

OPEN ACCESS

The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.



Journal of Threatened Taxa

Building evidence for conservation globally

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

NOTE

A REPORT ON THE POSSIBLE INTERBREEDING BETWEEN GRIZZLED GIANT SQUIRREL *RATUFA MACROURA* AND INDIAN GIANT SQUIRREL *RATUFA INDICA* FROM CHINNAR WILDLIFE SANCTUARY IN THE SOUTHERN WESTERN GHATS, INDIA

Kiran Thomas, D.K. Vinodkumar, Jomals Mathews John, M. Shaji & P.O. Nameer

26 December 2018 | Vol. 10 | No. 15 | Pages: 13024–13028

10.11609/jott.3995.10.15.13024-13028



For Focus, Scope, Aims, Policies and Guidelines visit <https://threatenedtaxa.org/index.php/JoTT/about/editorialPolicies#custom-0>

For Article Submission Guidelines visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions#onlineSubmissions>

For Policies against Scientific Misconduct visit <https://threatenedtaxa.org/index.php/JoTT/about/editorialPolicies#custom-2>

For reprints contact info@threatenedtaxa.org

Partners



صندوق محمد بن زايد
للمحافظة على
الكائنات الحية
The Mohamed bin Zayed
SPECIES CONSERVATION FUND



zooh!
ZÜRICH

Member



Publisher & Host





ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

OPEN ACCESS



Natural hybridisation events are recorded in many mammalian orders across the world. Schwartz (1980) reported more than 400 hybrids in mammals and many of them were fertile. Natural hybridisation among mammals, however, is less understood than that in other vertebrates. The possible evolutionary consequences of hybridisation between sympatric species are scarcely studied as such hybridisation was thought to be extremely rare until recently (Ermakov et al. 2002). The role of hybridisation and introgression in determining plant diversity was widely studied but little information is available on the effects of these on animal diversification (Dowling & Secor 1997).

Hybrid animal taxa are rarely reported worldwide. Careful testing of the reported hybrid should be done to understand its population viability. According to Dowling & Secor (1997), hybridisation leads to instantaneous creation of several unique complexes of polyploid and unisexual animals.

Two species of the giant squirrels are seen in the Western Ghats, *Ratufa indica* and *R. macroura*. The former is more widespread in distribution (Borges 2015) while the latter is confined only to a few sites (Joshua 1992; Babu & Kalaimani 2014). Though the distribution of these two giant squirrels mostly does not overlap, they do occur in close proximity at a few places. One such place is the Palani Hills in Tamil Nadu where they occur at different elevations (Moore & Tate 1965;

A REPORT ON THE POSSIBLE INTERBREEDING BETWEEN GRIZZLED GIANT SQUIRREL *RATUFA MACROURA* AND INDIAN GIANT SQUIRREL *RATUFA INDICA* FROM CHINNAR WILDLIFE SANCTUARY IN THE SOUTHERN WESTERN GHATS, INDIA

**Kiran Thomas¹ , D.K. Vinodkumar² ,
Jomals Mathews John³ , M. Shaji⁴ &
P.O. Nameer⁵**

^{1,4,5} Centre for Wildlife Studies, College of Forestry, Kerala Agricultural University, Thrissur 680656, Kerala, India
² UNESCO C2C for Asia & Pacific Region, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand 248001, India
³ GIS Analyst, Lincoln GIS District Office, 105 W Texas Ave, Ruston, Louisiana, 71270 USA
¹ kiranzthomas@gmail.com, ² dkvinod@gmail.com,
³ jomalsjohn@gmail.com, ⁴ shaji.mohan@kau.in,
⁵ nameer.po@kau.in (corresponding author)

Agarwal & Chakraborty 1979).

Morphology of the two species of giant squirrels in the Western Ghats

Indian Giant Squirrel *Ratufa indica*: The Indian or the Malabar Giant Squirrel is a squirrel of varying pelages whose back is a mixture of maroon and black with cream or buff underparts. Two subspecies occur in the Kerala part of the Western Ghats, namely *R. i. indica* seen north of the Palakkad Gap and *R. i. maxima* (Image 1) that is seen south of the Palakkad Gap. *Ratufa indica indica* is completely maroon on its back and ears, with

DOI: <https://doi.org/10.11609/jott.3995.10.15.13024-13028> | **ZooBank:** urn:lsid:zoobank.org:pub:DB10328E-C069-481A-A4C3-71B2AE049517

Editor: Justus Joshua, Green Future Foundation, Trichy, India.

Date of publication: 26 December 2018 (online & print)

Manuscript details: Ms # 3995 | Received 03 January 2018 | Final received 10 September 2018 | Finally accepted 20 November 2018

Citation: Thomas, K., D.K. Vinodkumar, J.M. John, M. Shaji & P.O. Nameer (2018). A report on the possible interbreeding between Grizzled Giant Squirrel *Ratufa macroura* and Indian Giant Squirrel *Ratufa indica* from Chinnar Wildlife Sanctuary in the southern Western Ghats, India. *Journal of Threatened Taxa* 10(15): 13024–13028; <https://doi.org/10.11609/jott.3995.10.15.13024-13028>

Copyright: © Thomas et al. 2018. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: Kerala Agricultural University (KAU).

Competing interests: The authors declare no competing interests.

Acknowledgements: The authors would like to thank the Chief Wildlife Warden, Kerala State Forest Department, for the study permit (WL10-947/2013). We also thank the Kerala Agricultural University (KAU) for the financial support for the conduct of the research. The Dean, College of Forestry, KAU, is also thanked for the encouragement and support.



**भारतीय वन्यजीव संस्थान
Wildlife Institute of India**



Image 1. Indian Giant Squirrel *Ratufa indica*



Image 2. Grizzled Giant Squirrel *Ratufa macroura*

a pale cream venter and pale face and tail tip. *Ratufa indica maxima* is similar to *R. i. indica* except for its black saddle across its shoulders, darker maroon on its dorsal side, and uniformly black and brown tail with no pale tip (Menon 2014; Borges 2015).

Grizzled Giant Squirrel *Ratufa macroura*: Also known as the Sri Lankan Giant Squirrel, this species is brownish-grey in colour. Its pale hair tips give it a grizzled look. The underside is dirty white and the ears, crown, and dorsal midline are dark brown or black (Image 2). It has three subspecies of which *R. m. dandolena*, the one that occurs in the Western Ghats, is the smallest of the giant squirrels in India. The ears are short and brown and the tail has long pale hairs making it look greyish compared to the tails of the other subspecies (Menon 2014). The cheeks are buff with small dark areas corresponding to the blackish cheek patches in the other two Indian *Ratufa* species. It has prominent black to grey or dark brown patches on the forehead and shoulders. The nose is pinkish and the ears are devoid of tufts of hair as in *R. indica* (Joshua & Johnsingh 2015).

We present here two instances of possible hybridisation between *R. indica* and *R. macroura*, observed in 2007 and 2014 from the Anjanad Valley in the Kerala part of the Western Ghats. The Anjanad Valley forms part of the Anamalai Hills of the Western Ghats and is one of the three locations in Kerala where the eastern slopes of the ghats fall within the Kerala State. It has a rain shadow effect, as some of the highest reaches and the broadest stretches of the Western Ghats lie immediately to its west (Nair 1992).

Along the eastern edge of the Anjanad Valley lies the Chinnar Wildlife Sanctuary. It is located 18km north of Marayur in the Idukki District of Kerala State. It is located between 10.25–10.35 °N & 77.08–77.26 °E and has a

total area of 90.44km² (Fig. 1). The Munnar-Udumalpet Road, SH 17, passes through the sanctuary for 16km and bisects it into almost equal portions. It is contiguous with Eravikulam National Park to its south and Indira Gandhi Wildlife Sanctuary to its north. It forms an integral part of the 1,187km² block of protected forests straddling the Kerala-Tamil Nadu border in the Anamalai Hills.

The terrain is undulating with hills and hillocks of varying heights. The altitude ranges from 400m at Chinnar to 2,372m at Nandamalai. The major peaks in the sanctuary are Varayattumalai (1,845m), Thengamalai (1,422m), Vellakkalmalai (1,883m), Jambumalai (1,395m), Aralipana (1,494m). The area is drained by two perennial rivers passing through the sanctuary, namely Chinnar and Pambar. During the northeastern monsoon that brings the major rains in the Anjanad Valley, a few ephemeral water sources take origin from the higher mountains and drain the area. The entire valley remains dry for the rest of the season.

The vegetation varies from sub-temperate sholas on the mountains to dry scrub in the arid plains. The vegetation of the sanctuary can be broadly classified into the following types according to Champion & Seth (1968): southern tropical thorn forest (scrub jungle), southern dry mixed deciduous forest (dry deciduous forest), southern moist mixed deciduous forest (moist deciduous forest), tropical riparian fringing forest (riparian forest), southern montane wet temperate forest (hill shola forest), and southern montane wet grassland (grassland). The dominant vegetation is dry deciduous forest followed by scrub forest. Together they constitute about 50% of the total forest area, which is located in the low altitude areas. The riparian fringing forests are linearly distributed along the hill folds and occupy a small area. Shola forests occupy a tiny fraction



Image 3. The Indian Giant Squirrel and the Grizzled Giant Squirrel staring each other after the copulation at Marayur Forest Division in Kerala, southern India



Image 4. The Indian Giant Squirrel chasing the Grizzled Giant Squirrel at Marayur RF

of the total area.

First instance: On 13 May 2007, we came across an interesting interaction between *R. indica* and *R. macroura* near the forest office of Marayur Forest Division. In this area, *R. i. maxima* has been seen beside a dried stream in a dry deciduous forest patch adjacent to the Chinnar WS. Interestingly, Marayur Reserve Forest is a place where *R. macroura* is only occasionally seen.

Two male *R. indica* were found combating for a female *R. macroura*. During the course of the combat, one of the individuals of the *R. indica* fell to the ground from a height of about 5m. The other *R. indica* then followed the *R. macroura* and was observed mounting her after a while. This event happened on a *Terminalia bellirica* tree at a height of about 10m. The copulation lasted only for a few seconds and when separated, they stared at each other for some time (Image 3). The *R. indica* male then continued following the *R. macroura*, presumably for another attempt to mount. The subsequent attempts, however, were unsuccessful as the *R. macroura* resisted the attempts and chased the *R. indica* away. Later, both chased each other and were seen running around for about 2½ hours, almost non-stop (Image 4).

Second instance: During our studies on *R. macroura* at Chinnar WS in 2013–14, we came across at least three to four different individuals with aberrant coat colour, which appeared to be the hybrids between *R. indica* and *R. macroura* (Images 5–7), which is about 17% of the total population of Grizzled Giant Squirrel

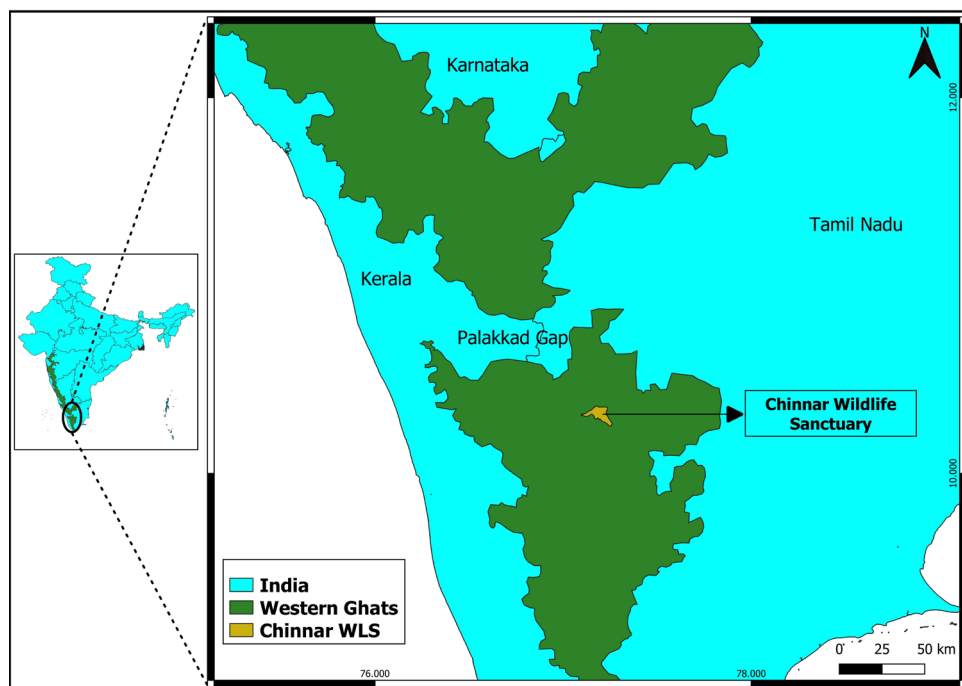


Figure 1. Study area - Chinnar Wildlife Sanctuary

Table 1. The details on the encounter of the suspected hybrids of *Ratufa indica* and *R. macroura* at Chinnar Wildlife Sanctuary in the southern Western Ghats

	Date of observation	Location
1	10.viii.2013	Chinnar checkpost
2	9.xi.2013	Churulipetti
3	23.i.2014	Along the stretch of Chinnar to Churulipetti streams
4	14.iii.2014	Koottar
5	1.iv.2014	Churulipetti
6	13.v.2007	Near the District Forest Office of Marayur Forest Department

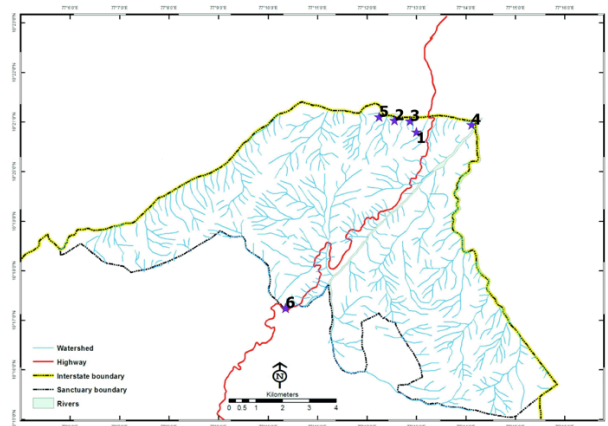


Figure 2. The locations where the hybrid individuals were sighted in Chinnar WS, southern India



Image 5. A hybrid between Indian and Grizzled Giant Squirrel in the Churulipetti area of Chinnar WS, Kerala, southern India

(Thomas & Nameer 2018). There were five instances between August 2013 and April 2014 (Table 1) when we encountered the suspected hybrid individuals at the



Image 6–7. 6 - Hybrid individuals between GGS and IGS showing varying pelage colour; 7 - Hybrid individual between GGS and IGS

sanctuary, the locations of which were mapped (Fig. 2). The general structure of the pelage colour of these hybrids was a mixture of both *R. indica* and *R. macroura*. We could, however, observe three different pelage patterns among the hybrid individuals. In one case, the pelage looked similar to that of *R. indica*, excepting the creamy white underparts and the cheeks, which were brown to chocolate brown in colour and the tail has chestnut tinge (Image 5). The second type of pelage looked similar to that of *R. macroura*, excepting that the grizzled upper part of the individual appeared brown to black in color (Image 6). The third type of pelage encountered was similar to that of the darker form of *R. indica* but the tail, instead of being completely black, had a pale tip (Image 7), a character similar to that of *R. i. indica*.

There was a previous instance of interbreeding between *R. indica* and *R. macroura* where seven hybrid

individuals were reported at Srivilliputhur Grizzled Giant Squirrel Sanctuary in Tamil Nadu, southern India (Joshua 1992). Joshua (1996) opined that the *R. macroura* was pushed towards the foothills of the Ayyanarkoil Valley in Grizzled Giant Squirrel Sanctuary, where *R. indica* exists. He further noted that the habitat shift in *R. macroura* was due to habitat degradation.

Ratufa indica was historically unknown in the Chinnar WS. The nearest known distribution of *R. indica* is in the Marayur RF, located towards the southwestern part of the Chinnar WS. Similarly, *R. macroura* was also not known from any habitat outside the riverine forests of Chinnar and Pambar rivers and their tributaries in Kerala. Over the last one decade or so, however, there were occasional sightings of *R. macroura* from the Marayur RF. These sightings became more frequent and regular since then. These range expansions of *R. macroura* to hitherto unknown sites could be due to the disturbances in its riverine habitats at Chinnar WS (Thomas & Nameer 2018). The expansion of the range of *R. macroura* into that of *R. indica* enable them to interact closely, thus leading to interbreeding.

It would be interesting to know whether these hybrids are fertile or not. Detailed investigation on the status of the hybrid individuals, exact reasons for hybridisation, and a study on the genetics of the *R. macroura* need to be undertaken at the Chinnar WS to find out the genetic purity of this species. The mixup and hybridisation between *R. macroura* and *R. indica* should be monitored to find out its effect on the long-term survival of the *R. macroura*, which has a restricted distribution and a Near Threatened species (Joshua et al. 2008). The interbreeding could be a challenge to the long-term conservation of *R. macroura* at Chinnar WS. At this juncture, it is noteworthy to recall the local extinction of the native Red Squirrel *Sciurus vulgaris* by the introduced Grey Squirrel *Sciurus carolinensis* in southern and northern England (Lloyd 1983; Reynolds 1985).

References

- Agarwal, V.C. & S. Chakraborty (1979). Taxonomic notes on some Oriental squirrels. *Mammalia* 43(2): 161–172.
- Babu, S. & A. Kalaimani (2014). New site record of Grizzled Giant Squirrel *Ratufa macroura* from Thiruvannamalai Forest Division, Eastern Ghats, Tamil Nadu, India. *Journal of Threatened Taxa* 6(2): 5492–5493; <https://doi.org/10.11609/JoTT.o3680.5492-3>
- Borges, R.M. (2015). Indian Giant Squirrel (*Ratufa indica*), pp483–500. In: Johnsingh, A.J.T & N. Manjrekar (eds.). *Mammals of South Asia, Vol. II*. The University Press (India) Private Ltd., Hyderabad, India, 720pp.
- Champion, H.G. & S.K. Seth (1968). *A Revised Survey of the Forest Types of India*. Government of India Press, Delhi, 404pp.
- Dowling, T.E. & C.L. Secor (1997). The role of hybridization and introgression in the diversification of animals. *Annual Review of Ecology and Systematics* 28: 593–619.
- Ermakov, O.A., V.L. Surin, S.V. Titov, A.F. Tagiev, A.V. Luk'yanenko & N.A. Formozov (2002). A molecular genetic study of hybridization in four species of ground squirrels (Spermophilus: Rodentia, Sciuridae). *Russian Journal of Genetics* 38(7): 796–809.
- Joshua, J. (1992). Ecology of the Endangered Grizzled Giant Squirrel (*Ratufa macroura*) in Tamil Nadu, south India. Ph.D Thesis. Bharathidasan University, Tiruchirapalli, Tamil Nadu, 191pp.
- Joshua, J. (1996). Interbreeding between Grizzled Giant Squirrel (*Ratufa macroura* Pennant) and Malabar Giant Squirrel (*R. indica* Erleben). *Journal of the Bombay Natural History Society* 93(1): 82–83.
- Joshua, J., de A. Goonatilake, W.L.D.P.T.S. & S. Molur (2008). *Ratufa macroura*. In: The IUCN Red List of Threatened Species. Downloaded on 23 December 2017.
- Justus, J. & A.J.T. Johnsingh (2015). Grizzled Giant Squirrel, pp501–512. In: Johnsingh, A.J.T. & N. Manjrekar (eds.). *Mammals of South Asia, Vol 2*. University Press, Hyderabad, India, 720pp.
- Lloyd, H.G. (1983). Past and present distribution of Red and Grey squirrels. *Mammal Review* 13(2–4): 69–80.
- Menon, V. (2014). *Indian Mammals: A Field Guide*. Hachette Book Publishing India Pvt. Ltd., Guragon, India, 528pp.
- Moore, J.C. & G.H.H. Tate (1965). A study of the diurnal squirrels, Sciurinae, of the Indian and Indo-Chinese subregions. *Fieldiana Zoology* 48: 1–351.
- Nair, S.C. (1992). *The Southern Western Ghats: A Biodiversity Conservation Plan*. Indian National Trust for Art and Cultural Heritage, Indraprastha Press, New Delhi, 91pp.
- Reynolds, J.C. (1985). Details of geographical replacement of the Red Squirrel (*Sciurus vulgaris*) by the Grey Squirrel (*Sciurus carolinensis*) in Eastern England. *Journal of Animal Ecology* 54: 149–162.
- Schwartz, S.S. (1980). *Ekologicheskie zakonomernosti evolyutsii (Ecological Regularities at Evolution)*. Nauka Publishers, Moscow.
- Thomas, K & P.O. Nameer (2018). Alarming population status of the Grizzled Giant Squirrel (*Ratufa macroura*) (Mammalia: Rodentia: Sciuridae) in Chinnar Wildlife Sanctuary, the Western Ghats, India. *Journal of Threatened Taxa* 10(10): 12350–12356; <https://doi.org/10.11609/jott.3536.10.10.12350-12356>





OPEN ACCESS



The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

December 2018 | Vol. 10 | No. 15 | Pages: 12907–13046

Date of Publication: 26 December 2018 (Online & Print)

DOI: 10.11609/jott.2018.10.15.12907-13046

www.threatenedtaxa.org

Articles

Dietary preference and feeding patterns of the urban Rhesus Macaque *Macaca mulatta* (Mammalia: Primates: Cercopithecidae) in Asola-Bhatti Wildlife Sanctuary in India

-- Ishita Ganguly & Netrapal Singh Chauhan, Pp. 12907–12915

Postembryonic development of the Tri-spine Horseshoe Crab *Tachypleus tridentatus* (Merostomata: Xiphosura) in a nursery habitat in the Philippines

-- Dorkas Kaiser & Sabine Schoppe, Pp. 12916–12932

Communications

Copulatory behavior of the Jaguar *Panthera onca* (Mammalia: Carnivora: Felidae)

-- Pedro Nacib Jorge-Neto, Cristiane Schilbach Pizzutto, Gediendson Ribeiro de Araujo, Thyara de Deco-Souza, Leanes Cruz da Silva, Jorge Aparecido Salomão Jr. & Hernan Baldassare, Pp. 12933–12939

Amphibians of the Dibang River Basin, Arunachal Pradesh: an annotated checklist with distribution records

-- Jayanta K. Roy, Ramie H. Begum & M. Firoz Ahmed, Pp. 12940–12952

Taxonomic studies on the gaudy grasshoppers (Orthoptera: Pyrgomorphae: Pyrgomorphidae) from the northeastern states of India

-- M. Imran Khan, M. Kamil Usmani, Shahnaila Usmani & Hira Naz, Pp. 12953–12968

Odonata (Insecta) diversity of Kuldih Wildlife Sanctuary and its adjoining areas, Odisha, eastern India

-- Subrat Debata & Kedar Kumar Swain, Pp. 12969–12978

Short Communications

On the diversity of the vertebrate fauna (excluding fishes) of Panchet Hill (Garh Panchkot), Purulia, West Bengal, India

-- Sanjib Chattopadhyay, Somenath Dey & Utpal Singha Roy, 12979–12985

First record of the rare Furry Lobster *Palinurellus wieneckii* (De Man, 1881) (Decapoda: Palinuridae) from the Arabian Sea

-- K.K. Idreesbabu, C.P. Rajool Shanis & S. Sureshkumar, Pp. 12986–12989

Description of life stages of dung beetle *Scaptodera rhammistus* (Fabricius, 1775) (Coleoptera: Scarabaeidae: Scarabaeinae) with notes on nesting and biology

-- Suvarna S. Khadakkar, Ashish D. Tiple & Arun M. Khurad, Pp. 12990–12994

An updated list of Odonata of southwestern Bangladesh

-- M. Sajjad Hossain Tuhin & M. Kawsar Khan, Pp. 12995–13001

On the reproductive biology of *Salacia fruticosa* Wall. ex M.A. Lawson

- an endemic medicinal plant of the Western Ghats, India

-- K. Subin, P.A. Jose & T.V. Sarath, Pp. 13002–13005

Partners



Contribution to the Macromycetes of West Bengal, India: 28–33

-- Rituparna Saha, Arun Kumar Dutta, Soumitra Paloi, Anirban Roy & Krishnendu Acharya, Pp. 13006–13013

Notes

The identification of Takin *Budorcas taxicolor* (Mammalia: Bovidae) through dorsal guard hair

-- Manokaran Kamalakannan, Pp. 13014–13016

Photographic evidence of Striped Hyena *Hyaena hyaena* (Mammalia: Carnivora: Hyaenidae) in Ramnagar forest division, Uttarakhand, India

-- Vipul Maurya, Jai Pratap Singh, Kahkashan Naseem, Surender Mehra, Parag M. Dhakate, Neha Verma & A.G. Ansari, Pp. 13017–13019

Range extension of the Least Leaf-nosed Bat *Hipposideros cineraceus* Blyth, 1853 (Mammalia: Chiroptera: Hipposideridae): to central India

-- M. Kamalakannan, C. Venkatraman, Tauseef Hamid Dar & Kailash Chandra, Pp. 13020–13023

A report on the possible interbreeding between Grizzled Giant Squirrel *Ratufa macroura* and Indian Giant Squirrel *Ratufa indica* from Chinnar Wildlife Sanctuary in the southern Western Ghats, India

-- Kiran Thomas, D.K. Vinodkumar, Jomals Mathews John, M. Shaji & P.O. Nameer, Pp. 13024–13028

***Ischnura fountaineae* (Insecta: Odonata: Zygoptera) in Oman, eastern Arabia**

-- Elaine Mary Cowan & Peter John Cowan, Pp. 13029–13031

First record of *Leptogenys hystericica* Forel, 1900 (Hymenoptera: Formicidae: Ponerinae) from Pakistan

-- Muhammad Tariq Rasheed, Imran Bodlah, Ammara Gull e Fareen & Xiaolei Huang, Pp. 13032–13036

First report of darkling beetle *Blaps orientalis* Solier, 1848 (Coleoptera: Tenebrionidae) from India

-- V.D. Hegde, D. Vasanthakumar & S.V. Manthen, Pp. 13037–13038

Notes on the occurrence of orchids *Bulbophyllum medioximum*, *Herminium edgeworthii* and *H. macrophyllum* (Orchidaceae) in Arunachal Pradesh, India

-- Krishna Chowlu, Avishek Bhattacharjee & Pankaj Kumar, Pp. 13039–13043

Lectotypification of two names in the genus *Gymnostachyum* (Acanthaceae)

-- M.C. Shameer & V.K. Sreenivas, Pp. 13044–13045

Miscellaneous

National Biodiversity Authority

Member



Publisher & Host

