



## Comparative Histopathology of Gladiator Swimming Crab (*Callinectes pallidus*) from two Coastal Areas in Lagos, Nigeria

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**ABSTRACT:** *Callinectes pallidus* is an economically important species of crab which inhabits both inshore and estuaries often susceptible to contamination from anthropogenic sources. The present study examined histopathology of the tissues of *Callinectes pallidus* from two coastal areas in Lagos, Nigeria, as a possible measure of degree of susceptibility to environmental stress. Tissues (hepatopancreas, gill, ovary, intestine and flesh) of samples of 30 crabs from each coastal site were processed for histological examination using standard method. The histopathological results in this study showed no structural alteration in gills, intestine and flesh in crabs from both sites, but there was a great structural degeneration and lesion in the hepatopancreas and ovaries of *C. pallidus* from Agbara (site 2). The environmental stressors identified in Agbara based on documented literatures includes Brewery effluents- that contains high carbohydrate, nitrogen and washing reagents; high concentration of heavy metals such as Cu, Zn and Fe and pharmaceutical effluents. The present study thereby revealed that hepatopancreas and ovaries of *C. pallidus* from Agbara (site 2) are more susceptible to these environmental stressors. Thus, it could be concluded that *C. pallidus* from site 2 are more susceptible to environmental stress than those from site 1. The present study also provide a fundamental information on the well being of *C. pallidus* from the two sites. Therefore, efforts should be intensified to avert future deleterious effect of the environmental stressors on the studied species in Agbara water body. ©JASEM

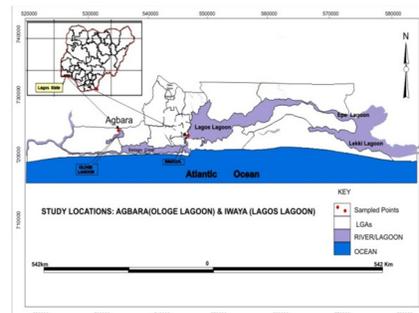
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**Keywords;** Susceptibility, hepatopancreas, ovary, stress, alteration and crab

The Gladiator swimming crab –*Callinectes pallidus* is an economically important species commonly sold in the open markets throughout the coastal towns of Lagos, Nigeria. Davis *et al.*, (2005) reported that this species inhabits both estuaries and inshore waters – habitats often susceptible to contamination from anthropogenic sources, open coastline and parasites. A considerable amount of research has been conducted on the effects of certain contaminants that have the potential to impact the endocrine system which regulate vital life processes in fresh water and marine fishes, as well as in some shore crabs (Pait and Nelson, 2002; Lye *et al.*, 2005, Stentiford and Feist, 2005). Similarly, environmental pollutant such as oil spill, heavy metals and dispersant have been reported to cause loss of species diversity, loss of habitat and destruction of breeding grounds of aquatic organisms (Ndimele, *et al.*, 2011). The present study therefore compared the histopathology of tissues of *Callinectes pallidus* from two coastal areas in Lagos, Nigeria to determine the degree of susceptibility of the species to environmental stress.

## MATERIALS AND METHODS

**Study Areas:** The study Site 1 (Iwaya) in Lagos Lagoon and Site 2 (Agbara) in Ologe Lagoon are as shown in Figure 1. Iwaya town is located east of Lagos Lagoon and is surrounded by several towns such as Yaba, Ijora and Kirikiri; all of which discharges their waste into the Lagoon. Agbara is located along Badagry express way which extends to Republic of Benin. It is an industrial and as well a residential areas with few population in comparison with Iwaya.



**Fig. 1:** Map showing the sampling sites in Ologe Lagoon and Lagos Lagoon

**Collection of Samples:** 60 specimens of *Callinectes pallidus* were collected alive from fisher folks at the water side of the two sites between April and October 2012. Specimens were sorted by sex using observation of characteristics abdomen shapes and the appearance of the first 2 pairs of pleopod (modified of gonopods in males). Sampling included 15 males and 15 female crabs from each sampling site.

**Preparation of Samples for Histopathology:** 30 crabs from each site were euthanized and fixed in Davidson's seawater fixative (Arkarajamorn, 1991, Hopwood, 1996). The carapace of euthanized crabs was carefully removed before placing the remaining carcass into the same solution for 24 hours before transfer to 70% industrial methylated spirit for transport and storage. Following fixation, the hepatopancreas, flesh, intestine, ovary and gills were removed, labeled according to the sites and processed for histological examination using standard

method described by Hopwood(1996). The tissues were sectioned (3-5.0 $\mu$ m thick) using a rotary microtome. The sections were stained with Harris'haematoxylin and eosin (Luna, 1968) and covered with a glass cover slip attached with mounting medium. The specimens were examined and photographed by using a digital camera under a compound microscope with haematoxylin and eosin scale bar of 100 $\mu$ m.

## RESULTS AND DISCUSSION

There were no structural differences on the gills for both sexes from the two sites (Fig.1a and b&2 a and b). This present observation on the gills of *Callinectes pallidus* agreed with the report of Stentiford and Feist(2005), and Doughtie and Rao (1984) but not similar to the findings of Adeboyejo *et al.*,(2013); Sharmila *et al.*,(2013) and Wang, 2011. This may suggest that the gill is not subjected to environmental stress in the water bodies.

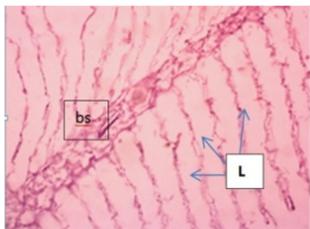


Fig. 1(a)

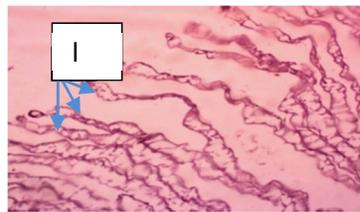


Fig. 1(b)

**Fig. 1:** Showing the gill structure and absence of lesion in male (a) and female (b) *C. pallidus* from Site 1. bs = Phyllobranchiate stem, L = Lamellae.

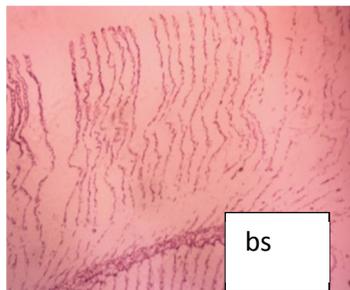


Fig 2(a)

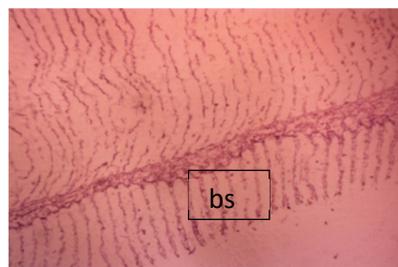
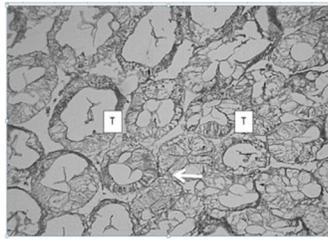


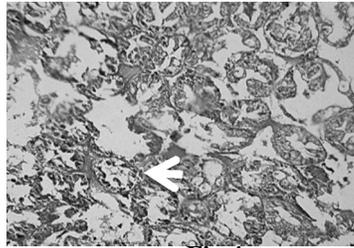
Fig 2(b)

**Fig. 2:** Showing the gill structure and absence of lesion in male (a) and female (b) *C. pallidus* from Site 2. bs = Phyllobranchiate stem, L = Lamellae.

The hepatopancreas of the male and female *C. pallidus* from site 1 as shown in Figures 3 and 5 respectively, did not show any visible lesion or necrosis while the hepatopancreas of the male and female *C. pallidus* from site 2 (Fig. 4 and 6) had a lot of lesions and necrosis.



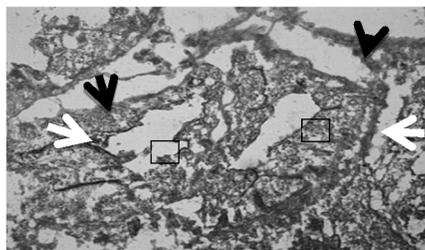
**Fig. 3**



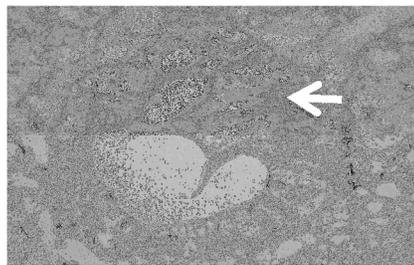
**Fig.4**

**Fig 3:** Hepatopancreas of male *C.pallidus* from Site 1 showing no lesion on the structure. T = hepatopancreatic tubule, white arrow = Epithelial cell

**Fig 4:** Hepatopancreas of male *C. pallidus* from Site 2 with lesion and necrosis. White arrow = tubular epithelial cell with lesion.



**Fig. 5**

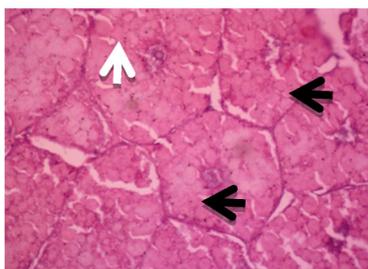


**Fig.6**

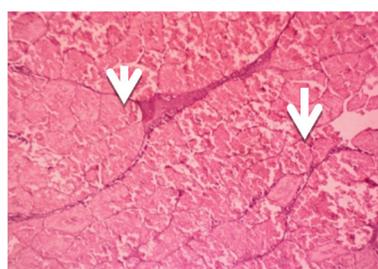
**Fig. 5:** Showing female *C. pallidus* whose hepatopancreas is void of necrosis at Site 1. L= Lumen, black arrow = epithelial cell without phagocytes, white arrow = epithelial cell with phagocytes.

**Fig. 6:** Hepatopancreas of female *C.pallidus* from Site 2 with lesion and necrosis Necrosis of the hepatopancreatic tubules (white arrow).

The presence of lesion on the tubular epithelial cells of the hepatopancreas of both female and male *C.pallidus* observed from Agbara in this study connotes with the findings of Stentiford and Feist (2005) who reported that environmental stress induces necrosis on the hepatopancreas of *Callinectes sapidus*. The result also agreed with the report of Wang, 2011 and Adeboyejo *et al.*,(2013). The histological analysis of the ovaries of the crab from the sites showed a varying oocytes development. The female crabs from site 1 (Fig. 7) possess oocytes with complete vitellogenesis, while the ovary of female from site 2 (Fig.8) had an incomplete vitellogenesis.



**Fig.7**



**Fig.8**

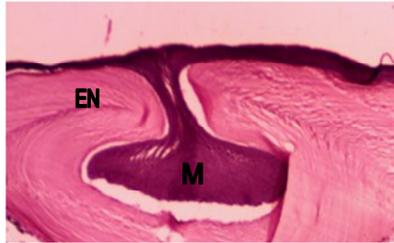
**Fig. 7:** Ovary of *C. pallidus* from Site 1 with complete vitellogenesis.

Black arrow = protein granules, white arrow = nucleus

**Fig. 8:** Ovary of *C. pallidus* from Site 2 with incomplete vitellogenesis. White arrow = nucleus

The incomplete vitellogenesis of the female *C.pallidus* from Agbara (site 2) may be considered as variation in the developmental period which depends on the conditions of the environment (Harris and Santos, 2000). On the other hand it might suggest that female *C.pallidus* from site 2 had their oocytes development retarded by the

environmental stress. The histological examination of the flesh of *C.pallidus* (Fig. 9a &b) showed neither sex nor site difference.



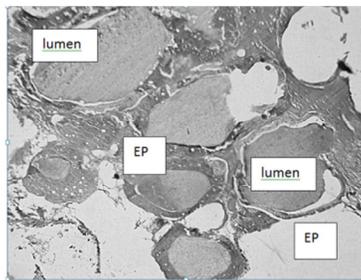
**Fig.9(a)**



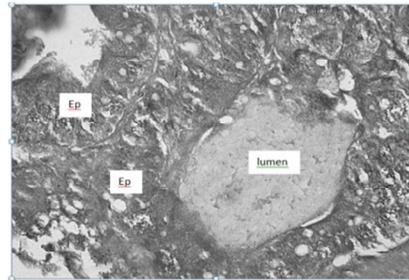
**Fig.9 (b)**

**Fig. 9:** Flesh of female *C. pallidus* from Site 1(a) and Site 2(b) showing no lesion. The flesh consisted of exocuticle (EX) endocuticle (EN) and Muscles (M)

Similarly, the intestine of the male *C.pallidus* examined in this study showed no clear distinction between the sites



**Fig.10**



**Fig.11**

**Fig. 10:** Intestinal parts of male *C. pallidus* from Site 1 devoid of lesion and necrosis. Ep = Intestinal epithelium, lumen = Intestinal lumen

**Fig. 11:** Showing no degeneration or alteration in the intestine of male *C.pallidus* obtained from Site 2. Ep =Intestinal epithelium, lumen = Intestinal lumen

The structure of flesh and intestine of the crab being similar from both sites in this study did not support the report of Stentiford *et al.*, (2004). However, the anterior protrusion of the intestine as observed in this study agreed with the report of Litulo (2005) who affirmed that the anterior and posterior midgut caeca protrude interiorly when there were no alteration on the structure. From various documented literatures on Agbara water bodies such as work of Adeboyejo *et al.* (2013) and Abdulmumim *et al* (2015), it has been affirmed that industrial effluents had adverse effect on aquatic organisms. The environmental stressors includes Brewery effluents which are high in carbohydrate nitrogen and the cleaning and washing reagents, high concentration of heavy metals such as Cu, Zn and Fe and pharmaceutical effluents. In the present study, it is evident that there are effects of environmental stress on the ovaries and hepatopancreas of *C.pallidus* from site 2 (Agbara). Thus, this study could be concluded that *C.pallidus* from site 2 are more susceptible to environmental stress than those from site 1. Also, the present study provide a fundamental information on the wellbeing

of *Callinectes pallidus* from the two water bodies. However, efforts should be intensified to avert future deleterious effect of the environmental stressors on the studied species especially in Agbara water body.

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