Platydemus manokwari 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Platyhelminthes	Turbellaria	Tricladida	Geoplanidae

Common name snail-eating flatworm (English), Flachwurm (German), flatworm (English)

Synonym

Similar species

Summary

Worldwide land snail diversity is second only to that of arthropods. Tropical oceanic islands support unique land snail faunas with high endemism; biodiversity of land snails in Pacific islands is estimated to be around 5 000 species, most of which are endemic to single islands or archipelagos. Many are already under threat from the rosy wolfsnail (Euglandina rosea), an introduced predatory snail. They now face a newer but no less formidable threat, the introduced flatworm Platydemus manokwari (Platyhelminthes). Both \"biocontrol\" species continue to be dispersed to new areas in attempts to control Achatina fulica.

view this species on IUCN Red List

Species Description

This flatworm has a uniform exterior appearance. The adult length is 40 to 65mm long, 4 to 7mm wide. The head end is more pointed than tail end. The flattened cross section has a thickness less than 2mm. The colour of the dorsal surface is very dark brown, almost black, with a thin medial pale line. The ventral surface is pale gray. (de Beauchamp, 1963).

Notes

A rhynchodemid flatworm, *Platydemus manokwari*, was discovered in New Guinea and originally described in 1962 (Kaneda Kitagawa and Ichinohe 1990). Little has been known of its biology except that it is nocturnal, and there apparently is no report on the rearing of this flatworm (Kaneda Kitagawa and Ichinohe 1990).

Uses

Platydemus manokwari provides some regulation of *Achatina fulica* and is attributed with eradication in some areas; however, probable adverse effects on indigenous gastropod fauna have been recorded (Barker 2002). Reports that this flatworm can control *A. fulica* remain correlative, and the individuals who continue to promote its use as a biological control agent appear not to have considered its potential impact on native species (Muniappan 1990, in Lydeard *et al*. 2004).

Habitat Description

Platydemus manokwari, which was first discovered in New Guinea, is typically a tropical species (Sugiura 2009). Generally *P. manokwari* is found in leaf litter in both undisturbed forest and habitats modified by humans in tropical and sub-tropical climates (Sugiura 2009). For example, it is found in leaf litter in high-altitude (>675 m) cloud forest on the island of Pohnpei in Micronesia (Eldredge & Smith 1995). This snail-eating flatworm is known to prefer wet conditions and is unable to survive in completely dry habitats (Kaneda *et al*. 1990, in Sugiura 2009). High humidity and adequate precipitation are essential for its survival (Kaneda *et al*. 1990, in Sugiura 2009).

In a study by Sugiura (2009) the survival rate of *P. manokwari* decreased when animals were exposed to 10°C for more than 2 weeks. Kaneda *et al*. (1992, in Sugiura 2009), examining the developmental period of *P. manokwari* egg cocoons and juveniles, suggested that the developmental threshold of juvenile and cocoon stages was 11.7°C and 10.0°C, respectively. Therefore, 10°C may be a threshold temperature for the establishment of *P. manokwari*. Ambient temperature may regulate seasonal variations in predation pressure on land snails. In Japan, higher temperatures may have promoted increases in flatworm population density and feeding activity from early summer to autumn, resulting in the very high predation pressures on land snails observed in July, September, and November (Sugiura 2009). Recent global warming may increase the probability of invasion and population establishment, and elevate the impacts of *P. manokwari* in temperate regions (Sugiura 2009).

Sugiura and colleagues (2006) surveyed the presence/absence of land snails and *P. manokwari* in September to October 2005 and found land snails of introduced species (*A. fulica*, *Acusta despecta*, and *Bradybaena similaris*) surviving in coastal areas, probably because of the absence of *P. manokwari*. *P. manokwari* does not occur in the urban coastal area, perhaps because of environmental factors such as lack of adequate vegetation (S. Sugiura *et al*. pers. comm., in Sugiura *et al*. 2006).

Reproduction

Hermphroditic, probably cross-fertilising.

Nutrition

Terrestrial flatworms (land planarians; Terricola) are predators of various soil invertebrates, such as earthworms, land snails, slugs, and arthropods (Ogren 1995, Winsor *et al*. 2004, in Sugiura 2009). It was revealed that in the Chichijima Island, Japan, *P. manokwari* fed not only on live land snails including predatory species, but also on other food resources such as live flatworms or a land nemertean species and the carcasses of slugs and earthworms (Ohbayashi *et al*. 2005). While *P. manokwari* feeds on slow-moving soil animals such as earthworms, it prefers live snails over other organisms (Sugiura 2010).

General Impacts
Please follow this link for a detailed account of the *Platydemus manokwari* (Snail-eating Flatworm) Impacts Information the environmental impacts of *Platydemus manokwari*. The information in this document is summarised below.
Invertebrate species represent more than 99% of animal diversity; however, they receive much less publicity and attract disproportionately minor research effort relative to vertebrates (Ponder and Lunney 1999, in Lydeard *et al*. 2004). The global decline of nonmarine molluscs may be facilitated by the spread and introduction of predatory flatworms (Platyhelminthes: Turbellaria), in particular the flatworm *P. manokwari*. *P. manokwari* has been introduced into many locations for use as a biological control agent for the giant African land snail (*Achatina fulica*). It is an effective predator that poses a serious threat to native snails. Vulnerable native snails threatened by *P. manokwari* include endemic Partulidae in Guam (Hopper & Smith 1992) and *Mandarina* snails in the Ogasawara Islands (Japan) (Satoshi 2003).
It is estimated that there are about 4000 native oceanic Pacific island land snails (a number that excludes the continental islands of New Zealand and the island of New Guinea (Barker 1999, Cowie forthcoming, in Lydeard *et al*. 2004). These unique native snail faunas are disappearing rapidly (Bauman 1996, Cowie 2001a, Cowie and Robinson 2003, in Lydeard *et al*. 2004). Terrestrial molluscs have the highest number of documented extinctions of any major taxonomic group (Lydeard *et al*. 2004). Since the year 1500, 288 (40.2%) of the 717 recorded extinctions of animal species have been molluscs, and terrestrial species (land snails) constitute 68.1% of all mollusc extinctions (IUCN 2008). The Endodontidae, probably the most diverse Pacific island family (Solem 1976, in Lydeard *et al*. 2004), appear to be completely extinct or reduced to sparse remnant populations. All the Partulidae of Moorea (French Polynesia) are extinct in the wild (Murray *et al*. 1988, in Lydeard *et al*. 2004). In Hawaii, as many as 90% of the 750 recognised species of land snails are extinct. On Rota (Northern Marianas), 68% of the 43 species are extinct or declining, and in the Samoan archipelago, almost all are declining, although a smaller percentage is extinct (Cowie & Robinson 2003). These estimates suggest that overall perhaps 50% of the land snail fauna of the Pacific islands has disappeared recently.
Experts suggest that the continued introduction of alien predators such as *P. manokwari* should be strongly discouraged in order to conserve such unique island snail species (Cowie &d Robinson 2003). The introduction of *P. manokwari* is a serious concern in the conservation of the unique land snails of tropical islands (Sugiura *et al*. 2006). It has been considered a cause of the extinction of native land snails on several Pacific and Pacific Rim islands (Sugiura & Yamaura 2009). The endemic snail genus *Mandarina* (Okochi *et al*. 2004) is thought to have declined because of *P. manokwari* predation on Chichijima (Chiba 2003, Ohbayashi *et al*. 2005, in Sugiura *et al*. 2006). Biological control introductions pose a serious threat to endemic land snails because both *E. rosea* and *P. manokwari* feed on any species of live gastropods, including *A. fulica* (Kaneda *et al*. 1990, Hopper & Smith 1992, Civeyrel & Simberloff, 1996, Cowie 2001, Cowie & Robinson 2003, Ohbayashi *et al*. 2007, in Sugiura 2009).

Management Info
Legislation: Barker (2002) describes the continued purposeful introduction of polyphagous enemies as done by "*people blissfully unaware of or blatantly dismissive of the ecological catastrophes unfolding in areas to which these same agents had earlier been introduced*". The introduction of the invasive flatworm *P. manokwari* is a serious concern in the conservation of the land snails. Accidental introductions as well as intentional ones should be actively prevented. Artificial removal in Japan of *P. manokwari* has been prohibited by the Invasive Alien Species Act since 2006 (Kawakatsu *et al*. 2007).
Physical control: Hot water treatment to destroy pests has recently been used during the quarantine of ornamental plants. Sugiura (2008) examined the possibility of using hot water treatment for introduced soil animals in potted plants. The author designed an experiment to determine whether hot water treatment (immersion in water at 40°C, 43°C, 45°C, 47°C or 50°C for 5 min) kills soil animals, including the invasive alien terrestrial flatworm *P. manokwari*. The water temperature required to kill flatworms (=43°C) and earth-worms (=43°C) was lower than that to kill snails (=50°C) and ants (=47°C). Use of hot water for protection from alien soil animal invasions may mitigate their environmental impacts, particularly on oceanic islands where valuable biota could be threatened (Sugiura 2008).
Research and Knowledge: Future priorities in Mollusc Conservation include research (biotic surveys and taxonomic studies along with gathering of basic ecological and biological information) (Lydeard *et al*. 2004).
Education and Awareness: Information exchange should be improved via dissemination of information through the internet, keys, education etc. enabling greater worker base through training (Lydeard *et al*. 2004).
Integrated Management: Greater integration and coordination between management agencies, research institutions, and other stakeholders is essential (Lydeard *et al*. 2004). The resources that are currently available to manage global non-marine mollusc biodiversity are insufficient. Scientific knowledge is scanty and scattered. Often there are too few staff to manage the existing protected areas, which typically focus on vertebrate species. Because of the lack of resources, mollusks and other less charismatic groups are usually ignored. Nevertheless, regional and species-specific conservation action plans must be developed on the basis of appropriately designed scientific studies, such as that undertaken in the United Kingdom for conservation of the land snail *V. moulinsiana* (Tattersfield 2003, in Lydeard *et al*. 2004). To develop such plans, greater integration, coordination, and networking among conservation management agencies, research institutions, and other stakeholders is essential. This approach will ensure that conservation is scientifically based and will help to avoid potentially disastrous ecological, economic, or legal consequences. Furthermore, local and national governments and their agencies, and nongovernmental organizations of all kinds (from international organizations to local conservation societies), must forge relationships to ensure that their goals are not competitive or contradictory and that their actions are in concert. Molluscs must not be ignored when new conservation areas are created. Both new and existing reserves must be adequately managed, with attention paid to mollusks, and in some instances reserves should be established explicitly for molluscs (Lydeard *et al*. 2004).

Pathway
Platydemus manokwari has been used as a biological control agent for the giant African snail.Alien soil animals can be unintentionally introduced by commercial trade among islands and continental landmasses (Sugiura 2008). Globalisation of commercial trade may have helped the transfer to non-invaded areas (Sugiura 2009). Movement of ornamental plants, potted plants, and other materials with soil can transfer *P. manokwari* to new areas (Sugiura 2009). Quarantine procedures for potted plants and other soil containing materials that can carry invasive flatworms are needed to protect against invasions in warming temperate areas (Sugiura 2008, in Sugiura 2009).*Platydemus manokwari* can readily be transported by soil on construction machines (Okochi *et al*. 2004).

Principal source: Barnes, 1968. de Beauchamp, 1963. Eldredge and Smith, 1994, 1995. Hopper and Smith, 1992. Muniappan, 1987, 1990. Muniappan *et al*., 1986.

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ALIEN RANGE

[3] AUSTRALIA
[1] FRENCH POLYNESIA
[1] GUAM
[5] JAPAN
[3] MALDIVES
[1] MICRONESIA, FEDERATED STATES OF
[4] NORTHERN MARIANA ISLANDS
[2] PALAU
[2] PHILIPPINES
[1] PORTUGAL
[3] SAMOA
[1] TONGA
[1] UNITED STATES
[1] VANUATU

Red List assessed species 4: EX = 1; CR = 3;

Partula clara **CR**
Partula gibba **CR**
Partula salifana **EX**
Samoana fragilis **CR**

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