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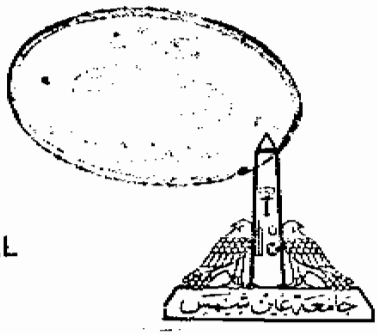

EFFECT OF CERTAIN WATER POLLUTANTS ON THE BIOLOGY OF SOME FRESHWATER ORGANISMS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF TEACHER PREPARATION IN ZOOLOGY

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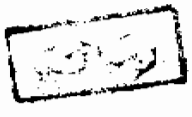

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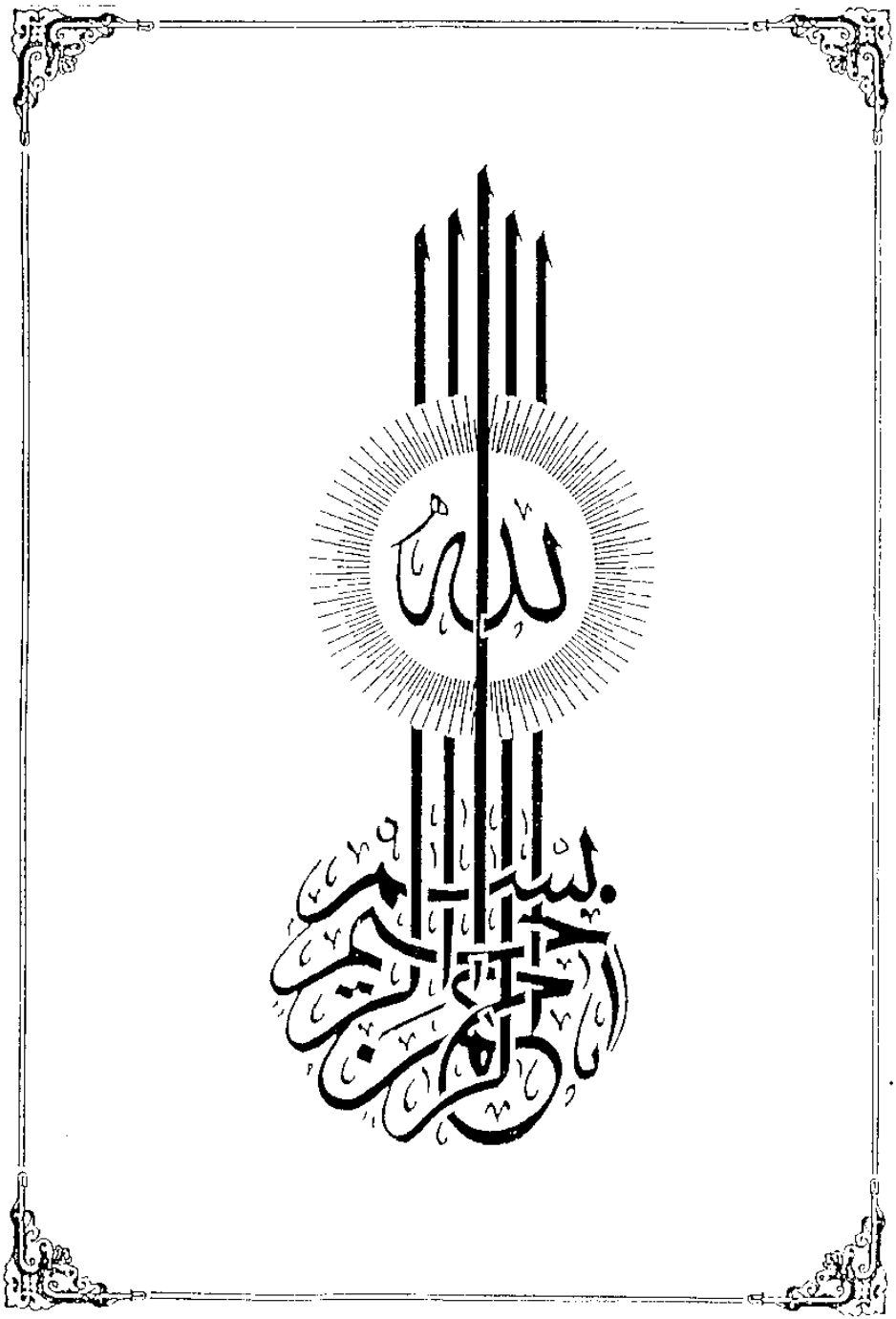
TO MY FAMILY



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The term , trace metal , identifies a large group of metallic elements which are present by limited amounts in nature as well as in living organisms . Trace metals are usually divided into two classes, the first includes Fe , Mg , Mn , Co , Zn ,Cu which are ,' essential' , for the correct functioning of biochemical processes . The second class is made up of metals without any established biological function such as Cd, Hg , Cr , Pb etc . and includes the more important contaminants in the aquatic environment (Aldoviarengo,1985). Moreover , Barak andMason(1990 a) reported that Hg , Cd and Pb are dangerous substances .

Doull *et al* . (1980) recorded the nature of the link between exposure to a contaminant in the environment and the dose received within an organism and referred to the threshold dose of heavy metals which generally means the maximum quantity that can be taken without causing death .

Lead and cadmium are metallic contaminants that have known essential function in human physiology . In the meantime , Hg and Pb are used as agricultural pesticides and Cd is present in fertilizers (Barak and Mason1990 a) .

The main source of cadmium pollution is through soil.Cadmium released from factory wastes and mining operations also pollute water and food crops .The toxic effects of these metals to aquatic organisms have been well documented and are dependent on the characteristics of the medium (Shivaraj and Patil , 1985) .

Lead is another serious environmental pollutant metal , due to widely use in industries . It is also well known that accumulation of lead may reach toxic levels and produces serious effects on living system . It has been well established that human intoxication with lead may be

acquired mainly from three sources. Firstly, painters using lead - paint as well as workmen grinding paint are always subjected to lead intoxication if proper precautions are not taken . Secondly , children may ingest small amounts of lead from walls . Thirdly , the greatest source of environmental lead is gasoline combustion produced by cars (Al - Hinzab , 1989) .

The body store of lead in the average adult population is about 150 to 400 mg and blood level average is about 25 mg/100 ml .A modest increase to 80 mg/100 ml blood is generally associated with clinical symptoms (Goyer , 1971) . Most of the previous investigations concern with the effect of lead compounds on the central nervous system of the developing embryos . Moreover , lead and other heavy metals impair the functioning of enzyme systems and trace quantities of these metals may have profound physiological effects (Mahaffy ***et al*** . , 1982) .

Current rates of emission of toxic metals to the environment were reported by Nriagu (1988) to pose problems of subclinical poisoning to several million people.Largequantities of these emissions are eventually washed into aquatic systems , where they contaminate the biota , includuig fish . Fish are often at the top of the aquatic food chain and may contain large amounts of some metals such as Pb & Cd (Barak and Mason , 1989) .

Several factors have been responsible for typical pattern of accumulation at the higher concentrations by aquatic organisms . Probably the most important factor affecting the accumulation of heavy metals in aquatic organisms is speciation , i .e. , the form in which the metal is present . There have been a number of investigations of the speciation of cadmium in natural waters , both theoretical and experimental , and a comprehensive review is provided by Rospor (1980) .

Aquatic organisms are exposed to heavy metals

by two different ways , either exposure to contaminated water or in food . The route of entry can either by via the gills or via the digestive tract , but accumulation of cadmuim from solid matter such as food is much less efficient than from the aqueous phase (Taylor , 1983) .

The resistance of the aquatic organism to metals also depends upon its size in assessing uptake and loss of pollutants (Martin and Caughtrey , 1982 , Shivaraj and Patil , 1985 , Hemelraad *et al* .,1986 a , Douben , 1989 a) .

The fish *Gambusia affinis* (Family Poecilliidae , Order Cyprinodontiformes, Class Actinopterygii) is a larvivorous fish indigenous to fresh waters of the southern part of North America .It has been introduced into many parts of the world as a means of malaria control , since it feeds on larval stages of mosquitoes that are carriers of plasmodic malaria (Seal , 1908 , Kuntz , 1913) . It was first introduced into Europe in 1912 (Ilin , 1968) and later into Asia (Wade and Sakaki , 1974) . At the present time , *Gambusia* is distributed allover the whole world . It has been established in small and moderate sized canals and drains of Egypt since many years .

On the other hand , freshwater clams are well known benthic organisms inhabiting various rivers and streams of the tropics and subtropics.The clam *Caelatura* (*Unio*) *aegyptiaca* (Family Unionidae , Order Heterodonta, Class Bivalvia) is commonly found among sedentary vegetation of small and moderate sized canals and drains in Egypt .

Both the fish *Gambusia affinis* and the clam *Caelatura aegyptiaca* were chozen for this study as they represent planktivorous organisms that coexist in the same habitats though the former is nektonic while the latter is benthic . Both animals are possibly exposed to the same water pollutants either in solution or in the sediment . Therefore , their pattern of response towards such pollutants