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Examining the Effects of Fish Parasites on Freshwater Capture and Culture Fisheries, As Well as Their Treatment Mechanisms

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Abstract:

This study describes Impacts of Fish Parasites on Freshwater Capture and Culture Fisheries. The growing global interest in fish farming has led to a greater need for information and insight into fish parasites. Fish raised in captivity are often released into the wild, both by accident and on purpose, where they may do well and have an effect on wild fish populations through ecological, genetic, and technical interactions. Aquaculture for fish production, fisheries improvement, and conservation is growing quickly, and many cultivated species are becoming domesticated by accident or on purpose. From October 2015 to September 2017, macroscopy was used to look for parasites in farmed fish. A total of 1828 fish were checked, including 694 Clarias gariepinus, 288 Cyprinus carpio, and 846 Oreochromis niloticus. This study discovered that the succeeding combinations of the three fish species C. gariepinus, O. niloticus, and C. carpio were responsible for the transmission of parasites across all of the fish species tested.

Keywords: culture fisheries, fish parasites, species, parasites.

1. INTRODUCTION

The technique of raising fish in captivity, sometimes known as aquaculture, has grown significantly in recent decades. Since 1970, the number of fish species farmed for human consumption has increased by a factor of ten, reaching over 160 (Tacon, A. J. (2003); Duarte, C. M., Marba, N. &Holmer, M. (2007); Bostock, J., et al (2010). Aside from above reasons, fish are also farmed for other reasons, such as for entertainment, decoration, biomanipulation, the preservation of endangered species, and scientific inquiry (Utter, F. &Epifanio, J. (2002). When an organism is raised in a laboratory, its natural habitat is radically altered, and its biology is typically manipulated on purpose, such as through selective breeding. As a result, domestication begins in the lives of fish that have been brought up in captivity. Domestication leads in organisms with enhanced performance in cultivated settings compared to their performance in the wild, as well as the possible expression of extra traits prized by cultivators.On the flip side, when returned into their natural habitats, these species often prove to be less robust than their wild counterparts. Even though humans have tamed a lot of fish species, only a small number of them have morphological and physiological differences that aren't seen in the wild and can't live without human care (Balon, 2004; Bilio, 2008). Wild and farmed fish populations have extensive and substantial interactions. Both unintentional and planned releases of cultured fish have reached unprecedented levels (McGinnity, P., et al., 2003; Naylor, R., et al., 2004; Laikre, L., et al., 2010). Most farmed fish are kept in ponds or cages, each of which might be breached accidentally or during floods, increasing the risk of escape.Fish raised in captivity are increasingly being released into the wild with the intention of improving or restoring fish populations. Domestic fish often live long enough to

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interact biologically and genetically with wild fish, despite the fact that they often fare worse in natural situations than their wild relatives.These kinds of meetings could be helpful or bothersome. Complicating factors include increased fishing pressure on wild fish as a result of fishermen's reactions to fish stocking, biotic deformation of wild fish, decreased fitness and genetic variation in populations where cultured and wild fish breed, and altered transmission of infectious illnesses (McGinnity, P., et al., 2003; Lorenzen, K. et al 2008b; Van Poorten, B. T., et al., 2011). Positive interactions can lead to overall population increases, which in turn assist sustain fisheries and reduce ecological or genetic threats for endangered populations. Predicting the long-term effects of interactions between farmed and wild fish has proven notoriously difficult (Fraser, D. J. et al 2008; Araki, H. &Schmid, C, 2010).study are especially sensitive to the effects of domestication on farmed fish, while characteristics of wild populations, release and fishing tactics, which makes sense given the interconnected nature of the ecological and genetic processes that shape them. So, the current situation presents both a chance and a necessity for studies on the biology of fish domestication.

1.1 FISH IN CULTURE SYSTEMS

Cultured fish's production rates, phenotypic as well as genetic quality, and health are all affected by the facility where they are raised, how they are cared for, and how their genes and health are managed. We only look at these effects through the eyepiece of a underlying manufacturing procedures, domesticated animals, as well as sickness, putting most of our attention on sickness.

- **Fish culture production**

Although fish culture systems vary greatly in terms of overall degree of control and production intensity, they are all primarily intended to house fish in artificial environments that promote their growth and survival, give the cultured organism the amount and quality of nutrients it needs, and keep predators and diseases away as much as possible. Fish in captivity can reach their physiologic maximum growth rate and experience dramatically reduced mortality in well-managed systems. Fish can be farmed at densities with per production rates that may be ten times greater than what is observed in wild systems. This is possible because nutrients can be brought in from outside and waste products can be taken out (Bostock et al., 2010; Welcomme et al., 2010).

- **Domestication**

Domestication is the act of altering a cultivated organism through repeated developmental effects and genetic mutations over multiple generations. As a rule, domestication results in offspring that excel in human care but struggle in the wild. Traditional explanations for animal domestication have focused on the role of organic and inorganic selection in altering animal genomes. The importance of developmental responses was previously underappreciated, but this has changed thanks to the renewed focus on the captive breeding of endangered species and the introduction of novel domesticates.

It is not always easy to figure out how important genetic or developmental responses are to patterns that can be seen. Experiments can show that fish with the same or a strongly linked genotype can adapt to different environments, and fish with different genotypes can adapt to the same surroundings to show that they are different because of their genes (Khaw et al., 2009). Even in well-designed tests, it can be hard to tell the difference between natural selection within a generation and developmental plasticity. In quantitative genetics, the "animal model" gives a way to

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break down genetic variability into its plasticity as well as selection parts when pedigree information is available (Wilson et al., 2010). We suggest classifying domesticated fish into four distinct types according to the extent to which their biology is manipulated and the desired outcome of these interventions. Here, we use the term "types" to refer to groups of phenotypes and genotypes that arise from the same processes but can nevertheless seem very different depending on the finer points of those processes.The simplest kind of domestication is driven by unintentional reactions to the cultural setting, which ultimately results in the development of captive types. Targeted alterations of the biology away from the captive type are at the heart of modern domestication techniques. Promoting features desired in aquaculture commodity production to generate a spectrum of completely domesticated types; generating or preserving wild-like types by cultivating them; or combining the two methods of fostering the wild phenotype and genotype. While domesticated creatures may remain in the same environment from generation to generation, they will nevertheless undergo gradual change.

- **Diseases**

Fish in captivity can develop a wide range of non-infectious diseases and injuries, including abnormalities of the spine and eyes, cataracts, fin erosion, and liver damage. These issues are more common in newly cultured species or newly developed culture methods due to a lack of knowledge and experience in husbandry, but they are much less common after these systems and species have grown established.

Parasites (in the broadest sense, such as microorganisms, microbes, and metazoa) can spread from wild fish to cultivated fish through polluted founder populations, but most typically this happens when the limits of the culture system are left open to the environment (Kurath& Winton, 2011). Still, keeping fish in society facilities makes it easy for parasites to direct life cycles to spread. Bacteria, viruses, many types of protozoa, and even some metazoans like sea lice fall into this category.It is not unusual for direct-life-cycle protozoa to create persistent strains in culture systems. These strains may become more dangerous than the initial strains found in low-density crazy fish populations due to the high number of hosts and other factors (Pulkkinen et al., 2010), As a result, most fish culture systems place a premium on eliminating direct-life-cycle parasites through a combination of preventative measures and therapeutic interventions. Continuous (batch) culture combined with disinfection of infrastructure and fallowing of areas to break temperature range, disease screening & stopping the transfer of sick animals, immunisation, and chemotherapy are among the most additional productive.Acceptable results for parasite control range from eradication to maintenance at levels that do not cause undue harm, and both extremes are possible depending on the culture system at issue.

2. REVIEW OF LITERATURE

Cole, V. J., et al (2018)explained the study ona review of the diversity, sustainability, and research needs of the world's polychaete worm fisheries as a resource to recreational fishermen.Polychaete worms are being widely harvested for commercial and recreational purposes, primarily from wild resources, caused by recreational fishermen's need for bait. This study finds 12 of a 81 family members of polychaetes that are employed as bait, with more than 60 species in each family (the most well-known being Arenicolidae, Eunicidae, Nereididae, or Onuphidae). A better understanding of a taxonomy, population relationships, population dynamics, or fishery activities endorsed by polychaete populations will lead to better management and more reliable access for user groups.

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Maciel, P. O., et al (2018)discussed the study ofCommercial fish from South America contain the family Trichodinidae. Trichodinidae-family ciliates seem to be protozoan parasites that really are important for South American farmed fish because, when there are a lot of them, they kill farmed fish in a big way. They are now more thoroughly understood and can be taxonomically distinguished in both wild and farmed fish. This study discusses about 15 distinct species found in Brazil that belong to three different genera. It also talks about how the parasite, host, and environment interacts with them, how to diagnose them, and how to treat them.In order to determine the essential elements of any production system, the presence of parasitic ciliates should be linked to agricultural circumstances such stress factors, quality of water, seasonality, age, and host immunity.

Teffer, A. K., et al (2018)conducted a study of Infections, fisheries capture, temperature, and host responses: multistressor influences on survival and behaviour of adult Chinook salmon. Chinook salmon (Oncorhynchustshawytscha) population decreases in recent years may be significantly influenced by poorly understood infectious illness dynamics of wild Pacific salmon. Specialists used holding, telemetry, and non-lethal biopsy and gillnet treatments on adult salmon in fresh water to learn more about how these factors affect how they live and where they go. The effects of simulated gillnetting were not amplified although high temperature did affect survival. Gillnetting raised infection loads, decreased migratory rates and distances travelled upriver, but had no impact on longevity. The result of this study increase our capacity to forecast how stresses can shorten the lifespan and success of salmon migration, show the diverse effects of infections, and contribute to our developing understanding of disease dynamics in wild fish populations.

Teffer, A. et al (2018)explained the study of Impacts of cumulative thermal, fishery, and infection development on adult Pacific salmon health and survival during freshwater residence (Doctoral dissertation).The development of infection, health, and survival of wild Pacific salmon are affected by cumulative stresses. A portion of the fish in each temperature group were treated with a simulation of such a fishing bycatch release at the start of the holding period (gillnet entanglement, air exposure). This study exposed to the river carried more infections and perished sooner than fish that avoided the lower river, indicating that infections have a causal effect on early mortality. These data confirm the role of infections originating from rivers in adult Pacific salmon early mortality in freshwater and shed light on the mechanisms underlying this mortality, which include influences from numerous infections, sex, species, water temperature, and fisheries stress.

Callier, M. D., et al (2018) conducted a study on Review of mobile wild species' attraction to and repulsion from finfish or shellfish aquaculture. This study has been conducted on the consequences of fish and Shellfish farming on natural populations that stay in one place, especially infauna. Additionally, mobile wildlife such as crustaceans, fishes, birds, and marine mammals are used in aquaculture operations, but these interactions are more complicated and have a range of impacts depending on whether the animals are drawn to (attraction) or repulsed by (repulsion) the farm operations. The set of capabilities that there are multiple spatial (vertical and horizontal) and temporal scales (season, feeding time, day/night cycle) at which mobile organisms connected with farming infrastructure are distributed. Modeling may be used to clarify outcomes, but extensive research is required to fully understand effects.

Hutson, K. S., et al (2018) explained the study ofCultures of aquatic parasites and their applications. Aquatic parasite culture is important in this time of rapid growth in aquaculture as well as trade because it helps us learn more about new diseases and how they affect the health of people and animals. However, due to their complicated life cycles, which frequently involve several hosts, numerous developmental stages, varied generation durations, and reproductive strategies, cultivating parasites poses a number of difficulties. Furthermore, it is still unclear what the majority of parasites need from their surroundings. For a small but growing number of aquatic illnesses, in in vitro and in vivo cultures are being established despite these inherent challenges. The development of sustainable aquatic industries and communities will be aided by the expansion of this resource, which will also make diagnostic procedures and treatment trials easier.

Aaen, S. M., et al (2015)discussed the study of Drug resistance in sea lice: a threat to salmonid aquaculture. The copepod ectoparasite known as sea lice, which afflict many different fish species, has a large reproductive capacity. The amount of morbidity-causing parasites is inversely correlated with fish size. Massive parasite dissemination is restricted by the low host density in nature. Salmon farms are frequently located close to wild salmonid migration paths because smolts are especially susceptible to sea lice infection. Several precautions are taken to protect salmonids, both farmed and wild, that are travelling by or residing close to the farms. The most consistent and effective medical treatment for farmed fish has been used extensively, making advantage of the available chemicals. Due to this, drug-resistant parasites have been found on farmed salmonids and possibly wild salmonids.

Torrissen, O., et al (2013) explained the study of Salmon liceimpact on wild salmonids and salmon aquaculture. Lepeophtheirussalmonis, a parasite that lives naturally in sea water, infects salmon. According to estimates from Norway and Ireland, medicated Atlantic salmon smolts used to have a 1.1:1-1.2:1 chance of reaching the sea, while untreated smolts had a 1.2:1 chance. Using cleaner fish to get rid of salmon lice has been shown to work, and wrasse aquaculture is a key part of reaching this goal. Salmon lice have serious financial repercussions for the salmon industry, both directly via the cost of prevention and treatment as well as indirectly through unfavourable public perception.

Lorenzen, K., et al (2012) conducted a study ofIntegrative biological control of domestication or interactions between wild fish for cultured fish. The aquaculture of fish for the production of commodities, the improvement of fisheries, and conservation is growing quickly, and many of the cultured species are accidentally or purposefully becoming domesticated. This study shows how management practises affect the process of domestication, how domesticated fish talk to wild fish as well as what occurs in terms of goods made, fish stocks productivity, and conservation. This study also make a classification of management systems based on how cultural and natural management practises are set upthat are most likely to provide desirable results in a given set of management goals and circumstances.

3. METHODOLOGY

This study was done on a fish farm with a culture intensive system at the central laboratory for aquaculture studies in India. There were 1828 species of farmed fish;such as 846 Oreochromis niloticus, 288 Cyprinus carpio, or 694 Clarias gariepinus.These fish were collected from October to September annually. The individuals of each species were chosen based on the season to cover different size groups. C. gariepinus (25–39.9 cm), C. carpio (12–21.9 cm), & O. niloticus were all in the small size group (14–21 cm). C. gariepinus (40–55 cm), C. carpio (22–33 cm), or O. niloticus were all in the large size group (22–30 cm).**Table 1** shows the number of parasites in C. gariepinus

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and how they change with the seasons.Parasite Prevalence among Examined Fish Species by Season is showed in **Table 2**.

4. RESULT

Table 1: Relationship between seasonal variations and percentage parasites infection of C. gariepinus

Size	Sex	No	Spring	Summer	Autumn	Winter	Total
Smallfish	**Male**	No.ofexamined	50	71	38	18	177
		No.ofInfected	38	63	31	10	142
		Percentageofinfection%	76.00	88.73	81.58	55.56	80.23
	Female	No.ofexamined	61	101	54	27	243
		No.ofInfected	51	93	42	20	206
		Percentageofinfection%	83.61	92.08	77.78	74.07	84.77
Largefish	**Male**	No.ofexamined	34	41	30	17	122
		No.ofInfected	27	37	21	7	92
		Percentageofinfection%	79.41	90.24	70.00	41.18	75.41
	Female	No.ofexamined	41	58	29	24	152
		No.ofInfected	31	45	20	11	107
		Percentageofinfection%	75.61	77.59	68.97	45.83	70.39

Parasite infection rates in C. gariepinus ranged widely across size and sex classes, as shown in **Table 1**. Small C. gariepinus fish have been most likely to have parasites in female samples (92%), and male samples were most likely to have parasites (55.56%) in the winter. It changed with the seasons for large fish. For males, it ranged from 41.18 to 90.24% inside the winter and summer. Average parasite infection rates peaked in the summer among small females (84.77%) and dipped to 70.39% among large females (when infected at their lowest) in the winter (70%). The percentage of C. Carpio infected with parasites ranged from a high of 77.42% in female small fishes during the summer to a low of 16.67% in male large fishes during the fall.

Table 2: Effect of season on the prevalence of parasites among examined fish species

Season	CyprinusCarpio, Oreochromisniloticus					
	no of examined	No of infected	no of examined	no of infected	no of examined	no of infected
Spring	186	147	103	52	214	132
Summer	271	238	89	63	321	257
Autumn	151	114	54	18	197	118
Winter	86	48	42	21	114	61
Total	694	547	288	154	846	568

According to the data, the maximal prevalence of C. gariepinus parasite infection occurred in the summer (87.82%) and decreased to 55.81% in the winter (**Table 2**). The total parasite infection rate in C. Carpio ranged from a peak of 70.79% in the summer to a low of 33.33 percent in the fall. When looking specifically at O. niloticus, however, total parasite infection peaked in the summer (80.06%) and dipped to its lowest value (53.51%) in the winter.

CONCLUSION

Due to the growing interest in aquaculture development, the impact of fish parasites is becoming an intriguing issue around the world. The impact of parasites on fish survival has been extensively studied in studies of fish raised in captivity or under culture conditions. Aquaculture of fish for the production of commodities, the improvement of fisheries, and conservation is growing quickly, with many domesticated species occurring accidentally or on purpose. The parasites were found to be common in all of the species studied, but they were more common in C. gariepinus than in O. niloticus and C. carpio. Stakeholders should train fish farmers on how to deal with these parasites before they start keeping fish.

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