

Alien invasive species: A threat to fisheries biodiversity

MOHAMMAD MAMUN CHOWDHURY

ALIEN Invasive Species (AIS) is comparatively a new term in biodiversity and this term is now being frequently used in different scientific workshops, seminars and roundtable discussions. Before proceeding to the brief discussion on AIS, let's know the definition which is defined as "an alien species (a species, subspecies, or lower taxon, introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce), whose introduction and/or spread threaten biological diversity and cause economic or environmental harm or harm to human health." AIS may be plant, microbes, insects, animals or fish. Now, this term is much popular in scientific arena of Bangladesh especially in fisheries because of the introduction of several AIS including the wild Piranha.

Over the years, Bangladesh has experienced a number of trans-fishers/introductions/translocation of finfish species primarily for aquaculture development. Fifteen species of fishes (Nile tilapia, Mossambique tilapia, GIFT, Common carp, Grass carp, Silver carp, Mirror carp, Bighead carp, Black carp, African Magur, Thai Pangus, Thai Magur, Thai Sarpunti, Piranha and Pirapitinga) have been introduced intentionally or unintentionally for culture purposes, two species (Gourami and Guppy) for pest control, one species (milkfish) for research purpose and at least 46 species for ornamental (aquarium) purposes. Nile tilapia, Mossambique tilapia, African Magur are native to Africa; Piranha and Pirapitinga are native to Latin America; Common carp, Grass carp, Silver carp, Mirror carp, Bighead carp and Black carp are native to China; Thai Magur, Thai pangus, and Thai Sarpunti are native to Thailand and GIFT (improved genetic strain of tilapia) is native to the Philippines.

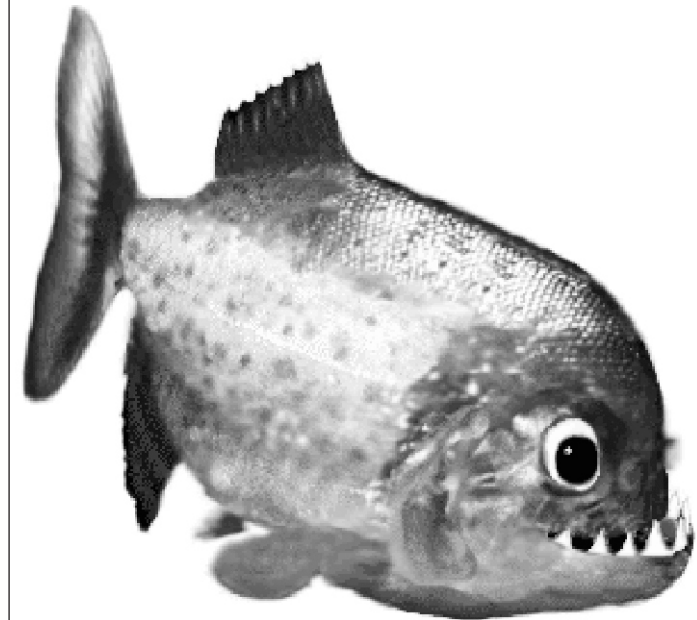
Tilapias, Chinese carps and Common carp were introduced and now being cultured as they have some unique characteristics like rapid growth in pond, high fecundity, uncomplicated hatchery production of seeds, utilisation of natural food, resistant to disease and tolerance to wide range of environmental degradation. Other species like Thai Pangus, Thai Magur and Thai Sarpunti were introduced for commercial purposes as they had high market price and customers treat them as replacement for indigenous species. Also, African Magur was introduced for commercial purposes as it can grow quickly in any closed water body with wide range of food (including decomposed fecal matter) but due to its devastating carnivorous nature it has been banned. Now, it is alarming that Piranha and Pirapitinga have been reported to be cultured in different parts of the country as they look alike Chanda fish but none can confirm their ways of introduction. All these AIS have more or less impacts directly or indirectly on biodiversity, ecology and environment which can be discussed as following:

Threats

Habitat alternation: Some fishes can directly alter the aquatic habitat like feeding habit of common carp cause pond bank erosion, increased turbidity and elevated nutrient concentrations synergised by substrate disturbance and by excretion. These alterations to physical and chemical conditions have ecological consequences, such as increased phytoplankton density in response to elevated nutrient levels, and reduced aquatic macrophyte growth. Grass carp feed on aquatic weeds which are, in turn, breeding arena of several indigenous fish species. So, reduced plant biomass and cover affect critical reproductive behaviour and habitat conditions for invertebrates and fishes, and also fish food resources.

Extinction of biodiversity: Naturally food and intentionally human are responsible for the

Socio-economic impacts are more significant in Bangladesh as the general fish farmers are not aware of the negative impacts of AIS. They are now more interested to culture AIS species like Tilapia, Silver carp, Common carp, Thai Sarpunti, Piranha and Pirapitinga instead of indigenous fishes as they are getting good market price within a short time with minimum inputs. In this way, the producers and retailers are controlling the customer's choice and destroying the market of local fishes, which have negative economic consequences. Also, the people are being deprived of nutrition from indigenous fishes like Mola and Dhela.

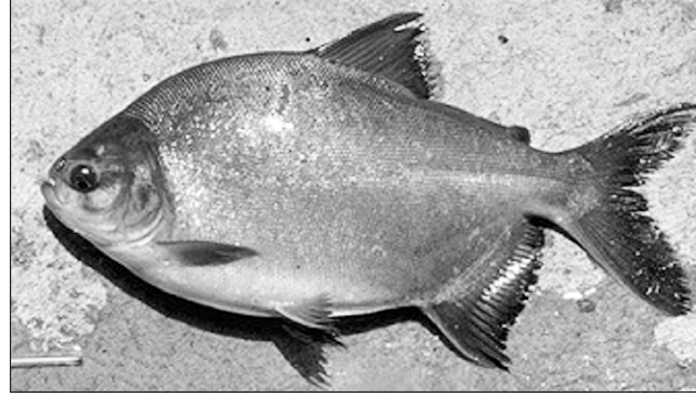


Piranha

introduction of AIS in natural water body. Tilapias, Common carp and Chinese carps compete with other indigenous fish species for natural foods (such as planktons, macrophytes and insects), which ultimately make the indigenous species vulnerable. Prolific breeding of tilapias makes natural food unavailable to the local fish species. It has been reported that Mozambique tilapias, which can tolerate brackish water, competes for algae and other resources are displacing mullet and brackish-water shrimp in coastal regions of Bangladesh. African Magur and Piranha directly feed on other local and indigenous species and as a

result several species are at the edge of extinction. Pirapitinga is primarily an aquarium fish and feeds on prepared aquarium feeds but in absence of that kind of food, they become carnivorous especially in pond ecosystem.

Introduction of diseases/pathogens: In Bangladesh, no in-depth investigation has been carried out to determine the introduction of disease or pathogens by AIS, which may be due to the lack of policies and quarantine facilities, but it is assumed that Argulus sp. has been introduced with the introduction of Chinese carps. It is also suspected that WSSV (White Spot Syndrome Virus) of Shrimp was



Pirapitinga

introduced from the different stocks of shrimp imported from neighbouring countries which caused a devastating fall in shrimp market of Bangladesh. If we look at the case of neighbouring country, it has been proved that the cestode worm *Bothriocephalus gowkonensis* was introduced in Sri Lanka with the introduction of Chinese major carps for aquaculture purposes which is already been introduced in Bangladesh.

Socio-economic impacts: These impacts are more significant in Bangladesh as the general fish farmers are not aware of the negative impacts of AIS. They are now more interested to culture AIS species like Tilapia, Silver carp, Common carp, Thai Sarpunti, Piranha and Pirapitinga instead of indigenous fishes as they are getting good market price within a short time with minimum inputs. In this way, the producers and retailers are controlling the customer's choice and destroying the market of local fishes, which have negative eco-

nomical consequences. Also, the people are being deprived of nutrition from indigenous fishes like Mola and Dhela.

Genetic impacts: Genetic impacts of AIS fall in two categories: i) Reduction in "effective population size" by the ecological and other effects of introduction ii) Alteration/extinction of gene pools of the species/stocks by cross-breeding/hybridisation and back-crossing. It has been reported that the native gene pools of *Clarius batrachus* (Deshi Magur) have been diluted through the use of hybrid *C. batrachus* × *C. gariepinus* for aquaculture. Introgression and hybridisation have been reported among Mozambique and Nile tilapia and GIFT. There are also reports on the intentional hybridisation among major carps and Chinese carps, which are major threats to the sustainable genetic biodiversity.

Management

Few countries have developed the comprehensive legal and institu-

tional systems that are capable of responding effectively to AIS. Bangladesh needs to response and make some policies for immediate implementation to manage AIS. The standard procedures for management of AIS include the following:

Monitoring and inspection: Vigilance and monitoring of known pathways of introduction for inland waters such as the live food fish trade, aquaculture, and aquarium releases, and stocking should be undertaken. Governmental staff should be trained for quarantine, border control, or other relevant facilities to be aware of the larger context and threats to biological diversity, in addition to practical training for aspects like identification and regulation of AIS introduction. The codes of conduct and best management practices, such as the FAO Codes of Conduct for Responsible Fisheries (FAO 1995a) should be followed. For transboundary inland water ecosystems, regional country cooperation is essential for effective invasive species management strategies.

Development of policies, rules and regulations pertaining to AIS management: Laws and regulations should be developed to combat the introduction of AIS with concentration on precautionary principles. A watchdog consisting of experts should be formed to revise those laws on the basis of its effectiveness in implementation.

Raising awareness: Involvement of local and indigenous communities and other relevant stakeholders should be promoted at all levels for the identification, prevention and control of AIS in inland water ecosystems. GO and NGO's should work together to raise awareness against AIS. Importers and exporters should be considered as key target groups for information/education efforts leading to better awareness and understanding of the issues, and their role in prevention and possible solutions.

Control by different methods: Mechanical, chemical and biological control are used separately or

collectively to contain the distribution of the invading species. Mechanical control involves directly removing individuals of the alien invasive species using devices (i.e., netting, angling) or draining of the water body that has become infested. It is highly specific to an invasive alien species, and is often very labour intensive and only applicable for pond system. Chemical control involves the application of pesticides like Cymbush or toxicants like Rotenone. Chemical control is often very effective as a short-term solution for pond ecosystem. Major drawbacks of chemical control are its high cost and non-target impacts on native species and water quality.

Biological control involves the intentional use of organisms (e.g., natural predators and pathogens, sterile individuals) to suppress populations of alien invasive species in large waterbody like river. Although, biological control is highly cost-effective, permanent, and self-sustaining but still there are needs for further research in this field and developing countries like Bangladesh need more manpower and expertise and financial support to implement this control method.

So, now it is the high time to concentrate on the studies of AIS in different perspectives and formulate policies and implement them as soon as possible to save the fisheries of Bangladesh.

Mohammad Mamun Chowdhury is Assistant Professor, Department of Fisheries, University of Dhaka.

Guest birds, ecology and tourism

MOHAMMAD SHAHIDUL ISLAM

BIRDS -- guests or hosts -- are beauties of nature and essential for keeping balance in ecology. Their flight, wandering around are key attraction to bird watchers. They feast their eyes on birds' activities. During the winter ponds, rivers, lakes, swam are strolled with the flocks of migratory birds. The idyllic beauty fuels the feelings of sight seeing into the hearts of juveniles.

The significance of eco-tourism for both balanced ecology and sustainable development through poverty reduction is no more new in Bangladesh. But people remember its importance until occasional tourism takes place and the fashion runs to keep it as a gray matter. At the outset of winter our care and love becomes acute for birds and environment. Nonetheless the enthusiasm is full of life to turn the nature and environment friendly. Positively, in this connection we have to keep remembering: Bangladesh should go very much a land of tourism besides remaining a land of birds and rivers.

Geographically Bangladesh is the only country that witnesses the pride of being rich in both guest and local birds that play a

Experts have already opined that the migratory birds have ecological benefits as they prey on insects and weeds thus contributing towards the betterment of agriculture. Similarly, the waste materials (bird droppings) contain organic matters that contribute towards the fertility of the soil. An account of birds is important to observe their existence -- whether their stay is fine in Bangladesh or do they face any threat?

significant part in balancing ecology. Bangladesh has almost every kind of ecological conditions, except desert and high mountains. Birds are flying-guards of nature. Birds' migration superbly demonstrates the complexity and the wonder of the web of life. Making it very responsive to the impacts of human activity, the evolution of individual migratory manoeuvres of different bird genera over the past thousands of years corresponds to a delicate balance of nature. One such human influence, global warming, caused basically by the burning of oil and coal since the industrial upheaval, is hovering to cause disastrous adjustment to this delicate balance.

Bangladesh welcomes a big number of guest birds from Central Asian states, Europe and India every year. The birds from North pay out winters in different swamplands of Bangladesh, which are distributed almost

throughout the country: Tanguar Haor, Jahangir Nagar University, Botanical Garden, Comilla Dharma Shagar are well known. After winters they go back to their native territories. Gifted with a remarkable geology, Bangladesh spans several of the world's ecological regions and is spread over wide latitude. February is the high time of their arrival and by March they start flying back home. These periods may vary depending upon weather affairs in Siberia and or in Bangladesh.

Bird watching has become an all the time more popular quest in Bangladesh; huge number of people have started making appointment and are seen on rendezvous with birds. Other locations that have started to attract global and foreign bird watchers, in the shape of tourists to Bangladesh, are narrow belts in the North-South areas when trees sprout, floral buds open, honey sucking and other tiny insects

swarm the air there and a range of avifauna concentrates in foothills on the start of summers. This is to certify here that Sundarban is also bird rich area and fantastic for eco-tourism.

In different Bangladesh habitats the guest birds live ethically with the message of beauty and humanity what are very much present in pictorial verses of romantic poets. As a host it is our duty to provide them contented and nonviolent environment, which can be done professionally by listed government natural resource pool. All swamplands are dynamic agents for recharging water tables and aquifers besides being home to birds. Human activities around the birds' dwellings, deforestation, hunting, water pollution, introduction of exotic fish species and exploiting the swamplands for fisheries' production on profit-making amount are some of the common interventions that cause frustration to birds anywhere. Immediately these need to

be stopped.

This is good to know that ministry of environment and forest, a few NGOs and some bird lovers are actively working in the field. A careful role of counting the birds, though a tiring job, can be recommended. The database must produce important results. The experts have already opined that the migratory birds have ecological benefits as they prey on insects and weeds thus contributing towards the betterment of agriculture. Similarly, the waste materials (bird droppings) contain organic matters that contribute towards the fertility of the soil. An account of birds is important to observe their existence -- whether their stay is fine in Bangladesh or do they face any threat? The authorities concerned should count the birds when they are on their way back home: how many came in and how many are flying back.

Mohammad Shahidul Islam is Training Officer National Hotel and Tourism Training Institute, Bangladesh Parjatan Corporation.

Stop catching jatka



MD. SIRAJUL ISLAM MOLLA

HILSHA is the national fish of Bangladesh. Its unique taste and nutritional value have made it the most popular fish not only in Bangladesh but around many parts of the world too. But the production of Hilsha has reduced tremendously over the years. It is now hardly possible even for a middle-class family to buy a good-size Hilsha at an awfully exorbitant price, whereas in the recent past, the majority of common people of the country were dependent on Hilsha to fulfil their nutritional demand throughout the year.

According to the Department of Fisheries, about 125,000 metric tons of Jatka (Hilsha fry) are caught every year, which seems to be the major cause of the fall in Hilsha production. As outlined in the year-book of the Bangladesh Bureau of Statistics, the production of Hilsha in major rivers has been declining tremendously since 1990. After about 50 percent fall in the production from 77,325 metric tons in 1989-1991 to 44,672 metric tons in 1990-91, it increased in a gradual manner up to 1995-1996 (61,289 metric tons). But thereafter it has been declining in a continuous process and in 1999-2000 it was only 49,786 tons. Although the data for the following years could not be collected, it can easily be apprehended that the production has further declined to a great extent for which there has been continuous scarcity of Hilsha in the markets and thus its price has already gone beyond the reach of common people. If this trend continued, the national fish of our country -- Hilsha -- will be extinct from the major rivers in the near future, maybe by the year 2025.

Contrary to the above, by saving only 10 percent Jatka, the production of Hilsha could be 540,000 metric tons in the first year considering the weight of one Jatka as 50

grams and a Hilsha two kilogram at the time of catching. And if we can keep it up, the Hilsha production by the year 2025 will be 31,17,400 metric tons and per capita consumption will be 15.6 kilograms among the estimated 20 crore people which is only 0.3 kilogram at present in a population of 14 crore.

Not only that, if we can do so, the production of other sweet-water fishes will also increase and our dependence on Hilsha will be declined and a huge quantity of Hilsha then can be exported.

Suppose if we can export only 25 percent of 31,17,400 metric tons Hilsha, we will be able to earn Tk 20,000 crore in a year.

Hilsha seems to be the most nutritious fish in Bangladesh containing the highest range of 200-400 kilo calorie per 100 gram of fish along with 273 kilo calorie energy, 180-200 mg calcium, 22 gram protein and 19-35 gram fat. Only a decade or two ago, majority of people were used to take Hilsha as the main curry at their feasts. During fall, the people were used to buy salted-Hilsha to meet their demand of fish. It may be recalled that salted-Hilsha contains more nutrition and other food values than fresh Hilsha. Such food-habit of people had played a vital role in the preservation of sweet-water fishes as they refrained from catching fishes indiscriminately from different sweet water sources.

Dramatic fall in Hilsha production might be the major cause of malnutrition among children of our country. About 60 percent children of Bangladesh are suffering from malnutrition (ASCON 10, ICDDR,B, 2002). These children grown up malnourished and thus suffer from various diseases and many of them ultimately die very untimely. Many female children grown up with malnourishment get married and give birth to malnourished children. This makes a vicious cycle of intergenerational malnourishment

and/or under-nutrition (HSB, ICDDR,B September 2006). But such disaster could be avoided significantly augmenting fish production of the country particularly the Hilsha production that alone could play a vital role in fulfilling the nutritional demand of the people.

Let us see how we can increase the production of our national fish. The 'current net' from everywhere of the country should immediately be seized and destroyed. There should be sufficient laws of the land against and the persons responsible for such practice should immediately be caught with the net of law and be awarded exemplary punishment so that none can dare to be involved in such business. Sufficient armed guards, if necessary, from the Bangladesh Navy or from the Bangladesh Rifles should immediately be deployed in all the river ways. Catching Jatka should strictly be prohibited during the period 1 November to 31 May. If necessary, the government can provide the fishermen some subsistence allowance during this period and when the situation would improve, the fishermen themselves would refrain from catching Jatka. Both 'Jatka' sellers and buyers should be arrested from the market or at least be fined on the spot by police. Vigilance teams should be formed at the areas from where fishermen catch Jatka. Media should continue to play their due role in publishing news and articles denouncing and discouraging catching of Jatka.

MD. Sirajul Islam Molla is Member-Secretary, Air and Noise Pollution Control Programme Bangladesh Parishad Andolan.

