

## Asia's first viviparous amphibian discovered in India

Amphibians are usually oviparous, i.e. they do not give birth to babies but lay eggs. However, a few species are known to be viviparous, wherein they give birth to their offspring instead of laying eggs.

Recently, scientists from India and the UK discovered viviparity in a caecilian (legless amphibian) *Gegeneophis seshachari*, which is a first find of its kind in India and the entire Asia.

A team of researchers comprising D. J. Gower (Department of Zoology, The Natural History Museum, London, UK), V. Giri (Bombay Natural History Society (BNHS), Mumbai, India), and M. S. Dharme and Y. S. Shouche (National Centre for Cell Science, Pune University Campus, Pune) made this finding and reported it in the *Journal of Evolutionary Biology*<sup>1</sup>.

*G. seshachari*, an endemic species from the Western Ghats (India), is the least known caecilian species in the world. It was discovered in 2003 by Ravichandran *et al.*<sup>2</sup> from a single specimen from Dorle village, Ratnagiri District, Maharashtra, India. It was a unique species among Indian caeciliids possessing an unsegmented terminal shield and lacking secondary annuli and scales. The species has been named after

B. R. Seshachar, recognizing his pioneering studies on Indian caecilians.

One of the recently collected specimens of *G. seshachari* was a gravid (pregnant) female about 165 mm long and 4.9 mm wide at the mid-body, containing four well-developed fetuses in its oviducts (Figure 1). This specimen was collected in June 2006 from Baraki village near Kolhapur District, Maharashtra<sup>1</sup>.

The researchers<sup>1</sup> found two fetuses in each oviduct with no visible yolk, gills/gill scars or fins, but specialized, deciduous foetal teeth. Also, a multi-layered tissue was found lying between the two fetuses in each oviduct, with walls highly vascularized. These fetuses before birth get nutrition by scraping out and eating away the nutritious multi-

layered tissue of their mother's oviducts by using their foetal teeth.

This discovery was a part of the BNHS research project on conservation of herpetofauna of the Western Ghats<sup>3</sup>. *Gegeneophis* is the only caecilian genus known to include oviparous and viviparous species, and *G. seshachari* is the smallest known viviparous caecilian.

Viviparity has evolved independently in this genus at least four times within these legless amphibians. The discovery of viviparity in *G. seshachari* adds to the knowledge of understudied caecilian reproductive biology and opens new doors for comparative studies of reproductive evolution.

1. Gower, D. J., Giri, V., Dharme, M. S. and Shouche, Y. S., *J. Evol. Biol.*, 2008, **21**, 1220–1226.
2. Ravichandran, M. S., Gower, D. J. and Wilkinson, M., *Zootaxa*, 2003, **350**, 1–8.
3. <http://www.dnaindia.com/report.asp?newsid=1189732&pageid=0>

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**Figure 1.** Dissected ventral view of *Gegeneophis seshachari* with four fetuses (photo credit: BNHS 4782).

## Project to save Snow Leopard launched

We are all familiar with species conservation programmes such as 'Project Tiger' and 'Project Elephant'. In a similar effort to save the Snow Leopard, the Government of India recently launched the Project Snow Leopard (PSL) on 20 January 2009 in New Delhi<sup>1</sup>. The PSL is an initiative to conserve the globally endangered flagship species (*Uncia uncia*; Figure 1) along with other wildlife populations found in the high-altitude Himalayas. It is an innovative project based on sound scientific plans, local wisdom and active participation of local communities.

On the occasion, the Ministry of Environment and Forests also released a document on the project. The PSL will cover five Himalayan states of Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh<sup>1</sup>. The project will be guided by a Central Steering Committee chaired by the

Director General of Forests, and will be technically supported by the Wildlife Institute of India (WII), Dehradun and the Nature Conservation Foundation, Mysore.

Under this project, State Snow Leopard Conservation Societies will be set up in each of the above-mentioned five states. To ensure effective management of the project, these societies will coor-



**Figure 1.** Snow Leopard, *Uncia uncia* (photo courtesy: [www.wfindia.org](http://www.wfindia.org)).

dinate with the Landscape-level Implementation Committees, which in turn, will coordinate with the village Wildlife Conservation Committees.

The Snow Leopard, a unique big cat, is the sole member of the genus *Uncia*. It has the most striking difference from other big cats in that it cannot give a full deep roar due to its under-developed fibro-elastic tissue in the vocal apparatus<sup>2</sup>. It is now 'endangered' (listed in the IUCN's Red List of Threatened Animals) because of its small population and man-animal conflicts. Today, its population in the country<sup>1</sup> is merely about 750.

The project is expected to arrest the declining population of the Snow Leopard, as the species has also been entitled under the recovery programme to be funded through the umbrella scheme of integrated development of wildlife habitats.

Focusing on conservation and recovery programmes for endangered species,

the PSL is an integrative conservation effort, including knowledge-based adaptive (wildlife) management policies and actions, landscape approach, promotion of stronger measures for wildlife protection and law enforcement, better understanding and management of human-wildlife conflict and promotion of awareness and education for wildlife conservation.

In addition to the Snow Leopard, other species which are expected to benefit from this project are Asiatic Ibex, Tibetan Argali, Ladakh Urial, Chiru, Takin, Serow and Musk Deer.

The PSL was modelled at a national conference (held in Ladakh during early July 2006), which was the culmination point of a two-year series of state-level conferences organized in the above-mentioned five states<sup>3</sup>. The concept of the PSL is an outcome of the collaborative efforts of the Nature Conservation Foundation (NCF), the International Snow Leopard Trust (ISTL), the Ministry of Environment and Forests (Government of India), WII, the State Governments, the Snow Leopard Network, local communities and certain NGOs<sup>3</sup>.

1. <http://pib.nic.in/release/release.asp?relid=46855>, accessed on 22 January 2009.
2. <http://dSPACE.dial.pipex.com/agarman/snowlep.htm>, accessed on 23 January 2009.
3. <http://www.snowleopardnetwork.org/newsblog/?p=15>, accessed on 23 January 2009.

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## MEETING REPORT

### Vibrant palaeobotany\*

The conference on plant life through the ages was inaugurated by D. K. Pande (Exploration, Oil & Natural Gas Corporation Limited). N. C. Mehrotra (BSIP, Lucknow) welcomed the guests. A. K. Srivastava (BSIP) introduced the themes of the conference. One of the senior-most palaeobotanists of the country, R. N. Lakhanpal was also present. The conference was presided over by Ashok Sahni (Punjab University, Chandigarh). He delivered the presidential address on 'Indian raft: On collision course'. De-Yuan Hong (Beijing, China) was part of the Chinese delegation.

There were more than 140 research contributions from 160 delegates representing different colleges, universities, research institutions and industrial organizations, and UNESCO South Asia Office and US-India Educational Foundation, New Delhi. The contributions were organized under 15 themes, and there were eight oral and two poster sessions.

In view of the importance of palaeobotanical research in the exploration of fossil fuel, i.e. coal and oil, a special session on fossil fuel was organized, which was presided over by Robert Spicer (Open University, Keynes, UK). Representatives of the two big industrial organizations, Oil and Natural Gas Corporation Limited (ONGC) and Western Coalfields Limited (WCL) came together to present their views on the relevance of

palaeobotany in fossil-fuel. D. C. Garg (WCL) inaugurated the session and D. K. Bhowmik (Keshav Dev Malaviya Institute of Petroleum Exploration, ONGC) discussed the application of palynology in dating the oil-bearing strata. The keynote addresses delivered by the delegates of ONGC and WCL on the significance of palaeobotany in the exploration of coal bed methane and hydrocarbon potentiality in India illustrated that palaeobotany will play a dynamic role in fossil-fuel industry. Spicer discussed the significance of plant fossils in climatic interpretation and the need to protect the fossils in natural condition.

The conference dealt with the classic aspects of palaeobotany, i.e. morphology, taxonomy, origin, evolution, survival, extinction and continuation of plant characteristics through their extinct and extant representatives. The conference also discussed the antiquity of life, significance of coal-forming vegetation, coal characteristics, giant gymnosperms of Mesozoic, emergence and evolution of angiosperms, Quaternary vegetation and forest history, palynology and palynostratigraphy and different sedimentary basins of India, micropalaeontology and sea-level changes, and palaeoethnobotany and dendrochronology.

Themes were also aligned to include the modern and relevant topics of the competitive world of science like biotechnological advancement, insect-plant interactions, microbial association and factors responsible for the disturbance of present and past ecosystem dynamics.

Manju Banerjee (Calcutta University) presided over the valedictory session and

highlighted the immense potentiality of palaeobotany.

The conference organizers sought the reactions from palaeobotanists, experts of related disciplines, academicians and research-oriented industries on the relevance of palaeobotany in the modern context. Encouraging responses were received to make palaeobotany exciting in the modern world of science.

Contributions on different aspects of palaeobotany highlighted the vibrant and dynamic characters of palaeobotanical researches in tune with the modern disciplines of science.

The participation of ONGC and WCL signifies the role of palaeobotany in prognostication and hypothecation of coal bed methane in different coalfields and in understanding the hydrocarbon potentiality in the oil-bearing strata.

The records of well-preserved plant fossils with different morphotypes and relationship advocate the need to undertake field work and to discover plant fossils from new areas. The morphotaxonomical study of plant fossils is useful to understand the evolution, biostratigraphy and climatic interference of past and present floras. It was suggested to provide technical knowledge to protect and preserve the fossils and sites in different parts of the country. The suggestion to have university-institute interactive programmes for the dissemination of palaeobotanical knowledge at university and college levels was appreciated.

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\*A report on the Conference on Plant Life Through the Ages organized by the Birbal Sahni Institute of Palaeobotany, Lucknow and the Palaeobotanical Society during 16-17 November 2008 at Lucknow.