



First Report of Invasive Alien Species of Slug *Laevicaulisharoldi* in Nepalgunj Sub-Metropolitan City, Banke, Nepal

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Abstract

Laevicaulis haroldi Dundee, 1980 has been documented for the first time in Nepal in October 2023. It is a native species to KwaZulu-Natal, South Africa. This invasive alien species was observed in the author's back yard kitchen garden, and garden of Mahendra Multiple Campus Nepalgunj sub-metropolitan city of Banke district, Lumbini Province, during farm work. The animal was closely inspected for 12 months and total 34 specimens, measuring an average of 4 ± 1.5 cm, were collected and confirmed as *Laevicaulis haroldi*, which is commonly known as Purcell's hunter slug or Caterpillar slug. The species is a new fauna to Nepal and the present status of this invasive species is unknown in the country.

Keywords: Colonize, First report, Invasive, *Laevicaulis haroldi*, Threats.

Introduction

Invasive alien species (IAS) are a major threat to ecosystem services, human health, economy, and biodiversity¹. Non-native terrestrial slug species are widely distributed globally² and new colonies of non-native alien slugs are constantly being recorded in different countries. The percentage of species of terrestrial snails is approximately 6% on Earth³. Nepal supports the occurrence of 138 species of terrestrial gastropods, 34 of which are new to Nepal⁴, and these are recorded from different parts such as Jhapa district of Nepal⁵. 39 species of mollusks have been reported from Shivapuri-Nagarjun National Park of Nepal representing 2 orders, 12 families, and 21 genera⁶. 9 species of mollusks have been documented from Nepal⁷ including *Laevicaulis alte* (black slug). 9 alien species of mollusks have been identified in Nepal^{8,9} (Table-1). According to Budha⁴, it is widely accepted that one of the main causes of the loss of biodiversity is the impact of Invasive Alien Species.

Laevicaulis haroldi is a member of the family Veronicellidae. It is a terrestrial slug that is a native species to the Kwa Zulu-Natal region of South Africa and the name is given after¹⁰. It is also called Purcell's Hunter Slug or caterpillar slug because it resembles the caterpillar of the Arthropods. This invasive alien species was first reported outside of its original habitat area in Maharashtra of India¹¹.

Later Mahapatra & Aravind¹ reported the species also from Karnataka, Tamil Nadu, Gujarat, Uttar Pradesh, Rajasthan and West Bengal of India. Since most slug species are poorly documented, new species added to faunal list of the nation sometimes go unnoticed until their establishment¹².

It is hopeful that this information about the increasing incidence of invasive faunal species in Nepal and their effects will be helpful to researchers, conservationists, policymakers, and students in future.

Materials and Methods

When I noticed the animal first time in October 23, I closely observed for 12 months since October 23 to September 2024 in its recorded habitat i.e., in backyard kitchen garden to study harms on plants of vegetables and fruits. Slugs have also been collected from the garden foliage by hand-picking and manual searching. The moist areas close to the structures at morning before sunshine were the main focus of the animal search. Collected animals were photographed using a Redmi 7 pro-Android cellphone and killed by asphyxiation in freshwater. The freshly dead animals were preserved in a 10% formalin solution and deposited in the museum of the Department of Zoology, Mahendra Multiple Campus, Nepalgunj, Nepal. Collected specimens were identified after¹⁰. The species was confirmed based on their morphological characteristics. The colour of mantle, lateral stripes, foot sole, tentacles, ommatophores were key morphological characteristics used for identification of the species.

Results and Discussion

The *Laevicaulis haroldi* was recorded first time from Banke Gaun (28°2'53.53"N; 81°37'17.85"E), and Mahendra Multiple Campus (28.03°51.52"N; 81.61°05.56"E) Nepalgunj sub-metropolitan city, Lumbini Province, Nepal. Its common name is Purcell's hunter slug, Caterpillar slug.

The recorded location was at the elevation of 150m from the sea level and average annual precipitation 1, 172mm. The species is native to KwaZulu-Natal, South Africa and is endangered under

IUCN Red list¹³. However, it is invasive species in Asian countries like India and was reported first time in 2015.

Table-1: List of alien and invasive species of mollusks in Nepal.

Order/Family/Zoological Name	Common Name	Introduced in Nepal (Yr.)
Class: Sastropoda		
Order: Stylommatophora (Terrestrial snails and slugs)		
Family: Agriolimacidae		
1. <i>Deroceras leave</i>	The Marsh Slug	Unknown
Family: Achatinidae		
2. <i>Lissachanina fulica</i>	African Giant Land Snail	1930s-40s
Family: Streptaxidae		
3. <i>Gulella bicolor</i>	Two-toned gulella	Unknown
Family: Veronicellidae		
4. <i>Laevicaulis alte</i>	The Veronicellid Slug	Unknown
Order: Architaenio Glossa		
Family: Ampullariidae		
5. <i>Pomacea canaliculata</i>	The Golden Apple Snail	Not confirmed
Order: Basommatophora		
Family: Lymnaeidae		
6. <i>Pseudosuccinea columella</i>		Unknown
Family: Planorbidae		
7. <i>Planorbarius corneous</i>		Unknown
Order: Viviparoidea		
Family: Viviparidae		
8. <i>Filopaludina sumatrensis</i>		Unknown
9. <i>Viviparus</i> sp.		Unknown



Figure-1: *Laevicaulis haroldi*. Dorsal (left) and Ventra surface with creeping sole (right).



Figure-2: *Laevicaulis haroldi*; Resting (Left), hyponotum and ommatophores (Middle) and on debris of grain (Right)

Characteristic Features: After I first time observed this species in Banke Gaun and Mahendra Multiple Campus, I collected a total of 34 specimens and measured. The average length of collected sample was 4 ± 1.5 cm. The body was oval with a whitish brown or yellowish colour mantle, white irregular lateral stripes, and the structure is wrinkled like a caterpillar (Figures-1 and 2). Blackish-brown pigmentation observed on the anterior and posterior ends of the mantle. Patchy white dots were present in the creamy white hyponotum. The foot sole was extremely narrow, less than half the breadth of the hyponotum, and grayish white (Figure-2). Lower tentacles were translucent white, whereas upper ommatophores were brown with an eyespot at the tip (Figure-2).

Ecology and Behavior: I recorded the behavioral characters of this species for 4 months. I found the species *L. haroldi* is nocturnal that feeds and moves around at night to avoid direct sunlight and hides after sunshine. It remains buried under bricks, logs, leaf litter, or other moist, cool places during the day. It was observed on leaves of ridged gourd, lady's finger, cauliflower, etc., and more frequently during morning of humid rainy and autumn seasons. It is herbivorous and observed staying on leaves of variety of plants, fruits and debris of grains (Figure-2). No serious harm on plants, fruits and vegetables in the garden was noticed by the *Laevicaulis haroldi* throughout study period but, it plays a significant role in the decomposition process and nutrient cycle.

Status: According to Mahapatra & Aravind¹ and Magare¹¹, outside its natural range, the species was first reported in Maharashtra state, and now well established in different states of India.

Discussion: This newly recorded species in Nepalgunj might be due to accidental invasion from Indian border. Accidental and deliberate introduction of species are posing major threats to regional biodiversity¹⁴ across the globe. Till date its distribution in other parts of Nepal is unknown, however, its presence in Nepalgunj might be dispersion with extensive movement of people¹⁵⁻¹⁸. Many terrestrial slugs are found globally in a wide range of habitats, from temperate to tropical areas¹⁹. The alien

species disperse globally by means of a range of paths, carriers, and vehicles²⁰. Nepal and India have open border relationship, and import of vegetables and fruits from India are massive. Research reports have indicated that the agricultural business is a major factor in the spread of invasive species²¹, and is the primary vector²² of these invasive slugs. Therefore, this area might be potential suitable area where the invasion of this species was significantly influenced by precipitation. This species harms mulberry bushes²³, affecting the nutritional contents of the plant¹¹, and it might be potential invasive species with destructive nature in Nepal. It consumed leaves of ridge gourd, lady's finger and cauliflower. Despite terrestrial slugs distributed globally in different habitats, alien and invasive terrestrial slugs of Nepal have been poorly investigated. The *Laevicaulis haroldi* has greater probability of dispersion and colonization in different Mid-hilly and Tarai districts of Nepal. Under prediction of Mahapatra & Aravind¹, because of change in climate the species will be found in greater abundance in various states in North East India, West Bengal, Bihar, Odisha, Karnataka, and Maharashtra.

Conclusion

The discovery of invasive *Laevicaulis haroldi* in the Nepalgunj sub-metropolitan city marks the invasion of this species to the Nepal. Its invasion in Nepal raises concerns regarding its potential impact on local biodiversity, agriculture, and ecosystems, particularly due to its invasive nature and adaptability to moist environments. As an herbivore with a role in the decomposition process, *Laevicaulis haroldi* could affect nutrient cycles, but it also poses a threat to certain crops and plants. It has greater chance of dispersion and colonization in Nepal. Therefore, further research needed to understand its reproductive ecology, population dynamics, and broader ecological effects in Nepal.

References

1. Mahapatra, B. B. and Aravind, N. (2021). *Laevicaulis haroldi* (Veronicellidae: Gastropoda), a potential future

- invader to India. *Current Science* (00113891), 120(11). <https://doi.org/10.18520/cs/v120/i11/1781-1785>
2. Rowson, B., Herbert, D. G., & Robertson, E. F. (2016). First reports of two terrestrial slugs (Gastropoda: Eupulmonata) from Southern Africa. *Journal of Conchology*, 42(3), 11-15. <https://doi.org/10.3897/zookeys.723.21817>
3. Clark, J. A. and May, R. M. (2002). Taxonomic bias in conservation research. *Science*, 297(5579), 191-192. <https://doi.org/10.1126/science.297.5579.191b>
4. Budha, P. B. (2015). Current state of knowledge on invasive and alien fauna of Nepal. *Journal of Institute of Science and Technology*, 20(1), 68-81. <https://doi.org/10.3126/jist.v20i1.13913>
5. Subba, B. R. (2003). Molluscan Check list of Ghodaghodi Tal Area, Kailali district. *Our Nature*, 1(1), 1-2. <https://doi.org/10.3126/on.v1i1.294>
6. Khanal, S. and Budha, P. B. (2013). Terrestrial gastropod fauna of Nagarjun forest, Shivapuri-Nagarjun National Park, Kathmandu, Nepal. *Journal of Institute of Science and Technology, Tribhuvan University*, 18(1), 113-119.
7. Subba, B. R. and Ghosh, T. K. (2008). Report on some terrestrial molluscs from different regions of Nepal. *Journal of Natural History Museum*, 23, 78-81. <https://doi.org/10.3126/jnhm.v23i0.1842>
8. Budha, P. B. and Naggs, F. (2008). The giant African land snail *Lissachatina fulica* (Bowdich) in Nepal. *The Malacologist*, 50, 19-21.
9. Irikov, A. and Bechev, D. (2011). Five new introduced snail species (Mollusca: Gastropoda) in Nepal. *Journal of Conchology*, 40(5), 575.
10. Dundee, D. (1980). *Laevicaulis haroldi*, a new veronicellid slug from Natal, South Africa (Gastropoda: Pulmonata). *The Nautilus*, 94(3), 118-120. <https://doi.org/10.5962/bhl.part.25834>
11. Magare, S. (2015). New record of exotic species of slug, *Laevicaulis haroldi* in India. *Records of the Zoological Survey of India*, 115(1), 105-107. <https://doi.org/10.26515/rzsi.v115/i1/2015/121575>
12. Rowson, B., Anderson, R., Turner, J. A., & Symondson, W. O. (2014). The slugs of Britain and Ireland: undetected and undescribed species increase a well-studied, economically important fauna by more than 20%. *PloS one*, 9(4), e91907. <https://doi.org/10.1371/journal.pone.0091907>
13. Herbert, D. (2013). *Laevicaulis haroldi*. The IUCN Red List of Threatened Species. <https://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T40089A50080884.en>
14. Lowry, E., Rollinson, E. J., Laybourn, A. J., Scott, T. E., Aiello-Lammens, M. E., Gray, S. M., Mickley, J., & Gurevitch, J. (2013). Biological invasions: a field synopsis, systematic review, and database of the literature. *Ecology and evolution*, 3(1), 182-196. <https://doi.org/10.1002/ece3.431>
15. Alonso, A., Castro-Diez, P., Saldana-Lopez, A., & Gallardo, B. (2019). The New Zealand mud snail *Potamopyrgus antipodarum* (JE Gray, 1853) (Tateidae, Mollusca) in the Iberian Peninsula: temporal patterns of distribution. *BioInvasions Record*, 8(2). <https://doi.org/10.3391/bir.2019.8.2.11>
16. Cowie, R. H., Hayes, K. A., Tran, C. T., & Meyer III, W. M. (2008). The horticultural industry as a vector of alien snails and slugs: widespread invasions in Hawaii. *International Journal of Pest Management*, 54(4), 267-276. <https://doi.org/10.1080/09670870802403986>
17. Hirano, T., Yamazaki, D., Uchida, S., Saito, T., & Chiba, S. (2019). First record of the slug species *Semperula wallacei* (Issel, 1874) (Gastropoda: Eupulmonata: Veronicellidae) in Japan. *BioInvasions Record*, 8(2). <https://doi.org/10.3391/bir.2019.8.2.07>
18. Serniotti, E. N., Guzmán, L. B., Beltramino, A. A., Vogler, R. E., Rumi Macchi, A., & Peso, J. G. (2019). New distributional records of the exotic land snail *Bradybaena similaris* (Férussac, 1822) (Gastropoda, Bradybaenidae) in Argentina. <https://doi.org/10.3391/bir.2019.8.2.12>
19. Barker, G. (2001). Gastropods on land: phylogeny, diversity and adaptive morphology. <https://doi.org/10.1079/9780851993188.0001>
20. Ruiz, G.M. and Carlton, J.T. (2003). Invasion Vectors: A Conceptual Framework for Management. *Invasive Species: Vectors and Management Strategies*, 459-504. ISBN:1-55963-902-4
21. Dehnen Schmutz, K., Touza, J., Perrings, C., & Williamson, M. (2007). A century of the ornamental plant trade and its impact on invasion success. *Diversity and Distributions*, 13(5), 527-534. <https://doi.org/10.1111/j.1472-4642.2007.00359.x>
22. Cowie, R.H. and Robinson, D. G. (2003). Pathways of introduction of nonindigenous land and freshwater snails and slugs. <https://www.cabidigitallibrary.org/doi/full/10.5555/20043133970>
23. Avhad, S., Shinde, K., & Hiware, C. (2013). Record of molluscan pests in mulberry gardens in Aurangabad district of Maharashtra State, India. *Indian Journal of Sericulture*, 52(1), 29-33.