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**A REVIEW ON STRESS RESPONSE STRATEGIES AMONG SHRIMPS AND FISHES**

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**ABSTRACT**

Our surroundings are full of animals dwelling in their specific habitat. Each one of them has to adapt itself to survive and flourish. Every organism whether its terrestrial or aquatic has to face variety of stress agents or stressors which influence and leave huge impact on their life and normal functioning. Stressors are the agents or factors which imposes several psychological, physiological and behavioural impacts on organisms. The impact of these factors could be termed as stress. Stress is a condition which imposes huge impact on terrestrial as well as aquatic animals. Aquatic animals like fishes and prawn have to face several stressors which cause change in their physiological condition. In the present article, an effort has been made to sum up the response of aquatic animals towards these stressors.

**Keywords: Aquatic animals, stress, response, stressors**

**INTRODUCTION**

Stress is basically a condition which denotes discomfort and uneasiness. It is the general nature of each creature that it gets affected by its surroundings, but if the prevailing surround imposes negative impact then it may cause disturbance in their morphology, physiology as well as survival. Such type of disturbing elements are considered as stress agents which influence normal life of creatures. Like

terrestrial animals, aquatic animals also undergone stress conditions due to several extrinsic and intrinsic environmental factors. There are so many factors (stressors) which may cause stress to the aquatic animals like unavailability of food, competitors, enemies, several abiotic factors like variation in light, temperature, humidity and chemical conditions like salinity, pH, hardness, solutes, etc. Even

the transportation and handling of animals particularly fishes and prawns may cause stress to them. Physiological responses of animals towards stress factors could be categorized as primary, secondary and tertiary responses. Primary responses constitute changes in hormone level, secondary response comprises variability in metabolism and functioning of animal and tertiary response involves variation in growth, defence mechanism (immunity) and behavioural responses. It has been observed that initially stressors are found to be bearable to the animals and they remain in stable state. But the continuous long-term exposure of stressed condition led to diseased or abnormal condition of animal. It is basically a long-term exposure with varied behavioural and physiological conditions. Stress free environment is the prime requirement for each organism to flourish. Cortex part of adrenal gland in vertebrates is responsible for secreting glucocorticoids hormones which are considered as stress hormones among vertebrates. These hormones tend to cause gluconeogenesis and affects reproductive, digestive and other physiological mechanisms of animal; they also impose their effects on immune response.

#### **STRESS RESPONSE AMONG SOME PECULIAR AQUATIC ANIMALS**

Zoologists had studied a lot and revealed several conditions of stress among aquatic

animals. Stress is a very common process, which affect all the living bodies of nature. Not only terrestrial animals but aquatic animals also suffered from these. Efforts have been made to assemble stress response shown by some aquatic animals particularly by shrimps and fishes.

Improper handling of aquatic animals led to change in cortisol level and cause stress condition among them. It had been observed that Yellow Perch (*Perca flavescens*) seemed to be highly sensitive with response to handling and disturbances in culture medium, which induced stress and led to death of fish [1].

It had been found that physical and chemical stressors may cause arousal of non-specific responses to the fishes but this may further lead to adapt the fish to maintain homeostasis. If the stressors were found to be more powerful, then it may lead to maladaptation and could affect the health of fish. Such changes in physiology could be caused due to change in plasma corticosteroids [2].

Studies revealed that physiological stress cause arousal of several hierarchal changes among fishes, which involved increase in glucose level, adrenalin secretion, etc. Acute responses could benefit fishes, while chronic responses might cause harm to them [3].

Stress effect could be clearly observed among fishes and other aquatic animals

over their gills, skin and other organs as they have to face procedures of capture, transportation, handling etc. which sometime led them to adaptation or may cause several morphological injuries [4].

Studies revealed that seasonal changes in temperature in association with thermocline and deck conditions may lead to mass mortality of Pacific halibut [5]. It had also been observed that diving might be responsible for causing stress condition among aquatic animals. Diving may induce acute and chronic embolic lesions, bubble formation etc. among cetaceans [6].

Probiotics also found to be played major role in fishes for fighting with physical, chemical and biological stress by developing innate immunity in them [7]. Stress responses might be varied as per the species response. A study had been done by applying specific lethal and sublethal techniques among five different species of shark and found that hammer head shark elicited highest stressed response, followed by blacktip, bull, lemon and tiger shark. Mortality of fishes depended on capture and release [8].

Sound is one of the major pollutants in present time, which is also found to induced physiological stress conditions among aquatic animals. It had been observed that noise produced by anthropogenic activities and by boats create physiological stressed condition among

coastal marine gaint kelpfish, *Heterosticus rostratus* by increasing cortisol level in the blood [9].

pH sensitive microencapsulated biomarkers had been applied in amphipods in Bikal Lake to know and access about in vivo stress conditions among aquatic animals. Such techniques were found to be quite relevant and applicable to know about stress conditions of animals [10].

Shrimps were found to be euryhaline, capable to survive in varied salinity conditions, but it had been reported that significant changes in abiotic components like salinity and temperature caused huge effect on gene expression of shrimps resulting in change in their physiology, growth and moulting [11].

Physical environmental conditions like temperature also impose stress among aquatic animals. Thermal variations severely affect metabolism as well as cardiac, nervous, respiratory physiology of marine invertebrates. Even long-term exposure to stressed conditions also imposed ill effects of reproductive cycles of animals [12].

Hatcheries were also found to be affected by stress. Larvae found to be most affected stage in the life cycle of fishes due to weak immune system. There found to be several factors which caused stressed condition and even mortality among hatcheries [13].

It had been observed on feeding juvenile brown marbled fish with diet rich in onion and ginger, they became more stress tolerant against infection of *V. harveyi* JML.1 as compared to those which were fed with non-supplemented diet [14].

Transportation also cause stress, a study had been carried to observe stress responses in cat fishes, which revealed that there was decline in blood protein level while antioxidant, specific enzyme activities, concentration of nitric oxide and mRNA had been increased. Channel Catfish was found to be more sensitive with respect to its transportation [15].

Stressotope, a habitat analyser system had been designed to study stress among bony fishes, which revealed multiple stress responses. This helped to evaluate out several behavioural and inter-specific responses among teleosts. This also helped to point out some common stressors among different species [16].

Fishes have to face multiple stressors that affect their population that led to various synergistic and antagonistic effects. Under such stressors, fishes were found to utilize their energy in defence mechanism and repairing [17].

Aquatic animals also found to be exposed through several anthropogenic and climatic stressors, for that animal associations proved to be good stress

relievers and help them to adapt accordingly [18].

Dietary supplements found to be responsible for altering stress response among shrimps. Diet could enhance the energy potential of shrimps to overcome multiple stress conditions among them [19]. Shrimps fed with fishmeal having scallop or squid found to have more growth and stress tolerability as compared to control diet shrimps [20].

High stocking density of prawn in nursery ponds also led to cause elevated level of oxidative enzymes which further imposed negative effects and resulted in disease outbreak. Excessive crowding also found to affect growth of organism [21].

Studies revealed that stressors imposed several physiological responses through CNS by secreting hormones like corticosteroids invertebrates, hyperglycemic hormone in crustaceans, which further caused increased in respiratory and heart rate which further elevated immune response among animals [22].

## DISCUSSION AND CONCLUSION

Stressed conditions found to impose several morphological and physiological effects on animal body. Like amount of mucous gets decreased. Mucus acts as a protective envelop over the body, which got removed or decreased while handling the animal. Chemical also found to decrease amount of mucus in fishes. Similarly, integument like

skin and their derivatives scales, etc. were found to be damaged by handling or by other animals while showing reproductive and behavioural responses. Several stressors could disturb hormonal equilibrium and caused less inflammatory responses. Even low temperature might be responsible to reducing antibody producing capacity of organism. Studies also revealed that environmental pollutants might cause oxidative stress among aquatic animals. Animals are the essential part of our diversity. Their well-being is equally important as ourself for the equilibrium of nature. Aquatic animals also keep equal importance as the terrestrial ones. Their diseased or stressed condition can cause severe harm to ecology as well the economy of the country. Thus, it is necessary that their stressed conditions should be prevented by providing them clean, pollution free environment. Handling should be done with utmost care. Exotic and harmful species should be prohibited to interact with endemic species. Good health management practices should be adopted. Anthropogenic activities should not hamper the life of animals. Stress response is a vast topic which needs to be think, studied and managed so that efforts could be formularized to prevent them.

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