

## Infestation of Africancatfish *Clarias Gariepinus* (Burchell, 1822) (Teleostei, Clariidae) by Nematodes *Eustrongylides* (Dioctophymatidae) and *Contracaecum* (Anisakidae) in the Mbôplains, West, Cameroon

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**ABSTRACT:** To evaluate the prevalence and intensity of infestation of African catfish, 120 *Clarias gariepinus* were sampled from February to December 2010 from two Rivers (Black water and Nkam) in the Mbô Floodplain of Cameroon. Examination of the fish in the laboratory of ichthyology and hydrobiology of the University of Dschang permitted the observation of two genera of Nematodes, namely *Eustrongylides* (dioctophymatidae) and *Contracaecum* (anisakidae). The prevalence and intensity of infestation of *C. gariepinus* with *Eustrongylides* and *contracaecum* were 18.5% and 7.1 ± 12.9, and 9.9% and 3.1 ± 3.2 respectively. The intensity of *Eustrongylides* and the length of *Eustrongylides* were positively correlated ( $r = +0.68$ ) with host body size of fish. The muscles of the trunk constituted a favorite location zone for the parasites. The bispecific infestation was 27.8%. As a function of site. The prevalence of infestation with *Eustrongylides* was 26.1 and 8.6% ( $P < 0.05$ ) with mean intensities of 8.7 ± 4.1 and 1 ± 0.0 in Black water and Nkam River respectively. *Contracaecum* infect 15.2 and 2.9% of the fish with mean intensities of 3.4 ± 3.3 and 1 ± 0.0 in Black water and Nkam respectively. On the other hand, correlation between intensity of *Contracaecum* and the condition K was negative ( $r = -0.76$ ) and significant ( $P < 0.05$ ) thus, the *Contracaecum* infestation may negatively affect the growth of the *Clarias gariepinus*.

**Keywords:** Mbô Plain, nematodes, prevalence, intensity, *Clarias gariepinus*

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### I. Introduction

African catfish, *Clarias gariepinus*, Clariidae family, is appreciated in Africa and has highly valued in the markets of major cities (2-3 Euro / kg). It is an important part of capture in Africa. Its importance in fish farming is well established: Although it was domesticated since 1974 and its production is increasing in Europe, Asia and Latin America, its African production stagnates [1]. Intensive production systems (biomass: 10 - 400 kg / m<sup>3</sup>, production: 1-4 kg / m<sup>3</sup> / d) in semi-open and closed circuits developed recently in Europe (family farms: 200 - 250 t / year are cost effective [2]).

However this species is particularly susceptible to parasitic diseases that may hamper production both quantitatively and qualitatively [3, 4, 5]. The effect of climate change on the one hand and the intensification of aquaculture to meet the increasing world demand for fish products on the other, is encouraging the emergence of aquatic diseases. Several authors have reported the adverse impact of parasites on fish host growth often accompanied by mortalities with great economic consequences in the fishing industry [4, 6, 7, 8, 9, 10]. In the Mbô plain of Cameroon, endemic parasitic infestations are reported in over half a century by indigents but so far, no study had been conducted to measure its impact. Yet the Mbô plain provides every year millions of *Clarias* fingerlings that are collected by fishermen and sold to many fish farmers [11]. Massive parasitic infestations of livestock *Clarias* spp were observed in a number of fish farmers stocked with fry collectors in the MBO plain.

The general objective of this work is to contribute to a better understanding of diseases and conditions under which they appear in *C. gariepinus* in order to increase fish production. This is specifically to determine the prevalence and intensity of infestations of *C. gariepinus* by parasites in the Nkam and the Black Water, two waterstreams of MBO Plain and evaluate the influence of endogenous and exogenous factors in the process of fish infestation by helminths.

## II. Materials and Methods

### 2.1- Study zone

The plain of MBO (LN: 5 ° 10'-5 ° 20' and LE10 ° 20'-10 ° 21 ') corresponds to the upper valley of Nkam. It is largely located in the Menoua Division, west of Cameroon. It covers about 40,000 hectares [12]. The warm climate is characterized by a dry season (November to March) with temperatures ranging from 18 to 30 ° C, and a rainy season that goes from March to November with temperatures of 26 ° C. The average annual rainfall is 1869mm. the soil is marked by waterlogging and varies depending on the situation: dewatered, flood or permanently flooded. The average fertility is compensated by the presence of water and increased organic matter which promotes high densities of oligochaete places. The plain of MBO is watered by three main rivers namely: Black Water, Menoua and Nkam. These rivers overflow in the rainy season, flooding the surrounding areas [12].

### 2.2- Parasitic examination of fish

A total of 120 *C. gariepinus* were collected in the plains of Mbo February to December 2010. The samples were collected immediately in coolers and moved to the ichthyology laboratory of the University of Dschang where they were dissected immediately or preserved in a freezer at 4 ° C for a maximum period of 3 days before autopsy.

The total length of each fish was measured and each fish was weighed. Sex was noted after opening of the abdominal cavity through an incision from the anus to the head and macroscopic observation of the gonads. Muscles, internal organs and gut contents were carefully observed with the naked eye. Each fish was gutted and split longitudinally with a knife. Muscle incisions were made in larger fish to look for parasites. The cysts were harvested and counted on the basis of location area. The length of each larva was measured after decapsulation of the cystic envelope and extraction of the larva to the tweezers. *Eustrongylides* was identified according to [4] and [13] and by [14, 15]. The fish were divided into three size classes [11-20], [20-30] and > 30cm. The prevalence and intensity of infestation were calculated according to [16]. The K condition factor was calculated according to [17].

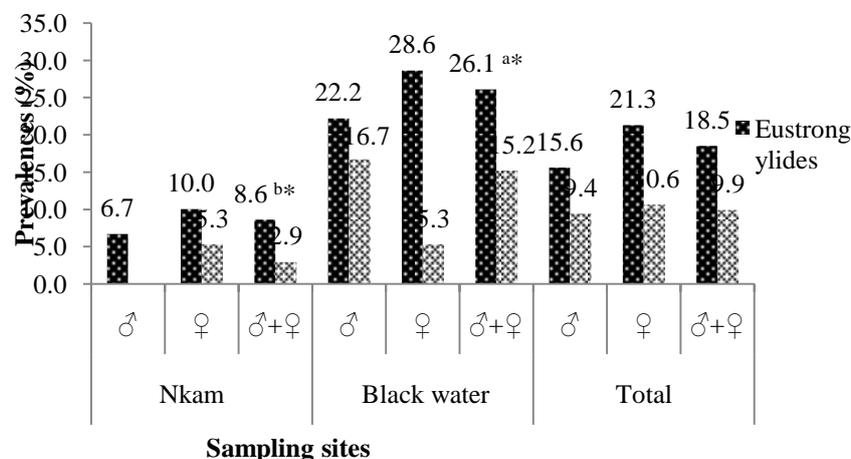
The prevalence of infections were compared by chi-square test. The ANOVA test was used to compare the intensities of infestation between size classes and sex of fish and between sites. The significance level of 5 % was used. The SPSS version 12.0 software was used for this purpose.

## III. Results

### 3.1 Prevalence of infestation by parasites function of type, sex of fish and Sites

The prevalence of parasitic infestations in type function, fish sex and sites (Fig. 1) shows that, regardless of site and sex of *Clarias*, the prevalence of infection in *Eustrongylides* is higher than in *Contracaecum* however no significant difference ( $P > 0.05$ ) was observed.

When the sex of the fish is considered independently of site, the two kinds of parasites in question is more prevalent in females than in males. However, no significant difference was observed ( $P > 0.05$ ). For the same site, the prevalence of infection in *Eustrongylides* in Black water is nearly double that in *Contracaecum* ( $P > 0.05$ ). Comparing infestations of fish at both sites regardless of sex, it appears that the prevalence of infestations by *Eustrongylides* and *Contracaecum* in the Black water respectively represent three to five times that observed in the Nkam ( $P < 0.05$ ).



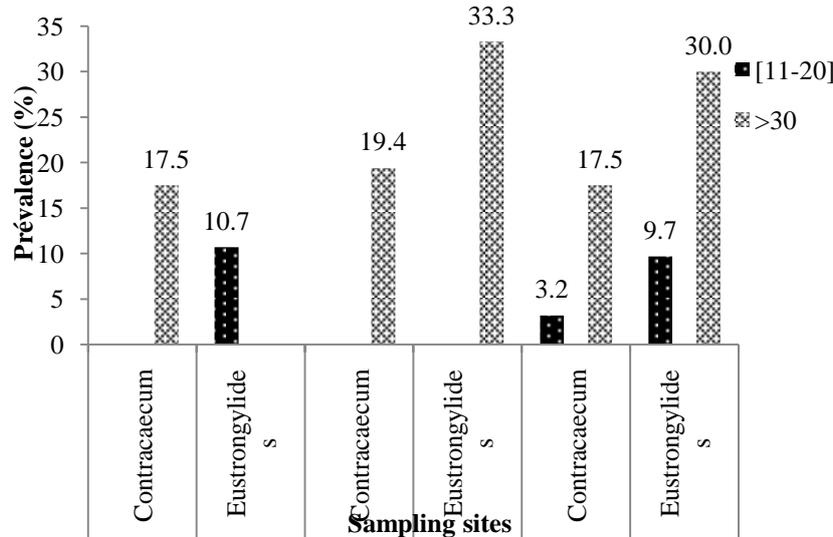
(a, b) The values assigned letters a \* and b \* are significantly different ( $P < 0.05$ )

**Fig 1:** Prevalence of infections by parasites function type, species and sex of fish and Sites

**3.2 Prevalence of infections depending on types of parasites, size classes and sites**

The Prevalence of infestation according to types of parasites, size classes and sites as shown in Fig.2 shows that regardless of site, the prevalence in *Eustrongylides* and *Contracaecum* in *C. gariepinus* were respectively 3 times and close to 5 times higher in class size > cm was observed. For the same site, in Nkam, the infestation by *Eustrongylides* was observed only in the smallest size class [11-20] cm while *Contracaecum* was observed only in the largest size class [20-30]cm compared to the size class [11-20] cm; no infestation in class > 30 cm); However, the prevalence of infestations of both parasites were comparable in both infested size classes (P> 0.05).

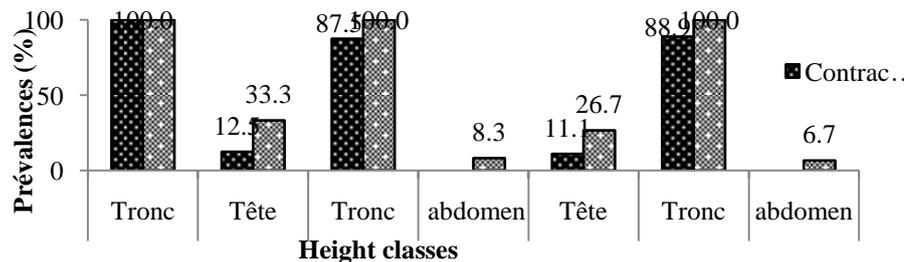
When considering sites infestations in the Black water by both parasites considered were observed in the size class > 30 cm regardless of the type of nematode considered; Moreover, the prevalence at *Eustrongylides* was higher by 71.6% than that at of *Contracaecum* (P <0.05).



**Fig 2:** Prevalence of infections depending on types of parasites, size classes of fish and Sites

**3.3- Prevalence of infestation according to parasites location areas and fish size classes**

The prevalence of infestation based on location areas parasites (Fig. 3) show that regardless of the size of classes, the infestation prevalence is very high in the monitored core muscles of the head and muscles of those organs of the abdominal cavity (P <0.01), whatever the considered parasite. In small fish [10-20] cm, the parasites are located only in the core muscles while infestation of the abdomen (visceral fat, liver and kidney) was observed only in the higher size classes] 20-30] and > 30 cm. *Eustrongylides* colonizes three areas (trunk, head and abdominal cavity), while *Contracaecum* was not observed in the abdominal cavity. On the other hand, 27.8% of infected fish host to both the two types of nematodes.



**Fig 3:** Prevalence of infestation according to size classes and location areas parasites

**3.4- infestations intensities depending on types of nematodes, species and sex of fish and Sites**

The intensity of infestation by gender nematodes, species and sex of fish and sites (Fig. 4) shows that regardless of the sites and sex, the infestation intensity by *Eustrongylides* is double that by *Contracaecum*.

Regardless of sites and considering the sex, in the males of *C. gariepinus*, the infestation intensity by *Eustrongylides* is higher while that in *Contracaecum* is rather higher in females (P> 0.05).

The average parasite charges considered depending on the site are very low (≤2) in the Nkam regardless of the type of parasite considered.

In the Black water, infestation intensity *Eustrongylides* was significantly (P <0.05) higher than that in *Contracaecum*.

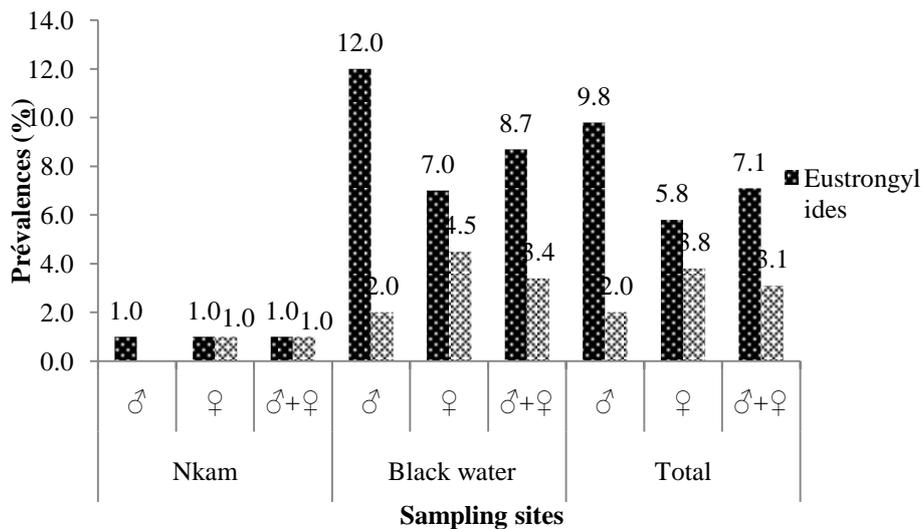


Fig 4: intensities infestations by sites, sex and kind of fish nematodes

### 3.5- infestations intensities depending on types of parasites, size classes and sites

The intensities of infestation according to type of parasite, size classes and site (Fig.5) show that regardless of site, the extreme size classes [11-20] and > 30 cm considered were the only ones infested and average intensities in the larger class (> 30 cm) were higher regardless of the parasite considered. However no significant difference ( $P > 0.05$ ) was noted.

When considering sites in Nkam, only the [11-20] cm size class was infested. The mean number of worms per fish is less than or equal to 2 regardless of the nematode species considered. In the Black water, infestations were observed in the size class > 30 cm and the average load of *Eustrongylides* was more than double that of *Contracaecum* ( $P < 0.05$ ).

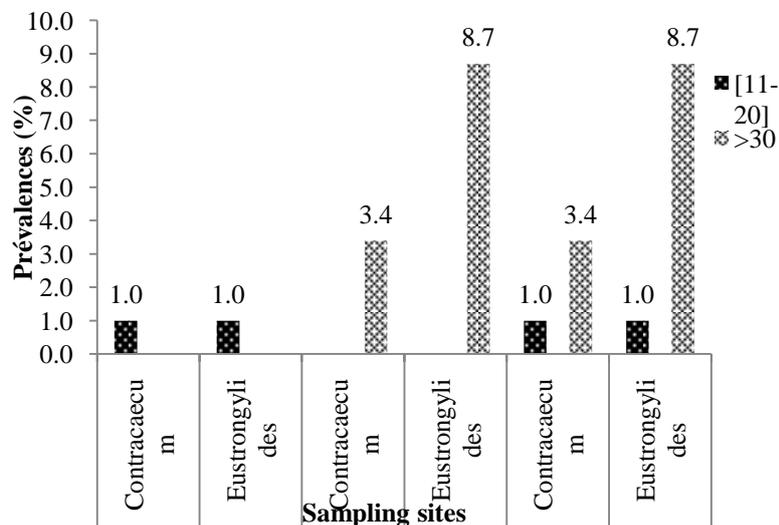


Figure 5: intensities of infestations by sites, species and sex of fish and type of nematodes

As appears from the table below, the total length of the fish is correlated ( $P < 0.05$ ) with the infestation intensities by *Eustrongylides*. Moreover, the parasite load of the genus *Contracaecum* was negatively correlated with the condition coefficient K, a very high significance ( $P < 0.05$ ) was observed.

Table 1: Correlation between fish size and intensity of infestation and K condition factor

Infestations intensities	<i>C. gariepinus</i>	
	Heights	K Conditions
<i>Eustrongylides</i>	+0,68*	+0,17
<i>Contracaecum</i>	+0,28	- 0,76*

The values assigned \* are significant ( $P < 0.05$ )

#### IV. Discussion

*Clarias gariepinus* is infested with the two types of nematodes. The parasite rates were positive and very significantly correlated with the size of the fish examined. This shows that these parasitisms change depending on fish size as several authors have already reported [4, 18,19]. Assuming that the size of the fish increases with age, assuming that the infestation is continuous throughout life, and or is based on the dietary intake capacity of fish,[20] thinks that the increase in parasite rates in relation to the size of the host is linked not only to the accumulation of parasites throughout its life but also to the change in diet.

The strong correlation observed between positive and significant size *C. gariepinus* and the *Eustrongylides* would demonstrate that *Eustrongylides* increases in size as a function of time set in the host. Indeed, the longest larvae *Eustrongylides* (178 mm) was observed in the bulk (3kg) of examined fish. Our results indicate that the fish is indiscriminately infected with regards to sex. These results are contrary to those obtained by [21] in 2004 in Nigeria, where females of *C. gariepinus* had more *africanus Eustrongylides* larvae than males.

A bi-specific parasitic association was observed. This evokes the absence of interspecific exclusion of these parasites in *C. gariepinus*. The body muscles (including the tail) are the preferred area for the location of parasites. These results are similar to those of [4]. This preference is due to the blood-sucking regimens of larvae of nematodes and considered an enabling environment for their best form of cysts. Therefore, for diagnostic purposes, search at the body muscles is enough. Furthermore, ante - mortem pathological signs formed by *Eustrongylides* were only observed in all infected fish belonging to the smaller class size [11-20] cm. This would significantly reduce the degree of infestation by *Eustrongylides* pond sorts of healthy juveniles.

No evidence of a negative effect of parasitism caused by *Eustrongylides* Fitness fish considered found. Indeed, fish infested with larvae *Eustrongylides* had no condition factor K lower than the average and therefore were not leaner than healthy fish. This result is in agreement with several authors [4, 22, 23]. However, the intensity of infestation in *Contracaecum* in fish was negatively correlated with the condition factor K. This implies a possible alteration of the physical condition of infested fish. Some authors have reported the nematode pathogenicity in fish. [24], find a macrocytopenia in *Chelon labrosus* caused by the acanthocephalus of the genus *Neoechinorhynchus*; that anemia increases when the nematode larva *Contracaecum* the encysted stage is also present.

The determinism of contaminated fish comes from their diet and habitat. Leopard frogs and mole crickets (insects) are commonly used for baiting hooks by fishermen from the plains of Mbô. According to nearby residents, amphibians are also infected with the same species observed in fish. This is in agreement with several authors [13, 22] who consider frogs to be separate nematode hosts. Similarly, the infestation of fish per *Contracaecum* is due to the ingestion of copepods known as first intermediate hosts of this parasite [15].

The determination of parasitic infections shows that the *Clarias* captured in Black water are most infested. Indeed, the alluvial plain of Black water offers a more favorable framework for the development of all links involved in the life cycle of nematodes observed:

Hydromorphic humus-rich soil and thus favorable to the development of oligochaetes first intermediate hosts *Eustrongylides*. Indeed, the distribution of *Eustrongylides* spp in fish in Florida has been linked to the aquatic ecosystem with hydromorphic soil [25].

Rich organic matter in rivers such as alluvial, brown algae and cow dung and ideal temperatures favor the development of zooplankton and earthworms. According to several authors [26, 27]. [13, 28, 29] note that, the prevalence of infection in *Eustrongylides* spp are high in high locations with oligochaete density;

The Presence in the Black water area of fish-eating birds such as the cormorant, geese and kingfishers.

#### V. Conclusion

At the end of the study, the following main conclusions were drawn: Parasitic infestations are influenced by site, class size, kind of nematode parasites and the location area considered in the hosts. Parasitic infestations were higher in the Blackwater. Parasitism evolves regardless of gender. The parasite rates move in the same direction as the fish size. Ante-mortem pathological signs formed by the *Eustrongylides* kind of parasite cysts were observed only among small fish [11-20] cm. Core muscles are the preferred area for locating larvae followed by the muscles of the head and those of the abdominal cavity. The K condition factor negatively correlated with the type of parasite larvae charge *Contracaecum* reflecting a possible negative effect on their physical condition of the fish examined.

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