OCCURRENCE AND DISSOLUTION OF RIGOR-MORTIS IN
Bagrus bayad macropterus AND *Mormyrus rume*
FROM RIVER RIMA SOKOTO

BY
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ABSTRACT

A total of eighty nine samples comprising 45 B. bayad and 44 M. rume from River Rima were subjected to evaluation of rigor-mortis occurrence and dissolution. Total weight and total length of the species were measured using electric top loading balance (16000gm) and measuring board, respectively. Stopwatch and calibrated thermometer were used for recording time and temperature to determine rigor mortis duration and temperature effect.

The results showed that the duration from capture to dissolution of rigor was higher in M. rume than B. bayad, despite the fact that temperature ranges were similar. Factors such as size distribution and level of exhaustion might have contributed to the variations. In the light of the above, it is recommended that factors resulting to rapid exhaustion of B. bayad be looked into with a view to lowering it and subsequent elongation of the rigor period.

Key words: Rigor mortis, occurrence, dissolution and River Rima.

INTRODUCTION

Fish generally plays a vital role in the economy of Nigerians. Apart from being a source of protein, containing all the essential amino acids, its high lysine content makes it a good supplement to cereals; in addition it contains Vit. A, D, and E. Above all fish remains the cheapest source of animal protein for an average Nigerian (Alexander, 1974 and Otitologbon *et al.* 1997). Fish is less tough and more digestible than beef, mutton, chevron and chicken due to more muscle protein than connective tissue protein (Eyo, 2001). These advantages coupled with increase in economic and population growth make the demand of fish to always supersede the supply (Fatunla *et al.,* 1982 and Ita, 1997)

Fish is a perishable biomaterial that has 70-80% of its weight as water component (Clucas, 1981). When a fish dies it remains in a wholesome condition for only a shot time. During this period, the fish is observed to be firm and tender, the skin is bright with firm scales. The gills are bright red exuding fish odour, depending on species and temperature prevailing. After some few hours the flesh begins to soften and later becomes flabby, the skin looses its sheen, the scales become loose, the gills at this time change colour from bright red to pink and later greenish with ammonia odour and the eyes become sunken in the cranium (Clucas and Ward, 1996 and Eyo, 2001).

Series of problems in production of quality fish arise due to poor handling of fish resulting from lack of technical know-how regarding fish handling immediately after caught in the tropics especially in the sub-saharan Africa (Emeagha-Jatau et al., 2002). Fish begins to spoil as soon as it is out of water (Clucas and Ward, 1996). And there exist dearth of information on keeping quality of fish from this river, which is the major source of fish in the study area. This work is therefore aimed at examining the duration of rigor-mortis of two species of fish (*Bagrus bayad macropterus* and *Mormyrus rume*) caught from Rima River Sokoto. This would enable us come up with maximum time required of fish out of water to remain qualitatively acceptable to consumers.

Material and Methods

Rima river which is the study site has its origin from Niger Republic and terminates in River Niger. Its tributaries include Sokoto, Bunsuru, Zamfara, Ka and Gawon-gulbi. Its catchment area is elongated and lying along the North-west to South-east alignment covering an estimated of 650 square kilometre and between $11^0,30^0$-30^0N latitude and 5^0 to 7^0, 3^0E longitude (Ita *et al* 1982).

A total of eighty nine samples (45 for *B. bayad* and 44 for *M. rume*) of live fish were collected from the fishermen in batches using plastic bowls after examination and then transported to the laboratory between August and September 2006. The fishes were stunned with the aid of hammer. Time was noted at stunning, pre-rigor, during rigor and after resolution. Also, noted was the environmental temperature. The morphometrics (length and weight) of the samples were taken. The total length (TL) was measured from the snout to the end of the caudal forked fin. The standard length (SL) was measured from the tip of the snout to the end of the vertebra column. The total weight was recorded using electric loading balance.

RESULTS

The size distribution of *Bagrus bayad macropterus* as indicated by total length ranges from 20-24cm and 30-33cm in the months of August and 18-21cm and 30-33cm in September, respectively (Table 1). Similarly the total size of *Mormyrus rume* ranged from 21-24cm and 30-33cm in August and 17-21cm to 31-33cm in September (Table 2). Frequency of occurrence indicated that total weight of samples of *B. bayad* were higher in September compared to those of August (Table 1 and 2). Similar pattern of larger samples in September for samples of *M. rume* was also observed.

Pre-rigor mortis, onset to full rigor, complete rigor to dissolution, as well as duration from capture to complete resolution of rigor, for both B. bayad and M. rume are shown on Tables 1 and 2, respectively.

Table 1. Rigor-mortis duration in *B. bayad macropterus*

Month	T.L cm)	T.W (g)	Frequency	Pre-rigor	Onset to Complete	Complete Rigor to dissolution	Total/onset of rigor to dissolution	Duration from capture to resolution of rigor	Temperature (^{0}C)
August	20.24	100-200	12	1:00-1:09	2:01-2:10	2:02-2:11	4:16	5:20	31
	30.33	201-400	10	1:23-1:32	2:25-2:34	2:08-2:18	4:14	6:14	30
September	18.21	100-200	10	1:65-1:80	2:02-2:09	2:02-2:12	4:14	5:19	30
	30.33	201-400	13	1:28-1:33	2:29-2:36	2:13-2:20	4:49	6:19	30

Table 2: Rigor-mortis duration in *M. rume*

Month	T.L (cm)	T.W (g)	Frequency	Pre-rigor	Onset Complete	Complete Rigor to dissolution	Total/onset of rigor to dissolution	Duration from capture to resolution of rigor	Temperature (^{0}C)
August	21-24	100-200	09	1:22-1:36	3:06-3:12	2:06-2:12	6:17	6:45	29
	30-33	201-400	11	2:00-2:10	2:19-2:24	3:09-3:16	3:33	7:39	30
	17-21	100-200	13	1:21-1:29	3:06-3:09	1:04-1:19	4:07	5:33	30
Sept	31-33	201-400	11	2:03-2:11	2:08-2:11	3:05-3:13	5:16	7:25	29

DISCUSSION

From the result obtained in this study, there were differences in the duration (time) of pre-rigor mortis between the two species of the same weight range; with *M. rume* taking a longer time than *B. bayad*. This may likely be due to differences in sufferings encountered during exploitation which subsequently led to the exhaustion of ATP during caught out. The finding here is in agreement with FAO (1995), that, rigor mortis starts immediately or shortly after death and is facilitated, if the fish is starved and glycogen reserves are depleted or if the fish is stressed. Efforts by *B. bayad* to extricate itself from the gill nets were likely more and this must have influenced the early dissolution of rigor in contrast to *M. rume*.

The time taken from the onset to full rigor was also observed to be longer in *M. rume* of the same weight of *B. bayad*; size was suggested to play a vital role in this direction. For Giannellis (1954) observed that a small size fish rigor may last longer than a large size fish. And this factor also affected dissolution in the same order. Though, the dissolution is more affected by temperature at which the fish were displayed, which is in agreement with FAO (1995) that, the onset and duration of rigor mortis are more rapid at high temperature.

The results of the present investigation indicate longer duration of rigor than the 4 hours each of *B. bayad* and *H. bebe accidentalis* recorded by Eyo, (2001). This variation could be attributed to factors such as size, level of exhaustion and pH of the species. This variation could also be due to the higher temperature in Kainji than in the present study area, and most probably high relative humidity

The total time of rigor-mortis as observed from pre-rigor to dissolution was higher in *M. rume*. Apart from the size and shape, which could be responsible factors, the pH, though not considered in this study could also be incriminated. Amlacher (1961) reported that pH affect rigor in many ways. If pH value is low, rigor set very rapidly with duration and that flat fish show a more extensive (longer period of rigor mortis) than round fish.

It is therefore concluded that variations exist between the two species under study in the onset and duration of rigor mortis. Similarly *M. rume* was shown to have longer period in rigor than *B. bayad*. Factors such as temperature and size were key determinants of these variations. It is therefore recommended that factors influencing the rapid exhaustion of ATP in *B. bayad* be looked into with a view to lowering it in order to prolong the rigor mortis period of this species.

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