Research Journal of Biological Sciences 5 (1): 1-5, 2010
ISSN: 1815-8846

Occurrence and Distribution of Grey Mullets *Liza falcippinis* and *Liza grandisquamis* from Buguma Creek, Niger Delta, Nigeria

[1]O.A. Akinrotimi, [2]O.M.G. Abu, [1]D.O. Bekibele and [3]B. Uedeme-Naa
[1]African Regional Aquaculture Central,
Nigerian Institute for Oceanography and Marine Research, Aluu,
P.M.B. 5122, Port Harcourt, Nigeria
[2]Agriculture Development Programme (ADP) Rumuodomaya, Port Harcourt, Nigeria
[3]Department of Animal Science and Fisheries, Faculty of Agriculture,
University of Port Harcourt, P.M.B. 6323, Port Harcourt, Nigeria

Abstract: Occurrence and distribution of two species of grey mullets *Liza falipinis* and *Liza grandisquamis* were monitored in Buguma creek. Sampling was done bimonthly from January to December 2007 which cover a total period of 12 months. The results from the study revealed that these mullets species occurred more in the dry season months (November to March) than in the wet season. The highest occurrence of (750.0±40.12) recorded in *Liza falcipinnis* was in the month of January and the lowest value (110.0±19.16) was observed in August. *Liza grandisquamis* has the highest value (480.0±40.12) in the month of February which the lowest occurrence (56.0±8.61) was recorded in the month of September. The result of the monthly size distribution of these species indicated that the Juveniles (average length 15.12 cm^2 weight 80.14 g) were constitently higher than the adult size (average length 43.64 cm and 800.12 g). The physico-chemical parameters monitored during the study period were within the same range except salinity which vary significantly ($p<0.05$) across the months with the highest values (16.18-21.11%) recorded during the dry season month. This indicated that the occurrence of the mullets in Buguma creek is highly influence by salinity levels.

Key words: Occurrence, distribution, mullets, seasons, salinity, creek, species

INTRODUCTION

The grey mullets are important to commercial fishery as they form a major constituent of the fish landing of artisanal fishermen in the Niger Delta regions of Nigeria (Akpan and Ubak, 2005). They are found in the coastal waters of most tropical and temperate zones and particularly abundant in creeks, estuaries and lagoons, many species of mullets enter fresh water and they generally swim in large shoals (Edwards *et al*., 2001). According to FAO (2007) adult mullets have been found in water of salinity ranging from 0-75% while juvenile can only tolerate such wide salinity ranges after they reach lengths of 4.7 cm. Akinrotimi (2009) reported that adults of mullets form huge schools near the surface over sandy or muddy bottoms of the sea and migrate into deep sea to spawn in large aggregates.

Although, these species always spawn at sea, they are highly euryhaline and thrive in a wide range of salinities (McDowall, 1988). Due to their euryhalinity, they are often stocked in brackish water pounds to improve fish yield (Ravagnan, 1992) and are introduced into fresh water lakes and reservoirs to create new fisheries (Ben-Tuvia *et al*., 1992). Distribution of euryhaline species is often affected by salinity because of osmoregulatory activities (Wootton, 1990; Akinrotimi *et al*., 2007). Consequently, many of these species have an optimum salinity level at which various density of distribution occurs indicating that there are differential distribution patterns along salinity gradients occurring in the wild.

Many researches on the occurrence and distribution of mullets in other part of West Africa include that of Rayne (1976) and Wilson (1977) on the species in Nigeria include that of Fagade and Olaniyan (1973), in Lagos Lagoon King (1984), in Bonny River (Olaniyi, 1984), in Nembe water side Port Harcourt, Akpan and Ubak (2005), in Cross River estuary but there paucity of information on

Corresponding Author: O.A. Akinrotimi, African Regional Aquaculture Central,
Nigerian Institute for Oceanography and Marine Research, Aluu, P.M.B. 5122, Port Harcourt, Nigeria

the occurrence and distribution of these species in Buguma creek, thus necessitating the need to carry out this research.

MATERIALS AND METHODS

Study area: The study was carried out at the brackish water fish farm station of the Nigerian Institute for Oceanography and Marine Research at Buguma, Rivers state, Nigeria.

The farm is located on longitude 6°51'E and 4°35'N (Fig. 1). The area is characterized by mangrove vegetation with mainly *Rizophora racemosa, Rizophora harrizonii, Avicenia Africana* and *laguncularia racemosa.*

The farm consists of 15 earthen ponds whose sizes range from 0.4-1 ha. These ponds receive water by tidal flow from Buguma creek through the main channel which is directly linked to the creek (Fig. 2).

Sample collection: Samples were collected twice a month from January 2007 to December 2007 covering a total period of 12 months. The fish were collected with dragging net at low tide from two recruitment ponds which is linked directly to the creek through the main channel.

After collection the fish were then sorted into different species and sizes (Juvenile and Adult). *Liza falcipinnis and Liza grandisquamis* were identified by counting the soft fin rays of the anal fin. *Liza falcipinnis* (8-9 soft fin rays) *Liza grandisqamis* (11-13 soft fin rays) (FAO, 1997). After sorting, the fish were then counted and the number recorded.

Data analysis: The data obtained from the study were collected and subjected to simple statistical methods using SPSS (Statistical Package for the Social Science).

Separation of means was done with the Duncan Multiple Range Test (DMRT) at 0.05% probability (Wahua, 1999).

Evaluation of water quality parameter: During the study, the following water quality parameters were monitored, temperature, pH, Dissolve Oxygen (DO), salinity, ammonia, nitrate and sulphide temperature were taken by using mercury in glass thermometer. pH was determined by the use of a pH-meter (model H1 9812, Hannah products Pontugal). Salinity was measured by hand held refratometer (Model HRN-2N Atago Products, Japan).

Dissolved oxygen levels in the experimental tank were determined by the Winkler method (APHA, 1985) while ammonia, nitrate and sulphide were measured using a test kit with a calorimetric chart product by SVNPV Biochem Beijing China.

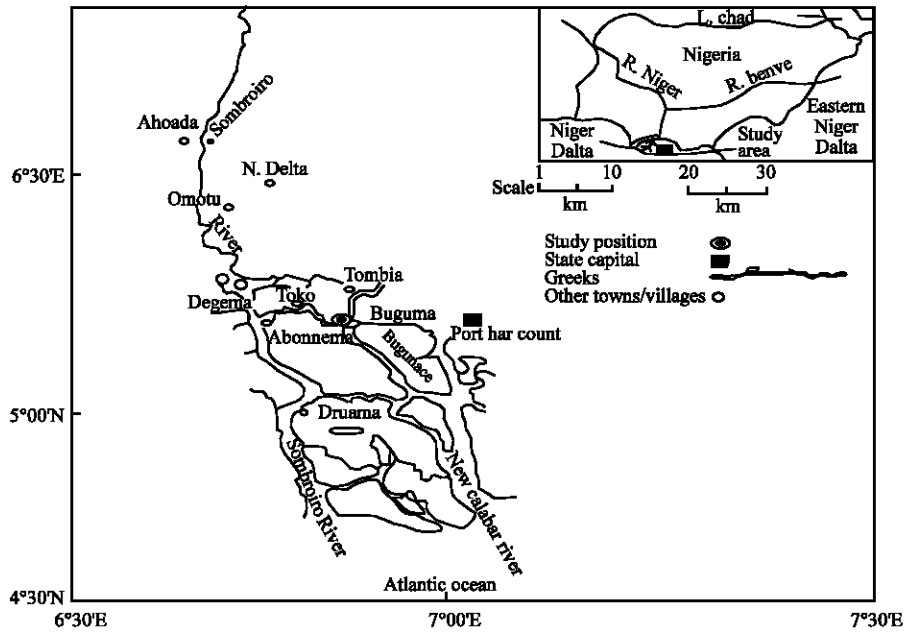

Fig. 1: Map of Niger Delta showing the sampling site

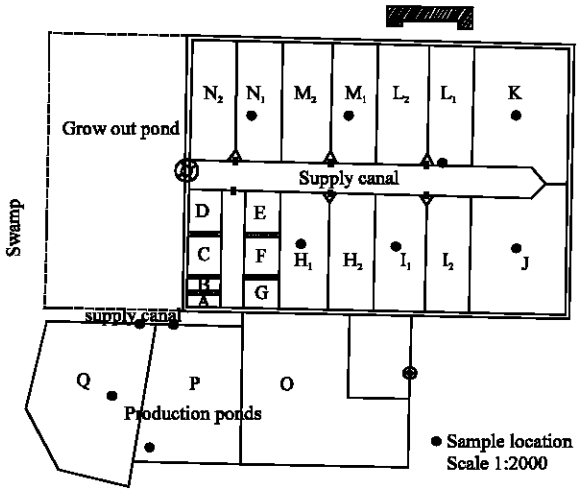

Fig. 2: Map of brackish water experimental fish farm

RESULTS AND DISCUSSION

The results of physico chemical parameters of the creek during the study period indicated that the e^H were within the same range with the highest 7.84±1.21 ∝ curred in October, while the lowest 6.74±1.11 was observed in the month of March (Table 1). The mean values of the Dissolved Oxygen (DO) ranged between 4.60 and 6.11 with the highest valve 6.04±2.11 recorded in the month of June and the lowest value 4.96±1.12 recorded in the month of July (Table 1). For salinity, the highest valve 20.14 being observed in January, while the lowest value 4.22 as recorded August (Table 1). The mean value of ammonia supplied and nitrite were within the same range with a small variation in all the 12 months under survey. The highest value of water temperature 33.24±1.24 was recorded in December and the lowest 27.14±3.10 was observed in the month of August (Table 1).

The results of monthly size distribution of *L. falcipinnis* and *L. grandisquamis* in Buguma creek were shown in Table 2. The results indicated that the Juveniles were consistently higher than the adult size in both species across the 12 months. For *L. falcipinni*, the highest number of Juveniles (650.0±40.21) and adult (100.0±17.62) were recorded in January. While, lowest for both sizes 107.0±13.26 and 3.0±2.41 were respectively in the month of August (Table 2).

In the species *L. grandisquamis* the highest number of Juvenile 303.0±21.67 and adult size 74.0±12.14 were observed in the month of January and February, respectively, while the lowest values (52.0±10.11, 6.0±1.02) were recorded in September and August, respectively (Table 2).

The monthly occurrence of *L. falcipinni* as shown in Table 2, revealed that the highest occurrence (750.0±40.11) of *L. falcipinni* was found in the month of January and the lowest (110.0±19.16) recorded in August. Monthly occurrence of *L. grandisquamis* indicated the highest value (480.0±40.11) to be in the month of February and the lowest (56.0±8.61) in September (Table 2).

The distribution and occurrence of fish species in the wild is ruled by a combination of environmental biotic and stohastic factors (Cardona, 2006). According to Allison, the abundance and movement of fishes are observed to be influence by water depth, shoreline activity, sediment type, availability of oxygen, illumination, turbidity, pH, conductivity, salinity, spawning activities, food availability, predation and season. Abowei similarly describe fish abundance and distribution as the products of interaction among fishes and other causes such as chemical, physical and industrial factors. Assessing the relative importance of environmental factors on the distribution of these mullet species showed that their occurrence and distribution was strongly affected by seasonality and salinity. The abrupt changes in the number of fish from dry season (November to March) and wet season (April to October) is probably because *L. falcipinnis* and *L. grandisquamis* are good osmoregulator as they maintain a stable internal salinity levels (Thomas, 1984; Kulikova *et al*., 1989). In these two species the cost of osmotic regulation is the lowest within the oligomesohaline range (Cardona, 2001) and therefore, their abundance is expected to be more within that ranges. Thus, it is not surprising to find that these two species showed a strong preference for sites with higher salinity. Although, adults may prefer more saline areas (Cardona, 2000). However, Chang *et al.* (2004) revealed the existence of individual species in the occurrence and distribution preference of mullets in Taiwan, as most species avoid fresh water sites throughout their life cycle whereas others species long periods there, such variability may also be true for these species as they are found in water of low salinity as observed in this study even in small quantities. Indeed, this result is in sharp contrast to Pombo *et al.* (2005) who suggested that turbidity and temperature were the parameters that ruled the distribution of *Liza ramado* in a Portuguese estuary, without any relevant role for salinity. However, these conclusion may be premature as Pombo *et al.* (2005) combined samples collected monthly at different sites in two different years in a single analysis, thus confusing the factors that rule seasonal changes in abundance with those ruling spatial. The monthly size distribution of *L. Facipinnis* and *L. grandisquamis* in

Table 1: Value (mean±5.∂) of water quality parameters of Buguma creek

Sampling months	Water quality parameters						
	pH	Salinity (0/00)	Dissolved oxygen (mg L^{-1})	Ammonia (mg L^{-1})	Sulphide (mylc)	Temperature (°C)	Nitrate (mg L^{-1})
January	7.10±0.21[a]	20.14 ±1.21[a]	5.16±0.19[a]	0.11±0.02[a]	0.05±0.01[a]	32.11±2.41[a]	0.01±0.00[a]
February	6.98±1.20[a]	21.11±1.21[a]	5.21±1.12[0]	0.13±0.01[a]	0.10±0.02[a]	31.12±1.21[a]	0.01±0.00[a]
March	6.74±1.11[a]	19.21±3.21[a]	4.64±2.14[0]	0.14±0.01[a]	0.06±0.03[a]	30.11±0.84[a]	0.02±0.01[a]
April	7.02±2.41[a]	17.61±2.11[b]	5.14±2.11[a]	0.10±0.02[a]	0.10±0.01[a]	29.12±1.34[a]	0.01±0.00[a]
May	7.11±2.02[a]	16.21±0.89[b]	5.32±1.18[a]	0.11± 0.01[a]	0.05±0.02[a]	31.22±1.14[a]	0.02±0.01[a]
June	6.94±1.41[a]	11.24±1.21[c]	6.04±2.11[a]	0.12±0.02[a]	0.08±0.01[a]	31.46±1.22[a]	0.02±0.01[a]
July	7.24±2.11[a]	10.11±2.14[c]	4.96±1.12[a]	0.13±0.02[a]	0.09±0.01[a]	28.11±3.41[a]	0.01±0.01[a]
August	6.84±2.14[a]	4.22±1.14[c]	5.26±3.11[a]	0.11±0.01[a]	0.07±0.01[a]	27.14±3.10[a]	0.001±0.00[a]
September	7.32±1.06[a]	12.14±2.14[c]	5.10±1.11[a]	0.12±0.01[a]	0.11±0.03[a]	29.32±1.12[a]	0.01±0.00[a]
October	7.84±1.21[a]	13.11±0.66[c]	6.02±1.11[a]	0.13±0.02[a]	0.13±0.01[a]	31.12±4.11[a]	0.01±0.01[a]
November	7.12±0.89[a]	13.84±0.6[c]	5.14±1.21[a]	0.10±0.01[a]	0.14±0.02[a]	32.14±3.12[a]	0.01±0.00[a]
December	7.64±1.11[a]	16.18±1.14[b]	4.99 ±1.41[a]	0.11±0.02[a]	0.09±0.03[a]	33.24±1.24[a]	0.01±0.00[a]

Means with the same superscript along the column are not significant (p>0.05)

Table 2: Mean values (mean±SD) of monthly size distribution of *Liza falcipinnis* and *Liza grandisquamis* from Buguma Creek

Sampling months	*Liza falcipinnis*		*Liza grandisquamis*	
	Juvenile	Adult	Juvenile	Adult
January	650.0±40.21[a]	100.0±17.62	40.30±21.67[b]	67.0±13.11[e]
February	594.0±20.39[a]	86.0±11.21[e]	321.0±32.410[c]	74.0±12.14[e]
March	519.0±20.18[a]	81.0±7.470[e]	330.0±28.55[c]	60.0±14.21[e]
April	440.0±20.67[b]	63.0±6.440[e]	301.0±29.01[c]	61.0±13.29[e]
May	368.0±18.71[c]	42.0±7.210[e]	278.0±20.19[c]	44.0±18.14[e]
June	300.0±11.28[d]	41.0±11.26[e]	180.0±12.79[d]	31.0±17.20[e]
July	202.0±21.14[e]	14.0±3.650[f]	101.0±11.34[e]	5.0±11.18[e]
August	107.0±13.26[e]	3.0±2.910[f]	56.0±9.210[e]	6.0±11.02[f]
September	259.0±13.61[e]	4.0±1.210[f]	52.0±10.11[e]	4.0±7.210[f]
October	250.0±12.62[e]	9.0±5.140[f]	107.0±3.110[e]	24.0±6.120[f]
November	3480±17.19[c]	13.0±3.120[f]	126.0±30.12[e]	25.0±9.340[f]
December	602.0±18.12[a]	44.0±4.110[e]	248.0±36.01[c]	70.0±11.21[e]

Means with the same superscript along the column are not significant (p>0.05)

Buguma creek as obtained in this research followed a trend where both the juveniles and the adult species were more in the dry season than the wet season month. This is in agreement with the result of King (1988) who reported same in Bonny estuary. In all the months under study, the juveniles were observed to be more in number than the adults sizes this is consistent with the result of Cardona (2006) in the Medditerranean estuary. This can be attributed to the fat that adults mullets have a preference for water with higher salinities as they live mostly and spawn readily in the sea. After spawning the fry migrate to the brackish water and estuaries where they can be collected for aquacultural purposes thus accounting for the higher occurrence juveniles than the adult as observed in this study.

CONCLUSION

The result of this research indicated that juveniles of mullets are present all the year round but are more in the dry season. Therefore, as fish farmers and aquaculturist will need this information of this type to know when to stock the ponds for rearing purpose. Also the importance of the studies species with its occurrence and distribution has a significant ecological value for the fish fauna, assemblage and competition. The observation of the adult size occurring at much lower frequencies in the mullets population of Buguma creek, supports the fact that the preference of the juveniles for waters of lower salinity is a very relevant factor in structuring of grey mullet assemblages.

REFERENCES

APHA, 1985. Standard Methods for the Examination of Waste Waters. 16th Edn., American Public Health Association, Washington, DC., pp: 360.

Akinrotimi, A.O., A.O. Anyanwu, P.E. Anyanwu and U.U. Gabriel, 2007. Influence of sex, acclimation methods and period on haematology of *Sarotherodon melanotheron* (Cichilidae). Res. Biol. Sci., 2: 348-352.

Akinrotimi, O.A., 2009. Culture techniques of mullets in Nigeria. A Paper Delivered in Africa Regional Aquaculture Organized Training Programme on Brackish Water Fish Farming in Nigeria, pp: 10.

Akpan, A.W. and R.G. Ubak, 2005. Aspects of the trophic ecology of *Liza falcipinnis* (Valenciennes 1836) (Pisces: Mugilidae) in the Cross River Estuary (Nigeria). J. Aquat. Sci., 20: 53-62.

Ben-Tuvia, A., E.B. Davidoff, J. Shapiro and D. Shepler, 1992. Biology and management of lake Kinneret fisheries. Isr. J. Aquacult. Bamidgeh, 44: 48-65.

Cardona, L., 2000. Effects of salinity on the habitat selection and growth performance of Mediterranean flat head mullet *Mugil ceplalus*. Estuar Coast Shelf Sci., 50: 727-737.

Cardona, L., 2001. Non-competitive coexistence between Mediterranean grey mullets evidences from seasonal changes in food availability, niche, breadth and trophic overlap. J. Fish Biol., 59: 729-744.

Cardona, L., 2006. Habitat selection by grey mullets in *Mediterranean estuaries*, the role of salinity. Scientia Marina, 70: 443-455.

Chang, C.W., Y. Lizuk and W. Tzeng, 2004. Migratory environmental history of the grey mullet *Mugil cephalus* as revealed by otholit Sr: Ca Raties. Mar. Ecol. Prog. Ser., 26: 277-288.

Edwards, A.J., A.C. Gill and P.O. Aboyweyere, 2001. A revision of irvines marine fishes of tropical West Africa. Darwin Initiative Report 2, No. 162/7/451, pp: 157.

FAO, 1997. Field Guide to the Commercial Marine Resource of the Gulfon Guina. FAO, Rome, pp: 300.

FAO, 2007. Cultured Aquatic Species Information Programme. FAO, Rome, Italy, pp: 9.

Fagade, S.O. and C.I.O. Olaniyan, 1973. The food and feeding interrelationship of the fishes in the Lagos lagoon. J. Fish Biol., 5: 205-225.

King, R.P., 1984. On the biology of the Mugulidae in the Bonny River (Niger Delta, Nigeria) with particular reference to feed ecology. M.Sc. Thesis, University of port Harcourt Nigeria, pp: 198.

King, R.P., 1988. Observation on *Liza falipinnis* (Valencienres, 1836) in Bonny River, Nigeria. Rev. Hydrobiol. Trop., 21: 63-70.

Kulikova, N.I., P.V. Shekk, L.I. Starusheiko and V.I. Rudenko, 1989. Effect of Salinity on Resistance to Low Temperatures in the Black Sea Mullets During Early Ontogenesis. In: Early Life History of Mariculture Species, Dushkina, L.A. (Ed.). Academic Press, Moscow, pp: 81-102.

McDowall, R.M., 1988. Diadromy in Fishes Migrations Between Freshwater and Marine Environments. 2nd Edn., Croom Helm, London, pp: 460.

Olaniyi, O.O., 1984. The food and feeding interrelationship of the fishes in the Nembe water shed, Port Harcourt (Nigeria) with Particular reference to the food and feeding habits of *Oxyurichthys occidentalis* and *Acertrosg obius schlegeli*. M.Sc. Thesis, University of Port Harcourt, Nigeria, pp: 220.

Pombo, L., M. Elliot and J.E. Rebelo, 2005. Environmental influence on fish assemblage distribution of an estuarine coastal lagoon Riade Aveiro (Pontogal). Sci. Mar., 69: 143-159.

Ravagnan, C., 1992. The growth of grey mullet in a rural and urbanized Irish estuary. J. Fish Biol., 45: 889-897.

Rayne, A.L., 1976. The relative Abundance and feeding habits of the grey mullet species occurring in an estuary in sierra-Leone, West Africa. Mar. Biol., 35: 277-286.

Thomas, P., 1984. Influence of some environmental variables on the ascorbic acid status of mullet. *Mugil cephalvs* L. tissues. Effect of salinity capture stress and temperature. J. Fish Biol., 25: 711-720.

Wahua, T.A.T., 1999. Applied Statistics for Scientific Studies. Africa Link Books, Aba, Nigeria, pp: 355.

Wilson, J.E.H., 1977. Biology of the mullet species occurring in the estuaries of Freedom, Peninsula. Bull. Inst. Mar. Biol. Oceaogra., 2: 15-17.

Wootton, R.J., 1990. Ecology of Teleost Fishes. 2nd Edn., Chapman and Hall, London, pp: 350.