comparative studies on certain systems of some marine molluscs in habiting egyptian water

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Mollusca gains ’much attention due to its importance from both academic and economic points of view. from the academic view, it is one of the most diverse in form and habit in all phyla. This makes them an interesting subject for comparative studies, yet such kind of researches is completely neglected by workers in this field. On the other hand, the edible molluscs, which represent non-traditional and cheap protein supply in many countries, might be considered as a promising food source in Egypt. However, the productivity and quality of such important food item may be greatly affected by pollutants which remarkably increased in seawater.In this work, three common edible molluscs namely, Venerupis aurea, Strombus triconis and Sepia officinalis (representing the three major classes: Pelecypoda, Gastropoda and Cephalopoda, respectively) were subjected to extensive comparative studies in an attempt to throw a light in their academic and economic importance. Tfie results of the present work include five directions:1- The first one concerns with the identification and description of the investigated species. Fifteen colour mprphs for V. auera were distinguished. Electrophoretic studies of foot muscle protein revealed that:-a-The proteinograms have 22, 20 and 23 fractions for the studied bivalve, gastropod and cephalopod species, respectively.b-There is absolute appearance (100%) for the fractions number 1 & 14 in all species.c-The higher content (relative area percentage of fraction) was observed in fraction number 2 for the bivalve V aurea, number 8 for the gastropod S. tricornis and number 9 for the cephalopod S. officinalis.d-The comparison between individual protein fractions of species in the term of relative mobility indicates that similarity was pronounced between V. aurea & S. tricornis (SC = 0.82) and V. aurea & S. officinalis (SC = 0.86) but lower similarity was observed between S. tricornis & S. officinalis (SC = 0.57). On the other hand, comparison between species in term of relative percentage area of fractions shows that the similarity was largely decreased.2-Estimation of biochemical contents of the investigated species reveals that they are of high nutritive value. They contain high contents of protein which may exceed 50% of the dry weight. So, they represent a cheap source of dietary protein in Egypt. It was also found that there is a progressive increase of proteins, lipids, and carbohydrates contents with the growth of the animal. This increasment might be attributed to the development of the gonad which is accompanied by the storage of reserve materials. The depletion of such materials in larger size may be attributed to spawning process.Regarding the levels of heavy metals in the investigated species ,

it was found that they are harmless to human consumers and had low limit values according the criteria of WHO about the concentration of metals.The results of the present work indicate also that the size/age of the animal affect the levels of metals inside their bodies. The more pronounced effect is the decreasing of the metal concentration with the increasing of body size.3-Comparative microscopical studies were carried out on the blood cells of the investigated species aiming to throw a light on the main differences(if present) between them which might help for understanding of theirfunctions.a-Microscopical examination of alive blood cells reveals that, theyhave two interesting behavioural features : aggregation (i.e. clumping of the cells together to form confluent mass) and spreading (i.e. their abilityto spread against glass substratum).b-The haemocytes of V. aurea can primarily be identified ashyalinocytes (agranulocytes) and granulocytes. However, fine examination using electron microscopy revealed the presence of three types of hyalinocytes. On the other hand, three types of blood cells (amoebocytes, hyalinocytes and granulocytes) were recognized in the haemolymph of S. tricornis while only one type, the granulocyte (mature leucocytes) wasrecognized in the cephalopod, S. officinalis.c-Histochemical studies were carried out differentiate between thevarious developmental stages that precede the mature leucocytes within the haemopoietic organ (white body) which is found behind the eye. Homologous haemopioetic organ were also observed in the bivalve V aurea. So, the occurrence or absence of certain type of haemocytes ind-Phagocytosis sequence events exhibited by certain haemocytes have been demonstrated. The other proposed functions such as food transport and detoxification of metals were also discussed.4- Comparative anatomical and histological studies were carried out on the renopericardial system of the investigated species.Despite the difference in some details, it was found that the renopericardial system of the three studied species are built on the same plane. The prourine is firstly produced by ultrafilteration through the heart wall to the pericardium. from there, it transferred to the kidney sac via theciliated renopericardial canal where the urine is modified by secretion and reabsorption.Histological studies lead to the identification of podocytes, the cells responsible for ultrafilteration, in the pericardial gland of the bivalve, V. aurea and in the branchial heart appendages of the cephalopods, S. officinal’s. This means that the branchial heart appendage can be regarded as a homologous tissue of the bivalve pericardial gland and represents the site of ultrafilteration. On the other hand, podocyts were not identified in the gastropod, S. tricornis. However, the highly vascular pericardium of this gastropod may represent the site of ultrafilteration.The degree of association between the vascular and excretory system and its relation to the mode of life of the investigated species and also the similarities between molluscan and vertebrate kidneys were discussed.5-The effect of five heavy metals (Cd, Pb, Zn, Cu & Ni) on some biological aspects of the bivalve V. aurea was monitored throughout 40 days of exposure.a-Regarding mortality of the animals, it was found that all metals are toxic. However, the mortality caused by nickel was the lowest where it did not exceed 50% after 25 days of exposure even at the concentration of 100 ppm. On the other hand, copper caused the highest mortality (100%) even at the very low concentration (0.5 ppm) after the same time. When ranked according to the toxicity of the tested metals ,

the order is Cu > Cd > Pb > Zn > Ni.b-Concerning the burrowing activity, the present investigation reveals that exposure to heavy metals for 24 hr. causes inhibition of burrowing activity, to a great extent. When ranked according to their inhibitory effect on burrowing activity, the order of metals was: Cu > CD131 V. Summary> Zn > Pb > Ni. Although inhibition of burrowing activity may expose the animal for the enemies, it can be considered as a protective adaptation that enabling it to avoid high concentration of metals since large areas of epithelium are exposed. However, such behaviour can be used as abioindicator for heavy metal pollution.c- Regarding the effect of cadmium on the haemocytes, the photomicrographs of the present study reveal that, the haemocytes may involved in immobilization and detoxification of cadmium. After exposure to cadmium, there were increase in the number of ribosomes& RER and subsequent increase in the number of SER cristae. These changes reflect a relevant protein synthesis that may be metallothionein which can bind cadmium and immobilize it. Detoxification of cadmium may be subsequently takes place by lysosome as evidenced by the prevalence of electron-dense granules in the treated granulocytes which are mostlylysosomes.Detoxification of cadmium is carried out until tissue exhaustion occurs, then homeostatic capability might be overpassed and pathological damages appear as a hyDROPic cytoplasm and nuclear degradation.d- Many histopathological changes were also observed in the renopericardial system upon exposure of the clams to cadmium. The most notable changes were the increase in the number of brown cells in the auricular wall that may be the first hint of detoxification and degradation of foreign substances. So, there is a possibility for using brown cell response as a biomarker for environmental pollutants.The kidney epithelium was also affected. Such effects include thickening of the basal lamina, haemocyte infiltration and vacuolization. Electromicrographs reveal that the excretory activity increased without remarkable cellular damage as evidenced by the massive extrusions ofconcretions. This suggested a novel mechanism for metal depuration from the organism that will be selectively advantageous with respect to tolerating marine pollution. On the other hand, the ability of the investigated species to live in a contaminated environment might, in turninfluence its potential as vector for human exposure to metals. Fortunately, degradation of kidney epithelium occured upon increasing of exposure time. Finally, the kidney becomes ill-defined mass of tissue andthe rate of mortality increased.