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Behavioral Choices Determines the Fate of Fish Species

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Fish are almost the 51% (27,977) of known living vertebrate species and taxonomically divided into various sub groups (Nelson, 2006). These constitute an important part in food chain and are towards extinction due to overfishing (Jackson *et al.*, 2001). It is a thought that behavior effects the survival of an animal because it has great impact on species distribution and environmental relations (Sih *et al.*, 2004). For example a fast moving (intermittent locomotion) animal could escape from a predator more easily than a slow moving animal (Kramer and McLaughlin, 2001). It will get more benefit in pursuing the pray, searching for mate and shelter, it will also has increased endurance and sensory senses. Animal's behavior is modulated by the sense of boldness, aggressiveness and activity, which determine the survival and social communities between them (Sih, 2011). Like other organisms, fish are also influenced by their behavior, as the bold bluegill fish has fast moving ability with fewer stops in swimming than the timid ones (Wilson and Godin, 2010). Thus it has high activity which may enhance its rate of survival by higher foraging and dispersing efficiencies. Aggressiveness is another behavioral character found in fishes but it may decrease the fish populations (Johnson, 2008). As significantly low growth rate was observed in the damselfish population with increased aggressive responses. Thus behavioral responses of an animal may determine the rate of its growth, predator-prey relationship and survival.

To demonstrate the relationship between behavior and the chance of being captured by fishing techniques Wilson *et al.* (2011) studied the boldness differences in bluegill sunfish. They captured the fish via angling and seined (seine net) methods from natural sites and pass them through different tests. Their study emphasized the presence of large behavioral differences within bluegill individuals. The fish caught by seine nets in the natural sites were usually bolder than the individuals caught from the angling technique. These bold fish spent least time in the refugee water and required less time to emerge from it. Moreover the large proportion of ectoparasites was present on the bold fish body. On the other hand timid fish spent more time in the refugee and only few parasites were present in their body. These fish required large time to emerge from it and swam with the base of refugee. Thus the water column used efficiency of fish was also a discriminating feature among them, bolder fish use less

water column than the timid fish. But this parameter was unable to differentiate the seined and angled fishes. Although, the individuals caught from seine method were considered bolder, a contradictory result was obtained when the seined fish were subjected to angling technique. In an outdoor experiment by the researchers, it was observed that the angling in open water will caught the bolder individuals. As only high boldness scored animals were caught more frequently, when fished in water without any refugee. The other physical tests; body length and weight showed non-significant differences in both kind (angled and seined) of individuals. Moreover these animals were also non-significantly different from each other in the presence of stress hormone, cortisol. However larger animals were with high plasma cortisol levels in their body. Hence, the boldness was directly related to the presence of ectoparasites and the proportion of being caught, it was independent to the physical state of animal. The individual caught from open water was bolder as they were away from refugee, but this increased the rate of being fished. This high incidence of bolder fish capturing might pose negative effect on its population rate. As Biro and Post (2008) reported that bolder fish frequently came in contact with the fishing gear; its higher feeding rate and activity made it vulnerable to the capturing technique. This caused the decrease in the important genotypes (fast-growing ability) as high quality genotypes were present in bold fish and harvested three times more frequently than slow-growing genotypes. Depending on this thought and examining the bluegill fish behavior, Wilson *et al.* (2011) proposed that fishing techniques determine the type of fish population. The fishing in open water will led to the death of bolder organisms only and timid fish population will survive as they faced least danger of extinction. This will also cause a bias in the observation of behavioral, conservational and population biologist, if they use single fishing technique or fished from single environment only. Thus this can be said that boldness may provide many benefits to animal growth and productivity but it put the important traits of bolder fish into great danger. As body weight and size did not affect fishing rate and bolder fish was mostly captured by its fearless attitude.

From above discussion this can be concluded that behavior has a great potential to establish specific population type. Because it not only determine the

feeding and reproductive rate but also affects the survival of an animal from being preyed. As Wilson *et al.* (2011) in their experiment observe that bold fish were usually exposed to fishing technique relatively at higher rate than timid, which was due to their fearless presence in the area of fishing. This contribute towards the large extinction rate of bold fish population as these were found in open water (usually used for commercial fishing) and did not spent large time under the refugee. Thus the biologist and fish industry should undertake healthy steps to protect the high quality traits of fish and should not fish from specific area only. Moreover the observational study of fish populations should be conducted at more than one type of environment or fish habitat. This will protect the environment from the deletion of fish's important behavioral traits.

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