

A Pictorial Identification Guide to Invasive Alien Species of Sri Lanka



Biodiversity Secretariat
Ministry of Mahaweli Development and Environment

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**Biodiversity Secretariat
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Introduction

An IAS is a non-native plant or animal species that, because of its growth and reproductive characteristics, can adapt to one or more habitats very quickly and proliferate, expanding in range. IAS are identified as a growing threat to biodiversity and also have negative impacts on economy, agriculture, tourism and society. This pictorial identification guide is intended to be used as a tool to help identify IAS in Sri Lanka. It also provides information on habitats/ecosystems that are threatened by IAS, their present distribution and proposed or possible control methods for each IAS mentioned in this guide.

Correct identification is the most important step in IAS management. Prevention of entry of invasive species is the most cost effective and environmentally responsible management tool available. Further, early identification increases the chances of eradicating an IAS at its initial stage of spreading. Therefore, correct identification will help prevent establishment of IAS in new areas as well as early detection of such species. It is expected that the reader will use this pictorial identification guide along with the three training modules (Training Manual for (1) Managers and Policymakers, (2) teachers and students and (3) Farmers and General public) which have been prepared in parallel with this guide to provide broader knowledge on IAS and their management.

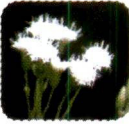
The users of this guide are requested to contact the relevant organizations that have been mentioned at the end of this guide for further information on IAS identification or to report your observations.

How to use the guide

Photograph showing habit

Mist Flower

Ageratina riparia



Habit - Small bush, 40 to 60 cm in height.

Identification - Mistflower is a short, expansive perennial herb that ranges in height from 40 to 60 cm. The stems of this plant produce roots at nodes (joints) that touch the ground. The leaves are lanceolate, with serrated margins, approximately 7.5 cm in length and 2.5 cm in width. Mistflower bears small white colour flowers in dense heads at the ends of the branches.

Invaded Ecosystems/Habitats - Montane forests, roadsides, stream banks.

Distribution - Montane zone (elevation 1500 m above sea level) where it is abundant in open areas in montane forests and along roadsides.

Control Method - Mistflower has been successfully controlled using biological agents such as white smut fungus *Entyloma ageratinae* and the gall fly *Procecidochares alani* in Hawaii and New Zealand. Mechanical removal is a possible control method in Sri Lanka, however, care must be taken to stop seed dispersal.



[14] A Pictorial Identification Guide to Invasive Alien Species of Sri Lanka

Common name
Scientific name

Special characters

Habit

Species description /
Distribution / Control
method

Photograph showing
affected habitat

Distribution map

[2]

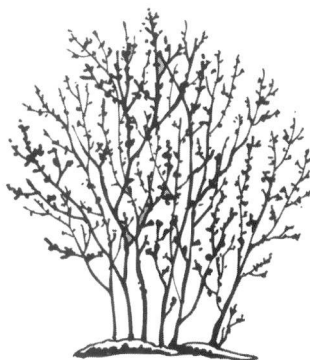
Guide to plant characters

Character identifications of plant species in this guide have been prepared using scientific terminology in their descriptions for better interpretation of the morphological characters. The following illustrations are provided to aid users at all levels to become familiar with these terms when identifying IAS in the field. The characters illustrated below describe only the specific states of the relevant morphological character. For further comprehension of other characteristics, user may need to refer a detailed plant taxonomy book.

Habit of the plant



tree



shrub



grass



herb

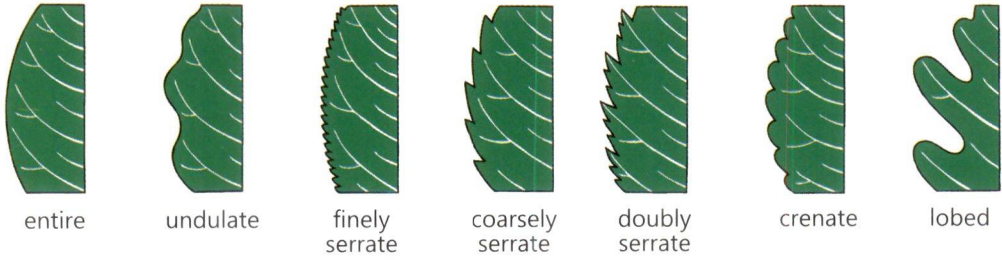


vine

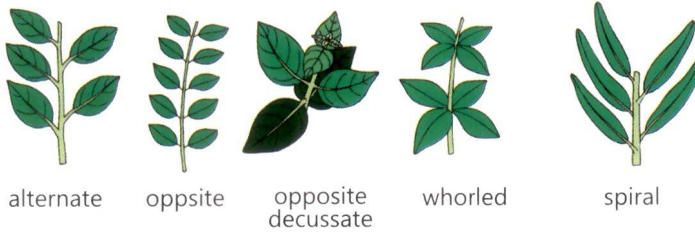


aquatic herb

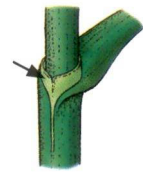
Leaf margins



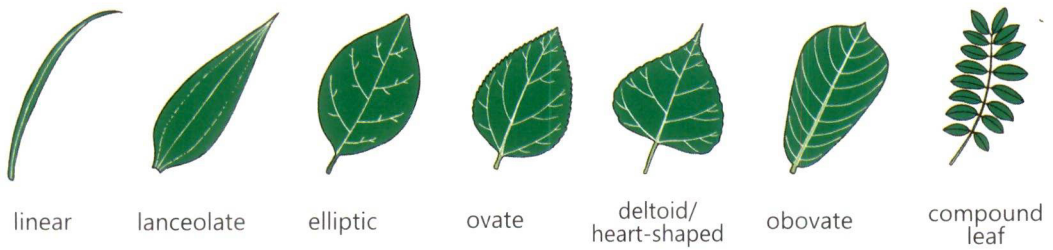
Leaf arrangement



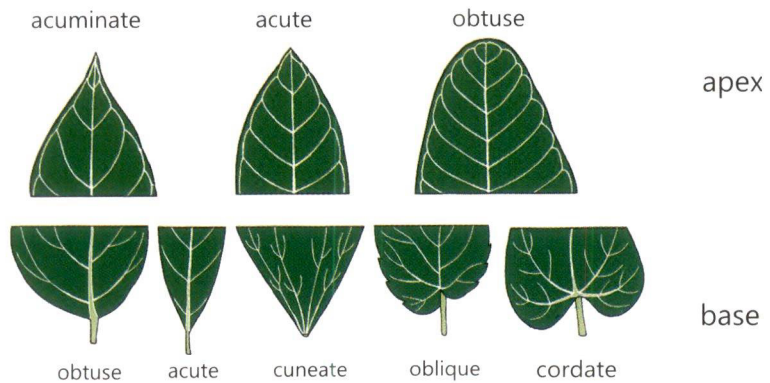
Ligule



Leaf shapes

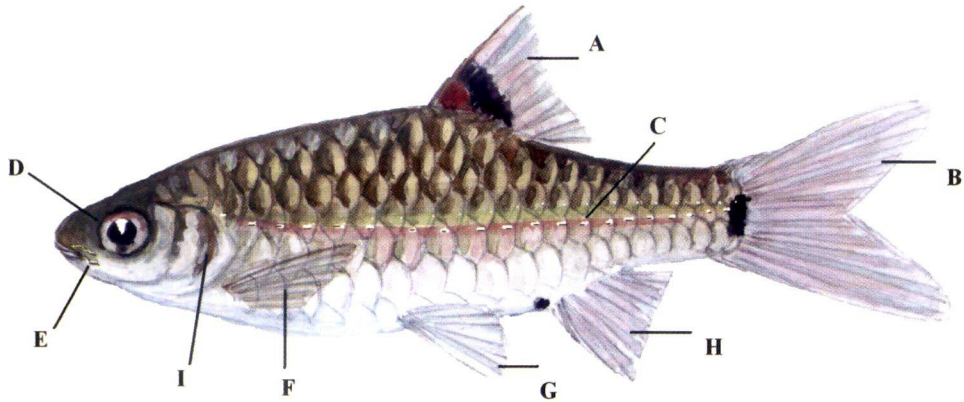


Leaf ends

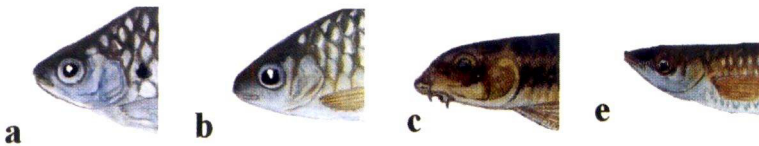


Guide for users

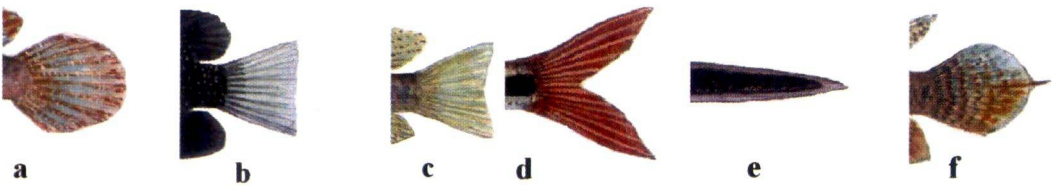
Following illustrations will help identifying invasive alien animals in the field. The characters, that are mentioned here, are only a selected set of common features and you may need to refer to other zoological books for further details on identification features.



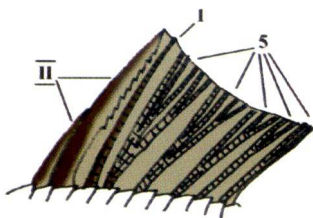
Fish Characters -A - Dorsal fin; B-Caudal fin; C-Lateral line; D-Eye; E-Mouth; F-Pectoral fin; I- Operculum; G-Ventral fin; H-Anal fin



Mouth shapes - a-terminal; b-sub terminal; c-inferior; e-superior

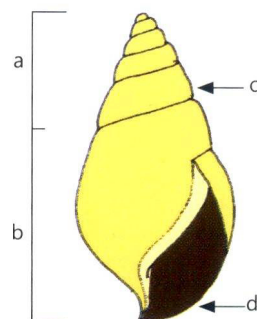


Tail shapes - a-rounded; b-truncate; c-lunate; d - forked; e-eel-like; f-lanciolate



Dorsal fin -
II - spines;
1- unbranched rays,
5 branched rays

Snail shell characters -
a - spine
b - body whorl
c - sutures
d - operculum



Invasive Alien Plants of Sri Lanka

Prosopis

Prosopis juliflora



Habit - A small tree, can reach up to 12 m in height.



Identification Characters - The Prosopis tree grows to a height of up to 12 m. It is sometimes shrubby with spreading branches. Branches cylindrical; the shrub is more or less round- or flat-topped, somewhat spiny with persistent, green (sometimes bluish grey/green or greyish, not reddish) foliage. Leaves are deciduous, bi-pinnate (1-3 pairs of pinnae), light green and compounded with 12 to 20 leaflets. It flowers shortly after leaf development. Flowers, 5-10 cm, are long green-yellow cylindrical spikes, which occur in clusters of 2 to 5 at the ends of branches. Pods are 20 to 30 cm long and contain between 10 and 30 seeds per pod. A mature plant can produce many thousands of seeds.

Invaded Ecosystems/Habitats - Lagoons, sand dunes, paddy fields, grasslands, home gardens

Distribution - Puttalam, Anuradhapura, Vavuniya, Mannar, Jaffna and Hambanthota districts.

Control Method - Total uprooting and burning, use in households as firewood, use for dendro-thermal power generation, chemical control.



Salvinia

Salvinia molesta



Habit - A free floating aquatic fern.



Identification Characters - The plant produces a horizontal rhizome (that lies below the water surface) and two types of fronds (buoyant and submerged). The mature plant produces egg-shaped spore sacs containing infertile spores. It lacks true roots but its submerged fronds function as roots. Its fronds are in whorls of three (two floating and one submerged). The floating fronds are positioned in an opposite orientation to each other and are round to oblong in shape. The papillae (small projections on fronds), end hairs and upper surface of the plant are water repellent in comparison to the under surface of the leaf, which attracts water. The fronds are light to medium green, often with brownish edges in mature plants, and with a distinctive fold in the center.

Invaded Ecosystems/Habitats - Wetlands

Distribution - In Sri Lanka, it is widespread within the low country of both the wet and dry zones.

Control Method - Floating ropes anchored to the bank have been used to reduce the spread of *Salvinia* within water bodies. *Salvinia* may be eradicated without subsequent re-infestation by draining a water body and drying out the weed. Machines, including land-based scoops and floating barges, may be used to harvest plants. Biological control with *Cyrtobagous salviniae* is also possible.



Water Hyacinth

Eichhornia crassipes



Habit - A free-floating plant, which is between 30-50 cm in height.



Identification Characters - Comprises of a very short indeterminate vegetative stem that produces a cluster of many fibrous roots, and stolons that gives rise to new plants at their apices. The leaves are in rosettes bearing large swollen petioles, a terminal inflorescence and numerous roots hanging in the water. The deep purple roots have a fine, feathery appearance. Flowers are pale lilac coloured, borne on a long spike with two bracts at the base.

Invaded Ecosystems/Habitats - Freshwater bodies such as tanks, canals, marshes, ponds etc.

Distribution - Island wide

Control Method - Herbicides can be used to control the plants. Mechanical removal of plants from the water body concerned is the best short-term solution. Biological control using *Neochatina eichhorniae* and *Neochatina bruchi* is also possible.



Guinea Grass

Panicum maximum



Habit - A tufted perennial grass, with a height of between 60-200 cm.



Identification Characters - *P. maximum* grows in densely tufted clumps with very short rhizomes; erect stems which are cylindrical with glabrous internodes, hairy nodes, and slightly flattened at the base. Leaf-blades are up to 35 mm wide and taper to a fine point. The panicle is 12-40 cm long, oblong or pyramidal, usually much-branched; the branches ascending to spreading, the lowest arranged in a whorl. Its open spikelets (resemblance of flowers) are 3-3.5 mm long, obtuse and are mostly purple red in colour.

Invaded Ecosystems/Habitats - Forest gaps, road sides, scrublands

Distribution - Island wide

Control Method - Cultivation and tillage to expose and kill perennating organs. The use of pre-emergence herbicides to prevent new growth, and post-emergence use of translocated herbicides to destroy both aerial and perennating parts of the plant can also be done.



Pitch-Apple

Clusia rosea



Habit - A terrestrial or hemiepiphytic tree or shrub with smooth bark, and a height of between 7-20 m.



Identification Characters - The leaves are thick, leathery and obovate and are 8-16 cm in length and 3.5-14 cm in width. The petioles are 1-2 cm long with a margined pit on the upper side near the base. The lateral veins in the leaves arise at a 45 degree angle or less from midrib. Flowers are white or pink and 3-4 cm long. Capsules are greenish brown, fleshy, globose and 5-8 cm in diameter and the seeds are dark red, thin and fleshy.

Invaded Ecosystems/Habitats - Forests, riparian habitats, mountain regions.

Distribution - In Sri Lanka *C. rosea* has established itself in the forests of the sub-montane region, ranging in elevations from 600-1300 m. They are particularly abundant in rock outcrops, forest edges and along streams (e.g. Hantana conservation area).

Control Method - Manual removal is recommended, but it is difficult to manually remove mature *C. rosea* trees once they are established.



Haumbupan

Typha angustifolia



Habit - Stems of *Typha angustifolia* are about 1.5 - 2.5 m tall, erect with linear leaves.



Identification Characters - Leaves about 1 to 1.5 m long, about 1 cm broad, semi-circular in section at the base and flattened towards the tip. Flowers arranged in a brown, fluffy, sausage-shaped spikes. Male and female spikes are separate. The seeds are very small, 1 - 1.2 mm long, c. 0.3 mm broad, brown, and attached to fine hairs. When ripe, the heads disintegrate into a cottony fluff from which the seeds are dispersed by wind.

Invaded Ecosystems/Habitats - This species will out compete natural species. There are some aquatic birds using leaves of this plants for nest building. Weaver birds build nests among these plants.

Distribution - Dry zone tanks with salinity

Control Method - The most effective method may be the removal by mechanical or manual means.



Lantana

Lantana camara



Habit - A low, erect or sub-climbing, vigorous shrub, which can grow up to 4 m in height.



Identification Characters - The leaves are ovate or ovate oblong, 2-10 cm long and 2-6 cm wide, and are arranged in opposite pairs. Leaves are bright green, rough, finely hairy, with serrate margins and emit a pungent odour when crushed. The stem is woody, square in cross section (mostly young stems), hairy when young, cylindrical and up to 15 cm thick as it grows older. Flower heads contain 20-40 flowers; the colour varies from white, cream or yellow to orange pink, purple and red. The fruit is a greenish blue-black colour, 5-7 mm in diameter, drupaceous, shining and with two nutlets.

Invaded Ecosystems/Habitats - Grasslands, scrublands, forests, home gardens, and roadsides.

Distribution - It is a major invasive species found throughout Sri Lanka and has invaded natural ecosystems particularly when open conditions are prevalent.

Control Method - Preventing the spread of Lantana is the most cost-effective management tool. Stick-raking, bulldozing, ploughing and grubbing (medium sized plants) are the main methods of mechanical control. Hand cutting using brush cutters, hand pulling, chain pulling and flame weeding are also used. Re-growth will be imminent if the rootstock is not removed while weeding. Re-vegetation of a treated site by planting trees or encouraging naturally occurring seedlings is a key component of a Lantana management program. Chemical methods are effective in the short-term, but are environmentally damaging and cannot be used on a long-term basis.



Annona

Annona glabra



Habit - A semi-deciduous tree, usually 3-6 m in height but can grow up to 15 m tall.



Identification Characters- The trunk is narrowly buttressed at the base. The leaf blade is ovate to elliptic, 7-15 cm long and up to 6 cm broad. The pedicel (stalk) is curved and expanded distally. Sepals are 4.5 mm long, 9 mm broad and apiculate. Outer petals are valvate, ovate-cordate, cream-coloured with a crimson spot at base within, 2.5-3 cm long and 2-2.5 cm broad. Inner petals are sub-imbricate, shortly clawed, 2-2.5 cm long, 1.5-1.7 cm broad, whitish outside and dark crimson within. Stigmas are sticky and deciduous. Fruits are up to 12 cm long, 8 cm broad, yellow outside when ripe, pulp is pinkish-orange, rather dry with a pungent-aromatic smell. Seeds are light brown, 1.5 cm long and 1cm broad.

Invaded Ecosystems/Habitats – Freshwater wetlands, estuaries and mangrove swamps, where it chokes these ecosystems.

Distribution - In Sri Lanka it is distributed in the lowland wet zone of the island and a few places in the dry zone.

Control Method - Physical removal of *Annona glabra* is the most effective method. However, it should be noted that this should be accompanied by the replanting of other native shrub species such as *Cerbera manghas*, *Syzigium* spp. and *Pandanus* spp. for best results.



Austroeupatorium

Austroeupatorium inulifolium



Habit - Small shrub, 1 to 5 m in height

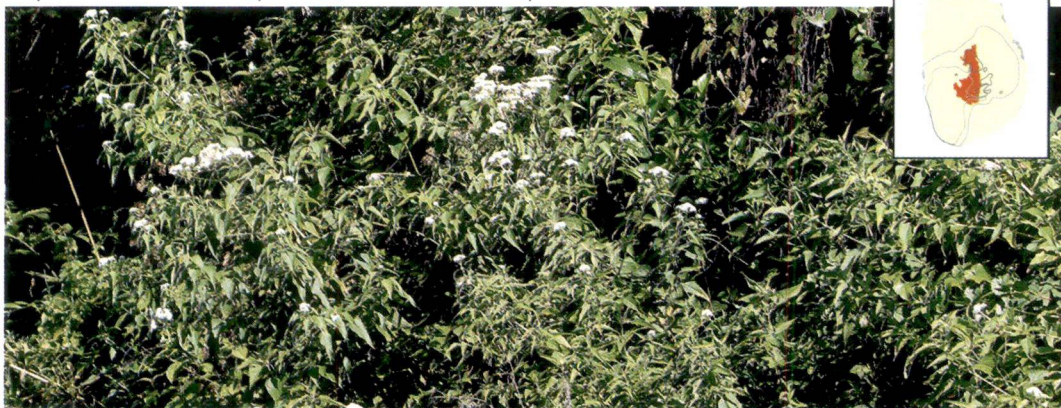


Identification Characters - *Austroeupatorium inulifolium* is a perennial spreading and scrambling shrub that grows up to 5 m in height (usually shorter). The shrubs have slender and cylindrical stems that are covered with dense short hairs. The spear-shaped, opposite and pubescent (hairy) leaves are 7 to 18 cm long and 2.5 to 8 cm wide. Floral heads of the inflorescence (compound flowers) are 2 to 3 mm in diameter and 5 to 6 mm long. They are arranged in large terminal clusters with each head comprising 3 or 4 series of coverings (involucres) enclosing 10 to 15 creamy white florets with corollas 4 to 5 mm long. The inflorescence is generally fragrant.

Invaded Ecosystems/Habitats - *A. inulifolium* has established itself in grasslands and grassland-forest ecotones of montane and lower-montane forests. Recently, it has been reported to be invading relatively undisturbed montane forests.

Distribution - montane and sub-montane regions above 1000 m from sea level.

Control Method - Manual removal of plants from invaded areas is the main method of control. Cutting stands before flowering is also another important control step as seeds are wind dispersed.



Shrubby Dillenia

Dillenia suffruticosa



Habit - A large evergreen shrub with sprawling branches. Grows up to 10 m in height (usually shorter).

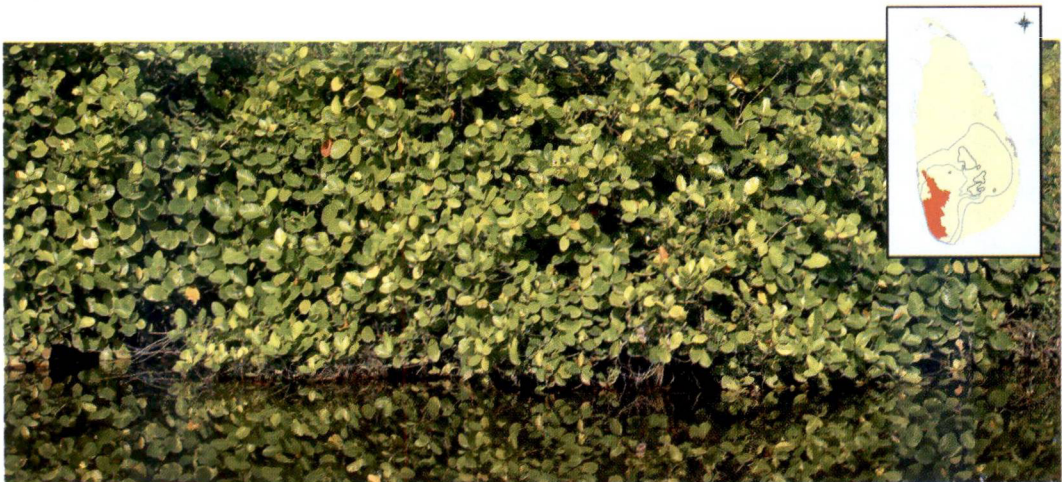


Identification Characters - The leaves are spirally arranged and are elliptic to obovate in shape. The leaves bear a 1-5 cm stalk that is broadly winged. Flowers are yellow, scentless and large and measure 12-37 cm in length and 6-25 cm in width. The flowers are found on long stalks, facing downwards, and are comprised of five petals. Fruits are tightly covered by fleshy sepals that split open to display the red seeds.

Invaded Ecosystems/Habitats - Marshy areas, forest edges, open scrublands and roadsides.

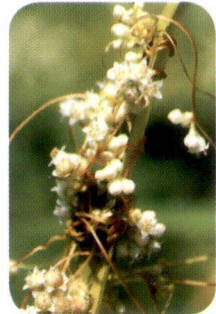
Distribution - In Sri Lanka, *D. suffruticosa* has established itself in the low country wet zone, especially in the Kalutara, Galle and Rathnapura districts.

Control Method - Not known.



Cuscuta

Cuscuta campestris



Habit - An angiosperm parasite consisting mainly of leafless, glabrous, yellow or orange twining stems.



Identification Characters - It has leafless, glabrous, yellow or orange stems and tendrils, bearing inconspicuous scales in the place of leaves. The true stems are about 0.3 mm in diameter. Flowers, each about 2 mm across, occur in compact clusters 1-2 cm across, petals are white coloured. The capsule (fruit) reaches 2-3 mm across when mature, with a depression between the two styles. The fruit is more exposed from the calyx. Seeds are irregular in shape, rough-surfaced and about 1 mm across.

Invaded Ecosystems/Habitats - Banks of irrigation channels, agricultural land.

Distribution - In Sri Lanka *C. campestris* is widely distributed in, but not limited to, the dry zone in areas such as Anuradhapura, Polonnaruwa and Hambantota; it is also found in patches in the low country wet zone.

Control Method - Hand-pulling is suitable only for scattered infestations as the infested plants have to be removed with the parasite. Scattered infestations can also be controlled by heat, using a hand-held flame gun. A range of soil-acting herbicides are also effective in preventing the germination and establishment of the parasite.



Alstonia

Alstonia macrophylla



Habit - A tall tree with a straight trunk and a high, narrow crown. Generally grows up to 30 m.



Identification Characters - The tree has a smooth and light grey coloured bark. The leaves are in whorls of three to four and are simple, penni-veined (feather like), membranous, and smooth (hairless) above. The leaf-blades are 10 to 50 cm long, 5 to 15 cm wide, and cuneate at the base. The white coloured flowers are about 7 mm in diameter, with a narrow corolla tube, and are placed terminally on twigs. The elongated green coloured fruits are about 30 cm in length and are filled with many small hairy seeds.

Invaded Ecosystems/Habitats - Grasslands, open areas, rainforests, disturbed forests.

Distribution - In Sri Lanka, this species has established itself in the lowland and sub-montane areas of the wet zone (elevation up to 1500 m)

Control Method - None known. Selective logging is a possible method to remove trees that grow within forests.



Ipil Ipil

Leucaena leucocephala



Habit - A thornless, long-lived shrub or tree, which may grow to heights of 7-18 m.

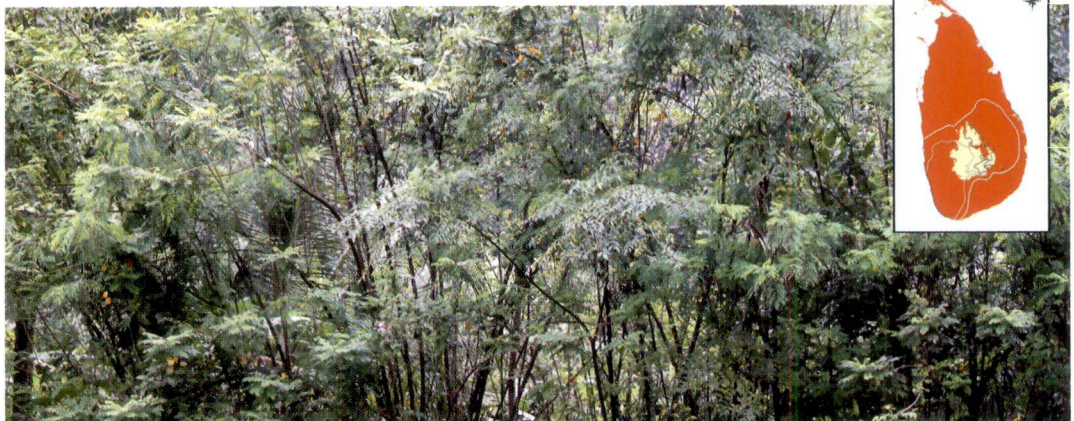


Identification Characters - Leaves are bipinnate with 6-8 pairs of pinnae bearing 11-23 pairs of leaflets 8-16 mm long. Bark on young branches is smooth, grey-brown/salmon pink. Darker grey-brown and rougher with shallow, rusty orange-brown vertical fissures and deep red inner bark is seen on the older branches and bole. The inflorescence is a cream coloured globular shape head which produces a cluster of flat brown pods 13-18 mm long. The pods occur in crowded clusters of 5-20 per flower head and are 11-19 cm long and 15-21 mm wide. They are pendulous, flattened and papery, and passively dehiscent with 8-18 seeds per pod.

Invaded Ecosystems/Habitats - Plantations, crops, dry mixed evergreen forests

Distribution - Island wide

Control Method - Where *L. leucocephala* is a weed in forest nurseries in India, solarization was found to be 100% effective in killing all plants and seeds, whereby a plastic sheet was used to cover moist soil for one month, increasing soil temperature.



Clidemia

Clidemia hirta



Habit - A densely-branched perennial shrub up to 3 m tall, but normally between 0.5 and 2 m.



Identification Characters - Many parts of the plant, including the stems, leaves and calyx, are hairy. The flowers, 0.5-1 cm across, have white or pink petals and are borne on short pedicels in axillary or terminal cymes of 6-20 flowers. The fruits (berries) are borne in clusters and turn from green to blue-black or deep purple as they mature.

Invaded Ecosystems/Habitats - Open areas in lowland rainforests.

Distribution - In Sri Lanka it is found in the sub-montane wet zone, open areas in lowland rainforest edges including Sinharaja Forest and is found to be spreading into higher elevations in the Kandy and Ambagamuwa areas.

Control Method - Mechanical removal is a possible control method in Sri Lanka. However, the thrip, *Liothrips urichi*, and the leaf spot fungus, *Colletotrichum gloeosporioides* f. sp. *clidemiae* are known to be effective biological control agents of this plant.



Parthenium

Parthenium hysterophorus



Habit - Annual, erect herbaceous plant, 30-90 cm in height.



Identification Characters - Parthenium plants first form a basal rosette, up to 30 cm in diameter, of finely lobed leaves. Plants then form a paniculately branched hairy stem with length wise grooves. The leaves on the stem are alternate, and the upper leaves are entirely to slightly lobed. All leaves are light green in colour and pubescent on both sides. Flowers, are borne on the tip of the stems and are small (3-5 mm wide) and whitish with tiny ray florets at each of the 5 distinct corners. A small seed is produced in each of the five corners.

Invaded Ecosystems/Habitats - Native grasslands, woodlands, riverbanks, roadsides and floodplains.

Distribution - Northern dry and arid zones of Sri Lanka.

Control Method - Grading, mowing, slashing and ploughing are considered inappropriate since they may promote seed dispersal as well as rapid regeneration from lateral shoots close to the ground. A beetle native to Mexico, *Zygogramma bicolorata*, is capable of defoliating and killing this weed. This weed has been found to be resistant to glyphosate, a popular systemic herbicide, prohibiting its control in this manner. Paraquat (Gramxone) solution is sometimes applied to plants, when the weeds are young.



Giant Mimosa

Mimosa pigra



Habit - Shrub, can reach up to 6 m in height.



Identification Characters - *Mimosa pigra* is a leguminous shrub, armed with broad-based prickles up to 7 mm long. The stem is greenish in young plants but becomes woody as the plant matures. Leaves are sensitive, bright green and bipinnate, consisting of a central prickly rachis 20-25 cm long with up to 16 pairs of pinnae of 5 cm long, each divided into pairs of leaflets 3-8 mm long. Flowers are pink and subglobose with pedunculate heads, 1 cm in diameter, each containing approximately 100 flowers. Each flower head consists of a cluster of 10 to 20 seedpods, which then mature and break into segments, each containing an oblong shaped seed. Hairs on the segments allow them to float on water and stick to hair or clothing, hence aiding in dispersal. Ripe seeds are light brown to brown or olive green. Seeds can survive at least 23 years on sandy soils, but seed viability decreases more rapidly on clay soils.

Invaded Ecosystems/Habitats - River banks, marshes, flood plains, lowland areas.

Distribution - Middle catchment of the Mahaweli river basin, as well as a few localities in the Colombo District.

Control Method - Total uprooting and burning or chemical methods can be used.



Prickly Pear Cactus

Opuntia dillenii



Habit - An upright or spreading, fleshy plant usually growing 50-100 cm tall and occasionally up to 2 m in height.



Identification Characters - The stems are much-branched and consist of a relatively large, flattened and elongated (i.e. elliptic or obovate) series of stem segments (i.e. succulent). These segments are hairless and sparsely covered in groups of 1-7 sharp spines (2-4 cm long). Its showy yellow flowers (6-8 cm across) are borne along the margins of the stem segments. The fruit, 4-6 cm long and 2.5-4 cm in diameter, have several tufts of small barbed bristles on their surface and turn reddish-purple as they mature.

Invaded Ecosystems/Habitats - Scrublands of Dry and Arid zones

Distribution - It is abundant in sandy areas of the dry and arid zone of Sri Lanka, especially in the Bundala and Yala National Parks, covering an area of more than 7000 ha including Hambantota.

Control Method - Mechanical removal is the best potential control method for this species in Sri Lanka.



Ulex

Ulex europaeus



Habit - Shrub, grows up to 2 m in height.



Identification Characters - *U. europaeus* is a many-branched, evergreen shrub. It is spiny and perennial and grows in dense impenetrable thickets. Shrubs branched, younger branches generally end in a spine and the younger parts tend to be green or bluish grey in colour and appear to be hirsute (hairy, shaggy) to tomentose (flattened hairs). The petals are yellow in colour and are about 15-20 mm long. Pods are also densely villous, are slightly compressed and are 11-20 mm long and 6-8 mm wide. The pod contains 1-4 seeds which are reniform (kidney-shaped) and brownish green.

Invaded Ecosystems/Habitats - Montane grasslands

Distribution - High altitude areas in the Central Highlands, especially in the Nuwara Eliya District.

Control Method - Mechanical removal has been practiced in Sri Lanka although it has found little success. However, repeating mechanical removal is recommended for the containment of the plant.



Wedelia

Sphagneticola trilobata



Habit - Mat forming perennial herb up to 60 cm in height (usually short)



Identification Characters - Stems are green, rounded, rooting at nodes, 10-30 cm long, the flowering portions ascending, covered with dense hairs, sometimes sparsely hairy. Leaves are fleshy, green, usually 4-9 cm long 1.5 cm and 2-5 cm wide, simple obovate, irregularly toothed or serrate. *S. trilobata* usually flowers throughout the year. Solitary flowers, arise on the leaf axils. Stalks 3-10 cm long, covering bell-shaped or hemispherical, ray florets often 8-13 per head, bright yellow in colour. Fruits are not immediately obvious.

Invaded ecosystems/habitats - Forest edges, roadsides, agricultural lands, home gardens

Distribution – widespread across the wet zone and coastal zone up to the upcountry regions of around 1000 m above sea level

Control method - Growth of *S. trilobata* can be controlled by carefully managing nitrogen fertilizer and irrigation. The importation and spread of this plant can be significantly reduced by public education on the aggressive nature of the species. It can also be effectively controlled by removing the top few centimetres of soil using a suitable tool, with the aim of removing the soil-stored seed bank.



Orange Cestrum

Cestrum aurantiacum



Habit - An evergreen, slightly scrambling shrub or small tree. The shrub grows up to a height of 180 cm.



Identification Characters - The leaves are 5-10 cm long and 4-6 cm wide and are glabrous and ovate, acute or acuminate in shape. It bears flowers, which have a powerful citrus like smell, especially in the night. These flowers have ovate, obtuse or reflexed lobes (3-4 mm) and are 1.4-2 cm in length. The fruits are berries, which are white in colour and contain approximately 4 seeds.

Invaded Ecosystems/Habitats - Agricultural land

Distribution - In Sri Lanka it is distributed in the montane region.

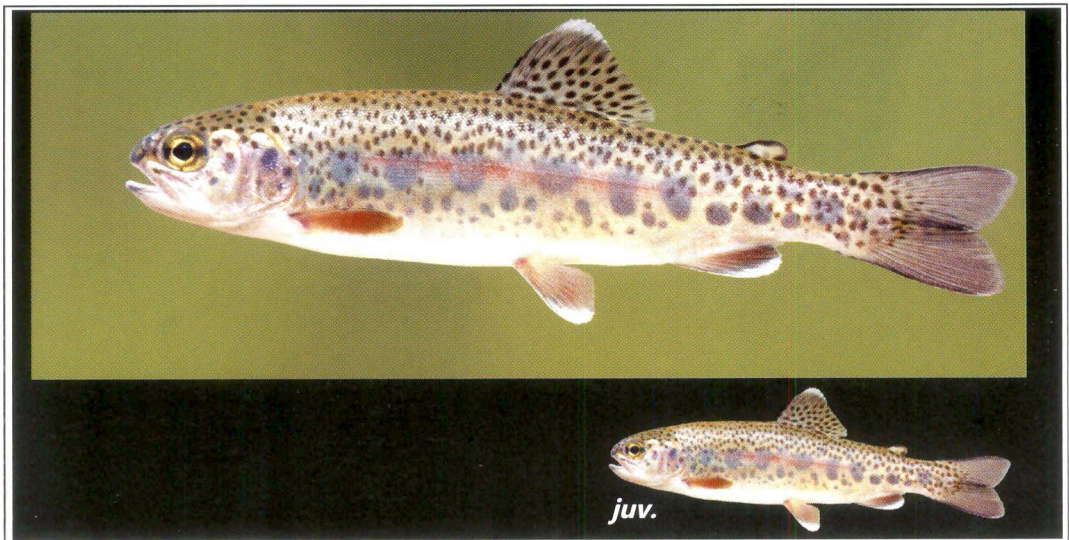
Control Method - Unknown. However chemical methods such as use of herbicides have been reported as effective. Mechanical removal is also possible.



Invasive Alien Animals of Sri Lanka

Rainbow Trout

Oncorhynchus mykiss



Size - A regular sized fish whose length ranges between 45-60 cm, but can reach a maximum of 120 cm.

Identification Characters - The rainbow trout can be distinguished from the other freshwater fishes of Sri Lanka by its elongate, moderately compressed body and by the presence of a jaw with teeth. The colour is grey dorsally and silvery on the sides. A faint pink stripe is present on both sides of the body. The entire body is spotted, including the head and the fins. Juveniles have larger lateral blotches.

Invaded Ecosystems/habitats - Upland streams

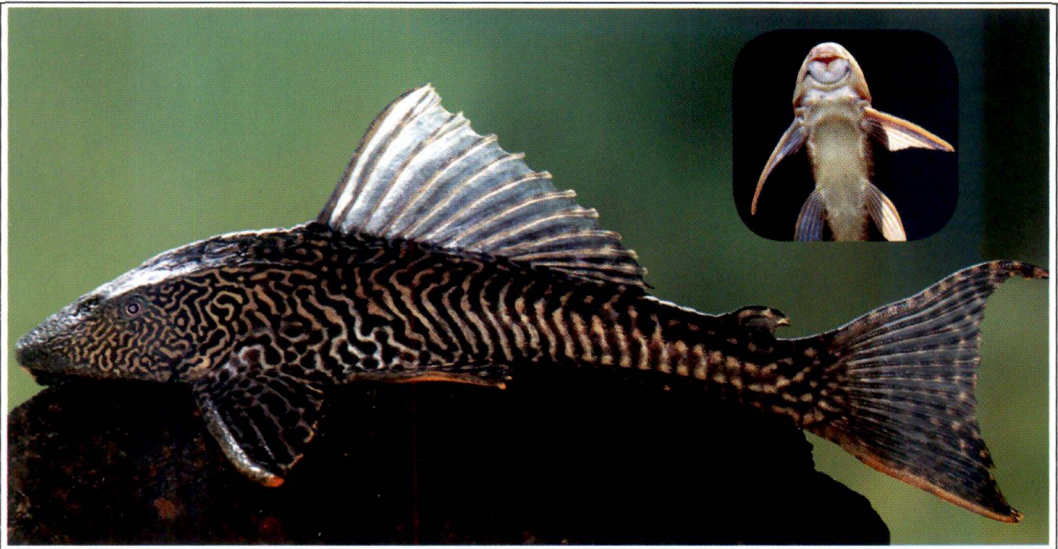
Distribution - Populations have only been established in a few streams in the montane regions between 1700-2000 m above sea level.

Control method - There are no recommended methods for controlling rainbow trout. Fishing will help control the population.



Scavenger

Pterygoplichthys spp.



Size - Regular sized fish, which is about 35 cm long but can grow up to 50 cm in length.

Identification Characters - The body of a mature *Pterygoplichthys spp.* is covered with flexible bony plates while the abdomen is covered with large white spots irregularly joined to form a vermiculate pattern. Ventral sucking mouth, pectoral fins with thick toothed spines, and the presence of 9-14 dorsal fin rays with a single spine distinguish this species from other *Pterygoplichthys* species.

Invaded Ecosystems/habitats - Freshwater reservoirs and estuaries. *P. spp.* browses on substrate, mainly feeding on benthic algae and aquatic weeds, but will also take worms, insect larvae and other bottom-dwelling invertebrates as food. Males excavate tunnels along banks, which leads to siltation problems and shoreline instability. Feeding behaviour could re-suspend sediment or alter substrate size and may displace smaller less aggressive native species. Its large pectoral and dorsal spines pose choking hazards to predaceous birds and damage to fishing gear and industry.

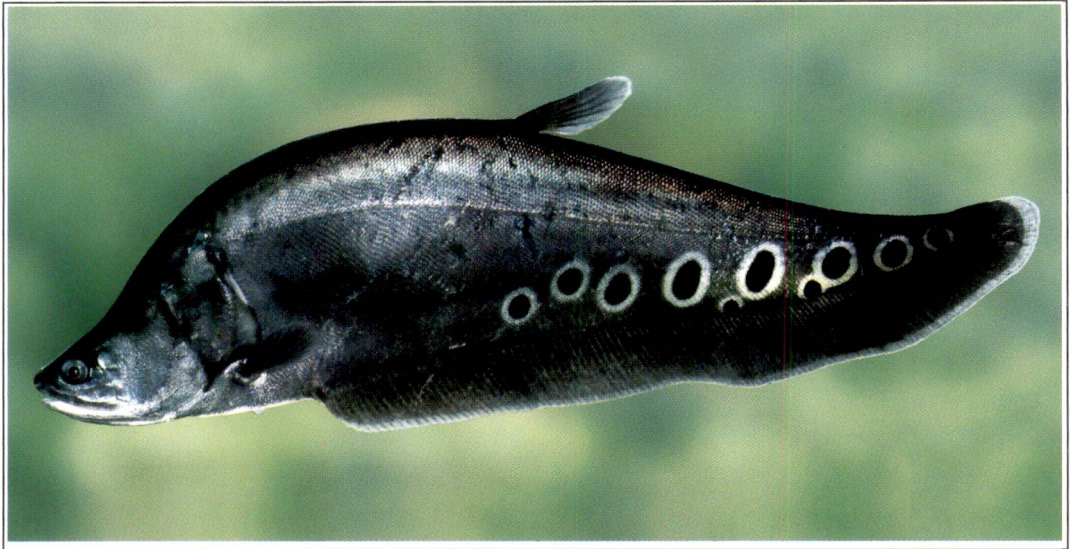
Distribution - The species inhabits freshwater streams and lakes. It thrives in weedy, mud-bottomed canals in its native habitat. In Sri Lanka it is present in freshwater reservoirs and river estuaries in the lowland and mid hills.

Control methods - There are no recommended methods for the removal of this species from natural habitats.



Clown Knife Fish

Chitala ornata



Size - Grows up to 100 cm in length. An adult fish may weigh about 5 kg.

Identification Characters - This species contains a unique morphological feature, the presence of a long anal fin, which continues along with the caudal fin. Mature fish normally display five to ten (or even more) black spots ringed with white, which usually decrease in size as the fish grows.

Invaded Ecosystems/habitats - Lakes, rivers and swamps.

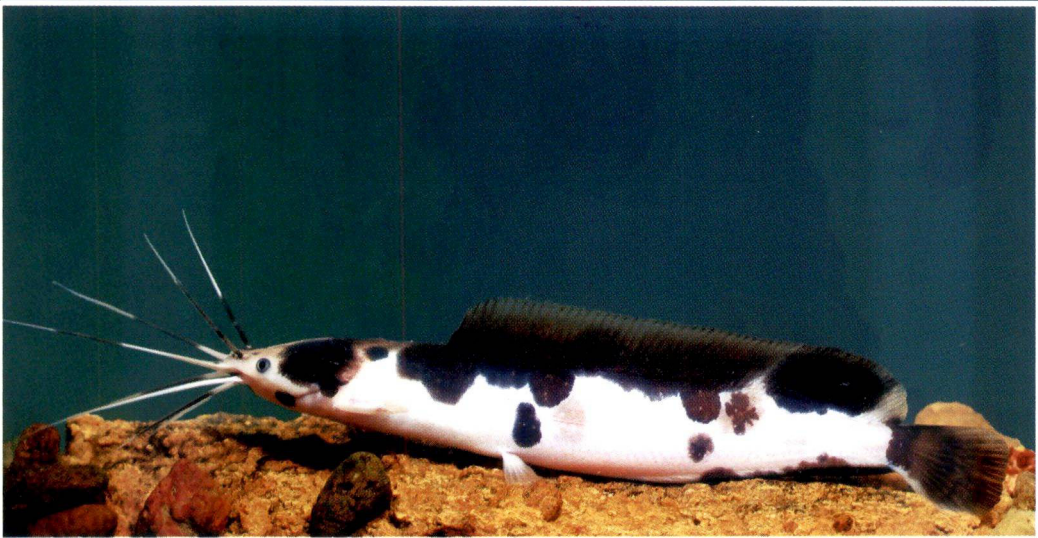
Distribution - Colombo and Kaluthara Districts.

Control method - There are no recommended methods for controlling *Chitala ornata*. Fishing will help control the population.



Marble Cat Fish

Clarias batrachus



Size - Medium sized fish, generally 26 cm in length but can grow up to 47 cm.

Identification Characters -It has a posterior compressed body that tapers towards the tail. The head is flat and wide with small eyes. There are four pairs of barbels on the upper and lower jaws. The mouth is broad with a series of small pointed teeth. The dorsal and anal fins are long and terminate in a lobe near the caudal fin. The body is scale-less and the colour is typically a uniform shade of grey or grey-brown with many small white spots along their sides. However, albinos and calico morphs are also present.

Invaded Ecosystems/habitats – Rivers, streams, canals and lakes.

Distribution - In Sri Lanka, this species has established itself in the rivers, streams and canals around Kandy and Colombo.

Control method - There are no recommended methods for the removal of this species from natural habitats.



Red Eared Slider Turtle

Trachemys scripta



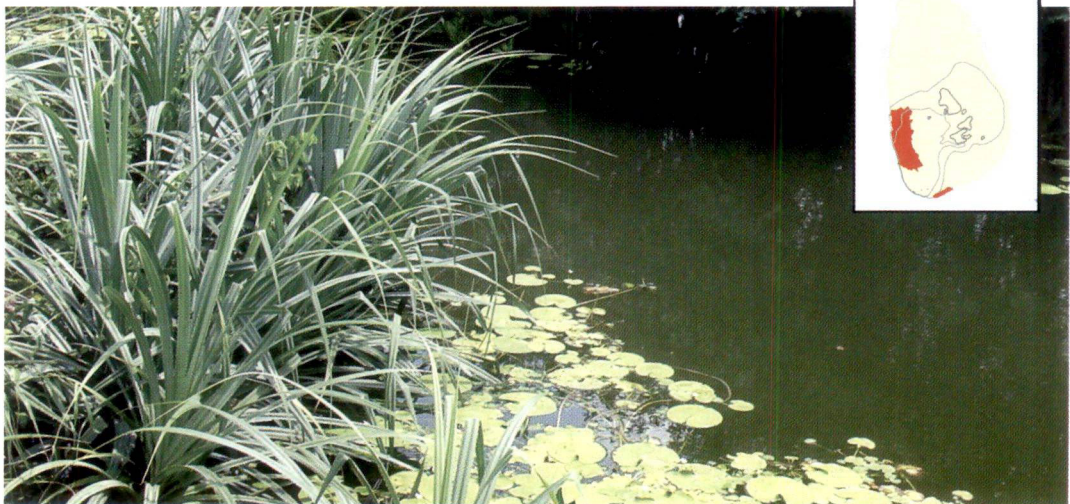
Size - Carapace length ranges between 12 cm to around 30 cm in adults.

Identification Characters - The red-eared slider is a medium sized freshwater turtle characterized by distinct yellow and red patches on each side of the head. It has a fairly flat, oval shell and a weakly keeled carapace. The colour of the carapace and skin are olive to brown with yellow stripes or spots.

Invaded Ecosystems/habitats - Lowland Wet Zone marshes.

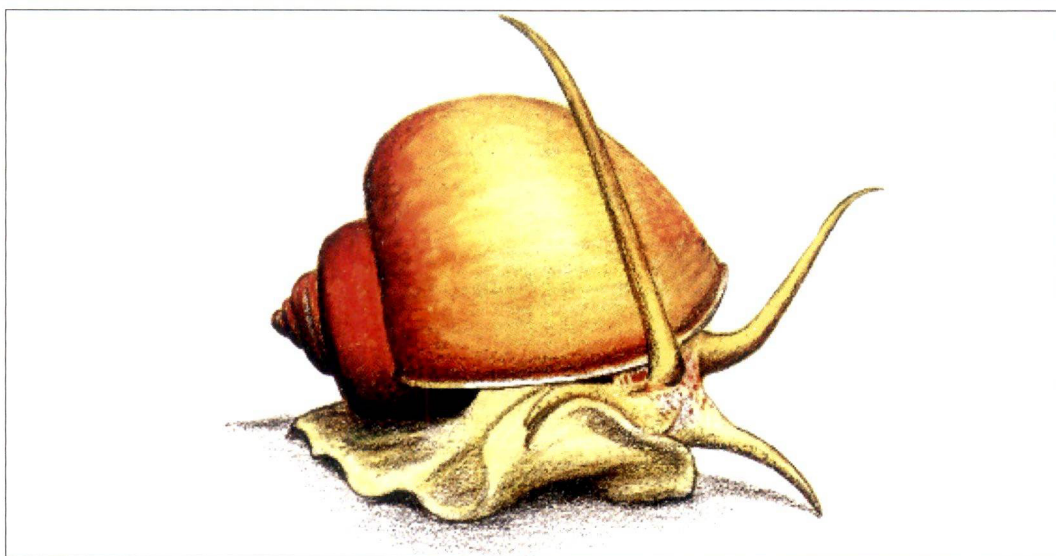
Distribution - It has been recorded in Colombo, Kalutara, Galle and Matara Districts.

Control method - There are no recommended methods for controlling Red-eared slider turtles in Sri Lanka.



Golden Apple Snail

Pomacea spp.



Size - Length of the shell ranges between 4-5 cm.

Identification Characters - *Pomacea diffusa* is a medium sized snail with a globular shell. The shells bear a raised spire and an operculum, but lack a channeled suture. Shell colour is generally brownish or golden-brown to yellow. Body colour varies from yellow to off white. Apple snails are voracious herbivores that feeds on a wide variety of plants. They prefer young, soft plants, but will clip mature, rooted plants at the soil surface. Apple snails will eat eggs and juveniles of other snails and will also eat decomposing organic matter.

Invaded Ecosystems/habitats - Lowland marshes, canals, streams, paddyfields.

Distribution - Lowland Wet Zone.

Control methods - Manual and mechanical removal of *P. diffusa* is recommended. Chemical removal can also be done, however using pesticides to control *P. diffusa* can be harmful to natural ecosystems. Manual removal of all life stages from agricultural and natural ecosystems is not feasible either.



Giant African Snail

Lissachatina fulica



Size - 7 cm in height and up to 20 cm in length.

Identification Characters - The fully grown *L. fulica* consists of 6 to 9 whorls, with a moderately swollen body-whorl and a sharply conical spire. The coiling of the shell is either clockwise (dextral) or counter-clockwise (sinistral) although the clockwise (dextral) cone is the more common. The outlines vary from very slender to moderately obese, the broader specimens tending to be shorter for the same number of whorls. Operculum absent. Shell colouration is highly variable, and dependent on diet. Typically, brown is the predominant colour and the shell is banded.

Invaded Ecosystems/habitats - Disturbed forests, home gardens and agricultural lands.

Distribution - Island wide

Control Methods – Mechanical removal, incineration or use of chemicals such as Metaldehyde, Methiocarb or a combination of these chemicals with other molluscicides as bait formulations or foliar sprays.



Places where further information can be obtained

Plants

Department of National Botanic Gardens

Peradeniya, Sri Lanka.

<http://www.botanicgardens.gov.lk/>

Department of Botany

Faculty of Science

University of Peradeniya

Peradeniya, Sri Lanka.

<http://www.pdn.ac.lk/sci/botany/>

Department of Crop Science

Faculty of Agriculture

University of Peradeniya

Peradeniya, Sri Lanka

[http://www.pdn.ac.lk/agri/dept/crop_home.php?dep=Department of Crop Science#](http://www.pdn.ac.lk/agri/dept/crop_home.php?dep=Department%20of%20Crop%20Science#)

Department of Plant Sciences

Faculty of Science

University of Colombo

Colombo 07, Sri Lanka.

<http://science.cmb.ac.lk/departments/plant-sciences/>

Plant Protection Service

P.O.Box 22

Gannoruwa

Peradeniya.

<http://www.agridept.gov.lk/index.php/en/institutes/325>

Animals

Zoology Division

Colombo National Museum

Sir Marcus Fernando Mawatha

Colombo 07, Sri Lanka.

<http://www.museum.gov.lk/>

Department of Zoology

Faculty of Science

University of Colombo

Colombo 07, Sri Lanka.

<http://science.cmb.ac.lk/departments/zoology/>

Faculty of Veterinary Medicine and Animal Science

Faculty of Agriculture

University of Peradeniya

Peradeniya, Sri Lanka

<http://www.pdn.ac.lk/vet/>

Department of Zoology and Environmental Management

Faculty of Science

University of Kelaniya

Dalugama, Kelaniya, Sri Lanka

<http://www.kln.ac.lk/science/depts/zoology/>

National Animal Quarantine Service

Animal Quarantine Office

41, Morgan Road

Colombo 2.

Plants and Animals

Faculty of Agriculture

University of Peradeniya
Peradeniya, Sri Lanka
<http://www.kln.ac.lk/science/depts/zoology/>

Post Graduate Institute of Agriculture

University of Peradeniya,
Old Galaha Road,
Peradeniya.
<http://www.pdn.ac.lk/agri/>

Postgraduate Institute of Science

University of Peradeniya
Peradeniya, Sri Lanka
<http://www.pgis.lk/>

National Aquatic Resources Research and Development Agency (NARA)

Crow Island
Colombo 15
<http://www.nara.ac.lk/>

IUCN Sri Lanka Country Office

No. 53 Horton Place
Colombo 07, Sri Lanka
http://www.iucn.org/about/union/secretariat/offices/asia/asia_where_work/srilanka/

Useful web links

<http://ias.capno.net/>
<http://www.cbd.int/invasive/>
<http://www.issg.org/>
http://ec.europa.eu/environment/nature/invasivealien/index_en.htm
<http://www.issg.org/database/species/search.asp?st=100ss>
<http://www.invasive.org/>
<http://www.doi.gov//invasivespecies/index.cfm>

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- Silva, P. and M. Kurukulasuriya (2010) Invasive alien fauna in Sri Lanka. Introduction, spread, impacts and management. In: Marambe, B.; Silva, P.; Wijesundera, S. and Atapattu, N. (eds.). *Invasive alien species in Sri Lanka - strengthening capacity to prevent introduction and spread*, pp. 39-61. Ministry of Environment and Natural Resources, Sri Lanka and United Nations Development Programme, Sri Lanka.



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