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Anti-predatory behaviour of a land snail *Bensonies monticola* W.H. Benson, 1838 (Mollusca, Gastropoda, Ariophantidae) against an *Aphaenogaster* sp. (Arthropoda, Hymenoptera, Formicidae) in the Western Himalaya, India

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Abstract
Predator-prey interactions are key drivers of defensive trait evolution in animals, including terrestrial gastropods. These snails have evolved a diverse range of defensive mechanisms which we broadly categorised as behavioural, morphological, and chemical strategies. Majority of the studies have focused on interactions with vertebrate or beetle predators, whereas interactions with social insects such as ants remain poorly documented. Here, we report a novel case of anti-predatory behaviour in the ariophantid snail *Bensonies monticola* W.H. Benson, 1838, from the Western Himalaya, India. During an encounter with an undescribed *Aphaenogaster* ant nest, the snail secreted frothy mucus that rapidly entrapped and immobilized multiple ants, leading to their mortality. This observation highlights a specialized adaptation against ant predation and represents the first documented ant-snail interaction for *B. monticola.* This finding expands the known repertoire of snail defence strategies and underscores the need for further studies on ant-snail interactions.

key words: Defense mechanism, terrestrial snail, Western Himalaya, Ariophantidae, chemical defence, Predator-prey interactions

1. Introduction
Predator-prey interactions are fundamental ecological forces that influence the diversity of biological forms (Vermeij, 1987). Predation pressure can drive the evolution of prey morphology and behaviour, often favouring defensive traits or strategies that enhance survival. Among terrestrial gastropods, shell characteristics, in particular, have served as prominent examples of anti-predatory adaptation (Vermeij, 1993).

Land snails, being slow moving and soft-bodied organisms, are highly vulnerable to a range of predators. To counter this, they have evolved a diverse suite of defensive mechanisms, which may be broadly categorised as behavioural, morphological, and chemical strategies (Table 1). The behavioural responses include rapid withdrawal into the shell and operculum closure, hiding in crevices or beneath litter, nocturnal activity, and the use of shell in active defence, such as shell-swinging or twisting movements to deter attackers (Hyman 1967; Pomeroy, 1968; Prior, 1985; Withers et al. 1997; Naranjo, 2003; Morii et al., 2016; Barrientos, 2020). Morphological adaptations encompass features such as thickened shells, specialized apertural barriers, conspicuous coloration, shell hairs that impede predator attachment, and in some species, autotomy of the foot as an escape mechanism (Hoso and Hori, 2008; Hoso, 2012; Liew and Schilthuizen 2014; Narayanan and Aravind 2021; Sato and Yoshikawa, 2024). Chemical strategies include the secretion of mucus, which may act as irritant or form a physical barrier against predation (Barrientos, 2020). In some cases, snails can also detect dietary chemical cues from predators, enabling them to avoid areas of elevated risk (Lefcort et al. 2006).

While the defensive repertoire of land snails is diverse, the majority of the studies have focussed on interactions with vertebrate or beetle predators (Morii et al., 2016). In contrast, their interactions with social insects as ants remain poorly documented, despite the ubiquity of ants in terrestrial ecosystems and their role as predators and scavengers.

Here, we report a novel case of anti-predatory behaviour in *Bensonies monticola* W.H. Benson, 1838, which secreted frothy mucus when attacked by an undescribed *Aphaenogaster* Mayr, 1853 ant in the Western Himalaya, India. To our knowledge, this is the first documented instance of ant-snail interaction in this genus, only the second known case of a frothy mucus defence within the family Ariophantidae.

Table 1. Defence mechanisms in terrestrial gastropods with examples

Category	Defense Mechanism	Example Species (Family)	References
Morphological Defenses	Apertural barriers (teeth, lamellae, folds)	*Satsuma caliginosa* (Camaenidae), *Thais lamellosa* (Muricidae), *Plectostoma* species (Diplommatinidae)	Hoso and Hori, 2008; Hoso, 2012; Appleton and Palmer, 1988; Liew and Schilthuizen, 2014
	Thickened shell	*Nucella lapillus* (Muricidae), *Cepaea nemoralis* (Helicidae)	Pascoal et al., 2012; Rosin et al., 2013
	Shell hairs/periostracal structures	*Moellendorffia diminuta* (Camaenidae)	Sato and Yoshikawa, 2024
	Protruding ribs and spines	*Plectostoma* species (Diplommatinidae)	Liew and Schilthuizen, 2014
	Conspicuous coloration (warning)	*Indrella ampulla* (Ariophantidae)	Narayanan and Aravind, 2021; Majhi et al., 2023
Behavioral Defenses	Withdrawal into shell/retraction	*Karaftohelix gainesi* and *K. selskii* (Bradybaenidae), *Cepaea nemoralis* (Helicidae)	Morii et al., 2016; Jaremovic and Rollo, 1979
	Shell swinging/active defense	*Tikoconus costarricanus* (Euconulidae), *Karaftohelix gainesi* and *K. selskii* (Bradybaenidae), *Acusta despecta* (Bradybaenidae)	Barrientos, 2020; Morii et al., 2016

Category	Defense Mechanism	Example Species (Family)	References
	Rapid climbing or movement	*Tikoconus costarricanus* (Euconulidae), *Satsuma caliginosa* (Camaenidae), *Cepaea nemoralis* (Helicidae)	Barrientos, 2020; Hoso, 2012; Jaremovic and Rollo, 1979
	Hanging upside down (aestivation)	*Tikoconus costarricanus* (Euconulidae)	Barrientos, 2020
	Autotomy (foot amputation)	*Satsuma caliginosa* (Camaenidae)	Hoso, 2012
Chemical Defenses	Sticky/frothy mucus secretion	*Indrella ampulla* (Ariophantidae), *Helix pomatia* (Helicidae), *Arion fasciatus* (Arionidae), *Deroceras reticulatum* (Agriolimacidae)	Majhi et al., 2023; Narayanan and Aravind, 2021; Pollard, 1975; Pakarinen, 1994; Mair and Port, 2002
		Bensonies monticola (Ariophantidae)	**Present study**
	Adhesive defensive mucus	*Triboniophorus graeffei* (Athoracophoridae)	Gould et al., 2019
	Shell surface mucus application	*Indrella ampulla* (Ariophantidae)	Majhi et al., 2023
	Antimicrobial mucus compounds	*Cornu aspersum* (Helicidae), *Achatina fulica* (Achatinidae), *Helix aspersa* (Helicidae), *Cryptozona bistrialis* (Ariophantidae), *Lissachatina fulica* (Achatinidae), and *Hemiplecta differenta* (Ariophantidae)	Velkova et al., 2024
	Bioluminescent	*Quantula striata* (Dyakiidae), *Q. weinkauffiana* (Dyakiidae), *Phuphania crossei, P. globosa, P. carinata,* and *P. costata* (Dyakiidae)	Pholyotha et al., 2023

2. Materials and methods

Study area

The observations of the anti-predatory behaviour of *Bensonies monticola* (Ariophantidae) against *Aphaenogaster* sp. (Formicidae) ants were based on an opportunistic sighting during fieldwork conducted on 23 September, 2024 at 1:53 pm. This was an opportunistic natural history observation recorded during field surveys; no experimental manipulation was performed. Observations were carried out at Makku Math, Rudraprayag District, Uttarakhand, India (30.4661464°N, 79.1604977°E; 2065 m amsl), within the Kedarnath Wildlife Sanctuary. The study area is situated in the Himalayan Moist Temperate Deciduous Forest (Champion and Seth, 1968). The major tree species present in the habitat include

Betula alnoides, *Alnus nepalensis*, *Daphniphyllum* sp., *Machilus odoratissima*, *Carpinus viminea*, *Cornus macrophylla*, *Cornus oblonga*, *Viburnum mullaha*, *Symplocos theifolia*, *Symplocos crataegoides*, *Rhododendron arboreum*, *Stranvaesia nussia*, *Quercus glauca*, *Quercus leucotrichophora*, and *Lyonia ovalifolia*.

Data collection

The anti-predatory response of the snail *Bensonies monticola* against the ant *Aphaenogaster* sp. was documented using mobile video recordings and photography. The ant species was identified using the updated Aphaenogaster keys for the Himalayas (currently in review) and was determined to be an undescribed species. The specimens have been deposited in PUAC (Punjabi University, Patiala Ant Collection) at the Ant Systematics and Molecular Lab, Patiala, maintained by the third author. Morphological examination of the ants was carried out using a Nikon SMZ1500 stereo zoom microscope. The snail was identified using available literature and comparative morphological characters. The snail specimens have been deposited in the Malacology Collection at the Freshwater Ecology and Conservation Lab, ATREE, Bangalore.

During the observation, the temperature ranged between 21.3 °C and 23.9 °C, with relative humidity at 77% with a digital thermo-hygrometer (Ap TechDeals; HTC 2). The site had 70%- 80% canopy cover (GLAMA application on Redmi Note 10 Pro) formed by large deciduous trees. The forest floor was covered with a thick layer of litter, fallen branches, and logs, and the soil was generally moist due to presence of nearby streams.

Ant colony characteristics

The nest of *Aphaenogaster* sp. consisted of more than 100 individuals. Colonies were non-parasitic and exhibited a compound colony structure without the division of major and minor caste in the workers. The nest was hypogaeic, located underground. This omnivorous species primarily forages within the subterranean layer or leaf litter, using both solitary and cooperative foraging strategies. The ants used debris to collect liquid food when provided with honey, demonstrating tool-use ability (Tripathy, 2025).

Figure 1. Habitat of the *Bensonies monticola* in HMTD forest

Figure 2. Different individuals of *Bensonies monticola* in their natural habitat: A) on the rock surface, B) on the underside of a dead and decaying log, C) within the crevices in bark of a standing tree, D) on a moss-covered log.

Figure 3. Different views of *Bensonies monticola*: A) ventral view and B) lateral view.

Figure 4. Defensive behaviour of *Bensonies monticola*: A) Initiation of frothy mucus secretion following intrusion by ants, B)-E) continuous secretion during the encounter.

Figure 5. Interaction between *Aphaenogaster* sp. and *Bensonies monticola*: A-D) *Aphaenogaster* sp. attempting to pop the frothy bubbles, E) an ant immobilized on the surface of snail, F-J) total mortality of ants after contact with the mucous secretion

Figure 6. *Bensonies monticola* surveying the area following completion of the interaction

3. Results & Discussion

In the study area, *Bensonies monticola* appeared to be a common species, occurring across multiple microhabitats within the HMTD forest (Fig. 1). Individuals were found on rock surfaces, beneath rocks, on tree bark, and inside decaying wood (Fig. 2 & 3). The majority occurred within decaying wood, where moisture levels were high but not overly wet or saturated. This is a similar kind of habitat for the *Aphaenogaster* sp. to make nest under these decaying logs. Which eventually suggests that there might be having frequent interactions between them in nature. The decayed wood was decomposing into soil, with many snails clinging to it at the interface of soil and wood. Additionally, several egg clutches were also documented in these habitats, indicating that decaying woods serves as an important oviposition site.

A unique interaction between *Bensonies monticola* and the ant species, *Aphaenogaster* sp., was observed, revealing an anti-predatory behaviour of the snail. During an excavation of a rock that sheltered an *Aphaenogaster* ant species nest, a resting *Bensonies monticola* was exposed. Upon disturbance, a large number of ants initiated an attack. In response, the snail secreted a frothy mucus around itself that entrapped the ants (Fig. 4). Several ants appeared to die almost immediately, while others were partially stuck or immobilized with appendages trapped and subsequently succumbed. Several ants attempted to rupture the frothy bubbles, but the mucus acted as a barrier, preventing them from reaching the snail's body (Fig. 5). Interestingly, the snail did not retreat into its shell; instead, it moved slowly around the disturbed site, leaving behind a conspicuous trail of froth (Fig. 6).

The defensive interaction between *Bensonies monticola* (shell diameter ~4 cm) and approximately 50 attacking *Aphaenogaster* sp. workers unfolded over approximately 7 minutes through a distinct sequence of behavioural and physiological responses. Upon exposure of the resting snail during rock excavation, ants immediately initiated a coordinated attack, which triggered instantaneous frothy mucus secretion that accumulated around the snail's body. The mucus secretion was continuous throughout the interaction, eventually covering an area of approximately 10 × 10 cm. Rather than employing passive shell retraction, the snail maintained an active defensive posture and moved deliberately at a constant, slow speed through the disturbed microhabitat, encircling the immediate area rather than retreating. This localized, circling locomotion meant that attacking ants repeatedly encountered the expanding mucus barrier as they pursued the snail (Fig. 6). As the frothy mucus layer accumulated and solidified, individual ants became progressively immobilized; approximately 20 ants became entrapped and subsequently died following mucus contact, while the remaining ~30 ants eventually retreated and escaped the interaction site (Fig. 4 & 5). No visible damage was observed on the snail's body following the interaction. After the attacking ants dispersed, the snail performed a distinct behavioural response: it made a U-turn and deliberately checked the surrounding area, apparently assessing whether additional threats remained before resuming normal activity. Notably, when the snail was manually handled after this post-attack reconnaissance behaviour, no defensive secretion was produced, indicating that the mucus response was specifically triggered by the *Aphaenogaster* predation threat rather than representing a generalized reaction to physical disturbance.

After the interaction concluded and the ants dispersed, the first author handled the snail and observed no further defensive secretion, unlike the behaviour reported for *Indrella ampulla* (Ariophantidae), which releases abundant defensive mucus secretions upon handling (Majhi et al., 2023). This absence of secretion under manual handling aligns with documented high energetic costs of defensive mucus production in terrestrial gastropods. In terrestrial gastropods, defensive secretion is associated with significant physiological costs, as mucus production directly links to body-water loss during locomotion (Cook, 2001). Experimental studies demonstrate that land snails and slugs increase movement and mucus production when exposed to chemical cues from predatory beetles, with these responses further accelerating water loss (Armsworth et al., 2005; Lefcort, Ben-Ami & Heller, 2006). The threat-avoidance hypothesis predicts context-dependent allocation of such costly defences, with organisms expected to deploy energetically expensive responses selectively in response to high-risk predation threats (Helfman, 1989; Mair and Port, 2002).

Unlike *Indrella ampulla*, *Bensonies monticola* did not exhibit mucus smearing behaviour on its shell. Instead, the frothy mucus secretion appears to serve as an effective barrier against ant predation specifically, rather than acting as a generalized deterrent.

Throughout this event, no debris was placed on the mucus by the ants. Typically, *Aphaenogaster* sp. exhibits a tool-use behaviour of covering liquid food with debris to soak it, then transporting it back to the nest (Tripathy, 2025; Lőrinczi, 2014). A similar behaviour was documented in a BBC Earth video (BBC Earth, 2019), where *Dorylus* sp. ants initially entrapped in the slug mucus they attempted to feed on. They later applied soil to absorb the slime, thereby bypassing the barrier and consuming the slug. Although this is not typical behaviour for *Dorylus* sp., they adapted to overcome the mucus barrier. In contrast, *Aphaenogaster* sp., for which debris-carrying is a characteristic foraging trait (Tripathy, 2025), did not attempt this strategy during the interaction with the snail. Similar observations were reported in Kenya, where *Dorylus nigricans* ants were deterred by a foamy secretion from a snail (Premaphotos, 2005), and similar ant-foamy secretion interactions have been observed between Carabidae beetles and snails (Němec and Horsák, 2019). Collectively, these observations suggest that frothy mucus secretion in land snails represents an adaptive mechanism specifically effective against arthropod predators such as ants and beetles.

4. Conclusion

This observation is notable as it represents the first documented ant-snail interaction involving *Bensonies monticola*, in which the snail employed frothy mucus as an anti-predatory defence, and only the second reported case of such a defence mechanism within the Ariophantidae family (after Majhi et al., 2023).

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Conflict of interest

The authors declare that they have no competing interests.

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Authors Contribution

Conceptualization: AT, APS, NKD; Methodology: AT, APS; Field investigation: AT; Identification: AT, HB, NKD; Formal analysis and morphometrics: AT; Data curation: AT; Visualization (figures): AT; Writing – original draft: AT, NKD; Writing – review & editing: AT, HB, NKD; Supervision: HB, APS.

References

Appleton, R.D., Palmer, A.R. (1988). Water-borne stimuli released by predatory crabs and damaged prey induce more predator-resistant shells in a marine gastropod. PNAS, 85(12), 4387–4391. doi:10.1073/pnas.85.12.4387

Armsworth, C.G., Bohan, D.A., Powers, S.J., Glen, D.M., Symondson, W.O.C. (2005). Behavioural responses by slugs to chemicals from a generalist predator. Animal Behaviour, 69, 805–811.

Barrientos, Z. (2020). A new aestivation strategy for land molluscs: hanging upside down like bats. UNED Research Journal, 12(1): e2802. doi:10.22458/urj.v12i1.2802

BBC Earth. (2019). Driver ants eat slug alive [video]. BBC Earth YouTube channel. Available from: https://www.youtube.com/watch?v=0YpDCt_IaNM (accessed on 2 Sep, 2025)

Carnegie Museum of Natural History. (2014). Land snail ecology - predators & defenses. Pittsburgh (PA): Carnegie Museum of Natural History. Available from: https://www.carnegiemnh.org/science/mollusks/predators.html (accessed on 2 Sep, 2025)

Champion, H.G., Seth, S.K. (1968). Revised survey of the forest type of India. New Delhi: Government of India Press. 404 p.

Cook, A. (2001). Behavioural ecology: on doing the right thing, in the right place at the right time. In: Barker GM, editor. The biology of terrestrial molluscs. Wallingford (UK): CABI Publishing. p. 447–487.

Deepa, M. (2022). Snails, foam and froth…bubbles are not always champagne! Natural History. Available from: https://naturalhistory.in/snailsbubbles-foam-and-froth-its-not-all-champagne/ (accessed on 2 Sep, 2025)

Gould, J., Valdez, J.W., Upton, R. (2019). Adhesive defence mucus secretions in the red triangle slug (*Triboniophorus graeffei*) can incapacitate adult frogs. Ethology. 125(8), 587–591. doi:10.1111/eth.12875

Helfman, G.S. (1989). Threat-sensitive predator avoidance in damselfish-trumpetfish interactions. Behavioral Ecology and Sociobiology, 24, 47–58.

Heller, J. (2015). What is a snail? In: Sea snails. Cham: Springer. doi:10.1007/978-3-319-15452-7_2

Hoso, M. (2012). Cost of autotomy drives ontogenetic switching of anti-predator mechanisms under developmental constraints in a land snail. Proceedings B, 279, 4811–4816. doi:10.1098/rspb.2012.1943

Hoso, M., Hori, M. (2008). Divergent shell shape as an antipredator adaptation in tropical land snail. The American Naturalist, 172(5), 726–732. doi:10.1086/591681

Hutton, T., Benson, W.H. (1838). On land and fresh-water shells of the western Himálaya. The Journal of Asiatic Society of Bengal, 7, 211–218.

Hyman, L.H. (1967). The invertebrates: Mollusca 1. Vol. VI. New York: McGraw-Hill.

Jaremovic, R., Rollo, C.D. (1979). Tree climbing by the snail *Cepaea nemoralis* (L.): a possible method for regulating temperature and hydration. Canadian Journal of Zoology, 57(5), 1010–1014. doi:10.1139/z79-128

Lefcort, H., Ben-Ami, F., Heller, J. (2006). Terrestrial snails use predator-diet to assess danger. Journal of Ethology, 24, 97–102.

Liew, T.S., Schilthuizen, M. (2014). Association between shell morphology of micro-land snails (genus *Plectostoma*) and their predator's predatory behaviour. PeerJ. 2, e329. doi:10.7717/peerj.329

Lőrinczi, G. (2014). Some notes on the tool-using behaviour of the ant, *Aphaenogaster subterranea* (Hymenoptera: Formicidae). Tiscia. 40, 17–24.

Mair, J., Port, G.R. (2002). The influence of mucus production by the slug, *Deroceras reticulatum*, on predation by *Pterostichus madidus* and *Nebria brevicollis* (Coleoptera: Carabidae). Biocontrol Science and Technology, 12(3), 325–335. doi:10.1080/09583150220128112

Majhi, K., Sil, M., Datta-Roy, A. (2023). A novel anti-predatory mechanism in *Indrella ampulla* (Gastropoda: Ariophantidae). Journal of Threatened Taxa. 15(8), 23819–23821. doi:10.11609/jott.8309.15.8.23819-23821

Morii, Y., Prozorova, L., Chiba, S. (2016). Parallel evolution of passive and active defence in land snails. Scientific Reports, 6, 35600. doi:10.1038/srep35600

Naranjo-García, E. (2003). Moluscos continentales de México: terrestres. Revista de Biologia Tropical, 51(Suppl. 3), 483–493.

Narayanan, S., Aravind, N.A. (2021). Observations on natural diet and reproductive behaviour of an endemic snail *Indrella ampulla* (Benson 1850) (Gastropoda: Ariophantidae) from the Western Ghats, India. Journal of Natural History, 55(47-48), 2961–2972. doi:10.1080/00222933.2022.2032857

Naskrecki, P. (2013). African Tuesday: beware of the snail. The Smaller Majority. Available from: https://thesmallermajority.com/2013/03/05/african-tuesday-beware-of-the-snail/ (accessed on 2 Sep, 2025)

Němec, T., Horsák, M. (2019). Specific damage recognised on land snail shells as a tool for studying predation intensity: differences related to habitat and predator types. Contributions to Zoology, 88(3), 277–296. doi:10.1163/18759866-20191402

Pakarinen, E. (1994). The importance of mucus as a defence against carabid beetles by the slugs *Arion fasciatus* and *Deroceras reticulatum*. Journal of Molluscan Studies, 60(2), 149–155. doi:10.1093/mollus/60.2.149

Pascoal, S., Carvalho, G., Creer, S., Mendo, S., Hughes, R. (2012). Plastic and heritable variation in shell thickness of the intertidal gastropod *Nucella lapillus* associated with risks of crab predation and wave action, and sexual maturation. PLoS One, 7(12), e52134. doi:10.1371/journal.pone.0052134

Pholyotha, A., Yano, D., Mizuno, G., Baba, Y., Hanamura, N., Sutcharit, C., Jirapatrasilp, P., Schilthuizen, M., Hirano, T. (2023). A new discovery of the bioluminescent terrestrial snail genus *Phuphania* (Gastropoda: Dyakiidae). Scientific Reports, 13, 15137. doi:10.1038/s41598-023-42364-y

Pollard, E. (1975). Aspects of the ecology of *Helix pomatia* L. Journal of Animal Ecology, 44(1), 305–329. doi:10.2307/3865

Pomeroy, D.E. (1968). Dormancy in the land snail, *Helicella virgata* (Pulmonata: Helicidae). Australian Journal of Zoology, 16(5), 857–869. doi:10.1071/zo9680857

Premaphotos/Nature Picture Library. (2005). Driver ants (*Dorylus nigricans*) attack shelled snail which defends itself by producing foam, Kenya. Available from:

https://www.naturepl.com/stock-photo-driver-ants-dorylus-nigricans-attack-shelled-snail-which-defends-image01089799.html (accessed on 2 Sep, 2025)

Prior, D.J. (1985). Water-regulatory behaviour in terrestrial gastropods. Biological Reviews, 60(3), 403–424. doi:10.1111/j.1469-185X.1985.tb00423.x

Rosin, Z.M., Kobak, J., Lesicki, A., Tryjanowski, P. (2013). Differential shell strength of *Cepaea nemoralis* colour morphs—implications for their anti-predator defence. Naturwissenschaften, 100, 843–851. doi:10.1007/s00114-013-1084-8

Sato, N., Yoshikawa, A. (2024). Function of snail shell hairs in anti-predator defense. The Science of Nature, 111, 13. doi:10.1007/s00114-024-01901-z

Tripathy, A. (2025). The tool makers of the Himalayas. Science Reporter. September issue, 56-57.

Velkova, L., Dolashki, A., Petrova, V., Pisareva, E., Kaynarov, D., Kermedchiev, M., Todorova, M., Dolashka, P. (2024). Antibacterial properties of peptide and protein fractions from *Cornu aspersum* mucus. Molecules, 29(12), 2886. doi:10.3390/molecules29122886

Vermeij, G.J. (1987). Evolution and escalation. Princeton: Princeton University Press.

Vermeij, G.J. (1993). A natural history of shells. Princeton: Princeton University Press.

Withers, P., Pedler, S., Guppy, M. (1997). Physiological adjustments during aestivation by the Australian land snail *Rhagada tescorum* (Mollusca: Pulmonata: Camaenidae). Australian Journal of Zoology, 45(6), 599–611.