

PRIORITY INVASIVE ALIEN PESTS THAT POSE A THREAT TO THE PITCAIRN ISLANDS



Chris Malumphy, Sharon Reid, Jackie Dunn and Simon Conyers

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Frontispiece

First row: German wasp *Vespula germanica* adult © Fir0002/Flagstaffotos; Rosy wolf snail *Euglandina rosea* © Tim Ross/Wikipedia; Coconut rhinoceros beetle *Oryctes rhinoceros* © Vitalfranz; Yellow ginger *Hedychium flavescens* © Wilder Mendez/Wikipedia. **Second row:** Giant African land snail *Achatina fulica* © C. Malumphy; Soapbush *Clidemia hirta* © F&K Starr/Wikipedia; Varroa mite *Varroa destructor* © Fera; Afrotropical house gecko *Hemidactylus mabouia* © Hans Hillewaert. **Third row:** Yellow fever mosquito *Aedes aegypti* © James Gathany & Prof. Frank Hadley Collins; Ship rat *Rattus rattus* © Vladimír Motyčka; Common myna *Acridotheres tristis* © TG Santosh/Wikipedia; Argentine ant *Linepithema humile* © Eli Sarnat, Antkey, USDA APHIS PPQ, Bugwood.org. **Fourth row:** Brown rat *Rattus norvegicus* © Reg Mckenna; Lionfish *Pterois* sp. © Vasenin / Wikipedia; Balloon vine *Cardiospermum grandiflorum* © ARC; Tiger mosquito *Aedes albopictus* © Susan Ellis, Bugwood.org. **Fifth row:** Molasses grass *Melinis minutiflora* © F&K Starr/Wikipedia; Oriental fruit fly *Bactrocera dorsalis* © Fera; Asian green mussel *Perna viridis* © United States Geological Survey; Killer algae *Caulerpa taxifolia* © Rachel Woodfield/Wikipedia.

Purpose and Scope

Invasive alien (also referred to as non-native or exotic) species are a major threat to biodiversity globally and particularly to the United Kingdom Overseas Territories (UKOTs). Early detection and identification of invasive alien species can enable effective and appropriate measures to be taken in a timely manner to eradicate, contain and/or manage the pests. The purpose of this guide is to provide simple factsheets on priority invasive alien pests that currently threaten plant health, human health and/or biodiversity in the Pitcairn Islands (Pitcairn, Henderson, Ducie and Oeno Islands), a UK Overseas Territory located in the southern Pacific Ocean. It also identifies the main pathways of introduction so that biosecurity inspections can be targeted. The guide is intended to be used by those working in biosecurity, and by all those interested in preserving the unique environments and biodiversity found in the Pitcairn Islands. The guide will not enable the user to accurately confirm the identify of the species of suspected invasive alien pest included in this guide, and further assistance will be required from a relevant specialist.

Species selection

The species included in this guide were selected from lists of priority economic, human and biodiversity threats identified for each UKOT during Horizon Scanning workshops/teleconferences held during 2018, organised by the Centre for Ecology and Hydrology and GB Non-Native Species Secretariat, and funded through the UK Conflict, Stability and Security Fund. The top 34 priority species that pose a threat to Pitcairn are included. They cover a wide range of organisms such as terrestrial plants, snails, mites, insects, fish, reptiles, birds, mammals and marine organisms (listed in Table 1).

Table 1. Priority Invasive Alien Pests that pose a Threat to the Pitcairn Islands

Pest Group	Order	Family	Species	Common name	Impact
Plant	Cyperales	Poaceae	<i>Melinis minutiflora</i>	Molasses grass	Biodiversity
Plant	Liliales	Liliaceae	<i>Asparagus densiflorus</i>	Asparagus fern	Biodiversity
Plant	Myrtales	Melastomataceae	<i>Clidemia hirta</i>	Soapbush	Biodiversity
Plant	Sapindales	Sapindaceae	<i>Cardiospermum grandiflorum</i>	Balloon vine	Biodiversity
Plant	Zingiberales	Zingiberaceae	<i>Hedychium flavescens</i>	Yellow ginger	Biodiversity
Plant	Myrtales	Melastomataceae	<i>Miconia calvescens</i>	Velvet tree	Biodiversity
Mollusca	Stylommatophora	Achatinidae	<i>Achatina fulica</i>	Giant African land snail	Economic
Mollusca	Stylommatophora	Spiraxidae	<i>Euglandina rosea</i>	Rosy wolf snail	Biodiversity
Acari	Parasitiformes	Varroidae	<i>Varroa destructor</i>	Varroa mite	Economic
Insect	Coleoptera	Scarabaeidae	<i>Oryctes rhinoceros</i>	Coconut rhinoceros beetle	Economic
Insect	Diptera	Culicidae	<i>Aedes aegypti</i>	Yellow fever mosquito	Human health and economic
Insect	Diptera	Culicidae	<i>Aedes albopictus</i>	Tiger mosquito	Human health and economic
Insect	Diptera	Tephritidae	<i>Bactrocera dorsalis</i> group	Oriental fruit fly	Economic
Insect	Hemiptera	Aleyrodidae	<i>Bemisia tabaci</i>	Tobacco whitefly	Economic
Insect	Hymenoptera	Formicidae	<i>Linepithema humile</i>	Argentine ant	Biodiversity

Table 1. continued.

Insect	Hymenoptera	Formicidae	<i>Trichomyrmex destructor</i>	Asian ant	Economic
Insect	Hymenoptera	Formicidae	<i>Wasmannia auropunctata</i>	Little fire ant	Economic
Insect	Hymenoptera	Vespidae	<i>Vespula germanica</i>	German wasp	Biodiversity
Insect	Hymenoptera	Vespidae	<i>Vespula vulgaris</i>	Common wasp	Biodiversity
Insect	Lepidoptera	Noctuidae	<i>Spodoptera frugiperda</i>	Fall Armyworm	Economic
Insect	Lepidoptera	Plutellidae	<i>Plutella xylostella</i>	Diamondback moth	Economic
Fish	Scorpaeniformes	Scorpaenidae	<i>Pterois</i> spp.	Lionfish	Human health, Biodiversity and Economic
Reptiles	Squamata	Diplodactylidae	<i>Woodworthia maculata</i>	New Zealand common gecko	Biodiversity
Reptiles	Squamata	Gekkonidae	<i>Hemidactylus frenatus</i>	Common house gecko	Biodiversity
Reptiles	Squamata	Gekkonidae	<i>Hemidactylus mabouia</i>	Tropical house gecko	Biodiversity
Reptiles	Squamata	Scincidae	<i>Oligosoma polychroma</i>	New Zealand common skink	Biodiversity
Birds	Passeriformes	Pycnonotidae	<i>Pycnonotus cafer</i>	Red-vented bulbul	Biodiversity
Birds	Passeriformes	Sturnidae	<i>Acridotheres tristis</i>	Common myna	Biodiversity
Mammals	Rodentia	Muridae	<i>Rattus norvegicus</i>	Brown rat	Human health and economic
Mammals	Rodentia	Muridae	<i>Rattus rattus</i>	Ship rat	Human health and economic
Marine	Bryopsidales	Caulerpaceae	<i>Caulerpa taxifolia</i>	Killer algae	Biodiversity
Marine	Myida	Dreissenidae	<i>Mytilopsis sallei</i>	Black striped mussel	Biodiversity
Marine	Myida	Mytilidae	<i>Mytilus galloprovincialis</i>	Mediterranean Mussel	Biodiversity
Marine	Mytilida	Mytilidae	<i>Perna viridis</i>	Asian green mussel	Biodiversity

Using the Factsheets

Each factsheet provides a characteristic picture and basic information on the taxonomy, description, biology, pathways of entry and potential impact. A distribution map is also included showing what is reported to be the native range (where it is known) coloured in blue, and the range where it has spread to, coloured in red. In many cases the species is not invasive (having a detrimental impact) in all the new areas where it has been introduced. The maps show that a species has been recorded from a country, although the organism may be restricted to only part of the country (e.g., southern USA) or be restricted to artificial environments (e.g., indoor plantings) in cooler regions. The mode of introduction by some marine species is unclear (it could be human mediated, natural or both).

Key sources of further information are provided for each species.

All identifications of suspected invasive alien pests should be confirmed by a specialist.

Pathways of Introduction

The main pathways of introduction identified for invasive alien pests to enter Pitcairn are listed in Table 2. This table may be used to assist biosecurity/phytosanitary inspections to focus on the main groups of invasive species that be carried on a pathway.

Table 2. Potential Pathways of Introduction of Priority Invasive Alien Pests

Pathway	How	Invasive species group
Live plants for planting - garden plant	Deliberate introduction; smuggled plant material and seeds	Live plants – all species
Contaminants of live plants for planting	Pests on live plants	Fall armyworm/ Caterpillars
		Tobacco whitefly
		Coconut rhinoceros beetle
Passengers and their luggage	Adults; maggots in fruit; seeds and plant debris in boot treads, stuck to velcro etc	Mosquitoes
		Ants
		Fruit flies
		Coconut rhinoceros beetle
		Ants
Shipping containers	Hitchhikers: flying adults, armyworm pupae, snail young and adults	Mosquitoes
		Ants
		Snails
	Adult hitchhikers	Rats
		Birds
		Lizards
Plant debris and seeds	Plants	
Vehicles	Seeds in compacted mud, and debris	Plants
Fresh produce	Maggots or caterpillars on produce	Fall armyworm/ Caterpillars
		Diamond back moth/ Caterpillars
		Oriental fruit fly
Habitat material (composts, aggregate, gravel, sand etc and plant pots)	Snail eggs, seeds or plant debris	Snails
		Ants
		Plants
Live bees and used bee keeping equipment		Varroa mite
Ship	Stowaways; flying insects, infested fruit, pest infestation, birds on deck	Mosquitoes
		Wasps
		Snails
		Rats
		Birds
		Lizards
Hull fouling	Adult stages stuck to hulls	Mussels
		Algae
Other	Stuck to floating plastic debris	Mussels
Ballast	Larvae	Mussels

Molasses Grass

Taxonomy

Order: Cyperales

Family: Poaceae

Species: *Melinis minutiflora* P.Beauv.

Summary

Native to Africa and introduced intentionally around the world. Grows well on poor soils but is strongly invasive. It is difficult to eradicate and poses a threat to agriculture and the environment. It forms dense mats that exclude native species, alter successional processes, reduce native tree and grass regeneration, and increase intensity and frequency of fires.



Molasses grass © F&K Starr/Wikipedia

Description and Biology

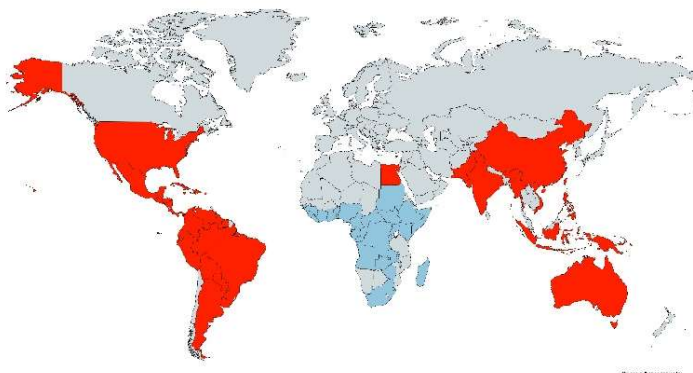
Perennial mat grass, strongly scented leaves (molasses-like), hairy and sticky, with stolons and loose straggling stems to 1.2 m tall. Stems cylindrical, 2-4 mm in diameter, with thick nodes and bent internodes, lying flat, only rising at the ends. The lowest nodes produce non-flowering shoots and a few adventitious roots. Root system fibrous with rhizomes present. Upright stems hairless, light green. Ligule a fringe of short hairs 1 mm long. Leaves hairy, up to 30 cm long with a rounded base, narrowing to an acute tip. Flowers at the top of upright stems, 15-25 cm long, erect, often purple-reddish. Seedlings can be easily recognized by the first leaf being ovate-orbicular, lying flat on the ground. Optimal temperatures range from 14°C to 27°C. Annual rainfall ranging from 1000 to 2000 mm but can tolerate 5 months of dry season.

Pathway of Entry

- Natural dispersal: seeds are dispersed by wind.
- Accidental dispersal: introduced as a fodder grass, also used as a pioneer species for planting in poor bare soils as it smothers any weeds that may emerge; seed contaminant.

Impact

Low spreading growth that smothers everything around it. Once established, it forms monotypic stands from rooted runners. It is adapted to fire, and the dense mats are generally only partly consumed. Regeneration from the remaining portions is rapid, and colony expansion into adjacent burned areas generally follows.



Further Information:

- <https://www.cabi.org/isc/datasheet/32983#toPictures>
- http://www.hear.org/pier/species/melinis_minutiflora.htm
- <http://www.iucngisd.org/gisd/speciesname/Melinis+minutiflora>

■ Native
■ Invasive

Asparagus Fern

Taxonomy

Order: Liliales

Family: Liliaceae

Species: *Asparagus densiflorus* (Kunth) Jessop

Synonyms: *A. aethiopicus*, *A. sprengeri*

Summary

Spiny perennial plant widely native to East Africa, introduced globally as an ornamental. It has naturalised and become a problem in Australia and the USA. It may quickly invade disturbed sites in open sun or partial shade, especially in sandy coastal habitats, along riverbanks and in low fertility soils.



Asparagus fern © i_am_jim /via wikipedia - CC BY-SA 4.0

Description and Biology

Perennial plant forming dense spiny mats, up to 2 m high, spreading by rhizomes bearing white tubers 2-3 cm long. Stems are shiny, hairless, green to brown, much-branched with leaves (2 cm long, 2-3 mm wide). The stems also bear straight spines, about 5 mm long, just below each branch. Flowers are in groups, white or pale pink, bell-shaped, with a corolla of 6 tepals and orange anthers. Fruit is a red berry 5-8 mm in diameter. Major flush of growth in the spring and a smaller one in the autumn. Flowering occurs in late winter and spring through to early summer and foliage may die back.

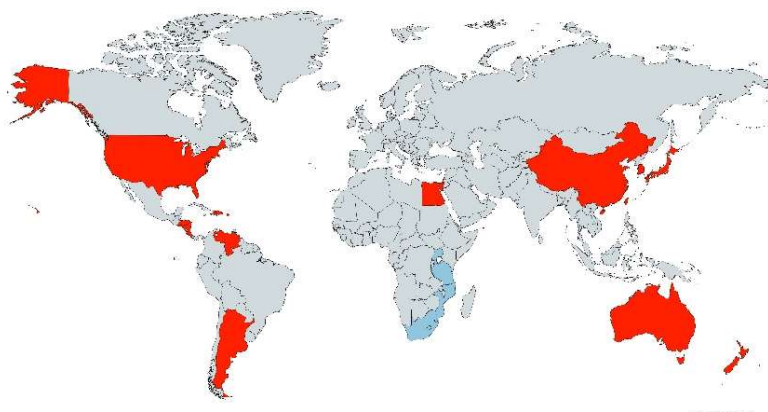
In native range found in light and sandy soils, dry to moist forest, woodland, forest edges, savannah, shady roadsides, and along riversides, also infertile, shallow soils of coastal sand dunes, beaches, cliffs and scrub. In Australia found in warm temperate regions of 10-20°C.

Pathway of Entry

- Natural dispersal: seeds by birds eating the red berries; tubers are spread by soil and water movement.
- Accidental dispersal: ornamental, commercially for sale as a component of cut-flower arrangements, careless disposal of rhizomes and tubers in garden waste.

Impact

It suppresses and smothers native ground flora, understorey shrubs and seedling/sapling trees by forming dense blankets of growth above ground and a mass of rhizomes and tubers below, and it depletes the soil of nutrients and moisture. Tolerates, or responds rapidly to disturbance such as cultivation, browsing, habitat destruction, and fire. It is difficult to identify/detect in the field during establishment phase, and long-lived and fast growing once established.



Further Information:

- <https://www.cabi.org/isc/datasheet/7410>
- http://www.hear.org/pier/species/asparagus_densiflorus.htm
- <http://www.iucngisd.org/gisd/speciesname/Asparagus+densiflorus>

■ Native
■ Invasive

Soapbush (Koster's Curse)

Taxonomy

Order: Myrtales

Family: Melastomataceae

Species: *Clidemia hirta* (L.) D. Don

Summary

Native to the Neotropics, an invasive weed on many tropical oceanic islands, and in South-East Asia, India and East Africa. Most tropical island forest areas are susceptible to *C. hirta* invasion, regardless of their floristic composition, so long as there is some form of disturbance e.g. cyclones.



Soapbush © F&K Starr/via wikipedia

Description and Biology

Densely-branched perennial shrub to 5 m tall but normally less than 3 m. The opposite, dark green leaves (up to 15 cm long and 8 cm wide) have prominent longitudinal veins, one midvein and four others that curve towards the leaf tip. Cross veins connect the main veins and all veins are raised underneath. Most plant parts are hairy. The flowers, 0.5-1 cm across, have white or pink petals and are borne on short stems in axillary or terminal groups of 6-20 flowers. The berries (6-9 mm) turn from green to blue-black or deep purple.

Fast growing and shade-tolerant pioneer shrub grows in primary forests and along steep embankments; prefers humid tropical lowlands and may invade both disturbed and undisturbed habitats. It is a weed of pastures, open grasslands, plantations, roadsides, open woodlands, waterways, riparian vegetation, forest margins and rainforests.

Pathway of Entry

- Natural dispersal: Fruits are abundantly produced, and seeds dispersed mainly by birds but also by other animals moving through the thickets, and by water.
- Accidental dispersal: human activities, such as in potting material and mud on machinery or vehicles.

Impact

Where invasive, the shrub establishes in forest gaps and other disturbed sites, forming dense and almost impenetrable thickets that shade out all native vegetation due to the large leaves. A mature plant can produce over 500 blue-black berries per year, each containing over 100 seeds. Seeds form a very large seed bank where they remain viable for up to 4 years. Seeds germinate better under partial shade than full light. It does not appear to tolerate salt spray. Declared a noxious weed in Hawaii, USA, Fiji and Australia.



Further Information:

- <https://www.cabi.org/isc/datasheet/13934#totaxonomicTree>
- http://www.hear.org/pier/species/clidemia_hirta.htm
- <http://www.iucngisd.org/gisd/speciesname/Clidemia+hirta>

■ Native
■ Invasive

Balloon Vine

Taxonomy

Order: Sapindales

Family: Sapindaceae

Species: *Cardiospermum grandiflorum* Sw.

Summary

Native to South America, introduced around the world mainly as an ornamental. It has become naturalized and invasive mostly in wet and humid habitats. It grows rapidly into the tops of trees, forms a thick curtain of stems, excluding light. Weight contributes to canopy collapse and ecosystem destruction.

Description and Biology

A tropical to sub-tropical perennial, woody, branched vine with ribbed stems and paired spirally-twisted tendrils. Leaves biternate, leaflets rhombic-ovate, ovate, or lanceolate, toothed edge, 2.5-10 cm long, the terminal one is larger than the lateral pair. Flowers in groups on a stalk 7-14.5 cm long; Four petals cream to pale yellow, obovate, each 7-9 mm long in a cross with 2 further erect in centre with yellow anthers between them. Seed capsules strongly inflated, 3-angled, 4.5-6.5 cm long. Seeds black with a white spot.

Thrives in well-drained soils and riparian habitats, preferring moist soils and tolerating occasional flooding. Optimal growth takes place in full sun. It inhabits the forest margins and invades from the edge inwards. It is also a weed in open urban areas, and along transport networks. Pollination is by insects such as flies, bees, butterflies and wasps.



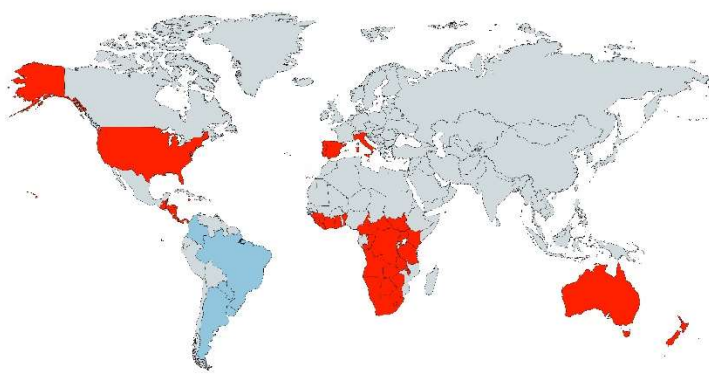
Balloon vine ©Krzysztof Ziarnek, Kenraiz/via wikipedia

Pathway of Entry

- Natural dispersal: the light papery seed capsules float in water and can also be transported by wind; spreads vegetatively by suckering.
- Accidental dispersal: ornamental purposes; careless disposal of root fragments. Cultivated for its curious seed pods, which are often transported by humans.

Impact

Plants can cover trees 10 m tall. The main mode of climbing is via the extensive tendrils, which twirl around supporting structures and other plants, forming large and dense smothering curtains of tangled stems that impede the growth of supporting vegetation, excluding light, and eventually killing trees. The weight of this species in severe infestations can also contribute to canopy collapse and ecosystem destruction. Seedlings of native shrubs and trees are unable to establish under the stands of this plant and ground flora is smothered. This species is declared a noxious weed in Australia and South Africa.



Further Information:

- <https://www.cabi.org/isc/datasheet/112965>
- <http://www.iucngisd.org/gisd/species.php?sc=1346>
- http://www.hear.org/pier/species/cardiospermum_grandiflorum.htm

■ Native
■ Invasive

Yellow Ginger

Taxonomy

Order: Zingiberales

Family: Zingiberaceae

Species: *Hedychium flavescens* Carey ex Roscoe

Summary

Native to India and Nepal, introduced to many locations around the world as an ornamental. It has become a weed of significant economic importance in countries with favourable moist and warm climates. It threatens the environment, native plant communities and biodiversity. It is similar in its ecology and impacts to other invasive *Hedychium* spp.

Description and Biology

Perennial herb with thick fleshy rhizomes, about 3 cm, and erect, leafy pseudostems of 1-3 m in height. The leaves are sessile and have slightly pubescent stems. Leaf blades are elongated with parallel side, 20-50 cm long and 4-10 cm wide and a pointed tip. Inflorescences are oblong spikes, 15-20 cm long. Flowers are creamy-white to pale yellow in a cone-like inflorescence, fragrant with yellow stamens. Corolla tube is 7-8.5 cm, long and slender. Appears to have three petals. Two base petals each 3-3.5 cm long at 180° to each other. Central petal erect between these, creamy yellow with an orange patch at base, longer than wide, and apex is 2-lobed. Single stamen/style arise on white tube from base of petals and project forwards. Fruits are globose capsules 1-2 cm in diameter with three valves, containing numerous seeds.



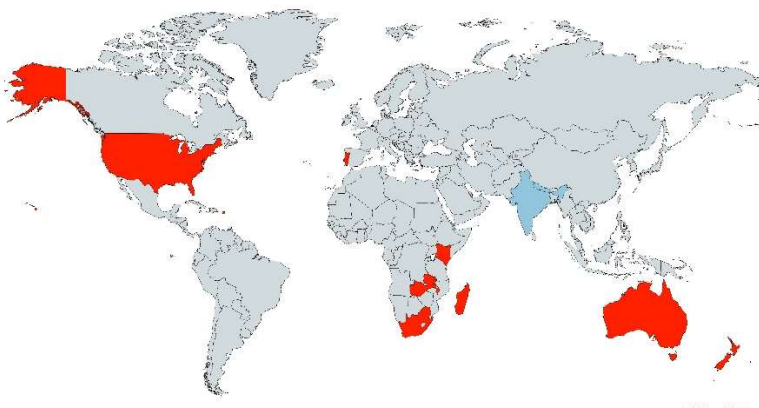
Yellow ginger © F & K Starr-2009 /via wikipedia

Pathway of Entry

- Natural dispersal: rhizome fragments are spread by flooding.
- Accidental dispersal: ornamental moved in trade and subsequently escaped cultivation as rhizome fragments spread by dumped vegetation, soil movement, and contaminated machinery.

Impact

Forms dense stands in wet areas such as ravine sides, roadsides, forest margins and disturbed forests, and impacts negatively on the ecosystem. Its spread and dispersal facilitated by vegetative regeneration of its dense rhizomes, which allows it to cover large areas of land and prevent the re-growth and establishment of native species, endangering rare and specialized plant communities. It is similar in its ecology and impacts to other invasive *Hedychium* spp.



Further Information:

- <https://www.cabi.org/isc/datasheet/107733>
- http://www.hear.org/pier/species/hedychium_flavescens.htm
- <http://www.iucngisd.org/gisd/speciesname/Hedychium+flavescens>

■ Native
■ Invasive

Velvet Tree

Taxonomy

Order: Myrtales

Family: Melastomataceae

Species: *Miconia calvenscens* D.C.

Summary

Native to the Neotropics, introduced to Africa, parts of N. America, the Caribbean and Pacific. Woody, pioneer, shrubby, shade tolerant tree with slender, vertical stems; thrives in tropical montane climate regimes; needs at least 1800-2000 mm of rain per year. It completely transforms invaded communities into species-poor stands due to dense shade beneath the weed.



Velvet tree © www.hear.org/starr/hiplants/index.html

Description and Biology

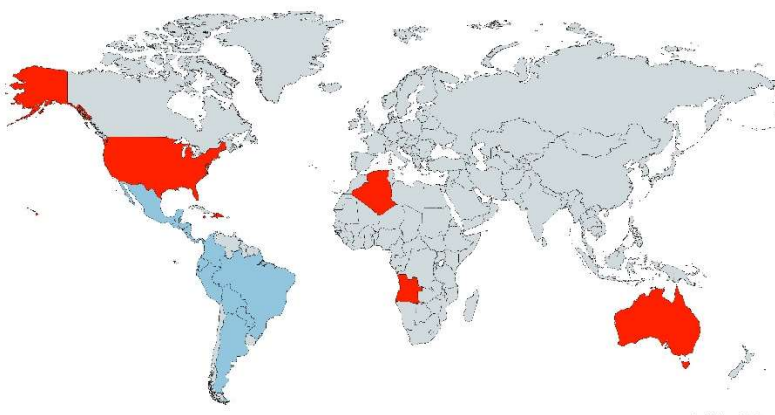
Small tree, 4-12 m tall, occasionally up to 16 m, with very large leaves. Leaves opposite, stalked, shiny, hairless, dark-green, oblong to oval, 20-80 cm long, 8-30 cm wide, rounded base, pointed tip. Prominent pale central vein and one on either side that follow the margin to the tip, with paired cross veins; all veins raised underneath. Can have iridescent purple undersides. Inflorescence is a large panicle 20-35 cm length, with 1000 to 3000 white or pink flowers, petals 2-3 mm long. Fruits purple-black, 3.5-4.5 mm in diameter. Prolific reproduction, with one mature tree flowering up to three times/year producing 2-3 million seeds each time; juvenile specimens can grow up to 1.5 m/year and reproduce when four to five years old. Longevity of seed bank in French Polynesia at least 15 years in damp conditions. Tolerates poor growing conditions if adequate moisture is available.

Pathway of Entry

- Natural dispersal: seeds primarily dispersed by birds, but also spread by wind and water.
- Accidental dispersal: highly attractive ornamental plant; Transportation on dirty machinery and vehicles; seeds and seedlings transported with soil.

Impact

One of the most destructive invaders in insular tropical rain forest habitats. It is a serious threat to ecosystems in the Pacific because of its ability to invade intact native forests. Described as the green cancer of Tahiti and the purple plague of Hawaii. Once established it drastically changes the ecosystem, biodiversity and water balance. It eliminates the native forest understorey vegetation, increasing rapid runoff and potential for soil erosion and landslides. Negatively effects livelihoods as well as biodiversity.



Further Information:

- <https://www.cabi.org/isc/datasheet/33990>
- http://www.hear.org/pier/species/miconia_calvenscens.htm
- <http://www.iucngisd.org/gisd/speciesname/Miconia+calvenscens>

■ Native
■ Invasive

Giant African Land Snail

Taxonomy

Order: Stylommatophora

Family: Achatinidae

Species: *Achatina fulica* Férussac

Summary

Giant African land snail is native to East Africa and has been introduced accidentally to many parts of the world with trade. It is highly invasive and a major plant pest. It can have an economic, environmental and social impact when introduced to new areas. It has been classified as one of the world's top 100 invasive species by the IUCN.

Description and Biology

Mature snails are readily identified by their large size and relatively long, narrow, conical shell which range from 5-10 cm but can reach more than 20 cm in length. Commonly light brown in colour, with alternating brown and cream bands.

In its native range its preferred food is decayed vegetation and animal matter, lichens, algae and fungi. Where it has become invasive it is broadly polyphagous, feeding on ornamentals, vegetable and fruit crops. It is hermaphroditic and after a single mating can produce five or six batches of fertile eggs a year, each containing 100-400 eggs. Adults have an average life span of 5-6 years but may live up to 9 years. Although it is a tropical snail, it can survive cold conditions, even snow, by aestivating for up to three years. It is normally nocturnal and crepuscular in its habits, though it will become active in the daytime during rainy or overcast periods.



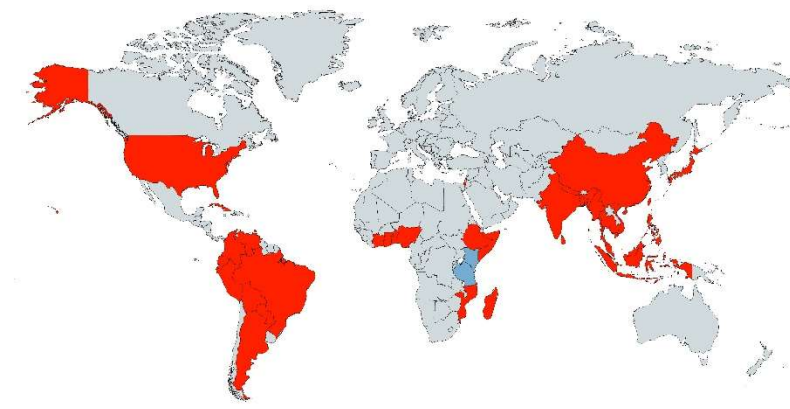
Giant African Land Snail © C. Malumphy

Pathway of Entry

- Natural dispersal: can move over short distances between host plants.
- Accidental dispersal: accidentally to many parts of the world with trade and/or intentionally as a food source, for scientific research and education, and as a novelty pet.

Impact

It has a voracious appetite, feeds on a wide range of crops, and is considered to be the most damaging land snail in the world. Snail populations can reach high densities and invade native ecosystems. It poses a serious environmental and conservation threat by eating native plants, modifying habitats, and out-competing native snail species. It can also vector plant diseases, for example, *Phytophthora palmivora*, and the human disease, eosinophilic meningitis, caused by the rat lungworm parasite, *Angiostrongylus cantonensis*. It is passed to humans through eating raw or improperly cooked snails.



Further Information:

- <https://www.cabi.org/isc/datasheet/2640>
- <http://www.iucngisd.org/gisd/speciesname/Achatina+fulica>
- <https://www.invasivespeciesinfo.gov/profile/giant-african-snail>

 Native
 Invasive

Rosy Wolf Snail

Taxonomy

Order: Stylommatophora

Family: Spiraxidae

Species: *Euglandina rosea* Férussac

Summary

Native to Central and North America, it was deliberately introduced to Indian and Pacific Ocean Islands from the 1950s onwards as a biological control agent for the giant African snail (*Achatina fulica*). However, the carnivorous rosy wolf snail fed on native molluscs causing expatriation and extinction of endemic species. Several *Partula* tree snail species of the French Polynesian Islands today only exist in captivity.



Rosy wolf snail © Tim Ross via Wikipedia

Description and Biology

The shell is large (up to 76 mm long, 27.5 mm diameter), thick and has prominent growth lines. The shape of the shell is fusiform with a narrow ovate-lunate aperture and a truncated columella; typically, the shell colour is brownish-pink. Adults are 7 to 10 cm long.

It is a cross-fertilising egg-laying hermaphrodite. Individuals live up to 24 months and 25 to 35 eggs are laid in a shallow pocket in the soil. These hatch after 30 to 40 days. It feeds on other snails and slugs, which they track down by following the slime trails left by their prey. It appears to prefer smaller individuals, which it swallows whole. It is usually found singly in forests, roadsides and urban gardens.

Pathway of Entry

- Natural dispersal: limited, can move over short distances searching for prey.
- Accidental dispersal: deliberately introduced as a potential biological control agent; hitch-hiking with trade.

Impacts

Rosy wolf snail has had a negative impact on native snail species in the countries into which it has been introduced. It has been responsible for the dramatic decline or eradication of many endemic species, particularly Partulidae and Achatinellinae. It has contributed to the extinction of at least 134 endemic snail species in oceanic islands.



Further Information:

- <http://www.iucngisd.org/gisd/species.php?sc=92>
- <https://www.cabi.org/isc/datasheet/23113>
- <https://www.plantwise.org/knowledgebank/datasheet/23113>

■ Native
■ Invasive

Varroa Mite

Taxonomy

Order: Parasitiformes

Family: Varroidae

Species: *Varroa destructor* (Anderson & Trueman)

Summary

Varroa mites are tiny red-brown external parasites of honeybees (*Apis* spp.). Although Varroa mites can feed and live on adults, they mainly feed and live on larvae and pupae in the developing brood, causing malformation and weakening of honeybees as well as transmitting numerous viruses. Originating in Asia and Japan it has now spread globally due mainly to importation of queen bees from infested colonies and movement of infested colonies for pollination. They are a major threat to apiculture.

Description and Biology

Adult female varroa mites are flat, reddish-brown with oval bodies, greater in width than length (1.6 x 1.1 mm). The females enter an open bee cell, just before it is capped, where it will hide in the brood food situated under the bee larvae. While inside the cell the female mites feed on the developing larvae, transferring viruses, and laying up to seven eggs. After 21 days (24 for male drones), the worker bee emerges along with any surviving mites which attach themselves to the bee's dorsum until they reach a new open cell containing a larva.



Varroa mites feeding between segments on a honeybee abdomen

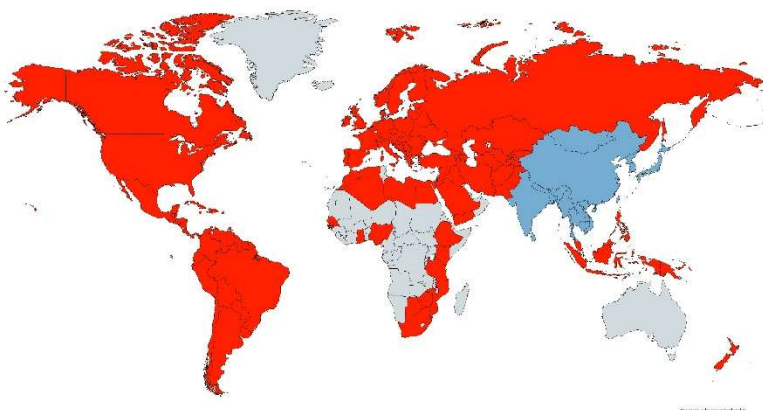
© Fera

Pathway of Entry

- Natural dispersal: mites are mobile and can easily spread within a bee colony, however they are unable to travel outside of the hive without a vector.
- Accidental dispersal: movement of infested colonies of bees has facilitated the rapid spread of Varroa and is the main means of spread over long distances.

Impact

Varroa has a negative economic, social and environmental impact due to its direct and indirect effect on honeybees. A loss in honeybees leads to lower crop yields, a loss in numbers of beekeepers and affects the environment as bees offer an immeasurable contribution to floral biodiversity and conservation.



Further Information:

- <https://www.cabi.org/isc/datasheet/107784>
- <http://www.iucngisd.org/gisd/speciesname/Varroa+destructor>

Native
Invasive

Coconut Rhinoceros Beetle

Taxonomy

Order: Coleoptera

Family: Scarabaeidae

Species: *Oryctes rhinoceros* (Linnaeus)

Summary

This beetle has many common names. It is native to the coconut-growing regions of South and South-East Asia and has been introduced to many islands in the Pacific and Indian Ocean. It is one of the most serious pests of coconut and African oil palm in southern and south-east Asia and the Western Pacific islands. It also damages native palms and *Pandanus* species.

Description and Biology

Adult beetles are dark brown to black, shiny, stout-looking, 35-50 mm long and 20-23 mm wide, with a prominent horn on head. The males having a relatively longer horn than the female. There are several similar looking adult beetles.

Eggs are usually laid in rotting palm material on which the larvae feed. The larvae can also develop in tree stumps, compost heaps, dung hills, sawdust or garbage dumps. Larval development takes 80-200 days. The pupal stage lasts 17-30 days and adults may live up to 6 months or more.



Coconut rhinoceros beetle © Vitalfranz

Pathway of Entry

- Natural dispersal: adults can fly.
- Accidental dispersal: spread throughout the Pacific by increased sea traffic during World War II; moved with planting material and adults hitch-hike on aircraft and boats.

Impact

The adult beetles feed by boring into the growing point or meristem of coconut palms and this is the primary cause of crop damage leading to loss of yield and death in coconut palms of all ages. Similar attacks stunt growth or may kill young oil palms.



Further Information:

- <https://www.cabi.org/isc/datasheet/37974>
- <http://www.iucngisd.org/gisd/speciesname/Oryctes+rhinoceros>
- https://en.wikipedia.org/wiki/Asiatic_rhinoceros_beetle

■ Native
■ Invasive

Yellow Fever Mosquito

Taxonomy

Order: Diptera

Family: Culicidae

Species: *Aedes aegypti* (Linnaeus)

Summary

Originally from Africa, it is now found in tropical, subtropical and temperate regions throughout the world and it is among the most widespread of all mosquito species. It is the primary vector for several important diseases and has a significant impact on public health.



Yellow fever mosquito adult © James Gathany & Prof. Frank Hadley Collins

Description and Biology

Adults are relatively small (4-7 mm long), the body is dark brown to black with distinctive white/silver stripes on the legs and other parts of the body. It is easily confused with *Ae. albopictus* but can be distinguished by the presence of a white/silver lyre-shaped patch on the scutum (dorsal part of the thorax). *Ae. albopictus* has a single, silvery-white stripe down the scutum.

Adult females primarily feed on humans, but occasionally feed on domestic animals. Larvae are usually found in water-filled containers, tyres and puddles close to human habitation. Temperatures between 21 – 29 °C are ideal for development. Larvae pass through four instars and feed on organic particulate matter in the water, such as algae and other microscopic organisms. If temperatures are cool, they can remain in the larval stage for months.

Pathway of Entry

- Natural dispersal: Usually disperses only a short distance, most studies show that the majority of *Ae. aegypti* travel less than 80m.
- Accidental dispersal: Accidental movement of water harbouring eggs and larvae via road, sea and air transport are means of medium to long-range dispersal. Rainwater collected in tyres that are moved internationally are a known means of spread.

Impact

Aedes aegypti is a nuisance insect, feeding in the daytime, and preferring shady areas. It has a significant impact on public health because it is the primary vector for several important diseases including Yellow fever virus, Dengue virus, Chikungunya virus and Zika virus.



Further Information:

- <https://www.cabi.org/isc/datasheet/95795>
- <https://www.ecdc.europa.eu/en/disease-vectors/facts/mosquito-factsheets/aedes-aegypti>
- https://en.wikipedia.org/wiki/Aedes_aegypti

■ Native
■ Invasive

Asian Tiger Mosquito

Taxonomy

Order: Diptera
Family: Culicidae
Species: *Aedes albopictus* (Skuse)

Summary

Native to the Oriental region, it has gone through a rapid global expansion in recent decades and has spread to at least 28 countries outside of its native range across North and South America, Africa, Oceania and Europe. It is a vector for several important diseases and has significant impact on public health.

Description and Biology

Asian tiger mosquito adults are small and slender (2-6 mm long), the body is dark brown to black with distinctive white/silver stripes on the legs and other parts of the body. It is easily confused with *Ae. aegypti*, but can be distinguished by the presence of a single, silvery-white stripe down the scutum (dorsal part of the thorax). *Ae. aegypti* has a white/silver lyre-shaped patch on the scutum.

Adult females feed on humans, domestic animals, birds, reptiles and amphibians. They naturally breed in bodies of water that are surrounded by vegetation such as tree holes, but it has successfully colonised many man-made sites and urban areas, breeding in abandoned containers, flowerpots, bird baths and used tyres. Areas with at least 500 mm of rainfall per year, with a warm month mean temperature of 20 °C and a mean winter temperature above 0 °C are most at risk. Populations in temperate regions overwinter as diapausing eggs.



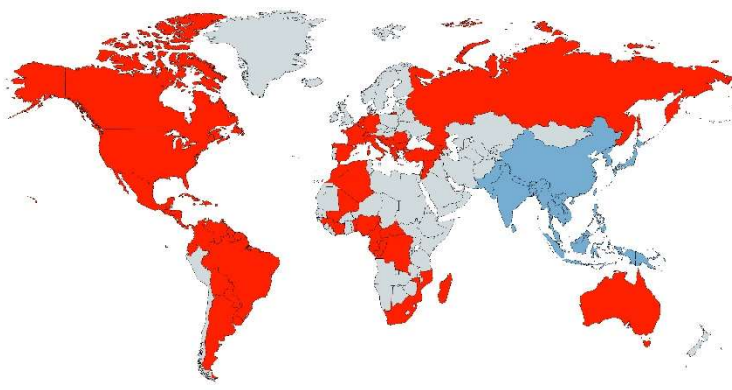
Asian tiger mosquito adult © Susan Ellis, Bugwood.org

Pathway of Entry

- Natural dispersal: adult flight range is less than 1 km with most dispersing less than 180 m during their lifetime.
- Accidental dispersal: medium to long-range dispersal by water harbouring eggs/larvae via road, sea and air transport. Rainwater collected in tyres that are moved internationally is a proven means of spread. The horticultural and nursery trade is also a means of transport, as Asian tiger mosquito has been intercepted in containerised shipments of *Dracaena* spp. (Lucky Bamboo), which is shipped in standing water.

Impacts

Aedes albopictus is a nuisance insect, feeding in the daytime preferring shady areas, 30-48 bites per hour have been recorded. It has a significant impact on public health because it is the primary vector for several important diseases including Dengue virus, Chikungunya virus and is a potential vector of Zika virus.



Further Information:

- <https://www.cabi.org/isc/datasheet/94897>
- <https://www.ecdc.europa.eu/en/disease-vectors/facts/mosquito-factsheets/aedes-albopictus>

■ Native
■ Invasive

Oriental Fruit Fly

Taxonomy

Order: Diptera

Family: Tephritidae

Species: *Bactrocera dorsalis* (Hendel) species complex

Summary

'Oriental fruit fly' is a member of a large group of morphologically similar species, many with overlapping host preferences. As well as being an important fruit pest in its native range, it is also a highly invasive species with a high dispersal potential and an extensive host range.



Adult male Oriental fruit fly © Fera

Description and Biology

Adult Oriental fruit flies are 8mm long, have a brown thorax with yellow markings, and variable black markings. The abdomen has two horizontal black stripes and a longitudinal median stripe which may form a T-shaped pattern. The wings have mostly clear membranes, except for a narrow costal band and anal streak.

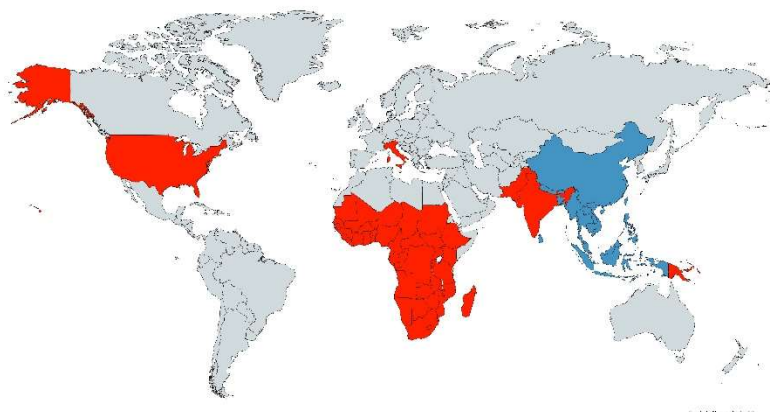
There are six developmental stages: egg, three larval instars, pupa and adult. Females lay eggs under the skin of fruit, and the larvae tunnel and feed within. The final instar larvae are creamy yellow or white and 10 mm long, they exit the fruit by making a small hole and fall to the ground where they pupate in soil. The lifecycle can be completed within a few weeks under ideal conditions, with up to ten generations of offspring per year. *Bactrocera dorsalis* is highly polyphagous, attacks over 270 host species in 50 plant families.

Pathway of Entry

- Natural dispersal: limited reliable data on the flight and passive wind-assisted dispersal of this species.
- Accidental dispersal: internationally in fruit trade and illegally in passenger baggage.

Impact

Increasing international tourism and trade, and changes in climate and land use, facilitate the introduction of the pest. It is considered one of the most destructive fruit fly pests and remains at the top of quarantine lists. Economic impacts include reduced production, the cost of eradication and surveillance, and significantly, lost export markets through quarantine restrictions. Damage to fruit crops is frequently high and may reach 100% yield loss. *Bactrocera dorsalis* is highly competitive with native fruit flies wherever it has established. There is potentially a significant environmental impact due to the increased use of chemical control in areas it has invaded.



■ Native

■ Invasive

Further Information:

- <https://www.cabi.org/isc/datasheet/17685>
- http://entnemdept.ufl.edu/creatures/fruit/tropical/oriental_fruit_fly.htm
- <https://gd.eppo.int/taxon/DACUDO>
- https://en.wikipedia.org/wiki/Bactrocera_dorsalis

Tobacco Whitefly

Taxonomy

Order: Hemiptera

Family: Aleyrodidae

Species: *Bemisia tabaci* (Gennadius) species complex

Summary

Tobacco whitefly or sweet potato whitefly is a complex of morpho-cryptic, sibling species. It is one of the most economically important agricultural and horticultural pests in the World, due in part to its broad polyphagy, prodigious reproductive capacity, adaptability, and ability to vector more than 110 plant pathogenic viruses.

Description and Biology

Adults are about 1 mm long, the yellow body and both pairs of wings are covered with a white, powdery, waxy secretion. The fourth-larval instar, known as the puparium is oval, narrowing posteriorly, and about 0.7 mm long. The adult emerges through a 'T'-shaped rupture in the pupal case.

Tobacco whitefly has six developmental stages: egg, four larval and the adult. An adult female may live for 60 days, and a male for between 9 to 17 days. Some 11 to 15 generations can occur within one year. It feeds on an extremely wide range of host plants (800+ species assigned to 90+ families), including crops grown outside in the tropics and sub-tropics e.g. cassava, cotton, sweet potato, tobacco, pepper and tomato, and numerous ornamental plants.



Tobacco whitefly puparium (left) and adult (right) © Fera

Pathway of Entry

- Natural dispersal: do not fly very efficiently but once airborne, can be transported long distances by wind
- Accidental dispersal: moved in plant trade

Impacts

It causes damage directly by feeding and indirectly by honeydew egestion and virus transmission. Feeding by adults and larvae causes chlorotic spotting, growth distortion, and premature leaf drop. The egested honeydew covers the surface of the foliage and fruit and serves as a medium for the growth of sooty moulds. This reduces the photosynthetic potential of the infested plant and lowers the market value of fruit and flowers. However, it is the viruses (*Geminivirus*, *Begomovirus*, *Closterovirus*, *Nepovirus*, *Carlavirus*, and *Potyvirus*) vectored by the whitefly that have the greatest economic impact. These can cause total failure of susceptible crops.



Further Information:

- <https://www.cabi.org/isc/datasheet/8927>
- <http://issg.org/database/species/ecology.asp?si=106&fr=1&sts=&lang=EN>
- <https://planthealthportal.defra.gov.uk/assets/factsheets/Bemisia-tabaci-Defra-Plant-Pest-Factsheet-Feb-2017-2.pdf>

Cosmopolitan, origin unknown

Argentine Ant

Taxonomy

Order: Hymenoptera

Family: Formicidae

Species: *Linepithema humile* (Mayr)

Summary

Native to eastern South America, it has spread widely to North America, Europe, South Africa, Japan, Australia and New Zealand. It is a highly invasive species that can outcompete and displace other ant species and arthropod fauna. Their invasion is of particular concern on oceanic islands due to the vulnerability and endemism typical of island ecosystems.



Argentine ant © Eli Sarnat, Antkey, USDA APHIS PPQ, Bugwood.org

Description and Biology

Argentine ant workers are small (2 – 3 mm long) and uniformly light brown in colour, males are winged and dark brown in colour. The queens are larger (4.5 – 5 mm long) dark brown with a large thorax, as broad as the head.

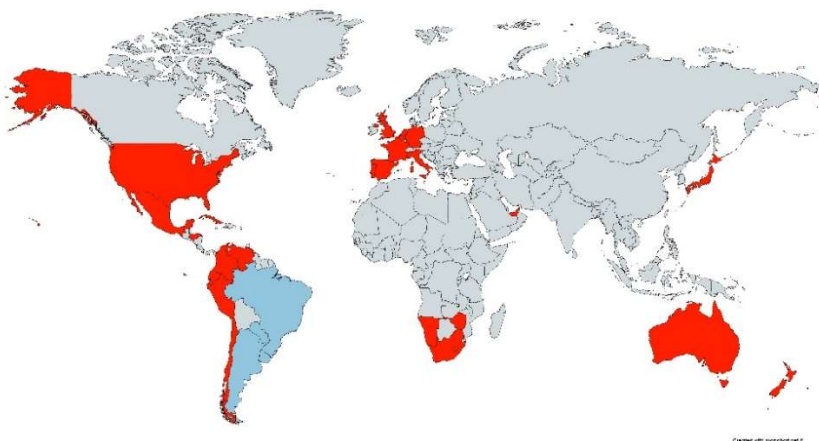
When introduced into new areas they can form multi-queened supercolonies with large numbers of offspring that dominate over other ant species. Nests may be found under piles of wood, stones, under buildings, in potted plants or in piles of leaves or other organic debris. They may move into houses or other buildings if disturbed.

Pathway of Entry

- Natural dispersal: by nest fission (budding)
- Accidental dispersal: human mediated transport via the shipment of infested articles e.g. building materials, plants, plant products, soil etc.

Impacts

It invades crops and plantations in search of hemipteran honeydew. By creating mutualistic interactions with these crop pests, they in turn affect the growth and production of the host plant. They displace native ant and arthropod species which alters several ecological processes such as ant-mediated seed dispersal and/or plant pollination and can reduce the available nectar for bees to forage on.



Further Information:

- <https://www.cabi.org/isc/datasheet/30839>
- https://antwiki.org/wiki/Linepithema_humile
- <http://issg.org/database/species/ecology.asp?si=127&fr=1&sts=&lang=EN>

■ Native
■ Invasive

Asian or Singapore Ant

Taxonomy

Order: Hymenoptera
Family: Formicidae
Species: *Trichomyrmex destructor* (Jerdon)

Summary

Native range unknown as it is now found in tropical regions worldwide, and it can live in urban environments in temperate climates. In some regions, particularly in urban areas, it is a major invasive pest. Foraging workers can chew through non-nutritive materials, such as fabric, rubber, and plastic. The ant sometimes attacks animals and people, inflicting painful bites. It is sometimes assigned to the genus *Monomorium*.

Description and Biology

A medium-sized ant, with the workers ranging from 1.8-3.5 mm and queens approximately 4 mm. They are light yellow to darker brown in colour, but usually have a darker brown abdomen.

They form multi-queened colonies, established in trees, in the soil, or inside buildings. In cooler climates they nest in heated buildings and have been found nesting inside power sockets and computers. They are generalist feeders, gathering living and dead insects, insect eggs, nectar, seeds, and almost any food item available in households.



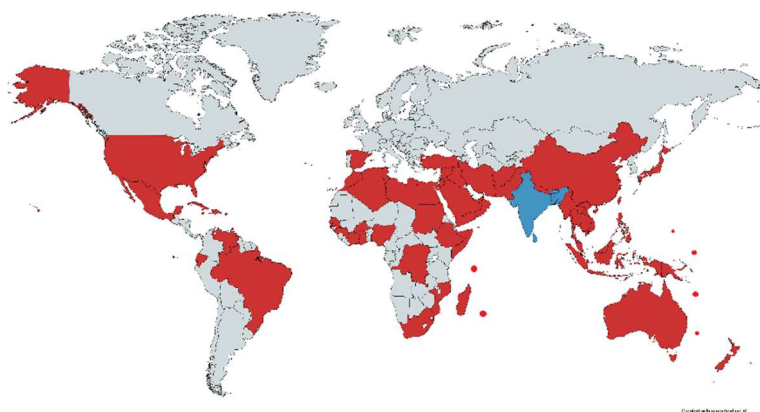
Asian ant © www.AntWeb.org

Pathway of Entry

- Accidental dispersal by human mediated transport via the shipment of infested articles e.g. building materials, ornamental plants, fruit produce, soil, logs, lumber products etc.

Impact

Trichomyrmex destructor is a pest species in urban areas, known for causing costly damage to structures, vehicles, and electronic devices with its chewing activity. They can damage cables and electrical insulation, causing malfunctions in electrical equipment and telecommunications systems. The ant has been known to cause car and house fires. People have complained of being attacked by swarms while sleeping in bed. However, it rarely has any negative effects on native fauna or habitats.



■ Native
■ Invasive

Further Information:

- <https://www.antweb.org/description.do?genus=trichomyrmex&species=destructor&rank=species>
- https://www.antwiki.org/wiki/Trichomyrmex_destructor

Little Fire Ant

Taxonomy

Order: Hymenoptera
Family: Formicidae
Species: *Wasmannia auropunctata* (Roger)

Summary

Native to Central and South America, the little fire ant has spread to parts of Africa, North America, Caribbean, Pacific, and Australia. It is an invasive pest that reduces biodiversity and abundance of flying and tree-dwelling insects and can eliminate arachnid populations. It is considered one of the 100 worst invasive species of the world by the IUCN due to its negative impact on natural ecosystems, agriculture and human health.

Description and Biology

A small to medium-sized ant, with the workers ranging from 1-2 mm and queens approximately 4.5 mm. They are light to golden brown in colour, queens are often darker as is the gaster (abdomen).

They form both multi-queened and single-queened colonies, have generalist feeding and nesting habits and thrive in a wide range of conditions. They exploit an extremely broad array of superficial cavities both natural and man-made, e.g. under rocks, under or within logs, plant debris, cavities within human products etc. They are not able to establish in cold climates but can survive in human habitations or infrastructure including climate-controlled buildings and greenhouse. This species is well-known for a painful sting, seemingly out of proportion to its size.



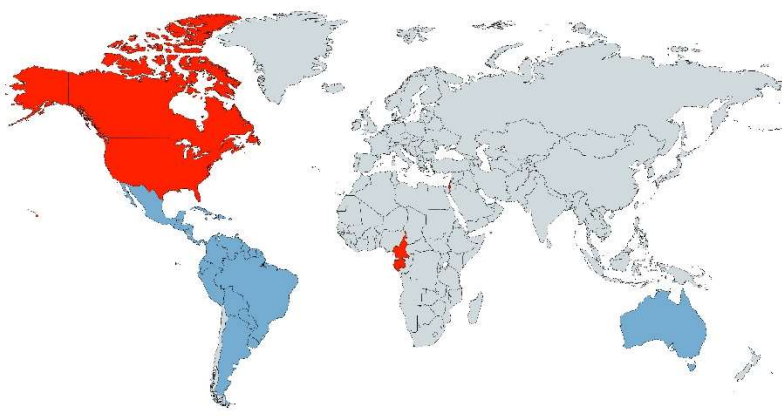
Little fire ant © Eli Sarnat, PIAkey: Invasive Ants of the Pacific Islands, USDA APHIS PPQ, Bugwood.org

Pathway of Entry

- Natural dispersal by nest fission (budding)
- Accidental dispersal human mediated transport via the shipment of infested articles e.g. building materials, ornamental plants, fruit produce, soil, logs, lumber products etc.

Impact

Wasmannia auropunctata may have negative impacts on biodiversity of vertebrates and invertebrates. They compete for food and cause a decline in numbers of small vertebrates. On the Galapagos archipelago, there is a marked reduction of scorpions, spiders and native ant species in infested areas, and it has been observed it eats the hatchlings of tortoises and attacks the eyes and cloacae of the adults. They are also a nuisance to plantation workers and horticulturists due to their painful sting.



Further Information:

- <http://www.iucngisd.org/gisd/species.php?sc=58>
- https://www.antwiki.org/wiki/Wasmannia_auropunctata
- <https://www.cabi.org/isc/datasheet/5670>

German Wasp

Taxonomy

Order: Hymenoptera

Family: Vespidae

Species: *Vespula germanica* (Fabricius)

Summary

A social wasp native to the Palaearctic but introduced to South Africa, Argentina, Australia, Chile, New Zealand, USA. Very similar in appearance to the common wasp and both are successful invaders with negative impacts as they efficiently exploit important food resources such as nectar and insects that native fauna may depend on. They construct ball shaped nests out of wood, tree bark etc usually underground but also in tree crevices, walls, roof spaces of buildings etc.

Description and Biology

Adult workers (always female) measure 12-17mm and queens around 20mm. They have the familiar black and yellow stripes with strong black markings including an arrow shaped mark down the middle of the abdomen and black spots either side. Facial markings on the head distinguish it from the common wasp. German wasp has a black dot or line in the centre of the face and a complete yellow band behind the eye. Colonies are annual and are initiated in spring by one queen. Workers gather protein to feed the larvae and sugars to feed themselves. In late summer new queens and male drones emerge from the nest. After mating the new queens overwinter in holes/sheltered locations. As the new queens depart all the other wasps in the colony die.



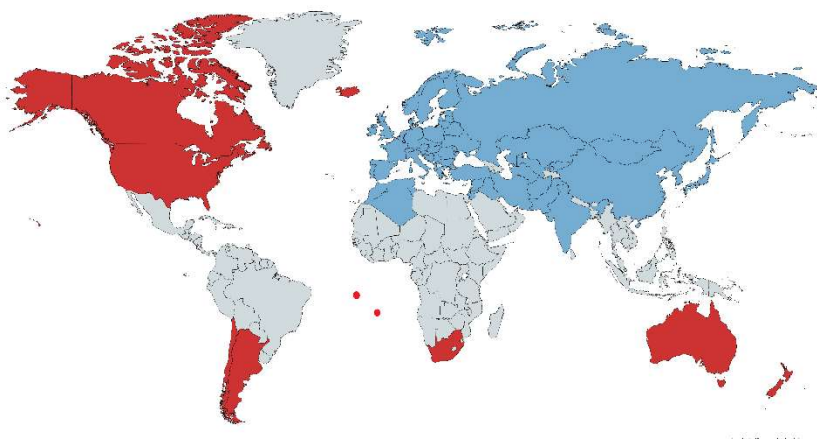
German wasp © Bugwood.org and Richard Bartz, Munich

Pathway of Entry

- Natural dispersal: Queen wasps can disperse over several kilometres when searching for new nest sites in spring.
- Accidental dispersal: Queen wasps search for well insulated places to hibernate and as a consequence have survived transportation in cargo to distant parts of the world.

Impact

The German wasp can have significant negative impact on horticulture, apiculture, tourism and outdoor social activities as well as animal health and biodiversity. Such impacts occur primarily in countries where the wasp has been accidentally introduced.



Further Information:

<https://www.cabi.org/isc/datasheet/56667>

<http://www.iucngisd.org/gisd/species.php?sc=896>

Common Wasp

Taxonomy

Order: Hymenoptera

Family: Vespidae

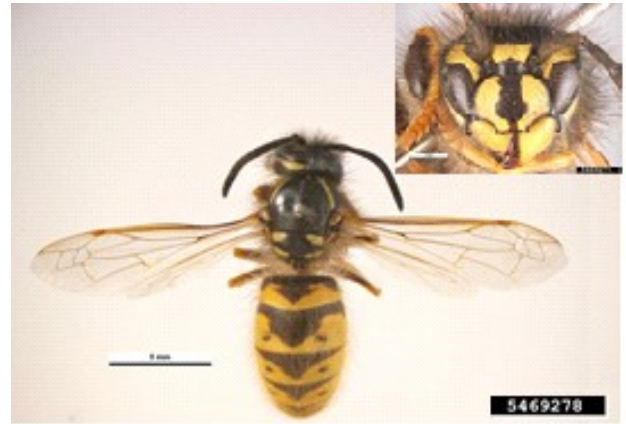
Species: *Vespula vulgaris* (Linnaeus)

Summary

This social wasp is native to Europe and parts of Asia but has since been introduced into Australia, New Zealand, Iceland, and St. Helena. The adults cause painful stings to humans, compete with other insects and birds for insect prey and sugar sources, eat fruit crops.

Description and Biology

Adult workers (always female) measure 12-17mm whereas the queen is around 20mm. They have the iconic black and yellow stripes with the abdomen split into six segments, one black/yellow stripe on each. The common wasp is very similar in appearance to the German wasp and can only be reliably distinguished by markings on the head: the common wasp has a black anchor shaped vertical line down the centre of its face and a black mark behind the eye. Colonies are annual and are initiated in spring by one queen. The colony expands throughout the season with workers gathering protein to feed the larvae and sugars to feed themselves. In late summer new queens and male drones emerge from the nest. After mating the new queens overwinter in holes/sheltered locations. As the new queens depart all the other wasps in the colony die.



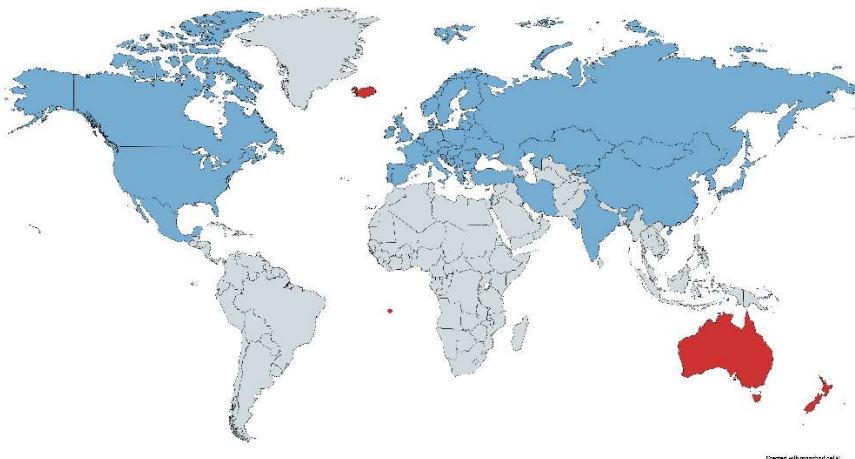
Common wasp © Bugwood.org

Pathway of Entry

- Natural dispersal: Queen wasps can fly between 30-70 km per annum.
- Accidental dispersal: Queen wasps can stowaway in human goods and are accidentally transported.

Impacts

The common wasp has a negative impact on biodiversity, forestry, conservation, agriculture, apiculture, horticulture, and human society and health. As an invasive species it outcompetes native fauna for honeydew and predares on important invertebrate pests. By consuming so much they take potential food sources away from native species and disrupt the natural food chain and ecosystem.



Further Information:

<https://www.cabi.org/isc/datasheet/56675>

<http://www.iucngisd.org/gisd/species.php?sc=67#>

■ Native
■ Invasive

Fall Armyworm

Taxonomy

Order: Lepidoptera

Family: Noctuidae

Species: *Spodoptera frugiperda* (Smith)

Summary

Native to the Americas but introduced to Africa and Asia where it has caused significant damage to crops, especially maize. The fall armyworm feeds in large numbers on leaves, stems and reproductive parts of more than 350 plant species causing major damage to economically important crops. It prefers maize but can feed on crops including rice, sorghum, millet, sugarcane, vegetable crops and cotton.

Description and Biology

The caterpillars grow from 2-34 mm long, light green to dark brown in colour with longitudinal stripes, dark elevated spots, and a black to orange brown head. Mature larvae have an inverted Y-shape in yellow on their head. The adult moths have a wingspan of 32-40 mm and are grey/brown in colour. The hind wing is iridescent silver white with a narrow dark border. The larvae are the damaging stage as they consume foliage and burrow into the growing parts of plants. Once their food source is exhausted, they invade neighbouring vegetation, usually in large numbers devouring almost all suitable plant material in their path. The caterpillars pupate in the soil and the adult moths emerge at night. Female moths lay about 1000-2000 eggs in clusters of up to 400 at night and cover the egg mass in greyish scales from her abdomen.



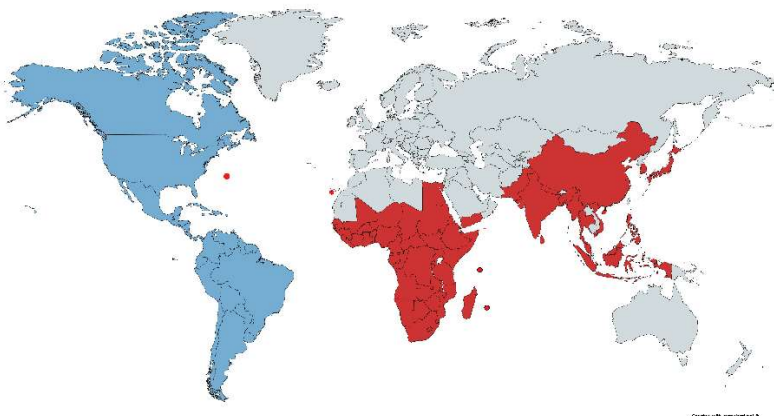
Fall armyworm © Fera

Pathway of Entry

- Natural dispersal: The adult moths are strong fliers travelling many kilometres during their maturation and have been recorded in low level jet streams.
- Accidental dispersal: They can be transported by air freight on vegetables, fruit or herbaceous ornamentals.

Impact

Fall armyworm has a negative economic impact as the caterpillars can cause significant yield loss in maize and other crops. If the larvae are numerous, they can completely defoliate plants. Caterpillars of *S. frugiperda* appear to be much more damaging to maize in West and Central Africa than most other African *Spodoptera* species. Pesticide use on maize and other host crops is increasing as a result, potentially having a negative impact in biodiversity and human health.



Further Information:

www.cabi.org

http://entnemdept.ufl.edu/CREATURES/field/fall_armyworm.htm

■ Native
■ Invasive

Diamondback moth

Taxonomy

Order: Lepidoptera

Family: Plutellidae

Species: *Plutella xylostella* Linnaeus

Summary

A highly invasive species that is probably of European origin but is now found throughout the Americas, Southeast Asia, Australia and New Zealand. The larvae feed on the upper epidermis of leaves leaving translucent windows or a 'shot hole' appearance.



Diamondback moth adult © CC-BY-SA-2.5 and GNU FDL



Diamondback moth larva © Fera

Description and Biology

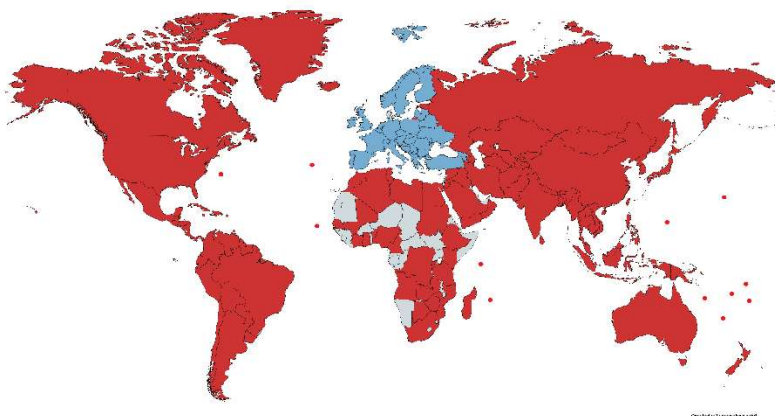
The adult is small, greyish brown with a slender 9 mm long body, 12-15 mm wingspan and pronounced antennae. When wings are folded, 3-4 diamond-shaped areas are formed by markings on the forewings, hence the name. Females deposit 150 eggs on average. Larvae are tiny and colourless when they first emerge and become green and 10 mm long when fully grown. Pupation occurs in a loose silk cocoon, 7 to 9 mm in length, usually formed on the lower or outer leaves or in florets. Total development time from the egg to pupal stage averages 25-30 days. They only attack Cruciferae, both cultivated crops and weeds. Plant damage is caused by larval feeding on leaves, flowers, flower buds and young seed pods. Although the larvae are very small, they can be numerous, resulting in complete removal of foliar tissue except for the leaf veins.

Pathway of Entry

- Natural dispersal: The adult moths are weak fliers, and disperse on average 13-35 m within a crop field, though they can be carried long distances on wind currents. They can travel on the wind uninterrupted for several days. They can cover distances of more than 2,000 miles, at a speed of more than 300 miles per night.
- Accidental dispersal: They can be transported by air or sea freight on seedlings and cruciferous vegetables.

Impact

Diamondback moth costs the global economy an estimated US\$4 -5 billion annually, but its impacts on local biodiversity and habitats in exotic ranges are unknown. It is a very difficult pest to control and has shown resistance to almost every insecticide.



 Native

 Invasive

Further Information:

- <https://www.cabi.org/isc/datasheet/42318>
- http://entnemdept.ufl.edu/creatures/veg/leaf/diamondback_moth.htm

Lionfish

Taxonomy

Order: Scorpaeniformes
Family: Scorpaenidae
Species: *Pterois* spp.

Summary

Lionfish is the common name for a genus of venomous coral reef dwelling fish native to the Indo-pacific. Two species, *Pterois volitans* (Red Lionfish) and *P. miles* (Devil Firefish) are significant invasive species in the western Atlantic, Caribbean Sea and Mediterranean Sea.



Red lionfish © Vasenin / Wikipedia

Description and Biology

The two species are morphologically similar, both with a distinctively banded head and body with reddish, golden brown or white bands stretching across a yellow background. The dorsal and anal fins possess dark rows of spots on a clear background. The dorsal fin has 13 long, strong spines and 9-11 soft rays, and the anal fin has three long spines and six or seven soft rays. They commonly reach 35 cm in length. Lionfish are gonochoristic, i.e. males and females exhibit sexual dimorphism only during reproduction and have a high frequency of spawning.

Lionfish are ravenous predators that hunt small fishes, shrimps, and crabs, using their venomous pectoral fins to trap and stun prey. They inhabit natural (e.g., reef) and artificial structures (e.g., wrecks, bridge pilings, seagrass etc.) at depths from just a few inches of water to over 300 m.

Pathway of Entry

- Natural dispersal: eggs and juveniles are carried on ocean currents and displaced by hurricanes and tropical storms
- Accidental dispersal: release of aquarium pets

Impact

With few predators of their own in their introduced range, lionfish have the potential to outcompete and prey on a large array of different types of species from all areas they inhabit. They are responsible for great reductions in fish numbers on coral reefs, where they prey on herbivorous fishes that consume macro-algae and help protect corals from algal overgrowth. Economic impacts include feeding on juveniles of the commercially important spiny lobster. Although their venom is not lethal, swimmers, snorkellers, divers, and fishermen are at risk from the painful sting from their sharp and venomous spines on their fins.



Further Information:

- www.cabi.org/isc/datasheet/109158
- <https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=963>

New Zealand Common Gecko

Taxonomy

Order: Squamata

Family: Diplodactylidae

Species: *Woodworthia maculata* (Gray)

Summary

New Zealand common gecko or Raukawa gecko is a small speckled gecko with a stout tail. Native to New Zealand, it is widespread across both the North and South Islands, and only rarely found on Stewart Island. They feed on invertebrates, nectar and fruit. It is part of a complex of 11 or more similar species.

Description and Biology

A small to medium sized gecko with average length of 15.5 cm. Dorsal surface largely grey or brown with irregular markings, including black, white, yellow/orange, and olive-green patches. The eyes are a greenish brown, with the snout-to-eye distance slightly longer, or equal to, the eye-to-ear distance. The mouth lining is pink, and the tongue is pink with a grey tip.

They are highly gregarious and lack territorial behaviour. Found in a range of habitats (from shorelines to inland beech and broadleaf forest), they are nocturnal but will sun bask. Ovoviviparous, generally giving birth to twins annually in the late summer. They are long lived, usually twenty years or more in the wild. They feed on invertebrates, nectar and fruit. They are often associated with flowering flax, pohutukawa and honeydew produced by scale insects.



New Zealand common gecko © Dr Lara Shepherd & Dr Leon Perrie

Pathway of Entry

- Natural dispersal: limited to probably less than 50 m per generation.
- Accidental dispersal: most likely movement of adults and juveniles via sea transport. Accidental release of captive animal.

Impact

The common gecko has not been found outside its native range. Introduced reptiles can have varied negative impacts on native species, including predation, competition for food, basking sites and other resources, hybridisation and spread of diseases and parasites, and they may alter the habitat of native species or disrupt ecosystem dynamics. This is most significant on islands where the number of endemic species is generally higher, and ecosystems are more vulnerable to introductions.



Further Information:

- <https://www.reptiles.org.nz/herpetofauna/native/woodworthia-maculata>
- https://en.wikipedia.org/wiki/Woodworthia_maculata
- <http://reptile-database.reptarium.cz/species?genus=Woodworthia&species=maculata>

 Native

Common House Gecko

Taxonomy

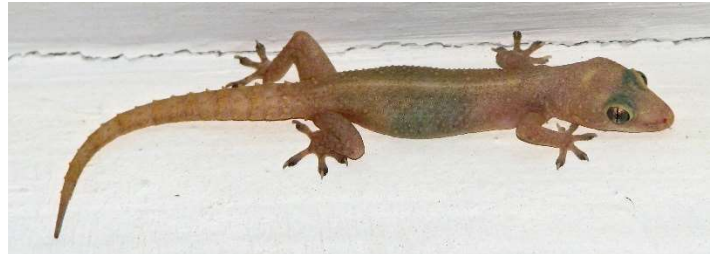
Order: Squamata

Family: Gekkonidae

Species: *Hemidactylus frenatus* Schlegel

Summary

The 'common house gecko' or 'Pacific house gecko' is an invasive species native to Southeast Asia that is now widespread in tropical and subtropical regions world-wide where they have negatively impacted native gecko populations.



Common house gecko © Praveenp

Description and Biology

They are small geckos, 7.5-15 cm long, with distinctive enlarged scales along their backs and arranged in bands on their tail. It is grey, light brown to beige in colour with greenish iridescence and a white underside. They have a series of pointed tubercles on the tail, vertical pupils and have a very distinctive "chuck, chuck, chuck" call.

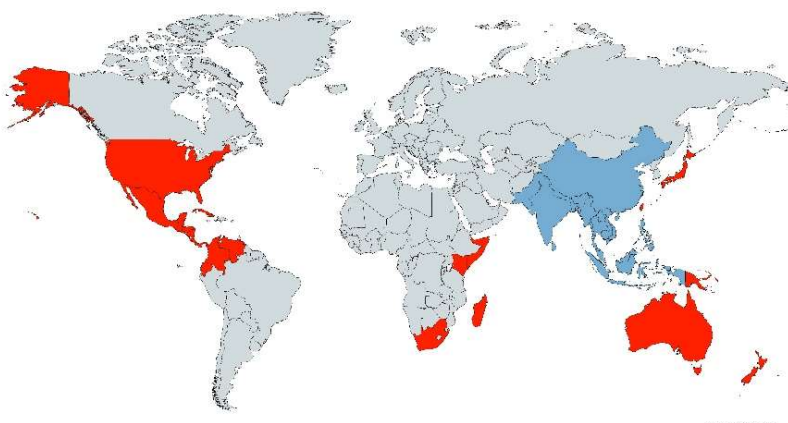
Introduced populations are almost always found on building walls near artificial lighting. *H. frenatus* is also known to inhabit natural environments, including in woodlands, patches of forest, on trees in open fields, rocky and forested areas, coconut palm trunks, under rotting logs, and among dense, low groundcover. Predominantly a nocturnal, opportunistic hunter which preys on a wide range of insects and spiders, *H. frenatus* is also known to consume juveniles of other geckos and skinks.

Pathway of Entry

- Accidental dispersal: stowing away boats or shipping containers. Release or escape of captive bred animals

Impact

The common house gecko has had various negative impacts on native gecko species. Predation, competition for food, basking sites and other resources, hybridisation and spread of diseases and parasites, and they may alter the habitat of native species or disrupt ecosystem dynamics. There are many records of *H. frenatus* displacing or causing decline in native geckos throughout its introduced range. They tend to be more aggressive and territorial, as well as, more tolerant of interspecific cohabitation and competition than endemic geckos. They can consume a disproportionately higher amount of insect prey than some endemics. Impacts are most significant on islands where the number of endemic species is generally higher, and ecosystems are more vulnerable to introductions.



Further Information:

- www.cabi.org/isc/datasheet/80353
- www.iucngisd.org/gisd/species.php?sc=1344

■ Native
■ Invasive

Tropical House Gecko

Taxonomy

Order: Squamata

Family: Gekkonidae

Species: *Hemidactylus mabouia* Moreau de Jonnès

Summary

Tropical house gecko or Afro-American house gecko is an invasive species native to sub-Saharan Africa. It is now widespread throughout southern North America, South and Central America. They are usually closely associated with modern human dwellings. They are known to displace and predate upon native geckos.

Description and Biology

A medium sized gecko, typically 12.5 cm long as adult with a slender body and flat head that is wider than their neck. Most of the body is covered in black/brown bands, and they change their colour from dark brown to a grey almost white to mimic their surroundings. They have dorsal scales, and rows of tubercles on the body and tail. In their native range, tropical house gecko habitat is tropical and shrub forests. Now widespread, their habitats include urban and suburban areas, sandy areas, scrubby areas near beaches, on tree trunks, and on the outside walls of houses.

They are nocturnal and are usually found near artificial lighting where they hunt for prey. They are generalist opportunistic invertebrate feeders, with a preference for cockroaches, spiders, isopods, grasshoppers and centipedes, beetles and moths. They have a year-round reproductive cycle, with up to 7 clutches per year.



Tropical house gecko © Hans Hillewaert

Pathway of Entry

- Natural dispersal: they are territorial with a limited range; they can be confined to the single wall of a building or one tree.
- Accidental dispersal: stows away on boats or shipping containers, also moved by air transport. It can deposit eggs on fishing boats.

Impact

Introduced reptiles have varied negative impacts on native species, including predation, competition for food, basking sites and other resources, hybridisation and spread of diseases and parasites, and they may alter the habitat or disrupt ecosystem dynamics. This is most significant on islands where the number of endemic species is generally higher, and ecosystems are more vulnerable. In Florida, its introduction has caused declines in native gecko species, and they consume hatchlings of other gecko species and of anoles. They tend to be more aggressive and territorial.



Further Information:

- <https://www.cabi.org/isc/datasheet/80353>
- <http://www.iucngisd.org/gisd/species.php?sc=1639>
- https://en.wikipedia.org/wiki/Tropical_house_gecko

 Native
 Invasive

New Zealand Common Skink

Taxonomy

Order: Squamata

Family: Scinidae

Species: *Oligosoma polychroma* Patterson &
Daugherty

Summary

The New Zealand common skink or Southern grass skink is endemic to New Zealand where it is found across both the North and South Islands, and Stewart Island.

Description and Biology

Oligosoma polychroma is a small-bodied, slender skink, which reaches 5-5.5 cm long as an adult. Their skin is shiny brown or black in colour and can be either striped or speckled on the dorsal surface. They can be distinguished from the similar brown skink by their straw-coloured iris. The females are viviparous, giving birth to small clutches of fully formed live young.

They are diurnal and can occupy a range of open habitats, from coastal rocky shorelines to alpine areas. They prefer grasslands, scrublands and vineland, particularly dry, open areas where they spend the majority of their time in cracks and crevices of rocks, going into the open only to bask in the sun or forage. They primarily feed upon a wide variety of invertebrates, particularly beetles, spiders, caterpillars and crickets, but they also drink nectar and feed on seeds and fruits.



New Zealand common skink © Tony Jewell

Pathway of Entry

- Natural dispersal: limited
- Accidental dispersal: human assisted jump dispersal, most likely movement of adults and juveniles via sea transport.

Impact

The New Zealand Common Skink has not established outside its native range. Introduced reptiles can have varied negative impacts on native species, including predation, competition for food, basking sites and other resources, hybridisation and spread of diseases and parasites, and they may alter the habitat of native species or disrupt ecosystem dynamics. Lizards are critical for ecosystem processes; they pollinate native plants and disperse native plant seeds through eating fruit.

This is most significant on islands where the number of endemic species is generally higher, and ecosystems are more vulnerable to introductions.



Further Information:

- www.doc.govt.nz/nature/native-animals/reptiles-and-frogs/lizards/skinks/common-skink/
- <https://en.wikipedia.org/wiki/Oligosoma>

 Native

Red-vented bulbul

Taxonomy

Order: Passeriformes

Family: Pycnonotidae

Species: *Pycnonotus cafer* (Linnaeus)

Summary

Native across the Indian subcontinent and has been introduced in many other parts of the world where it has established on several Pacific islands including Fiji, Samoa, Tonga and Hawaii. It has also established in parts of the Middle East and North America. It is included in the list of the world's 100 worst invasive alien species. They are considered pests as they damage fruit crops.

Description and Biology

It is readily identified by its short crest giving the head a squarish appearance. The body is dark brown with a scaly pattern while the head is darker or black. The rump is white while the vent is red. The black tail is tipped in white. The sexes are similar in appearance, although the male tends to be slightly larger.

They breed year-round with a peak between January and October. The birds can have up to three broods per season with two to four eggs per clutch. The eggs are pinkish-white base colour and are profoundly blotched with purplish brown. This is a bird of dry scrub, open forest, plains and cultivated lands. They are omnivorous, feeding on feed on fruits, petals of flowers, nectar, insects and occasionally geckos.



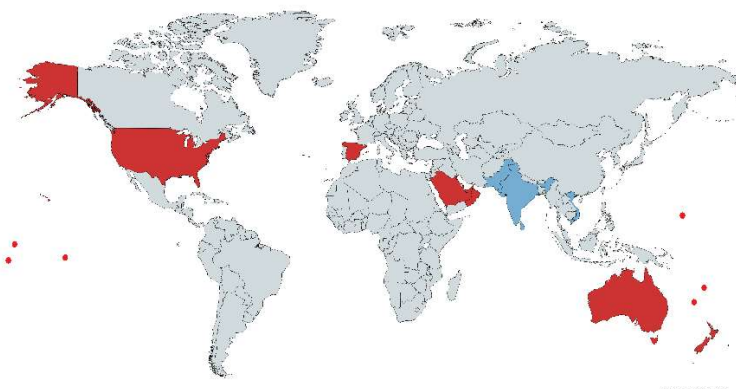
Red-vented bulbul © J.M.Garg/Wikipedia

Pathway of Entry

- Natural dispersal: capable of long-distance dispersal. In South Africa a ringed bird flew 381 km in a year.
- Accidental dispersal: deliberate introduction to control invertebrate crop pests; accidental or deliberate release of caged pet birds.

Impacts

Pycnonotus cafer are reported to destroy fruits, flowers, beans, tomatoes, peas and ripe fruit (e.g. bananas and other soft fruits). They may also help in the spread of seeds of other invasive species. Along with red-whiskered bulbuls this species has led to changes in the population dynamics of butterfly morphs on the island of Oahu in Hawaii. Here the population of white morphs of the *Danaus plexippus* butterfly have risen over a period of 20 years due to predation of the orange morphs by these bulbuls.



 Native
 Invasive

Further Information:

- www.cabi.org/isc/datasheet/45977
- www.iucngisd.org/gisd/species.php?sc=138
- https://en.wikipedia.org/wiki/Red-vented_bulbul

Common Myna

Taxonomy

Order: Passeriformes

Family: Sturnidae

Species: *Acridotheres tristis* (Linnaeus)

Summary

Native to Asia where it is an omnivorous open woodland bird with a strong territorial instinct. It is rapidly expanding its range and adapts extremely well to urban environments. It was declared by the IUCN as one of the World's most invasive species that poses an impact to biodiversity, agriculture and human interests.

Description and Biology

It is readily identified by the brown body, black hooded head and the bare yellow patch behind the eye. The bill and legs are bright yellow. There is a white patch on the outer primaries and the wing lining on the underside is white. The sexes are similar, and birds are usually seen in pairs and are believed to pair for life.

They are omnivorous, feeding on insects, arachnids, crustaceans, reptiles, small mammals, seeds, grain and fruits and discarded waste from human habitation. They forage on the ground among grass for insects, and especially for grasshoppers. They roost communally throughout the year, either in pure or mixed flocks with other mynas and crows. It is a hollow-nesting species; that is, it nests and breeds in protected hollows found either naturally in trees or artificially on buildings (for example, recessed windowsills or low eaves).



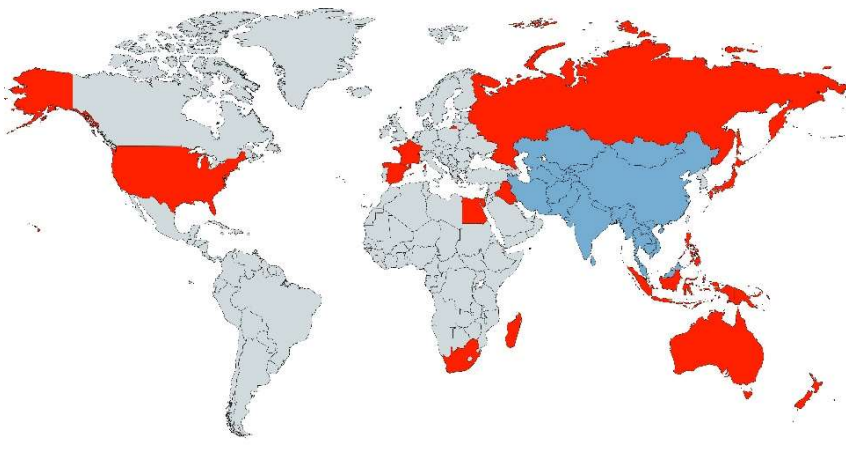
Common myna © TG Santosh/Wikipedia

Pathway of Entry

- Natural dispersal: capable of long-distance dispersal. In South Africa a ringed bird flew 381 km in a year.
- Accidental dispersal: deliberate introduction to control invertebrate crop pests; accidental or deliberate release of caged pet birds.

Impacts

It outcompetes native birds for food and nesting areas. The males actively defend areas ranging up to 0.83 hectares in size. Mynas can cause considerable damage to ripening fruit, particularly grapes, cereal crops are susceptible where they occur near urban areas. Roosting and nesting commensal with humans create aesthetic and health concerns. They carry avian malaria and exotic parasites such as *Ornithonyssus bursa* mite which can cause dermatitis in humans. The myna can also help spread agricultural weeds.



Further Information:

- <https://www.cabi.org/isc/datasheet/2994>
- <http://www.iucngisd.org/gisd/species.php?sc=108>

 Native
 Invasive

Brown Rat

Taxonomy

Order: Rodentia

Family: Muridae

Species: *Rattus norvegicus* (Berkenhout)

Summary

Brown rat or Norway rat is globally widespread and highly invasive. It has caused or contributed to the extinction or range reduction of native mammals, birds, reptiles and invertebrates through predation and competition. It is economically damaging as a plant pest, a domestic nuisance by chewing through power cables, spoiling food and spreading diseases.

Description and Biology

The fur is coarse and brown or dark grey on the back with paler grey or brown fur on the underparts. Larger than the Ship rat (*R. rattus*), the body length ranges from 15 to 28 cm, the tail ranges from 10.5 to 24 cm. They have relatively small ears - which usually do not cover the eyes when pulled forward. The tail is shorter than the head-body length - the opposite is true for *R. rattus*.

Generally nocturnal, they are true omnivores and will consume almost anything, but cereals form a substantial part of the diet. They are good swimmers, climbers and diggers, often excavating extensive burrow systems. They breed throughout the year if conditions are suitable, with a female producing up to five litters a year. On continents and large islands, they are usually closely associated with human habitation but on oceanic islands (such as New Zealand) they are free-living in forest and wetland habitats.



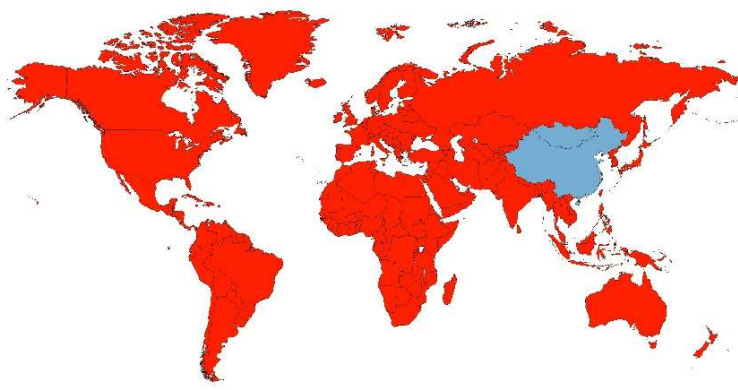
Brown rat © Reg Mckenna

Pathway of Entry

- Natural dispersal: usually territorial but will spread when food is scarce, and migrations have been observed. They can cross up to 2 km of water if conditions are suitable.
- Accidental dispersal: primarily stowing away on shipping vessels, they commonly live near wharves.

Impacts

Brown rats restrict the regeneration of many plant species by eating seeds and seedlings. They prey upon most animal species smaller than themselves such as reptiles, small birds, bird eggs and freshwater and intertidal species. They eat food crops and spoil human food stores by urinating and defecating in them. Additional economic damage is caused by rats chewing through power cables etc. and spreading diseases, including Weil's disease, rat bite fever, cryptosporidiosis, viral hemorrhagic fever, Q fever and hantavirus pulmonary syndrome.



■ Native
■ Invasive

Further Information:

- <https://www.cabi.org/isc/datasheet/46829>
- <http://www.iucngisd.org/gisd/species.php?sc=159>
- https://en.wikipedia.org/wiki/Brown_rat

Ship Rat

Taxonomy

Order: Rodentia
Family: Muridae
Species: *Rattus rattus* (L.)

Summary

Ship rat or Black rat is globally widespread and highly invasive. It will feed on and damage almost anything and has directly caused or contributed to the extinction of many species of wildlife including birds, small mammals, reptiles, invertebrates and plants, especially on islands. It can also be damaging to agricultural crops and horticultural plants.



Ship rat. © Vladimír Motyčka

Description and Biology

The fur is variable, usually black to light brown with paler fur on the underparts. Smaller than the Brown rat (*R. norvegicus*), the body length ranges from 12.75 to 18.25 cm, the tail ranges from 15 to 22 cm. They have relatively large ears - which usually cover the eyes when pulled forward. The tail is longer than the head-body length - the opposite is true for *R. norvegicus*.

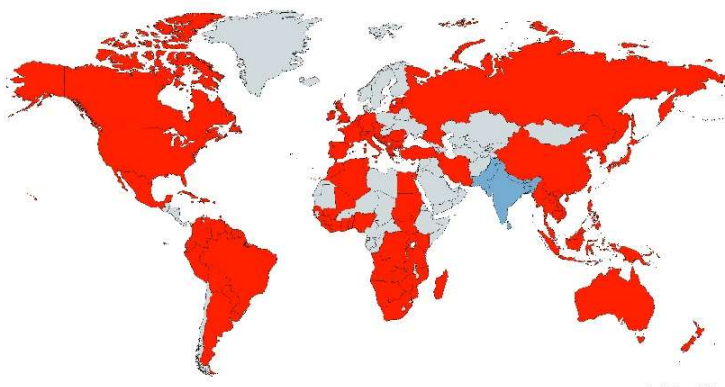
They are omnivores and will consume a wide range of foods, including seeds, fruit, stems, leaves, fungi, and a variety of invertebrates and vertebrates, although they can be a selective feeder. Ship rats are great climbers and adapt to a wide range of habitats, preferring to live in dry upper levels of buildings in urban areas, and in cliffs, rocks, the ground, and trees.

Pathway of Entry

- Natural dispersal: usually territorial but will spread when food is scarce. They can swim, crossing 500 m of water if conditions are suitable.
- Accidental dispersal: primarily stowing away on shipping vessels.

Impact

Ship rats restrict the regeneration of many plant species by eating seeds and seedlings, adversely affecting the ecology of islands (eg. New Zealand). They prey upon most animal species smaller than themselves such as reptiles, small birds, bird eggs and invertebrates. They compete with native animals for resources and has completely displacing many native species in Madagascar, the Galapagos, and the Florida Keys. The primary economic impact of *R. rattus* relates to agricultural and horticultural damage. It can destroy up to 30% of crops annually. Additional economic damage is caused by rats chewing through power cables etc. and spreading diseases.



Further Information:

- <https://www.cabi.org/isc/datasheet/46831>
- <http://www.iucngisd.org/gisd/speciesname/Rattus+rattus>
- https://en.wikipedia.org/wiki/Black_rat

■ Native
■ Invasive

Killer Algae

Taxonomy

Order: Bryopsidales
Family: Caulerpaceae
Species: *Caulerpa taxifolia* (M.Vahl) C.Agardh

Summary

Native to the tropical waters of the Indian, Pacific and Atlantic oceans, it is widely used as a decorative plant in salt-water aquaria. A cold-tolerant invasive strain of the alga was accidentally introduced to the Mediterranean, where it has spread over large areas forming dense monocultures that prevent the establishment of native seaweeds and excludes almost all marine life. This has affected the livelihoods of local fishermen.



Killer algae © Rachel Woodfield/Wikipedia

Description and Biology

It is light green with upright leaf-like fronds arising from creeping stolons. The fronds are flattened laterally and the small side branchlets are constricted at the base; they are opposite in their attachment to the midrib and curve upwards and narrow towards the tip. Frond diameter is 6-8mm and frond length is usually 3-15cm in the shallows, 40-60cm in deeper situations.

It is monoecious and in native population reproduce sexually; male and female gametes fuse forming a zygote which grows through two stages prior to becoming the adult. In the Mediterranean reproduction is vegetative by fragmentation.

Pathway of Entry

- Natural dispersal: fragmentation.
- Accidental dispersal: dumping of the contents of aquaria into the sea. Cuttings can be distributed over long distances by boat anchors or fishing nets.

Impact

The alga can have a negative impact on biodiversity and the economy. It can crowd out native seaweeds, forming dense monocultures, altering entire ecosystems. Millions of dollars have been spent on eradicating incursions of the invasive strain of the algae in southern California and South Australia. In the Mediterranean the alga typically inhabits polluted, nutrient-rich areas such as sewage outfalls and has had a positive impact by reducing pollution levels.



Further Information:

- <https://www.cabi.org/isc/datasheet/29292>
- <http://www.iucngisd.org/gisd/species.php?sc=115>

Caribbean False Mussel

Taxonomy

Order: Myida
Family: Dreissenidae
Species: *Mytilopsis sallei* (Recluz)

Summary

Caribbean false mussel or black-striped false mussel is native to tropical and sub-tropical parts of the western Atlantic Ocean and Caribbean, around Central and northern South America; and has been introduced to the Indo-Pacific region. It is an opportunistic species, found in intertidal and shallow waters. It is a major fouling species, forming dense monocultures which can lead to a substantial reduction in biodiversity.

Description and Biology

It is a small, fingernail sized mussel, 8-25 mm in length. It has a varied shell colouration, from black through to a light colour, with some small individuals having a light and dark zig-zag pattern. The right valve is larger and overlaps the left valve. It settles in clusters.

Caribbean false mussels are ambi-sexual, meaning they change sex during their lifecycle. At any one time, a proportion of the population will have both male and female reproductive organs. Females release tens of thousands of eggs which are fertilised in the water column. These develop into free-floating planktonic larvae which usually settle within a few days. Spawning occurs in the autumn or early winter.



Caribbean false or Black-striped mussel © Northern Territory Government, Australia

Pathway of Entry

- Natural dispersal: limited as the planktonic larvae settle within a few days.
- Accidental dispersal: ship ballast, hull fouling and contamination of aquaculture equipment

Impact

The mussel is an extremely prolific and fecund species, rapidly forming dense colonies. It has been responsible for massive fouling on wharves and marinas, seawater systems (pumping stations, vessel ballast and cooling systems) and marine farms. In preferred habitats, it forms dense monospecific groups that exclude most other species, leading to a substantial reduction in biodiversity.



Further Information:

- <https://www.cabi.org/isc/datasheet/119604>
- <http://issg.org/database/species/ecology.asp?si=1047&fr=1&sts=&lang=EN>
- <https://www.dpi.nsw.gov.au/fishing/pests-diseases/marine-pests/found-in-australia/black-striped-mussel>

■ Native
■ Invasive

Mediterranean Mussel

Taxonomy

Order: Mytilida

Family: Mytilidae

Species: *Mytilus galloprovincialis* Lamarck

Summary

Mediterranean mussel is part of a complex of closely related species. It is native to the Mediterranean and Adriatic and Black Seas; it has been introduced to various regions around the world, both accidentally through shipping and deliberately for cultivation. It is highly invasive due to its high fecundity, rapid rate of spread and its ability to outcompete native mussels.

Description and Biology

It is a large mussel, 50-80 mm in length, occasionally reaching 150 mm. The shell is dark blue or brown to almost black. The two shells are equal and nearly quadrangular.

Adults reproduce sexually by releasing gametes into the water column where fertilisation takes place. Fertilised eggs develop into free swimming larvae which remain in the water for 2-3 weeks after which they settle and attach onto hard substrate using a byssus. Spawning occurs once a year when water temperatures are at their highest. The life span is typically 2-3 years.



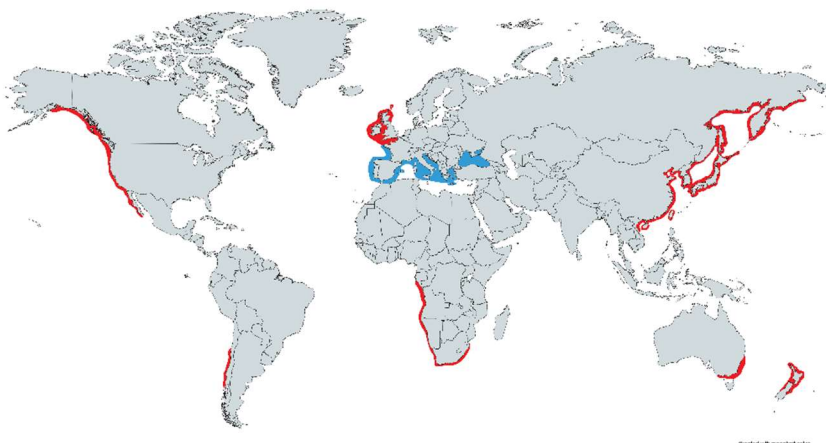
Mediterranean mussel © Andrew Butko, Wikipedia

Pathway of Entry

- Natural dispersal: planktonic larvae are dispersed by physical processes
- Accidental dispersal: ship ballast, hull fouling and introduction for farming

Impact

The mussel rapidly forms dense colonies, outcompeting and displacing native mussels, and becoming the dominant mussel species in many localities. It is causing significant changes in community structure and trophic relationships.



Further Information:

- <https://www.cabi.org/isc/datasheet/73756>
- <http://www.iucngisd.org/gisd/species.php?sc=102>
- <https://en.wikipedia.org/wiki/Mediterrane>

■ Native
■ Invasive

Asian Green Mussel

Taxonomy

Order: Mytilida

Family: Mytilidae

Species: *Perna viridis* Linnaeus

Summary

Native to the Asia-Pacific region and introduced to the Caribbean, and waters around Japan, North America, and South America. It quickly forms dense colonies in a range of environmental conditions, causing blockage in intake pipes of industrial plants, clogging crab traps and clam culture bags and impeding commercial harvest. It also out-competes many other fouling species.

Description and Biology

It is a large mussel, 80-100 mm in length, occasionally reaching 165 mm. The shell has a smooth exterior surface characterised by concentric growth lines and slightly concave ventral margin. The shell is covered with a greenish (variable in older mussels) skin.

Adults reproduce sexually by releasing gametes into the water column where fertilisation takes place. Fertilised eggs develop into free swimming larvae which remain in the water for 2-3 weeks after which they settle and attach onto hard substrate using a byssus. Spawning occurs once or twice a year. The life span is typically 2-3 years



Asian green mussel © United States Geological Survey

Pathway of Entry

- Natural dispersal: planktonic larvae are widely dispersed by physical processes
- Accidental dispersal: ship ballast, hull fouling and the experimental introduction for farming

Impact

The mussel rapidly forms dense colonies in a range of environmental conditions, causing blockage in intake pipes of industrial plants, clogging crab traps and clam culture bags and impeding commercial harvest. Fouling creates a need for increased maintenance and if not carried out regularly can cause decreases in fuel efficiency. It also out-competes many other fouling species, causing changes in community structure and trophic relationships.



Further Information:

- <https://www.cabi.org/isc/datasheet/70090>
- <http://issg.org/database/species/ecology.asp?si=731&fr=1&sts=&lang=EN>
- <https://sealifebase.ca/summary/Perna-viridis.html>
- https://en.wikipedia.org/wiki/Perna_viridis

■ Native
■ Invasive