

Figure 5. *a*, Sericite masked with limonite/iron oxide and very fine size quartz in radioactive shale. *b*, Alpha track matching with limonite and iron oxide on radioactive shale. *c*, Adsorbed uranium on radioactive phyllite corresponding with alpha track. *d*, Alpha track on radioactive phyllite.

basement and overlying sediments. These faults probably acted as conduits for transfer of uranium-bearing solution from basement rocks. Kanhari and adjoining areas can be looked for structurally controlled and fracture-bound unconformity type of uranium mineralization considering favourable geological set-up where Paleoproterozoic Nandgaon Group (Bijli Rhyolites) is unconformably overlain by Mesoproterozoic Chilpi Group.

This finding has opened up a new target area for future uranium exploration

within rocks of Chilpi Group and underlying basement rocks of Nandgaon Group.

1. Basu, A. K., *Geol. Surv. India, Spec. Publ.*, 2001, **55**, 181–204.
2. Thorat, P. K., Natrajan, A., Guha, K. and Chandra, S., *Geol. Surv. India, Spec. Publ.*, 1990, **28**, 167–180.
3. Tripathi, C., Ghosh, P. Thambi, P. I., Rao, T. V. and Sibendra, C., *Geol. Surv. India, Spec. Publ.*, 1981, **3**, 17–30.
4. Condie, K. C., *Chem. Geol.*, 1993, **104**, 1–37.

5. McLennan, S. M. and Taylor, S. R., *J. Geol.*, 1991, **99**, 1–21.
6. Sensarma, S. Hoernes, S. and Mukhopadhyay, D., *Proc. Indian Acad. Sci. (Earth Planet. Sci.)*, 2004, **113**(4), 619–648.
7. McKelvey, V. E., Everhart, D. L. and Garrels, R. M., *Econ. Geol.*, 1955, 15th anniversary volume, p. 491.

ACKNOWLEDGEMENTS. We thank the Director, Atomic Minerals Directorate for Exploration and Research (AMD) for encouragement and granting permission to publish this paper. We thank our colleagues from the Physics, Chemistry, XRF and Petrology laboratories, AMD, Nagpur for providing laboratory support.

Received 2 February 2014; revised accepted 16 June 2014

U. P. SHARMA^{1,*}
S. SHUKLA¹
P. K. SINHA¹
R. K. PUROHIT¹
A. MAJUMDAR¹
A. K. RAI²

¹Atomic Minerals Directorate for Exploration and Research, AMD Complex, Civil Lines, Nagpur 440 013, India

²Atomic Minerals Directorate for Exploration and Research, AMD Complex, Begumpet, Hyderabad 500 016, India

*For correspondence.
e-mail: upsharma.amd@gov.in

Occurrence of Asian small-clawed otter *Aonyx cinereus* (Illiger, 1815) in Eastern India

The Asian small-clawed otter (*Aonyx cinereus*) is found across much of South and Southeast Asia, with a continuous population in Southeast Asia, Northeast India and Himalayan foothills and a purportedly disjunct population in the hill ranges of the Western Ghats in South India^{1,2}. Five subspecies have been identified, namely *Aonyx cinereus* (Illiger, 1815), *A. c. fulvus* (Pohl, 1926), *A. c.*

wurmbi (Sodi, 1953), *A. c. concolor* (Rafinesque, 1832) and *A. c. nirnai* (Pocock, 1940). Among these, the former three occur in Southeast Asia, *A. c. concolor* occurs in Upper Myanmar, Yunnan (China), Nepal, Bhutan, Assam, Arunachal Pradesh, Garhwal, southeast of Kumaon and the Himalayan foothills through Sikkim to Kolkata, and *A. c. nirnai* has been recorded from southern

India in Coorg (Kodagu), Karnataka; Ashambu, Nilgiri and Palani hills, Tamil Nadu and some places in Kerala^{3–5}. This species was earlier not recorded from the Eastern Ghats and other regions of Odisha. Here we report the occurrence of the species from this area, specifically from Odisha (Figure 1). Only one species of otter, smooth-coated Otter *Lutrogale perspicillata* (I. Geoffroy Saint-Hilaire,

SCIENTIFIC CORRESPONDENCE

1826) had earlier been reported from the state⁶.

While carrying out biodiversity surveys in different protected and non-protected areas of Odisha during 2005–2012, direct sightings and indirect evidences such as footprints and spraints (otter faeces) of Asian small-clawed otter were encountered in several hill streams

(Table 1). Direct observations of Asian small-clawed otter were from Ghusurigudi stream (19°41'54.9"N, 83°06'30.3"E and 19°41'57.6"N, 83°06'27.7"E – WGS-84) in Karlapat Wildlife Sanctuary; Kotagarh stream (19°50'59.3"N, 83°43'08.5"E – WGS-84) and Luddu waterfall (19°51'36.6"N, 83°52'39.5"E – WGS-84) in Kotagarh Wildlife Sanctuary. All

these sites fall within the Eastern Ghats of Odisha. Subsequently, in 2012 three individuals of this species were observed in streams of Kachudahan (21°52'15.7"N, 86°30'33.4"E) in Similipal Tiger Reserve (north Odisha). Furthermore, photographs of an old skin of otter recovered by the Forest Department of Kalahandi South Division were studied, which show distinctive characters of *A. cinereus* such as claws not extending beyond the toes and bare rhinaria with a flat dorsal margin, unlike the other Asian otter species⁷. The skin was discoloured as it was kept in the kitchen of a tribal house, which makes it difficult to identify at subspecies level. Indirect evidences of this species were recorded from Kandhamal, Rayagada, Kalahandi, Parelakhemundi and Mayurbhanj districts of Odisha. Footprints of Asian small-clawed otter recorded during the study ($n = 51$) were quite distinct from other otter species found in the distribution range, as inferred from the absence of claw marks and reduced webbing^{4,8}. To avoid confusion, footprints were recorded only from the sites where other otter signs such as tracks, spraints and holts were found. Similarly, spraints ($n = 157$) observed during the study period comprised maximum of undigested exoskeleton of crabs along with lesser percentage of bones of frogs, feathers of birds and scales of fishes, which is in agreement with the earlier observation of crab-eating habit of the species^{4,8}. Photographs of the species along with direct sightings, of an old pelt and other evidences confirm occurrence of the Asian small clawed otter in Odisha (Figure 2).

This species is found in perennial streams in riparian ecosystem with big boulders, with or without a wide bank and signs were recorded in both muddy and sandy shoreline. They are adapted to moderately disturbed habitats, where human activities occur only by day. During dry season, this species abandons the drying hill streams and congregates at places with shallow water. All these observations concur with the previous studies carried out on the habitat preference of the species in South India^{9,10}.

Habitat destruction due to changing land-use pattern in the form of development, illegal encroachment in the sanctuaries, increasing forest dependency and reduction in prey biomass due to over-exploitation seems to be the main threat to this species, as it is for other otter

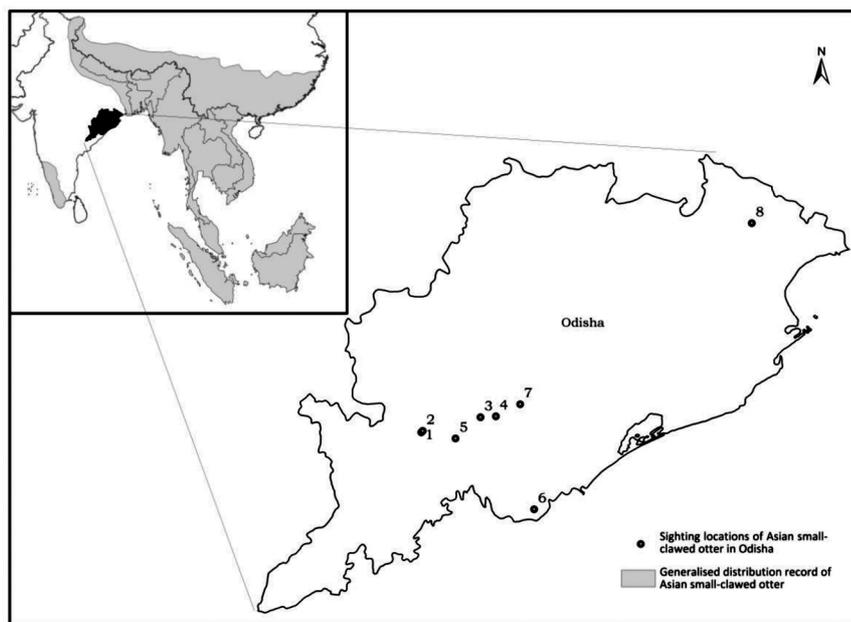


Figure 1. Map showing distribution of Asian small-clawed otter as hypothesised before the current records and in Odisha.

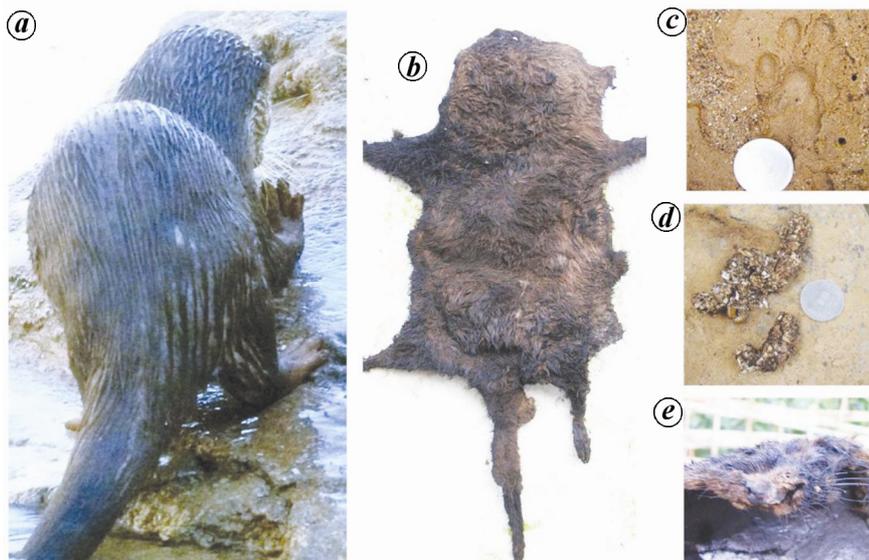


Figure 2. Photographs of Asian small-clawed otter and its signs. *a*, Asian small-clawed otter at Kotagarh Wildlife Sanctuary, Odisha. *b*, Pelt of Asian small-clawed otter recovered by Forest Department, Kalahandi South Division. *c*, *d*, Spraint and footprints of the species from Karlapat Wildlife Sanctuary. *e*, Close-up showing rhinaria of the otter pelt recovered by the Forest Department.

Table 1. Locations and habitat characteristics of the different protected and non-protected areas of Odisha, where presence of Asian small-clawed otter was observed (datum: WGS 84)

Location	Coordinates and altitude	Habitat characteristics	Anthropogenic activities
Karlapat Wildlife Sanctuary	19°41'54.9"N 83°06'30.3"E	Stream with water depth 1.5–2 m. Sandy-loam bank substrate with large to medium rock boulders; <i>Mangifera indica</i> , <i>Terminalia arjuna</i> and <i>Diospyros malabarica</i> trees along the bank.	Human activities confined to morning hours; fishing activities moderate.
Karlapat Wildlife Sanctuary	19°41'57.6"N 83°06'27.7"E	Streams with water depth <1.5 m. Sandy-loam bank substrate with large to medium rock boulders; <i>M. indica</i> , <i>T. arjuna</i> and <i>D. malabarica</i> trees along the bank.	Occasionally used by humans for fishing.
Kotagarh Wildlife Sanctuary	19°50'59.3"N 83°43'08.5"E	Streams with clay-loam bank; swallow stream with thick shrubs; water depth <1 m.	Regularly used by humans during morning hours.
Kotagarh Wildlife Sanctuary	19°51'36.6"N 83°52'39.5"E	Streams with water depth <2 m. Sandy-loam bank substrate with large to medium rock boulders; <i>M. indica</i> , <i>T. arjuna</i> and <i>D. malabarica</i> trees along the bank.	Occasionally used by humans; fishing activities moderate.
Muniguda, Rayagada	19°37'49.44"N 83°27'43.57"E	Streams with water depth <2 m. Sandy-loam bank substrate with large to medium rock boulders; <i>Dillenia pentagyna</i> , <i>D. malabarica</i> , <i>M. indica</i> and <i>T. arjuna</i> along the bank.	Moderate disturbance in the area due to fishing activities.
Gandahati, Parelakhemundi	18°53'49.7"N 84°16'15.0"E	Streams with water depth <2 m. Sandy-loam bank substrate with large to medium rock boulders; <i>D. malabarica</i> , <i>Ficus arnottiana</i> , <i>Ficus exasperata</i> and <i>Salix tetrasperma</i> along the bank.	Occasionally used by humans for fishing and collection of NTFP. Fresh otter scat found during December 2013.
Gadadi, Raikia, Kandhamal	19°59'02.8"N 84°07'36.3"E	Streams with water depth < 2 m. Sandy-loam bank substrate with large to medium rock boulders; <i>D. malabarica</i> , <i>T. arjuna</i> , <i>Barringtonia acutangula</i> , <i>Terminalia alata</i> , <i>Ficus racemosa</i> along the bank.	Less disturbed area; occasional fishing and bathing activities noticed.
Similipal Tiger Reserve	21°52'15.7"N 86°30'33.4"E	Rocky stream bed; clay bank; small to medium waterfalls and water depth of about <1 m. <i>M. indica</i> and <i>D. malabarica</i> trees along the bank.	Occasionally used by humans for bathing; moderate fishing activities confined during night.

species². Another important threat to the Asian small-clawed otter comes from illegal hunting for its pelt¹¹. Otters in Odisha may be facing threats due to poaching, large-scale fishing (even during night) and poisoning of water for fishing activities. It was also observed that the local communities specifically hunt for crabs, which form the major part of the diet for this species of otter. In Karlapat Wildlife Sanctuary, the local Kondh tribe explained about hunting of otters for meat and pelt using dogs. Small-clawed otters are also caught/trapped by locating the dens and then surrounding them with nets. Some people catch otters during night using spotlights. The local communities say that they have witnessed a drastic drop in small-clawed otter population over the last decade. In non-protected areas, mostly in south Odisha, otters are deliberately hunted for skin and meat; while the meat is consumed, the skin is sold to the local traders for Rs 300–500 per pelt.

In the villages of Phulbani and Kandhamal districts, local communities were found keeping otter pups as pets, stating that when they die the meat is often consumed and the pelt is kept at home to be sold to the traders.

Occurrence of Asian small-clawed otter from the Eastern Ghats and other parts of Odisha has presumably been overlooked by previous workers. The lack of systematic survey in many parts of the Eastern Ghats has resulted in a biased understanding of distribution of many species across the Indian subcontinent, which is evident from the recent discoveries of herpetofauna^{12,13}. This finding also supports the hypothesis that wetter zones across eastern India harbour relict population of once widely distributed humid forest species^{14,15}. Although most parts in the Eastern Ghats face threats from habitat destruction, the remnant patches of forests serve as refuge for many lesser known and conservation-dependent species. Such habitats can

be targeted for systematic biodiversity exploration and can be secured from unplanned developmental activities. Additionally, as this species occur on the southeastern boundary of Odisha (18°53'49.7"N, 84°16'15.0"E) adjoining Andhra Pradesh, a contiguous population of the species along the Eastern Ghats is predictable. Further studies on taxonomy, distribution status and ecology of Asian small-clawed otter in eastern India would help in understanding the subspecies status and extent of its geographical range. The Asian small-clawed otter is listed in the Schedule I of the Indian Wildlife (Protection) Act, 1972. It is also categorized as Vulnerable by the IUCN Red List of Threatened Species¹⁶ and listed in the Appendix II of CITES¹⁷. This report indicates that Asian small-clawed otter is distributed in three protected areas in Odisha, where it can be given conservation priority and its habitat outside protected areas can be monitored. Effective conservation planning

SCIENTIFIC CORRESPONDENCE

and awareness programmes by the Forest Department involving biologists, conservation organizations and local communities can save the species from the resulting threats.

1. Pocock, R. I., *The Fauna of British India including Ceylon and Burma, Mammalia, Vol. 2. Carnivora*, Taylor and Francis, London, 1941, pp. 1–503.
2. Hussain, S. A., In *ENVIS Bulletin on Wildlife and Protected Areas*, Wildlife Institute of India (WII), Dehradun, 1999, vol. 2, pp. 1–38.
3. Harris, C. J., *Otters. A Study of the Recent Lutrinae*, Weidenfeld & Nicolson, London, 1968, pp. 1–398.
4. Hussain, S. A., Gupta, S. K. and de Silva, P. K., *IUCN Otter Spec. Group Bull.*, 2011, **28**(2), 63–75.
5. Corbet, G. B. and Hill, J. E., *The Mammals of the Indomalayan Region: A Systematic Review*, Natural History Museum Publications, 1992, pp. 1–488.
6. Acharjyo, L. N., In *Envis Bulletin on Wildlife and Protected Areas*, WII, Dehradun, 1999, vol. 2, pp. 62–64.
7. Sivasothi, N. and Burhanuddin, H. M. N., *Hydrobiologia*, 1994, **285**, 151–170.
8. Kruuk, H., Kanchanasaka, B., O'Sullivan, S. and Wanghongsa, S., *Nat. Hist. Siam Soc.*, 1993, **41**, 23–30.
9. Prakash, N., Mudappa, D., Shankar Raman, T. R. and Kumar, A., *Trop. Conserv. Sci.*, 2012, **5**(1), 67–78.
10. Perinchery, A., Jathanna, D. and Kumar, A., *J. Mammal.*, 2011, **92**(4), 796–802.
11. Meena, V., *Zoos Print's*, 2002, **17**(2), 696–698.
12. Mohapatra, P. P., Das, A. and Dutta, S. K., *Herpetol. Rev.*, 2010, **41**(1), 111.
13. Agarwal, I., Wilkinson, M., Mohapatra, P. P., Dutta, S. K., Giri, V. and Gower, D. J., *Zootaxa*, 2013, **3696**(4), 534–546.
14. Mani, M. S., In *Ecology and Biogeography of India* (ed. Mani, M. S.), Dr W. Junk B. V. Publishers, Hague, The Netherlands, 1974, pp. 698–724.
15. Abdulali, H., *Proc. Natl. Inst. Sci. India*, 1949, **15**, 387–393.
16. IUCN, IUCN Red List of Threatened Species, Gland, Switzerland, 2008; <http://www.iucnredlist.org> (accessed on 15 March 2014).
17. CITES, The CITES species, Geneva, Switzerland; <http://www.cites.org> (accessed on 15 March 2014).

ACKNOWLEDGEMENTS. We thank the Principal Chief Conservator of Forests and Chief Wildlife Warden, Odisha for permission to work in Karlapat and Kotagarh Wildlife Sanctuaries and the Project Director, Odisha Forestry Sector Development Project for providing funding opportunities for a rapid

survey in the Eastern Ghats parts of the state. We also thank DFO, Karlapat Wildlife Sanctuary, DFO, Baliguda Wildlife Division and Dr A. K. Nayak, Regional Chief Conservator of Forests and Field Director of Similipal Tiger Reserve for support and guidance; Prasad K. Dash, S. K. Sajan and S. Debata for their help during various field trips; Manoj V. Nair, for useful comments that helped improve the manuscript, and Manish K. Bakshi, Similipal Tiger Reserve for preparing the distribution map.

Received 20 January 2014; revised accepted 25 May 2014

PRATYUSH P. MOHAPATRA^{1,*}
HIMANSHU S. PALEI²
SYED AINUL HUSSAIN³

¹Department of Zoology,
Government Science College,
Chhatrapur,
Ganjam 761 020, India

²P. G. Department of Zoology,
North Orissa University, Takatpur,
Baripada 757 003, India

³Wildlife Institute of India,
Post Box # 18,
Dehra Dun 248 001, India

*For correspondence.
e-mail: mohapatrapratyushp@gmail.com