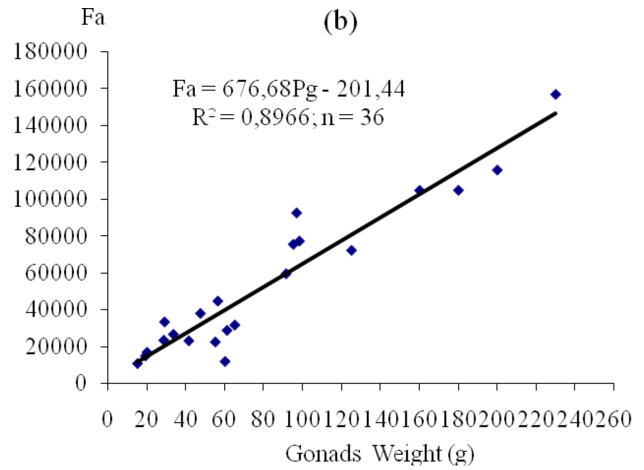


Figure 5b: Evolution of the fecundity as a function of the weight of the gonads for

C. jaensis (a) and *C. gariepinus* (b)

III.3. Oocytes diameter

The monthly evolution of the oocytes diameter for C. *jaensis* and C. *gariepinus* (Fig. 6) shows high significant values ($p < 0.05$) between *C. jaensis* and *C. gariepinus* for each month. From September to January, it was not possible to dissociate the oocytes from the ovarian tissues at the end of the measurement because the sizes were too small.

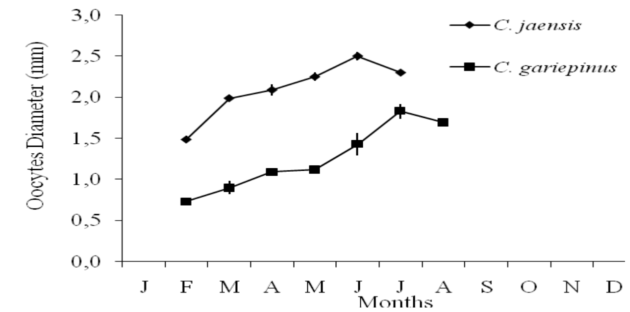


Figure 6: Monthly evolution of the Oocytes diameter of *C. jaensis* and *C. gariepinus*

III.4. Monthly evolution of the sexual maturity stages of C. jaensis and C. gariepinus in the males

The monthly variation of the sexual maturity stages of the male C. *jaensis* and *C. gariepinus* is illustrated in Figure 7. It highlights the fact that :

Three types of sexual maturity (II, III and IV) were identified in the two species from May to July with a higher percentage of sexual maturity for stage IV of *C. jaensis* in July. Stages IV and V were observed in August and September with a week proportion of stage V and the absence of stage IV of C. *gariepinus* in September. The months of February and October had a single stage (stage II) of sexual maturity for the two species.

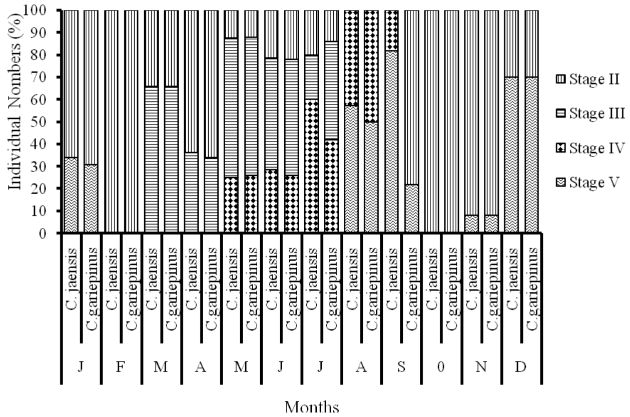


Figure 7: Monthly evolution of the sexual maturity stage for the male of *C. jaensis*

and *C.gariepinus*

III.5. Evolution of the sexual maturity stages of C. jaensis and C. gariepinus **in the female**

All the sexual maturity stages (Fig. 8) were seen in May and June for the two species of C. *jaensis* with the highest percentage of sexual maturity for stage IV was registered in May. Three stages of sexual maturity were observed between January and March with the predominance of stage IV in March and aé n extension to April for *C. jaensis*. The two stages of sexual maturity were observed in April, August, October and November with the exception of *C. gariepinus* for the months of April and October. The month of December was characterized by a single stage (stage V) for the two species.

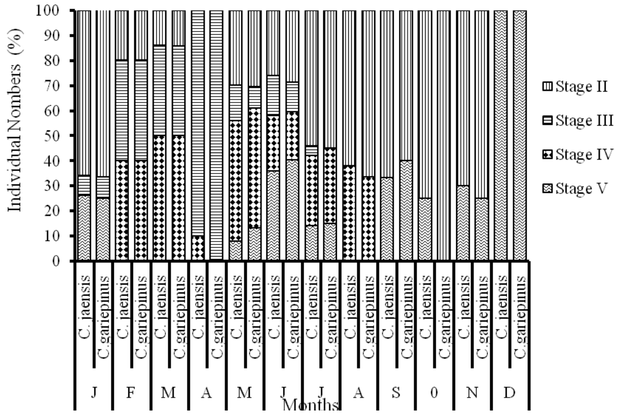
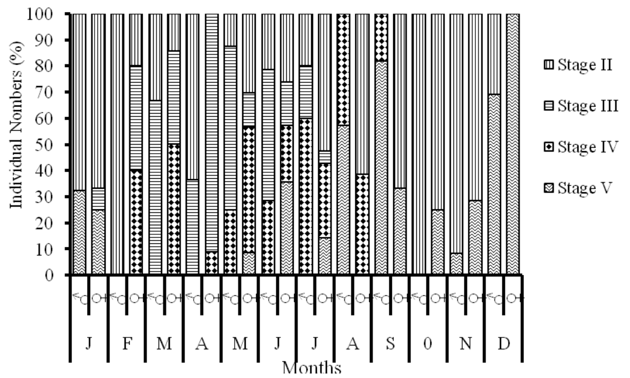


Figure 8: Monthly evolution of the sexual maturity stage for the female of *C. jaensis*

and *C. gariepinus*

III.6. Evolution of the sexual maturity stage for the male and female of *C. jaensis*

The males and females of *C. jaensis* showed different types and percentages of sexual maturity in September and March (Fig. 9). Three and four stages of sexual maturity were observed for the males and females in May and July with the predominance of Stage IV in May for the females and in July for the males. Two and three stages of sexual maturity were observed in January, February and March with the exception of February with the males having a single stage of maturity (stage II). Two different stages appeared in April, August, September, November and December with the exception of females and a single stage (stage V) in December.

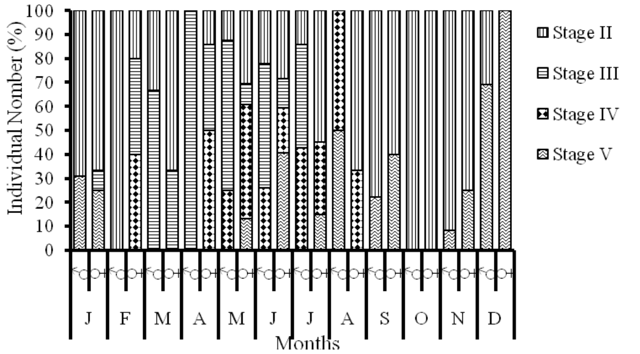


♀: Female, ♂: Male

Figure 9: Monthly evolution of the sexual maturity stage for the male and female of *C. jaensis*

III.7. Evolution of the sexual maturity stage for the male and female of *C. gariepinus*

The monthly evolution of the sexual maturity stage (Fig.10) was very similar with *C. jaensis*. However, the weak variations were registered in March, April, July, September and October. And for July three stages were observed for the females of *C. gariepinus* as against four of C*. jaensis* in April. In the month of March more than 50% of the females of C*. jaensis* were in stage IV with no females of C*. gariepinus* found in this stage.



♀: female, ♂: male

Figure 10. Monthly evolution of the sexual maturity stage for the males and females of C*. gariepinus*

IV. Discussion

A comparison of the GSI for the females of the two species indicated some inferiority as cited [6] for *C. gariepinus* in Israël (0,99 – 11,30%) and [7] in Lake Sibaya of South Africa (0,1 - 80%); and [8] in the Ouémé delta (0,02 – 25,23%). Even the males were inferior with 0,27 – 1,08%; 0,01 – 5,5%; 0,01 – 2,3% and 0,12 – 6,32% obtained respectively by the same authors. The last values obtained confirm that the females were significantly superior over the males.The variability of these parameters with the regions was linked to different environmental conditions. The results were influenced by internal factors of the species. The high and low values were obtained respectively from June to August and October which is in line with [8]. However, limitations occurred during the period of observation in May – June and in September [6] and [7]. The monthly breakdown of the maturation stage shows that the male and female in stage III were observed in May and July and for stage IV, from May to August for *C. gariepinus* and until September for *C. jaensis*. Contrary to [8], the females in stage IV were registered for a longer period than the males. The differences observed were linked to environmental conditions [8, 9].

The fecundity was lower with C*. jaensis* compared to *C. gariepinus*, with the female of 40 cm producing 7660 eggs for *C.jaensis* against 32,319 for *C. gariepinus*. The fecundity of C *gariepinus* was higher which is in line with [7] in Lake Sibaya with females producing 16,800 eggs with inferior results reported [8] and 75 300 eggs in the Ouémé Delta and 49000 eggs in the Asi river of Turkey [10]. These differences can be explained by internal and environmental factors.

The relation between fecundity and total body weight were of a linear type for the two species. These relationships demonstrated that the female *C. jaensis* of 400g produces 6375 eggs against 16454 for *C. gariepinus.* Nevertheless, with 60g of gonads, 11,332 and 40,399 eggs were produced. This result is similar with [10] in Turkey with *C. gariepinus* with 30, 611 eggs for the female of 400g and 42,808 eggs for 60g of gonads. This result is linked to reproductive strategies of the different species.

The Oocytes diameter of the two species increased from February to June and a reduction in July and August. These observations can be attributed to yearly fluctuations of the GSI which is in line with [10] .

In *C. jaensis* and *C. gariepinus* two groups of oocytes were observed as compared with studies carried out by [8] for *Clarias gariepinus*. It is recommended that reproduction should be carried out between May and August. From the aquaculture perspectives, the fishes from natural environment could be used for artificial reproduction during the same period.

V. Conclusion

In a study that involves comparing the reproductive characteristics two species of catfish Clarias *gariepinus* and *Clarias jaensis* in the Mbo Lowlands of Western Region of Cameroon, the following conclusions were arrived at :

- GSI was higher for the females as compared to the males;
- The stage III and IV of the sexual maturity were observed in May and July for males with a prolongation of the stage IV to August for *C. gariepinus* and September for *C. jaensis*. For the females it was registered in February and August with stages II and V dominant in September and January for the two species;
- Maturation period was common in all the females during the months May to August with reproductive break from September to January;
- The fecundity varies with the species, and increases exponentially with the size and linearity with the total body weight and the weight of gonads;
- The oocytes diameter of *C. jaensis* was higher from those of *C. gariepinus* during the months of the study.

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