concentration followed an initial decrease, which slowly increased until the end of the experiment. This could be due to a decrease in mineralization in the later stages.

In the present study it was found that though wood litter had high initial lignin than leaf litter, weight loss was rapid due to feeding of termites as well as increase in the mineralization of nutrients. Therefore, it can be stated that the termites play an important role in decomposition of wood. Further investigations are required on this aspect. The decomposition rate is also influenced by soil moisture and rainfall.

1. Vesterdal, L., Influence of soil type on mass loss and nutrient release from decomposing foliage litter of beech and Norway spruce. *Can. J. For. Res*., 1999, **29**, 95–105.
2. Wedderburn, M. E. and Carter, J., Litter decomposition by four tree types for use in silvipastoral systems. *Soil Biol. Biochem*., 1999, **31**, 455–461.
3. Stephen, C. H., Nitrogen transformation in fallen tree boles and mineral soil of an old-growth forest. *Ecology*, 1999, **80**, 1385–1394.
4. Champion, H. G. and Seth, S. K., In *A Revised Survey of the Forest Types of India*, Government of India, Delhi, 1968, pp. 56–106.
5. Supriya, L., Plant biodiversity, biomass and nutrient dynamics of *Dipterocarpus* forest of Manipur, Ph D thesis, 2002.
6. Genet, J. A., Genet, K. S., Thomas, M. B., Murphy, P. G. and Lugo, A. E., Response of termite community and wood decomposition rates to habitat fragmentation in a sub-tropical dry forest. *Trop. Ecol*., 2001, **42**, 35–49.
7. Miller, M. M., Varama, M., Heinonem, J. and Hallaksela, A. M., Influence of insects on the diversity of fungi in decaying spruce wood in managed and natural forest. *For. Ecol. Manage.*, 2002, **166**, 165–181.
8. Olson, J. S., Energy storage and the balance of producers and decomposers in ecological systems. *Ecology*, 1963, **44**, 322–331.
9. Harmon, M. E. *et al.*, Ecology of coarse woody debris in temperate ecosystem. *Adv. Ecol. Res*., 1986, **15**, 133–302.
10. Peterson, H. and Luxton, M., A comparative analysis of soil fauna populations and their role in decomposition processes. *Oikos*, 1982, **39**, 288–388.
11. Yamashita, T. and Takeda, H., Decomposition and nutrient dynamics of leaf litter in litter bags of two mesh sizes set in two *Dipterocarpus* forest sites in peninsular Malaysia. *Pedobiologia*, 1998, **42**, 11–21.
12. Sandhu, J., Sinha, M. and Ambasht, R. S., Nitrogen release from decomposing litter of *Leuceana leucocephala* in the dry tropics. *Soil Biol. Biochem.*, 1990, **22**, 859–863.
13. Swift, M. J., Heal, O. W. and Anderson, J. M., In *Decomposition in Terrestrial Ecosystems*, Blackwell Scientific Publications, UK, 1979.
14. Dasselar, A. V. V. and Latinga, E. A., Modelling the carbon cycle of grassland in the Netherlands under various management strategies and environmental conditions. *J. Agric. Sci*., 2000, **43**, 183–194.
15. Okeke, A. I. and Omaliko, C. P. E., Leaf litter decomposition and carbondioxide evolution of some agroforestry fallow species in southern Nigeria. *For. Ecol. Manage*., 1992, **50**, 103–116.
16. Austin, A. T. and Vitousek, P. M., Precipitation, decomposition and litter decomposability of *Metrosideros polymorpha* in active forests on Hawaii. *J. Ecol*., 2000, **88**, 129–138.
17. Bilbro, J. D., Undersander, D. J., Fryrear, D. W. and Lester, C. M., A survey of lignin, cellulose and acid detergent fiber ash contents of several plants and implications for wind erosion control. *J. Soil Water Conserv*., 1991, **64**, 314–316.
18. Reid, I. D., Biodegradation of lignin. *Can. J. Bot*., 1995, **73**, S1011–S1018.
19. Laishram, I. D. and Yadava, P. S., Lignin and nitrogen in the decomposition of leaf litter in a subtropical forest ecosystem in Shiroy Hills in north-eastern India. *Plant Soil*, 1992, **106**, 59–64.
20. Bargali, S. S., Singh, S. P. and Singh, R. P., Patterns of weight loss and nutrient release from decomposing leaf litter in an age series of eucalyptus plantations. *Soil Biol. Biochem*., 1993, **25**, 1731–1738.
21. Couteaux, M. M., Mctiernan, K. B., Berg, B., Szuberla, D., Dardenne, P. and Bottner, P., Chemical composition and carbon mineralization potential of scots pine needles at different stages of decomposition. *Soil Biol. Biochem*., 1998, **30**, 583–595.
22. Taylor, B. R., Air drying depresses rates of leaf litter decomposition. *Soil Biol. Biochem*., 1998, **30**, 403–412.
23. Musvoto, C., Campbell, B. M. and Kirchmann, H., Decomposition and nutrient release from mango and miombo woodland litter in Zimbabwe. *Soil Biol. Biochem*., 2000, **32**, 1111–1119.
24. Ribeiro, C., Madeira, M. and Araújo, M. C., Decomposition and nutrient release from leaf litter of *Eucalyptus globulus* grown under different water and nutrient regimes. *For. Ecol. Manage.*, 2000, **171**, 31–41.

Received 1 April 2006; revised accepted 22 March 2007

Nyctibatrachus karnatakaensis nom. nov., a replacement name for the giant wrinkled frog from the Western Ghats

K. P. Dinesh[1,*], C. Radhakrishnan[1], A. H. Manjunatha Reddy[2] and K. V. Gururaja[3]

[1]Zoological Survey of India, Western Ghats Field Research Station, Calicut 673 002, India
[2]Indgen Life Technologies, 114/5, 18th 'A' Main, Muneshwara Block, Bangalore 560 026, India
[3]Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560 012, India

Amphibian research in the Western Ghats looks promising, as 21 new species have been described since 2000. Moreover, it has also provided better insights into the aspects of biogeography, Gondwana relicts and endemism. On the other hand, lack of proper systematics is leading to ambiguities and chaos in amphibian taxonomy. We are presenting a case of a recently described species, *Nyctibatrachus hussaini*, as an invalid name due to lack of typification and deposition of type specimen in any museum. Here we propose a replacement name for the species – *Nyctibatrachus karnatakaensis* nom. nov., – as well as holotype designation and vouchering the same in a museum.

Keywords: Amphibians, nomenclature, *Nyctibatrachus karnatakaensis*, *Nyctibatrachus hussaini*, the Western Ghats.

*For correspondence. (e-mail: zsicalicut@sancharnet.in)

THE Western Ghats is the flag-bearer of biodiversity wealth of India for the very reason that it harbours not only a vast number of flora and fauna, but also many endemic and endangered species; hence it is aptly called a biodiversity hotspot[1]. Initiatives from biodiversity conservation have led to a spurt in research activities in the Western Ghats, which include species inventorying/monitoring and conservation assessment/management of many taxonomic groups such as mammals, reptiles, amphibians, fishes[2], etc.

Amphibians as one such group, have led to a number of new descriptions from the region, as many as 21 new species[3–20] in the first six years of the present millennium. Endemism, biogeography, evolution and Gondwana relicts[21–26] are the other dimensions of research on the amphibians in the Western Ghats. These have provided ample scope for further research in an era of extinction[27,28]. On the contrary, they have also led to certain ambiguities and incompleteness in taxonomic identities, invalid species names, ambiguous ecological status, etc. Though the drawbacks look trivial, they have made the amphibian taxonomy and research ultimately more chaotic and meaningless. This calls for proper taxonomic and nomenclatural procedures, and a review of the systematics of the region, as they are the building blocks of any research in biodiversity. Despite having been repeatedly cautioned by many researchers on the importance of proper systematics in amphibians[29–33], it has largely been ignored. As Dubois[32] has rightly pointed out, such information gathered without systematic approach would be useless.

This communication is an attempt in zoological nomenclature, to remove the uncertainty attached to *Nyctibatrachus hussaini*, an invalid name owing to the lack of type specimen recorded. We were able to collect the type specimen from Kudremukh National Park, Karnataka, describe the holotype and provide a new replacement name to substantiate our stand, as detailed in this communication.

N. hussaini is the largest among wrinkled frogs (Anura: Nyctibatrachidae) described from the Western Ghats. It was a new finding[6], and was given common name as Giant wrinkled frog[34]. The description was based on morphometry and comparison between the congeners, but lacked typification (designating holotype/paratype, etc.) and vouchering of the same in any museum, which triggered the issue of invalidity of the species name.

Lack of typification and vouchering of the specimen in a museum are serious errors in systematics (International Code for Zoological Nomenclature[35], hereafter called the Code). The prime reason is that one cannot really compare specimens if earlier specimens are not properly designated as holotype and deposited in a recognized museum.

In the present context of the description of *N. hussaini*, it appears that the authors were unaware of the procedures of typification and vouchering of a new species as can be inferred from the description. At the same time, the reviewers of the paper in the journal, as qualified taxonomists of amphibians, are also equally responsible for overlooking the error. The authors of *N. hussaini* have reasoned that since collection of specimens is restricted to a national park, they deposited a dead specimen in the Forest Range Office (Wildlife Division), Kudremukh, instead of depositing it in a museum. However, the specimen deposited in the Forest Office is untraceable and hence, we do not have any specimen designated as *N. hussaini* apart from its published data.

According to the Code, for a new species described after 1999 it must have a holotype designated and deposited in a museum. Since description of *N. hussaini* did not meet these criteria, Das and Kunte[18], citing Article 16.4 and 72.3 of the Code proposed to consider *N. hussaini* as an invalid name.

During a recent faunistic survey at Kudremukh National Park, an anuran specimen was collected from an area close to the type locality of *N. hussaini*. It is a species of Nyctibatrachidae, possessing digital disks, femoral glands, no lateral line system persisting in adulthood, rhomboidal iris, wrinkled skin, bifid tongue without papilla, disc on finger and toe tips, squat and robust body. On comparison with all 11 valid species in the family, this specimen turned out to be unique and shared few morphological characters with *N. humayuni* and *N. petraeus*. Since two of us (K.V.G. and A.H.M.R.) were involved in the description of *N. hussaini*, we verified the characteristics of the presently collected specimen with the published data of *N. hussaini*. The present specimen closely resembled *N. hussaini* in morphological characters[6]. Since *N. hussaini* is an invalid name, we present here a comparison of the data of the present specimen with those of other valid species of Nyctibatrachidae. We also provide a new replacement name, *Nyctibatrachus karnatakaensis* nom. nov. for our specimen, designating it as a holotype and considering *N. hussaini* as its objective junior synonym.

Nyctibatrachus karnatakaensis nom. nov. Figures 1–3. Holotype (ZSI/WGFRS/V/A 579), an adult female collected

Figure 1. Adult female of *Nyctibatrachus karnatakaensis* nom. nov. holotype in life.

from a 3° perennial stream with big boulders amidst a shola forest in Manikyadhara Betta, Kudremukh National Park (13°21.6′N; 75°07.9′E, ~900 m asl), Sringeri Taluk, Chikmagalur District, Karnataka, southwest India, by K. Rajmohana on 19 October 2005 between 09.30 and 10.30 h. The specimen is deposited in the faunal holdings of the Western Ghats Field Research Station (WGFRS), Zoological Survey of India (ZSI), Calicut, Kerala.

Abbreviations are adopted from Das and Kunte[18]: SVL, Snout-vent length; HL, Head length; HW, Head width; HD, Head depth; BW, Body width; TBL, Tibia length; ED, Eye diameter; UE, Upper eyelid width; IN, Internarial distance; IO, Interorbital distance; ES, Eye-to-snout distance; EN, Eye-to-nostril distance and AG, Axilla-to-groin distance. The largest known species of *Nyctibatrachus* has the following characteristics: SVL 63.3 mm (Table 1); body robust and squat, with relatively equal width at waist and behind the shoulder; head wider than long (HW/HL = 1.34), depressed; snout blunt; snout with a Y-marked fold bifurcating at the level of the nostrils, a small transverse fold between the inter-orbital space; nares oval, elevated, dorsally positioned, nearer to the eye than snout (EN/ES = 0.43); internarial distance more than distance from anterior margin of eye-to-nostril (IN/EN = 1.26); eyes large (ED/HL = 0.37), diameter greater than eye-to-nostril distance (ED/EN = 1.71); upper eyelids small; skin not co-ossified with bony elements of the cranium; inter-orbital width more than eyelid width (IO/UE = 1.69); canthus rostralis indistinct; loreal region slightly concave; maxillary teeth present; a distinct symphysial knob on anterior edge of mandible; mouth extending up to posterior corner of eye; tongue bifid without a papilla, free posteriorly; choanae located close to anterior edge of palate; vomerine ridges strong and large, in two oblique series, beginning at anterior proximal margin of choanae, each patch of vomerine ridge with single row bearing 11 teeth; contracted pupils rhomboidal; tympanum indistinct; a strong fold extending from the posterior corner of the eye to the tip of the jaw and a supra tympanic fold from the posterior corner of the eye to above the insertion of the forearm; supracloacal fold and postcloacal tubercles absent; dorsum, including upper eyelids and upper surfaces of limbs with fine transverse skin folds, appearing like tubercles.

Arm short and stout; fingers long and stout, lack webbing; relative length of fingers (longest to shortest): III > IV > II > I; tips of fingers dilated, with circummarginal grooves; width of disk on finger I wider than other disks on fingers; subarticular tubercles prominent, rounded, subequal on fingers and toes, numbering one on I and II fingers, and two on III and IV; prominent palmer tubercles present (Figure 3 *a*); hind limbs relatively short and stout, failing to overlap when folded at right angles to the axis of the body; toes (Figure 3 *b*) long and thin; webbing on all toes to base of disks, except on toe IV, where

Figure 2. Dorsal view of holotype (marker = 10 mm) of *N. karnatakaensis* nom. nov. (preserved specimen – ZSI/WGFRS/V/A579).

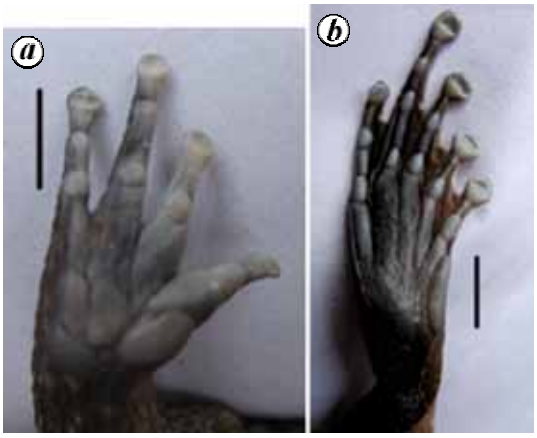

Figure 3. ***a***, Right hand (marker = 7 mm) and ***b***, Right foot (marker = 7 mm) of holotype of *N. karnatakaensis* nom. nov. (ZSI/WGFRS/V/A579).

Table 1. Measurements (in mm) of the holotype *Nyctibatrachus karnatakaensis* nom. nov., in comparison with *Nyctibatrachus petraeus* (Das and Kunte[18])

	N. karnatakaensis nom. nov. ZSI/WGFRS/V/A579	*N. petraeus* ZSI A. 10070
Sex	Female (holotype)	Female (holotype)
SVL	63.3	43.2
HL	21.0	10.3
HW	28.2	16.0
HD	20.6	7.8
BW	30.6	12.8
TBL	28.2	18.7
ED	7.9	4.2
UE	4.6	3.2
IN	5.8	4.5
IO	7.8	8.3
ES	10.7	6.3
EN	4.6	5.6
AG	20.1	15.0

webbing is up to distal subarticular tubercle on both inner and outer sides; relative length of toes (longest to shortest): IV > III > V > II > I; toe tips rounded with circummarginal grooves; subarticular tubercles well developed, oval, numbering one on I and II toes; two on III and V toes, and three on IV toe; thick elongated inner metatarsal tubercle; outer metatarsal tubercle absent; toe disks more wider than finger disks; a slightly crescentic tarsal fold extending from the posterior edge of the inner metatarsal tubercle up to just the beginning of the tarsus; tarsal fold present.

In preserved specimen (Figure 2), dorsum blackish-brown with mottled yellow spots; mottling extends to tip of toe and fingers, including the upper eyelid. A dotted small white band is seen from the posterior corner of the eye to the angle of joining of the forearm. Tip of fingers and toes with a dorsal horizontal white band. No dorsolateral fold present on the body. Throat brownish granular with fine longitudinal folds; rest of venter glandular with a light creamish-brown colour and with fine folds. Fore and hind limbs brownish with granular folds; hind limbs barred with unclear dotted white bands. Tongue unpigmented and creamish.

In life (Figure 1) dorsum black mottled equally with rusty-brown and yellow; snout and head region with more rusty-brown colour; limbs blackish, mottled with yellow dotted bands; rhomboidal pupil black with golden yellow sclera; a blackish bar in the inter-orbital region; throat brownish with white spots on the margin of the throat; venter pale brown.

N. karnatakaensis is named in honour of the state of Karnataka, wherein the type locality Kudremukh National Park is situated.

We compared this specimen with all valid 11 species of *Nyctibatrachus. N. karnatakaensis* nom. nov is considerably different from *N. aliciae*, *N. beddomii*, *N. deccanensis*, *N. kempholeyensis*, *N. major*, *N. minor*, *N. sanctipalustris*, *N. sylvaticus* and *N. vasanthi* in size, head length to head width ratio, complete webbing on toes, distinct subarticular tubercles and in body skin-fold pattern. In possessing blunt snout, narrow eyelid, indistinct tympanum, circummarginal grooves, webbing pattern and in the absence of canthus rostralis *N. karnatakaensis* resembles *N. humayuni* and in having wider head, snout projecting beyond mouth, oblique series of vomerine ridges with 11 teeth, webbing on toes reaching base of disks except on toe IV, it resembles *N. petraeus*. Differences between *N. karnatakaensis* and *N. humayuni* are as follows: adult size – SVL, 63.3 mm vs 48 mm; snout length, longer than eye diameter vs equal to eye diameter; position of nostril, nearer to eye vs equidistant from eye and snout; vomerine ridges with 11 teeth vs 6–8 teeth; subarticular tubercles, prominent on fingers and toes vs feebly developed on fingers; inner metatarsal tubercle, subequal to first toe vs half of first toe; colour in preservative, blackish-brown with mottled yellow spots vs greyish or brownish-black without mottling. Differences between *N. karnatakaensis* and *N. petraeus* are as follows: adult size – SVL, 63.3 vs 43.2 mm; position of nostril, nearer to eye vs nearer to snout; nares, elevated vs non-elevated; internarial distance – IN/EN, 1.26 vs 0.80; eye diameter – ED/EN, 1.7 vs 0.75; inter-orbital width and eyelid width – IO/UE, 1.6 vs 2.59; symphysial knob, distinct vs indistinct; glandular structures in rectal region, absent vs present; colour in preservative, blackish-brown with mottled yellow spots vs brown dorsally and unpatterned uniform cream ventrally. Morphometric details and comparative information are provided in Table 1.

Amphibian taxonomy in the global scenario has been debated often, seeking systematic and stringent measures in nomenclature and taxonomy[32]. Daniels[33] has cautioned about taxonomic uncertainties associated with biodiversity of the Western Ghats. Chaitra *et al.*[36] have again rekindled this issue in the context of biodiversity documentation and more specifically on the amphibian diversity. Despite such repeated cautions, it is unfortunate that the name *N. hussaini* lost taxonomic validity due to lack of typification and proper deposition in a museum.

1. Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. and Kent, J., Biodiversity hotspots for conservation priorities. *Nature*, 2000, **403**, 853–858.
2. Molur, S. and Walker, S., Conservation assessment of the herpetofauna of India – An overview. *Hamadryad*, 1998, **23**, 169–178.
3. Dutta, S. K. and Ray, P., *Microhyla sholigari*, a new species of microhylid frog (Anura: Microhylidae) from Karnataka, India. *Hamadryad*, 2000, **25**, 38–44.
4. Vasudevan, K. and Dutta, S. K., A new species of *Rhacophorus* (Anura: Rhacophoridae) from the Western Ghats, India. *Hamadryad*, 2000, **25**, 21–28.
5. Dubois, A., Ohler, A. and Biju, S. D., A new genus and species of Ranidae (Amphibia, Anura) from south-western India. *Alytes*, 2001, **19**, 53–79.
6. Krishnamurthy, S. V., Manjunatha Reddy, A. H. and Gururaja, K. V., A new species of frog in the genus *Nyctibatrachus* (Anura: Ranidae) from Western Ghats, India. *Curr. Sci*., 2001, **80**, 887–891.
7. Biju, S. D. and Bossuyt, F., New frog family from India reveals an ancient biogeographical link with the Seychelles. *Nature*, 2003, **425**, 711–714.
8. Bossuyt, F., A new species of *Philautus* (Anura: Ranidae) from the Western Ghats of India. *J. Herpetol*., 2003, **36**, 656–661.
9. Giri, V., Wilkinson, M. A. and Gower, D. J., New species of *Gegeneophis* Peters (Amphibia: Gymnophiona: Caeciliidae) from southern Maharashtra, India, with a key to the species of the genus. *Zootaxa*, 2003, **351**, 1–10.
10. Kuramoto, M. and Joshy, S. H., Two new species of the genus *Philautus* (Anura: Rhacophoridae) from the Western Ghats, Southwestern India. *Curr. Herpetol*., 2003, **22**, 51–60.
11. Ravichandran, M. S., Gower, D. J. and Wilkinson, M., A new species of *Gegeneophis* Peters (Amphibia: Gymnophiona: Caeciliidae) from Maharashtra, India. *Zootaxa*, 2003, **350**, 1–8.
12. Bhatta, G. and Prashanth, P., *Gegeneophis nadkarnii* – a caecilian (Amphibia: Gymnophiona: Caeciliidae) from Bondla Wildlife Sanctuary, Western Ghats. *Curr. Sci*., 2004, **87**, 388–392.
13. Bhatta, G. and Srinivasa, R., A new species of *Gegeneophis* Peters (Amphibia: Gymnophiona: Caeciliidae) from the surroundings of Mookambika Wildlife Sanctuary, Karnataka, India. *Zootaxa*, 2004, **644**, 1–8.

14. Giri, V., Gower, D. J. and Wilkinson, M., A new species of *Indotyphlus* Taylor (Amphibia: Gymnophiona: Caeciliidae) from the Western Ghats, India. *Zootaxa*, 2004, **739**, 1–19.
15. Biju, S. D. and Bossuyt, F., Two new *Philautus* (Anura: Ranidae: Rhacophorinae) from Ponmudi Hill in the Western Ghats of India. *Copeia*, 2005, **1**, 29–37.
16. Biju, S. D. and Bossuyt, F., A new species of frog (Ranidae, Rhacophorinae, *Philautus*) from the rainforest canopy in the Western Ghats, India. *Curr. Sci*., 2005, **88**, 175–178.
17. Biju, S. D. and Bossuyt, F., New species of *Philautus* (Anura: Ranidae, Rhacophorinae) from Ponmudi Hill in the Western Ghats of India. *J. Herpetol*., 2005, **39**, 349–353.
18. Das, I. and Kunte, K., New species of *Nyctibatrachus* (Anura: Ranidae) from Castle Rock, Karnataka State, Southwest India. *J. Herpetol*., 2005, **39**, 465–470.
19. Biju, S. D. and Bossuyt, F., Two new species of *Philautus* (Anura, Ranidae, Rhacophorinae) from the Western Ghats, India. *Amphibia–Reptilia*, 2006, **27**, 1–9.
20. Das, I. and Dutta, S. K., New species of *Polypedates* (Anura: Rhacophoridae) from the Western Ghats, Southwest India. *J. Herpetol*., 2006, **40**, 214–220.
21. Roelants, K., Jiang, J. and Bossuyt, F., Endemic ranid (Amphibia: Anura) genera in southern mountain ranges of the Indian subcontinent represent ancient frog lineages: Evidence from molecular data. *Mol. Phylogenet. Evol*., 2004, **31**, 730–740.
22. Bossuyt, F. *et al.*, Local endemism within the Western Ghats–Sri Lanka biodiversity hotspot. *Science*, 2004, **306**, 479–481.
23. Gower, D. J. *et al.*, A molecular phylogeny of Ichthyophiidae (Amphibia: Gymnophiona): Out of India or out of Eurasia. *Proc. R. Soc. London*, 2002, **269**, 1563–1569.
24. Sparks, J. S., Molecular phylogeny and biogeography of the Malagasy and South Asian cichlids (Teleostei: Perciformes: Cichlidae). *Mol. Phylogenet. Evol*., 2004, **30**, 599–614.
25. Karanth, P., Evolution of disjunct distribution among wet zone species of the Indian subcontinent: Testing various hypothesis using a phylogenetic approach. *Curr. Sci*., 2003, **85**, 1276–1283.
26. Karanth, P., Out-of-India Gondwanan origin of some tropical Asian biota. *Curr. Sci*., 2006, **90**, 789–792.
27. Dubois, A., The relationships between taxonomy and conservation biology in the century of extinctions. *C.R. Biol*., 2003, **326**, S9–S21.
28. Aravind, N. A., Uma Shaanker, R. and Ganeshaiah, K. N., Croak, croak, croak: Are there more frogs to be discovered in the Western Ghats? *Curr. Sci*., 2004, **86**, 1471–1472.
29. Dubois, A., Note préliminaire sur le groupe de *Rana limnocharis* Gravenhorst, 1829 (Amphibiens, Anoures). *Alytes*, 1984, **3**, 143–159.
30. Dubois, A. and Ohler, A., Early scientific names of Amphibia Anura. I. Introduction. *Bull. Mus. Natl. Hist. Nat*., 1996, **18**, 297–320.
31. Dubois, A. and Ohler, A., Early scientific names of Amphibia Anura. II. An exemplary case: *Rana arborea* Linnaeus, 1758. *Bull. Mus. Natl. Hist. Nat*., 1996, **18**, 321–340.
32. Dubois, A., Synonymies and related lists in zoology: General proposals, with examples in herpetology. *Dumerilia*, 2000, **4**, 33–98.
33. Daniels, R. J. R., Taxonomic uncertainties and conservation assessment of the Western Ghats. *Curr. Sci*., 1997, **73**, 169–170.
34. Daniels, R. J. R., *Amphibians of Peninsular India*, Universities Press (India) Pvt Ltd, Hyderabad, 2005, pp. 224–226.
35. Anon., International Commission on Zoological Nomenclature, 2006; http://www.iczn.org/iczn/index.jsp?nfv=&booksection=preface accessed on 25 July 2006.
36. Chaitra, M. S., Vasudevan, K. and Shankar, K., The biodiversity bandwagon: The splitters have it. *Curr. Sci*., 2004, **86**, 897–899.

ACKNOWLEDGEMENTS. The first two authors are grateful to The Director, Zoological Survey of India, Kolkata for facilities and encouragement. We also thank to T. V. Ramachandra, Centre for Ecological Sciences, IISc, for valuable suggestions and laboratory facilities provided. We thank the Principal Chief Conservator of Forests, Karnataka for the permission rendered for conducting faunistic survey in Kudremukh National Park. Finally, we thank Darrel Frost, Associate Dean of Science for Collections, American Museum of Natural History and an anonymous referee for their valuable suggestions and critical comments on the manuscript.

Received 4 September 2006; revised accepted 8 March 2007

Why is the South Korean peninsula largely aseismic? Geodetic evidences

Shuanggen Jin*, Pil-Ho Park and Jong-Uk Park

Space Geodesy Research Group, Korea Astronomy and Space Science Institute, 61-1 Hwaam-dong, Yuseong-gu, Daejeon 305-348, South Korea

Northeast Asia, including Korea, North China, Philippines and Japan, is one of the most seismically active regions in the world, with some of the most catastrophic earthquakes in human history. However, the South Korean peninsula has remained largely aseismic with respect to the surrounding highly-seismic areas. In this communication, we present geodetic evidence in support of the largely aseismic nature of South Korea by analysing the crustal strain and energy density rates derived from recent dense geodetic observations. The dilation rates show that Northeast Asia is under high WNW–ENE oriented compressional strain regime, but the rates are lower in South Korea. In addition, the scalar strain rates and strain energy density rates further imply that the South Korean peninsula is a stable block with low rates. High rates are mainly inferred in North China, southwest Japan and the western boundary of the Philippine Sea plate, consistent with high seismicity in these areas. Furthermore, we speculate that the low seismicity in South Korea may continue in the future.

Keywords: Earthquake, geodetic evidences, South Korean peninsula, strain energy density.

SUBDUCTION of the Philippine Sea and Pacific plates and expulsion of the Eurasian plate with the Indian plate collision[1–5] make Northeast Asia one of the most active seismic regions (Figure 1). The Korean peninsula is located in the northeastern Asia margin, between the Chinese continent and the Japanese Island Arc. However, it has never experienced a catastrophic earthquake in the past 2000 years[6]. In contrast, the neighbouring regions such as North China, Philippines and Japan are seismically active. In addition, some researchers consider the Korean Peninsula as part of the Archean Sino-Korean craton[7] (Figure 1). If so, it is surprising that the Korean peninsula has been largely

*For correspondence. (e-mail: sgjin@kasi.re.kr)