

ALIEN INVASIVE FAUNA IN NATURAL HABITATS AND THEIR IMPACT ON INDIGENOUS BIOTA

C.N.B. Bambaradeniya

IUCN-The World Conservation Union
Sri Lanka.

SUMMARY

A survey was conducted to identify the alien invasive fauna in Sri Lanka and their spread in the natural habitats of the country. The results revealed that there are 10 species of alien invasive fauna in natural ecosystems in the different bio-climatic zones of Sri Lanka, resulting from both deliberate and accidental introductions. This paper highlights the impact of these species on the natural ecosystems of Sri Lanka and propose measures such as awareness programmes, training of personnel to detect alien biota, strengthening of current legislation to address issues pertaining to alien invasive fauna, and adoption of strict quarantine procedures to avoid detrimental introductions in the future.

INTRODUCTION

Over the past centuries, the ever-increasing human population has contributed to the over-exploitation of animals and plants, as well as to the degradation or modification of natural habitats. Besides these two anti-biodiversity anthropogenic factors, there is yet another danger to our biological diversity today, the growing threat of alien invasive biota.

It has been well documented that alien invasive species have resulted in massive and rapid losses of biodiversity, especially in island communities (Clout 1995). Sri Lanka, being an island with a rich biodiversity, the threat of alien invasive biota is very real. Although this issue was neglected during the past, there is a growing concern since recent time, and attempts have already been made to identify invasive fauna in Sri Lanka and generate public awareness (Gunawardena 1996; Bambaradeniya *et al.* 1998). This paper reports some preliminary findings on the alien invasive fauna and their status in natural habitats of Sri Lanka.

METHODOLOGY

Field visits were made (commencing from May, 1995) to natural ecosystems (mainly in protected areas) in the different bio-climatic zones of Sri Lanka. The ecosystems surveyed included both terrestrial (forest types, grasslands, etc.) and wetland (rivers, streams, marshes, tanks, ponds, etc.) ecosystems. The threats of the different alien invasive fauna on native biodiversity were also recorded during the field surveys, supplemented with published sources. The current major contributors to the introduction of alien invasive fauna were also identified.

RESULTS AND DISCUSSION

Alien Invasive Fauna in Natural Ecosystems

Preliminary observations made during the past four years have enabled to document 10 species of alien invasive fauna in natural ecosystems in the different bio-climatic zones of Sri Lanka. These includes 8 species of vertebrates (freshwater fish - 6 spp.,) and two species of invertebrates (molluscs - 2 spp.) (Table 1).

The total includes 7 species of aquatic invaders (6 fish and a mollusc) and 3 species of terrestrial invaders (2 mammals and 1 mollusc). Other than the above alien invasive species, three species of alien domestic animals (dogs - *Canis domesticus*, cats - *Felis domesticus*, cattle - *Bos taurus*) were observed to exhibit invasive behaviour in certain areas of the island. Of the total alien invasive species recorded, five are distributed throughout the island (*A. fulica*, *S. mossambicus*, *P. reticulata*, *R. rattus*, *B. bubalis*). Others are currently restricted to one or two bio-climatic zones; i.e. *C. chitala*, *H. plecostomus*, *P. canaliculata* in the Lowland Wet Zone, *O. mykiss* in the Montane Zone and *T. pectoralis* in the Intermediate and Dry Zones.

Mode and Purpose of Alien Introductions

The alien invasive fauna documented during the present survey includes both deliberate and accidental introductions. The deliberate introductions have been for commercial fishery (*S. mossambicus*, *T. pectoralis*), sport fishery (*O. mykiss*), mosquito control (*P. reticulata*) and agriculture/animal husbandry (*B. bubalis*). Some have been introduced accidentally, via ships (3 sub-species of *R. rattus*). Others have been introduced or 'escaped' into natural habitats

due to the negligence of aquarists/ornamental fish breeders (*C. chitala*, *H. plecostomus*, *P. canaliculata*). Considering the current situation, agricultural NGO's and ornamental fish breeders clearly stand out as two major contributing sources to the introduction of alien biota in Sri Lanka.

Table 1. Alien Invasive Fauna in Natural Ecosystems of the Different Bioclimatic Zones of Sri Lanka.

Invasive Species	Distribution	Affected Ecosystems/ Protected Areas
Rainbow trout <i>Oncorhynchus mykiss</i>	Monatane Zone	Streams (Horton Plains, Hakgala, Peakwilderness)
Clown knife fish <i>Chitala chitala</i>	Lowland Wet Zone	Tanks, ponds, slow-flowing rivers, marshes.
Plectosomus catfish <i>Hypostomus plecostomus</i>	Lowland Wet Zone	Tanks, ponds, slow-flowing rivers, marshes.
Guppy <i>Poecilia reticulata</i>	Island Wide	Tanks, ponds, slow-flowing rivers, marshes, streams.
Tilapia <i>Sarotherodon mossambicus</i>	Island Wide	Tanks, reservoirs, slow-flowing rivers, marshes.
Snake-Skin gouramy <i>Trichogaster pectoralis</i>	Dry & Intermediate Zones	Tanks, reservoirs, marshes, streams.
Golden apple snail <i>Pomacea canaliculata</i>	Lowland Wet Zone	Tanks, ponds, marshes.
Giant african snail <i>Achatina fulica</i>	Island Wide	Natural and managed terrestrial habitats
House rat <i>Rattus rattus</i>	Island Wide	Natural and managed terrestrial habitats.
Domestic/feral buffalo <i>Bubalus bubalis</i>	Island Wide	Forests (Bundala, Yala, Wasgomuwa, Hakgala, Udawalawe).

Impact of Alien Invasive Fauna on Native Biodiversity

The major impacts of alien invasive fauna documented during this survey are summerized under four major categories;

(a) *Direct exploitation or destruction of native biota:* The biggest threat of alien invaders documented is that they function as vectors, which transmit diseases and parasites to vulnerable native biota. Certain habits of alien invasive fauna also make some native biota vulnerable to disease causing pathogens. For instance, among the alien freshwater fish species documented, the tank-cleaner (*Hypostomus plecostomus*) has been observed to attach itself by the ventral sucker to the bodies of larger fish. When it detaches, the slime layer of fish, which acts as a protective covering is also removed, making the host susceptible to diseases. Alien invaders also destroy native biota by being active predators or herbivores. Among the alien invasive fish documented, three species (*O. mykiss*, *C. chitala* and *P. reticulata*) are active predators of native aquatic fauna. The rainbow trout (*O. mykiss*) occurs in cold streams of the montane zone, mainly in the Horton Plains National Park, which is also known to be the sole locality of the endemic shrimp *Caridina singhalensis* (Pethiyagoda 1991). As the trout is known to feed on aquatic organisms such as crabs, shrimps, insects and other fish, it is possible that it has affected the populations of the above endemic shrimp as well as other endemic crabs (*i.e. Ceylonthelphusa sorror*) in the montane zone streams.

The clown-knife fish (*Chitala chitala*) is a large voracious carnivore, which feeds on slow moving native fish. As it is spreading rapidly in the streams, rivers, ponds and marshes of the wet zone, it may have already effected the populations of the endemic fish, which are mainly distributed in this zone. The guppy (*P. reticulata*), which is a prolific breeder distributed in aquatic habitats throughout Sri Lanka, has been observed to feed on the eggs of native amphibians (De Silva 1996). The feral cats (*Felis domesticus*) and dogs (*Canis domesticus*) also attack native wild animals such as reptiles, birds and small mammals.

(b) *Superior competitors for resources:* All alien invasive fauna act as superior competitors of resources and thereby displace native fauna. Among the alien freshwater fish species, the Tilapia (*S. mossambicus*) is non-selective in its diet and breeds prolifically, enabling it to colonize tanks, reservoirs and slow-flowing rivers, while displacing some of the native inhabitants such as *Laheo porcellus* and *L. dussumieri*. The feral buffaloes pose a threat to native large herbivores such as deer, sambhur and elephant by competing for limited food resources, especially in the dry zone habitats. The wallowing habit of buffaloes in water makes the aquatic habitats muddy, thereby deterring other animals such as elephants, which come to drink water. The feral buffaloes

have also contributed to changes in vegetation communities in natural ecosystems.

(c) *Hybridization with native biota*: The two species of exotic mammals (*R. rattus* and *B. bubalis*) have become agents of hybridization, where they have interbred with indigenous sub-species. Three sub-species of the house rat (*R. r. rattus*, *R. r. alexandrianus*, and *R. r. rufescens*) have been accidentally introduced to Sri Lanka by ships. These have now interbred with the two local sub-species (*R.r. kandianus*, *R.r. kelaarti*) to form mixed populations (Phillips 1980). Similarly, the domestic buffalo has interbred with the native wild water buffalo (*B. bubalis*), to form feral populations.

(d) *Agricultural pests*: The house rat (*R. rattus*) is a major grain feeding pest of rice, while the giant African (*A. fulica*) is a pest of agricultural/horticultural crops. The feral buffalo (*B. bubalis*) also causes damage to various agricultural crops, mainly in the dry zone of Sri Lanka. It is possible that the golden apple snail (GAS - *Pomacea canaliculata*) could reach pest levels in the near future, as such situations have been reported from other countries. For instance, the GAS has invaded the rice fields in many parts of Asia, and functions as a major pest of rice, causing severe economic damage especially in the Southeast Asian region (Naylor 1996). The GAS has been imported to Sri Lanka during early 1980's by the ornamental fish traders. Being a prolific breeder, the GAS became a nuisance to fish breeders, who dumped them into drains and ditches, which proved to be ideal habitats for the snail. Thereafter, the GASs have found their way to some of the surrounding marshes and tanks in the western province, and established large populations (Gunawardena 1996). Although the occurrence of GAS in rice fields of Sri Lanka has not been reported to date, such a situation can occur in the near future, as it is reported to spread in aquatic habitats in the Central and South-western areas of Sri Lanka.

Other Recently Introduced Alien Fauna, which could be a Threat in Future

Two species of recently introduced alien fauna, the bumble bee (*Bombus terrestris*) and the Piranha fish could pose a major threat to native biodiversity, if they escape into natural ecosystems. The bumble bee has been introduced by an agricultural NGO for the purpose of pollinating strawberries grown for commercial purposes under green-house conditions at Nuwara-eliya, in the Montane Zone. It has been well documented that *B. terrestris* is capable of

spreading in and invasive manner, displacing the native hymenopteran pollinators (Dafni and Shimida 1996; Batra 1995). The Piranha is a voracious carnivore that occurs in the rivers and streams of south America. Several species of Piranha have been imported to Sri Lanka by the ornamental fish breeders, and these are currently being kept in aquariums, mainly in the western province of Sri Lanka. If the Piranhas are released into surrounding water bodies, it could lead to a threat similar to that of the clown-knife fish.

CONCLUSIONS AND RECOMMENDATIONS

These preliminary findings indicate that necessary action should be taken immediately to protect our native biodiversity from the growing threats of alien invasive fauna. Measures such as awareness programmes, training of personnel to detect alien biota, strengthening of current legislation to address issues pertaining to alien invasive fauna, and adoption of strict quarantine procedures would enable to avoid future detrimental introductions. However, in order to control and eradicate the already established alien invaders, a multitude of control measure will have to be adopted, supported with solid scientific research and regional collaboration. In addition, regular monitoring of the already affected natural ecosystems should be carried out to determine the status and impacts of alien invasive fauna on native biodiversity.

REFERENCES

- Bambaradeniya, C.N.B., Meegaskumbura, M.P.B., Ekanayake, S.P. and Gunawardena, J. (1998): Biodiversity of Sri Lanka and the growing threat of invasive biota. *Loris*, XXI (6): 222-230.
- Batra, S.W.T. (1995): Bees and pollination in our changing environment. *Apidologie*, 26: 361-370.
- Clout, M. (1995): Introduced species: The greatest threat to global biodiversity? *Species* 24: 34-36.
- Dafni, A. and Shimida, A. (1996): The possible ecological implications of the invasion of *Bombus terrestris* (L.) (Apidae) at Mt Carmer, Israel.
- De Silva, A. (1996): The herpetofauna of Sri Lanka; a brief review. Published by the author. 100 pp.
- Gunawardana, J. (1996): The submerged threat of Golden Apple snail. *The Island*, December 1st, 1996.

- Naylor, R. (1996): Invasions in Agriculture: Assessing the cost of the Golden Apple Snail in Asia. *Ambio* 25 (7): 443-448.
- Pethiyagoda, R. (1991): Freshwater fishes of Sri Lanka. Wildlife Heritage Trust.
- Phillips, W.W.A. (1980): Manual of the mammals of Sri Lanka. (Part II) Wildlife and Nature Protection Society, Sri Lanka.