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## Ornamental fish industry in sri lanka pdf

The characteristics, structure and resources of Sri Lanka's major freshwater and pig water sectors have no aquaculture traditions and only marine shrimp and aquarium fish farming have been developed to any extent. Sri Lanka has a low population of native freshwater fish plus 18 other exotic species, among the introduced species, three large Chinese carp species, namely grass carp (*Ctenopharyngodon idellus*), silver carp (*Hypophthalmichthys molitrix*) and large-head carp (*Aristichthys nobilis*) and three large Indian carp species, catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala*) are of particular importance to freshwater aquaculture. Although 112 species of edible pig water are available only one marine shrimp is used in coastal aquaculture. In recent years, shrimp exports have contributed more than 50% of total export income from the aquaculture industry with the production of aquarium fish contributing an additional 11%. Current output from seasonal aquarium fish farming contributes only 1.2% to national freshwater fish production, however, due to its cognitive potential, it has been identified as an activity that can boost freshwater fish production in the country and enhance the livelihoods of rural poor. Other aquaculture sectors identified for development and promotion include coastal finfish farming, seaweed farming and freshwater shrimp farming. Key organizations involved in aquaculture development and management under the Ministry of Fisheries and Marine Resources are the Department of Fisheries Resources, the National Fisheries Resource Research and Development Agency (NARA) and the National Aquaculture Development Agency (NAQDA). NARA is the main national research organization tasked with conducting research and development activities in the field of fisheries resources while NAQDA is entrusted with commercial aquaculture development activities and expansion activities. The National Institute of Fisheries and Maritime Engineering (NIFNE) is in charge of education and training. The Aquaculture Quality Improvement and Development Project, with the support of the Asian Development Bank, began in mid-2002 to address the components of Aquaculture Inland Aquaculture Fisheries Development in the National Aquaculture Development Action Plan. The reason for implementing the project is to leverage the enormous potential to develop inland fisheries resources to ensure food security and improve the socio-economic situation of rural people in coastal areas as a means to reduce poverty. History and overview Sri Lanka has no aquaculture tradition, although large freshwater and pig water sources are available in the country, almost no aquaculture was carried out until the early 1980s. Since that time fish farming in seasonal village tanks, marine shrimp farming in land ponds and live aquarium fish exports have reached commercial sizes while other attempted methods such as farming fish in pig ponds, cage farming, medicated animals and seaweed farming have yet to be developed. Freshwater fish farming in seasonal village tanks was initiated in 1979 by the Inland Fisheries Department of the Ministry of Fisheries with 23 tanks in the dry zone of the country and from 1979 onwards, tilapia and carp farming was carried out. In the early 1980s, a number of small-scale entrepreneurs and a few multinationals met incentives offered by the government, including input duty-free imports, embarking on giant tiger shrimp farming (*Penaeus monodon*) in coastal ponds. In the late 1990s, commercial development of Indo-Pacific swamp crabs (*Scylla serrata*) in flexible wire mesh cages began in coastal lagoons. In contrast, the aquarium industry in Sri Lanka has a long history and was started with small-scale household-based shops in cities. In the early 1930s, there were a number of small-scale importers, breeders and hobbyists in Sri Lanka; a commercial aquarium began in 1952 in Colombo, the capital of Sri Lanka. The industry was commercialized by a few entrepreneurs about 50 years ago and now it has grown into a thriving industry that affords profits and jobs for many. Aquarium fish farming is carried out mainly in cement tanks. Human Resources Jobs created from seasonal aquarium farming are estimated at 6,000 of which 13 percent are women (Siriwardena and Jayakody, 2003). It is estimated that in 1999, the aquaculture industry provided about 40,000 jobs both directly and indirectly, accounting for 11% of all jobs in the aquaculture industry (Siriwardena, 1999). However, the previous estimate of 20,000 directly working as a result of shrimp farming has now been reduced to 8,000 (Hettiarachchi, 2000) due to the repeated appearance of epidemics in the shrimp industry. Women's participation in shrimp farming is about 5 percent of the total workforce (Siriwardena and Jayakody, 2003). An estimated 2,500 people participated in the production and breeding of aquarium fish (Hapantanthri et al (2001); of which about 30 percent were estimated to be women, however, no thorough survey was done to this effect (Siriwardena and Jayakody, 2003). Seasonal village tank distribution system and characteristics Seasonal village tanks are mainly found distributed on the dry zone of Sri Lanka, there are currently an area of 667 hectares of seasonal village tanks used for fish farming (Siriwardena and Jayakody, 2003), this is only 10 percent of the total potential area for development. Management measures applied in seasonal village tank culture include mainly stocking with young and their next harvest; fish feed is made. The rate of stocking ranges from 2,000 to 3,000 animals per year, the average water area of seasonal tanks according to farming ranges from 4.5 hectares to 7 hectares. It has been proven that by adding inputs such as fertilizers and animal feed and using higher drop rates output up to 2,000 kg/ha from water bodies can be achieved. Shrimp farming The current shrimp farming industry in Sri Lanka is concentrated in the northwest coastal belt with a farm area of more than 4,500 hectares with 70 breeds, of which the total farm area of the ponds occupies an area of about 3,000 hectares. There are a total of 1,344 farm facilities, of which 47.7 percent are considered operating facilities without proper permits (Siriwardena, 2001b). On the east coast in Batticaloa district, where shrimp farming in Sri Lanka first began in the late 1970s but has been abandoned due to civil unrest, operations have recurred in recent years. More than 60 small farms with an average farm area of 1-2 hectares were put into operation at the end of 2002, with a total pond area of 155 hectares. Shrimp farming was practiced using an open operating system in the pond until the white spot virus in 1996 and the yellow-head virus in 1998 caused serious economic damage in the industry. The production cycle is between 140-160 days with 1.8 culture cycles completed each year. After these outbreaks, the industry developed closed and semi-closed production systems as well as full circulatory systems. The drop density used before the epidemic ranged from 20 to 30 after the larvae on m2, after the outbreak, the industry reduced the drop density to less than 15 after larvae per m2. The main input feed in the shrimp farming sector is imported, as well as paddle wheels, pumps and generators. Animal feed contributes 50-60% to the total cost of shrimp production. Fattening crab Commercial farm units use different sizes of plastic coated wire mesh cages for crab fattening, but the most commonly used cage is 2m x 2m x 0.5-0.75 m for easy handling (Jayamanne, 2003). The average stocking density of farmers is 10-15 kg of water crabs/m2. Bivalves, shrimp heads, slaughterhouse waste and trash fish are the basic food used in crab fattening. Aquarium fish farming is widespread in Sri Lanka but breeders and exporters are mostly limited to the Colombo region. Development facilities tend to be cement blocks, glass aquariums and soil ponds, with breeders practicing simple natural breeding techniques for freshwater aquarium fish farming. The most commonly used feed supplements in the industry are animal feed, shrimp and poultry. Cultured Lankans have a relatively limited number of freshwater fish species with 111 species recorded (Pethiyagoda, 1991). 80 species of freshwater fish native to 11 families of riverine swamp-destids and lack of real lacustrine species (Fernando and Indrasena, 1969), twenty-seven species are endemic and Cyprinidae form the most commonly represented family (De Silva, 1988). In contrast to its poor native animal system, there are 18 exotic species, including an estuary transplant, sea salmon (*Salmo trutta*), which was imported to Sri Lanka (Chandrasoma, 1983). It is generally accepted that a commercial domestic fishing business only developed in Sri Lanka after the introduction of exotic Mozambican tilapia (*Oreochromis mossambicus*). Of the species imported, the following three large Chinese cornfish and three large Indian cornfish are of particular importance in aquaculture. Of the native freshwater fish species, 54 are regularly exported and currently form the mainstay of the aquarium export industry. Of the 27 endemic freshwater species, 21 have decorative value. Pillai (1965) recorded a total of 112 edible species from the warthen waters of Sri Lanka: 65 percent of sea migrants, 30 percent of strict warthening water species and 5 percent freshwater. Of the 112 species, only one species, the dairy fish (*Chanos chanos*) and the giant tiger prawn (*Penaeus monodon*) are used in coastal aquaculture. Seasonal aquarium aquaculture practices/systems have been identified to prioritize aquaculture development under the National Aquaculture Development Plan to promote freshwater fish production in the country. In contrast, shrimp farming is a valuable source of foreign exchange revenue and it has been devoted to further expansion as it covers the largest number of any exported product and earns the highest amount of foreign exchange. Fattening crabs is also being noticed as an export-oriented activity. Pig water fish farming, coastal fish farming in net cages, sea grass farming and boys farming have not yet reached commercial size. Fifty-eight farms were recorded as participating in dairy farming in 1987 with a total water area of 3.70 hectares and an output of 6.6 tons, worth 92,000 SLR (Siriwardena, 1989), however, despite significant production of dairy fish from some experimental pens (Siriwardena, 1988); it has not fully grown to commercial scale due to marginal profits. The production of South American stone pearls (*Perma perna*), which is being carried out by a few farmers in the western and southern regions and the production of *Gracilaria edulis* seaweed also provides some promising results. Production The graph below shows the total aquaculture production in Sri Lanka according to FAO's statistics: Markets and trade Freshwater fish raised in seasonal tanks are simply sold at local fairs called 'pola' by farmers themselves or sold to an intermediary for sale in local markets. In contrast more than 90 percent of farmed shrimp are exported and sold directly from producers to producers/exporters. The production balance is sold locally. Store. The increase in aquarium fish exports has been observed following technological developments in livestock and livestock of more than 46 species of freshwater aquarium fish. However, the export of marine aquarium fish is entirely dependent on the capture of wildlife species and there are now more than 200 species of marine life belonging to 40 families are exported. Increasing pressure on wild aquarium fish has led to the decline of some wild fish populations; as a result, the government has banned or restricted some species of sea fish and freshwater for export. Sri Lanka's main export market for farmed shrimp is Japan, followed by the United States and European Union countries. The European Union market mainly takes small shrimp in both input and tail-only products. Regulations on fish products (exports) in 1998 and aquaculture regulations (residue monitoring) in 2000 require inspection and certification of compliance with these regulations by the licensee for each export shipment. A special emphasis has been placed on oversight to ensure there are no antibiotic residues under European Union guidelines and requirements. The agency competent to issue a certificate of free residue is the Director of the Fisheries Department. Sri Lanka exports aquarium fish to more than 18 destinations, 10 main export markets, based on the value of exported aquarium fish: Germany, France, United Kingdom, Belgium, Netherlands, Spain, Switzerland, Japan, United States and Italy. According to Customs statistics, there are 66 large and small aquarium fish exporters in Sri Lanka, of which 10 exporters have exported aquarium fish worth more than 10 million SLR per year. Documentation ceding the types of bacteria and quantities, especially for *Vibrio cholerae*, is required by some buyers before exporting aquarium fish, this is to prevent the spread of the disease through cross-border movements of live aquatic animals. The live fish export health certificate issued by the Department of Animal Health and Production is consistent with infectious disease agents listed by the Network of Asia Pacific Aquaculture Centers (NACA) and the International Office of Epizootics (OIE). Contributions to the freshwater fish economy are provided primarily from fishing in reservoirs, seasonal tank farming and freshwater pond fish farming without significantly affecting the production and income of domestic fish as well as the ability to enhance livelihoods. Due to the lack of village-level organizations with seasonal tank management capabilities and community/private sector involvement in seed supply, the development of seasonal tank farming and freshwater pond farming collapsed after the recovery of state patrons for aquaculture in 1990, this support was restored in 1994. We seasonal cage fish farming is 0.46 tons/ha and contributes 330 tons to the total domestic freshwater fish production, equivalent to only 1.2% of the national freshwater fish production. However, due to its potential to enhance the livelihoods of the rural poor, it has been identified as an area for support. Over the past decade income from foreign income as a result of shrimp farming ranged between SLR 551.7 billion in 1992 and SLR 4 billion in 1998. In recent years, shrimp exports have contributed over 50% of total export income from the aquaculture industry. In absolute terms, the industry has continuously achieved more than 2,000 million foreign exchange SLR since 1995, moreover, shrimp farming has contributed to the development of supporting industries such as lime shops / manufacturers, fiberglass manufacturers, feed stores, machinery supply and repair facilities, hardware stores and laboratories. A significant amount of forex is obtained through the export of

aquarium fish. In 2002, this figure was SLR 680 million, accounting for about 11% of total export income from fish and seafood. The contribution of aquarium fish exports from Sri Lanka, in monetary terms, amounts to just over 1 percent of the value of global trade in ornamentals. Aquaculture development in Sri Lanka primarily targets potential exports with opportunities available to the rural poor coming in the form of employment, mostly labor. When compared to shrimp farming, livestock and aquarium fish farming have a greater impact on people's livelihoods as the industry has grown as a cottage industry throughout Sri Lanka, mainly in the form of small-scale growers and breeders. Promoting and managing the Ministry of Fisheries and Marine Resources (MFOR) Institutional Frameworks hold common responsibility for aquaculture activities in Sri Lanka. In the ministry there are three departments and agencies with specific responsibilities related to aquaculture spread over the departments under their control, namely: The Department of Fisheries and Fisheries Resources (DFAR), National Fisheries Resource Research and Development Agency (NARA), The National Aquaculture Development Agency (NAQDA) is controlled by the Department of Inland Aquaculture Development (IAD) and the Coastal Aquaculture Development Board (CAD). Regulatory RegulationsThe Fisheries and Fisheries Act (1996) refers to the management, regulation, conservation and development of fisheries and fisheries resources in Sri Lanka. Part VI of the Act refers to aquaculture. Section X of the Act gives the Minister of Fisheries and Fisheries Resources general power to implement regulations on all issues outlined in the Act, including the management and regulation of aquaculture. Some regulations have been adopted under the Act, which has an impact on and aquaculture products. Sri Lanka's National Aquaculture Development Agency (1998) established the National Aquaculture Development Agency and regulated its functions and constitution. The government has a common policy responsibility for the development of the aquaculture industry in Sri Lanka. For more information on aquaculture legislation in Sri Lanka please click on the following link: Overview of national aquaculture laws - Sri Lanka Studies, education and trainingThe National Fisheries Research and Development Agency (NARA) is the main national research organization required to carry out research and development activities in the field of aquaculture resources while the National Aquaculture Development Agency (NAQDA) is entrusted with aquaculture development and trade expansion activities. Research priorities are primarily determined depending on national requirements. The study aims to meet the objectives set out in the National Fisheries Development Plan, which is the policy text of the fisheries sector. Industrial issues, institute-industrial partnerships and regional trends are also considered when prioritizing research. Recently, rural aquaculture development has been prioritized as one of the measures to enhance livelihoods and reduce poverty in rural areas. The problem for research is identified through farmer/community counseling and back feed received from extensive activities beyond the highly lit areas through scientific forums. In addition to NARA and NAQDA some universities participate in aquaculture research, although mostly studied in the wild. Currently there are a number of associations operating in the field of aquaculture: The Association of Shrimp Farmers and Exporters. Shrimp Farmers Association. Local Association of Small Shrimp Farmers. Association of Aquarium Breeders and Exporters. For aquaculture research there are very few partnerships between organizations and industries, although research has been provided to organizations from the aquaculture industry. NARA has given high priority to farmers/communities participating in more research for institutional research, nara currently conducts research on farms with participation in the areas of integrated aquaculture in rural areas, freshwater and aquaculture shrimp farming, disease diagnosis, control and prevention in landscape as well as shrimp aquaculture, management of fish farming in seasonal village tanks, aquaculture farmers, community involvement in fish farming Trends, issues and developmentMo policy decisions were made in July 1990 to revoke state patrons from inland aquaculture and aquaculture and therefore the proposals included in the National Fisheries Development Plan for this sub-sector have been excluding proposals related to shrimp and ornamental farming livestock and culture where operations are entirely in the hands of the private sector. However, a World Bank study estimates that in 1990, the inland aquaculture and aquaculture sector contributed US\$24 million annually to Sri Lanka's rural economy. The period immediately after the elimination of patrons i.e. between 1990-1994 showed a sharp decrease in inland aquaculture production and aquaculture to 12 000 tons in 1994. Termination of seed supply, as well as the expansion and technical support provided by the government are the main causes of this decline. The Government in 1994 announced the restoration of the policy of inland aquaculture development and aquaculture over a 10-year period from 2002-2012. A key component of the Ministry of Fisheries and Marine Resources Action Plan for 2002-2010 relating to the Inland Fisheries and Fisheries Development Plan. The Aquaculture Resource Quality Improvement and Development Project, supported by the Asian Development Bank, began in mid-2002 to address the aquaculture and inland aquaculture development component. The reason for implementing the project is to leverage the country's enormous potential to develop inland fisheries resources to ensure food security and improve the socio-economic situation of rural people in coastal areas as a means to reduce poverty. Despite the potential of seasonal village tanks to boost domestic freshwater fish production, development has progressed at a slow pace mainly due to a lack of juvenile fish to stockpile seasonal tanks. Community involvement in fried fish breeding should be increased to meet this need for minors, in this matter, recommending the establishment of seasonal tank management groups including farmers, small breeding farm operator, juvenile fish producer and a technical support unit for seasonal tank management. In coastal shrimp farming, disease management has become a major issue. Uncontrolled expansion beyond bearing capacity as well as deterioration in water quality has been the main cause of the epidemic that has led to production losses worth up to one billion SLR of foreign income (Siriwardena, 2001a). The rapid expansion of shrimp farming over the past decade has contributed to environmental issues along with conflicts between stakeholders as well as recent outbreaks. The following resources have been or are believed to have been affected by shrimp farming activities (Siriwardena, 2001b): ecologically sensitive habitats, wildlife, farmland, wild fish populations and groundwater. According to estimates by the Ministry of Fisheries of Northwestern Province, more than 1,200 hectares of mangrove forests have been completely destroyed due to shrimp farming. Despite the recommendations made to declare the northern part Mundal Lagoon as well as its southern mudflats as protected areas (De Silva and Jacobson, 1995), a significant proportion of these areas have been developed for shrimp farming. The main agricultural lands that have been affected in the northwest coastal belt due to shrimp farming are rice paddies and coconut-producing land. The attractive profit from shrimp farming does not justify the conversion of these agricultural lands into shrimp ponds. According to the Ministry of Fisheries of Northwestern Province, the area of the farm using groundwater for shrimp farming is 720 hectares. Based on the actual water area according to farming with 25 percent fresh water for dilution, groundwater demand is estimated at 1.0 million m<sup>3</sup>/dilution (Siriwardena, 2001b). As a result, due to a lack of adequate supply of fresh water for drinking and other use in this area, shrimp farming has led to a degree of user conflict. The likely cause of fish death in the Dutch Canal, which is the main source of water for industry, is recorded high concentrations of sulfate, non-ionized ammonia and nitrite (Corea, et al. , 1995). In addition, the following issues have been raised by village communities living in shrimp farming areas (Siriwardena, 1999). The community has greater rights to state land than non-resident shrimp farmers who 'infiltrate'. Saltwater intrusion into wells and agricultural land. Mangrove clearance affects local communities who sustainably use this resource. Loss of grazing soil affects livestock. There is no provision for expected employment opportunities for the local community. Obstructing traditional access routes to fisheries. Groundwater loss due to mass extraction later. BibliographyFAO publications related to aquaculture for Sri Lanka.FAO. 2005 . Aquaculture, 2003. Five Books on Fisheries Statistics - Vol.96/2. United Nations Food and Agriculture Organization, Rome, Italy. 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