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All North Indian Rivers are Polluted ; Yamuna Maximum
Forests are also Vanishing in the Region

The famed rivers of India's Gangetic Plains are turning into "sewage", threatening the life and health of millions of people dependent on them, warned a team of 11 environmental activists who cycled through the region covering around 1,800km in 27 days.

On way to their final stop, Dehradun, during Dec. 2012, team members said that they crossed 24 rivers while cycling through North Bengal, Bihar and Uttar Pradesh.

"Not one river was fit to bathe in. The water at many places resembled sewage water. Among the most polluted rivers we came across was the Yamuna in western U.P., Varuna and Gandak," said Anil P. Joshi, a Padma Shri-awardee,who heads a Dehradun-based environmental NGO, HESCO. "The growing pollution of rivers is a stark sign of wider ecological imbalance in the region," he added.

The group is demanding that the government introduce the 'gross environmental product (GEP).' Like the GDP, the GEP would monitor the health of India's natural assets.

They said none of the States they travelled through had achieved even half of India's target of 33% area under forests. Bengal had 14.64%, Bihar 7.23%, U.P. 3.61% and Delhi 11.94%.

" Forests are vanishing in these States. Even the ones that survive are grade C forests, consisting of bushes rather than broad-leaved trees." The team travelled through 31 districts, held 300 meetings and reached out to around 10,000 people. They interacted with 1,200 village youth through the yatra and found that 80% of them had not seen a forest.

The cyclists also made extensive notes on falling water table, polluted underground water and degradation of agricultural lands in various districts.

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The Indian Crab Syndrome
Why don't We Encourage Research?

British medical journal *The Lancet* published data on why the scientific research at Indian Institutes may never be healthy.

SHOBHA JOHN

Anyone who challenges the prevailing orthodoxy finds himself silenced with surprising effectiveness—George Orwell

Doctors, especially those in India, can relate to this. When the 2010 Nobel Prize for medicine was given to Dr. Robert G. Edwards, many said it was 32 years late. Edwards and fellow researcher Patrick Steptoe did pioneering work on IVF but had to constantly wage a psychological and physical war on the opposition. They also had to battle to pay the bills. Eventually, they won through. But so many don't, particularly in developing countries like India.

What Might Have Been

Kolkata doctor Subhash Mukhopadhyay developed an IVF technique and was instrumental in the birth of the world's second test tube baby, Durga, just three months after the first, Louise Brown. It was Edwards and Steptoe who proudly fathered the IVF technique that brought Louise into the world in July 1978. Mukhopadhyay has long claimed he—and India—would have got there first. Instead, he was attacked by peers and the state government and prevented from publishing his research outside India. Mukhopadhyay committed suicide in 1981. In 2005, the Indian Council of Medical Research (ICMR) acknowledged Mukhopadhyay as creator of India's first test tube baby, but it was too little, too late.

Doctors admit the going is tough in the Indian universe of scientific and medical research. There are various ways in which research is impeded, explains Dr. G P Talwar, founder-director of the National Institute of Immunology (NII), who has discovered two vaccines. "Heads of department (HoDs) put up opposition to anything unconventional and are part of expert groups, which one can't fight against."

Indian Crab Syndrome

A doctor at a well known institute recalls drafting a paper with other researchers 15 years ago, on an instrument that treated asthma in smokers. Their head of department rejected it eight times in a row. But today the instrument is used the world over. The doctor admits it was time needlessly lost and "I feel sad and hurt today and try to rationalize. Perhaps there were pressures on the HoD to reject it."

Talwar admits he too has suffered as a consequence of the Indian crab syndrome. "I was selected as associate professor at the All India Institute of Medical Sciences (AIIMS) in 1956. When the post for professorship came up, I and 22 others were rejected by an expert who hoisted a relatively unknown student there." And that's why, he asserts, research at Indian Institutes rarely comes up with path-breaking work. Staff selection may be biased and meritorius students may find it hard to survive or prosper unless they have a godfather, he says.

Talwar recounts the tremendous opposition he faced while conducting clinical trials on a leprosy vaccine at AIIMS in 1970. The obstructionism dalayed the research work by at least three years, he claims. "In 1983, I founded NII. Field trials had started but people alleged I had stolen the idea, despite the Drug Controller and the US FDA approving it. I was asked to leave NII in 1994. "But he had luck on his side—he was taken on as a consultant at the International Centre for Genetic Engineering and Biotechnology. In 2008, the bacteria, *Mycobacterium indicus pranii*, was named after him (Pran is his first name). "I felt vindicated."

Talwar's birth control vaccine also ran into heavy weather. A persistent and damaging rumour was put around that the anti-hCG vaccine would render a woman sterile. But at an International Congress, Talwar's paper was noticed by Dr. Sheldon Segal, Director of Population Council, a non profit organization. Segal mentioned it to the Population Council's founder John Rockefeller III. He, in turn, persuaded Karan Singh, then India's Health Minister to patent it in the 1980s. Many trials were conducted and Talwar received grants from Canada and the Rockefeller Institute.

Research Papers

Talwar was lucky. Often, senior people insist their name be put on research papers written by junior colleagues. Research papers, either delivered at seminars or published in journals, are an important part of peer acceptance. In established medical journals abroad the name of the researcher comes first and that of principal investigator last. In India, the person who is overall in charge of the research usually wants his name first, say researchers.

Dr. Anoop Misra, director and head of the department of diabetes and metabolic diseases at Delhi's Fortis Hospitals, was Professor of Medicine at AIIMS for 30 years. He

(contd. on page 11)

(2) Genus *Lamproptera* Gray, 1832
1. *Lamproptera curius* (Fabricius, 1787)
i. *L. c. curius* (Fabricius, 1787) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
2. *Lamproptera meges* (Zinken, 1831)
i. *L. m. virescens* (Butler, 1870) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.

Tribe TEINOPALPINI

(1) Genus *Meandrusa* Moore, 1888
1. *Meandrusa lachinus* (Fruhstorfer, 1902)
i. *M. l. lachinus* (Fruhstorfer, 1902) - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Uttarakhand, W. Bengal.
2. *Meandrusa payeni* (Boisduval, 1836)
i. *M. p. evan* (Doubleday, 1845) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.

(2) Genus *Teinopalpus* Hope, 1843
1. *Teinopalpus imperialis* Hope, 1843
i. *T. i. imperialis* Hope, 1843 - Assam, Manipur, Meghalaya.
ii. *T. i. himalaicus* Rothschild, 1898 - Arunachal Pradesh, Sikkim, W. Bengal.

Subfamily PARNASSIINAE

Tribe ZERYNTHIINI

(1) Genus *Bhutanitis* Atkinson, 1873
1. *Bhutanitis lidderdalii* Atkinson, 1873
i. *B. l. lidderdalii* Atkinson, 1873 - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.

Tribe PARNASSIINI

(1) Genus *Parnassius* Latreille, 1804

[Hundreds of subspecies have been proposed from the Central Asian and Himalayan region in this genus, the validity and limits of which are yet to be finalised. Hence only species are shown below].

1. *Parnassius maharaja* Avinov 1916
2. *Parnassius delphius* Eversmann 1843
3. *Parnassius stoliczkanus* C. & R. Felder 1864
4. *Parnassius nandadevinensis* Weiss 1990
5. *Parnassius staudingeri* Bang-Haas 1882
6. *Parnassius stenosemus* Honrath 1890
7. *Parnassius acdestis* Grum-Grshimailo 1891
8. *Parnassius cephalus* Grum-Grshimailo 1891
9. *Parnassius augustus* Fruhstorfer 1903
10. *Parnassius charltonius* Gray 1852
11. *Parnassius acco* Gray 1853
12. *Parnassius hannyngtoni* Avinov 1916
13. *Parnassius simo* Gray 1853
14. *Parnassius hardwickii* Gray 1831
15. *Parnassius jacquemontii* Boisduval 1836
16. *Parnassius epaphus* Oberthür 1879
17. *Parnassius actius* Eversmann 1843
18. *Parnassius tianschanicus* Oberthür 1879

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(Fam. Papilionidae concluded).

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Sd/-Dr. R.K. Varshney
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Subspecies Catalogue of the Butterflies of India (Papilionidae)
A Synopsis

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Family PAPILIONIDAE
Subfamily PAPILIONINAE
Tribe TROIDINI

(1) Genus *Losaria* Moore, 1902
1. *Losaria coon* (Fabricius, 1793)
i. *L. c. cacharensis* (Butler, 1885) - Assam, Meghalaya
ii. *L. c. sambilanga* (Doherty, 1886) - Nicobar Is.
2. *Losaria rhodifer* (Butler, 1876) - Andaman Is.

(2) Genus *Pachliopta* Reakirt, 1865
1. *Pachliopta hector* (Linnaeus, 1758) - Peninsular India to W. Bengal. Straggler on Andamans.
2. *Pachliopta pandiyana* (Moore, 1881) - Western Ghats south of Goa.
3. *Pachliopta aristolochiae* (Fabricius, 1775)
i. *P. a. aristolochiae* (Fabricius, 1775) - Throughout India
ii. *P. a. sawi* (Evans, 1932) - Car Nicobar Is.
iii. *P. a. goniopeltis* (Rothschild, 1938) - Andaman Is.
iv. *P. a. camorta* (Moore, 1877) - Central Nicobar Is.
v. *P. a. kondulana* (Evans, 1932) - South Nicobar is.

(3) Genus *Troides* Hübner, 1819
1. *Troides helena* (Linnaeus, 1758)
i. *T. h. cerberus* (C. & R. Felder, 1865) - Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Orissa, Mizoram, Sikkim, Tripura, W. Bengal.
ii. *T. h. heliconoides* (Moore, 1877) - Andaman Is.
iii. *T. h. ferrari* Tytler, 1926 - South Nicobar Is.
2. *Troides minos* (Cramer, 1779) - Western Ghats south of Maharashtra.
3. *Troides aeacus* (C. & R. Felder, 1860)
i. *T. a. aeacus* (C. & R. Felder, 1860) - Arunachal Pradesh, Assam, Nagaland, Manipur, Meghalaya, Mizoram, Tripura, Sikkim, Uttarakhand, W. Bengal.

(4) Genus *Atrophaneura* Reakirt, 1865
1. *Atrophaneura aidoneus* (Doubleday, 1845) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Uttarakhand.
2. *Atrophaneura varuna* (White, 1842)
i. *A. v. astorion* (Westwood, 1842) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Uttarakhand, W. Bengal.

(5) Genus *Byasa* Moore, 1882
1. *Byasa latreillei* (Donovan, 1826)
i. *B. l. latreillei* (Donovan, 1826) - ?Himachal Pradesh, ?Jammu & Kashmir, Sikkim, Uttarakhand, W. Bengal.
ii. *B. l. kabrua* (Tytler, 1915) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland.
2. *Byasa polla* (de Nicéville, 1897) - Arunachal Pradesh, Nagaland, Manipur.
3. *Byasa nevilli* (Wood-Mason, 1882) - Assam, ?Meghalaya.
4. *Byasa polyeuctes* (Doubleday, 1842)
i. *B. p. polyeuctes* (Doubleday, 1842) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
ii. *B. p. letincius* (Fruhstorfer, 1908) - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
5. *Byasa dasarada* (Moore, 1858)
i. *B. d. dasarada* (Moore, 1858) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
ii. *B. d. ravana* (Moore, 1858) - Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttarakhand.
6. *Byasa crassipes* (Oberthür, 1893) Arunachal Pradesh,

Manipur.

7. *Byasa plutonius* (Oberthür, 1876)
   i. *B. p. pembertoni* Moore, 1902 - ?Arunachal Pradesh, Sikkim, W. Bengal.
   ii. *B. p. tytleri* Evans, 1923 - Manipur, Nagaland.

Tribe PAPILIONINI

(1) Genus *Papilio* Linnaeus, 1758

1. *Papilio agestor* Gray, 1831
   i. *P. a. govindra* Moore, 1864 - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
   ii. *P. a. agestor* Gray, 1831 - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.
2. *Papilio epycides* Hewitson, 1864
   i. *P. e. epycides* Hewitson, 1864 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
3. *Papilio slateri* Hewitson, 1859
   i. *P. s. slateri* Hewitson, 1859 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
4. *Papilio paradoxa* (Zincken, 1831)
   i. *P. p. telearchus* Hewitson, 1852 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
5. *Papilio clytia* Linnaeus, 1758
   i. *P. c. clytia* Linnaeus, 1758 - Throughout India except Jammu & Kashmir, Punjab and Rajasthan.
   ii. *P. c. flavolimbatus* Oberthür, 1879 - Andaman Islands.
6. *Papilio polymnestor* Cramer, 1775
   i. *P. p. polymnestor* Cramer, 1775 - Peninsular India as far north as W. Bengal, Madhya Pradesh and Gujarat.
7. *Papilio memnon* Linnaeus, 1758
   i. *P. m. agenor* Linnaeus, 1758 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, South Nicobar Islands, Tripura, W. Bengal.
8. *Papilio mayo* Atkinson, 1874 - Andaman Islands.
9. *Papilio bootes* Westwood, 1842
   i. *P. b. bootes* Westwood, 1842 Meghalaya.
   ii. *P. b. mixta* Tytler, 1915 - Manipur, Nagaland.
   iii. *P. b. janaka* Moore, 1857 - Arunachal Pradesh, Assam, Sikkim, Uttarakand, W. Bengal.
10. *Papilio alcmenor* C. & R. Felder, 1865
    i. *P. a. alcmenor* C. & R. Felder, 1865 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, W. Bengal.
11. *Papilio protenor* Cramer, 1775
    i. *P. p. euprotenor* Fruhstorfer, 1908 - Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, W. Bengal.
12. *Papilio elephenor* Doubleday, 1845 - Assam.
13. *Papilio bianor* Cramer, 1777
    i. *P. b. polyctor* Boisduval, 1836 - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
    ii. *P. b. ganesa* Moore, 1842 - Arunachal Pradesh, Assam, Sikkim, W. Bengal.
    iii. *P. b. gladiator* Fruhstorfer, 1902 - Manipur, Meghalaya.
14. *Papilio paris* Linnaeus, 1758
    i. *P. p. paris* Linnaeus, 1758 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Uttarakhand, W. Bengal.
    ii. *P. p. tamilana* Moore, 1881 - Western Ghats as far north as Maharashtra.
15. *Papilio arcturus* Westwood, 1842
    i. *P. a. arcturus* Westwood, 1842 - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.
    ii. *P. a. arius* Rothschild, 1908 - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
16. *Papilio krishna* Moore, 1858
    i. *P. k. krishna* Moore, 1858 - Arunachal Pradesh, Sikkim, W. Bengal.
    ii. *P. k. manipuri* Tytler, 1939 Manipur.
17. *Papilio crino* Fabricius, 1793 - Peninsular India as far north as W Bengal.
18. *Papilio buddha* Westwood, 1872 - Western Ghats as far north as Goa.
19. *Papilio dravidarum* Wood-Mason, 1880 - Western Ghats as far north as Goa.
20. *Papilio castor* Westwood, 1842
    i. *P. c. castor* Westwood, 1842 - Assam, Manipur, Meghalaya, Mizoram, Nagaland.
    ii. *P. c. polias* Jordan, 1909 - Arunachal Pradesh, Sikkim, W. Bengal.
21. *Papilio helenus* Linnaeus, 1758
    i. *P. h. helenus* Linnaeus, 1758 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Uttarakhand, W. Bengal.
    ii. *P. h. daksha* Hampson, 1889 - Western Ghats south of Gujarat.
22. *Papilio nephelus* Boisduval, 1836
    i. *P. n. chaon* Westwood, 1844 - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, W. Bengal.
23. *Papilio prexaspes* C. & R. Felder, 1865
    i. *P. p. andamanicus* Rothschild, 1908 - Andaman Islands.
24. *Papilio polytes* Linnaeus, 1758

i. *P. p. romulus* Cramer, 1775 - Throughout mainland India.
ii. *P. p. stichioides* Evans, 1912 - Andaman Islands.
iii. P. *p. nikobarus* C. Felder, 1863 - Nicobar Islands.
25. *Papilio liomedon* Moore, 1875 - Western Ghats as far north as Goa
26. *Papilio demoleus* Linnaeus, 1758
i. *P. d. demoleus* Linnaeus, 1758 - Throughout India below 2000m elevation.
27. *Papilio machaon* Linnaeus, 1758
i. *P. m. asiatica* Ménétriès, 1855 - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
ii. *P. m. ladakensis* Moore, 1884 - Jammu & Kashmir (high altitude).
iii. *P. m. verityi* Fruhstorfer, 1907 - Arunachal Pradesh, Manipur, Meghalaya, Nagaland.
iv. *P. m. hookeri* Gaonkar, 1999 - Sikkim, W. Bengal (high altitude).

Tribe LEPTOCIRCINI

(1) Genus *Graphium* Scopoli, 1777
1. *Graphium eurous* (Leech, 1893)
i. *G. e. caschmirensis* Rothschild, 1895 - Himachal Pradesh, Jammu & Kashmir, Uttarakhand.
ii. *G. e. sikkimica* Heron, 1899 - Arunachal Pradesh, ?Manipur, Meghalaya, ?Nagaland, Sikkim, W. Bengal.
2. *Graphium mandarinus* (Oberthür, 1879)
i. *G. m. garhwalica* (Katayama, 1988) - Uttarakhand.
ii. *G. m. paphus* (de Nicéville, 1886) - Arunachal Pradesh, Sikkim, W. Bengal.
3. *Graphium agetes* (Westwood, 1843)
i. *G. a. agetes* (Westwood, 1843) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
4. *Graphium nomius* (Esper, 1799)
i. *G. n. nomius* (Esper, 1799) - Delhi, Rajasthan, Sikkim, Uttarakhand, Uttar Pradesh, Bihar, throughout drier parts of Southern India to W. Bengal.
ii. *G. n. swinhoei* (Moore, 1878) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
5. *Graphium aristeus* (Stoll, 1781)
i. *G. a. anticrates* (Doubleday, 1846) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
6. *Graphium antiphates* (Cramer, 1775)
i. *G. a. naira* (Moore, 1903) - Western Ghats as far north as Goa
ii. *G. a. pompilius* (Fabricius, 1787) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
7. *Graphium epaminondas* (Oberthür, 1789) - Andaman Islands.
8. *Graphium cloanthus* (Westwood. 1841)
i. *G. c. cloanthus* (Westwood, 1841) - Throughout the Himalaya and N.E. India.
9. *Graphium sarpedon* Linnaeus, 1758
i. *G. s. sarpedon* Linnaeus, 1758 - Throughout the Himalaya and N.E. India.
ii. *G. s. teredon* (C. & R. Felder, 1864) - W. Ghats as far north as Gujarat; ?Madhya Pradesh.
10. *Graphium doson* (C. & R. Felder, 1864)
i. *G. d. axion* (C. & R. Felder, 1864) - along the Himalaya from Uttarakhand to Arunachal Pradesh and N.E. India. ?Delhi.
ii. *G. d. eleius* (Fruhstorfer, 1907) - S. India to W. Bengal.
11. *Graphium evemon* (Boisduval, 1836)
i. *G. e. albociliatis* (Fruhstorfer, 1901) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
12. *Graphium eurypylus* (Linnaeus, 1758)
i. *G. e. acheron* (Moore, 1885) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
ii. *G. e. macronius* (Jordan, 1909) - Andaman Islands.
13. *Graphium chironides* (Honrath, 1884)
i. *G. c. chironides* (Honrath, 1884) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, W. Bengal.
14. *Graphium agamemnon* (Linnaeus, 1758)
i. *G. a. agamemnon* (Linnaeus, 1758) - Himalaya from Uttarakhand to Arunachal Pradesh, N.E. India.
ii. *G. a. menides* (Fruhstorfer, 1904) - S. India.
iii. *G. a. andamana* (Lathy, 1907) - Andaman Islands.
iv. *G. a. decoratus* (Rothschild, 1895) - Car and Central Nicobar Islands.
v. *G. a. pulo* (Evans, 1932) - S Nicobar Islands.
15. *Graphium macareus* (Godart, 1819)
i. *G. m. indicus* (Rothschild, 1895) - Sikkim, W. Bengal.
ii. *G. m. lioneli* (Fruhstorfer, 1902) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland.
16. *Graphium xenocles* (Doubleday, 1842)
i. *G. x. xenocles* (Doubleday, 1842) - Sikkim, Uttarakhand, W. Bengal.
ii. *G. x. phrontis* (de Nicéville, 1897) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
17. *Graphium megarus* (Westwood, 1844)
i. *G. m. megarus* (Westwood, 1844) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland.

(2) Genus *Lamproptera* Gray, 1832
1. *Lamproptera curius* (Fabricius, 1787)
i. *L. c. curius* (Fabricius, 1787) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.
2. *Lamproptera meges* (Zinken, 1831)
i. *L. m. virescens* (Butler, 1870) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland.

Tribe TEINOPALPINI

(1) Genus *Meandrusa* Moore, 1888
1. *Meandrusa lachinus* (Fruhstorfer, 1902)
i. *M. l. lachinus* (Fruhstorfer, 1902) - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Uttarakhand, W. Bengal.
2. *Meandrusa payeni* (Boisduval, 1836)
i. *M. p. evan* (Doubleday, 1845) - Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.

(2) Genus *Teinopalpus* Hope, 1843
1. *Teinopalpus imperialis* Hope, 1843
i. *T. i. imperialis* Hope, 1843 - Assam, Manipur, Meghalaya.
ii. *T. i. himalaicus* Rothschild, 1898 - Arunachal Pradesh, Sikkim, W. Bengal.

Subfamily PARNASSIINAE

Tribe ZERYNTHIINI

(1) Genus *Bhutanitis* Atkinson, 1873
1. *Bhutanitis lidderdalii* Atkinson, 1873
i. *B. l. lidderdalii* Atkinson, 1873 - Arunachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, W. Bengal.

Tribe PARNASSIINI

(1) Genus *Parnassius* Latreille, 1804

[Hundreds of subspecies have been proposed from the Central Asian and Himalayan region in this genus, the validity and limits of which are yet to be finalised. Hence only species are shown below].

1. *Parnassius maharaja* Avinov 1916
2. *Parnassius delphius* Eversmann 1843
3. *Parnassius stoliczkanus* C. & R. Felder 1864
4. *Parnassius nandadevinensis* Weiss 1990
5. *Parnassius staudingeri* Bang-Haas 1882
6. *Parnassius stenosemus* Honrath 1890
7. *Parnassius acdestis* Grum-Grshimailo 1891
8. *Parnassius cephalus* Grum-Grshimailo 1891
9. *Parnassius augustus* Fruhstorfer 1903
10. *Parnassius charltonius* Gray 1852
11. *Parnassius acco* Gray 1853
12. *Parnassius hannyngtoni* Avinov 1916
13. *Parnassius simo* Gray 1853
14. *Parnassius hardwickii* Gray 1831
15. *Parnassius jacquemontii* Boisduval 1836
16. *Parnassius epaphus* Oberthür 1879
17. *Parnassius actius* Eversmann 1843
18. *Parnassius tianschanicus* Oberthür 1879

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Sd/-Dr. R.K. Varshney
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Ganga Sagar
The Sagar Island is Threatened to Sink

DOLA MITRA

Where? A 300 sq. km island in South 24 Parganas District, West Bengal, situtated in the Hooghly delta, 80 nautical miles south of Kolkata; with a year-round population of 1,60,000 people, mainly fisherfolk and farmers. Two to four lakh people descend on the isle during the annual Ganga Sagar mela in mid-January.

What? The island is rapidly sinking and may not exist in a couple of decades. Many of its embankments are already under water, sweet water ponds have turned salty, farmlands on the coast are submerged, an important temple has had to be moved inland three times already.

Why? Due to climate change and a rise in sea levels, according to scientists. A nearby island, Lohachara, sank about seven years ago.

"God will never allow this island to go down under water," thunders Sadhu Baba, standing waist-deep in water in his loincloth, body covered in ash, hands stretching up towards the sky. "The day that happens, the world will be destroyed," he proclaims apocalyptically. If you are standing near him on Sagar Island, looking at the scene unfolding all around, you just might want to believe him. The Ganga Sagar Mela, the two-day religious fair which falls in mid-January on Makar Sankranti every year, attracts hundreds of thousands to this island in the South 24 Parganas district of West Bengal. A vast beach stretching across the silver, sandy south-eastern tip of the island is taken over by a sea of humanity—not just pilgrims and sadhus from across the country but also a jostling crowd of national and international tourists, journalists, photographers, police and politicians. As you watch this sea of bodies, it really is very difficult to imagine it becoming a part of the vast open sea strething out beyond. And, like Sadhu Baba, there is hardly a visiting pilgrim ready to face that bleak possibility.

"This is a centuries-old ritual...holiness has grown deep roots in this land...not even the sea gods can shake it," says Gita Devi, 50, from Bihar, who's been visiting the mela since her childhood. "My parents were deeply religious, and they came here to pray for a child. After I was born, they continued coming, year after year. My husband and I don't miss a year . I cannot imagine a day when this island won't exist."

A neighbouring island, Lohachara, also inhabited, did sink slowly but steadily below the surface seven years ago. But then Lohachara is not Sagar, which, as locals and legends tell it, is no ordinary island. Located at the point where the river Ganga flows wildly into the Bay of Bengal, it is the place where, according to inhabitants, "God came down to earth" in the form of Kapil Muni. Its mela is considered the country's second biggest Hindu pilgrimage event, after the Kumbh Mela.

A sadhu named Bachcha Shiv who has come down to 'Sagar Deep' from a temple in Kanchrapara, north of Kolkata, reassures Gita Devi: "Kapil Muni's land will never go down...never."

But just a few miles out, where the villages of Sagar Island stretch out along the open bay, decay and erosion tell a different tale. "The sadhus and pilgrims are living in a fool's paradise," scoffs Sushil Bhunyan, who lives in a village called Rashpur on Sagar Island. The 37-year-old fisherman says, a note of helplessness creeping into his voice, "Over the last couple of years, the sea has encroached on our land so fast and so furiously that we don't know what to do, where to go?" All the sweet water ponds in the area have turned saline, he says, and farmlands have come to be submerged: "We have had to abandon our lands lining the coast and move inward. But how far can we go? The whole island will cave in one day," he says.

Bhunyan is only too willing to take us on a tour of the devastation wreaked by the ocean. With tears in his eyes, he points towards a place in the open sea, and says, "My original hut used to be there. But the sea swept..." The high wind sweeps his voice away. A wide stretch of ground along the sea is dotted with remnants of an entire forest of trees, uprooted by the encroaching waves. The sea's power and fury is dramatically visible, barrages built with bricks and cement have been knocked down pounded by waves crashing incessantly against them. Almost like the boy in the legend, who put his finger in the dyke to prevent a flood, the villagers have tried to block the sea with nylon bags stuffed with sand. But to no avail—the bags too have been washed away.

Professor Sugata Hazra, director, School of Oceanographic Studies, Jadavpur University, who's been studying the phenomenon of sinking island in the deltas off the Bay of Bengal, confirms that Sagar Island is eroding at an alarming rate: "Sagar Island is in danger. Many of its embankments are already under water. It's going down so fast that by 2020 to 2030, it will render hundreds and thousands of its people homeless." He points out especially to the southern and south-western parts of the island (which house the mela), saying

they are eroding faster, not just because of exposure to the open sea but because of the crosscurrents of the confluence as the Ganges gushes into the Bay of Bengal. The culprits are the same as the world over, as Hazra avers, "climate change and a rise in sea levels."

The Kapil Muni temple has had to be moved inland three times in the last three decades (the first time was in1977) because of the encroaching sea. Says temple priest Mahabir Das, who comes from Ayodhya to perform puja during the mela: "Scientists will have their explanations. But we have recently installed an idol of Lord Hanuman to propitiate the gods." At least the temple authorities have a plan. The administration seems to have none, so far, for the rehabilitation of the villagers.

Back in the villages, nightly meetings are on to discuss sea levels and the surges in sea water. Most villagers can not understand why the sea has got "even more angry", as they put it, in the last two years. In the entire village, only one man, a school teacher named Ajit Kumar Das, has heard about global warming. "*Bishha ushhnota*? (Global warming?)" he asks rhetorically, when you ask him about the rising sea. "They held a conference in Europe. Am I right? Did they come up with a solution? Do they know what the problem is?" he sniggers. Then he says, as though it was a command. "Tell them to come to Ganga Sagar mela next time."

Evolution of Mammalian Brain Size

The Key is Nose

BRIAN VASTAG

If you like your big human brain, you can thank your nose—or at least the noses of your earliest mammal cousins.

That's because 200 million years ago, a keen sense of smell drove an explosive growth in brain size that pushed mammals out from under the shadow of dinosaurs, a new study concludes.

Enhanced smell probably gave the first mammals — tiny shrewlike creatures— the ability to sniff out insects and grubs at night while allowing them to avoid being eaten by stinky dinosaurs, the study authors suggest.

That enhanced sense of smell "gave mammals our head start," said Timothy Rowe, the paleontologist who led the work, published in the Journal *Science*. For the study, Rowe and his collegues deployed powerful X-ray machines to scan the fossilized skulls of two of the earliest, and tiniest, mammals. Although the brains of these early human cousins disappeared long ago, the organs left imprints on the inner surface of the skulls. Reading those impressions—called endocasts— revealed for the first time the size, shape and structure of early mammalian brains.

These brains were much bigger, relative to body size, than those of the squat reptiles that preceded them, Rowe said. Particularly enlarged was the olfactory bulb, a dual lobed structure at the front of the brain that processes smells. An enlarged olfactory bulb implies a very sensitive sniffer.

Much later in evolution, early humans developed ever bigger brains, but, ironically lost their delicate sense of smell. In its place, day- living humans and other primates developed superior vision useful for plucking fruit and scanning the horizon for predators.

For the tiny shrew-like creatures that scurried underfoot of giant reptiles, though, the sense of smell was vital. It allowed them to navigate the world at night, when dinosaurs were probably asleep, Rowe said, while steering them away from danger and toward their kin. "Being able to smell a lot better than your reptile counterparts would be a huge advantage." said Anjali Goswami, a paleontologist at University College, London, who wasn't involved in the research. The two fossilized skulls Rowe scanned were found in southwest China in the 1980s and date to about 195 million years ago, during a long period dubbed as the Mesozoic that was dominated by the rapid evolution of dinosaurs. But the earliest mammals were born then, too, eking out a living on the margins.

Zhe-Xi Luo, the Chinese paleontologist who discovered the two fossils, invited Rowe to study the specimens in the mid-1980s. As Rowe nervously held the smallest of the skulls, from a paper clip-size species dubbed *Hadrocodium*, he yearned to peek inside.

But 25 years ago, the only way to see inside a fossilised skull was to slice it apart. In the time since, Rowe and his colleagues at the University of Texas at Austin (U.S.A.), helped develop powerful X-ray scanning machines. These scanners work much like CT machines at hospitals, using sophisticated software to reconstruct 3D images of hidden structures.

Rowe began scanning skulls from the reptilian ancestors of mammals, cat-size creatures called cynodonts. The scans showed cynodont brains to be simple and relatively small, with tiny olfactory bulbs.

In contrast, when Rowe finally scanned the *Hadrocodium* skull, he saw that it displayed many of the features of modern mammalian brains. In addition to the dramatically enlarged olfactory bulb, the *Hadrocodium* brain sported a wrinkly, topmost layer missing in reptiles, the neocortex.

The neocortex processes tactile information from the skin — and from hair, which the earliest mammals probably possessed, said Rowe's colleague Thomas Macrini, who worked on the study.

While providing warmth, individual hairs also act like whiskers, sensing the wind and helping animals navigate tight spaces, such as underground dens. It takes a lot of brain power to process that sensory information — power located in the neocortex.

A large neocortex also implies improved agility and better motor coordination, Rowe said, other skills handy for scurrying away from predators. As the neocortex grew, so did cognitive abilities, or thinking power.

And so with their noses — and pelts — leading the way, the brains of our tiniest, most distant cousins laid the groundwork for an explosion in ever-bigger mammalian brains that evolved after the dinosaurs died out.

(From '*The Washington Post*').

(b.f. from page 3)

says, "Some of my juniors at AIIMS weren't allowed to do research on HIV. Even the patient registry which has personal details such as address, phone number, etc, was controlled by the HoD."

The Babu Lag

Bureauratic tangles can delay research as well. At AIIMS, says Misra, one has to apply to a senior, then the HoD, who approaches the director. It might take six months just to be given money to buy even small research tools (from grants awarded either by the Indian Council for Medical Research or the Department of Science and Technology). "In private institutions, one just needs to get the research cleared by an ethics panel. Viable research can be set up within a month."

Ethics can, however, be a tricky matter and it can cut both ways. Guwahati cardiac surgeon Dr. Dhani Ram Baruah ran into intense trouble in 1997 for transplanting a pig's heart, lung and kidney in a 32 year-old man. The patient died within a week and Baruah was roundly vilified by the scientific community. His lab was burnt down and he was thrown into prison, charged with violating human organ transplantation laws.

What's the Solution?

- Have institutional reforms and a process to keep heads of department in check. Beat the system, says Talwar. Be courageous and persevere.
- Search for greener pastures. Misra has never regretted leaving AIIMS. "I am doing more research than ever before, 3-4 hours every afternoon, I get grants from the UK, Sweden and India and have 10 research officers working for me."
- Find someone senior to help. Misra works closely with his juniors, checking every aspect of their research and papers before sending them to established journals for "peer review". Some of his juniors have published as many as 15 papers in established journals.

Red Sandalwood

The large-scale smuggling of endangered red sandalwood, which grows only in Indian forests and commands a princely price in markets of China, Japan and Western countries, has forced the Supreme Court of India to try and save it from extinction. They have done this by suggesting that picking or uprooting of red sandalwood from wild be made a penal offence under the Wildlife Protection Act.

A bench of Justices K.S. Radhakrishnan and Chandramauli Kumar Prasad directed the Centre to take steps to include Red Sandalwood in Schedule VI of the Act, as requested by Andhra Pradesh.

There are only six other plant species in Schedule VI such as Beddomes' Cycad, Blue Vanda, Kuth, Ladies Slipper Orchid, Pitcher Plant and Red Vanda.

Accepting the arguments of amicus curiae and senior advocate P.S. Narasimha, the court said it was giving the direction for inclusion of red sandalwood in the prohibited list, since "it is reported that nowhere in the world this species is seen, except in India and we owe an obligation to world, to safeguard this endangered species for posterity". Red sandalwood is found only in south India, especially in AP's Cuddapah and Chittoor districts that share border with Tamil Nadu. The court noted that it possessed medicinal properties.

New Record Of Seagrass Associated Testate Amoebae from Palk Bay, Tamil Nadu (Protozoa : Rhizopoda)

L. BINDU

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Palk Bay is situated on the southeast coast of India between latitude 9° 55'- 10° 45' N and longitude 78° 58'-79°55'E. The Bay itself is about 110 km. long and is surrounded on the northern and western sides by the coastline of state of Tamil Nadu on mainland of India. The plants and animals of this Bay are dependent on various physicochemical factors including nutrients which are responsible for the fertility of the water bodies (Harvey, 1995).

Seagrasses are specialized marine flowering plants classified under the super order Alismatiflorae, belonging to one of the six families of the class Monocotyledonae, and adapted to the near shore environment. These form extensive meadows supporting high biodiversity (Connolly et al., 1999). The taxonomic inventorization and systematics of Protozoa with reference to the seagrass areas is a lacuna, in these important ecosystems of India. In this context the present study of seagrass associated ecosystems was undertaken and 20 species of seagrass associated rhizopods belonging to 8 genera and 6 families were identified and are reported here. All the species are recorded for the first time from sea grass. All collections were made by Bindu, L. and party, except mentioned otherwise. The distribution of all reported species is cosmopolitan.

Subkingdom : Protozoa
Phylum : Sarcomastigophora
Class : Lobosea
Order : Testacealobosa
Family : Arcellidae

1. *Arcella discoides* Ehrenberg, 1843
Material examined : 1 ex., Thondi, 29. x. 2010, Dr. K. Venkatraman and party; 2 exs., Thondi, 5. x. 2011; 2 exs., Athankarai, 4. ii. 2012; 3 exs., Mimisel, 3. ii. 2012.

2. *Centropyxis aculeata* (Ehrenberg, 1832) Stein, 1857
Material examined : 3 exs., Adirampatinam, 30. x. 2010, Dr. K. Venkatraman and party; 2 exs., Mallipatinam, 6. x. 2011 ; 2 exs., Devipatinam, 5. x. 2011; 1 ex., Adirampatinam, 6. x. 2011.

3. *Centropyxis aerophila* Deflandre, 1929
Material examined : 4 exs., S. P. Patinam, 7. x . 2011; 2 exs., Devipatinam, 5. x. 2011; 2 exs., Mallipatinam, 6. x. 2011; 1 ex., Athankarai, 4. ii. 2012.

4. *Centropyxis constricta* (Ehrenberg, 1841) Penard, 1902
Material examined : 3 exs., Pasipatinam, 3. ii. 2012; 1 ex., Mallipatinam, 6. x. 2011.

5. *Centropyxis minuta* Deflandre, 1929
Material examined : 1 ex., Thondi, 29. x. 2010, Dr. K. Venkatraman and party; 2 exs., Mimisel, 7. x. 2011; 2 exs., Mallipatinam, 6. x. 2011; 3 exs., Thirupalaikkudy, 5. x. 2011; 1 ex., Athankarai, 4. ii. 2012.

6. *Centropyxis orbicularis* Deflandre, 1929
Material examined : 1 ex. Mimisel, 3. ii. 2012; 2 exs., Thondi, 2. ii. 2012; 2 exs., Mimisel, 7. x. 2011.

Family : Difflugiidae

7. *Difflugia acuminata* Ehrenberg, 1838
Material examined : 8 exs., Devipatinam, 5. x. 2011; 5 exs., Devipatinam, 2. ii. 2012; 3 exs., Thondi, 2. ii. 2012; 2 exs., Mimisel, 3. ii. 2012; 3 exs., S. P. Patinam, 3. ii. 2012.

8. *Difflugia globulosa* Dujardin, 1837
Material examined : 1 ex., Athankarai, 4. ii. 2012; 2 exs., Devipatinam, 5. x. 2011.

9. *Difflugia lobostoma* Leidy, 1879
Material examined : 3 exs., Mallipatinam, 6. x. 2011; 1 ex., Mimisel, 7. x. 2011.

10. *Difflugia lucida* Penard, 1890
Material examined : 1 ex.,Thondi, 29. x. 2010, Dr. K. Venkatraman and party; 2 exs., Devipatinam, 5. x. 2011; 1 ex., Athankarai, 4. ii. 2012; 3 exs., Panaikulam, 4. ii. 2012.

11. *Difflugia oblonga* Ehrenberg, 1838
Material examined : 4 exs., Devipatinam, 5. x. 2011; 2 exs., S.P. Patinam, 7. x. 2011; 2 exs., Mimisel, 3. ii. 2012; 1 ex., Athankarai, 4. ii. 2012.

12. *Difflugia tuberculata* Wallich, 1864
Material examined : 1 ex., Thirupalaikkudy, 29. x. 2010, Dr. K. Venkatraman and party; 3 exs., Thondi, 5. x. 2011; 2 exs., Mallipatinam, 6. x. 2011; 2 exs., S. P. Patinam, 3. ii. 2012; 1

ex., Athankarai, 4. ii. 2012.

13. *Nebela dentistoma* Penard, 1890
Material examined : 2 exs., Mallipatinam, 6. x. 2011; 3 exs., S. P. Patinam, 7. x. 2011.

14. *Nebela wailesi* Deflandre, 1936
Material examined : 2 exs., Mimisel, 7. x. 2011; 2 exs., S. P. Patinam, 7. x. 2011; 2 exs., Mimisel, 3. ii. 2012; 3 exs., Athankarai, 4. ii. 2012; 1 ex., Panaikulam, 4. ii. 2012.

15. *Cyphoderia ampulla* (Ehrenberg, 1840) Leidy, 1878
Material examined : 2 exs., Mallipatinam, 6. x. 2011.

16. *Euglypha acanthophora* (Ehrenberg, 1842) Perty, 1849
Material examined : 2 exs., Thondi, 5. x. 2011; 2 exs., Devipatinam, 5. x. 2011; 1 ex., S. P. Patinam, 3. ii. 2012; 2 exs., Athankarai, 4. ii. 2012.

17. *Euglypha cristata* Leidy, 1874
Material examined : 2 exs., S. P. Patinam, 7. x. 2011; 6 exs., Thondi, 2. ii. 2012; 4 exs., Devipatinam, 2. ii. 2012.

18. *Euglypha rotunda* Wailes & Penard, 1911
Material examined : 2 exs., Mallipatinam, 6. x. 2011; 1 ex., Mimisel, 7. x. 2011.

19. *Trinema enchelys* (Ehrenberg, 1838) Leidy, 1878
Material examined : 2 exs., Thondi, 5. x. 2011; 3 exs., Devipatinam, 5. x. 2011; 2 exs., Mallipatinam, 6. x. 2011; 2 exs., Mimisel, 3. ii. 12; 2 exs., Athankarai, 4. ii. 2012.

20. *Trinema lineare* Penard, 1890
Material examined : 2 exs., Thondi, 5. x. 2011; 1 ex., Devipatinam, 5. x. 2011; 3 exs., S. P. Patinam, 3. ii. 2012; 1 ex., Athankarai, 4. ii. 2012.

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Vitamin C curbs Cancer

Nearly 30 years after Nobel laureate US biochemist Linus Pauling suggested that vitamin C supplements can prevent cancer, researchers from Johns Hopkings Institute in Baltimore have confirmed that in mice at least, vitamin C—and potentially other antioxidants—can inhibit the growth of some cancer tumours.

Conventional wisdom has it that antioxidants mop up volatile oxygen free radical molecules and prevent DNA damage associated with degenerative diseases associated with aging, such as cancers, cardio-vascular disease, cognitive impairment, Alzheimer's disease, immune dysfunction, cataracts and macular degeneration.

The Hopkins study, however, found that the antioxidants' actual role is to destabilise a tumour's ability to grow under oxygen-starved conditions.

The work, led by Dr. Chi Dang, Professor of Medicine and Oncology at Johns Hopkins, is published in the medical journal *Cancer Cell*.

So far, studies linking antioxidants to cancer prevention have been conflicting. "Research has conclusively linked diet and lifestyle with some cancers such as those of the uterus, breast, colon and stomach, but there is no conclusive proof that antioxidants can be prescribed for cancer prevention.

"However vitamin C and other antioxidants are good for health and boost immunity. We ask cancer survivors to include a lot of fresh fruits and vegetables in their diet," says Dr. Sameer Kaul, Senior Consultant in Oncology, Apollo Hospital.

When it comes to boost antioxidant intake, food sources of antioxidants are better than diet supplements, health newsletter *Mayo Clinic Health Letter* said, quoting recent research. The best known food components with antioxidant activities are vitamins A, C, and E; *i*-carotene; the mineral selenium ; and the compound lycopene.

"Many antioxidants can be identified in food by their distinctive colours—the deep red of cherries and of tomatoes; the orange of carrots; the yellow of mangoes; and the blue-purple of red cabbage, plums, blackberries (*jamun*), brinjal and red grapes. Purple, in fact, is considered the best source of antioxidants," says nutritionist Rekha Sharma, the senior vice president, VLCC Healthcare.

Major Vitamin C sources are : Berries, Legumes (beans), Fruits (cherries, pears, plums, lemon, pineapple, orange), Vegetables (spinach, brinjal, broccoli), Nuts and Grains (wheat, oat).

Travel to North - East India
To see Himalayan Peaks and other Nature Wonders

SNEHA MAHALE
E-mail : *sneha.mahale@hindustantimes.com*

East India has a lot to offer in terms of natural beauty, exotic locations and culture. And if you move away from the crowds on the plains and into the hills, there is lots to see and do in the winter. From the tallest peak in the world to one of the most isolated towns in the country, there's something for everyone in the cold months.

Mount Everest and Brahmaputra Delta

Heading to the North-East? Don't miss on the opportunity to see the world's tallest peak and its adjoining mountain ranges. Take a no-frills flight from Delhi to Guwahati, and pray you have a pilot who was a tour guide in his last life. And the next thing you know, you will have the pleasure of seeing the peak without suffering a climb or facing the cold. Winter is also a great time to see the mountain in all its snowy finery and as in our case, for checking out the other major peaks in the area. If you go a little ahead, you also have a bird's eye view of the expansive Brahmaputra delta. Spread over acres of land, the basin still has enough water for you to appreciate how powerful that river must be in the monsoon.

Sela Pass

Now what could be more adventurous than driving down the second highest motorable road in the world in peak winter? This Pass in Arunachal Pradesh stands at a height of 13,700 feet and was named after a girl (Sela) who died a martyr. In winter, weather conditions change rapidly and car engines are known to shut down due to the intense cold. Paradise Lake lies close to the Pass and often freezes over at this time of the year . The Pass is a popular tourist spot and you can play in the snow. And we have been warned that snow leopards frequent the area often. So be on your guard.

Tawang

A trip to this final frontier on the Indo-China border really tests your resolve, but you will be rewarded with beauty unparalleled. Once there, you could visit the PT Tso Lake that often freezes in winter. The cold makes it difficult for fish to survive in the water. Then there are the Jang waterfalls, where certain scenes of the Shah Rukh Khan-Madhuri Dixit starrer Koyla (1997) were shot. Or visit the 400-year old monastery and listen in to the constant chanting of the Buddhist monks. You can also stop by The Jaswant Garh Indo Chinese Memorial or Tawang's War Memorial and relive the Indo-China war.

Harbhajan Singh Temple

No, this isn't a tribute to the Indian spinner by some cricket fanatic. Instead, the shrine, located in between the Jelep La Pass and Nathu La Pass, has been built in memory of Baba Harbhajan Singh, a sepoy. He went missing and was thought to have drowned in a glacier during the 1962 Sino-Indian War. Though his body was discovered three days later, locals still believe that he is "on duty" and even conducts his rounds at nights, protecting the lives of his fellow soldiers. In fact, the army sends money to his family as he is still on their payroll.

Frozen Tsangu Lake

Just about 34 kms away from Gangtok lies a serene lake at an altitude of 12,400 ft on the Gangtok - Nathu La highway. Though the surrounding area remains covered in ice throughout the year, the lake tends to freeze completely in winter, becoming a major tourist attraction. You'd find families, walking around the lake or enjoying a yak ride.

Eagle's Nest Wildlife Sanctuary

When you think of the North - East and wildlife, Kaziranga and its one-horned rhinos are the first thoughts that come to your mind. However, located within Arunachal Pradesh in the west Kameng district, lies another Sanctuary that is a bird lover's delight. The sanctuary covers an area of 217 sq km, and is home to endangered animals like the elephant, tiger, leopard, goral and red panda. However, you must visit the place for its 454 species of birds including varieties of kites, hawks, vultures and eagles. Though the area is taken care of by the army, accommodation is available within the Sanctuary itself.

Keep in Mind

- Some States that share a border with our neighbours need a permit.
- Winter means that the day starts at 4am and ends at 4pm.
- At times, the only access road to these exotic places is in deplorable condition, causing a car to break down. So keep your car gear handy.
- A car is a must all the time, since most tourist spots are at quite a distance from the city centres.
- Be prepared for lack of hospitality from the natives.

The Silent Killer : High Blood Pressure

High blood pressure or hypertension is rampant though we don't pay much attention to it. The malady does not show any symptoms, until it is too late. Keeping blood pressure under check regularly is a must for everyone.

ARCHANA DARSHAN

Stressed professionals are getting hypertension at younger age. Thus, it makes sense to get your blood pressure checked at regular intervals, just like dental cleanings. You also need to know more about it all.

Blood Pressure Facts

- Blood is carried from the heart to all parts of our body in vessels called arteries, says Dr. Hansa Gupta, Consultant Cardiologist with Escorts Kalyani.
- Each time our heart beats about 60-70 times a minute at rest, it pumps oxygen-rich blood through the blood vessels, or arteries, that run through our body.
- Blood pressure is the force of the blood pushing against the walls of the arteries. The more forceful it is—the higher it is—the more likely it is to damage the walls of your arteries, informs Dr. Hansa.
- Your blood pressure changes throughout the day. It is lowest when you're asleep, and it rises when you awaken. It also can rise when you are excited, nervous, or active. So it varies throughout the day.
- Our blood pressure is at its highest when the heart beats, pumping the blood. This is called systolic pressure—the first number of your blood pressure reading. When the heart is at rest, between beats, your blood pressure falls—diastolic pressure the second number of your blood pressure reading.
- The recommendations of Joint National Committee VII, a central activity of the NHLBI's National High Blood Pressure Education Programme, a patient and professional education programme on classifying high blood pressure for adults aged 18 years or older are as follows:
  - Normal is 120 systolic / 80 diastolic
  - Pre-hypertension is 120-139 / 80-89
  - Stage I hypertension - 140-159 / 90-99
  - Stage II hypertension - 160 or more / 100 or more
- Since readings may vary it is recommended that hypertension be diagnosed only after two or more eleavated readings obtained on at least two visits over a period of one to several weeks.

Knowing Numbers

- It is important for pre-hypertensives and hypertensives to grasp the significance of the numbers of their blood pressure readings. Systolic pressure—the first number of your blood pressure reading plays a greater role towards keeping your heartbeat steady.
- The recommendations of JNC VII have advised doctors not to ignore the systolic hypertension. After the age of 50 the systolic pressure—the first number of your blood pressure is harder to control than the diastolic, or the second number. Systolic blood pressure is linked to cardiovascular outcomes.
- The difference between systolic and diastolic pressure, higher and lower numbers of your blood pressure reading reveals your pulse pressure. "The normal value is 40 and if the difference becomes 50 it substantially raises the risk of atrial fibrillation," says cardiologist Dr. Gray F. Mitchell, President of Cardiovascular Engineering, a private company that does research funded by the US National Institute of Health. The research got reported in the February 2007 issue of the *Journal of the American Medical Association*.
- In atrial fibrillation, the upper chambers of the heart tend to quiver, rather than beat steadily. The condition can lead to formation of blood clots that travel to the brain, causing stroke. It is also associated with other major problems, including heart failure.

Risk Factors

"Anyone can develop high blood pressure. In most of the cases the reasons are unknown", says Dr. Gupta. But these factors increase your chances of getting hypertension, she says:

- Overweight
- A man over the age of 45 or a woman over the age of 55
- Have a family history of high blood pressure
- Have pre-hypertension, a reading of 120-139 / 80-89 mmHg
- Kidney disease
- Hormonal imbalances, like ladies with hypothyroid, on Oral Contraceptive Pills with oestrogen or Hormone Replacement Therapy may get high blood pressure.

Besides, other things that increase your chances of developing high blood pressure are :

- Eating too much salt

- Drinking too much alcohol
- Being physically inactive.

Untamed High Blood Pressure

- High blood pressure can cause your heart to work too hard and become larger, which can lead to heart failure. The term heart failure does not mean that the heart will stop working. In heart failure, the heart can not pump enough blood through the body. Heart failure develops over time, as the pumping action of the heart gets weaker.
- Uncontrolled high blood pressure results in stiff, inflexible artery walls that are a veritable magnet for white blood cells, cholesterol, and other blood components that accuumulate and form plaque. It's easy to envision the damage high-pressure blood flow can wreak if you already have plaque buildup: that blood rushing past at high force.
- High blood pressure can cause blood vessels in your kidneys to narrow resulting in kidney failure.
- Untamed high blood pressure can cause blood vessels in your eyes to burst or bleed, which may cause vision changes and can result in blindness.
- High blood pressure can be dangerous for pregnant women and their unborn babies.

Managing Hypertension

Dr. Gupta advises, "Once diagnosed as a hypertensive you will always need to be on guard. Lifestyle modifications go a long way in managing high blood pressure." She shares the tips:

- **Lose Weight**

A 10 kg weight loss is associated with a systolic blood pressure reduction of 5 to 20 mmHg.

- **DASH**

DASH stands for "Dietary Approaches to Stop Hypertension." The DASH eating plan includes whole grains, poultry, fish, and nuts, and has reduced amounts of red meats, sweets, added sugars and beverages containing sugars.

- **Reduce Dietary Sodium**

Sodium sneaks on our plates mostly in the form of canned foods, instant soups, carbonated beverages and fast foods. Say no to table salt. Flavour your food with lots of ground pepper. Pepper is a strong, dominant flavour that can help you reduce your interest in salt. In fact, your tongue is easily trained away from its salt addiction, Sodium intake should not be more than one teaspoon of table salt in a day.

- **Slide Potassium in Diet**

Eat a banana or a quarter of a cantaloupe at each breakfast. That's because both are rich in potassium. Potassium is sometimes called the "un-salt" because if you don't get enough of it, your blood pressure is likely to rise. Other high potassium foods include spinach, lima beans, sweet potatoes, and avocados. Snack on dried apricots, as like bananas they are a good source of potassium.

- **Exercise**

Regular aerobic physical activity such as brisk walking at least 30 minutes per day, most days of the week can reduce systolic blood pressure.

- **Do Not Smoke or Chew Tobacco**

The nicotine in cigarettes and other tobacco products causes your blood vessels to constrict and your heart to beat faster, which temporarily raises your blood pressure. If you quit smoking or using other tobacco products, you can significantly lower your risk of heart disease and heart attack, as well as help lower your blood pressure.

- **Manage Stress**

Learn stress management techniques, like breathing exercises to defeat stress.

- **Take Medication Every Day**

Most importantly people on medication should not quit medicines on their own.

These tips will help you manage high blood pressure.

Obituary

Rosa Henderson

Coccidologist

Rosa Henderson graduated from the University of Canterbury, New Zealand, in 1965 and was a Research Fellow investigating chromosome abnormalities in leukaemia at the Cytogenetics Unit, Christchurch Hospital, for 5 years. After a 15 year break from science bringing up her family, she began an entomological career in 1985 at DSIR, Mt Albert. When the DSIR was disbanded in 1992, Rosa became a science technician for Landcare Research working on Scale insects in the N.Z. Arthropod Collection. She has been employed till now as a senior science technician and section curator of Hemiptera : Sternorrhyncha in NZAC. Rosa was author or co-author of 37 scientific papers, including three major works on Scale insects as volumes in the *Fauna of New Zealand* series, two written in collaboration with Chris Hodgson (Wye College and Cardiff, U.K.) on the family Coccidae. Her most recent volume in the series (vol. 66, 2011, 275 pp.) included the description of four new genera and seven new species.

—Peter Buchanan
Science Team Leader, Systematics,
Landcare Research, Auckland-1142 (New Zealand).

On a Collection of Diptera from Ladakh, Jammu and Kashmir, with New Record of *Lucilia sinensis* (Calliphoridae) from India

BULGANIN MITRA

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According to Mani (1962), Shannon, 1926, reported *Chrysotoxum ladakense* of the family Syrphidae from the Rupeshu valley (16,000 ft) of Ladakh which was probably the first report of a Dipteran insect from this cold desert area, and Hutchinson, 1933, seems to be the first worker who collected the midges (Chironomidae) from Ladakh area. Comparatively recently Maheshwari (1989) surveyed various lakes of Ladakh and reported 52 species of Chironomidae.

The author made a collection trip to Ladakh, from 30th August, 2008 to 28th September, 2008, with a view to collect and study the Dipteran fauna of this cold desert ecosystem. The present communication reports 26 species of 20 genera under 13 families. One species, *Lucilia sinensis* Aubertin, of the family Calliphoridae, is reported as a new record from India. All collections were made by the author.

Family : Limoniidae

1. *Limonia (Dicranomyia)* sp.
Material examined : 3♀♀ 3♂♂, Rangidum, Kargil district, 3.ix.2008.

Family : Tabanidae

2. *Tabanus (Tabanus) striatus* Fabricus
Material examined : 1♀, Chaklamsar, 16.ix.2008.

Family : Therevidae

3. *Thereva* sp.
Material examined : 1♀, Bajgo, 16.ix.2008.

Family : Bombyliidae

4. *Systoechus socius* Walker
Material examined : 1♂, Hunder Sand dune (10,185 ft), 13.ix.2008.

Family : Syrphidae

5. *Eristalis (Eristalis) tenax* (Linnaeus)
Material examined : 1♂, Karzoo (11,896 ft), Leh, 5.ix.2008; 3♀♀ 1♂, Gangaltak (10,276 ft), 14.ix.2008; 1♀, Diskit (10,104 ft), 13.ix.2008; 2♀♀ 1♂, Rangdum (12,139 ft), 19.ix.2008; 1♂, Nyoma (13,721 ft), 9.ix.2008; 1♂, Hunder Sand dune (10,185 ft), 13.ix.2008; 1♂, Kargil (8,901 ft), 21.ix.2008.

6. *Eristalis (Eoseristalis) arbustorum* (Linnaeus)
Material examined : 2♀♀, Karzoo (11,896 ft), Leh, 12.ix.2008; 3♀♀ 1♂, Karzoo (11,896 ft), Leh, 6.ix.2008; 2♂♂ 2♀♀, Gangaltak (10,276 ft), 14.ix.2008; 1♀, Hunder Sand dune (10,185 ft), 13.ix.2008.

7. *Eristalis (Eoseristalis) cerealis* Fabricius
Material examined : 1♀, Gangaltak (10,276 ft), 14.ix.2008.

8. *Episyrphus balteatus* (De Geer)
Material examined : 2♀♀, Gangaltak (10,276 ft), 14.ix.2008.

9. *Volucella zonaria* Poda
Material examined : 1♀, Hunder Sand dune (10,185 ft), 12.ix.2008.

10. *Metasyrphus (Metasyrphus) lumiger* (Meigen)
Material examined : 2♀♀ 5♂♂, Gangaltak (10,276 ft), 14.ix.2008; 1♀, Karzoo (11,896 ft), Leh, 5.ix.2008; 1♂, Bazgo, 16.ix.2008; 1♂, Hunder Sand dune (10,185 ft), 13.ix.2008.

11. *Metasyrphus (Metasyrphus) latifasciatus* (Macquart)
Material examined : 1♂, Karzoo (11,896 ft), Leh, 6.ix.2008.

12. *Syritta pipiens* Linnaeus
Material examined : 1♀, Chumathang (13,286 ft), 11.ix.2008; 1♂, Hunder Sand dune (10,185 ft), 13.ix.2008; 1♀, Karzoo (11,896 ft), Leh, 6.ix.2008.

Family : Ulididae

13. *Physiphora aenea* Fabricius
Material examined : 1♀, Diskit (10,104 ft), 13.ix.2008.

Family : Tephritidae

14. *Compiglossa absthiini* (Fabricius)
Material examined : 1♀, Nider village (13,805 ft), 8.ix.2008.

15. *Dioxyna sororcula* (Wiedemann)
Material examined : 1♀, Nider village (13,805 ft), 8.ix.2008.

Family : Sepsidae

16. *Sepsis himalayensis* Brunetti
Material examined : 1♂, Nyoma (13,721 ft), 9.ix.2008.

17. *Sepsis cynipsea* Linnaeus
Material examined : 1♂, Kargil (8,901 ft), 21.ix.2008.

Family : Hippoboscidae

18. *Hippobosca variegata* Megerle

Material examined : 1♀, Nyoma (13,721 ft), 8.ix.2008.

Family : Muscidae

19. *Musca (Musca) domestica* Linnaeus

Material examined : 3♀♀ 2♂♂, Karzoo (11,896 ft), Leh, 5.ix.2008; 2♀♀ 3♂♂, Diskit (10,104 ft), 13.ix.2008; 3♀♀, Nyoma (13,721 ft), 9.ix.2008; 1♂1♀, Kargil (8,901 ft), 21.ix.2008.

20. *Orthellia viridis* (Wiedemann)

Material examined : 2♀♀ 3♂♂, 5 km away from Rangdum (12,140 ft), 19.ix.2008.

Family : Calliphoridae

21. *Melinda grisea* Malloch

Material examined : 1♀ 1♂, Nider village (13,805 ft), 8.ix.2008.

22. *Calliphora (Calliphora) vicina* Robineau-Desvoidy

Material examined : 3♂♂, Diskit (10,104 ft), 13.ix.2008; 1♀ 2♂♂, Karzoo (11,896 ft), Leh, 12.ix.2008.

23. *Lucilia sericata* (Meigen)

Material examined : 2♂♂, Gangaltak (10,276 ft), 14.ix.2008.

24. *Lucilia sinensis* Aubertin

Material examined : 2♂♂, Karzoo (11,896 ft), Leh, 5.ix.2008.

Remark : This is the first record of this species from India.

Family : Sarcophagidae

25. *Sarcorhodendorfia* sp.

Material examined : 2♂♂, Karzoo (11,896 ft), Leh, 5.ix.2008.

26. *Bercaea cruentata* Meigen

Material examined : 2♀♀ 1♂, Karzoo (11,896 ft), Leh, 5.ix.2008; 1♂, Bazgo, 16.ix.2008.

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Dance is better than Exercise

Popular prejudice offers a b&w picture of brain versus brawn. We are told that exercise develops the body while reading, writing and thinking are meant to develop the brain. Nothing could be more flawed.

'A sound brain in a sound body' is not just a saying. It encapsulates the spiritual wisdom of our traditional societies. We know now that every cerebral activity like reading, writing or solving a mathematical problem may be primarily concerned with the brain, but also has a direct impact on the body. And the emotions, feeling and sensory reactions created by brainwork have a bearing, however subtle, on the body and its health.

Similarly, every kind of exercise has an impact on the brain and the nervous system. There's the direct effect when we plan and think about exercise. At the same time there's the indirect effect due to the release of adrenaline and other chemical substances in the blood from exercising.

Classical dance involves both the physical and the neurological halves of the body and dance students develop such a high ability to remember, calculate and plan that their academic record, too, improves significantly. In Indian dance training, the skills that are imparted are almost universal: from control of the body in every position and movement, except climbing, to a heightened sense of the body in space and overall alertness. There is also the refinement of the fine neuromuscular adjustments of a whole host of cooperating nerve fibres.

Now, the autonomous nervous system connects with the involuntary organs like the heart muscles, blood vessels of the respiratory system and the muscles of the digestive tract. Through connections that dance creates between the autonomous and the central nervous systems, the exercises of the skeletal muscles have a tremendous influence on them and heighten the balance between the reciprocal nerve fibres regulating the heart muscles, blood vessels and the intestinal tract. This indirect effect is very important in helping a child grow into a healthy adult, free from disease.

In his book, *The Function of the Human Body*, Guy A.C.C. says, "Repetition is the great secret of success, to allow the whole coordinated performance to become smooth and satisfactory." He talks only of sports and such activity. Dance scores over them because it combines in itself a host of skills like speed, stamina, dexterity, endurance and grace, normally attained by different exercises for each benefit.

This not only saves time but, as dancers swear, comes with a high degree of genuine enjoyment enhancing a holistic spiritual connect. Especially since the source of the drive to dance is in the emotional mechanism, invaluable in the nervous organisation of man!

—Shanta Serbjeet Singh

Research Notes

ARTIFICIAL BLOOD DEVELOPED FROM CULTURED STEM CELLS IN IIT-MADRAS LAB

PUSHPA NARAYAN

A team of scientists from the Department of Engineering Design IIT-Madras has been successful in creating enough red blood cells from the stem cells, to be used as 'artificial blood' in people who need transfusion.

Having proved their oxygen carrying capacity, the RBCs will now go into 'mass production' before starting human trials in three years, scientists said. The IIT team recently got a funding approval from the Union Ministry of Science and Technology to produce artificial blood on an industrial scale. This blood would be tested on animals before human trials. If the trials prove successful it will help hospitals overcome shortage of blood and save many accident victims. "We will be able to provide any amount of safe and disease-free blood at half the cost of blood sold now," said the study's Principal Investigator, Dr Soma Guhathakurta, a Visiting Professor at the Department of Engineering Design IIT-M.

In the past few months, Dr Soma and her team of researchers have made trillions of red blood cells—the carrier of hemoglobin that delivers oxygen to various body tissues and clears up carbon dioxide—on a petri dish. They cultured adult stem cells derived from the cord blood in the presence of some "nutritional supplements", for 17 days in the laboratory.

The stem cells, which are undifferentiated cells with the potential to turn into any cells, developed into red blood cells.The Department of Biotechnology (DBT) has recently approved a plan from the scientists to develop a bio-reactor for large-scale production of artificial blood. The reactor will be built with support of IIT's Biotechnology Department. "We will simultaneously process papers for performing animal trials with the artificial blood. It will first be tested on anemic mice. If they are able to accept it and survive, we will take it to the next level," she said. Globally, scientists have been working on artificial blood. While a French team has begun human trials, a UK team is set to follow suit. Dr Soma, a heart surgeon, says their research is different, as unlike other cases, they have been able to exclusively produce red blood cells. So far nobody has been able to mass produce only red blood cells.

"Almost all earlier attempts have had at least 40% of white blood cells in the culture. Introducing such artificial blood into a patient with a weak immune system could be tricky. As a surgeon, I would prefer only red blood cells," she said.

The IITians say they did not use expensive enzyme or growth factors. " Despite this, the yield was a billion times high. In a typical RBC blood bag, there are about a trillion (1 follwed by 12 zeros) red blood cells. On our petridish we had a yield of about a quadrillion (1 followed by 15 zeros) cells from the starting point of about a million stem cells," said Venkatesh Balasubramanian, Associate Professor in the Department of Engineering Design.

The WHO says a country needs a minimum stock of blood equal to 1% of its population. This means India neeeds 12 million units of blood, but collects only nine million units annually, though demand has gone up drastically. The cost of blood has gone up in the last few years, as blood has to be subjected to several tests to ensure it is disease-free, says Dr K. Selvaraju, former State Blood Transfusion Officer. This could be avoided in artificial blood.

It may take at least five years for artificial blood to be available for clinical use, as large-scale trials will follow. The research hasn't been published in peer-reviewed science journals owing to the intellctual property concerns of the scientists.

Blow to heart saves a dying man

A 46-year-old surgeon got a fresh lease of life on board a Kolkata-Chennai flight cruising at 30,000 feet recently. He fell unconscious and lost all pulse but was revived miraculously after a doctor on board gave a strong blow to his rib cage close to the heart. He sat up as if woken up from a deep slumber.

The flight had around half a dozen doctors returning to Chennai after an annual conference. Dr. J.S. Rajkumar, chairman of Lifeline Hospitals, who was one of the first to rush to his help, said it was a shocking experience which taught several others a lesson about the importance of Cardio Pulmonary Resuscitation (CPR).

"Assessing him rapidly, we saw to our horror that he had no pulse, even in his neck, and was ice cold and unresponsive. He was dead for all practical purposes," said Dr. Raj Kumar. "I have never felt such cold skin in my life. I gave a strong pericardial thump (a strong blow to the rib-cage in front of the heart) and he jumped back to life. His pulse and blood pressure returned to normal," he said.

The passenger was driven to Vijaya Hospital for further monitoring as soon as the flight landed in Chennai.

FIRST REPORT OF AN INDO-PACIFIC SERGEANT FISH *ABUDEFDUF VAIGIENSIS* FROM NORTHERN EAST COAST OF INDIA

DIPANJAN RAY, PRASANNA YENNAWAR* and ANIL MOHAPATRA

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Family Pomacentridae is among the world's most ornamental fish families, with 28 genera and 348 species (Nelson, 2006) distributed in all tropical seas, mainly Indo-Pacific, with a few genera inhabiting brackish water habitats (Allen, 1991). It includes damselfishes and anemonefishes, which are very popular in the aquarium trade. Various studies have been carried out on fish faunal diversity of Northern east coast (West Bengal and Odisha) of India (Manna & Goswami, 1985; Goswami, 1992; Talwar et al., 1994; Chatterjee et al., 2000; Mohapatra et al., 2007; etc.). All these reports together have not reported any fish of the family Pomacentridae from West Bengal and/or Odisha coasts. During the local surveys around the coastal areas of Odisha and West Bengal, a fish was collected which after thorough scrutiny was identified as *Abudefduf vaigiensis* (Quoy & Gaimard, 1825). This marine species is mainly reef associated and oceanodromous. *A. vaigiensis* is well known in aquarium fish trade.

Six specimens were collected: four examples from Digha Mohona (21°37.843'N, 87°32.827'E) of West Bengal, during June 2011; and another two examples from Talsari (21°36.403'N, 87°23.385'E) of Odisha on 1st August, 2011. All the specimens are registered and deposited in the museum of Marine Aquarium and Regional Centre, Zoological Survey of India, Digha (W. Bengal).

The fish is small, with laterally compressed body, has a small, oblique terminal mouth and a single nostril on either side of the snout. Opercle, preopercle and interopercle finely serrated & smooth. Suborbital smooth, upper and lower edge of caudal base without projecting spiniform rays. Teeth usually conical to flattened in two rows (inner row difficult to detect in small specimen). Horizontal scale rows above middle of lateral line is 3½. Lateral line scales 20-21. Dorsal fin with 13 spine and 12 soft rays, anal fin with 2 spines and 12 soft rays, anal and dorsal fins not filamentous, 18-19 Pectoral fin rays; Pelvic fin with 1 spine and 5 soft rays, Caudal fin forked, Gill rakers 25-29. Colour bluish-white with five black bars on sides; bright yellow on back; all fins dusky. Total length of the specimens were between 100-153mm, standard length 75-113 mm, Body depth 1.79-1.92 times to standard length, head length 3.42-3.53 times to standard length, eye diameter 3.40-3.72 times to head length, Inter orbital space 2.82-3.18 times in head length. Snout length 3.30-3.41 times in head length.

This fish is widely distributed in Indo-Pacific region covering Red Sea and eastern Africa to the Line and Tuamoto islands, north to southern Japan, and south to Australia. In Indian coastal waters this species has so far been reported from Andaman and Nicobar Is. (Rao, 2003), Lakshadweep (Varghese et al., 2011), and Tamil Nadu (Murty, 2002).

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NOCTUID MOTH DIVERSITY OF THE VALMIKI TIGER RESERVE, BIHAR

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Valmiki Tiger Reserve is the 18th Tiger Reserve of the country. It is located in the West Champaran district of Bihar, and covers an area of 880.78 sq. km. It was declared as a wildlife sanctuary in 1978 and a tiger reserve in 1990. It represents varied type of physiography, like bhabar and terai containing streams, nullahs, swamps and marshes. The entire area of Valmiki Tiger Reserve has a natural bhabar dun sal forest, dry siwalik sal forest, Gangetic moist & mixed deciduous forest, khair - sisso forest, cane brakes, Eastern wet alluvial grassland and barringtonia swamp forest. The diverse ecological features along with diverse flora have resulted in rich faunal diversity in the Valmiki Tiger Reserve (VTR). However, very few studies have been made on its faunal diversity, especially insect diversity of VTR.

The author, through a departmental research programme, has studied the Noctuid moth diversity of VTR and prepared a preliminary list of Noctuid moth species. Two surveys were conducted in the months of June, 2011 and June 2012, in the seven localities i.e., Madanpur, Valmikinagar, Kotraha, Ganauli, Naurangia don, Govardhana and Manguraha. Identifications of the collected moths were done with the help of relevant literature (Hampson 1892, 1894). In this study, the classification proposed by Lafontaine & Fibiger (2006) has been followed, where Arctiidae and Lymantridae are considered as the subfamilies of Noctuidae.

The collection tours resulted in the collection of 320 examples under 36 species represented by 27 genera of family Noctuidae. All the collected species have been reported for the first time from Valmiki Tiger Reserve. The list of collected species follows:

Order LEPIDOPTERA
Family NOCTUIDAE

1. *Aegocera bimacula* (Walker)
2. *Arna bipunctapex* (Hampson)
3. *Artena dotata* (Fabricius)
4. *Asota ficus* (Fabricius)
5. *Asota caricae* (Fabricius)
6. *Bocula erota* Swinhoe
7. *Brunia antica* (Walker)
8. *Calesia haemorrhoa* Guenee
9. *Callopistria recurvata* Moore
10. *Creatonotus interruptus* (Linnaeus)
11. *Creatonotus transiens* (Walker)
12. *Cyana guttifera* (Walker)
13. *Episparis liturata* (Fabricius)
14. *Eressa confinis* (Walker)
15. *Euproctis digramma* Guer
16. *Euproctis guttata* (Walker)
17. *Euproctis scintillans* (Walker)
18. *Euproctis semisignata* Walker
19. *Hyblaea puera* (Cramer)
20. *Hyela quadripartita* Walker
21. *Lyclene calamaria* (Moore)
22. *Lyclene dharma* (Moore)
23. *Lyclene obsoleta* (Moore)
24. *Lymantria marginata* Walker
25. *Lymantria mathura* Moore
26. *Lymantria rhodina* Walker
27. *Micraloa emittens* (Walker)
28. *Olepa ricini* (Fabricius)
29. *Ophiusa tirrhaca* (Cramer)
30. *Remigia frugalis* (Fabricius)
33. *Spodoptera litura* (Fabricius)
32. *Spirama retorta* (Cramer)
34. *Syntomoides imaon* (Cramer)
31. *Sarbanissa albifascia* (Walker)
35. *Trignodes hyppossia* (Cramer)
36. *Westermannia superba* Hübner

Acknowledgements: The author is highly thankful to the Director, Zoological Survey of India, Kolkata, for providing necessary facilities.

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NEW RECORDS OF SOME TESTATE AMOEBAE FROM SINGHORI WILD-LIFE SANCTUARY, MADHYA PRADESH (PROTOZOA : RHIZOPODA)

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Singhori Wildlife Sanctuary was established in 1976. It spreads over a total area of 288 sq. km in Madhya Pradesh. The tiger, leopard, sambhar, chital and wild boar etc. are principal fauna and teak is the principal flora.

Reports on free-living rhizopods from Madhya Pradesh are scanty and the present account comprises 10 species of testate amoebae from moss samples of this Sanctuary. The collections were made by a survey team of the Central Zone Regional Centre of ZSI, Jabalpur, in Feb. 2010 from Barna reservoir. The classification of Levine et al. (1980) is followed. All species are new records from this Sanctuary.

Protozoa

Order : Arcellinida

Family : Arcellidae

1. *Arcella catinus* Penard, 1890
Habitat: freshwater and moss.
Distribution : Arunachal Pradesh, Assam, Jammu & Kashmir, Mizoram and Uttarakhand.

2. *Arcella megastoma* Penard, 1902
Habitat : Freshwater and moss.
Distribution : Andhra Pradesh.

Family : Centropyxidae

3. *Centropyxis aculeata* (Ehrenberg, 1832) Stein, 1857
Habitat: Freshwater and moss.
Distribution :Assam, Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh, Kerala (Nilgiri Biosphere reserve), Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Sikkim, Tripura and West Bengal.

4. *Centropyxis ecornis* (Ehrenberg, 1841) Leidy, 1879
Habitat: Freshwater and moss.
Distribuition : Assam, Andhra Pradesh, Arunachal Pradesh, Himachal Pradesh, Kerala (Nilgiri Biosphere Reserve), Manipur, Meghalaya, Nagaland, Sikkim and West Bengal.

5. *Centropyxis oblonga* (Deflandre, 1929)
Habitat: Moss.
Distribution : Assam, Meghalaya, Nagaland and Sikkim.

6. *Centropyxis spinosa* (Cash & Hop.1905) Deflandre,1929
Habitat: Freshwater and moss.
Distribution : Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and West Bengal.

Family : Difflugiidae

7. *Difflugia corona* Wallich, 1864
Habitat: Freshwater and moss.
Distribution : Assam, Andhra Pradesh, Kerala (Nilgiri Biosphere Reserve), Tripura and West Bengal.

8. *Difflugia globulosa* Dujardin, 1837
Habitat: Freshwater, Sphagnum and Moss.
Distribution : Andhra Pradesh, Rajasthan, Meghalaya and West Bengal.

9. *Difflugia lebes* Penard, 1899
Habitat: Moss.
Distribution : Himachal Pradesh.

10. *Difflugia lithophila* Penard, 1902
Habitat: Freshwater and Moss.
Distribution : Chandigarh, Meghalaya, Tripura and West Bengal.

Acknowledgements : The author is grateful to the Director, Zoological Survey of India, Kolkata for the facilities provided. Also thankful to Dr. Jayasree Thilak, Scientist, SRC, for providing the moss samples for the present study.

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Levine N. D., Coliss, J. O., Cox, F. E. G., Deroux, G., Grain, J. et al. 1980. A newly revised classification of the Protozoa. *J. Protozool.*, 27 (1): 37-58.

Spider Silk's Strength

Scientists have decoded the secret of spider silk's strength and what makes the fibre at least five times as tough as piano wire.

Researchers at Arizona State University (ASU) found a way to obtain a wide variety of elastic properties of the silk of several intact spiders' webs, using a sophisticated but non-invasive laser light scattering technique.

"Spider silk has a unique combination of mechanical strength and elasticity that make it one of the toughest materials we know," said Professor Jefferv Yarger of ASU's Department of Chemistry and Biochemistry.

"This work represents the most complete understanding we have of the underlying mechanical properties of spider silks," Yarger said.

Spider silk is an exceptional biological polymer, related to collagen. "This information should help provide a blueprint for structural engineering of an array of bio-inspired materials, such as precise materials engineering of synthetic fibres to create stronger, stretchier, and more elastic materials," said Yarger.

ARE THERE ONLY A HANDFUL OF MOTH SPECIES IN DELHI ?

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Lepidoptera, the second largest Order of insects in number of species, consists of the butterflies and the moths. It is generally believed that out of the two, moths comprise about 90% and butterflies only 10% of species. Thus, moths ought to be roughly 10 times more than butterflies in numbers and in species at any place.

It so happened that while compiling the faunal species occurring in Delhi, for the *'Fauna of Delhi'* volume (Z.S.I., 1996), I and one of my colleagues have reported only 11 species of moths, belonging to 7 families (Ghosh & Varshney, 1996). This list was compiled from two older publications of Cotes & Swinhoe (1887-89) and Longstaff (1912).

In comparison to these merely 11 species of moths, we all well know that hundreds of species of butterflies have been reported from Delhi, in the studies of A.S. Jandu, 1941-43; J.P. Donahue, 1966-67; R. Ashton, 1972; P. Smetacek, 2000; and others.

It is hence, an anomalous situation. Workers on the Lepidoptera in general and of the Indian region in particular are required to explain it.

I offer some of my own thoughts as follows :

(i) Ghosh & Varshney did not go more scouting. There might be some other publications dealing with moth species of north India including Delhi.

(ii) Insect collections in I.A.R.I., New Delhi (National Pusa Collection) may be having a lot of specimens from this area. Collections in F.R.I., Dehra Dun, and even in B.N.H.S., Mumbai and Z.S.I., Kolkata, need to be checked to know how many moths from Delhi are there. I do not recollect if any of them have published catalogue of their moth holdings.

(iii) Workers like Colin P. Smith, Pokhara (Nepal), Peter Smetacek, Bhimtal (Uttarakhand), G.S. Arora, I.J. Gupta, D.K. Mondal et al. erstwhile of Z.S.I. (Kolkata), and several specialists out from the Department of Zoology, Punjabi University, Patiala (Punjab) can throw light on the subject in black and white.

(iv) After the monumental volumes by Hampson (1893-96) and Bell & Scott (1937), a new compilation of the moth species occurring in India has become necessary. The distribution of genera and species in its listings shall depict the Indian States, to know the range.

For classification and nomenclature in this work, books by Barlow, 1982, on the moths of South-east Asia, and Robinson, 1994, on the smaller moths of South-east Asia, both published by the Malayan Nature Society, Kuala Lumpur (Malaysia) could be helpful. *'Lepidoptera of Nepal'* by Smith, 2010, will also be helpful.

(v) And lastly, a question. Is it possible that the area of Delhi, heavily and widely urbanized being the capital of nation, has gradually sacrificed all the habitat and flora related to the survival of moths, to the concrete jungle ?

Readers' discretion awaited.

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Herbal Therapy for Rabbits

The Indian Veterinary Research Institute claimed to have come up with a new method to cure wounds of animals— herbal treatment.

By using extracts of leaves such as *Tridax procumbance* (ghamara), *Calendula officinalis* (garden marigold), *Adansonia digitata* (gorakh imli), wounds of livestock can be healed. The Institute has come up with the treatment after healing of wounds of rabbits by using leaves of the above mentioned plants.

Scientists started clinical trial of the herbs on six groups, each comprising six rabbits. The rabbits were given proper anesthesia and their backs were wounded. They were checked on 14th, 21st and 28th day. It was found that wounds treated with *T. procumbance* cured faster than other plants.

New Publications

BOOK REVIEW

Handbook on Diversity in some of the Indian Butterflies (Insecta: Lepidoptera), by Gupta, I. J. and Mridula Majumdar. 2012. 1-324 pp. Published by the Director, Zool. Surv. India, Kolkata. Published: February, 2012. ISBN: 978-81-8171-298-1. Price in India: Rs. 2975/- ; Foreign: $ 175; £ 120.

The book entitled "*Handbook on Diversity in some of the Indian Butterflies*" by I. J. Gupta, Scientist-'C' (Retired) and Mridula Majumdar, Senior Zoological Asstt., both of the Zoological Survey of India, Kolkata, has been published by the Director, Zoological Survey of India, in the Hand book series of the departmental publications.

The authors have treated 113 species of butterflies, representing two superfamilies: Papilionoidea with four families, viz., Papilionidae, Pieridae, Nymphalidae and Lycaenidae along with their subfamilies; and Hesperioidea with the family Hesperiidae and its three subfamilies. They have dealtwith Introduction in general and chapters on Collecting, Setting, Pinning, Storage and Display in the Museums; Morphology; Classification of butterflies including a Key to Identification of their families; followed by Species/subspecies under their superfamilies, families and subfamilies; References; Index to names of species of food-plants, and Common names of species of butterflies. The well written text is supported by more than 250 coloured illustrations.

Authors have selected species for inclusion in this book considering criteria of wing expanse, beauty/ugliness, polymorphism, flight, etc. (as examples mentioned on pages 15 and 16). Information on each species includes the valid name, followed by names used by earlier workers, photographs of upperside and underside of male/female or both, common name, diagnostic and morphological characters, variations in its subspecies, form etc., wing expanse, habit, habitat and ecology, short life-history, food plants, distribution and the status (of abundance). All these aspects have been well documented.

The small size of photographs of some specimens, and some being indistinct, e.g. *Callerebia nirmala nirmala*— upperside of female (page 144), *Poritia hewtsoni* [correction : *hewitsoni*] *hewtsoni*— underside of male (page 244), *Pseudozizeeria maha maha*— upperside of female (page 274); not maintaining uniformity in mentioning the year with name of author in the title of species; inclusion of illustrations for only two out of 80 well studied life-histories of species; etc. are some of the short-comings. The printing of some coloured photographs and the binding of the book are not up to the mark. Also, the unusual high price of the book for its paper-back edition will be a restraint on the pocket of readers.

Despite such certain deterrents, the reader will definitely be helped with the valuable information provided on various aspects of Indian butterflies. The authors are complimented for their appreciable contribution.

—R.K. Varshney

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Subspecies Catalogue of the Butterflies of India (Lycaenidae)
A Synopsis

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(Contd. from Vol. 14, No. 4, page 124)

(47) Genus *Arhopala* Boisduval, 1832

[Evans (1957) has monographed this group. Nomenclature for species and subspecies here have been followed after Bridges (1988).]

98. *Arhopala ace* De Niceville, 1893
 i. *A. a. arata* Tytler, 1915 - Manipur.
99. *Arhopala abseus* (Hewitson, 1862)
 i. *A. a. indicus* Riley, 1923 - Assam, Karnataka (Coorg, North Kanara), Sikkim.
100. *Arhopala allata* (Staudinger, 1889)
 i. *A. a. suffusa* Tytler, 1915 - Manipur.
101. *Arhopala oenea* (Hewitson, 1869)
 i. *A. o. oenea* (Hewitson, 1869) - Assam, Uttarakhand (Mussoorie), Sikkim.
 ii. *A. a. khamti* Doherty, 1891 - Assam, Sikkim.
102. *Arhopala agelastus* (Hewitson, 1862)
 i. *A. a. agelastus* (Hewitson, 1862) - "India".
103. *Arhopala agrata* De Niceville, 1890
 i. *A. a. binghami* Corbet, 1946 - Manipur.
104. *Arhopala alesia* Felder & Felder, 1865
 i. *A. a. sacharja* Fruhstorfer, 1914 - Manipur.
 ii. *A. a. wimberleyi* (De Niceville, 1887) - Andaman & Nicobar Is (Andamans).
105. *Arhopala amantes* (Hewitson, 1862)
 i. *A. a. amantes* (Hewitson, 1862)- Karnataka (North Kanara), Maharashtra (Poona), South India,
 ii. *A. a. apella* (Swinhoe, 1887) - Central India/ Madhya Pradesh, Orissa (Ganjam), Sikkim, Uttarakhand (Mussoorie to Kumaon), West Bengal.
106. *Arhopala arvina* (Hewitson, 1863)
 i. *A. a. ardea* (Evans, 1932) - Assam.
107. *Arhopala asinarus* (Felder & Felder, 1865)
 i. *A. a. tounguva* (Grose-Smith, 1887) - Andaman & Nicobar Is. (Andamans).
108. *Arhopala athada* (Staudinger, 1889)
 i. *A. a. apha* De Niceville, 1895 - Assam.
109. *Arhopala bazaloides* (Hewitson, 1878)
 i. *A. b. bazaloides* (Hewitson, 1878)- Assam, Karnataka (Coorg, Mysore, North Kanara), South India, Kerala (Travancore).
110. *Arhopala bazalus* (Hewitson, 1862)
 i. *A. b. teesta* (De Niceville, 1866) - Assam, Sikkim, Uttarakhand (Kumaon).
111. *Arhopala camdeo* Moore, 1858
 i. *A. c. camdeo* Moore, 1858 - Assam, North India, Sikkim.
 ii. *A. c. sebonga* (Tytler, 1926) - Manipur.
112. *Arhopala centaurus* (Fabricius, 1775)
 i. *A. c. coruscans* Wood-Mason & de Niceville, 1880 - Andaman & Nicobar Is.(Andaman).
 ii. *A. c. pirama* (Moore, 1881) - Karnataka (North Kanara).
 iii. *A. c. pirithous* (Moore, 1884) - North East (Assam, Sikkim), West Bengal.
113. *Arhopala democritus* (Fabricius, 1773)
 i. *A. d. lycaenaria* (Felder & Felder, 1860) - Nagaland (Naga Hills).
114. *Arhopala dispar* Riley & Godfrey, 1971
 i. *A. d. fracta* Evans, 1957 - Assam (Margherita).
115. *Arhopala eumolphus* (Stoll,1780)
 i. *A. e. eumolphus* (Stoll,1780) -- Assam, Bengal coast, Sikkim.
116. *Arhopala fulla* (Hewitson, 1862)
 i. *A. f. andamanica* (Wood-Mason & De Niceville, 1881) - Andaman & Nicobar Is.(Andaman)
117. *Arhopala hellenore* Doherty, 1881
 i. *A. h. hellenore* Doherty, 1881 - Assam.
118. *Arhopala paramuta* (De Niceville, 1884)
 i. *A. p. paramuta* (De Niceville, 1884) - Assam, Sikkim.
119. *Arhopala perimuta* (Moore, 1858)
 i. *A. p. perimuta* (Moore, 1858) - Assam, Sikkim.
120. *Arhopala opalina* (Moore, 1884)
 i. *A. o. opalina* (Moore, 1884) - Assam.
121. *Arhopala overdijkinki* Corbet, 1941
 i. *A. o. unda* Evans 1957 - "India" [probably Malaya].
122. *Arhopala rama* (Kollar, 1844)
 i. *A. r. rama* (Kollar, 1844) - Himalayas, J. & K. (Kashmir), North India, Sikkim.

ii. *A. r. ramosa* (Evans, 1925) - Assam.

123. *Arhopala ralanda* Corbet, 1941

i. *A. r. ralanda* Corbet, 1941 - Assam.

124. *Arhopala silhetensis* (Hewitson, 1862)

i. *A. s. silhetensis* (Hewitson, 1862)- Assam (Cachar), Manipur, Nagaland (Naga Hills), Sikkim.

125. *Arhopala selta* (Hewitson, 1869)

i. *A. s. constanceae* De Niceville, 1894 - Andaman & Nicobar Is. (Andaman).

(48) Genus *Bindahara* Moore, 1881

126. *Bindahara phocides* (Fabricius, 1793)

i. *B. p. areca* C. Felder, 1862 - Nicobars.

ii. *B. p. moorei* Fruhstorfer, 1904 - South India.

iii. *B. p. phocides* (Fabricius, 1793) - Andaman & Nicobar Is.(Andamans), Sikkim to NE India.

(49) Genus *Catapaecilma* Butler, 1879

127. *Catapaecilma major* Druce, 1895

i. *C. m. anais* Fruhstorfer,1915 - Manipur, Meghalaya (Khasi Hills), Nagaland (Nagas).

ii. *C. m. callone* Fruhstorfer, 1915 - South India.

iii. *C. m. major* Druce, 1895 - Uttarakhand (Mussoorie) to Sikkim.

(50) Genus *Cheritra* Moore, 1881

128. *Cheritra freja* (Fabricius, 1793)

i. *C. f. freja* (Fabricius, 1793) Uttarakhand (Kumaon) to NE. India.

ii. *C. f. jaffra* (Godart, 1924) - South India.

(51) Genus *Chrysozephyrus* Shirozu & Yamamoto, 1956

129. *Chrysozephyrus duma* (Hewitson, 1878)

i. *C. d. dumoides* (Tytler, 1915) - Manipur, Sikkim.

130. *Chrysozephyrus disparatus* (Howarth, 1957)

i. *C. d. interpositus* (Howarth, 1957) - Sikkim.

ii. *C. d. pseudoletha* (Howarth, 1957) - Meghalaya (Khasi Hills).

(52) Genus *Dacalana* Moore, 1884

131. *Dacalana cotys* (Hewitson, 1865)

[Cantlie (1962) treated it as *Pratapa cotys* (Hewitson, 1865)]

i. *D. c. cotys* (Hewitson, 1865) - Sikkim to Arunachal Pradesh.

(53) Genus *Deudorix* Hewitson, 1863

[Cantlie (1962) has been followed for names of species and subspecies.]

132. *Deudorix epijarbas* (Moore, 1858)

i. *D. e. amatius* Fruhstorfer, 1912 - Sikkim to NE India, Andaman & Nicobar Is. (Andamans, South Nicobars).

ii. *D. e. ancus* Fruhstorfer, 1912 - J. & K. (Kashmir) to Uttarakhand (Kumaon).

iii. *D. e. epijarbas* (Moore, 1858) - South India to Orissa, West Bengal (Kolkata).

133. *Deudorix hypergyria* (Elwes , 1893)

i. *D. h. gaetulia* De Niceville, 1893 - Assam to other NE. States.

134. *Deudorix perse* Hewitson, 1863

i. *D. p. ghela* Fruhstorfer, 1912 - South India.

ii. *D. p. perse* Hewitson, 1863 - Assam, H. P. (Kangra), Orissa, Sikkim, Maharashtra (Mumbai), Manipur (Imphal), Meghalaya (Khasi Hills, Umran), Nagaland (Nagas, Nichuguard).

135. *Deudorix smilis* Hewitson, 1863

i. *D. s. maseas* Fruhstorfer, 1912 - Andaman & Nicobar Is. (Andamans).

ii. *D. s. smilis* Hewitson, 1863 - Assam, Meghalaya (Jaintia Hills).

136. *Deudorix kessuma* (Horsfield, 1829).

i. *D. k. deliochus* Hewitson, 1874 - Manipur (East Manipur).

(54) Genus *Drupadia* Moore, 1884

137. *Drupadia scaeva* (Hewitson, 1863)

[Cantlie (1962) treated it as *Marmessus scaeva* (Hewitson).]

i. *D. s. cyara* (Hewitson, 1878) - Sikkim to Arunachal Pradesh.

(55) Genus *Eliotiana* Kocak, 1996

[Kocak & Seven (1997) have been followed for nomenclature of the genus, species and subspecies]

138. *Eliotiana jalindra* (Horsfield, 1895)

i. *E. j. indra* (Moore, 1884) - Orissa, West Bengal (Kolkata), Sikkim to NE India.

ii. *E. j. macanita* Fruhstorfer,1912- South India.

iii. *E. j. tarpina* (Hewitson, 1878) - Andaman & Nicobar Is. (Andamans).

(56). Genus *Esakiozephyrus* Shirozu & Yamamoto, 1956

139. *Esakiozephyrus bieti* (Oberthuer, 1886)

[Cantlie (1962) mentioned it as '*Esakiozephyrus mandara* De Niceville'.]

i. *E. b. dohertyi* (De Niceville, 1889) - Uttarakhand (Kumaon).

ii. *E. b. mandara* (Doherty, 1886) - H. P. (Kulu) to Uttarakhand (Garhwal).

(57).Genus *Flos* Doherty, 1889

140. *Flos apidanus* (Cramer, 1773)

i. *F. a. ahamus* Doherty, 1891 - Assam.

141. *Flos diardi* (Hewitson, 1862)

i. *F. d. diardi* (Hewitson, 1862) - Assam, Sikkim, 'India'.

142. *Flos fulgida* (Hewitson, 1863)

i. *F. f. fulgida* (Hewitson, 1863) - Assam, Sikkim.

(58). Genus *Horaga* Moore, 1881

143. *Horaga onyx* (Moore, 1858)

i. *H. o. cingalensis* Moore, 1884 - South India.

ii. *H. o. onyx* (Moore, 1858) - H. P. (Kangra) to NE India.
iii. *H. o. rana* De Niceville, 1889 - Andaman & Nicobar Is. (Andamans).
144. *Horaga syrinx* (C. Felder, 1860)
i. *H. s. moulmeina* Moore, 1884 - Sikkim to NE India.
(59) Genus *Hypolycaena* Felder & Felder, 1862
145. *Hypolycaena erylus* (Godart, 1824)
i. *H. e. andamana* Moore, 1877 - Andaman & Nicobar Is. (Andamans).
ii. *H. e. himavantus* Fruhstorfer, 1912 - Sikkim to NE India.
146. *Hypolycaena thecloides* (Felder & Felder, 1860)
i. *H. t. nicobarica* Evans.1925 - Andaman & Nicobar Is. (Central and South Nicobars).
(60) Genus *Iraota* Moore, 1881
147. *Iraota rochana* (Horsfield, 1829)
i. *I. r. boswelliana* Distant, 1885 - Assam, Manipur, Meghalaya (Khasias).
148. *Iraota timoleon* (Stoll, 1783)
i. *I. t. arsaces* Fruhstorfer, 1907 - South India, Madhya Pradesh.
ii. *I. t. timoleon* (Stoll, 1783) - Andaman & Nicobar Is. (Andamans), Orissa, Uttarakhand (Mussoorie) to NE India.
(61). Genus *Loxura* Horsfield, 1829
149. *Loxura atymnus* (Stoll, 1780)
i. *L. a. atymnus* (Stoll, 1780) - Assam, Central India, Himalayas, South India, Uttarakhand (Mussoorie), West Bengal.
[*L. a. continentalis* Fruhstorfer has been treated by some workers as a separate subspecies, but Bridges (1988) considered it as synonym of the nominate subspecies.]
iii. *L. a. prabha* (Moore, 1877) - Andaman & Nicobar Is. (Andamans).
iv. *L. a. nicobarica* Evans, 1932 - Andaman & Nicobar Is. (Nicobars).
(62) Genus *Mahathala* Moore, 1878
150. *Mahathala ameria* (Hewitson, 1862)
i. *M. a. ameria* (Hewitson, 1862) - West Bengal (Kolkata).
ii. *M. a. kiangana* Talbot, 1942 - Assam.
(63) Genus *Neocheritra* Distant, 1885
151. *Neocheritra fabronia* (Hewitson, 1878)
i. *N. f. fabronia* Hewitson - Sikkim to NE India.
(64) Genus *Panchala* Moore, 1882
152. *Panchala ammonides* (Doherty, 1891)
i. *P. a. elira* (Corbet, 1941) - Assam.
153. *Panchala birmana* Moore, 1884
i. *P. b. birmana* Moore, 1884 - Manipur.
154. *Panchala ganesa* (Moore, 1858)
i. *P. g. ganesa* (Moore, 1858) - North India (J. & K.- Kashmir to Uttarakhand-Kumaon) and Sikkim.
ii. *P. g. watsoni* (Evans, 1912) - Assam.
(65) Genus *Pratapa* Moore, 1881
155. *Pratapa deva* (Moore, 1858)
i. *P. d. deva* (Moore, 1858) - Madhya Pradesh, South India, West Bengal (Kolkata).
ii. *P. d. lila* Moore, 1884 - Andaman & Nicobar Is. (Andamans), Uttarakhand (Mussoorie) to NE India.
156. *Pratapa icetas* (Hewitson, 1865)
i. *P. i. extensa* Evans, 1925 - Sikkim to NE India.
ii. *P. i. icetas* (Hewitson, 1865) H. P. (Kangra) to Uttarakhand (Kumaon).
iii. *P. i. mishmia* Evans, 1925 - Arunachal Pradesh (Mishmi Hills), Assam.
157. *Pratapa icetoides* (Elwes, 1891)
i. *P. i. carmentalis* (De Niceville, 1893) - Assam.
(66) Genus *Rapala* Moore, 1881
158. *Rapala dieneces* (Hewitson, 1878)
i. *R. d. dieneces* (Hewitson,1878) - Assam to NE India, and West Bengal (Kolkata).
ii. *R. d. intermedia* (Staudinger,1888) - Andaman & Nicobar Is. (Andamans).
159. *Rapala elcia* Hewitson, 1863
i. *R. e. nicevillei* Swinhoe, 1911 - NE India (Assam).
160. *Rapala iarbus* (Fabricius, 1787)
i. *R. i. iarbus* (Fabricius, 1787) - Sikkim to NE India.
ii. *R. i. sorya* (Kollar, 1844) J. & K. (Kashmir) Orissa, Punjab (Amritsar), South India, Uttarakhand (Kumaon), U. P. (Kanpur), West Bengal (Kolkata).
161. *Rapala manea* Hewitson, 1863
i. *R. m. schistacea* (Moore, 1879) 'India', Andaman & Nicobar Is. (Andamans).
162. *Rapala nissa* (Kollar, 1844)
i. *R. n. nissa* (Kollar, 1844) - Western Himalaya.
ii. *R. n. ranta* Swinhoe, 1897- NE India (Sikkim, Assam).
163. *Rapala pheretima* (Hewitson, 1863)
i. *R. p. petosiris* (Hewitson, 1863) - Sikkim, NE India and West Bengal (Kolkata).
164. *Rapala suffusa* (Moore 1879)
i. *R. s. suffusa* (Moore, 1879) - Andaman & Nicobar Is. (Andamans). NE India (Assam).
[*R. s. rubicunda* Evans, 1925 mentioned by Cantlie (1962) has been treated as a synonym of the nominate subspecies by Bridges (1988).]
165. *Rapala varuna* (Horsfield, 1829)
i. *R. v. grisea* (Moore, 1879) - H. P. (Kangra) to Uttarakhand (Kumaon).
ii. *R. v. lazulina* (Moore, 1879) - South India, West Ben-

gal (Kolkata).
iii. *R. v. orseis* Hewitson, 1863 - Andaman & Nicobar Is. (Andamans), Sikkim to NE India.
iv. *R. v. rogersi* Swinhoe, 1911 - Andaman & Nicobar Is. (Central Nicobars).

(67) Genus *Remelana* Moore, 1884
166. *Remelana jangala* (Horsfield, 1829)
i. *R. j. andamanica* (Wood-Mason & De Niceville, 1881)- Andaman & Nicobar Is. (Andamans).
ii. *R. j. ravata* (Moore, 1866) - Sikkim to NE India.

(68) Genus *Sinthusa* Moore, 1884
167. *Sinthusa chandrana* (Moore, 1882)
i. *S. c. chandrana* (Moore, 1882) - H. P. (Kangra), Uttarakhand (Kumaon).
ii. *S. c. grotei* (Moore, 1884) - Sikkim to NE India.
168. *Sinthusa nasaka* (Horsfield, 1829)
i. *S. n. amba* Kirby, 1878 - Sikkim to NE India.
ii. *S. n. pallidior* Fruhstorfer, 1912 - H. P. (Kangra), Uttarakhand (Kumaon).

(69) Genus *Spindasis* Wallengren, 1857
169. *Spindasis elima* (Moore, 1877)
i. *S. e. elima* (Moore, 1877) - South India to Himalayas, Sikkim.
ii. *S. e. uniformis* (Moore, 1882) - J. & K. (Kashmir).
170. *Spindasis ictis* (Hewitson, 1865)
i. *S. i. ictis* (Hewitson, 1865) - Central India to low hills.
171. *Spindasis lohita* (Horsfield, 1829)
i. *S. l. himalayanus* (Moore, 1884) - Sikkim to Arunachal Pradesh.
ii. *S. l. lazularia* (Moore, 1881) - South India.
iii. *S. l. zoilus* (Moore, 1877) - Andaman & Nicobar Is. (Andamans).
172. *Spindasis nipalicus* (Moore, 1884)
i. *S. n. evansii* (Tytler, 1915) - Manipur, Nagaland (Naga Hills).
ii. *S. n. nipalicus* (Moore, 1884) - J. & K. and Himachal Pradesh (Kulu).
iii. *S. n. rukma* (De Niceville, 1889) - Sikkim.

[Bridges (1988) treated *S. n. sani* (De Niceville, 1887) as synonym of *S. n. rukma* (De Niceville, 1889).]
173. *Spindasis syama* (Horsfield, 1829)
i. *S. s. peguanus* Moore, 1884 - Orissa, Sikkim to NE India.
174. *Spindasis vulcanus* (Fabricius, 1775)
i. *S. v. vulcanus* (Fabricius, 1775) - Throughout India except Eastern Himalayas and Assam.

(70) Genus *Surendra* Moore, 1879
175. *Surendra vivarna* (Horsfield, 1829)
i. *S. v. biplagiata* Butler, 1883 - South India.
ii. *S. v. quercetorum* (Moore, 1858) - Uttarakhand (Dehradun) to NE India.
iii. *S. v. latimargo* Moore, 1879 - Andaman & Nicobar Is. (Andamans).

(71) Genus *Tajuria* Moore, 1881
176. *Tajuria cippus* (Fabricius, 1798)
i. *T. c. cippus* (Fabricius, 1798) - Andaman & Nicobar Is. (Andamans), 'India'.
177. *Tajuria isaeus* (Hewitson, 1865)
i. *T. i. tyro* De Niceville, 1895 - Manipur, Assam.
178. *Tajuria megestia* (Hewitson,1869)
i. *T. m. megistia* Hewitson (Hewitson,1869) - Assam.
ii. *T. m. thyia* De Niceville, 1893 - Meghalaya (Khasi Hills).

[*T. jajala thyia* De Niceville, 1893 reported by Cantlie (1962) is its synonym (Bridges, 1988).]
179. *Tajuria luculenta* (Leech, 1890)
i. *T. l. nela* Swinhoe, 1896 - Assam.
180. *Tajuria yajna* (Doherty, 1886)
i. *T. y. istroidea* De Niceville, 1887 - Assam, Sikkim.
ii. *T. y. yajna* (Doherty, 1886) - Uttarakhand (Mussoorie to Kumaon).

(72) Genus *Thaduka* Moore, 1879
181. *Thaduka multicaudata* (Moore, 1879)
i. *T. m. kanara* Evans, 1925 - South India

(73) Genus *Zinaspa* De Niceville, 1890
182. *Zinaspa todara* (Moore, 1884)

[Cantlie (1962) mentioned it as *Surendra todara* Moore. Names of subspecies have been followed after Bridges (1988).]
i. *Z. t. todara* (Moore, 1884) - South India.
ii. *Z. t. distorta* (De Niceville, 1887) - Sikkim.

[Varshney (2010) treated these subspecies as species.]

F. Subfamily LIPHYRINAE

(74). Genus *Liphyra* Westwood, 1864
183. *Liphyra brassolis* Westwood
i. *L. b. brassolis* Westwood - Sikkim to NE India.

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(Fam. Lycaenidae concluded).

Letters

Received with thanks *Bionotes* Vol. 14, No. 4, Oct-Dec 2012. It is very fascinating as it contains very valuable information like 'Earth has 8.7 million species', and '2° C temp. rise predicted for India by 2030', apart from useful bionotes. It is really commendable job that you are doing dedicatedly in bringing out '*Bionotes*' regularly and timely without compromising quality and get-up. Kindly accept my heartiest congratulations and best wishes for its continuation.

Also, best wishes for the New Year 2013.

—Dr. I.C. Gupta,
Chief Editor '*Current Agriculture*',
23/287, CHB, Pal Road,
Jodhpur-342 008 (Rajasthan).

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Thanks for *Bionotes* 14.3 just arrived, with the final part of your Nymphalid list of India, which agrees completely with my list for Nepal (except for the constant wrangling between "lumpers" and "splitters" as to whether to consider the superfluity of names as Genera or Subgenera.) Also a useful list of 172 species from Mumbai's Sanjay Gandhi National Park.

But what I'm really writing about is to apologize for a mistake made in my article earlier this year on "Butterflies on *Poinsettia*", which has only just been pointed out to me. Of course *Poinsettia* does not grow here at 3,200 metres! It should have been **3,200 feet**! I actually keep my altitude records in feet. (My G.P.S. gives readings in feet.) But since the modern custom is to give heights in metres I changes the "ft." to "m." but forgot to change the "3,200" to "980". My sincere apologies for this.

Incidentally that *Poinsettia* has just come into full flower, and has already started attracting butterflies—8 species each on two consecutive days (12 species in all), three of them from genus *Athyma*, which is interesting since recently there have been very few *Athyma* about here locally. It will be interesting to compare with last year's records. Hopefully it will exceed the 50 species, as I've started recording two weeks earlier this year, and already have seen 5 species that were not on the previous list. I'm actually quite surprised, that they are visiting it now. For most of the time last year the *Poinsettia* was about the only plant in flower, but just now we have Diwali phul (French Marigolds) in plenty, Phapha (Buckwheat), and many other small flowers in the grass.

Another point of interest is that I've had two species already on it, that I've not seen in this locality before as well as others only seen rarely. (Also it may be noted that I had three species only seen on *Eupatorium* in mid winter that were not recorded anywhere else during a whole year's survey of the Ban Palay Danda, as noted in my Pokhara Valley list of 2011.) This seems to suggest that at least some species of butterflies have a distinct preference for certain flowers, rather than just going for those that happen to have the most nectar at that time.

—Colin Smith,
Pokhara (NEPAL).
E-mail : *colin.butterfly@yahoo.com*

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We are submitting herewith two hard copies and a CD of our research paper entitled "Effect of temperature on reproductive and egg laying behavior of Silk Moth *Bombyx mori* L." for the favour of publication in your esteemed journal 'Bionotes'. Kindly accept it for publication in your esteemed journal.

Thanking you in anticipation,

—J.V. Balkhande and **Dinesh Wanule,**
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