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BIONOTES

Vol. 19, No. 3

Bionotes is honoured to have received, time to time, messages from the Vice-President of India; Union Ministers Shri Suresh P. Prabhu, Shri Prakash Javadekar, Dr. Harsh Vardhan; Secretary Deptt. of Biotechnology; Prof. J. V. Narlikar, Prof. C.N.R. Rao, Dr. M. S. Swaminathan, Dr. S. Z. Qasim, Prof. M. S. Mani, Dr. Ishwar Prakash, Dr. U. S. Srivastava, Prof. T. C. Narendran; Director Botanical Survey of India, Director Zoological Survey of India, Ex- Director General SACEP, Director National Botanical Research Institute, Director Central Tasar Research & Training Institute, Director Bombay Natural History Society; Editor *Zoo's Print Journal*, Editor *Natural Product Radiance* and Office of the Dalai Lama.

We have reproduced writings of E. O. Wilson, Jagmohan, Khushwant Singh, Ruskin Bond, Vir Sanghvi, Prof. Madhav Gadgil, Prof. Raghavendra Gadagkar, Prof. C. R. Babu. Also published contributed articles by Smt. Maneka Gandhi, Dr. S. Z. Qasim, Prof. T. N. Anathakrishnan, Dr. Ananda R. Joshi, Dr. K. K. Verma, Lt. Col. J. N. Eliot, Prof. C. K. Varshney, Dr. A. K. Ghosh, Dr. M. Sanjappa, Dr. J. R. B. Alfred, Prof. C. A. Viraktamath, Prof. R. K. Sinha, Dr. Kailash Chandra and Dr. Kumar Ghorpade.

We published biographical sketches of eminent scientists Ernst Mayr, Norman Borlaug, T. N. Annandale, Salim Ali, M. S. Mani, M. L. Roonwal, T. N. Ananthakrishnan, Romulus Whitakar and Billy Arjan Singh.

Articles of *Bionotes* have been indexed in the *Indian Science Abstracts*, NISCAIR, Indian Citation Index, CAB International Abstracts (U. K.), BIOSIS (U. K.), Thomson Reuters (U. S. A.) including *Zoological Record*, Cambridge Scientific Abstracts (U. S. A.); and are available at the Natural History Museum, Library & Archives (London), Naturkundemuseum (Erfurt), National Science Library (New Delhi) and some online databases. *Bionotes* is approved by the U. G. C. (India).

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BIONOTES

A Quarterly Newsletter for Research Notes and News on Any Aspect Related with the Life Forms

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Platinum Jubilee Number

INVOCATION

इन्द्रो विश्वस्य राजति। शं नो अस्तु द्विपदेशंचतुष्पदे ।। (यजुर्वेद 36.8)

May the Resplendent Lord illumine the universe. May He be gracious to us and all the bipeds and quadripeds in the universe.

स नः पवस्व शं गवे शं जनाय शमर्वते। शꣳ राजन्नोषधीभ्यः ।। (सामवेद 653)

O Radiant Lord, may you purify our minds so that the spirit of welfare of all rises in our hearts. May you grant health and happiness to our people, kindness upon our cows and horses. May medicinal plants be for our benefit.

स्वस्ति नो मिमीतामश्विना भगः स्वस्ति देव्यदितिरनर्वणः ।
स्वस्ति पूषा असुरो दधातु नः स्वस्ति द्यावापृथिवी सुचेतुना ।। (ऋग्वेद 5.51.11)

O Lord, with thy grace, may the scientists and teachers are guided by preceptors to be engaged in our welfare. May the waters and air be purified for our prosperity. O supreme being, may the sun and clouds be a protective power to bestow prosperity upon us. May the stars' bright light on earth grant us happiness.

शं न इन्द्रो वसुभिर्देवो अस्तु शमादित्येभिर्वरुणः सुशंसः ।
शं नो रुद्रो रुद्रेभिर्जलाषः शं नस्त्वष्टा ग्नाभिरिह शृणोतु ।। (ऋग्वेद 7.35.6)

May the Sun with its life giving rays grant us happiness. May the vast oceans by raising clouds be beneficial to us. May the Lord with his power of punishing the wicked establish the reign of justice and peace. May the learned with their intellect deliver inspiring sermons to us.

शं नो वातः पवताꣳ शं नस्तपतु सूर्यः ।
शं नः कनिक्रदद्देवः पर्जन्यो अभिवर्षतु ।। (यजुर्वेद 36.10)

May the wind blow pleasantly for us, may the sun be pleasantly warm for us and for all our people. May the divine clouds shower rain for our production and pleasure.

स्वस्ति नः पथ्यासु धन्वसु स्वस्त्यप्सु वृजने स्वर्वति ।
स्वस्ति नः पुत्रकृथेषु योनिषु स्वस्ति राये मरुतो दधातन ।। (ऋग्वेद 10.63.15)

O learned men of science and spirituality, may we get security on roads and deserts. May we have safety on waterways. May we have protection in hostile environment. May our offsprings be blessed for their welfare in the mother's womb. May wealth provide us with peace and security for our welfare.

द्यौः शान्तिरन्तरिक्षꣳ शान्तिः पृथिवीशान्तिरापः शान्तिरोषधयः शान्तिः । वनस्पतयः शान्तिर्विश्वे देवाः शान्तिर्ब्रह्म शान्तिः सर्वꣳ शान्तिः शान्तिरेव शान्तिः । सा मा शान्तिरेधिः ।। (यजुर्वेद 36.17)

May the sky, i.e. bright universe, be peaceful, may the mid region be peaceful, may the earth be peaceful, may the waters be peaceful, may the food crops along with medicinal plants be peaceful, may the forests and vegetables be peaceful, may all bounties of the nature be peaceful, may the knowledge in all spheres with their thinkers and preachers be peaceful, may there be peace everywhere, may such peace, i.e. harmony, come to us and all friendly creatures of the universe.

—D.N. BHARDWAJ
Avantika (Ist), Ramghat Road, Aligarh.

डॉ. हर्ष वर्धन
DR. HARSH VARDHAN

सत्यमेव जयते

मंत्री
विज्ञान और प्रौद्योगिकी एवं पृथ्वी विज्ञान
भारत सरकार
नई दिल्ली – 110001

MINISTER
SCIENCE & TECHNOLOGY AND EARTH SCIENCES
GOVERNMENT OF INDIA
NEW DELHI - 110001

MESSAGE

It gives me immense pleasure to note that **BIONOTES**, a research newsletter on Bio-Sciences has published its 75th issue as a Special Number in September, 2017.

This periodical caters to young research workers, studying various aspects of Life Sciences, in Colleges, Universities and Research Institutions of India and from a few other countries.

I extend my best greetings to the **BIONOTES** and wish them all the best in all their future endeavours.

Harsh

(Dr. Harsh Vardhan)

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Message

The research in Science and Technology in India has intensified in the post independence period. The number of research projects and the diversity of the topics are attracting new talents. Considering the total number of academic and research institutes in India and the professionals working, outlet for publishing results of research papers have also increased over the years.

Bionotes, a quarterly newsletter for research notes is being continuously published over last 18 years as a quarterly publication. The articles in **Bionotes** are abstracted or indexed in renowned abstracting services in India and abroad. I send my heartiest congratulations to the honorary editors Dr. R. K. Varshney and Dr. S.K. Saxena and all the members of the committee on the glorious occasion of publication of 75th issue of **Bionotes**.

I hope it will continue to serve its purpose in the coming decade. Congratulations.

Dr. A. K. Ghosh
Director
Centre for Environment and Development;
Former Director Zoological Survey of India;
Member ABS Expert Group,
National Biodiversity Authority; and
Visiting Faculty in Jadavpur University
and Calcutta University.
Kolkata, 2nd April 2017.

P.K. Hajra
Former Director
Botanical Survey of India

Dalanwala, Dehra Dun.
27th May 2017.

MESSAGE

I am very delighted to know that BIONOTES, a research newsletter on Biosciences is going to publish its 75th issue as a special number in September 2017.

I learnt the newsletter is being published regularly for the past eighteen years. I hope the researchers and students from different universities and research institutions of India are benefitted from this newsletter and will continue to be so in the future.

I wish the 75th issue a grand success and I hope it will highlight the various fields of research in biosciences.

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ডঃ অশোক কান্তি সান্যাল
সভাপতি

MESSAGE

I am glad to know that the BIONOTES, a research newsletter on Bio-Sciences is going to publish its 75th Issue as a Special Number in September, 2017. My source of happiness, however, lies on two facts. One, being associated with Dr. R. K. Varshney, D.Sc., Editor of BIONOTES in Zoological Survey of India for over 30 years, I closely observed how meticulous he was and to what extent he was dedicated to researches on different aspects of bio-sciences; two, the great success of Dr.Varshney in publishing this quarterly research journal for the last 20 years. The journal is very popular especially among the young researchers and scholars for quick publication of their short papers and notes with information of great value to the future workers. I think Dr.Varshney is paying back what he received from the society through his untiring services rendered in editing the journal.

I extend my best wishes to all its associates and also wish much more success of the journal.

(Dr. A. K. Sanyal)
Chairman

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11th July 2017.

Message

I am extremely glad to learn that 75th issue of *Bionotes* (Platinum Jubliee Number) will be released on Sept. 1, 2017. I am particularly happy because I have been associated with it for more than 10 years.

Although named as Research Newsletter, but it has been publishing full length research papers, research notes, review articles, book reviews, letters, latest scientific news etc. Abstracts of papers are being included in national as well as international abstracting journals. Recently U. G. C. has also approved it in the recent list of approved journals for scientific publications.

I have been very much impressed with its timely publication. The quality of papers, printing, editorial standards and overall get up are worth appreciating.

Dr. R. K. Varshneya who is highly qualified and having served Z. S. I. Calcutta as Additional Director (Scientist SG) has been doing wonderful job after retirement, for serving the cause of science through A Biologists Confrerie. It consists of several prominent scientists, but Dr. Varshneya who has been working as Secretary and Hony. Editor deserves appreciation for carrying out most of the job involved in the process from A to Z.

—I. C. Gupta

In Memoriam

J. G. KOENIG
The First Naturalist of the Modern India
(1728 - 1785)

T.B. FLETCHER

(From *Report Proc. 4th Ent. Meeting, Pusa. 1921)*

"Johann Gerhard König, commonly called John Gerard Koenig by contemporary English writers, was born at Lemenen in Courland (Denmark) on 29th November, 1728[1]. We know that he was a pupil of Linnaeus who commemorated his name by bestowing the generic name *Koenigia*[2] on a curious little plant discovered by Koenig during the latter's travels in Iceland in the year 1765.

The exact year in which Koenig first arrived in India is not known with certainty but it was proable about 1767[3]. We know at least that, in a letter written to Linnaeus from Tranquebar on 26 July 1769, he refers to another letter written more than three months before, but this former letter is apparently not now extant.

Koenig apparently came to India, under the protection of the King of Denmark, as Physician to the Danish settlement at Tranquebar[4]. It seems probable, however, that he accepted this appointment mainly as giving him an opportunity of improving the, at that time, very scanty knowledge of the Natural History of India. Little is said in contemporary accounts of his medical duties, but we know that he resided for several years at Tranquebar where he applied himself indefatigably to acquiring a knowledge of Indian Plants. It is more than probable that he also made considerable collections of insects and that it is to his energies that we owe the long list of insects described from Tranquebar during the succeeding twenty years by Fabricius, with whom we know that Koenig was in communication. He seems, indeed, to have paid some attention to every branch of Natural History, as we read of his giving assistance in mineralogy to Dr. James Anderson, who in 1795 was Physician General at Fort St. George. It is, however, as a Botanist that Koenig is best known and all of his published writings deal with Botany, with the exception of his paper on Termites. Little is on record concerning Koenig's life at Tranquebar but we can picture him performing the routine duties of Medical Officer in charge of that small Danish Settlement and devoting every spare moment to the acquisition of specimens and knowledge of that Natural History which is loved so well. Whenever his opportunities and finances afforded, he made occasional collecting expeditions from Tranquebar and thus visited the Dutch, French and British Settlements along the Coromandel Coast and in all of them entered into friendly relations with everyone whose tastes were similar to his own. Dr. Russell, who met him in later years and who writes feelingly of his uniformly friendly relations with Koenig, says of him at this period that, "More covetous of fame than of fortune, he preserved in his pursuits with an enthusiam that set bodily fatigue, spare meals, and a scorching climate at

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[1]The place and date of birth are given by Hagen (Bibliotheca Entom. I, 428).

[2]Mantissa Linn. Gen. Pl. p. 13.

[3]Dr. Russell says "probably in 1768". Foulkes (*Madras Journal of Literature and Science*, No. 11, New Series - May 1861) says that Koenig "had preceded Rottler in the mission by nearly ten years." Rottler arrived at Tranquebar on 5th August 1776.

[4]In his "Biographical Memoir of Dr. Rottler", published in the *Madras Journal of Literature and Science*, No. 11, New Series -- May 1861, the Rev. T. Foulkes notes that "besides [Koenig] the naturalist, who was for a while the Medical Adviser of the mission [the Danish Mission at Tranquebar], and not ordained, there was at the same time a missionary of the same name in holy orders at Tranquebar. In the documents that I have consulted the accounts of these two individuals seem to be hopelessly intermingled. The Clergyman died in 1795, after 27 years' residence in India."

[5]Dr. Russell (Preface to Volume I of "Coromandel Plants") says "the Pullicate Hills, in April 1766." The date is an obvious *lapsus calami* for 1776 as just previously he had given 1768 as the probable year of Koenig's first arrival in India. The Pullicate Hills are evidently the same as the Palliacatti Mountains referred to by Koenig. Pulikat is on the coast a few miles North of Madras.

defiance; while the simplicity of his manners, and his unassuming readiness to impart knowledge to others, conciliated, almost at first sight, the benevolence of those with whom he conversed.....and everywhere he acquired friends."

The slender salary of his appointment at Tranquebar proved, however, quite inadequate to bear the expense of his travels, however frugally conducted, in search of novelties, and in about the year 1774 Koenig, by the influence of some of the many friends he had made during his wanderings, obtained an appointment as Naturalist to the Nawab of Arcot, in whose service he remained for several years, and during this period he made excursions amongst the hills near Vellore and Ambur, and to other localities which promised to yield novelties. Thus in year 1776, he made a short collecting expedition to the Nagori Hills[5] with Dr. George Campbell, a young medical man in the service of the East India Company and stationed at Madras, and who seems to have given proof of some talent as a botanist. His friendship with Koenig, accentuated perhaps by their companianship during this excursion, appears to have kindled his enthusiasm into a resolve to devote himself seriously to the study of Botany, for shortly after this he sent to England for a large consignment of books on this subject; but, says Russel, "they never reached him; for being wounded, and taken prisoner, in the unfortunate defeat of Colonel Baillie's detachment, in September, 1780, he died a short time after, universally lamented."

During at least portions of the time during which he was in the service of the Nawab of Arcot, Koenig resided in Madras and his intercourse with the English employed there in the Company's service seems to have gained him the friendship of all of them who took any interest in Natural Science. Many indeed, were glad to receive instruction from a pupil of the celebrated Linnaeus, and amongst these are mentioned especially Dr. James Anderson, afterwards Physician General at Fort St. George, and Dr. Roxburgh, afterwards Inspector of the Botanical Gardens at Calcutta, who was then living at Samalkota.

It was probably during his residence in Madras that Koenig has outlined a scheme for the investigation of the natural resources, not only of India, but of South Eastern Asia, but this he was quite unable to carry out with his own slender resources, added to which his salary from the Nawab of Arcot was not paid regularly. Moved by these considerations, in 1778 he represented the facts of the case to the Board of the East India Company, which was pleased to grant him a monthly allowance "in order to enable him the better to prosecute his researches."

"With this aid, he proceeded in the month of August 1778 to the Straits of Malacca and Siam; from whence he returned towards the end of 1779. From his report to the Board of Madras, it appears, that he had the good fortune to meet with several new subjects of Natural History, and to make some discoveries in Botany and Mineralogy, which he flattered himself might prove acceptable to the Public; particularly in respect to the article of tin ore..... He intimated also his intention of sending to St. Helena, by the ships then on departure, the seeds of such esculent and other plants, and of such trees or shrubs as he had then got ready, and might probably be of use in that island" (Russell).

After his return from Siam he appears to have entered into a more formal Agreement under which he was to devote his whole time to the service of the East India Company, whose Board in Madras was pleased in 1780 to make an addition to his salary, which met with the approval of the court of Directors in England.

In the same year (1780) he made a short excursion to Trincomali, in Ceylon, and in early in 1781 a second excursion to Colombo. He must, however, have been in Ceylon before, as an earlier visit is noted in his paper on Termites published in 1779, and it was during this earlier visit that he met with *Eutermes monoceros*. As he notes (page 331) that this was subsequent to his trip to the Nagori Hills, which took place in April 1776, he must have visited Ceylon between this date and 1779.

The beginning of June 1782 witnessed the arrival in India of Dr. Patrick Russell, whose name survives to the present day throughtout India in both the Scientific and English names of Russell's Viper, at once one of the best-known and most deadly of Indian Snakes. Koenig and Russell met at Tranquebar, immediately after the latter's arrival, and at once formed a friendship and commenced a correspondence which lasted until Koenig's death three years later. With his accustomed liberality Koenig not only gave Russell a copy of his own list of the Plants of the Coast of Coromandel but also a number of specimens, as an inducement to the latter to interest himself in Indian Botany.

During the next two years we have no direct knowledge of Koenig's movements or doings but it may be gathered between the lines of Dr. Russell's remarks that his health was beginning to show signs of becoming undermined by his strenuous labours in the Tropics during a period of upwards of twenty years. Dr. Russell tells us at least that he had hinted more than once that Koenig ought to prepare his manuscripts and specimens, so that, in case of his death, they might be published, if possible by Sir Joseph Banks or at least under his auspices.

For some time Koenig had been under a promise to

(Contd. on page 83)

Planning of Water Management Practices in India

(1)

Ecologist Jayanta Bandyopadhyay once wrote that water, not oil, was the resource whose availability and quality would determine India's future. I recalled that remark when reading a report recently submitted to the Centre (A 21st Century Institutional Architecture fro India's Water Reforms). Rigorously researched and closely argued, this report displays a deep familiarity with social and economical life across India, and offers a set of forward-looking recommendations as well. It is by far the best sarkari report I have read in years.

Some alarming facts listed by the report include: "If the current pattern of demand continues, about half of the demand for water will be unmet by 2030"; "Water tables are falling in most of the parts of India"; "60% of India's districts face groundwater over exploitation and /or serious quality issues; There is fluoride, arsenic, mercury, even uranium in our groundwater"; "Average cost over-run is as high as 1,382% in major irrigation projects and 325% in medium projects"; "Water use efficiency in agriculture in India is among the lowest in the world; it is 25-30%, whereas in China it is twice as high"; "The single most important factor explaining the drying up of India's peninsular rivers is the over-extraction of groundwater"; "Cities produce 40,000 million litres of sewage every day and barely 20% of it is treated".

The report identifies several kinds of water crises in India. First, that water stored in large dams is not reaching the farmers for whom it is meant. Second, that groundwater resources are now being rapidly depleted and polluted as well. These two crises threaten the sustainability of agriculture. But there is a thrid, emerging crisis; caused by rapid industrialisation and urbanisation. Cities and factories draw on the water resources of the hinterland, leading to conflicts between town and country. They also use these resources extremely carelessly.

The report makes many sensible suggestions to resolve these crises. It argues that water management is too important to be left to engineers alone; rather, it needs inputs from a wide variety of academic disciplines, including ecology, economics, sociology, and climate science.

Second, the present license-permit-quota-raj system of water allocation, which gives the State and its functionaries a dominant role, must give way to a more participatary system, in which farmers and other end-users have a critical say in how water is allocated and used.

Third, there must be, at both a conceptual and practical level, integrated policies for surface water and groundwater. The report identifies a disease named "hydro-schizophrenia", whereby the "left hand of surface water does not know what the right hand of groundwater is doing." A fourth recommendation, aimed at the private sector, is that it must be made mandatory for all companies to include details of their water footprint in their annual reports.

The report observes that the two bodies currently in operation, the Central Water Commission (CWC) and the Central Groundwater Board (CGWB), have valuable expertise and knowledge. Yet both agencies remain rooted in the 20th century. They still operate on the "build-neglect-rebuild" model, which has outlived its utility. Water management now needs to follow a demand-side rather than supply-side approach, actively involving end-users, while eschewing a one-size-fits-all model in favour of one that recognises regional variations in natural resources endowments, social structures, and livelihood patterns.

The report thus recommends a new institutional architecture for water management in India, whereby the CWC and CWGB would be merged into a new national water commission. The report contains a detailed outline of what this new commission would do; what kind of origanisational design it would have, what experts it would need to recruit, and what policies it might execute.

Notably, the report stresses that the new commission should have a "strong regional presence in all the major river basins of India". The country has 22 major river basins; remarkably, at present there are 11 river basins in which neither the CWC and CGWB has an active research centre. Once established, this new commission will overcome this deficiency; further, it will operate in a genuinely holistic fashion, so that in each of these river basins, goundwater and surface water are treated in an integrated manner. Perhaps the planning commission needed to be disbanded. But a new water commission along the lines recommended here definitely needs to be created. Sadly, except for a round-table in the Economic and Political Weekly (December, 2016) this report has not got the public attention it deserves.

Our media is obsessed with the winning and losing of elections; whereas the truth is that the use and abuse of water is even more critical to India's economic, social, political, and civilisational future.

— RAMACHANDRA GUHA

(2)

Water planning in India has been on an unsustainable path for centuries. In the 16th century, Mughal Emperor Akbar decided to build a new capital in Fatehpur Sikri (City of Victory). In 1589, Robert Fitch, one of the earliest English

travellers to India, noted that Agra and Fatehpur Sikri were "two great cities, either of them much greater than London and more populous".

The history of the new capital was not so auspicious. Akbar used it only for 13 years and then abondoned it to return to his old capital permanently. The main reason was very severe water scarcity.

Fatehpur Sikri is a magnificent monument to India's poor water planning. Over the centuries India's water planning has improved incrementally whereas its drivers of water use have increased exponentially, making its water situation worsen steadily with time.

Take population, only one driver of increasing water use. In 1947, the total population of undivided India was 390 million. By 2050, total population of the three countries of undivided India will be 2,206 billion, a 5.66 fold increase in little over a century. India is expected to overtake China around 2022 as the most populous country in the world.

Population growth, rapid urbanisation and industrialisation and exponential growth in human activities over the past century, have resulted in higher water requirements for all types of water uses: human, thermo-industrial and agricultural. Furthermore, all water bodies within and near population centres have already been contaminated seriously with domestic and industrial pollutants. This has posed serious health and environmental problems.

In addition, with steady economic growth, higher literacy and increasing skill levels, the number of Indian middle class families has gone up exponentially. The median income of Indian households is expected to reach over $10,000, by 2030, in 2014 prices. Direct results of this affluence have been rapid changes in dietary patterns and energy consumption levels. As the country has prospered, people have moved to a higher protein-based diet like milk products, fish and meat, all of which need significantly more water to produce than cereal-based diets. Their energy consumption has gone up because of increasing use of refrigerators, washing machines and cars. All these need extra energy and no energy can be generated without significant amount of water.

In terms of water, the country now is facing a perfect storm. This means water management practices in India need to change dramatically in the coming years. However, we do not see any sustained political will which will be essential to take some hard decisions in the future.

The problem is further exacerbated by the fact that all important rivers in India are interstate, and water management is basically a state subject on which the Centre has very limited control.

Because of poor water management in all the Indian states and steadily increasing water demands, India is now witnessing increasing conflicts on water allocations in interstate rivers. This has become a serious challenge to the regional stability of the country. Interstate water allocation conflicts have triggered numerous protests, violence and property destructions. If these conflicts continue and grow , they may prove to be one of the biggest political contraints to India's future economic growth and social cohesion.

A major challenge now is the absence of permanent and efficient dispute resolution mechanisms for water allocation in interstate rivers. Under the Interstate Water Disputes Act of 1956, ad hoc tribunals can be established on a case by case basis whenever conflicts between two states cannot be resolved by mutual discussion. The objective of this Act was to allow the states to discuss and resolve the conflicts before engaging in adjudication.

Our research indicates that tribunals have often contributed to long-drawn negotiation processes which have led to hardening of the positions of the individual states, instead of promoting compromises.

There are several problems with the existing tribunal system. First, there are no uniform, logical and common processes. They have considerable directions in terms of processes to arrive at settlements as also underlying concepts under which settlements are made. Fundamental assumptions have often varried from one tribunal to other significantly.

Second, tribunal results are non-binding to the states.

Third, the Centre has been reluctant to establish institutions for implementing the awards.

Fourth, there is no fixed stipulated time frame for negotiations and adjudications. The Cauvery Tribunal took17 years. Karnataka then promptly decided to file a Special Leave Petition to the Supreme Court to thwart the final award, further delaying the settlement.

An important factor linking water disputes to state politics is the power of state campaigns in distracting voters from real issues of poor governance and lack of administrative skills and actions. Water has now assumed the role of a political weapon.

With a number of states defying orders of tribunals and Supreme Court, water is becoming an important threat to India's federalism and future social and economic development.

In the absence of functioning water institutions at central and state levels and lack of political will to take hard decisions at all political levels, interstate water allocation problems will become increasingly more difficult to resolve. It proves Mark Twain's adage " Whiskey is for drinking, water is for fighting over."

—ASIT K. BISWAS, CECILIA TORTAJADA and UDISHA SAKLANI

Planning Research on Climate Change and Zooplankton Density and Diversity in the Sagar Island, Indian Sundarbans Delta

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Introduction

Sundarbans, shared by India with Bangladesh, is located within one of the largest delta in the world, of 3 major rivers—Ganga, Meghna, Brahmaputra (GMB). Deltas are recognized as one of the most vulnerable areas in the era of climate change and a separate alliance of some of the largest delta dominated countries have been formed. The phenomenon of climate change is positive to affect coastal and marine ecosystem involving the food chain which sustains coastal and marine fisheries. Physico-chemical water of any delta water in the past along with their trend of fish landing may help to indicate possible adverse impacts.

A recent media report (The Times of India, December 19, 2016) quoted Central Marine Fishery Research Institute (CMFRI) report that more fish species on the east coast, especially in the coast of Odisha and West Bengal, are highly vulnerable to climate change : however it attributed the "vulnerability" factor not only to climate change but also to increasing fishing pressure and lower productivity, a total 47 of 68 species or 60% of the fish species studied were found to be vulnerable to climate change; these include the bombay duck, sharks, pomfrets, catfish, besides crustacean—shrimps. With sea surface temperature rising, most affected fish species are considered the ones that live in surface or near surface water called pelagic species, and they comprise of 50% of fish landing, according to CFMRI Report.

Bay of Bengal has also been under 'Large Marine Ecosystem' study (Vivekanandan et al., 2012). Analysis of long term changes in sea water temperature, acidity, deoxygenation, cyclones and sea-level rise etc in Bay of Bengal will help to understand large scale impacts on biological process and ocean productivity. The study revealed that 'traditional fishers would be most vulnerable to climate change'.

The present research is aimed at comparing the past data of 1980s with that of 2016-2018. To access any possible changes in physico-chemical parameters of coastal waters, seasonal data on salinity, pH, temperature, etc. of 1980s with that of the 2016-2018 during the same season would be compared.

Likewise density of zooplankton per unit area would also be compared to understand changes. Work is also in progress to found out any changes in diversity or major species of zooplankton.

Methodology

Field survey of selected stations in Sagar Island, Indian Sundarbans, is being carried out monthly from month of September 2016 to March 2017 and work would be continued till 2018. Water samples were collected (500ml) in all six stations viz, Sagar, Kachuberia, Sikarpur, Hatipeta, Chemaguri, Phuldubi (Fig. 1). Some parameters were re-

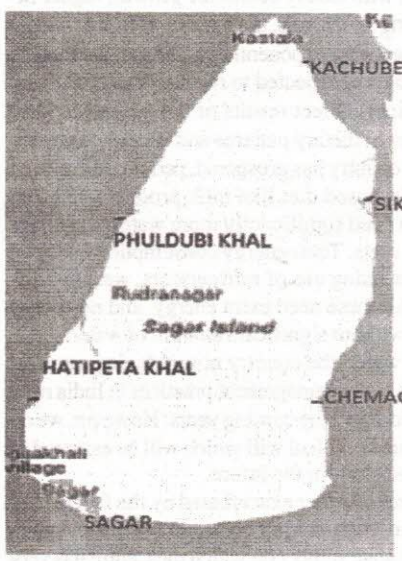

Fig. 1. The Map showing 6 stations where the study is being conducted.

corded in-situ such as temperature, pH, salinity while for the others water samples are brought to the laboratory of the School of Environmental Studies, Jadavpur University, for further analysis.

For determination of zooplankton density, Sedgewick Rafter counter and for zooplankton diversity ICES zooplankton manual would be followed.

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(b.f. from page 79)

pay a visit to his old friend Claud Russell, then Chief of the Company's Factory at Vizagapatnam, and with whom his brother Dr. Patrick Russell was then living, and in 1784 he fulfilled this promise and stayed for a short time at Vizagapatam on his way to Calcutta. During this halt he examined and arranged a collection of plants made by Dr. Russell, who again impressed upon him the necessity of arranging his manuscripts, which he promised to do. But the eagerness with which he sought novelties during the journey and the claims of his work in Calcutta prevented this being done and, on his return to Vizagapatam in April 1785, he had not carried his good resolutions into effect "though the declining state of his health at that time rendered it more than ever expedient to prepare for an event which he himself appeared to consider at no great distance".

For two or three weeks he stayed with the Russells at Vizagapatnam and during this period he seemed to recover his health to great extent, and in May proceeded to Jagannathpur where he proposed to make an immediate commencement of the task of putting his manuscripts in order. But towards the end of the month he suffered a relapse of his former complaint (dysentery) under which he gradually sank until he expired on 26th of June 1785 inspite of the skill and friendly attentions of Dr. Roxburgh, who was then living close by at Samalkota.

On 6th June he had made his will by which he bequeathed all his papers to Sir Joseph Banks and few days before his death he had seen all such papers as were then with him sealed up in the presence of Dr. Roxburgh, by whom they were afterwards despatched safely to Sir Joseph Banks; but others of his manuscripts, particularly those left at Tranquebar (including the Journal of his visits to Ceylon), were unfortunately not recovered, although Dr. Russell and Dr. Roxburgh did all in their power to obatin possession of them.

For many years Koenig had maintained a correspondence with Linnaeus and other European Botanists eminent at the time, and several of his communications to them regarding Indian Botany were published in the Transactions of the Societies of Copenhagen and Berlin, or included in the words of Retzius and other authors.

Although it is certain that he forwarded to Europe most, it not all, of the numerous insects described by Fabricius from Southern India, we know nothing of his direct interest in entomology beyond the present paper on Termites. Considering that absolutely nothing was known of the economy and habits of these insects before that time, his observations seem remarkably accurate and serve to show that Koenig set an extremely high standard for his time as the first entomological observer who accomplished any scientific work in India. His paper seems well worthy of being rescued from the obscurity in which it has remained for over one hundred and forty years."

[The above is taken from T. B. Fletcher's (1921) "Koenig's paper on South Indian Termites" published in the Report of the Proceedings of the Fourth Entomological Meeting, Pusa, 7-12 February 1921, pp. 312-333, pls LII-LV (especially pp. 313-318).

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Blooming Glory

The Japanese make such a fuss about their Sakura; why don't we Indians do the same with our Chinar, Laburnum and Shiuli?

SEEMA GOSWAMI
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It has been on my bucket list for the longest time ever: visiting Japan during the Sakura season. It is trickier than it sounds. There is never any guarantee when the Sakura will bloom, though forecasters try their best to nail a period down. And once the Sakura does flower, the cherry blossoms have a very short life expectancy: a week if you are lucky. And the Sakura season itself lasts about a fortnight or so. So, unless you time your visit just right—and have the luck of the devil—it is hard to be sure that you will catch the cherry blossoms at their finest.

Well, I am happy to report that even though I planned my trip last year, I was lucky enough to arrive in Tokyo and Kyoto at peak viewing time. And what a view it was! Sprawling trees of all shape and size overladen with blossoms that went all the way from pristine white to cherry pink, taking in every shade in between for good measure. The Sakura proliferated in the parks, it blossomed on every street corner, it lined the roads in its majestic glory, it even popped up along the rails of the bullet train from Tokyo to Kyoto and back.

But what I found even more amazing was how Sakura viewing was a family activity for the Japanese. They even have a name for it: *Hanami*, which literally means 'flower watching'. And when you do your flower watching at night, it is called *Yozakura*, which literally translates as 'night Sakura'.

So, as the trees in all the parks in Tokyo and Kyoto bloom, entire families set out with a picnic basket to spend the day under the shade of the cherry blossoms. They lay down their plastic sheets on the green, and settle down to eat, drink and yes (this is Japan after all), use those ubiquitous selfie sticks to take selfies against the backdrop of the blooming Sakura. Not that I can afford to act all superior; I was doing just that as well (though without the obligatory selfie stick).

I couldn't help but wonder why we in India don't celebrate our seasonal marvels with quite the same passion, panache and elegance. It's not as if we don't have the same kind of natural beauty that flashes forth for brief periods to dazzle us before disappearing all too soon.

Take Kashmir's Chinar, for instance, which changes colour to a spectacular russet and then a brilliant crimson in the autumn. The spectacle lasts only for a few weeks before the tree sheds its leaves and shuts down for the winter. This should be as special for us as the Sakura is for the Japanese. And yet, we don't see people from the rest of India descending on Kashmir to view this superb sight. Indeed, it barely registers with most of us, as we wait for the snowfall to descend so that we can plan a winter vacation.

Closer home, in Delhi, the roads and parks come alive, in spring with the yellow golden gleam of the Laburnum (you may also know this as Amaltas) and the bright red of the Semal tree. The flowering period lasts only a few weeks but while it is on it turns the city into a vision of natural beauty. But we hardly spare the blooms a glance before going on about our day. There is none of the overwhelming wonder that the Japanese experience with their Sakura.

Sad, isn't it? Wouldn't it be wonderful if we too could engage in a spot of Hanami, taking our kids, our parents, our friends for a day out in the park, to just sit in the shade of a Laburnum or Semal tree and take in their beauty? If we could just lay down a blanket on the grass and bring out a picnic basket, and spend the day marvelling at the beauty of nature? (Of course, it would be even better if we could emulate the Japanese in yet another way: in clearing up and carrying back our own garbage, leaving the area as pristine as ever.)

Growing up in Calcutta, I was as excited as the next child about the advent of Puja. But in all that excitement for pandal-hopping, none of us paid much attention to the flowering Shiuli (it is called Harshingar in North India) which heralds the arrival of the Goddess every year.

The white blooms with a peach/pink centre would carpet the floor every morning, spreading their sweet scent through the neighbourhood. And then even before you had fully registered their beauty, the Shiuli flowers would vanish, reappearing only the following year as Durga Puja drew near.

The flowering of the Shiuli should have been as special to Bengalis as the flowering of the Sakura is to the Japanese. Everyone just took its beauty for granted and went on with the festivities. And I can't help but think that we missed a trick there.

Well, spring is almost gone but how about this Puja, we have a special week of just celebrating the Shiuli in all its colourful and fragnant glory as a precursor to the festivities.

(From *Brunch* April 17, 2016)

JACK of all FRUITS

(1)

It's good to know that my old friend the jackfruit is finally coming into its own. Apparently it is now much in demand in western countries, a fashionable substitute for meat fillings for burgers, sandwiches, pies etc., with one enthusiast even calling it "mutton hanging from a tree".

Here in India we have always appreciated a good jackfruit curry, or even better, a jackfruit pickle. I'm a pickle fiend myself, and among the 20 different pickles on my sideboard there is always a jar full of jackfruit pickle; that's why I call it an old friend. But I had no idea it tasted like mutton. The seed and the pulp have their own individual flavour.

As it grows on a tree we call it fruit, but we cook it as though it were a vegetable. And if, to some, it tastes like mutton, then perhaps some meat-eaters will become vegetarians and some vegetarians might not care for its meaty flavour!

When I was a boy, we had an old jackfruit tree growing beside the side veranda. I spent a lot of time in the trees surrounding my grandmother's bunglow, and this one was easy to climb. The others included several guava and litchi trees, lemons and grape-fruits, and of course a couple of mango trees—but these last were difficult to climb.

"Why do you spend so much time in the trees?" complained my grandmother. "Why not do something useful for a change?"

"The trees are my brothers," I would say, "I like to play with them."

And I still think of them as my brothers, although I can no longer climb trees or play in them.

Just as no two humans are exactly alike (unless they happen to be twins), so no two trees are the same. Like humans they grow from seed. They develop branches as arms and leaves like flowing hair. We give birth to children; they give birth to fruits and flowers. We shelter our young, they shelter small creatures of the forest.

But unlike us, they spring from the soil, from the land —that very land that gives us food and pasture and protection; the land that we so casually take for granted, preferring to build upon it rather than grow upon it. Where will our cattle graze when the last green spaces have gone?

"No problem", says a young friend. "We can always import our milk".

—RUSKIN BOND

(2)

First it was the drumstick, and now the world is discovering the benefits of yet another Indian superfood—the jackfruit. Once looked down upon as a poor man's food, the fruit, which is now being hailed as the new vegan superfood, is making its way into everything from biryanis to burgers.

From the unripe pods to seeds and the ripe fruits, all forms of bumpy green fruit with a golden heart is making its way to Indian meals. Malayalis use it to make everything from vegetable dishes to payasams, for Bengalis, it is the "gaach patha" or "mutton that grows on the tree". In the West, the chewy pods are fast becoming a substitute for meat while, in India, people are using it to replace carbohydrates.

Jackfruit is high in dietary fibre, is a rich source of vitamin C, a powerful antioxidant, and is packed with phytonutrients, which may reduce the risk of many cancers.

Vitamin C helps in the absorption of iron. The fruit is also a rich source of riboflavin, which helps to heal oral ulcers, and the vitamin A in it prevents macular degeneration of the eye. It is also an important source of magnesium so it further helps in the absorption of calcium, and fights osteoporosis. It is these health benefits that people abroad are discovering. In North India, we have Kathal (jackfruit) ki biryani, as well as kormas, and kebabs made of it.

Thr fruit is said to be among the top food trends of 2017. This January, at the Fancy Food Show in the US, the star ingredient was jackfruit. It is used as a meat replacer in restaurants in New York and San Francisco. The young fruit is considered a good replacement for pulled pork and is served on burgers along with caramelised onion chutney. An Indian is planning to stock jackfruit chips and jams in Hot Breads stores there.

Entrepreneurs have been quick to spot the marketing potential. A Keralite gave up a flourishing career with Microsoft to launch Jackfruit365 in 2013. "I have always wondered why jackfruit doesn't feature on the menu in five-star hotels," adding that he realised it was because the fruit was 'too sticky, smelly and seasonal'. So he came up with an idea of selling freeze-dried jackfruit.

The ripe fruit can be used to make pies and panna cotta, while the unripe pods can replace meat or tofu. After jackfruit365 became a 100% diabetic diet company, they sell only unripe fruit online. The dried, sliced jackfruit can also be powdered and the flour added to idli or dosa batter and phulkas. Studies have revealed consumption of unripe jackfruit can help fight high blood sugar level. Ripe pods are not good for diabetics. The ripe fruit has a glycemic index (GI) of 63, while the unripe pods has a GI of only 52.

—PRIYA MENON

A Mantra for Free Partnership

Dr. Kalam's Unique Innovative Idea

LAKSHMAN PRASAD

3/6, Marris Road, Mendu Compound, Aligarh-202001.

Dr. A.P.J. Abdul Kalam was a fascinating and multi-faceted personality. His eminence was not confined to the journey of an obscure village boy from Rameshwaram to Rashtrapati Bhavan. From his childhood he was intensely humane and spiritual. Throughout his life he chased dreams and success chased him. Acclaimed as, India's Missile Man, Dr. Kalam wanted to catapult the nation to the status of a developed country by 2020.

Whosoever came in contact with Dr. Kalam, was greatly impressed with his simplicity, sincerity of purpose, dedication, devotion, determination, knowledge, memory, kindness, approachabitity. Many people of the country have not only achieved success in their work but also received accolades and laurels by following the path shown by Dr. Kalam.

Even after assuming the office of the *President of India*, Dr. Kalam was not lacking in his simplicity and humility. He was always keen to visit educational institutions and religious places. He never hesitated to accept the best ideas and beliefs of any religion without any discrimination and hesitation. Once when he went to an Ashram in Gujarat, a Sannayasi (Saint) asked Dr. Kalam, "How do you manage to remain so energetic and enthusiatic all the time?" He replied in a very simple manner that I always think what can I give to country and the society? When I meet a child, what can I give him so that he can be happy? Similarly, when I meet saints, I always think what can I give them? This sort of my thinking keeps me energetic and enthusiatic every moment. Dr. Kalam further told Swami Ji that the world teaches us what can we give to others, which will help them to move forward? In reply, Swami Ji told that Ahemdabad is such a city where we always talk about taking—taking from others and do not pay attention to the point of giving it to others. Dr. Kalam said that we have to develop a fully positive thinking in society. In this way, we can bring some changes in our thinking and mind set. Therefore, there is a great need for positive thinking and ideas which can bring changes in attitude of our society.

When Dr. Kalam was leaving the Ashram, about 40 media people surrounded him and urged him to interact with them. Dr. Kalam, as a teacher, asked them to keep aside their cameras, pens and pads. All the media persons followed his suggestion and advice. After that Dr. Kalam said that I offer you "Free Partnership" and asked them to accept it. Almost all media persons very anxiously enquired what this "Free Partnership" offered by him was? In reply, Dr. Kalam said that you become a partner in the progress and advancement of the country without any stake. Further, he advised then to become a partner in the progress of their wife and their family members and their wife should not be any competition amongst themselves. Similarly, you become a participant in the progress and upliftment of your child as well as in the progress of your seniors and juniors of your office. Please play a positive role. Such role can be played and followed by only the person whose thinking is fully positive. Some media persons asked Dr. Kalam to smile. He said you should make the country smile through your positive and constructive works and deeds.

There are lot of hidden messages in Dr. Kalam's advice. "The country will smile", only when every citizen of this country fulfils/performs his duties with sincerity, full devotion and dedication. In the present prevailing circumstances of the society, every big/small judge will have to do justice in a consistent manner without any discrimination, greed etc. Likewise, the politicians and statesmen will also have to abstain from personal selfishness and act positively for the development of the society and country. Apart from this, another very important section of society i.e. the teacher fraternity has to make the students highly knowledgeable without any discrimination and greed etc. Similarly, physicians/doctors will also have to play a significant role in making the nation healthy by avoiding monstrousness. There is a need to make the country bureaucracy completely clean and free from greed and corruption. Industrialists have a very important role to play in the economic and social progress of the country. They have to set up high standards of integrity and honesty. To make the country smile the scientists and technologists will have to play a important and constructive role in developing new discoveries, products, equipments, processes, systems etc. The neglected section of society such as farmers, labourers have to work with dedication and devotion which will bring change in their attitude and thinking resulting into improvement in their standard of living.

In other words, as Mahatma Gandhi gave a slogan "Do or Die" for the freedom of the country, in the same way Dr. Kalam gave a "Mantra" of "Free Partnership" to make India a great and developed nation. This will certainly pave the way of the country towards progress and prosperity.

An Updated List of the Longhorn Beetles of West Bengal (Coleoptera : Cerambycidae)

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Gahan (1906) is the pioneer worker on cerambycid beetles in India, as well as in West Bengal. Biswas et al. (2014) in their work on Dooars have reported 178 species of cerambycid beetles from West Bengal. Recently, Mitra et al. (2015) have published a list of 146 species under 84 genera of 38 tribes belonging to 4 subfamilies of the family Cerambycidae from West Bengal.

After consultation of the *Catalogue of Palaearctic Cerambycoidea* (Updated on 20.02.17) by Danilevsky (2010), and other available literature, present communication reports 512 species under 197 genera of 52 tribes belonging to 4 subfamilies of the family Cerambycidae from the state of West Bengal (Table 1). Among these, subfamily Lamiinae shares 340 species under 124 genera of 25 tribes, followed by Cerambycinae (143 species, 57 genera and 19 tribes), Prioninae (24 species, 11 genera and 6 tribes) and Lepturinae (5 species, 5 genera and 2 tribes) (Table 1).

Of them, 66% species are restricted in their distribution within the Oriental Region, and 31.50% species extend their distribution up to Palaearctic Region. Besides this, 2.30% species of cerambycid fauna of West Bengal are also found in Afrotropical Region, followed by 1.70% species in Nearctic, 1.50% species in Australasian and 0.20% species in Neotropical Regions.

District-wise reported species reveal that, Darjeeling is the highly explored district (392 species), followed by Jalpaiguri (93), Kolkata (11), Kalimpong (10), South 24 Parganas (10), Malda and West Midnapore only one species each. There are 19 species which are reported from 'West Bengal' having no specific locality (marked NSL).

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Table 1. List of Cerambycid species so far reported from West Bengal.

	Tribe	Species name	District
		SUBFAMILY LEPTURINAE	
1	LEPTURINI	*Paranaspia frainii* (Fairmarie, 1897)	Darjeeling
2		*Pyrocalymma pyrochroides* Pic, 1927	Darjeeling
3	XYLOSTEINI	*Formosotoxotus masatakai* Ohbayashi, 2007	Darjeeling
4		*Palaeoxylosteus kurosawai* Ohbayashi & Shimomura, 1986	Darjeeling
5		*Peithona prionoides* Gahan, 1906	Darjeeling
		SUBFAMILY PRIONINAE	
6	AEGOSOMATINI	*Aegosoma bowringi* Gahan, 1894	Jalpaiguri
7		*Aegosoma sinicum ornaticolle* White, 1853	Darjeeling
8		*Baralipton maculosum* Thomson, 1857	Darjeeling, Kolkata
9		*Dinoprionus cephalotes* Bates, 1875	Darjeeling

10		*Nepiodes bowringi* (Gahan, 1894)	Jalpaiguri
11		*Nepiodes costipennis costipennis* (White, 1853)	Jalpaiguri
12		*Nepiodes sulcipennis* (White, 1853)	South 24 Parganas
13		*Spinimegopis nepalensis* (Hayashi, 1979)	Darjeeling
14		*Spinimegopis tibialis* (White, 1853)	Kalimpong, Darjeeling
15	ANACOLINI	*Sarmydus antennatus* Pascoe, 1867	Darjeeling
16	EURYPODINI	*Palaeomegopis lameeri* Boppe, 1911	Darjeeling
17	MACROTOMINI	*Anomophysis elliotti* (Waterhouse, 1884)	Jalpaiguri
18		*Anomophysis inscripta* (Waterhouse, 1884)	Darjeeling, Kolkata
19		*Anomophysis plagiata* (Waterhouse, 1884)	Darjeeling
20		*Anomophysis spinosa* (Fabricius, 1787)	Jalpaiguri
21	PRIONINI	*Dorysthenes (Lophosternus) buqueti* (Guerin-Meneville, 1844)	Jalpaiguri
22		*Dorysthenes (Lophosternus) granulosus* (Thomson, 1861)	Darjeeling, Jalpaiguri
23		*Dorysthenes (Lophosternus) huegelii* (Redtenbacher, 1844)	Darjeeling
24		*Dorysthenes (Lophosternus) indicus* Hope, 1831	Jalpaiguri, Darjeeling
25		*Dorysthenes (Lophosternus) zivetta* Thomson, 1877	Darjeeling
26		*Dorysthenes rostratus* (Fabricius, 1793)	Jalpaiguri
27		*Prionomma (Ancyloprotus) bigibbosun* White, 1853	Darjeeling
28	REMPHANINI	*Rhaphipodus gahani* Lameere, 1903	Darjeeling
29		*Rhaphipodus subopacus* Gahan, 1890	NSL
		SUBFAMILY CERAMBYCINAE	
30	ANAGLYPTINI	*Anaglyptus (Agalophis) fasciatus* (Thomson, 1857)	Darjeeling
31		*Anaglyptus longispinis* Gardner, 1939	Darjeeling
32	CALLICHROMATINI	*Anubis bipustulatus* Thomson, 1865	Darjeeling
33		*Anubis fimbriatus* Bates, 1879	Darjeeling
34		*Anubis inermis* (White, 1853)	Darjeeling
35		*Aphrodisium (Aphrodisium) cantori* (Hope, 1839)	Darjeeling
36		*Aphrodisium* (Aphrodisium) *cribricolle Neervoort* van de Poll, 1890	Darjeeling
37		*Aphrodisium (Aphrodisium) hardwickianum* White, 1853	Darjeeling
38		*Aphrodisium (Aphrodisium) neoxenum* White, 1853	Darjeeling
39		*Aphrodisium (Aphrodisium) planicolle* Neervoort van de Poll, 1890	Darjeeling
40		*Aphrodisium (Aphrodisium) robustum* Bates, 1879	Darjeeling
41		*Aphrodisium (Opacaphrodisium) griffithi* Hope, 1839	Darjeeling
42		*Cataphrodisium rubripenne* (Hope, 1843)	NSL
43		*Chelidonium argentatum* (Dalman, 1817)	Darjeeling
44		*Chloridolum (Chloridolum) alcmene* Thomson, 1865	Darjeeling
45		*Chloridolum (Chloridolum) nympha* (White, 1853)	Darjeeling
46		*Ipothalia micaria* Holzschuh, 1990	Darjeeling
47		*Polyzonus (Polyzonus) bizonatus* White, 1853	Darjeeling
48		*Polyzonus brevipes* Gahan, 1906	Darjeeling
49		*Polyzonus sinense* (Hope, 1841)	Darjeeling
50		*Scalenus fulvus* (Bates, 1879)	Darjeeling
51		*Zonopterus flavitarsis* Hope, 1842	Darjeeling
52	CALLIDIINI	*Callidium viridicolle* Pic, 1926	Darjeeling
53	CALLIDIOPINI	*Ceresium declaratum* Holzschuh, 1990	Darjeeling

54		*Ceresium lepidulum* Holzschuh, 1982	Darjeeling
55		*Ceresium leucosticticum* White, 1855	Jalpaiguri
56		*Ceresium propinquum* Holzschuh, 1982	Darjeeling
57		*Ceresium rufum* Lameere, 1890	Jalpaiguri
58		*Ceresium zeylanicum* White,1855	Jalpaiguri, South 24 Parganas
59		*Gelonaetha hirta* (Fairmaire, 1850)	Kolkata
60		*Stenodryas apicalis* Gahan, 1893	West Midnapore
61		*Stenodryas bicoloripes* Pic, 1922	Jalpaiguri
62		*Stenodryas fascipennis* Holzschuh, 1984	Darjeeling
63		*Stenodryas nigromaculatus* (Gardner, 1942)	Jalpaiguri
64	CERAMBYCINI	*Aeolesthes (Aeolesthes) holosericea* Fabricius, 1787	Darjeeling
65		*Aeolesthes (Aeolesthes) indicola* Bates, 1891	Darjeeling, Jalpaiguri
66		*Derolus discicollis* Gahan, 1906	South 24 Parganas
67		*Derolus mauritanicus* (Buquet, 1840)	Jalpaiguri
68		*Dialeges pauper* Pasco, 1856	Darjeeling
69		*Diorthus cinereus* (Fabricius, 1793)	NSL
70		*Hoplocerambyx spinicornis* (Newman, 1842)	Darjeeling, Jalpaiguri
71		*Neocerambyx paris* (Wiedemann, 1821)	Darjeeling
72		*Neoplocaederus ferrugineus* (Linnaeus, 1758)	Kolkata
73		*Neoplocaederus obesus* Gahan, 1890	NSL
74		*Pachydissus parvicollis* Gahan, 1891	Darjeeling, Jalpaiguri
75		*Pachydissus schmutzenhoferi* Holzschuh, 1990	Darjeeling
76		*Rhytidodera bowringii* White, 1853	Darjeeling
77		*Rhytidodera consona* Holzschuh, 1965	Darjeeling
78		*Trachylophus sinensis* Gahan, 1888	Jalpaiguri
79		*Xoanodera regularis* Gahan, 1890	Darjeeling, Jalpaiguri
80	CLEOMENINI	*Artimpaza obscura* Gardner, 1926	Darjeeling
81		*Cleomenes ornatus* Holzschuh, 1981	Darjeeling
82		*Dere khatrii* Holzschuh, 1984	Darjeeling
83		*Kurarua pedongensis* Heyrovsky, 1961	Darjeeling
84		*Nida championi* Gardner, 1926	Darjeeling
85		*Paramimistena assimilata* Holzschuh, 1999	Darjeeling
86		*Paramimistena polyalthiae* Fisher, 1940	Kalimpong
87		*Paramimistena subglabra* Gressitt & Romdon, 1970	Darjeeling
88	CLYTINI	*Chlorophorus acrocarpi* Gardner, 1942	Darjeeling
89		*Chlorophorus annularis* (Fabricius, 1787)	Kolkata, Jalpaiguri, South 24 Parganas
90		*Chlorophorus annularoides* Holzschuh, 1983	Darjeeling
91		*Chlorophorus annulatus* (Hope, 1831)	Darjeeling
92		*Chlorophorus arciferus* Chevrolat, 1863	Darjeeling
93		*Chlorophorus douei* (Chevrolat, 1863)	Kalimpong
94		*Chlorophorus furcillatus* Holzschuh, 1989	NSL
95		*Chlorophorus henriettae* Holzschuh, 1984	Darjeeling
96		*Chlorophorus insidiosus* Holzschuh, 1986	Darjeeling

97		*Chlorophorus semisinuatus* Pic, 1949	Darjeeling
98		*Demonax albicinctus* (Hope, 1831)	Darjeeling
99		*Demonax blairi* Gardner, 1940	Kalimpong
100		*Demonax ingridae* Holzschuh, 1983	Darjeeling
101		*Demonax jamesi* Holzschuh, 1986	Darjeeling
102		*Demonax josefinae* Holzschuh, 1983	Darjeeling
103		*Demonax leucoscutellatus* (Hope, 1831)	Darjeeling
104		*Demonax narayani* Holzschuh, 1984	Darjeeling
105		*Demonax nigromaculatus* Gahan, 1906	Darjeeling
106		*Demonax rosae* Holzschuh, 1983	Darjeeling
107		*Demonax sonneratiae* Gardner, 1940	South 24 Parganas
108		*Demonax testaceus* (Hope, 1831)	Darjeeling
109		*Demonax traudae* Holzschuh, 1983	Darjeeling
110		*Ischnodora macra* Chevrolat, 1863	Darjeeling
111		*Ischnodora munda* Holzschuh, 1990	Darjeeling
112		*Perissus chatterjeei* Gardner, 1940	Jalpaiguri
113		*Perissus laetus* Lameree, 1893	Jalpaiguri
114		*Perissus mutabilis mutabilis* Gahan, 1894	Darjeeling
115		*Rhaphuma acrocarpi* Gardner, 1940	Kalimpong
116		*Rhaphuma anopla* Holzschuh, 1983	Darjeeling
117		*Rhaphuma aranea* Holzschuh, 1984	Darjeeling
118		*Rhaphuma bhaktai* Holzschuh, 1983	Darjeeling
119		*Rhaphuma fallax* Chevrolat, 1863	NSL
120		*Rhaphuma fulgurata fulgurata* Gahan, 1906	Darjeeling
121		*Rhaphuma horsfieldii* (White, 1855)	Darjeeling
122		*Rhaphuma ilsae* Holzschuh, 1983	Darjeeling
123		*Rhaphuma joshii* Holzschuh, 1984	Darjeeling
124		*Rhaphuma laosica* Gressitt & Rondon, 1970	Darjeeling
125		*Rhaphuma lubricula* Holzschuh, 2003	Darjeeling
126		*Rhaphuma nishidai* Hayashi & Makihara, 1981	Darjeeling
127		*Rhaphuma placida* Pascoe, 1858	Darjeeling
128		*Rhaphuma querciphaga* Holzschuh, 1984	Darjeeling
129		*Xylotrechus buqueti* (Laporte de Castelnau & Gory, 1841)	Darjeeling
130		*Xylotrechus incurvatus contortus* Gahan, 1906	NSL
131		*Xylotrechus incurvatus incurvatus* (Chevrolet, 1863)	Darjeeling
132		*Xylotrechus javanicus* (Castelnau & Gory, 1841)	Jalpaiguri
133		*Xylotrechus (Xylotrechus) liciatulus* Holzschuh, 2006	Darjeeling
134		*Xylotrechus longithorax* Pic, 1922	Jalpaiguri
135		*Xylotrechus (Xylotrechus) stebbingi* Gahan, 1906	Darjeeling
136		*Xylotrechus (Xylotrechus) subdepressus* (Chevrolat, 1863)	Darjeeling
137		*Xylotrechus smei* (Laporte & Gory, 1836)	Jalpaiguri
138		*Xylotrechus subscutellatus* Chevrolat, 1863	NSL
139	COMPSOCERINI	*Rosalia (Eurybatus) decempunctata* (Westwood, 1848)	Darjeeling
140		*Rosalia (Eurybatus) formosa* (Saunders, 1839)	Darjeeling
141		*Rosalia (Eurybatus) gravida* Lameere, 1887	Darjeeling
142		*Rosalia (Eurybatus) hariola* (Thomson, 1860)	Darjeeling
143		*Rosalia (Eurybatus) lateritia* (Hope, 1831)	Darjeeling
144	ELAPHIDIINI	*Nyphasia apicalis* Gahan, 1893	NSL
145		*Nyphasia pascoei* Lacordaire, 1869	Darjeeling

146	HESPEROPHANINI	*Gnatholea simplex* Gahan, 1890	Darjeeling
147		*Stromatium barbatum* (Fabricius, 1775)	Jalpaiguri, South 24Parganas, Kolkata
148		*Stromatium longicorne* (Newman, 1942)	Jalpaiguri
149		*Zoodes compressus* (Fabricius, 1787)	Jalpaiguri
150	MOLORCHINI	*Glaphyra (Glaphyra) darjeelingensis* (Gardner, 1936)	Darjeeling
151		*Glaphyra (Glaphyra) sikkimana* Holzschuh, 2003	Darjeeling
152	OBRIINI	*Comusia bengalensis* (Fisher, 1940)	Darjeeling
153		*Stenhomalus (Stenhomalus) mecops* Holzschuh, 1990	Darjeeling
154	OXYCOLEINI	*Merionoeda (Macomolorchus) ebruata* Holzschuh, 1989	Darjeeling
155		*Merionoeda (Merionoeda) indica* (Hope, 1831)	Darjeeling
156		*Merionoeda (Merionoeda) scutulata* Holzschuh, 1989	NSL
157	PROTHEMINI	*Prothema aurata* Gahan, 1906	Darjeeling
158	PYRESTINI	*Erythrus bicolor* (Westwood, 1848)	Darjeeling
159		*Erythrus suturellus* Holzschuh, 1984	Darjeeli
160		*Pachylocerus crassicornis* (Olivier, 1795)	Kolkata
161	THRANIINI	*Thranius simplex* Gahan, 1894	Jalpaiguri
162		*Thranius triplagiatus* Gahan, 1906	Darjeeling
163	TILLOMORPHINI	*Epipedocera lugens* Holzschuh, 1990	Darjeeling
164		*Epipedocera undulata* (Hope, 1837)	Darjeeling
165		*Epipedocera zona* Chevrolat, 1863	Darjeeling
166	TRACHYDERINI	*Euryphagus lundii* (Fabricius,1793)	Jalpaiguri
167		*Purpuricenus sanguinolentus* (Olivier, 1795)	NSL
168	XYSTROCERINI	*Noserius indicus* (Gahan, 1906)	Kolkata
169		*Oplatocera (Epioplatocera) oberthuri* Gahan, 1906	Jalpaiguri
170		*Tetraommatus filiformis* Perroud, 1855	Jalpaiguri
171		*Xystrocera festiva* Thomson, 1861	Darjeeling
172		*Xystrocera globosa* (Olivier, 1795)	Jalpaiguri, Kolkata, South 24 Parganas
		SUBFAMILY LAMIINAE	
173	ACANTHOCININI	*Cristosydonia alterna* Holzschuh, 2003	Darjeeling
174		*Driopea riopea schmidi* Breuning, 1972	Darjeeling
175		*Eoporis (Eoporimimus) differens* Pic, 1926	Jalpaiguri
176		*Eoporis pedongensis* Breuning, 1969	Darjeeling
177		*Eryssamena (Cristeryssamena) cristipennis* (Breuning, 1963)	Jalpaiguri
178		*Eryssamena paralaosica* Bruening, 1968	Jalpaiguri
179		*Mimohoplorana puncticollis* Breuning, 1960	Darjeeling
180		*Mimoxenolea sikkimensis* (Breuning, 1961)	Darjeeling
181		*Ostedes (Ostedes) albomarmorata* Breuning, 1969	Darjeeling
182		*Ostedes (Trichostedes) assamana* Breuning, 1961	Jalpaiguri
183		*Ostedes (Ostedes) harmandi* Breuning, 1968	Darjeeling
184		*Ostedes (Ostedes)sikkimensis* Breuning, 1958	Darjeeling
185		*Pararondibilis sikkimensis* Breuning, 1961	Darjeeling
186		*Pareoporis nigrosignata* Breuning, 1969	Darjeeling
187		*Pareryssamena fuscosignata* Breuning, 1969	Darjeeling
188		*Rondibilis (Rondibilis) sikkimensis* (Breuning, 1961)	Darjeeling
189		*Rondibilis (Striatorondibilis) pedongensis* Breuning, 1961	Darjeeling
190		*Transipochira sikkimensis* Breuning, 1977	Darjeeling

191		*Trichodiboma clytoides* Breuning, 1961	Darjeeling
192		*Trichohoplorana dureli* Breuning, 1961	Darjeeling
193		*Trichorondibilis rufipennis* Breuning, 1960	Darjeeling
194		*Tuberenes robustipes* (Pic, 1939)	Darjeeling
195	AGAPANTHIINI	*Cleptometopus fuscosignatus* Breuning, 1947	Darjeeling
196		*Cleptometopus indistinctus* Breuning, 1940	Darjeeling
197		*Cleptometopus mimolivaceus* Breuning, 1972	Darjeeling
198		*Cleptometopus mniszechii* (Lacordaire, 1872)	Darjeeling
199		*Cleptometopus parolivaceus* Breuning, 1966	Darjeeling
200		*Cleptometopus quadrilineatus* (Pic, 1924)	Darjeeling
201		*Cleptometopus sikkimensis* Breuning, 1972	Darjeeling
202		*Cleptometopus subteraureus* Breuning, 1967	Darjeeling
203		*Eucomatocera vittata* White, 1846	Jalpaiguri
204		*Hippocephala (Hippocephala) proxima* Breuning, 1840	Darjeeling
205		*Phelipara (Phelipara) affinis* Breuning, 1940	Darjeeling
206		*Pothyne distincta* Breuning, 1950	Darjeeling
207		*Pothyne macrophthalma* Breuning, 1940	Darjeeling
208		*Pothyne ochracea* Bruening, 1940	Jalpaiguri
209		*Pothyne paralaosensis* Bruening, 1968	Jalpaiguri
210		*Pothyne septemvittipennis* Bruning, 1963	Jalpaiguri, Darjeeling
211		*Pothyne sikkimana* Breuning, 1968	Darjeeling
212		*Pothyne sikkimensis* Breuning, 1940	Darjeeling
213		*Pothyne variegata variegata* Thomson, 1864	Darjeeling
214		*Pseudocalamobius proximus* Breuning, 1940	Darjeeling
215		*Pseudocalamobius rufescens* Breuning, 1940	Darjeeling
216		*Pseudocalamobius truncatus* Beruning, 1940	Darjeeling
217		*Tetraglenes flavovittatus* Breuning, 1948	Jalpaiguri
218		*Tetraglenes hirticornis* (Fabricius, 1798)	Jalpaiguri
219	ANCYLONOTINI	*Palimna palimnoides* (Schwarzer, 1925)	Darjeeling
220		*Palimna yunnana* Breuning, 1935	Darjeeling
221		*Parorsidis nigrospersa* (Pic, 1926)	Jalpaiguri
222		*Parorsidis transversevittata* Breuning, 1963	Jalpaiguri
223	APODASYINI	*Euseboides plagiatoides* Breuning, 1950	Darjeeling
224		*Euseboides plagiatus* Gahan, 1893	Darjeeling
225		*Miccolamia (Miccolamia) relucens* Holzschuh, 2003	Darjeeling
226		*Miccolamia (Miccolamia) rugulosa* Holzschuh, 2003	Darjeeling
227		*Ropica affinis* Breuning, 1939	Darjeeling
228		*Ropica coomani* Pic, 1926	Darjeeling
229		*Ropica dorsalis* Schwarzer, 1925	Darjeeling
230		*Ropica pedongensis* Breuning, 1968	Darjeeling
231		*Ropica pseudosignata* Breuning, 1938	South 24 Parganas
232		*Ropica rosti* Breuning, 1958	Darjeeling
233		*Ropica subaffinis* Breuning, 1968	Darjeeling
234		*Zotalemimon lineatoides* (Breuning, 1969)	Darjeeling
235		*Zotalemimon posticata* (Gahan, 1894)	Darjeeling
236	APOMECYNINI	*Apomecyna (Apomecyna) cretacea* (Hope, 1831)	Darjeeling
237		*Apomecyna (Apomecyna) histrio histrio* (Fabricius, 1792)	Darjeeling
238		*Apomecyna (Apomecyna) leucosticta* Hope, 1831	Darjeeling

239		*Apomecyna (Apomecyna) tigrina indica* Breuning, 1969	Darjeeling
240		*Apomecyna saltator* (Fabricius, 1787)	Darjeeling, Malda, South 24 Parganas, Kolkata,Jalpaiguri.
241		*Cornallis gracilipes* Thomson, 1864	Darjeeling
242		*Diaxenes dendrobii* Gahan, 1894	Darjeeling
243		*Estigmenida robusta* Breuning, 1940	Darjeeling
244		*Eremosybra flavolineatoides* Breuning, 1965	Jalpaiguri
245		*Falsoropica sikkimensis* Breuning, 1973	Darjeeling
246		*Iproca pedongensis* Breuning, 1968	Darjeeling
247		*Laosepilysta flavolineata* Breuning, 1965	Jalpaiguri
248		*Neosybra flavovittata* Breuning, 1954	Darjeeling
249		*Pemptolasius humeralis* Gahan, 1890	Darjeeling
250		*Pseudectatosia strandiella* Breuning, 1940	Darjeeling
251		*Setoropica laosensis* Breuning, 1965	Jalpaiguri
252		*Sybra (Sybra) bioculata sikkimana* Breuning, 1969	Darjeeling
253		*Sybra (Sybra) elongatula* Breuning, 1939	Darjeeling
254		*Sybra (Sybra) icanoides* Breuning, 1942	Darjeeling
255		*Sybra (Sybra) longipes* Breuning & De Jong, 1941	Darjeeling
256		*Sybra (Sybra) sikkimensis* Breuning, 1939	Darjeeling
257	ASTATHINI	*Astathes (Tetraophthalmus) gibbicollis* Thomson, 1865	Jalpaiguri
258		*Astathes(Tetraophthalmus) violaceipennis* (Thomson, 1857)	Jalpaiguri
259		*Momisis monticola* Breuning, 1956	Darjeeling
260		*Plaxomicrus sikkimensis*, Breuning, 1956	Darjeeling
261	BATOCERINI	*Apriona (Apriona) paucigranula* Thomson, 1878	Darjeeling
262		*Apriona (Apriona) trilineata*, Chevrolat, 1852	Darjeeling
263		*Apriona cinerea* Chevrolat, 1852	Jalpaiguri
264		*Apriona germari* (Hope, 1831)	NSL
265		*Batocera (Semibatocera) parryi* (Hope, 1846)	NSL
266		*Batocera calana Parry*, 1844	Darjeeling
267		*Batocera davidis Fairemaire*, 1878	Jalpaiguri
268		*Batocera horsfieldi* Hope, 1839	Darjeeling
269		*Batocera lineolata* Chevrolat, 1852	Darjeeling
270		*Batocera numitor* Newman, 1842	Darjeeling
271		*Batocera roylii* (Hope, 1833)	Darjeeling
272		*Batocera rufomaculata* (De Geer, 1775)	Darjeeling, Jalpaiguri, Kolkata, South 24 Parganas
273		*Microcriodes sikkimensis* Breuning, 1943	Darjeeling
274	CROSSOTINI	*Moechotypa asiatica* Pic, 1903	Darjeeling
275		*Moechotypa sikkimensis* (Pic, 1903)	Darjeeling
276		*Moechotypa thoracica* (White, 1858)	Darjeeling
277	CEROPLESINI	*Thysia wallichi* (Hope, 1831)	Jalpaiguri
278	DESMIPHORINI	*Eunidiella pilosa* Breuning, 1940	Darjeeling
279		*Ipochiromima sikkimensis* (Breuning, 1982)	Darjeeling
280		*Mimoscapeuseboides pedongensis* Breuning, 1976	Darjeeling
281		*Mimozotale (Mimozotale) sikkimensis* Breuning, 1940	Darjeeling
282		*Pareuseboides albomarmorata* Breuning, 1948	Darjeeling

283		*Rhodopina albomaculata* (Gahan, 1890)	Darjeeling
284		*Rhodopina albomarmorata* Breuning, 1958	Darjeeling
285		*Rhodopina alboplagiata* (Gahan, 1890)	Darjeeling
286		*Rhodopina laevepunctata* Breuning, 1958	Darjeeling
287		*Rhodopina pubereoides* (Breuning, 1956)	Darjeeling
288		*Vittatopothyne flavovittata* (Breuning, 1960)	Darjeeling
289	DORCASCHEMATINI	*Macrocamptus virgatus* (Gahan, 1890)	Jalpaiguri
290		*Microlenecamptus albonotatus flavosignatus* Rondon & Breuning, 1970	Jalpaiguri
291		*Olenecamptus anogeissi* Gardner, 1930	Jalpaiguri
292		*Olenecamptus bilobus* (Fabricius, 1801)	Jalpaiguri
293		*Olenecamptus dominus* Thomson, 1860	Jalpaiguri
294		*Olenecamptus indianus* (Thomson, 1857)	Darjeeling
295		*Olenecamptus pseudostrigosus* Breuning, 1938	Kalimpong
296	EUNIDIINI	*Falseunidia albosignata* Breuning, 1943	Darjeeling
297	GNOMINI	*Imantocera penicillata* Hope, 1831	Darjeeling
298	MESOSINI	*Aesopida malasiaca* Thomson, 1864	Jalpaiguri
299		*Agelasta (Dissosira) sikkimensis*, Breuning, 1963	Darjeeling
300		*Agelasta (Pseudagelasta) bifasciana* White, 1858	Darjeeling
301		*Agelasta (Pseudagelasta) fallaciosa* Breuning, 1938	Darjeeling
302		*Anagelasta (Anagelasta) apicalis* Pic, 1925	Darjeeling
303		*Cacia (Ipocregyes) cephalotes* (Pic, 1925)	Darjeeling
304		*Cacia (Pericacia) cretifera cretifera* (Hope, 1831)	Darjeeling
305		*Cacia (Pericacia) cretifera dilacerata* Breuning, 1939	Darjeeling
306		*Coptops aedificator* (Fabricius, 1793)	Jalpaiguri
307		*Coptops leucosticticus leucosticticus* White, 1858	Jalpaiguri
308		*Falsomesosella (Falsomesosella) gardneri* Breuning, 1938	Darjeeling
309		*Falsomesosella (Falsomesosella) mediofasciata* Breuning, 1968	Darjeeling
310		*Mesocacia multimaculata* (Pic, 1925)	Darjeeling
311		*Mesosa (Aplocnemia) affinis* Breuning, 1936	Darjeeling
312		*Mesosa (Aplocnemia) sikkimensis* Breuning, 1935	Darjeeling
313		*Mesosa (Perimesosa) bimaculata* Breuning, 1936	Darjeeling
314		*Mesosa (Perimesosa) binigrovittipennis* Breuning, 1968	Darjeeling
315	MONOCHAMINI	*Acalolepta affinis* Breuning, 1935	Darjeeling
316		*Acalolepta albosparsuta* Breuning, 1965	Jalpaiguri
317		*Acalolepta basicornis* (Gahan, 1894)	Darjeeling
318		*Acalolepta bifasciata* (Westwood, 1848)	Darjeeling
319		*Acalolepta crassepunctifrons* (Breuning, 1960)	Darjeeling
320		*Acalolepta gardneri* (Breuning, 1938)	Darjeeling
321		*Acalolepta griseipennis* (Thomson, 1857)	Jalpaiguri
322		*Acalolepta griseopalgiata* Breuning, 1935	Darjeeling
323		*Acalolepta inaequalis* (Gardner, 1937)	Darjeeling
324		*Acalolepta laeviceps* (Breuning, 1937)	Darjeeling
325		*Acalolepta punctiforns* (Gahan, 1894)	Darjeeling
326		*Acalolepta scotti* (Breuning, 1936)	Darjeeling
327		*Acalolepta sericans* (Breuning, 1938)	Darjeeling
328		*Acalolepta sikkimensis* (Breuning, 1935)	Darjeeling
329		*Acalolepta sulphurifera* (Hope, 1842)	Darjeeling
330		*Acalolepta tenuipes* (Breuning, 1938)	Darjeeling

331		*Agniomorpha ochraceomaculata* Breuning, 1935	Darjeeling
332		*Agnoderus gnomoides* Thomson, 1864	Darjeeling
333		*Annamanum indicum* Beuning, 1938	Kalimpong
334		*Annamanum sikkimense* Breuning, 1942	Darjeeling
335		*Anoplophora beryllina* (Hope, 1840)	Darjeeling
336		*Anoplophora sollii* (Hope, 1839)	Darjeeling
337		*Anoplophora stanleyana stanleyana* Hope, 1839	Darjeeling
338		*Aristobia approximator* (Thomson,1865)	Jalpaiguri
339		*Aristobia horridula* (Hope, 1831)	Darjeeling
340		*Blepephaeus arrowi* Breuning, 1935	Darjeeling
341		*Blepephaeus indicus* Breuning, 1935	Darjeeling
342		*Blepephaeus succinctor* (Chevrolat, 1852)	Jalpaiguri
343		*Epepeotes uncinatus salvazai* Pic, 1925	NSL
344		*Falsagnia obenbergeri* Breuning, 1938	Darjeeling
345		*Hoplothrix amicator* (Gahan, 1888)	Darjeeling
346		*Macrochenus guerinii* (White, 1858)	Jalpaiguri
347		*Macrochenus isabellinus* Aurivillius, 1920	Jalpaiguri
348		*Monochamus desperatus* Thomson, 1857	Darjeeling
349		*Monochamus dubius* Gahan, 1894	Darjeeling
350		*Monochamus gardneri* Breuning, 1938	Kalimpong
351		*Monochamus (Monochamus) bimaculatus* Gahan, 1888	Darjeeling
352		*Monochamus subtrangularis* Breuning, 1972	Darjeeling
353		*Paraepepeotes westwoodi* (Westwood, 1848)	Darjeeling
354		*Paragnia fulvomaculata* Gahan, 1893	Darjeeling
355		*Paraleprodera insidiosa* (Pascoe, 1888)	Jalpaiguri
356		*Paraleprodera stephanus* White, 1858	Darjeeling
357		*Paruraecha (Paruraecha) sikkimensis* Breuning, 1938	Darjeeling
358		*Pharsalia (Antennopharsalia) antennata* Gahan, 1894	Darjeeling
359		*Pharsalia (Cycos) gibbifera* (Guerni-Meneville, 1844)	Darjeeling
360		*Pharsalia (Cycos) subgemmata* (Thomson, 1857)	Jalpaiguri
361		*Pharsalia (Pharsalia) pulchra* Gahan, 1888	Jalpaiguri
362		*Polytretus cribripennis* Gahan, 1893	Darjeeling
363		*Pseudonemophas versteegii* (Ritsema, 1881)	Jalpaiguri
364		*Sternohammus sericeus* (Breuning, 1937)	Darjeeling
365		*Sternorsidis brunnea* Breuning, 1959	Darjeeling
366		*Thermonotus nigripes* Gahan, 1888	Darjeeling
367		*Xenicotela distincta* (Gahan, 1888)	Darjeeling
368	MORIMOPSINI	*Aconodes pedongensis* Breuning, 1956	Darjeeling
369		*Aconodes sikkimensis* (Breuning, 1940)	Darjeeling
370		*Aconodes truncata* (Breuning, 1938)	Darjeeling
371		*Morimopsis granulipennis* Breuning, 1966	Darjeeling
372		*Morimopsis lacrymans* Thompson, 1857	Darjeeling
373	MYTHODINI	*Phyodexia concinna* Pascoe, 1871	Darjeeling
374	NYCTIMENINI	*Nyctimenius tristi* (Fabricuius, 1792)	Darjeeling
375	PETROGNATHINI	*Ithocritus ruber* Hope, 1839	Darjeeling
376	PHYTOECIINI	*Linda rubescens* (Hope, 1831)	Darjeeling
377		*Linda testacea* (Saunders, 1839)	Darjeeling
378		*Nupserha acuta* Holzschuh, 1986	Darjeeling
379		*Nupserha annulata annulata* (Thomson, 1857)	Darjeeling

380		*Nupserha basipilosa* Holzschuh, 1986	Darjeeling
381		*Nupserha flavipennis* Breuning, 1950	Darjeeling
382		*Nupserha fricator* (Dalman, 1817)	Jalpaiguri
383		*Nupserha fuscodorsalis* Wang & Chiang, 2002	Darjeeling
384		*Nupserha lenita* (Pascoe, 1867)	Darjeeling
385		*Nupserha pallidipennis pallidipennis* (Redtenbacher, 1844)	Darjeeling
386		*Nupserha quadrioculata* (Hunberg, 1787)	Jalpaiguri
387		*Nupserha rotundicollis* Breuning, 1950	Darjeeling
388		*Nupserha schmidi darjeelingensis* Holzschuh, 1990	Darjeeling
389		*Nupserha schmidi schmidi* Breuning, 1966	Darjeeling
390		*Nupserha spinifera spinifera* Gressitt, 1948	Darjeeling
391		*Nupserha ventralis* Gahan, 1894	Darjeeling
392		*Oberea nr. modica* (Gahan, 1895)	Jalpaiguri
393		*Oberea (Oberea) bisbipunctulata* Breuning, 1960	Darjeeling
394		*Oberea (Oberea) consentanea* Pascoe, 1867	Darjeeling
395		*Oberea (Oberea) ferruginea* Thunberg, 1787	Darjeeling
396		*Oberea (Oberea) montivagans medioplagiata* Breuning, 1960	Darjeeling
397		*Oberea (Oberea) posticata* Gahan, 1894	Darjeeling
398		*Oberea (Oberea) sikkimensis* Breuning, 1960	Darjeeling
399		*Oberea formosana* Pic, 1911	Jalpaiguri
400		*Oberea yunnanensis* Breuning, 1947	Jalpaiguri
401		*Obereopsis atrosternalis* Breuning, 1957	Darjeeling
402		*Obereopsis darjelingensis* Breuning & Heyrovsky, 1964	Darjeeling
403		*Obereopsis flavodiscalis flavodiscalis* Breuning, 1982	Darjeeling
404		*Obereopsis nigriceps nigriceps* Breuning, 1957	Darjeeling
405		*Obereopsis obscura nigroabdominalis* Breuning, 1972	Darjeeling
406		*Obereopsis pedongensis* Breuning, 1960	Darjeeling
407		*Obereopsis pseudoannulicornis* Breuning, 1982	Darjeeling
408		*Obereopsis quadrinotaticollis lahungi* Breuning, 1982	Darjeeling
409		*Obereopsis rufescens* Breuning, 1960	Darjeeling
410		*Obereopsis sericea* Gahan, 1894	Darjeeling
411		*Obereopsis sericeoides* Holzschuh, 2006	Darjeeling
412		*Obereopsis sikkimensis* Breuning, 1957	Darjeeling
413		*Obereopsis subteratra* Breuning, 1957	Darjeeling
414		*Obereopsis varieantennalis* Breuning, 1982	Darjeeling
415		*Phytoecia (Phytoecia) sikkimensis* Pic, 1907	Darjeeling
416	POGONOCHERINI	*Exocentrus alni Fisher*, 1932	Darjeeling
417		*Exocentrus diversiceps* Pic, 1931	Darjeeling
418		*Exocentrus explanatidens* Pic, 1930	Darjeeling
419		*Exocentrus fisheri Gressitt*, 1932	Darjeeling
420		*Exocentrus flemingiae Fisher*, 1932	Darjeeling
421		*Exocentrus ravillus* Holzschuh, 1948	Darjeeling
422		*Exocentrus transversifrons* Fisher, 1940	Darjeeling
423	PTEROPLIINI	*Cenodocus laosensis* Breuning, 1965	Jalpaiguri
424		*Egesina (Callienispia) anterufipennis* Breuning, 1958	Darjeeling
425		*Egesina (Egesina)basirufa* Breuning & Heyrovsky, 1961	Darjeeling
426		*Egesina (Niijimaia) flavopicta* Breuning & Heyrovsky, 1961	Darjeeling
427		*Egesina (Niijimaia) sikkimensis* Breuning, 1940	Darjeeling
428		*Marmylaris buckleyi* Pascoe, 1857	Darjeeling

429	*Marmylaris truncatipennis* Breuning, 1940	Darjeeling
430	*Mimectatosia compacta* Breuning, 1959	Darjeeling
431	*Mispila (Trichomispila) pedongensis* Breuning, 1968	Darjeeling
432	*Niphona (Niphona) fuscatrix* Fabricious, 1792	Darjeeling
433	*Niphona (Niphona) hookeri* Gahan, 1900	Darjeeling
434	*Niphosoma sikkimense* Breuning, 1957	Darjeeling
435	*Pseudolophia uniformis* Breuning, 1938	Darjeeling
436	*Pterolophia (Ale) ocheromaculata* Breuning, 1940	Darjeeling
437	*Pterolophia (Ale) sikkimensis* Breuning, 1938	Darjeeling
438	*Pterolophia (Armatopraonetha) bifasciata* Breuning, 1968	Darjeeling
439	*Pterolophia deformis* Breuning, 1939	Kalimpong
440	*Pterolophia (Hylobrotus) annulata* (Chevrolet, 1845)	Darjeeling
441	*Pterolophia (Hylobrotus) gerardiniae* Breuning, 1938	Darjeeling
442	*Pterolophia (Hylobrotus) lateralis* Gahan, 1894	Jalpaiguri
443	*Pterolophia (Hylobrotus) obscuroides* Breuning, 1938	NSL
444	*Pterolophia (Hylobrotus) tibialis* Breuning, 1937	Darjeeling
445	*Pterolophia inexpectata* Breuning, 1937	Darjeeling
446	*Pterolophia kaleea* (Bates, 1866)	Jalpaiguri
447	*Pterolophia (Lychrosis) zebrina* (Pascoe, 1858)	Darjeeling
448	*Pterolophia mimoconsularis* Breuning, 1968	Jalpaiguri
449	*Pterolophia (Mimoron) brevegibbosa* Pic, 1926	Darjeeling
450	*Pterolophia (Mimoron) pedogenesis* Breuning, 1968	Darjeeling
451	*Pterolophia (Mimoron) ropicoides* Breuning, 1968	Darjeeling
452	*Pterolophia ochraceolineata* Breuning, 1943	NSL
453	*Pterolophia oculata* Breuning, 1938	NSL
454	*Pterolophia (Pterolophia) apicefusca* Breuning, 1938	Darjeeling
455	*Pterolophia (Pterolophia) bituberata* Breuning, 1938	Darjeeling
456	*Pterolophia (Pterolophia) bituberculata* Breuning, 1938	Darjeeling, Kalimpong
457	*Pterolophia (Pterolophia) consularis* Pascoe, 1966	Darjeeling
458	*Pterolophia (Pterolophia) dorsalis* (Pascoe, 1858)	Darjeeling
459	*Pterolophia (Pterolophia) granulosa* Breuning, 1938	Darjeeling
460	*Pterolophia (Pterolophia) ligata* Pascoe, 1862	Darjeeling
461	*Pterolophia (Pterolophia) marmorata* Breuning, 1938	Darjeeling
462	*Pterolophia (Pterolophia) nigricans* Breuning, 1938	Darjeeling
463	*Pterolophia (Pterolophia) nigrovirgulata* Breuning, 1939	Darjeeling
464	*Pterolophia (Pterolophia) obscurata* Breuning, 1938	Darjeeling
465	*Pterolophia (Pterolophia) pedongana* Breuning, 1968	Darjeeling
466	*Pterolophia (Pterolophia) persimilis* Gahan, 1894	Darjeeling
467	*Pterolophia (Pterolophia) pseudobscuroides* Breuning, 1938	Darjeeling
468	*Pterolophia (Pterolophia) pseudoculatoides* Breuning, 1968	Darjeeling
469	*Pterolophia (Pterolophia) pseudotincta* Breuning, 1938	Darjeeling
470	*Pterolophia (Pterolophia) rufobrunnea* Breuning, 1938	Darjeeling
471	*Pterolophia (Pterolophia) subbicarinata* Breuning, 1968	Darjeeling
472	*Pterolophia (Pterolophia) sikkimana* Breuning, 1973	Darjeeling
473	*Pterolophia (Pterolophia) touzalini* Breuning, 1973	Darjeeling
474	*Pterolophia (Pterolophia) transversefasciata* Breuning, 1938	Darjeeling
475	*Pterolophia (Pterolophia) tubericollis* Breuning, 1938	Darjeeling
476	*Pterolophia sthenioides* Breuning,1937	Darjeeling

477		*Pterolophia subtubericollis* Breuning & Hearovsky, 1964	Darjeeling
478		*Trichoniphona albomarmorata* Breuning, 1968	Darjeeling
479		*Sthenias (Sthenias) franciscana* Thomson, 1865	Darjeeling
480		*Sthenias (Sthenias) persimilis* Breuning, 1938	Darjeeling
481		*Sthenias partealbicollis* Breuning, 1968	Jalpaiguri
482		*Sthenias (Sthenias) pseudodorsalis* Breuning, 1938	Darjeeling
483		*Xynenon bondii* (Pascoe, 1859)	Darjeeling
484	SAPERDINI	*Glenea (Stiroglenea) andamanica* Breuning, 1958	Jalpaiguri
485		*Glenea (Accolona) astathiformis* Breuning, 1958	Jalpaiguri
486		*Glenea (Aridoglenea) cancellata* Thomson, 1865	Darjeeling
487		*Glenea (Aridoglenea) vaga* Thomson, 1865	Darjeeling
488		*Glenea beesoni* Heller, 1926	Darjeeling
489		*Glenea chalybeata* Thomson, 1861	Darjeeling
490		*Glenea (Glenea) flava* Jordan, 1895	Darjeeling
491		*Glenea (Glenea) glechomoides* Breuning, 1982	Darjeeling
492		*Glenea (Glenea) indiana* (Thomson, 1857)	Jalpaiguri
493		*Glenea (Glenea) nigerrima* Breuning, 1953	Darjeeling
494		*Glenea (Glenea) ornata* Gahan, 1889	Darjeeling
495		*Glenea (Glenea) pseudoluctuosa* Breuning, 1953	Darjeeling
496		*Glenea (Glenea) sikkimensis* Breuning, 1982	Darjeeling
497		*Glenea (Glenea) sulphurea* Thomson, 1865	Darjeeling
498		*Glenea (s.str.) pulchella* Pascoe, 1857	NSL
499		*Glenea (s.str.) pulchra* Aurivillius, 1926	Jalpaiguri
500		*Glenea (s.str.) t-notata* Gahan, 1889	Jalpaiguri
501		*Glenea (Rubroglenea) rubricollis* (Hope, 1842)	Darjeeling
502		*Glenea (Stiroglenea) cantor cantor* Fabricius, 1787	Jalpaiguri
503		*Glenea (Stiroglenea) spilota* Thomson, 1861	Darjeeling
504		*Heteroglenea bastiensis* Breuning, 1953	Darjeeling
505		*Paraserixia flava* Breuning, 1954	Darjeeling
506		*Serixia bootangana* Breuning, 1858	Darjeeling
507		*Stibara (s.str.) tricolor* (Fabricius, 1792)	Jalpaiguri
508		*Stibara teraspilota* Hope, 1840	Jalpaiguri
509	XENOLEINI	*Hirtaeschopalaea robusta* Breuning, 1937	NSL
510	XYLORHIZINI	*Thylactus sikkimensis* Breuning, 1938	Darjeeling
511		*Thylactus simulans* Gahan, 1890	Darjeeling
512		*Xylorhiza adusta* (Wiedmann, 1819)	Jalpaiguri

New Fabrics from Nature

Whe ther lotus, hemp or bamboo, the long bast fibres from the stem are extracted and spun into yarn, with or without chemical solvents. The yarn is then woven into cloth. There's also seaweed fabric manufactured in a similar way, and viscose made from woodpulp.

Banana Wear : Textile researchers at Maharaja Sayajirao University of Baroda recycle waste generated at banana plantations into fabric. They've succeeded at manufacturing banana cloth.

Fish and Mushroom leather : Fish leather is a roughly 40-day process that involves soaking fish skins in chemical solutions to remove the scales and oils, and then tanning them. Mushroom leather, on the other hand, cultivates the fungus for fashion, manipulating its mycelium or 'skin' under varying conditions of temperature and humidity and then tanning it to arrive at a convincing, animal-friendly stand-in for leather.

Fish leather makes use of discarded fish skins. Mushroom leather is strong, durable, carbon-negative and versatile: it can be tweaked to resemble cow, snake and even ostrich skin.

Birds and their Status in Khijadia Bird Sanctuary, Gujarat, an Asian Fly Way Stopover Place in India

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Gulf of Kachchh in Gujarat (India) inhabits many water birds. Variety of winter migrants visit the area regularly. Mundkur (1991) recorded 115 species in freshwater, of which about half were migratory. Naik et al. (1991) reported nesting of 12 tree-nesting and six ground-nesting water bird species in the Marine National Park. Parasharya (1984) studied ecology of Western Reef-Egret; Bhuva (1999) studied feeding ecology of four migratory waders; Gadhvi (2001) studied breeding ecology of Asian White Ibis in Bhavnagar city; and Dave (2002) studied ecology of piscivorous birds in inland wetlands of semiarid parts of Saurashtra.

Study Area

Khijadia Bird Sanctuary (KBS) is located at 22°28' N 70°01' E and is spread over an area of 6.055 sq. km (Fig. I). Khijadia Bird Sanctuary is one of the Important Bird Area (IBA) from Gujarat state, India (Islam & Rahmani, 2004). It joins with Marine National Park on one side and on the other Dhunvav river empties freshwater in it. Both habitats are separated by mud wall.

Terrestrial plants include *Zizyphus* sp. and *Acacia nilotica*. Mangroves like *Avicenia* sp. is found in marine water. In freshwater *Phragmites karaka, Oxystelma* sp. *Ipomea aquatica, Amaranthus veredi* are seen.

Two triple tire watchtowers are built to observe the birds from a height. The freshwater area of the sanctuary is divided in various blocks by road.

Maximum temperature stands at 40°C during summer (March-June) and minimum temperature is 8°C during winter (Nov.-Feb.). The rainy season extends from July to October and rainfall averages 550mm. The height from mean sea level ranges from 3 to 19m.

Methodology

The fieldwork was carried out for eight months from first week of July 1997 to the last week of February 1998. English name and scientific name follow Manakadan & Pittie (2001). Total bird species have been categorized in waterbirds, wetland dependent birds as per Kumar (2003) and terrestrial birds.

Abbreviations used: BRS-Biome Restricted Species; NT-Near Threatened; Vu-Vulnerable; and CD-Conservation Dependent.

Results and Discussion

152 bird species belonging to 45 families were noted. Among 152 birds, 40 were resident migratory, 54 were migratory and 58 were resident bird species. 106 species are water birds or wetland dependent. Among these two crane species utilized the area for roosting purpose in large number whereas other birds utilized the area mainly for feeding. 46 terrestrial bird species are also observed. Table III depicts 13 Globally Threatened species observed in the KBS. Among these Black-necked Stork, Painted Stork, Asian Openbill Stork, Indian Skimmer and Darter have been recorded breeding in the KBS (personal observation). Dalmatian Pelican, Comb Duck and Eastern Imperial Eagle are listed in Appendix I of CITES whereas Eurasia Spoonbill is listed in Appendix II of CITES.

KBS provides ideal habitat for 152 bird species, migratory (54), resident migratory (40) and local (58) species. The bird sanctuary provides feeding habitat to many bird species. Notably large number of two migratory crane species, Common Crane (*Grus grus*) and Demoiselle Crane (*Grus vigro*) uses the sanctuary for roosting. 13 Globally Threatened species are also reported in the KBS.

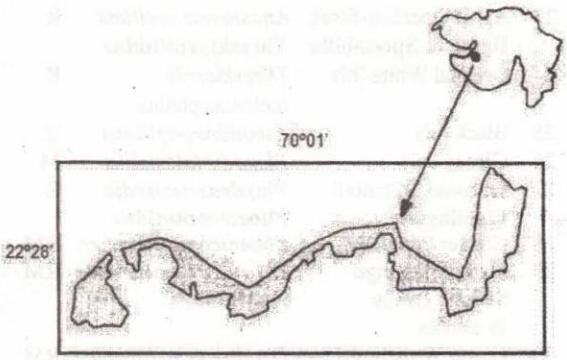

Fig. 1. Site location of Khijadia Bird Sanctuary, Gujarat.

Table 1. Check list of wetland bird species seen in the Khijadia Bird Sanctuary, Gujarat.

	Common Name	Scientific Name	Status
	Grebes	**Podicipedidae**	
1	Little Grebe	*Tachybaptus ruficollis*	R
2	Black-necked Grebe	*Podiceps nigricollis*	M
3	Great Crested Grebe	*Podiceps cristatus*	M
	Pelicans	**Pelecanidae**	
4	Great White Pelican	*Pelecanus onocrotalus*	RM
5	Spot-billed Pelican	*Pelecanus philippensis*	RM
6	Dalmatian Pelican	*Pelecanus crispus*	M
	Cormorants/Shags	**Phalacrocoracidae**	
7	Great Cormorant	*Phalacrocorax carbo*	RM
8	Little Cormorant	*Phalacrocorax niger*	RM
	Darters	**Anhingidae**	
9	Darter	*Anhinga melanogaster*	RM
	Herons, Egrets & Bitterns	**Ardeidae**	
10	Grey Heron	*Ardea cinerea*	R
11	Purple Heron	*Ardea purpurea*	R
12	Little Green Heron	*Butorides striatus*	R
13	Indian Pond-Heron	*Ardeola greyii*	R
14	Cattle Egret	*Bubulcus ibis*	R
15	Large Egret	*Casmerodius albus*	R
16	Median Egret	*Mesophoyx intermedia*	R
17	Little Egret	*Egretta garzetta*	R
18	Western Reef-Egret	*Egretta gularis*	R
19	Black-crowned Night-Heron	*Nycticorax nycticorax*	R
20	Great Bittern	*Botaurus stellaris*	M
	Storks	Ciconiidae	
21	Painted Stork	*Mycteria leucocephala*	R
22	Black-necked Stork	*Ephippiorhynchus asiaticus*	RM
23	Asian Openbill-Stork	*Anastomus oscitans*	R
	Ibises & Spoonbills	**Threskiornithidae**	
24	Oriental White Ibis	*Threskiornis* melanocephalus	R
25	Black Ibis	*Pseudibis papillosa*	R
26	Glossy Ibis	*Plegadis falcinellus*	M
27	Eurasian Spoonbill	*Platalea leucorodia*	R
	Flamingos	**Phoenicopteridae**	
28	Greater Flamingo	*Phoenicopterus ruber*	RM
29	Lesser Flamingo	*Phoenicopterus minor*	RM
	Swans, Geese & Ducks	**Anatidae**	
30	Lesser Whistling-Duck	*Dendrocygna javanica*	RM
31	Brahminy Shelduck	*Tadorna ferruginea*	M
32	Northern Pintail	*Anas acuta*	M
33	Common Teal	*Anas crecca*	M
34	Spot-billed Duck	*Anas poecilorhyncha*	R
35	Gadwall	*Anas strepera*	M
36	Garganey	*Anas querquedula*	M
37	Eurasian Wigeon	*Anas penelope*	M
38	Northern Shoveller	*Anas clypeata*	M
39	Common Pochard	*Aythya ferina*	M
40	Comb Duck	*Sarkidiornis melanotos*	RM
	Cranes	**Gruidae**	
41	Sarus Crane	*Grus antigone*	R
42	Demoiselle Crane	*Grus virgo*	M
43	Common Crane	*Grus grus*	M
	Rails, Crakes, Moorhens, Coots	**Rallidae**	
44	White-breasted Waterhen	*Amaurornis phoenicurus*	R
45	Common Moorhen	*Gallinula chloropus*	R
46	Purple Moorhen	*Porphyrio porphyrio*	R
47	Common Coot	*Fulica atra*	R
	Jacanas	**Jacanidae**	
48	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	RM
	Oystercatcher	**Haematopodidae**	
49	Eurasian Oystercatcher	*Haematopus ostralegus*	M
	Plovers, Dotterels, Lapwings	**Charadridae**	
50	Yellow-wattled Lapwing	*Vanellus melabaricus*	R
51	Red-wattled Lapwing	*Vanellus indicus*	
52	Common Ringed Plover	*Charadrius hiaticula*	M
53	Little Ringed Plover	*Charadrius dubius*	R
54	Kentish Plover	*Charadrius alexandrinus*	R
55	Lesser Sand Plover	*Charadrius mongolus*	M
	Sandpipers, Stints, Snipes, Godwits & Curlews	**Scolopacidae**	
56	Whimbrel	*Numenius phaeopus*	M
57	Eurasian Curlew	*Numenius arquata*	M
58	Black-tailed Godwit	*Limosa limosa*	M
59	Bar-tailed Godwit	*Limosa lapponica*	M
60	Common Redshank	*Tringa totanus*	M
61	Marsh Sandpiper	*Tringa stagnatilis*	M
62	Common Greenshank	*Tringa nebularia*	M
63	Wood Sandpiper	*Tringa glareola*	M
64	Terek Sandpiper	*Xenus cinereus*	M
65	Common Sandpiper	*Actitis hypoleucos*	M

66	Ruddy Turnstone	*Arenaria interpres*	M
67	Pintail Snipe	*Gallinago stenura*	M
68	Jack Snipe	*Lymnocryptes minimus*	M
69	Little Stint	*Calidris minuta*	M
70	Temminck's Stint	*Calidris temminckii*	M
71	Dunlin	*Calidris alpina*	M
72	Curlew Sandpiper	*Calidris ferruginea*	M
73	Ruff	*Philomachus pugnax*	M
	Ibisbill, Avocets & Stilts	**Recurvirostidae**	
74	Black-winged Stilt	*Himantopus himantopus*	R
75	Pied Avocet	*Recurvirostra avosetta*	RM
	Stone-Curlew & Stone-Plovers /Thick-knees	**Burhinidae**	
76	Stone-Curlew	*Burhinus oedicnemus*	R
77	Great Stone-Plover	*Esacus recurvirostris*	R
	Gulls, Terns & Noddies	**Laridae**	
78	Yellow-legged Gull*	*Larus cachinnans*	M
79	Pallas's Gull	*Larus ichthyaetus*	M
80	Brown-headed Gull	*Larus brunnicephalus*	M
81	Black-headed Gull	*Larus ridibundus*	M
82	Slender-billed Gull	*Larus genei*	M
83	Whiskered Tern	*Chlidonias hybridus*	M
84	Gull-billed Tern	*Gelochelidon nilotica*	M
85	Caspian Tern	*Sterna caspia*	RM
86	Common Tern	*Sterna hirundo*	RM
87	River Tern	*Sterna aurantia*	R
88	Little Tern	*Sterna albifrons*	R
	Skimmers	**Rynchopidae**	
89	Indian Skimmer	*Rhynchops albicollis*	RM
	Wetland dependent birds		
	Kingfishers	**Alcedinidae**	
90	Small Blue Kingfisher	*Alcedo atthis*	R
91	White-breasted Kingfisher	*Halcyon smyrnensis*	R
92	Black-capped Kingfisher	*Halcyon pileata*	M
93	Lesser Pied Kingfisher	*Ceryle rudis*	R
	Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers	**Accipitridae**	
94	Brahmini Kite	*Haliastur indus*	RM
95	Western Marsh-Harrier	*Circus aeruginosus*	M
96	Eastern Imperial Eagle	*Aquila heliaca*	RM
	Owls	**Strigidae**	
97	Brown Fish Owl	*Ketupa zeylonensis*	R
	Bee-eaters	**Meropidae**	
98	Chestnut-headed Bee-eater	*Merops leschenaulti*	
99	Blue-cheeked Bee-eater	*Merops persicus*	RM
	Swallows & Martins	**Hirundinidae**	
100	Common Swallow	*Hirundo rustica*	M
101	Wire-tailed Swallow	*Hirundo smithii*	R
	Wagtails & Pipits	**Motacillidae**	
102	Citrine Wagtail	*Motacilla citreola*	RM
103	Yellow Wagtail	*Motacilla flava*	M
104	Black-headed Yellow Wagtail	*Motacilla flava malenogrisea*	M
105	Grey Wagtail	*Motacilla cinerea*	M
106	White Wagtail	*Motacilla alba*	M

Table 2. Check list of terrestrial bird species seen in the Khijadia Bird Sanctuary, Gujrat.

	Comman Name	Scientific Name	Status
	Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers	**Accipitridae**	
1	Black Kite	*Milvus migrans*	R
2	Black-shouldered Kite	*Elanus caeruleus*	R
3	Eurasian Griffon	*Gyps fulvus*	RM
	Falcons	**Falconidae**	
4	Red Headed Falcon	*Falco chicquera*	R
	Pheasants, Partridges, Quails	**Phasianidae**	
5	Grey Francolin	*Francolinus pondicerianus*	RM
	Pigeons & Doves	**Columbidae**	
6	Blue Rock Pigeon	*Columba livea*	R
7	Eurasian Collared-Dove	*Streptopelia decaocto*	R
8	Red Collared-Dove	*Streptopelia tranquebarica*	R
9	Little Brown Dove	*Streptopelia senegalensis*	R
	Parakeets & Hanging-Parrots	**Psittacidae**	
10	Rose-ringed Parakeet	*Psitttacula krameri*	R
	Cuckoos, Malkohas & Coucals	**Cuculidae**	

11	Pied Crested Cuckoo	*Clamator jacobinus*	RM
12	Indian Cuckoo	*Cuculus micropterus*	RM
13	Drongo Cuckoo	*Surniculus lugubris*	R
14	Asian Koel	*Eudynamys scolopacea*	R
15	Greater Coucal	*Centropus sinensis*	R
	Barn Owls	**Tytonidae**	
16	Barn Owl	Tyto alba	R
	Swifts	**Apodidae**	
17	Common Swift	*Apus apus*	
18	House Swift	*Apus affinis*	R
	Bee-eaters	**Meropidae**	
19	Small Bee-eater	*Merops orientalis*	R
	Rollers	**Coraciidae**	
20	Indian Roller	*Coracias benghalensis*	RM
	Hoopoes	**Upupidae**	
21	Common Hoopoe	*Upupa epops*	M
	Larks	**Alaudidae**	
22	Ashy-crowned Sparrow-Lark	*Eremopterix grisea*	RM
23	Common Crested Lark	*Galerida cristata*	RM
	Wagtails & Pipits	**Motacillidae**	
24	Eurasian Tree Pipit	*Anthus trivialis*	RM
	Bulbuls & Finchbills	**Pycnonotidae**	
25	Red-vented Bulbul	*Pycnonotus cafer*	R
26	Himalayan Bulbul	*Pycnonotus leucogenys*	R
	Shrikes	**Laniidae**	
27	Great Grey Shrike	*Lanius excubitor*	RM
28	Brown Shrike	*Lanius cristatus*	M
		Muscicapidae	
	Thrushes, Shortwings, Robins, Forktails, Wheaters	**Turdinae**	
36	Common Stonechat	*Saxicola torquata*	RM
37	Rufous-tailed Wheater	*Oenanthe xanthoprymna*	RM
38	Desert Wheater	*Oenanthe deserti*	M
39	Indian Robin	*Saxicoloides fulicata*	RM
40	Variable Wheater	*Oenanthe picata*	M
	Babblers, Laughingthrushes, Babaxes, Barwings, Yuhinas	**Timaliinae**	
41	Common Babbler	*Turdiodes caudatus*	RM
42	Jungle Babbler	*Turdiodes striatus*	R
	Goldcrest, Prinias, Tesias, Warblers	**Sylviinae**	
43	Common Tailor Bird	*Orthotomus sutorius*	RM
	Sunbirds & Spiderhunters	**Nectariniidae**	
44	Purple Sunbird	*Nectarinia asiatica*	R
		Passeridae	
	Sparrows & Snowfinches	**Passerinae**	
45	House Sparrow	*Passer domesicus*	R
	Weavers	**Ploceinae**	
46	Baya Weaver	*Ploceus philippinus*	R
	Starlings & Mynas	**Sturnidae**	
29	Common Myna	*Acridotheres tristis*	R
30	Bank Myna	*Acridotheres ginginianus*	RM
31	Rosy Starling	*Sturnus roseus*	M
	Orioles	**Oriolidae**	
32	Eurasian Golden Oriole	*Oriolus oriolus*	RM
	Drongos	**Dicruridae**	
33	Black Drongo	*Dicrurus macrocercus*	RM
	Crows, Jays, Treepies, Magpies	*Corvidae*	
34	House Crow	*Corvus splendens*	R
35	Jungle Crow	*Corvus macrorhynchos*	R

Table 3. Some Globally Threatened species observed in the Khijadia Bird Sanctuary, Gujrat.

	Common Name	Scientific Name	Global Status
1	Spot-billed Pelican	*Pelecanus philippensis*	Vu
2	Indian Skimmer	*Rhynchops albicollis*	Vu
3	Eastern Imperial Eagle	*Aquila heliaca*	Vu
4	Sarus Crane	*Grus antigone*	Vu
5	Dalmatian Pelican	*Pelecanus crispus*	CD
6	Darter	*Anhinga melanogaster*	NT
7	Painted Stork	*Mycteria leucocephala*	NT
8	Black-necked Stork	*Ephippiorhynchus asiaticus*	NT
9	Asian Openbill Stork	*Anastomus oscitans*	NT
10	Oriental White Ibis	*Threskiornis melanocephalus*	NT
11	Lesser Flamingo	*Phoenicopterus minor*	NT
12	Black Ibis	*Pseudibis papillosa*	BRS/ NT
13	Yellow-wattled Lapwing	*Vanellus melabaricus*	BRS

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Insect Vending Machine

The Houston Museum of Natural Science's Brown Hall of Entomology is raking in quite a lot of money with an admittedly "unusual" vending machine that dispenses only **snacks made from insects.**

Dinosaurs in India

1. **189 years ago** : Captain W.H. Sleeman of the Bengal Army visits a hill near his house in Jabalpur, Madhya Pradesh and finds some unusual bones. They turn out to be from a large plant-eating reptile, the first to be found in Asia. No one knows what to call it. The term 'dinosaur' (Greek for terrible lizard) is finally coined in 1842.

2. ***Barapasaurus tagorei*** (15 m) : India's long-legged vegetarian. Named for its build (bara = big, pa = leg) and for Rabindranath Tagore. Long-necked, weighting 14 tonnes, it's one of India's most complete skeletons. We even know it had spoon-shaped teeth.

3. ***Alwalkeria maleriensis*** (1.5 m) : One of the earliest known dinosaurs, its bones were discovered in Adilabad (now in Telangana). It was built for speed and agility, and weighed only 3kg—even its bones were hollow. But teeth were sharp.

4. ***Kotasaurus yamanpalliensis*** : 13.4 metres high, the *Kotasaurus* would have stood tall in Yamanapalli, Telangana, where its bones were found. The dinosaur seemed to have been a plant-eater.

5. ***Jainosaurus*** : Discovered near Jabalpur in M.P. and named for palaeontologist Sohan Lal Jain, it walked on all fours, was 18 metres long with a 6-metre neck.

6. ***Rajasaurus narmadensis*** (9 m) : The top dog of the Cretaceous period. It walked on two legs , had a horn near its crown, and would have been agile, and possessing a strong bite. Fossils found near Ahmedabad.

7. ***Campylognathus indicus*** : It's the only Indian avian species. But only a fragment was unearthed, so its existence is in doubt. It was named for its curved jaw and probably fished in the seas from Rajasthan to Meghalaya.

8. ***Indosaurus*** (7 m) : Fossils found near Jabalpur in M.P. indicate that this carnivore weighed 700 kilos, had stocky legs, a complex skull and bony crests between its eyes.

9. ***Jubbulpuria*** : Named after Jabalpur in M.P., where fossils were excavated, it was barely half a metre tall and 1.2 metres long. But it was known to be a sharp predator.

10. **The Indian Subcontinent** : Drifts northward, taking her dinosaurs with her. Local dinos now include the *Indosuchus, Isisaurus, Rajasaurus, Laevisuchus, Jainosaurus* and *Campylognathus*.

India's dinosaurs tend to be smaller and have more in common with those from Australia, Madagascar and South America. Only 20-odd Indian species have been recognised so far.

Ecosystem Services by the Indian Courser bird, *Cursorius coromandelicus*

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Indian Courser *C. coromandelicus* is one of the resident breeder in India which inhibits sparse grasslands. It is called as *'Dhavik'* in Marathi. The name *Dhavik* is derived from its fast walking style on open countryside plains. Of course, it's a member of sporadic family Glareolidae. Its various habitats include wetlands as well as savannahs.

Indian Courser is characterized by its brown crown, chestnut coverts and chalky white long legs and sharp curved bill adapted to insectivorous diet predominantly (Ali, 1996). Both male and female are alike but adults, juveniles and subadults occur in flocks often. Despite its long history, adapted for omnivorous feeding habit composed with various insect orders Lepidoptera, Orthoptera, Coleoptera are major preferred groups (Vanjari, 2015). Fascinating natural history of this beautiful winged creature also provide crucial ecosystem services which made a resilient acquaintance with human being. A fragile ecosystem has been precariously balanced alive with the species like Great Indian Bustard *Ardeotis nigriceps*, Yellow-wattled Lapwing *Vanellus malabaricus*, Rain Quail *Coturnix coromandelica* with Indian Courser *Cursorius coromandelicus*.

Ecosystem services are the processes and conditions by which natural ecosystem and species composed it up, sustain and fulfill human life (Daily, 1997). They are integral aspects of human lives. It is mainly composed by its indicators, drivers and values. Conceptually they are classified as Provisioning services, Regulating services, Cultural services and Regulating services (MA, 2005). Expanding built up areas, urbanization, and increasing land conversion into agricultural practices had huge decline in natural habitat. Human well-being, poverty and development index and conservation of life on earth are interlinked. In order to meet the biodiversity conservation and its management, there is necessity to understand services provided by a species.

Many flagship bird species such as Great Indian Bustard *Ardeotis nigriceps*, Lesser Florican *Sypheotides indica* are critically endangered (Birdlife International, 2001). Presently, ornithologists and ecologists do not have enough population of these species to assess their services and ecological functions in depth. On the other hand, Bush Quails *Perdicula* sp., Buttonquail *Turnix* sp., Courser *Cusrsorius* sp., Sandgrouse *Pterocles* sp., Larks *Calandrella* sp. and *Alauda* sp. these are few dwellers of same habitat which are least concern (Prasad, 2003). Hence, this could be best opportunity to investigate ecosystem services in grassland ecosystem and their economical impact on agriculture at species level.

Study region

Solapur is a semi arid province, situated in southern Maharashtra. It lies in drought prone area at 455mt from MSL. Adulating land pattern with southern tropical thorny forest type is major texture of this land. Climatic condition were average during field visits with temperature 19°C-38°C and 54-86% respective humidity. Vegetation is covered potentially with grasses and herbs, but also rich in arboreal flora. Grasses are second largest rich family contribute to land cover (Garad et al., 2015). Four study plots were selected on the basis of representative numbers of individuals at each site. i.e. Hiraj (17°42'33"N,75°49'20"E), Kumbhari (17°65'72"N, 75°98'45"E), Gangewadi (17°50'02"N, 76°00'14"E) and Mulegaon (17°40'09?N 75°59'14"E). Behavioural observations were recorded on field in morning and late evening. Vanjari et al. (2014) suggested that it has fair population density in the district. Perhaps, this is a preliminary assessment which has an open end to develop into further extent. This could be more relevant accessory tool for planning of habitat and management of reserves.

Provisioning service: Game birds of India fascinated passionate hunters as well as poachers. Indian Courser was

Table 1. Amount of Guano of Indian Courser.

Dropping analysis	Indian Courser	Surrounding
Total weight	4.842 gm	9.706 gm
Number of samples(n)	8	11
Mean weight of a drop	0.674gm	0.856gm

Source : Vanjari (2015)

one of the favorite in its family. Though in recent years or even during present investigations, author did not come across with such illegal hunting of Indian Courser in Solapur so far.

Cultural services: Recent day's there is an increasing trend of exploring the dried trails of pristine protected area of Deccan plateau. On immense tract of tropical thorny forests, which exceptionally rich in spectacular wildlife, Indian courser is one of the favourite bird species. Not only for professionals but also amateur photographers and film makers which keenly observed during field trips. This species also allows huge number of nature lovers to serve its cultural essence through creating amuse to have an exposures and documentaries. This practice has a high potential to improve economic through tourism for well being of local tribe and Fishermans. However, this leads to common public awareness about wild life.

Regulating Services: Birds are predominantly regulating agro ecosystem and health of human population by controlling pest surveillance. Indian courser was recorded while feeding on ants, most Common Weevil, Beetle, Cockroach and Scale insects on juvenile crops Jowar, Maize and Wheat. Few plots were grown vegetables like Tomato and Toor pulse where five to six individuals spreded over four acres of cultivated land. During off cultivation season as well as on fallow lands coursers spend their day time to grab the food from below top soil. On country side landscapes where flower and rich grass species were pecked during insect catching. Faecal analysis shows the presence of unbroken seeds of grasses. It composed of Calcium, Seeds and chitin skeleton of insects.

Supporting Services: Indian Courser form the linkage of food chains in better words in grassland as well as agro ecosystems. Generally, native species support other native species more effectively than non-native. Faecal analysis revealed that, it rich in Calcium. It helps to keep soil highly nutritious. Dropping of *C. coromandelius* contains high density of chitinous material (Table 1), which made up of exoskeleton of insects and worms. At present study site top soil layer exposed with very harsh and desiccated conditions often, in results, it become deficient of organic matter which can be nourished by this manure.

Above results are in accordance with the ground work by Whelan et. al. (2008).

Recommendations

Empirical evidences are much demanded in order to conserve the biodiversity. To achieve that, this context clearly indicates that, *C. coromandelicus* contributes its function to regulate the ecosystem by unique diet preferences. These efforts support valuation to ensure benefits from species to humans (Wenny et al., 2011). Eye catching beauty and behavior have marginated the group of naturalists through developing a culture towards nature and species. It is more important to consider that an assessable population of species can give significant service than bottle necked one. Birds are resource linkers, but ecological functions and services of *C. coromandelicus* could help stakeholders and decision makers predict, prepare for and possibly prevent the economical consequences population declines of species in Peninsular India.

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(Concluded).

Distributional Record of Orthopteran Diversity in the Pin Valley National Park, Western Himalaya

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Among insects, Orthoptera is one of the largest orders, having over 20,000 species from whole world and about 1,750 species (Tandon & Hazra, 1998), which is about 10% of the total world species. A number of remarkable endemic genera and species of Orthopterans occur in the Himalaya. In the North West Himalaya, highest elevation at which these insects have been found is between 4775 and 4875m (Mani, 1968).

The Pin Valley national park is situated between 31° 44' 57" and 32° 59' 57" N latitude, and between 76°46' 29"and 78°41'34" E longitude, at the altitude 3,300 to 6,632 meters in Trans Himalaya. The temperature of this park varies from 19.7° to-10° C. Pin valley National Park is a cold desert, interspersed with a few alpine meadows, but there is a heavy pressure on the meadows, the seasonal influx of livestock of migratory graziers. It was declared as a National Park on 9th January 1987. It occupies the area of 67,500 hectares. Forest types found include, Dry Alpine, Scrub and Dwarf Juniper scrub. The Mammal fauna of area includes- Red India fox, Ibex, Tibetan gazelle, Snow Leopard, Himalayan Marmot, Himalayan Mouse-hare, Indian Hodgsoris Blue Sheep, wolf etc.

Present studies were conducted by collecting grasshopper samples from different localities, at different altitudes and climatic conditions. Grasshoppers were collected using insect net, by sweeping, light-trap and hand picking. In laboratory, the specimens were relaxed in a specially prepared relaxing chamber, stretched, pinned and then allowed to dry in a desiccator for 2-3 weeks depending on climatic conditions. All identified specimens were deposited in the Sociobiology and Behavioural Ecology research laboratory of Department of Biosciences, Himachal Pradesh University, Shimla. All specimens were collected by S.K. Thakur.

Present study reveals ten species of Orthoptera under five subfamilies and one family. Earlier Shishodia (2008) recorded five species (2 up to generic level) distributed under one family and five genera. Five species are new record (marked with asterisks *) for the state of Himachal Pradesh.

Order: Orthoptera

Family: Acrididae

Subfamily: Acridinae

1. *Anaptygus rectus* Ragge*

Material examined: 1 ex male, 03. vi. 2002, near forest hut Kaza (3400m).

Subfamily: Oedipodinae

2. *Oedipoda himalayana* Uvarov

Material examined: 1 ex male, 3 ex female, 1 Nymph, 10.x.2002, Sagnum (3500m).

3. *Sphingonotus longipennis* Saussure

Material examined: 2 ex male, 09.x.2002, Mudh Sagnum (3500m); 1ex, 10. x. 2002, (3900m), Thango (3900m).

4. *Sphingonotus* sp.*

Material examined: 1 ex, 09.x.2002, Mudh Sagnum (3500m).

5. *Gastrimargus africanus sulphureus* (Bei-Bienko)*

Material examined: 1 ex male, 03.vi. 2002, near forest hut Kaza (3400m).

Subfamily: Catantopinae

6. *Paraconophyma sacabra* (Walker)

Material examined: 1 ex. 09.x.2002, Mudh (3500m).

7. *Catantops humalis humilis**

Material examined: 1 ex male, 03.vi. 2002, near forest hut Kaza (3400m).

8. *Bryodema luctuasum indum* (Saussure)*

Material examined:1 ex female, 1 ex male, 09. xi. 2002, Thango (3900M).

Subfamily: Gomphocerinae

9. *Dnopherula (Aulacobothrus)* sp.

Material examined: 1 ex male, 03. vi. 2002, Mudh (3500m); 1 ex female, 09.x.2002, Thango (3900m).

10. *Chorthipus (Chorthipus)* sp.

Material examined: 1 ex male, 4 ex female, 11. x. 2002, Manthang Sagnum (3500m).

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Some Physiochemical Properties of the Casts of Earthworm, *Metaphire posthuma* from Clay Loam Soil

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The beneficial effect of earthworm casts in increasing soil fertility is well documented by Darwin (1881). Earthworm casts consist of excreted masses of soil, mixed with residues of comminuted and digested organic material. Some authors have contributed on various properties of earthworm cast. However, no study has been carried out on the physiochemical properties of casts of earthworm *Metaphire posthuma* (Vaillant) from clay-loam soil.

Materials and methods

Casts of *M. posthuma* were collected by means of their shape and size from an orchard in the district of North 24 Parganas, West Bengal, at regular monthly interval from May 2012 to April 2013. Before collection, all casts cleared off from the selected area of sampling site and after a day fresh casts were collected, which kept frozen until analyzed and at the same time, adjacent soil samples were (10-20 cm profile) collected. Standard procedure as described by Basak (2002) were adopted for determination of various parameters.

Results

Tables 1, 2 show different physiochemical parameters of earthworm cast and the surrounding soil. Distinct seasonal variation of different parameters recorded in the cast as well as in surrounding soil. Casts usually have a higher or nearly same pH, more kjeldahl and available nitrogen, available phosphorus, available potassium, electrical conductivity, organic carbon and C: N ratio than surrounding soil (Table 1, 2).

Discussion

Seasonal variation in activities of earthworm occurs mainly due to the changes in soil temperature, moisture and organic carbon; leads to the seasonal changes in composition of casts. Casts have higher or nearly same pH compared to that in the adjacent soil samples. Probable explanation is that soils neutralized by secretions from the intestine and or from calciferous glands and by ammonia that excreted. This is consistent with findings of Darwin (1881), Verma & Chauhan (1979) and Reddy (1983). Organic carbon content was higher in worm cast than in the adjacent soil, this finding, however, is in agreement with Gupta & Sakal (1967) and Reddy (1983). This occurs as earthworms ingested food material that enriched with carbon. Available and total nitrogen content of casts is higher than that of surrounding soil. Dash & Patra (1977) also made similar observation in grassland at Orissa while studied a mixed population of *Lampito mauritii* and an

Table 1. Showing various physiochemical characteristics of the cast of *Metaphire posthuma*.

Month	pH	EC (dSm^{-1})	OC (%)	Avail. N_2 ($Kgha^{-1}$)	Avail. P_2O_5 ($Kgha^{-1}$)	Avail. K_2O ($Kgha^{-1}$)	Total N2 (%)	C:N
May'12	7.4	0.56	3.4	610	215	1200	0.48	7.08
June'12	7.2	0.48	3.72	595	185	1005	0.53	7.01
July'12	7.6	0.48	3.9	522	125	905	0.48	8.12
Aug'12	7.1	0.56	2.86	485	225	678	0.32	8.93
Sept'12	7.1	0.65	3	560	185	739	0.38	7.89
Oct'12	7.2	0.82	3.2	530	135	735	0.42	7.61
Nov'12	7.4	0.55	2.5	660	290	850	0.31	8.06
Dec'12	7.4	0.79	2.7	610	305	690	0.36	7.5
Jan'13	6.6	0.56	3.2	405	125	650	0.42	7.61
Feb'13	6.9	0.72	2.9	485	210	670	0.55	5.27
March'13	6.9	0.3	3.9	590	222	585	0.52	7.5
April'13	6.9	0.64	3.5	565	175	755	0.45	7.77

Table 2. Showing various physiochemical parameters studied in the surrounding soil.

Month	Surrounding Soil							
	pH	EC (dSm1)	OC (%)	Avail. N2 (Kg ha-1)	Avail. P2O5 (Kg ha-1)	Avail.K2O (Kg ha-1)	Total N2 (%)	C:N
May'12	6.7	0.39	1.8	335	111	340	0.36	5.0
June'12	6.5	0.22	1.2	345	114	175	0.32	3.75
July'12	6.4	0.29	1.7	260	95	400	0.43	3.95
Aug'12	6.8	0.15	1.8	305	105	395	0.28	6.42
Sept'12	6.9	0.2	1.54	230	45	427	0.37	4.16
Oct'12	6.9	0.28	1.71	205	90	495	0.42	4.07
Nov'12	6.6	0.36	1.4	225	75	565	0.4	3.5
Dec'12	6.6	0.3	1.5	355	86	505	0.45	3.33
Jan'13	6.6	0.2	1.2	305	70	480	0.2	6.00
Feb'13	6.9	0.2	1.2	285	70	470	0.25	4.8
March'13	6.4	0.3	1.5	290	82	505	0.23	6.52
April'13	6.5	0.3	1.72	345	95	225	0.35	4.91

unidentified ocnerodrilid. Increase nitrogen content in cast might be due to the nitrogenous excretory product and enzymatic digestion of organic material in the gut of earthworm.

The C : N ratio of casts generally higher compared to soil. It was also the observation by Lee (1967) and Kale & Krishnamoorthy (1981). Present study pointed out that casts have higher concentrations of available phosphorus and potassium than underlying soil. Gupta & Sakal (1967) also recorded similar result. The increased availability of phosphorus and potassium in earthworm casts is not only due to enhanced microbial and enzymatic activity but might depends on the type of food, they intake. Higher electrical conductivity in the cast than neighbouring soil confirms the previous observation of Joshi & Kelkar (1952). This denotes an increase in the level of soluble salts. The elevated level of nutrients in the cast indicates that the nutrients, which locked up in the organic matter, mobilized into plant-available forms in the cast during passage of this plant material through the gut of the worms.

From present study, it can be concluded that earthworm activities in the soil cause change in the physiochemical properties of the soil and increase soil fertility. The nature of change depends on the type of the soil, presence or absence of litter and the species of earthworm involved in the process.

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Drug Sniffer Flies

Fruit flies could help in fighting crime against illegal drugs and explosives. Their smell receptors and bio-chemical sense of smell could help in contraband detection. Their attraction to the smell of wine is due to their love for fermenting fruit. They sniff it out more accurately than metal oxide sensors.

A Note on Two New Species *Baeoentedon farazi* Jamali & Zeya and *Pomphale atturensis* Jamali & Zeya (Hymenoptera: Eulophidae)

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Two new species *Baeoentedon farazi* Jamali & Zeya, and *Pomphale atturensis* Jamali & Zeya (Hymenoptera : Chalcidoidea : Eulophidae : Entedoninae) were described by Jamali & Zeya (2017) from the specimens collected from the Indian State of Karnataka. Unfortunately, authors did not mention the depository of the holotypes of those new species and consequently, the new names published in this paper are unavailable, according to Article 16.4.2 of the fourth edition of the *International Code of Zoological Nomenclature*, 1999.

Therefore, in order to make the names available, authors hereby provide the following acronyms for the depositories of the type material of those new species:

NBAIR= National Bureau of Agricultural Insect Resources, Bengaluru, India.

ZDAMU= Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, India.

1. *Baeoentedon farazi* Jamali & Zeya sp. nov.

Holotype: 1 female (on slide under 4 coverslips, slide No. EUL.143), labelled 'INDIA: Karnataka: Bengaluru, Kaval, 4.ii.2015 (MT), Coll. K. Veenakumari. (NBAIR, Registration No. ICAR/NBAIR/EULP.100).

Paratype: 1 female (on slide under four coverslips, slide No EUL, 79), INDIA: Karnataka: Bengaluru, Kaval, 30.i.2015 (MT), Coll. K. Veenakumari. (ZDAMU, Registration No. HYM. CH.768).

2. *Pomphale atturensis* Jamali & Zeya sp. nov.

Holotype: 1 male (on slide under 4 coverslips, slide No. EUL.81), labelled 'INDIA: Karnataka, Bengaluru, Attur, 2.vii.2012, Coll. K. Veenakumari'. (NBAIR, Registration No. ICAR/NBAIR/EULP.101).

Paratype: 1 male (slide No. EUL.82) INDIA: Uttar Pradesh, Etah, Jalesar; 2 male (slide Nos. EUL.95 and EUL.96), Hathras, 09.iii.2013, Coll. M.T. Khan. (ZDAMU, Registration No. HYM. CH.769).

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Two Super Foods

Royal jelly and saffron are the queen and king of superfoods.

1. Royal jelly : This special compound is a unique health food that has been in use since ancient times across China and South East Asia due to its many health and youth bestowing properties.

What is Royal jelly? : A product of honey, royal jelly is the food that worker bees feed their queen bee. The queen bee is the most fertile bee in the hive and her only job is to rest and eat this magical food. With this as her sole diet, the queen bee grows to a very large size and eventually is so fertile that she gives birth to many, many bees.

Health benefits : Today, royal jelly is used to treat menopausal symptoms, it helps manage infertility and is added in skin creams for its anti-ageing effects. It is also used to improve brain and neuronal functions that are linked with ageing.

2. Saffron : If royal jelly is the queen, then saffron (kesar) is the king of superfoods. In terms of weight, it's even more expensive than gold and has been in use for thousands of years because of its special medicinal benefits.

Health benefits : Saffron is very warm in its post-digestive effect and hence, it should only be consumed in winters. It is frequently given to asthma patients in warm milk and is very good for treating recurring sinusitis, upper respiratory infections, weak lungs and low vitality.

It is also considered to be an aphrodisiac linked to male fertility improvement and is an ingredient in medicines used to treat skin disorders as well as blemish-reducing skin creams. The other benefits of saffron include the treatment of menstrual disorders. Diabetics should drink saffron boiled in milk with a teaspoon of ghee. And if you have a weak liver, it helps get rid of toxins.

—Shikha Sharma

New Publications

Book Review

MONARCHS AND MILKWEED—A Migrating Butterfly, A Poisonous Plant, and their Remarkable Story of Coevolution, by Anurag Agrawal. 2017. 283 pp., Price US $ 29.95. Published by Princeton University Press, Princeton (U. S. A.) and Oxford (U. K.). ISBN: 9780691166353 (hard back: alk.paper)

The book opens with the following quote from Homero Aridjis :

"You who go through the day
like a winged tiger
burning as you fly
tell me what supernatural life
is painted on your wings
so that after this life
I may see you in my night"

Recommended by several biology authors, this book deals with the topic how plants and plant-feeding insects have coevolved. It also shows how scientists over the past century have painstakingly identified the processes that shape webs of interacting species. From biochemical to evolutionary perspectives, this book brings the conflict of milkweeds and monarch butterflies to new light. There are a total of 9 chapters and more than 80 colour illustrations.

Monarch butterflies (*Danaus plexippus*) are one of the nature's most recognizable creatures, known for their bright orangish-red colour with prominent black vein-stripes. They are famous for their epic migration from the Eastern North U. S. A. and Canada to Mexico. The book presents a vivid investigation into how the monarch butterfly has evolved closely alongside its common larval host plant, the milkweed (*Asclepias syriaca*). Milkweed is a toxic plant named for its sticky white substance (milk) emitted, when its leaves are damaged. This coevolution showing the inextricable and intimate relationship between the two, exists for millenia. Ecological and evolutionary processes are beautifully described in this endearing book.

For the Indian lepidopterists, the book provides an illustrated depiction, on its page 19, of the taxa under tribe Danaini (Fig. 1). It is a phylogenetic visual representation of the evolutonary relationships in the tribe, including Indian elements. Note that most other species of milkweed butterflies are not shown here, e.g., only 4 species of *Danaus* are shown out of 12 recognised species known presently in this genus. The Ithomiini is other sister tribe, of which several hundred species occur in the tropics, but none in India. The author, Anurag Agrawal, is a Prof. in the Deptt. of Ecology & Evolutionary Biology and the Deptt of Entomology at the Cornell University (U. S. A.). The book is presented in lucid language with easy-on-eye printing and get-up. Its binding is superb (hard back) and the paper used is art paper (acid-free) throughtout. It has a beautiful jacket. The book is recommended to all science libraries in general and to the lepidopterists in particular.

—R. K. Varshney

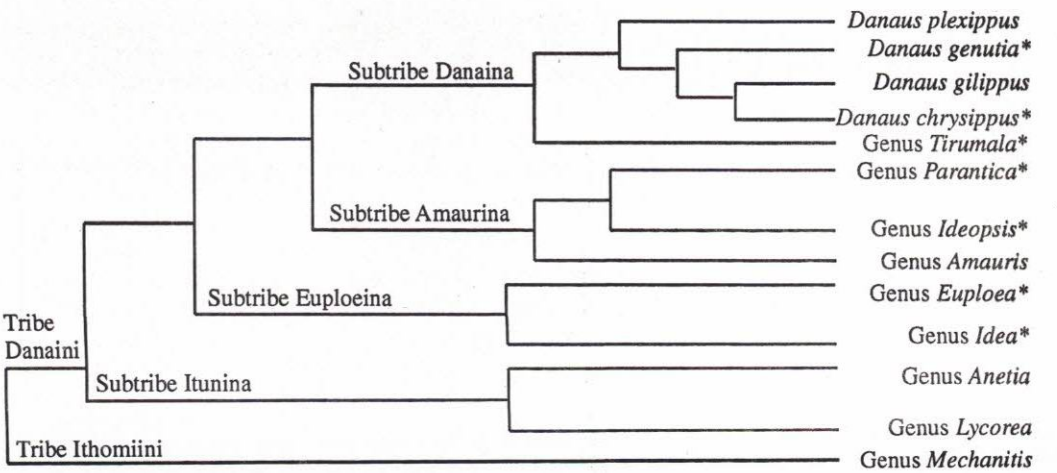

Fig. 1. Evolutionary relationships in some genera and species of Tribe Danaini. *Indian taxa.

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