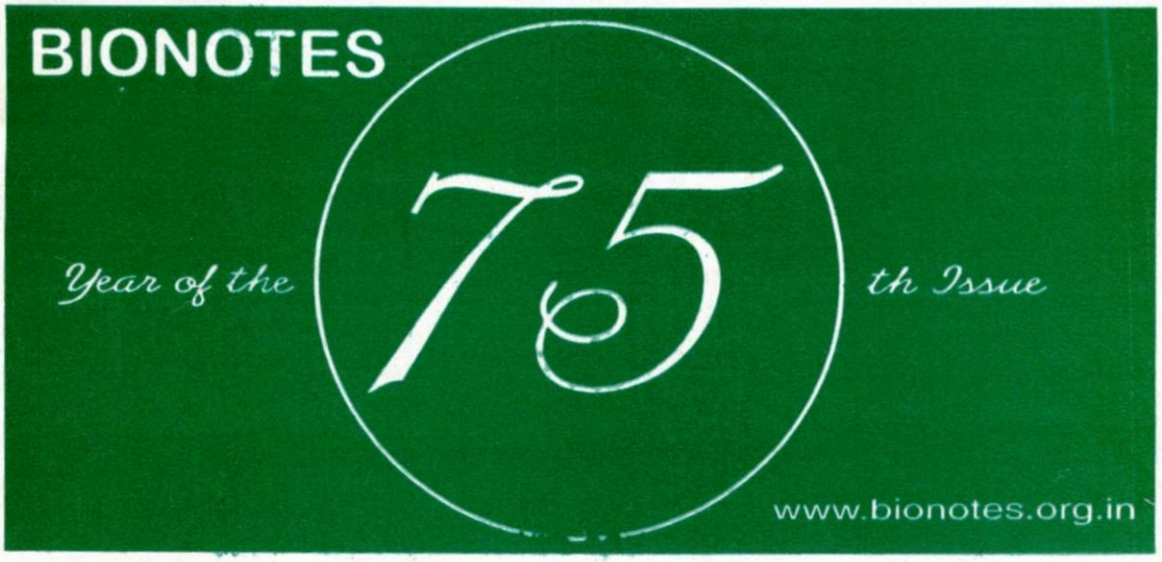
ISSN 0972-1800



Quarterly Research Newsletter of A Biologists Confrerie

Vol. 19, No. 4 **Oct. - December, 2017**

The Snow Leopard is now 'vulnerable'

It is no longer 'endangered' : IUCN

The snow leopard is no longer an endangered species, but its population in the wild is still at risk because of poaching and habitat loss, conservationists said recently.

The International Union for Conservation of Nature said on 14th Sept. 2017 that new data taken through 2016 prompted the reclassification of the snow leopard from the endangered list to the vulnerable category. The difference means, simply, that the animals have gone from "very high risk" to "high risk" of extinction in the wild. The team's lowest estimate was that about 4,000 live in the wild.

But the snow leopard can still face a decline of 10% or more over the next three generations in its habitats, which are mostly mountainous areas of Central Asia, including Kyrgyzstan and Pakistan. It "still faces a high risk of extinction," the conservation group said, from habitat loss and degradation, declines in prey populations and poaching for illegal wildlife trade, among other reasons.

"It is essential to continue and expand conservation efforts to reverse its declining trend and prevent this iconic cat from moving even closer to extinction," the group said.

Conservationists warned that the risks are not over for the snow leopards, whose distinctive appearances make them attractive to poachers. Their tails are longer than most cats' to help them balance on steep slopes. Their skins are thick and whitish, patterned with dark rosettes and spots. Their bones and other body parts are used in traditional Asian medicine.

Emerging potential threats include mining and other infrastructure development that would affect their habitats, the report said.

The IUCN, in its report on the snow leopard, noted the population numbers could be partly speculative, given the difficulties in collecting hard data on the elusive and secretive species across all regions.

—Christine Hauser

Date of Publication : 1st December, 2017

BIONOTES

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

Bionotes articles are abstracted/indexed/available in the ***Indian Science Abstracts,*** **INSDOC; NISCAIR;** ***Zoological Record*****; Thomson Reuters (U.S.A.); CAB International (U.K.); The Natural History Museum Library & Archives, London; Library Naturkundemuseum, Erfurt (Germany)** etc. and online databases.

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CONTENTS

(Vol. 19, No. 4)

Conferences

8th European Hemiptera Congress
at Katowice, Poland

From 24th to 29th June, 2018

On behalf of the Organizing Committee, I am delighted to announce the 8th European Hemiptera Congress (EHC 8) and 11th International Workshop on Leafhoppers and Planthoppers of Economic Importance, organized by the Department of Zoology, Faculty of Biology and Environmental Protection, University of Silesia in Katowice, Poland.

The European Hemiptera Congress (EHC 8) will focus in research on all groups of the Hemiptera, in all aspects including ethology, bioacoustics, physiology, morphology, molecular biology, cytology, ecology, biogeography, faunistics, taxonomy, phylogeny, palaeontology, applied research on pests and pest management, databases and management of collection.

The 8th European Hemiptera Congress (EHC 8) will take place from the 24th to the 29th of June 2018 in Villa Verde Hotel of Zawiercie, 40 km from Katowice (Poland).

The registration is open!

A detailed information can be find on the website of the 8th European Hemiptera Congress:

http://www.8-european-hemiptera-congress-wbios.us.edu.pl

—Jolanta Brozek
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Katowice (Poland).

●●●

'SECURE Himalaya'
Global Wildlife Programme Conference

Oct. 2017

The Central Govt. of India has launched a six-year project for conservation of locally and globally significant biodiversity, land and forest resources in the high Himalayan ecosystem spread over four states in India.

Protection of snow leopard and other endangered species and their habitats is one of the key components of the project, which will also focus on securing livelihoods of the people in the region and enhancing enforcement to reduce wildlife crime.

The project—called SECURE Himalaya—was launched by the Union environment minister Harsh Vardhan in association with the United Nations Development Programme (UNDP) on the inaugural day of the Global Wildlife Programme (GWP) conference in New Delhi on 2nd Oct. 2017.

SECURE, which stands for, Securing Livelihoods, Conservation, Sustainable use and Restoration of High Range Himalayan ecosystems, is meant for specific landscapes. It includes Changthang (Jammu and Kashmir), Lahaul - Pangi and Kinnaur (Himachal Pradesh), Gangotri - Govind and Darma-Byans Valley in Pithoragarh (Uttarakhand) and Kanchenjunga - Upper Teesta Valley (Sikkim).

Enhanced enforcement efforts and monitoring under the project will also curb illegal trade in some medicinal and aromatic plants, which are among the most threatened species in these landscapes.

The minister on the occasion also launched India Wildlife mobile App and released the country's National Wildlife Action Plan for the period 2017-2031. The plan focuses on preservation of genetic diversity and sustainable development through 103 wildlife conservation actions and 250 projects.

Strengthening and improving protected area network; landscape level approach for wildlife conservation; control of poaching and illegal trade in wildlife; mitigation of human -wildlife conflicts and management of tourism in wildlife areas are among the key focus areas of the national plan.

Referring to the plan, Union environment secretary, Ajay Narayan Jha, noted that the issues like integrating climate change in wildlife planning; wildlife health management and conservation of coastal and marine ecosystems are some of the new issues which have been included in this third national wildlife action plan.

Besides India, representatives and wildlife experts from 18 countries are participating in the Global Wildlife Programme conference. Jha said that the conference would provide a platform to build strategic partnerships among all the 19 nations and enable India to strengthen its enforcement mechanism to control wildlife trafficking.

Some of the issues that will be discussed during the conference include leveraging partnerships to promote shared benefits on public-private partnerships and opportunities in wildlife-based tourism. The programme is a World Bank-led partnership that promotes conservation and sustainable development by combating illicit trafficking in wildlife.

Torture Through The Ages

The Jallikattu, the Bull fight and the Fox hunt

DIPANKAR GUPTA

That there are two sides to jallikattu, those who are for and those who are against, only shows that India is both global and updated. If we walk back to the past, sensitivity to torture of any kind is a rather contemporary phenomenon, showing up first in the 19th century. Till then, worldwide, the torture of both humans and animals was taken as normal.

Between 1807-50, as if making up for past injustices, our collective consciousness suddenly woke up to ethically question the torture of all living beings. Is it just coincidence that around this time, in Britain for example, slave trade was abolished, the 1832 Reform Act was passed, and bear baiting, even dog fights, became illegal?

Conferring respect on ordinary electorates was accompanied by a ban on cruelty to animals and people, as if one entailed the other. Till then, voters were limited to a select few and hanging was a popular, town square event. Likewise, to set dog against dog, or bear against dogs, were huge draws often patronised by the rich and powerful. Elizabeth I, reportedly, could not tear herself away from such spectacles.

It would appear then that with the increase in democratic awareness, we also became mindful of animal life. Decades before Darwin came on the scene, 19th century attitudes were inclining towards accepting humans and animals as somewhat continuous creations. Therefore, what applied to us was now being extended to include other living creatures too. By this token, convicts, their wickedness notwithstanding, deserved consideration as well.

Again, it was in the mid-19th century that the hangman's rope was lengthened so that death would be quick; the earlier short drop left the condemned person dangling for long. Crucifixion, stoning, or the Chinese practise of Li Ching, where the convict's flesh was slowly sliced off (hence the phrase, death by a thousand cuts), were no longer considered civilised. Likewise, in 1839, Britain banned punishment by drawing and quartering as this involved the strewing of the dead person's body parts.

All of this is crazily off the charts today, but in the past they were seen as normal, even fun. Though we still continue with capital punishment, yet we strive to make it as pain free as modern medical knowledge will allow—enter the lethal injection. No more howling and cheering from a frenzied crowd; the sentence is now delivered within prison confines.

All these changes have happened in recent times as old fashioned torture is no longer acceptable. Humans and beasts, individually and singly, are not to be put in pain, and if they have to die because we must punish, or we must eat, let us deliver the blow as softly as we can. Yet, when man and beast are performing together in acts that involve pain, sometimes death, there has been much stronger resistance against banning them. This is true of jallikattu, the bull fight and the fox hunt.

All these three were once banned and then un-banned. On these matters, the struggle between status quoists and change agents has been very contentious and bitter. The Catalonia region of Spain disallowed bullfights, but the Spanish Supreme Court ruled against it. The fox hunt likewise won judicial approval and, for the time being, jallikattu has also earned a reprieve.

Unlike dog fights or bear baiting, these are no longer instances of ouright animal torture as humans are also involved. This is what makes jallikattu and bullfights appear sporty for now there is an aura of uncertain outcome, though highly controlled. Consequently, guilt is replaced by participatory euphoria and it is this that gives them the look and feel of being cultural and harmless.

If however, only the rich participate in the sport, as in the case of tiger hunts, then such acts do not become "cultural", deserving of popular approval. Fox hunting was never passionately defended as long as it was limited to the aristocrats. From the 1950s on numerous fox hunting clubs, with middle class membership, sprang up all over Britain lending this activity a democratic character.

The Spanish bullfight has always been a spectacular public sport, not just because it entertained large crowds but also because matadors came from the ranks of ordinary people. It is this as well as their skills that together made bullfighters like Antonio Ordinez, Luis Dominguin, and Manuel Benitez (also known as El Cordobez) such superstars.

Jallikattu still does not have its home bred heroes, but it too is a popular sport that has become culture as it pits man against beast, rather ordinary men against ordinary beasts. It is almost as if we compelled to demonstrate our mastery over nature at regular intervals. But because we are blessed with cunning, a trait that animals do not possess, we pick on four-legged creatures that are not carnivores, nor are naturally dangerous to us. We hunt foxes, that attack poultry, or we fight bulls that have no quarrel with humans. Nobody would like to take on tigers or grizzly bear and then call it culture.

As humans we need to show off our cultural might and we do this best by fighting the weak, never the strong, not even those who are our equals. This is what prompted the anarchist Peter Kropotkin to remark that nature is not "red in tooth and claw", but people are.

Anti - Microbial Resistance

High-quality water and sanitation are low-cost solutions to the humanity's gravest health threat

POONAM KHETRAPAL SINGH

Regional Director, World Health Organisation (WHO), Southeast Asia.

Clean, safe and well-managed water is fundamental to public health. Where water is unclean or sanitation poor, life-threatning diseases such as cholera and typhoid can take root. And where water is unregulated or enforcement lax, contamination from chemicals, pathogens or excreta is a persistent risk. Poor hygiene, meanwhile, exacerbates each of these problems, amplifying one of humanity's gravest health security threats: antimicrobial resistance (AMR).

AMR occurs when the effectiveness of antimicrobial drugs - including antibiotics - is diminished due to mutations in infectious bacteria. This happens when antibiotics are ill-regulated and overused, or when they are used inappropriately or for non-human health. Bacterial mutations and the superbugs they create make treating basic infections such as skin sores or diarrhoea next to impossible. They also make surgery risky. Around 7,00,000 people across the globe already die of AMR each year. If present trends persist, by mid-century AMR will kill more people than cancer.

So where does water, sanitation and hygiene come in ?

To start with, poor sanitation and unsafe water causes a range of bacterial infections that heighten antibiotic usage. Though access across the Southeast Asia region to improved water sources is now at 90%, poor operation and maintenance of water and sanitation systems continues to be a fact of life for many. Millions of people region-wide remain susceptible to water-borne diseases, with high rates of infection compounded by self-medication and inappropriate antibiotics use.

Next, poor water, sanitation and hygiene (WASH) in healthcare facilities is a cause of hospital-acquired infections that accelerate bacterial mutations. Just 38% of healthcare facilities in low- and middle-income countries have rudimentary WASH amenities, resulting in the incubation of a range of deadly pathogens. It is no coincidence that some of the most vicious antibiotic-resistant bacteria, including NDM1 and MRSA, emerged from healthcare settings.

And finally, ill-regulated waste water is scattering antibiotic residues and antiobiotic-resistant bacteria throughout the environment, including in drinking water and the food chain. Across the region contaminated wastewater from homes, hospitals, pharmaceutical industries, nursing homes and livestock farms is finding its way into natural water sources, as well as soil and crops. This is hastening the spread of antibiotic resistant pathogens, and increasing human antibiotic consumption.

As countries finalise National Action Plans to counter AMR, a return to core WASH principles is needed. By including WASH in multi-sectoral planning, and staying true to a 'One Health' approach, governments can neutralise one of AMR's key accelerators and help reverse AMR's growing menace. And they can do so in a way that is cost-effective and has a range of other public health benefits.

There are three interventions that will have immediate impact.

First, governments can hasten efforts to achieve safe water and sanitation for all. Communities lacking clean water and effective sanitation should be identified in both rural and urban areas, and steps taken to ameliorate their situation. This could mean treating water at its point of use or systematising the operation and maintenance of local water supply systems. It could also mean investing water supply systems to serve unreached populations. At the same time, access to safely-managed toilets should be increased by investing in and building them, and by promoting behavioral change aimed at ending open defecation.

Second, WASH amenities and training can be enhanced at all healthcare facilities. This can be done by ensuring each facility has a safe and adequate water supply, and that toilets and medical waste management facilities are in or near it. Hand-washing stations should be readily accessible at key points of care, and healthcare workers should be trained in WASH procedures as part of wider infection prevention and control initiatives. To this end, WHO's Clean Care is Safer Care programme is essential resource, and can be integrated with national policies.

And third, regulation and treatment of wastewater can be vastly improved. To do so, investing in water management and treatment infrastructure is crucial, while creating public-private partnerships able to extend service coverage may also be effective. Key contaminators such as hospitals and pharmaceutical plants can meanwhile be encouraged—or required— to develop onsite treatment plants able to neutralise antibiotics and resistant bacteria. Wastewater used in aquaculture and agriculture should also be better regulated to keep

(Contd. on p. 128)

A Checklist of the Roadside Trees of Kolkata City

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Introduction

From the time of human civilization there is intricate and close relationship between plants, specially trees, and human beings. The forests and trees of urban areas are essential elements both for the environment and the people of urban community. The beneficial roles of street trees are extended manifolds, like protection of local watershed, providing shade on asphalt etc and surrounding structures, thereby improving energy efficiency for local buildings, reduction of air pollution, absorption of greenhouse gases, improving the aesthetic beauty and reduction of ambient air temperature. Due to the pressure of urbanization, the green sources in urban city are limited only as the gardens or parks and as roadside trees.

Only few studies have been done on the roadside green sources in urban area or cities in India such as, Bangalore (Nagendra & Gopal, 2010); Chandigarh (Kohli et al., 1998); Kalyani (Roy & Mukherjee, 2011); Gwalior (Bhat & Sharma, 2016); Mandsaur (Mitra & Singh, 2012); Burdwan (Ganguly & Mukherjee, 2016) and Kadapa (Nagireddy et al., 2015).

The aim of the present study was to achieve preliminary information of the roadside tree diversity planted on footpaths of various roads of Kolkata, which are potential for carbon sequestration and conservation of urban animal diversity. Earlier Mukhopadhyay & Chakravarty (2008) have enumerated the plant wealth of a part of Kolkata, the Raj Bhawan.

Materials and Methods

Data was collected by field surveys from various roads of Kolkata city stretching from north to south and east to west part of the city, particularly Prince Anwar Shah Road, under Kolkata Metropolitan Corporation Area (KMC). Survey was carried out from April, 2016 to April, 2017. With the help of collected samples (leaf, flowers, seeds etc) alongwith pictorial documentation, the avenue trees of the study area were identified to their taxonomic position, following Mukherjee (1983); Krishen (2006); Guha Bakshi (1984) etc. Based on the abundance pattern, the avenue trees were categorized into four phases as high, moderate, low and rare.

Results and Discussion

After the study, 104 tree species belonging to 33 families were recorded as roadside trees in Kolkata city, among which *Ficus benghalensis, Ficus religiosa, Drypetes roxburghii, Neolamarckia cadamba, Peltophorum pterocarpum, Delonix regia, Pongamia pinnata* and *Mimusops elengi* were found to be most abundantly distributed (Table 1). It was also found that the avenue trees were dominated by native types which might be satisfactory for conservation of regional biodiversity. Three tree species namely, *Spathodea campanulata, Leucaena leucocephala* and *Pithecelobium dulce* were found to be invasive in nature. Not only that, maximum avenue trees were found to be evergreen which are preferable for shading perspectives in urban areas.

Most of the Indian cities are far behind in race of quality as well as quantity control of urban forests than the cities in Europe and America. High population density is one of the reasons for underdevelopment of urban greenery sector. Species selection demands maximum attention for urban plantation. Hedge type plants and decorative garden plants can beautify the city than to purify the environment. Recent development in industrialization and urbanization has resulted in a profound deterioration of urban environmental quality and also human health by producing large amount of pollutants (Wagh et al., 2006). There is requirement of large-scale aforestation and green belt development in and around urban areas. Additionally this perennial green envelope has the potentiality to abate the impacts of pollutants. Proper planning and planting scheme depending upon the magnitude and type of pollution, selection of pollution-tolerant and dust scavenging trees and shrubs should be done for bioremediation of urban environment. Resistant trees considering their agro-climatic suitability and canopy architecture, is to be planted in right manner for efficient reduction of pollution in urban areas (Roy & Singh, 2014). It was found that plant species of Indian origin with a good air pollution tolerance index (APTI) scoring show a good dust trapping and carbon sequestering (Sahu & Sahu, 2015; Mate & Deshmukh, 2015). Planting is to be done in such a way so that green belt is developed within a short period and remains effective over the years.

Acknowledgements : Authors like to acknowledge Dr. P.K. Roy, Principal of J.C.C. College and the Governing Body of J.C.C. College for co-operation and financial support for the research work.

Table 1. Roadside tree diversity of Kolkata with their names and abundance.

	Family	Scientific name	Common name	Local name	Abundance
1	Moraceae	*Ficus religiosa* L.	Sacred Fig	Asawath	H
2		*Ficus virens* Ait	White Fig	Pilkhan/Pakud	L
3		*Ficus benghalensis* L.	Bengal Fig	Bat	H
4		*Ficus rumphii* Bl.	Mock peepul	Pakur	L
5		*Ficus hispida* L.	Fig tree	Dumur	L
6		*Ficus arnotiana* Miq.	Indian Rock Fig	Paras peepul	L
7		*Ficus elastica* Roxb. ex Horn	Indian rubber bush	Rubber bot	R
8		*Artocarpus lacucha* Buch- Ham	Monkey jack	Daifal	R
9		*Artocarpus hirsutus* Lam.	Wild Jack	-	R
10		*Artocarpus heterophyllus* Lam.	Jackfruit	Kathal	L
11	Combretaceae	*Terminalia arjuna* (Roxb.) Wight & Arn	Arjun tree	Arjuna	L
12		*Terminalia catappa* L.	Indian almond	Kath Badam	M
13		*Terminalia chebula* Retz.	Chebulic myrobalan	Haritaki	L
14		*Terminalia belerica* (Gaertn) Roxb.	Bastard myrobalan	Triphala	L
15	Fabaceae	*Albizia lebbeck* (L.) Willd.	Frywood/lebbek	Koroi	M
16		*Delonix regia* (Boj. ex Hook.)	Fire tree	Krishnachura	H
17		*Bauhinia variegate* L.	Mountain ebony	Kanchan	M
18		*Bauhinia purpurea* L.	Purple orchid	Kanchan	M
19		*Tamarindus indica* L.	Tamarind	Tentul	L
20		*Cassia siamea* (Lam.) Irwin & Bameby	Kassod tree	Kasud	H
21		*Edinanthera pavoniana* L.	Red Bead tree	Rakta Kamal	R
22		*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Quickstick	Biliti Sirish	L
23		*Leucaena leucocephala* (Lam.) de Wit	Subabul	Subabul	M
24		*Peltophorum pterocarpum* (DC.) K.Heyne	Yellow Flame	Radhachura	H
25		*Saraca asoca* (Roxb.) Willd.	Ashoka tree	Ashoka	L
26		*Samanea saman* (Jaeq.) Merr.	Rain tree	Sirish	M
27		*Cassia roxbergii* DC	Red Cassia	-	L
28		*Cassia fistula* L.	Indian Labrnum	Badarlathi	M
29		*Acacia auriculiformis* Benth.	Earpod Wattle	Sonajhuri	L
30		*Dalbergia sissoo* Roxb.	Indian Rosewood	Sishoo	L
31		*Pongamia pinnata* (L.) Pierre	Indian Beech	Karanja	H
32		*Erythina indica* L.	Indian coral tree	Mandar	L
33		*Butea monosperma* (Lam.) Taub.	Flame of the forest	Palash	L
34		*Acacia nilotica* (L.) Willd.ex. Delile	Egyptian acacia	Babul	R
35		*Amherstia nobilis* Wall.	Orchid Tree	Urbasi	R
36		*Dalbergia lanceolaria* L. f.	-	Takoli	R
37	Bignoniaceae	*Tecoma stans* (L.) H.B. & K.	Yellow bell	Tecoma	L
38		*Spathodea campunalata* P. Beauv.	Scarlet Bell	Ghantakarna	M
39		*Tabebiua pallida* (Lindl.) Miers	Cuban pink trumpet	-	R
40		*Tabebuia aurea (Silva manso)* Benth. et Hook.f. ex S. Moore	Caribbean trumpet	-	L
41		*Millingtonia hortensis* L. f.	Indian cork tree	Akashneem	R
42	Apocynaceae	*Thivetia peruviana* (pers).	Yellow oleander	Kalke	L
43		*Nerium indicum* (L.)	Nerium Oleander	Rakta karabi	L
44		*Plumeria alba* L.	White Frangipani	Dolon champa	L
45		*Plumeria rubra* L.	Red Frangipani	Rakta karabi	R
46		*Alstonia scholaris* (L.) R. Br.	Black board tree	Chhatim	R

47	Annonaceae	*Polyalthia longifolia* (Sonn.) Thwaites	False Ashoka	Debdaru	L
48		*Annona squamosa* L.	Custard apple	Aata	R
49		*Annona reticulata* L.	Netted custard apple	Noa	R
50	Meliaceae	*Azadirachta indica* A. Juss.	Indian Lilac	Neem	L
51		*Swietenia mahogoni* L.	West Indian Mahogany	Mahogony	L
52		*Swietenia macrophylla* King.	Honduras Mahogany	Mahogony	M
53		*Toona ciliata* M.Roem.	Red cedar	Mahogony	L
54		*Eucalyptus* sp. Hook.	Eucalyptus	Eucalyptus	L
55		*Melia azadirach* L.	Pertian lylac	Mahaneem	L
56		*Aphanamixis polystachya* (Wall.) R. Parker	Rohituka tree	Pittaraj	R
57	Myrtaceae	*Callistemon viminalis* (Sol. ex Gaertn.)	Weeping Bottle brush	Botol brush	M
58		*Psidium guajava* L.	Guava	Peara	L
59		*Syzigium cumini* (L) Skeels	Java Plum	Jam	M
60	Arecaceae	*Borassus flabellifer* L.	Daab Palm tree	Tal	R
61		*Cocos nucifera* L. (Palmae)	Coconut tree	Narkel	L
62		*Phoenix sylvestris* (L.) Roxb.	Indian Date	Khejur	R
63		*Areca catechu* L.	Areca nut	Supari	R
64		*Corypha utan* Lam.	Cabbage Palm	Buri palm	R
65	Malvaceae	*Sterculia foetida* L	Wild almond	Baksho badam	M
66		*Pterygota alata* (Roxb.) R.Br.	Heart shape	Budhha narkel	R
67		*Bombax ceiba* L.	Silk Cotton	Desi Shimul	M
68		*Ceiba pentandra* (L.) Gaertn.	White Silk-Cotton	Swet shimul	L
69		*Thespesia populnea* L. Soland. ex Corr.	Portia tree	Pasur	M
70		*Berrya cordifolia* (Wild.)	Trincomalee wood	Saral	R
71	Anacardiaceae	*Mangifera indica* L.	Mango	Aam	M
72		*Sponius dulcius* Parkinson	Jew plum	Amra	L
73	Rutaceae	*Murraya paniculata* (L.) Jack.	Orange jessamine	Kamini	M
74		*Aegle marmelos* (L.) Corrêa	Bengal quince	Bael	R
75		*Murraya koenigii* L. Sprengal	Curry leaves	Sweet neem	R
76		*Citrus maxima* (Burm.) Merr.	Pomelo	Batabi lebu	R
77		*Limonia acidissima* L.	Wood apple	Kadbel	R
78	Sapotaceae	*Mimusops elengi* L.	Spanish cherry	Bakul	M
79		*Madhuca latifolia* Roxb.	Honey tree	Mohua	L
80	Rhamnaceae	*Zyziphus jujuba* Mill.	Chinese date	Kul	R
81		*Zyziphus mauritiana* Lam.	Indian Plum	Topa kul	R
82	Callophyllaceae	*Calophyllum inophyllum* L.	Alexandrian laurel	Sultan champa	L
83		*Messua ferrea* L.	Indian rose chestnut	Nageshwar	L
84	Euphorbiaceae	*Trewia nudiflora* L.	False white teak	Pithali	L
85		*Drypetes roxburghii* (Wall.) Hurus.	Lucky Bean tree	Putranjib	H
86	Sterculinaceae	*Pterospermum acerifolium* L.	Karnikra	Kanakchampa	M
87		*Kleinhobia hospita* L.	Heart shape	Bola	R
88	Lecythidaceae	*Couroupita guianensis* Aubl.	Cannonball tree	Nagkeshar	L
89		*Barringtonia acutangula* (L.) Gaertn.	Indian Oak	Hujal	R
90	Oleaceae	*Nyctanthes arbor-tristis* L.	Night Jasmine	Sheoli	L
91	Rubiaceae	*Neolamarckia cadamba* (Roxb.) Bosser.	Burflower tree	Kadam	H
92	Lythraceae	*Lagerstromia speciosa* (L.) Pers.	Common Crape myrtle	Jarul	M
93	Ehertiaceae	*Cordia dichotoma* Frost F	Indian Chery	Bohnari	R
94	Ulmaceae	*Trema orientalis* (L.) Blume.	Indian Charcoal	Chikun	L
95	Dileniaceae	*Dillenia indica* L.	Elephant Apple	Chalta	L

96	Magnoliaceae	*Michelia champaka* L.	Champok	Champa	M
97	Moringaceae	*Moringa oleifora* Lam.	Drumstick tree	Sajne	L
98	Tiliaceae	*Grewia asiatica* L.	Falsa	Falsa	L
99	Ebenaceae	*Diospyros malabarica* (Desr.) Kostel.	River ebony	Gaab	R
100	Capparaceae	*Crataeva roxburghii* R.Br.	Caper tree	Barun	R
101	Lamiaceae	*Gmelina arborea* Roxb.	White teak	Goomar tree	R
102	Verbenaceae	*Tectona grandis* L. f.	Ship tree	Segun	R
103	Simaroubaceae	*Ailanthus excelsa* Roxb.	Tree of heaven	Swarnabrikhha	R
104	Mimosaceae	*Pithecellobium dulce* (Roxb.) Benth.	Monkey pod	Gilapi	M

H= High, M= Moderate, L= Low, R= Rare.

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(b. f. from p. 124)

water and food systems free of potentially harmful residues and bacteria.

Though each of these interventions will have substantial impact, they must be supported by surveillance systems that can monitor the problem effectively and allow policymakers in all sectors to respond as and where needed. There is much that we still do not know about the quantity of antibiotics and resistant bacteria in the environment, and the various ways it got there, meaning gathering actionable information is crucial.

Reversing AMR and safeguarding the efficacy of our most precious drugs—antibiotics—is a complex undertaking. It requires addressing how antibiotics are produced and regulated; how they are prescribed and consumed; and how different sectors can work together to counter a range of AMR-related threats. It is an understanding for which WASH principles are well-suited, and for which WASH resources should be marshalled. In home and hospital, town and city, high quality water, sanitation and hygiene is a vital and cost-effective means to beat back AMR's rapid emergence.

A List of the Fish fauna in Thar Desert of Rajasthan

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Rajasthan, the biggest state in India has many water bodies and a few rivers too. Based on the water and drainage system, the state can be divided into six distinct geographic regions, the western region known for the Thar Desert is devoid of any perennial riverine system, however, Indira Gandhi Nahar Pariyojna (IGNP) carrying water from the Harike Barrage in Punjab passes through Sri Ganganagar, Bikaner and Jaisalmer districts falling under this region. The semiarid region amid the Aravalli Ranges and the western desert is present from Jalore to Jhunjhunu districts. Luni River drains southern part of this region while the northern part remains dry. A larger number of small water bodies exist in the Aravalli Hill area in its uneven landscape particularly in the districts of Pali, Udaipur and Sirohi. The eastern region is mainly drained by the Banas River and its tributaries and consists of a large number of reservoirs in Sawai Madhopur, Bundi, Alwar and Bharatpur districts. The southern region consists of stony highlands where maximum numbers of man-made lakes are present. The Chambal ravine region lies in said region along the River Chambal forming boundary between Rajasthan and the adjacent Madhya Pradesh state.

The Thar Desert of Rajasthan comprising 13 districts has never been considered a good habitat site for fish faunal diversity. But, Ghaggar River and the introduction of IGNP and its escape reservoirs, and little dams in the foothills of Aravalli ranges have provided a unique landscape and diverse physiographic features. These factors have made this area having immense potential for Ichthylogical studies.

Yazdani (1996) has given description of main water systems of Thar Desert of Rajasthan, which is divided into two important drainage systems, viz. Himalayan river system and Luni river system. Himalayan river system transports water and fish resources to this area through Satluj and Beas river system. Both of them are the tributaries of Great Indus River. Their water has been brought by IGNP canal to the north and north western desert districts of Thar Desert, which has its origin at Harike Barrage in Punjab and runs almost 650 km to its tail in Jaisalmer district. Ghaggar River which starts from Shivalik foothills in Himachal Pradesh flows through Hanumangarh district and before losing its distinctiveness in the desert sand near Suratgarh, it gives rise to 18 escape reservoirs. All of them are good sources of fish diversity. This river brings mixture of sub Himalayan fishes to this area (Johal & Dhillon, 1981).

The supplementary water drainage system is Luni River system. This river originates from Anna Sagar near Ajmer district and traverses through the Thar Desert before losing its identity in the Rann of Kachchh. Besides, these two major water systems, all other districts of the Thar Desert have their individual small seasonal rivers, ponds and wetlands, except Churu district. Pali, Jalore and Sirohi districts are situated at the foothills of Aravalli ranges, have check dams which become full of water when there is good rainfall during monsoon. All of them sustain the mixture of fish fauna which ranges from exotic fish like common carp and fishes of the Peninsular India, which could have entered here due to alteration in recent geological epoch (Krishnan, 1952).

Fish fauna of Rajasthan is mainly known due to the work of Hora et al. (1952), Datta et al. (1970), Johal et al. (1993), Yazdani (1996) and Mohan et al. (2013). Yazdani (1996) has reported a total of 142 species from the entire Thar Desert, out of which 112 species belonging to 64 genera 26 families and six orders were reported from the Thar region of Rajasthan. Cyprinidae was reported as the main family with 58 species, followed by 12 species of catfishes namely, Bagridae, Schibeidae and Sisoridae. Johal et al. (2000) has revealed the occurrence of 67 fish species belonging to 7 orders, 16 families and 42 genera from the Thar Desert of Rajasthan, whereas Mohan & Singh (2006) reported 80 species of fishes belonging to 6 orders, 20 families and 37 genera from 13 districts of the Thar Desert.

In total, 124 species of fish are recorded so far from the Thar Desert of Rajasthan in the present list, which is compiled on the basis of existing literature and observations, collection and identification made by the authors.

List of the fishes found in the Thar Desert of Rajasthan :

Class : Actinoptergii

Order: Osteoglossiformes

Family : Notopteridae

1. *Notopterus notopterus* (Pallas)
2. *Chitala chitala* (Ham.-Buch.)

Order : Clupeiformes

Family : Clupeidae

3. *Gudusia chapra* (Ham.-Buch.)

Order : Cypriniformes

Family : Cyprinidae

4. *Catla catla* (Ham.-Buch.)
5. *Carassius carassius* (Linn.)
6. *Chagunius chagunio* (Ham.-Buch.)
7. *Cirrhinus mrigala* (Ham- Buch)
8. *Cirrhinus reba* (Ham.-Buch.)
9. *Cyprinus carpio* (Linn.)
10. *Ctenopharyngodon idella* (Val.)
11. *Labeo angra* (Ham.-Buch.)
12. *Labeo bata* (Ham.-Buch.)
13. *Labeo boga* (Bloch)
14. *Labeo boggut* (Sykes)
15. *Labeo calbasu* (Ham.-Buch.)
16. *Bangana dero* (Ham.-Buch.)
17. *Labeo dussumieri* (Val.)
18. *Labeo dyocheilus* (McClelland)
19. *Labeo fimbriatus* (Bloch)
20. *Labeo potail* (Sykes)
21. *Labeo rajasthanicus* (Datta & Majumdar)
22. *Labeo gonius* (Ham.-Buch.)
23. *Labeo rohita* (Ham.-Buch.)
24. *Bangana diplostoma* (Heckel)
25. *Labeo pangusia* (Ham.-Buch.)
26. Rohu-catla Hybrid
27. *Osteobrama cotio* (Ham.-Buch.)
28. *Puntius amphibius* (Val.)
29. *Puntius chola* (Ham.)
30. *Puntius dorsalis* (Jerdon)
31. *Systomus sarana* (Ham.-Buch.)
32. *Puntius sophore* (Ham-Buch.)
33. *Puntius terio* (Ham.-Buch.)
34. *Pethia conchonius* (Ham.-Buch.)
35. *Pethia ticto* (Ham.-Buch.)
36. *Puntius vittatus* (Day)
37. *Tor khudree* (Sykes)
38. *Tor putitora* (Ham.-Buch.)
39. *Tor tor* (Ham.-Buch.)
40. *Hypophthalmichthys molitrix* (Val.)
41. *Chela cachius* (Ham.-Buch.)
42. *Securicula gora* (Bloch)
43. *Salmostoma bacaila* (Ham.-Buch.)
44. *Salmophasia phulo* (Ham.-Buch.)
45. *Salmophasia balookee* (Sykes)
46. *Salmophasia punjabensis* (Day)
47. *Amblypharyngodon microlepis* (Bleeker)
48. *Amblypharyngodon mola* (Ham.-Buch.)
49. *Cabdio morar* (Ham.-Buch.)
50. *Barilius barlia* (Ham.-Buch.)
51. *Barilius barna* (Ham.-Buch.)
52. *Barilius bendelisis* (Ham.-Buch.)
53. *Barilius vagra* (Ham.-Buch.)
54. *Danio rerio* (Ham.-Buch.)
55. *Esomus danrica* (Ham.-Buch.)
56. *Raiamas bola* (Ham.-Buch.)
57. *Megarasbora elanga* (Ham.-Buch.)
58. *Rasbora daniconius* (Ham.-Buch.)
59. *Devario aequipinnatus* (McClelland)
60. *Devario devario* (Ham.-Buch.)
61. *Crossocheilus diplochilus* (Heckel)
62. *Garra gotyla* (Gray)
63. *Garra lamta* (Ham.-Buch.)
64. *Garra mullya* (Skyes)

Family : Psilorhynchidae

65. *Psilorhynchus balitora* (Ham.-Buch.)

Family : Nemacheilidae

66. *Schistura baluchiorum* (Zugmayer)
67. *Acanthocobitis botia* (Ham.-Buch.)
68. *Nemacheilus corica* (Ham.-Buch.)
69. *Nemacheilus denisoni* Day

Family : Cobitidae

70. *Lepidocephalichthys guntea* (Ham.-Buch.)
71. *Botia birdi* Chaudhuri
72. *Botia lohachata* Chaudhuri

Order : Siluriformes

Family : Bagridae

73. *Sperata aor* (Ham.-Buch.)
74. *Sperata seenghala* (Sykes)
75. *Mystus bleekeri* (Day)
76. *Mystus cavasius* (Ham.-Buch.)
77. *Mystus tengara* (Ham.-Buch.)
78. *Mystus vittatus* (Bloch)
79. *Rita rita* (Ham.-Buch.)

Family : Siluridae

80. *Ompok bimaculatus* (Bloch)
81. *Ompok pabda* (Lace.)
82. *Wallago attu* (Schn.)

Family : Schilbeidae

83. *Ailia coila* (Ham.-Buch.)
84. *Clupisoma garua* (Ham.-Buch.)
85. *Eutropiichthys vacha* (Ham.-Buch.)
86. *Silonia silondia* (Ham.-Buch.)

Family : Amblycipitidae

87. *Amblyceps mangois* (Ham.-Buch.)

Family : Sisoridae

88. *Bagarius bagarius* (Ham.-Buch.)
89. *Nangra nangra* (Ham.-Buch.)
90. *Gogangra viridescens* (Ham.-Buch.)

91. *Glyptothorax telchitta* (Ham.-Buch.)
92. *Glyptothorax pectinopterus* (McClelland)
93. *Erethistes pusillus* (Muller & Troschel)

Family : Clariidae

94. *Clarias batrachus* (Linn.)
95. *Clarias gariepinus* (Linn.)

Family : Heteropneustidae

96. *Heteropneustes fossilis* (Bloch)

Family : Loricariidae

97. *Pterygoplichthys disjunctivus* (Weber)

Order : Beloniformes

Family : Belonidae

98. *Xenentodon cancila* (Ham.-Buch.)

Family : Adrianichthyidae

99. *Oryzias melastigma* (McClelland)

Order : Cyprinodontiformes

Family : Aplocheilidae

100. *Aplocheilus blockii* Arnold
101. *Aplocheilus lineatus* (Val.)

Family : Poeciliidae

102. *Gambusia affinis* (Baird & Girard)

Family : Cyprinodontidae

103. *Aphanius dispar* (Ruppell)

Order : Synbranchiformes

Family : Mastacembelidae

104. *Macrognathus aral* (Bloch & Schn.)
105. *Mastacembelus armatus* (Lacepede)
106. *Mastacembelus pancalus* (Ham.-Buch.)

Order : Perciformes

Family : Cichlidae

107. *Oreochromis mossambicus* (Peters)

Family : Ambassidae

108. *Chanda nama* Ham.-Buch.
109. *Parambassis baculis* (Ham.-Buch.)
110. *Parambassis ranga* (Ham.-Buch.)

Family : Nandidae

111. *Nandus nandus* (Ham.-Buch.)

Family : Gobiidae

112. *Acentrogobius viridipunctatus* (Val.)
113. *Glossogobius giuris* (Ham.-Buch.)

Family : Osphronemidae

114. *Trichogaster fasciata* Bloch & Schneider
115. *Trichogaster lalius* (Ham.-Buch.)
116. *Osphronemus goramy* Lacepède

Family : Channidae

117. *Channa gachua* (Ham.-Buch.)
118. *Channa marulius* (Ham.-Buch.)
119. *Channa orientalis* Bloch & Schn.
120. *Channa punctata* (Bloch)
121. *Channa striata* (Bloch)

Order : Mugiliformes

Family : Mugilidae

122. *Chelon parsia* (Ham.-Buch.)
123. *Mugil cephalus* Linn.
124. *Rhinomugil corsula* (Ham.-Buch.)

In total, 124 species of fish are reported here from the Thar Desert of Rajasthan. The most dominating order is Cypriniformes which is represented by 69 species, while order Siluriformes is represented by 25 species, followed by Perciformes with 15 species.

Maximum number of fish species and their abundance were recorded from the Jailsalmer and Bikaner districts, mainly due to the extension of IGNP and the presence of five escape reservoirs, namely, Digha, RD 1356, RD 1120, RD 750 and RD 507. These reservoirs are quite deep and full of macro vegetation which provides suitable habitat for fish growth and breeding.

The species diversity of fishes was also higher in Pali and Sirohi districts on account of the three perennial water bodies, namely, Jawai Dam, Raipur dam (Pali district) and West Banas dam (Sirohi district).

Recommendations

Some of the recommended measures to protect the threatened species are as follows: Selected perennial water bodies should be developed as fish sanctuaries; Care should be taken to protect the breeding ground of fishes; Regular monitoring of fish diversity and sample collection, and Restoration of threatened species by stocking of yearlings along with *in situ* conservation. Overexploitation of fishes particularly during breeding period should be checked and critical level should be maintained in regional water bodies.

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Interview

On Air Pollution in Delhi and NCR

An interview with SUNITA NARAIN,

Director General, Centre for Science & Environment (CSE)

ROHIT E. DAVID

Q. What's the cause of sudden escalation of air pollution over NCR and other parts of north India?

A. Adverse weather, combined with crop burning in Punjab and Haryana, and existing and uncontrolled pollution because of emissions from vehicles, factories, garbage in our cities. According to IMD (India Meteorological Department), the weather situation of the past few days was unprecedented.

Two air circulatory systems — one bringing pollutants from crop burning in Punjab and Haryana, (including according to one theory dust from a multi-day dust storm in Iraq, Kuwait and Saudi Arabia) and the other bringing moisture from the east—collided over Delhi region.This formed a cloud of pollutants, trapped in moisture, which combined with near calm wind conditions at the ground level, and suffocated the region. Crop burning is seasonal — it will stop by November 15 — but the other two factors, adverse weather and uncontrolled pollution, will remain. Therefore, we must not indulge in blame games — political theatrics will not mitigate pollution, hard and sustained action to reduce emissions will.

Q. When this is an annual feature, why has it been impossible to find a long-term solution?

A. It is an annual feature, because weather turns adverse during winter. But sadly, governments are still not serious enough about long-term solutions. So, we see competitive populism when pollution spikes — it seems everybody loves a good pollution — but not enough work on solutions.

Q. Do emergency measures such as odd-even and shutting down schools make a difference?

A. Emergency measures are critical, but they are only emergency measures. Last year, the Supreme Court directed government to formulate a smog alert system — the Graded Response Action Plan (GRAP). This year, during the smog emergency, within 12 hours of pollution levels rising, the Environment Pollution (Prevention and Control) Authority has directed actions, like closure of hot-mix plants and increase of parking charges. But EPCA did not direct closure of schools. Instead its advisory was to ask children, at home or schools, to remain indoor. It also did not direct government to bring the odd-even scheme even though this is part of GRAP.

On November 8, when EPCA imposed severe plus conditions (public health emergency level) in the city, it directed governments to stop entry of trucks and to stop construction across NCR. However, by November 9, the Central Pollution Control Board informed EPCA that pollution levels were coming down and by November 11-12 the situation would be much better. Therefore, it took the decision not to direct government to impose odd-even scheme.

The good news is that the analysis from Pune-based IITM (Indian Institute of Tropical Meteorology) is showing that the emergency measures taken have resulted in a reduction in pollution. Therefore, it is clear that emergency measures work. But the effort has to be that we take long-term steps so that emergency does not occur.

Q. Air quality is worsening all over India. Why isn't this public health hazard a political issue yet?

A. I believe this is changing. People are getting more aware of the health risks. Our common outrage will drive actions. It is important to stress that air pollution affects all — the rich and the poor. It is also important that we understand that even the rich cannot protect themselves by installing air purifiers. These measures are not enough to keep away the assault of these toxins from our bodies. We must work to push solutions and drive action.

Q. From a national standpoint, what are the steps we must initiate?

A. There is a clear road-map on what needs to be done. The fact is we know that vehicle numbers; polluting vehicles on the road; use of dirty fuels like pet coke, furnace oil and coal; garbage burning and mismanagement of road and construction dust are the key causes of pollution. All this can be fixed and must. But it requires sustained action and not chest-beating during high smog episodes.

Distributional records of some Parasitoids of Tetracneminae from India (Hymenoptera: Encyrtidae)

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Introduction

The present paper deals with distributional records of some species belonging to the subfamily Tetracneminae. These are known to be parasitoids of pests of economically important agricultural crops. The study is based on a small collection of Tetracneminae made from some Indian States during 2012 –2016. The paper contains distribution of 15 species of the subfamily Tetracneminae, including 6 species which are newly recorded from some Indian States. Several papers were earlier published on such records (Hayat et al., 2007; Hayat et al., 2008; Hayat & Khan, 2008; Hayat & Khan, 2009; Usman et al., 2013, 2014; Hayat & Veenakumari, 2014; Zeya et al., 2014; Zeya & Veenakumari, 2016; Hayat et al., 2015a; Hayat et al., 2015b).

Unless noted otherwise, the specimens are on cards. Citation is given for only 5 species (*Rhopus angulianus* Hayat (2008), *R. hebbalensis* Zeya & Hayat (2014), *R. kollamensis* Usman & Zeya (2013), *R. rymma* Hayat & Khan (2008), and *R. zoleno* Usman & Zeya (2013)) which were described after 2006, as citations to other species are available in Hayat (2006).

The following abbreviations are used in the text:

GBPUAT = Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.

(MT)= Malaise traps. (This and two other abbreviations in brackets are used under 'Material examined' section to indicate the method of collection.)

(SN) = Sweep Net.

(YPT) = Yellow Pan Trap.

The following acronyms are used for the depositories:

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

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

Records of species

1. *Anagyrus gracilis* (Hayat)

Material examined. INDIA: UTTAR PRADESH: Bareilly, Ramganga, 1 female (on slide No. EH. 2030) 15.iii.2015 (SN), Coll. M.M. Jamali; Aligarh, 6 females, 24.vi.2016 (SN); 1 female, 8.vi.2016 (SN); 1 female, 22.vi.2016 (SN); 1 female, 21.vi.2016 (SN), Coll. O.S Navik. (ZDAMU). ANDHRA PRADESH: East Godavari, Thimmapuram, 1 female 7.ii.2014 (SN), Coll. S.K Ahmad; East Godavari, Thimmapuram, 1 female 7.ii.2014 (SN), Coll. M.T Khan; Krishna, Chepalakundi, 1 female (slide No.EH.1949), 12.ii.2014 (SN), Coll. S.K. Ahmad. (ZDAMU).

Distribution. India: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Delhi, Himachal Pradesh, [?] Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal. (Medagascar; Nepal).

2. *Apoleptomastix bicoloricornis* (Girault)

Material examined. INDIA: HIMACHAL PRADESH: Shimla, Nayyar, 2 females, 4 males, 7.viii.2014 (MT), Coll. K. Veenakumari (NBAIR). TAMIL NADU: Krishnagiri, Hosur, Uddanapalli, 1 female, 8.xii.2014 (MT), Coll. K. Veenakumari (NBAIR). UTTAR PRADESH: Aligarh, 1 female, 31. v.2016 (SN), Coll. O.S Navik; Muradabad, Mainather, 2 females, 23.iii.2015; Bareilly, Kareli, 8 females, 15.iii.2015(SN) Coll. M.M. Jamali; Hathras, Sasni, 1 female, 5.iii.2013 (SN), Coll. S.K. Ahmad. (ZDAMU).

Distribution. India: Andhra Pradesh, Arunachal Pradesh, Assam, Delhi, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal. (Widely distributed from South Africa through India, Tadzhikistan and southern China to Australia).

3. *Callipteroma sexguttata* Motschulsky

Material examined. INDIA: MAHARASHTRA: Kolhapur, road to Panhala, 2 females, 21.xi.2012 (SN), Coll. K. Veenakumari. (NBAIR).UTTAR PRADESH: Aligarh, 6 females, 25.xii.2014 (SN); 2 females, 5.i.2015(SN); 1 female, 23.xii.2014 (SN); Bareilly, Kareli, 1 female, 15.iii.2015 (SN), Coll.M.M. Jamali; Hathras, Sasni, on grass, 1 female, 5.iii.2013 (SN); Hathras, Sasni, on potato, 1 female, 5.iii.2013 (SN), Coll. M.T. Khan. (ZDAMU). HIMACHAL PRADESH: Solan, Baddi, 1

female, 2.x.2013(SN), Coll. P.T. Anwar & F.S.K. Amer. (ZDAMU). TAMIL NADU: Krishnagiri, Hosur, Uddanapalli, 1 female, 8.xii.2014 (MT), Coll. K. Veenakumari. (NBAIR).

Distribution. India: Arunachal Pradesh, Delhi, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand , West Bengal. (Cosmopolitan in the old World, also southern Europe, south and central former USSR, Middle East, Africa, Madagascar, and countries of Indo-pacific region).

4. *Callipteroma testacea* Motschulsky

Material examined. INDIA: TAMIL NADU: Krishnagiri, Hosur, Uddanapalli, 1 female 27.xi.2014 (SN), Coll. K. Veenakumari. (NBAIR).

Distribution. India: Assam, Delhi, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh , Maharashtra, Tamil Nadu, Uttar Pradesh, Uttarakhand. (Africa; Madagascar; Pakistan; Srilanka; Bangladesh; Papua New Guinea; Australia).

5. *Monstranusia antennata* (Narayanan)

Material examined. INDIA: UTTAR PRADESH: Aligarh, 1 female, 31.v.2016 (SN), Coll. O.S. Navik. (ZDAMU).

Distribution. India: Delhi, Odisha, Uttar Pradesh. (Egipt; Nigeria; Kenya; South Africa; Afghanistan; Pakistan).

6. *Rhopus angulianus* Hayat **[New record]**

Rhopus angulianus Hayat, 2010: Female. Holotype female, India, Orissa [Odisha].

Material examined. INDIA: ANDHRA PRADESH: East Godavari, Thimmapuram, 1 females (on slide, No. EH. 2187), 7.ii.2014 (SN), Coll. MT. Khan (ZDAMU).

Distribution. Andhra Pradesh (present record), Odisha.

7. *Rhopus atys* Noyes & Hayat

Material examined. INDIA: KARNATAKA: Hessaraghatta, CIFA, 2 females (on slide, No. EH. 2204, EH. 2205), 27.iii.2014 (YPT); Chikkaballapur, Nandi Hills, Channagiri, 1 females (on slide, No. EH. 2206), 18.vi.2014 (YPT), Coll. K. Veenakumari (NBAIR).

Distribution. India: Andhra Pradesh, Assam, Delhi, Jharkhand, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh.

8. *Rhopus desantisiellus* Ghesquiere

Material examined. INDIA: ANDHRA PRADESH: East Godavari, Sarpavaram, 1 female (on slide, No. EH. 2189), 5.ii.2014 (SN), Coll. S.K. Ahmad (ZDAMU).

Distribution. India: Andhra Pradesh, Kerala, Odisha, Rajasthan, Uttar Pradesh, Uttarakhand. (Argentina).

9. *Rhopus gramineus* Hayat

Material examined. INDIA: KARNATAKA: Bengaluru, Attur, 1 female (on slide, No. EH. 2192), 30.vii.2013 (YPT); Bengaluru, Hessaraghatta, Fisheries Division, 2 females (on slide, No. EH. 2193, EH. 2195), 26.iii.2014 (YPT); 1 female (on slide, No. EH. 2194), 27.iii.2014 (YPT); Hessaraghatta, CIFA, 1 female (on slide, No. EH. 2196), 27.iii.2014 (YPT), Coll. K. Veenakumari, (NBAIR). TAMIL NADU: Krishnagiri, Kalamangalam, Jakkari, 1 female (on slide, No. EH. 2192), 21.ii.2015 (YPT), Coll. K. Veenakumari (ZDAMU).

Distribution. India: Arunachal Pradesh, Delhi, Himachal Pradesh, Karnataka, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal. (Malaysia; Pakistan).

10. *Rhopus hebbalensis* Zeya & Hayat

Rhopus hebbalensis Zeya & Hayat, in Zeya et al., 2014: 27. Female. Holotype female, India, Karnataka.

Material examined. INDIA: KARNATAKA: Hessaraghatta, CIFA, 1 females (on slide, No. EH. 2204, EH. 2191), 27.iii.2014 (YPT), Coll. K. Veenakumari (NBAIR).

Distribution. Karnataka.

11. *Rhopus kollamensis* Usman & Zeya **[New record]**

Rhopus kollamensis Usman & Zeya, Usman et al., 2013: 118. Female. Holotype female, India, Kerala.

Material examined. INDIA: ANDHRA PRADESH: Guntur, Rajamandi, 1 female (on slide, No. EH. 2198), 10.ii.2014 (SN); 2 females, 10.ii.2014 (SN), Coll. M.T. Khan; Guntur, Kolanukonda, 1 female (on slide, No. EH. 2199), 11.ii.2014 (SN); 1 female, 11.ii.2014 (SN), Coll. S.K. Ahmad; Guntur, Kolanukkonda, 1 female (on slide, No. EH. 2200), 11.ii.2014 (SN); Krishna, Chepalakundi, 1 female (on slide, No. EH. 2201), 12.ii.2014 (SN), 1 female, 12.ii.2014 (SN), Coll. M.T. Khan. (ZDAMU).

Distribution. India: Andhra Pradesh (present record), Kerala.

12. *Rhopus nigroclavatus* (Ashmead)

Material examined. INDIA: ANDHRA PRADESH: Vishakhapatnam, Kailashpuram, 2 females (on slide, No. EH. 2163, Eh. 2164), 2.ii.2014 (SN); East Godavari, VK Rayapuram, 1 female (on slide, No. EH. 2165), 5.ii.2014 (SN); East Godavari, Sarpavaram, 1 female (on slide, No. EH. 1386), 5.ii.2014 (SN), Coll. M.T. Khan; East Godavari,Thimmapuram, 1 female (on slide, No. EH. 2166), 7.ii.2014 (SN), Coll. S.K. Ahmad; East Godavari, Guntur, Rajamandi, 6 females (on slides, No. EH. 2167, EH. 2168, EH. 2169,EH. 2170, EH. 2171, EH. 2172), 10.ii.2014 (SN), Coll. S.K. Ahmad; Guntur, Kolanukunda, 3 females (on slides, No. EH. 2173, EH. 2174, EH. 2175), 11.ii.2014 (SN); Krishna, Chepalakundi, 2 females (on slides, No.EH.

2176, EH. 2177, 12.ii.2014 (SN), Coll. S.K. Ahmad (ZDAMU). DELHI: IARI, Pusa, 2 females (on slides, No. EH.2182, EH. 2183), 10.ii.2016 (SN), Coll. SB. Zeya (ZDAMU). MAHARASHTRA: Kolhapur, road of Panhala, 1 female (on slide, No. EH. 2157), 21.xi.2012 (SN), Coll. K. Veenakumari (NBAIR). ANI: South Andaman, Sippighala, 1 female (on slide, No. EH. 2158), 20.i.2013 (SN); Little Andaman, Hut Bay, Waterfall, 1 female (on slide, No. EH. 2160), 28.i.2013 (SN), Coll. K.Veenakumari (NBAIR). UTTAR PRADESH: Aligarh, Akrabad, 1 female (on slide, No. EH. 2159), 8.iii.2013 (SN), Coll. M.T. Khan (ZDAMU). KARNATAKA: Chikkaballapur, Nandi Hills, 1 female (on slide, No. EH. 2161), 22.vi.2013 (SN); Bengaluru, Adugodi, NIANP, 1 female (on slide, No. EH. 2162), 25.i.2014 (YPT); Bengaluru, Hessaraghatta, 2 females (on slide, No. EH. 2178, EH. 2179), 27.iii.2014 (YPT); Bengaluru, Hessaraghatta, Fisheries Division, 1 female (on slide, No. EH. 2180), 28.iii.2014 (YPT); Bengaluru, Jarakabande, Kavel, 1 female (on slide, No. EH. 2181), 7.vi. 2014 (MT); Coll. K.Veenakumari (NBAIR). UTTAR PRADESH: Aligarh, 2 females (on slides, No.EH.2032, 2034), 1 male (on slide, No. EH. 2033), 8.vi.2016 (SN), Coll. O.S. Navik (ZDAMU). UTTARAKHAND: Ramnagar Ghatti, 1 female (on slide, No. EH.1369), 30.x.2009 (SN), Coll. F.R. Khan; GBPUT, Pantnagar, 2 females (on slide, No. EH. 2184, EH. 2185), 6.vii.2016 (SN), Coll. O.S. Navik (ZDAMU).

Distribution. India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala, Odisha, Puducherry, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal. (Cosmopolitan)

13. *Rhopus rymma* Hayat & F.R. Khan

Rhopus rymma Hayat & Khan, in Hayat et al., 2008: 108. Female. Holotype female, India, Uttar Pradesh.

Material examined. INDIA: UTTAR PRADESH: Rampur, Benazir Bagh, 1 female (on slides, No. EH.2190), 21.iii.2015 (SN), Coll. M.M. Jamali (ZDAMU).

Distribution. India: Uttar Pradesh.

14. *Rhopus segestes* Noyes & Hayat **[New record]**

Material examined. INDIA: KARNATAKA: Hessaraghatta, CIFA, 2 females (on slide, No. EH. 2202, EH. 2203), 27.iii.2014 (YPT), Coll. K. Veenakumari (ZDAMU).

Distribution. India: Andhra Pradesh, Karnataka (present record), Kerala.

15. *Rhopus zoleno* Usman & Zeya **[New record]**

Rhopus zoleno Usman & Zeya, in Usman et al., 2013:123. Female. Holotype female, India, Uttar Pradesh.

Material examined. INDIA: ANDHRA PRADESH: East Godavari, Thimmapuram, 1 females (on slide, No. EH. 2187), 7.ii.2014 (SN), Coll. MT. Khan (ZDAMU).

Distribution. India: Andhra Pradesh (present record), Uttar Pradesh.

Acknowledgements : Authors thank the Chairman, Department of Zoology, Aligarh Muslim University, Aligarh, for providing working facilities. The Science and Engineering Research Board, Department of Science and Technology, New Delhi, and Network Project on Insect Biosystematics, Indian council of Agricultural Research, are gratefully acknowledged for financial assistance. Thanks to Dr. K. Veenakumari, Principal Scientist, Dr. O.S. Navik, Scientist-B, NBAIR, Bengaluru, Dr. S.M.A. Badaruddin, Research Associate, Dr. F.R. Khan, former Research Associate and M.T. Khan and S.K. Ahmad former Senior Research Fellows, in the Network Project of Insect Biosystematics, A.M.U. Centre, for putting up their collections for the study.

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Letters

Dear scale insect community,

I recently started a postdoc in Laura Ross laboratory at the University of Edinburgh. For my project with Laura, we are looking for population of the obscure mealybug (*Pseudococcus viburni*) with accessory chromosomes. We would like to make a geographic survey of such populations and also use some of them for experimental work to better understand their transmission under Paternal Genome Elimination.

We would like to kindly ask if you have recently encountered the species and if so, would you be willing to send us a few females with ovisacs fixed in Carnoy fixative (ethanol: chloroform: acetic acid, 6:3:1) for 24 hours then transferred to 80-90% ethanol (by removing the fixative and adding ethanol).

This would allow us to look for accessory chromosomes.

Don't hesitate to contact me for any concerns or information regarding shipping.

—Isabelle Vea
Marie Curie Postdoctoral Fellow
The University of Edinburgh
Institute of Evolutionary Biology
Ashworth Laboratories
Charlotte Auerbach Road
Edinburgh, EH9 3FL (Scotland).
E-mail : isabelle.vea@ed.ac.uk

●●●

I am looking for a good quality jpeg or tif file of a photograph of Prof. K. K. Verma for purpose of a book. The book is on the leaf beetles of New Caledonia, a subject Prof. Verma and Prof. Jolivet published several times.

In *Bionotes* 16 (2014) on page 31 you have published a photo that might suit this purpose. Could you share the file of this photograph ? I thank you in advance.

—Ron Beenen
Martinus Nijhoffhove 51
NL 3437 ZP Nieuwegein
(The Netherlands).
E-mail : r.beenen@wxs.nl

●●●

Please find enclosed our MS entitled, 'Impact of ZnO Nanoparticles on the biodiversity of aquatic flora and fauna', for possible consideration in *Bionotes*.

We declare that the article is original and not submitted elsewhere for publication.

—Dr. Pijus Kanti Samanta
Assistant Professor
Post Graduate Department of Physics
Prabhat Kumar College
Contai-721 401, Midnapore East (West Bengal).
E-mail : pijush.samanta@gmail.com

●●●

I am forwarding the following article for publication, for your consideration:

'Underutilized Mushrooms in India and its scope in cultivation and as possible food alternatives'.

The authors are : (i) Ms. Puja Kumari, Research student, (ii) Dr. Vijay Bihari Lal, Retd. Head of Deptt. of Zoology, Tilka Manjhi University, Bhagalpur, and (iii) Prof. Sunil Kumar Choudhary, Head of Deptt. of Botany, Tilka Manjhi University, Bhagalpur.

—Dr. Bijay Krishna
Retd. Dy. Director and H. O. O.,
Botanical Survey of India,
Ministry of Environment & Forest, Govt. of India;
Presently at Patna (Bihar).

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A Qualitative Study of Neuronal Staining with a Modified Golgi Cox Method

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Introduction

The Golgi method has been described as the *'only histological technique with personality'* (Scheibel & Scheibel, 1978). The classic Golgi method for staining neurons, first developed by Camillio Golgi in 1873 is unique in that it stains only a few cells (1-10%) in their entirety, thus making it possible to visualize all the processes of the stained neurons and a detailed study thereof. It consists of two steps—chromation of the tissue in potassium dichromate followed by impregnation of cells by immersion of the tissue in silver nitrate solution. Several variants of the classic Golgi method (Golgi, 1873) have been developed. The greatest drawbacks of the classic Golgi method and its variants are the inconsistency of impregnation and high failure rate (Zhang et al., 2003).

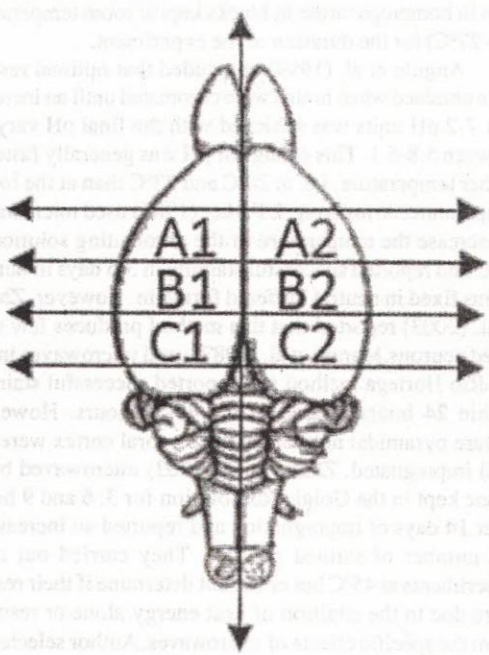

Fig. 1. Four coronal cuts and 1 sagittal cut to obtain 6 blocks from one rat brain.

The Golgi-Cox method is one of the more actively utilized Golgi methods (Zhang et al., 2003). In this method both chromation and impregnation are achieved simultaneously by immersing the specimens in a single solution containing both potassium dichromate and the impregnating metal ions (mercuric chloride). The advantages include an increased probability of staining a large number of neurons (Scheibel & Scheibel 1978), better dendritic morphology (Buell, 1982) and excellent contrast.

Besides inconsistency, the exceptionally long duration of time required to achieve neuronal impregnations is an important disadvantage shared by all Golgi methods.The duration of impregnation using the Golgi-Cox method has been variously reported to range between 14 days (Glaser & Van der Loos, 1981; Zhang et al., 2003) to 80 days (Rutledge et al., 1969, 1974), compared to 5 – 8 days if the rapid Golgi method is used (Globus & Schiebel, 1966). This study was conducted with the aim of reducing the time required for successful staining of neurons using the Golgi-Cox method in 5 mm blocks of brain. Author tested the effect of temperature on the dynamics of neuronal impregnation.

Materials and Methods

Experiments were conducted on inbred male wistar rats (250- 300 g) maintained in standard home cages under 12-h light/dark cycle with food and water *ad libitum*. Rats were sacrificed by cervical dislocation followed by decapitation. Brains were removed, washed with distilled water and then freshly prepared Golgi-Cox solution (Rutledge et al., 1969). Three coronal blocks: A, B and C, each 5 mm thick were prepared using a brain slicer (WPI). Each block was divided sagitally into two equal halves. The six blocks were labeled A1, A2, B1, B2, C1 and C2 respectively (Fig. 1) and placed in separate cotton lined amber bottles containing 30 ml fresh Golgi-Cox solution. Bottles of blocks A1, B1 and C1 were placed in an incubator maintained at 37°C. Bottles containing blocks A2, B2 and C2 (controls) were kept at room temperature (26°C to 27°C).

Impregnation and staining of neurons was checked after 6 hours, 12 hours and 24hours. At each time point one block (e.g. A1) was removed from the bottles kept at 37°C and the contralateral block (e.g. A2) from the bottles kept at

Table 1. Comparison of staining between brain blocks kept at 37°C and at room temperature after incubation for 6, 12 and 24 hours.

Block/ Section Thickness	Duration of Incubation	Results after impregnation at 37°C	Results after impregnation at 26 °C
5mm / 100-120 micron	6 hours	Nucleation centres, filled cell bodies, few stained branches seen.	None of the sections in any animal tested show evidence of beginning of impregnation.
5mm/ 100-120 micron	12 hours	Completely filled neurons in cortical region though not in deeper brain areas.	Similar to sections obtained after 6 hours impregnation except for the outline of a few dendrites seen in one section.
5mm/ 100-120 micron	24 hours	Completely filled neurons in cortical and sub cortical region.	Some nucleation centers, very few partially filled cell bodies in some cortical areas.

26°C (Table 1). Sections (250-300 microns) were prepared from each block.Sections were rinsed twice in distilled water (five minutes each). They were then kept in ammonia solution (1part ammonia: 3 parts distilled water) for 20 minutes each. Thereafter, they were rinsed twice in distilled water (five minutes each) and kept in 2% sodium thiosulphate for 20 minutes in the dark. The sections were then rinsed twice in distilled water (five minutes each), differentiated in grades of alcohol, cleared in toluene and mounted in DPX on gelatinized slides.The slides were allowed to dry at room temperature and were observed under a microscope at low and high magnification. Images were captured using a digital camera attached to the microscope Three sets of experiments were conducted. Qualitative analysis of sections was carried out to study if all the branches of neurons were filled and if dendritic spines could be visualized.To be taken as successfully filled, neuronal profiles had to satisfy two criteria,namely,the presence of untruncated dendrites and consistent and complete filling of dendrites.

Results

Complete impregnation of neurons was achieved by incubation at 37°C and stained dendritic spines could be seen against a clear background, in contrast hardly any neurons were stained in blocks kept at room temperature. The differences in the rate of filling of neurons were evident as early as 6 hours after the start of impregnation. By 12 hours numerous completely filled neurons could be seen in the cortical region of blocks incubated at 37°C and within 24 hours, all regions of the section (cortical and sub cortical regions) showed several successfully impregnated neurons.

Discussion

The Golgi-Cox solution used by author in this experiment is the same as reported by Rutledge et al. (1969). Using 5 mm thick slices of cat brain, they reported the duration of impregnation to be 40-80 days. This paper describes a modification of one of the physical parameters i.e., temperature, at which Golgi-Cox impregnation of neurons is carried out. In our study the temperature was the only variable between two contralateral blocks.While excellent staining was achieved within 24 hours in blocks incubated at 37°C, very few, if any, stained neurons could be seen in homotopic areas in blocks kept at room temperature (26-27°C) for the duration of the experiment.

Angulo et al. (1994) concluded that optimal results were obtained when brains were chromated until an increase of 1.7-2 pH units was achieved with the final pH varying between 5.8-6.1. This change of pH was generally faster at higher temperature, i.e. at 20°C and 23°C than at the lower temperature. Armstrong & Parker (1986) used microwaves to increase the temperature of the chromating solution to 55°C and reported successful staining in 3-5 days in human brains fixed in neutral buffered formalin. However, Zhang et al. (2003) reported that this method produces few well filled neurons.Marani et al. (1987) used microwaves in the del Rio Hortega method and reported successful staining within 24 hours instead of the 48-72 hours. However, mature pyramidal neurons in the cerebral cortex were not well impregnated. Zhang et al. (2003) microwaved brain tissue kept in the Golgi-Cox solution for 3, 6 and 9 hours after 14 days of impregnation and reported an increase in the number of stained profiles. They carried out their experiments at 45°C but could not determine if their results were due to the addition of heat energy alone or resulted from the specific effects of microwaves. Author selected an incubation temperature of 37°C because it allows to avoid the negative effects, if any, of gentle cooking at higher

temperature (Marani et al., 1987) on neural architecture. Besides, author did not observe any significant increase in precipitation of salts at this temperature.

Conclusion

Incubating brain blocks at 37°C dramatically reduced the time required to achieve complete staining of neurons. This method will allow researchers to increase their turnover and will be especially valuable in applications like tissue biopsy. This modification will also make the process more reliable and avoid wastage of precious tissue samples. An additional advantage is that it does not require any specialized equipment or chemicals.The reason behind the better results in present study may be due to the effect of temperature on the pH of the impregnating solutions. Further studies are needed to probe the underlying mechanism.

Acknowledgement: The author is thankful to Professor B. N. Mallick, School of Life Sciences, Jawaharlal Nehru University, New Delhi, for providing laboratory facilities for conducting the experiments.

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Disastrous Effect of Interlinking Rivers
Alien Fish Tore the Nets

When Venkat Ramana, a fisherman from Tadepalli in Amaravati along the Krishna river, netted a big catch recently, the joy did not last long — his net was damaged.

Later, he heard others too complaining of the problem. The culprit turned out to be an alien variety of fish with sharp teeth and spikes.

Ramana and many others in the Vijayawada-Amaravati belt, whose livelihood is fishing, are discovering a new variety identified as Sailfin Catfish. Of no commercial value, this species is believed to have made its way into Krishna from the Godavari river through the Polavaram canal which was built to link the two rivers.

Besides damaging nets, the fish preys on commercially viable varieties, affecting overall catch and livelihood of fishermen. Invasion of such alien species is emerging as a major ecological challenge for the State, which built the interlinking canal two years ago to divert excess floodwater from Godavari to Krishna.

Researchers had then warned of collateral damage. "Invasion of non-native species will cause extinction of native species. Krishna's unique fish biodiversity will be lost due to interlinking," said an expert from the Acharya Nagarjuna University.

Interlinking has also increased turbidity and mineral content of Krishna water, a study by MVR College of Engineering and Technology, near Vijayawada, found.

"River linking is fraught with environmental dangers. It should be tackled by building reservoirs en route the link canal with sieves to hold back any alien species," says environmentalist V. Satyanarayana.

Two Months Catch of Butterflies (Lepidoptera) from District Ludhiana, Punjab

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Lepidoptera (scaly wings) is highly specialized order of insects, which includes the butterflies, skippers and moths which are further divided into two suborders i.e., Heterocera and Rhopalocera. Butterflies can be classified into two superfamilies, Hesperioidea and Papilionoidea. Whereas former consists of a single family viz., Hesperiidae (Skippers), and the latter includes four families: *Papilionidae* (Swallowtails), *Pieridae* (Whites and Yellows), *Nymphalidae* (Brush-footed butterflies) and *Lycaenidae* (Blues) (Kehimkar, 2008).

Butterflies always remain a fascination to the mankind. From the ecological view point butterflies also play an important role in food web. Some of them, like Monarch butterflies viz., *Danaus plexippus, D. erippus, D. cleophile, D. chrysippus*, due to their palatability act as dispensable food of many birds and reptiles present in grassland and forest ecosystems. Different stages of butterflies are fed upon by various higher groups of animals. Butterflies also act as pests of various agricultural and forestry crops, which poses a serious damage to both quality and quantity due to their phytophagous feeding habit. The present study aims to check the species diversity from their conservation point of view.

During pre-monsoon period from March to April in year 2017, a study was carried out to check the butterfly fauna of district Ludhiana, Punjab. A total of 19 species belonging to five families were recorded during the aforesaid period. Out of five families, Pieridae, represented by 8 species was the most dominant, followed by Nymphalidae (7 species), Papilionidae (3 species) and Lycaenidae (1 species). *Pieris brassicae* Linnaeus was the most dominant species of butterfly in terms of number of individuals collected, followed by *Danaus chrysippus chrysippus* Linnaeus and least by *Tirumala limniace* Cramer.

Material and Methods

The butterfly collection was made with the help of insect net swept over the bushes. The collected butterflies thus transferred very carefully to the killing jar which contains a killing agent ethyl acetate. After killing, spreading was done on a spreading board (250-300 mm in length) which was a long, flat board with central adjustable groove. After 3-4 days, the paper strips were removed and the specimen along with the central insect pin was shifted to an insect storage box. These boxes were properly fumigated with naphthalene balls. Then the specimens were labelled properly with geographical data slips carrying information about the collected specimen.

In the present paper, classification given by Van Nieukerken et al. (2011) is followed. All collections were made by Gurmeet Kaur.

Order: LEPIDOPTERA
Clade: Obtectomera Minet, 1986
Superfamily: Papilionoidea Latreille, 1802
Family: Pieridae

Genus: *Catopsilia* Hübner, 1816

1. *Catopsilia pomona* Fabricius (Lemon Emigrant)

Material examined: Punjab: Dist. Ludhiana; PAU, 244m, 27.iii.2017, 2♂♂.

2. *Catopsilia pyranthe* Linnaeus (Mottled Emigrant)

Material examined: Punjab: Distt. Ludhiana; Alamgir, 251m, 26.iii.2017, 2♂♂, 2♀♀.

Genus: *Colias* Fabricius, 1807

3. *Colias fieldi* Menetries (Dark Clouded Yellow)

Material examined: Punjab: Dist. Ludhiana; Kohara, 251m, 5.iii.2017, 1♂, 1♀.

Genus: *Eurema* Hübner, 1819

4. *Eurema hecabe* Linnaeus

Material examined: Punjab: Dist. Ludhiana; Sahnewal, 251m, 20.iii.2017, 3♀♀; Pohir, 262m, 26.iii.2017, 1♀; Pakhowal, 252m, 2.iv.2017, 1♂, 1♀; Raikot, 239m, 2.iv.2017, 1♀; Jagraon, 234m, 9.iv.2017, 2♀♀; Ladhowal, 229m, 11.iv.2017, 2♂♂.

Genus: *Belenois* Hübner, 1819

5. *Belenois aurota* Fabricius (Pioneer)

Material examined: Punjab: Dist. Ludhiana; PAU, 244m, 27.iii.2017, 2♂♂.

Genus: *Cepora* Billberg, 1820

6. *Cepora nerissa* Fabricius (Common Gull)

Material examined: Punjab: Dist. Ludhiana; Machhiwara, 262m, 12.iii.2017, 2♂♂; Machhiwara, 262m,

12.iii.2017, 1♀.

Genus: *Ixias* Hübner, 1816

7. *Ixias pyrene* Linnaeus (Yellow Orange Tip)

Material examined: Punjab: Dist. Ludhiana; Mundian Kalan, 251m, 12.iii.2017, 3♂♂.

Genus: *Pieris* Schrank, 1801

8. *Pieris brassicae* Linnaeus (Large Cabbage White)

Material examined: Punjab: Dist. Ludhiana; Kohara, 251m, 5.iii.2017, 1♂; Pohir, 262m, 26.iii.2017, 1♂; Mullanpur, 251m, 9.iv.2017, 2♂♂; Ladhowal, 229m, 11.iv.2017, 1♂; Katani kalan, 252m, 5.iii.2017, 1♂.

9. *Pieris canidia* Sparrman (Indian Cabbage White)

Material examined: Punjab: Dist. Ludhiana; PAU, 244m, 2.iii.2017, 2♂♂, 1♀; Kohara, 251m, 5.iii.2017, 1♀; Neelon, 261m, 5.iii.2017, 2♂♂; Mundian Kalan, 251m, 12.iii.2017, 1♀; Machhiwara, 262m, 12.iii.2017, 2♂♂; Payal, 252m, 20.iii.2017, 1♂, 2♀♀; Jassowal, 252m, 26.iii.2017, 1♂; Pohir, 262m, 26.iii.2017, 1♂; Ladhowal, 229m, 11.iv.2017, 1♂.

Family: Papilionidae

Genus: *Graphium* Scopoli, 1777

10. *Graphium doson* Felder, C. & R. (Common Jay)

Material examined: Punjab: Dist. Ludhiana; Dehlon, 262m, 26.iii.2017, 2♀♀.

Genus: *Papilio* Linnaeus, 1758

11. *Papilio demoleus* Linnaeus (Lime Butterfly)

Material examined: Punjab: Dist. Ludhiana; Sidhwan Khurd, 237m, 9.iv.2017, 3♂♂.

12. *Papilio polytes* Linnaeus (Common Mormon)

Material examined: Punjab: Dist. Ludhiana; Khanna, 269m, 19.iii.2017, 2♂♂.

Family: Nymphalidae

Genus: *Danaus* Kluk, 1807

13. *Danaus chrysippus* Linnaeus (Plain Tiger)

Material examined: Punjab: Dist. Ludhiana; PAU, 244m, 2.iii.2017, 1♂; Katani Kalan, 252m, 5.iii.2017, 1♀; Neelon, 261m, 5.iii.2017, 1♀; Mundian Kalan, 251m, 12.iii.2017, 1♂; Khanna, 269m, 19.iii.2017, 2♂♂; Payal, 252m, 20.iii.2017, 1♂; Jassowal, 252m, 23.iii.2017, 1♂; Pakhowal, 252m, 2.iv.2017, 1♂; Sidhwan Khurd, 237m, 9.iv.2017, 2♂♂; Hambran, 239m, 11.iv.2017, 1♂, 1♀.

Genus: *Tirumala* Moore, 1880

14. *Tirumala limniace* Cramer (Blue Tiger)

Material examined: Punjab: Dist. Ludhiana; Dehlon, 262m, 26.iii.2017, 1♀.

Genus: *Phalanta* Horsfield, 1829

15. *Phalanta phalantha* Drury (Common Leopard)

Material examined: Punjab: Dist. Ludhiana; Mullanpur, 251m, 9.iv.2017, 2♀♀.

Genus: *Cynthia* Fabricius, 1807

16. *Cynthia cardui* Linnaeus (Painted Lady)

Material examined: Punjab: Dist. Ludhiana; Katani Kalan, 252m, 5. iii.2017, 1♀; Raikot, 239m, 2.iv.2017, 1♂, 1♀; Jagraon, 234m, 9.iv.2017, 3♀♀.

Genus: *Hypolimnas* Hübner, 1816

17. *Hypolimnas misippus* Linnaeus (Danaid Eggfly)

Material examined: Punjab: Dist. Ludhiana; Hambran, 239m, 11.iii.2017, 1♂.

Genus: *Junonia* Hübner, 1816

18. *Junonia orithya* Linnaeus (Blue Pansy)

Material examined: Punjab: Distt. Ludhiana; Neelon, 261m, 5.iii.2017, 1♂; Raikot, 239m, 2.iv.2017, 1♂.

Genus: *Ariadne* Horsfield, 1829

19. *Ariadne merione* Cramer (Common Castor)

Material examined: Punjab: Dist. Ludhiana; Doraha, 252m, 19.iii.2017, 1♂; Jassowal, 252m, 26.iii.2017, 1♂.

Family: Lycaenidae

20. *Pseudozizeeria maha* Kollar (Pale Grass Blue)

Material examined: Punjab: Dist. Ludhiana; Doraha, 252m, 19.iii.2017, 2♀♀.

Acknowledgements: The authors are thankful to the Head, Department of Life Sciences, RIMT University for providing necessary research facilities and also to the Head, Department of Entomology, PAU, Ludhiana, and ZSI, Kolkata, for identification of the material.

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On the Phytophagous and Predatory Mites on some Medicinal Plants occurring in Sundarbans area of West Bengal

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Introduction

Sundarban is located in Ganga-Brahamputra delta by the Bay of Bengal and it is the world's largest single tract mangrove system covering 4100sq.kms, of which 2/3 areas come under Bangladesh and remaining 1/3 is in India (W.B). UNESCO in 1997 declared Sundarbans as a World Heritage Site. It is having the largest number of mangrove species, many of which are having medicinal values.There are several others which also have medicinal properties.

Many of those medicinal plants are known to inhabit a variety of mite species, the exploration and documentation of those have been neglected so far. In view of that and keeping in mind the fact that this area is immensely rich with medicinal plants, the present study was undertaken and accordingly surveys were conducted to some of those areas and the present paper embodies the results thereof.

Material and Methods

The collection sites were : 1. Sagar Island (21.7269°N, 88.1096°E), 2. Gosaba (22.1652°N, 88.8079°E), and 3. Dhamakhali and Jeliakhali (22.3615°N, 88.8645°E).The surveys were conducted during January to July 2017.The mites were collected by directly examining the leaves in the field under 20x hand lens. The mites after collection were preserved in vials containing 70% ethyl alcohol. Many a times the leaf samples were also brought to the laboratory and those were examined under stereo binocular microscope for collection of mites. The mounting was done in Hoyer's medium. The identification was done by consulting the updated literature. All the identified species have been listed with their localities, hosts/habitats and relative abundance.

Results

The identification of mites from Sundarban area of West Bengal revealed the occurrence of 33 species under 19 genera , 11 families belonging to 3 orders and all those have been listed in Table 1 giving their hosts/habitats, relative abundance and remarks. This report includes 5 species of mites which form new records for India. The members belonging to phytophagous and predatory mites were represented by 17 species and 16 species, respectively.

It may be mentioned in this connection that the previous works like Gupta (2005, 2012) Gupta et al., (2007), Lahiri et al. (2004) have also published records of mites on medicinal plants, but the area of surveys which were covered in the present report were not included in their studies.

Acknowledgements : Sincere thanks are due to the Department of Science and Technology, Govt. of West Bengal, for providing financial assistance; to the Principals of Krishnagar Govt. College and Barasat Govt. College, as well as to the Secretary, Ramakrishna Mission Ashrama, Narendrapur, for providing laboratory facilities and finally to Dr. Sanjoy Poddar, Dept. of Zoology, Barasat Govt. College, for encouragement and necessary advice.

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Table 1. List of mites collected on medicinal plants from the Sundarbans area of West Bengal.

	Classification	Host & Habitat	Locality	Relative abundance	Remarks
	PHYTOPHAGOUS GROUP				
	Order I : PROSTIGMATA				
	Family 1 : Tetranychidae				
1.	*Eutetranychus orientalis* (Klein)	*Carica papaya*	A, B	3	Z1
2.	*Oligonychus punicae* (Hirst)	*Gmelina arborea*	A, C	2	Z3
3.	*Oligonychus sapienticolus* Gupta	*Musa sapienticola*	C	3	Z2
4.	*Tetranychus ludeni* Zacher	*Eugenia jambolana*	A, B	3	Z2
5.	*Tetranychus neocaledonicus* Andre	*Psidium guajava*	A, B	2	X, Z3
6.	*Tetranychus macfarlanei* Baker & Pritchard	*Acacia auriculiformis*	C	1	X, Z3
7.	*Tetranychus fijiensis* Hirst	*Abelemoschus moschatus*	C	3	X, Z2
8.	*Tetranychus hypogeae* Gupta	*Cinnamomum tamala*	B	3	X, Z3
9.	*Schizotetranychus tephrosiae* Gutierrez	*Ixora coccinea*	A	3	Z3
10.	*Schizotetranychus mansoni* Gupta	*Azadirachta indica*	A, B	3	X, Z3
11.	*Aplonobia sphaeralceae* (Tuttle & Baker)	*Citrus reticulata*	A, B	3	X, Z3
12.	*Ptrobia harti* (Ewing)	*Oxalis corniculata*	C	2	Z1
	Family 2 : Tenuipalpidae				
13.	*Brevipalpus mitrofanovi* Pegazzano	*Ocimum sanctum*	A	2	X,Z2
14.	**Brevipalpus trinidadensis* Baker	*Phoenix dactylifera*	A, C		X, Z2, NRI
15.	*Brevipalpus phoenicis* (Geijskes)	*Justica adhatoda*	A	3	X, Z2
16.	*Raoiella indica* Hirst	*Cocos nucifera*	A, C	2	Z3
	Family 3 : Tarsonemidae				
17.	*Eotarsonemus* sp.	*Justica adhatoda*	A	3	X, Z3
	PREDATORY GROUP				
	Family 4 : Cunaxidae				
18.	**Cunaxa evansi* Den Heyer	*Ocimum sanctum*	A	3	X, NRI, Z3
19.	**Cunaxa terrula* Smiley	*Justica adhatoda*	C	3	NRI, Z3
	Family 5: Eupodidae				
20.	*Eupodes sigmoidensis* Strandmann & Goff	*Musa sapienticola*	C	3	X, Z3
	Family 6 : Stigmaeidae				
21.	*Agistemus fleschneri* Summers	*Solanum melongena*	C	3	Y, Z3
	Family 7 : Erythraeidae				
22.	*Erythraeus orientalis* Khot	*Acacia auriculiformes*	C	3	Y, Z3
	Family 8 : Raphignathidae				
23.	*Raphignathus* sp.	*Mangifera indica*	C	3	Z3
	Family 9 : Tydeidae				
24.	*Pronematus* sp.	*Cocos nucifera*	A	3	X, Z3
	Order II : MESOSTIGMATA				
	Family 10 : Phytoseiidae				
25.	*Amblyseius largoensis* (Muma)	*Citrus limon*	A, C	2	Z3
26.	**Amblyseius coffeae* De Leon	*Cinnamomum tamala*	B	3	NRI, Z3
27.	**Amblyseius fletcheri* Schicha	*Scutelleria javanica*	C	3	Y, NRI
28.	*Amblyseius cucurbitae* Rather	*Carica papaya*	A	3	Z3
29.	*Euseius ovalis* (Evans)	*Murraya koenigii*	A	3	Z2
30.	*Euseius rhododendronis* (Gupta)	*Helotropium indicum*	C	3	Y, Z3
31.	*Euseius coccineae* (Gupta)	*Momordica charantia*	A	3	Y, Z3
32.	*Neoseiulus longispinosus* (Evans)	*Mangifera indica*	C	3	Z3

Order III : ASTIGMATA					
Family 11 : Glyciphydidae					
33.	*Glycyphagus destructor* (Schrank)	*Musa sapienticola*	C	3	Y, Z4

Abbreviations :
X=New host record, Y=New habitat record, Z1=Highly damaging, Z2=Moderately damaging, Z3=Casual occurrence, Z4=Accidental occurrence,*Species earlier not recorded from India.
A=Sagar island, B=Gosaba, C=Dhamakhali and Jeliakhali.
1=highly abundant (greater than 10mites/leaf); 2=less abundant or moderate (between 5-10/leaf); 3=least abundant (less than 5/leaf).

Genitalic Studies of a Moth, *Megacorma obliqua* (Lepidoptera : Sphingidae)

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Walker (1856) described the present species i.e., *obliqua* under genus *Macrosila* for the first time. He distinguished this species from *Psilogramma menepheron* Cramer on the basis of the presence of a cavity on second segment of labial palpus, massive thorax and having a long black band along vein M3 of forewing reaching outer margin. Hampson (1892) discussed it under *Pseudosphinx discistriga* Walker. Rothschild & Jordan (1903) erected a new genus *Megacorma* for its proper placement. Bell & Scott (1937), D'Abrera (1986), Holloway (1987), Inoue *et al.* (1997) and Pittaway & Kitching (2000) have followed the same nomenclature for this monotypic genus.

Material and Methods

Survey tours were undertaken in North East India and South India. As many as 13 adult specimens were collected from different localities. The male and female specimens were dissected to explore the genitalic features. The terminology for naming different parts of genitalia has been followed after Klots (1970). Diagrams were drawn with the help of graph eye-piece fitted in Stereo-zoom binocular.

Genus *Megacorma* Rothschild & Jordan

Labial palpus short, porrect; second segment narrower at base, triangular; much shorter than first segment and having a cavity which is less deep than in other allied genera. Proboscis longer than body. Antenna broad near base, gradually thinning towards distal end. Thorax massive, extending far beyond base of fore wing. Forewing with apex pointed but not produced; anal margin strongly emarginate beyond middle; basal one-fourth portion of anal vein forked; Cu2 arising from middle of cell; M3 from lower angle; M2 from well below middle of discocellulars; M1 (R5, R4) stalked; discocellulars closed; discal cell less than half length of wing. Hindwing with apex rounded; both anals present; 2A forked at base; Cu1 from well before lower angle of cell; M2 from well below middle of discocellulars; M1 and Rs moderately stalked from upper angle of cell; Sc+R1 anastomosing with cell up to middle; discal cell half length of wing. Legs with hind tibia as long as first tarsal segment; mid tibia with one pair and hind tibia with two pairs of tibial spurs; tarsi long, slender, spines short; mid and hind tarsi with conspicuous comb of prolonged spines; pulvillus present. Male genitalia with uncus long, curved, with pointed tip; gnathos simple; tegumen inverted U-shaped, longer than vinculum; saccus narrow with round ending; juxta bean-shaped; transtilla narrow; valva slipper-shaped with both costa and sacculus differentiated; saccular projection having a row of numerous small pointed projections at its distal end; small spines present above saccular projection; no friction scales; aedeagus simple, without any sclerotized projection. Female genitalia with corpus bursae globular; signum lanceolate; ductus bursae quite long, membranous; ostium bursae guarded by semi sclerotized genital plate; ductus seminalis originating from anterior end of genital plate; anterior apophyses shorter than posterior ones; papilla analis oblong, fringed.

Remarks: The present genus is characterized by distinct labial palpus, long thorax, wing pattern and saccular projection in male genitalia. It is represented by single species i.e. *obliqua* (Walker) from the Oriental region.

***Megacorma obliqua* (Walker)**

Macrosila obliqua Walker, 1856, *List specimens Lepid. Insects Colln. Br. Mus. London*, 8: 208.

Wing Expanse: Male: 118-142 mm; Female: 146-150 mm.

Male genitalia: Uncus long, curved, narrow at middle, tip pointed, semi-sclerotized, dorsally setosed in middle; gnathos simple, hood-like, reaching lower level of uncus; tegumen broad, inverted U-shaped, longer than vinculum, slightly sclerotized; vinculum, short, well sclerotized; saccus narrow with rounded tip; juxta bean-shaped; transtilla narrow, moderately sclerotized. Valva extending well beyond level of uncus, slipper-shaped; costa demarcated, setosed; sacculus broad, semi-sclerotized; saccular projection broad at base, narrow at middle, broad distally having nine small pointed projections; small spines present above saccular projection; distal end of valva semi-membranous; well setosed, squarish. Aedeagus simple, narrow, both walls equally sclerotized, semi-sclerotized; vesica without any armature (Fig. 1).

Female genitalia: Corpus bursae globular, membranous; signum lanceolate; ductus bursae narrow, quite

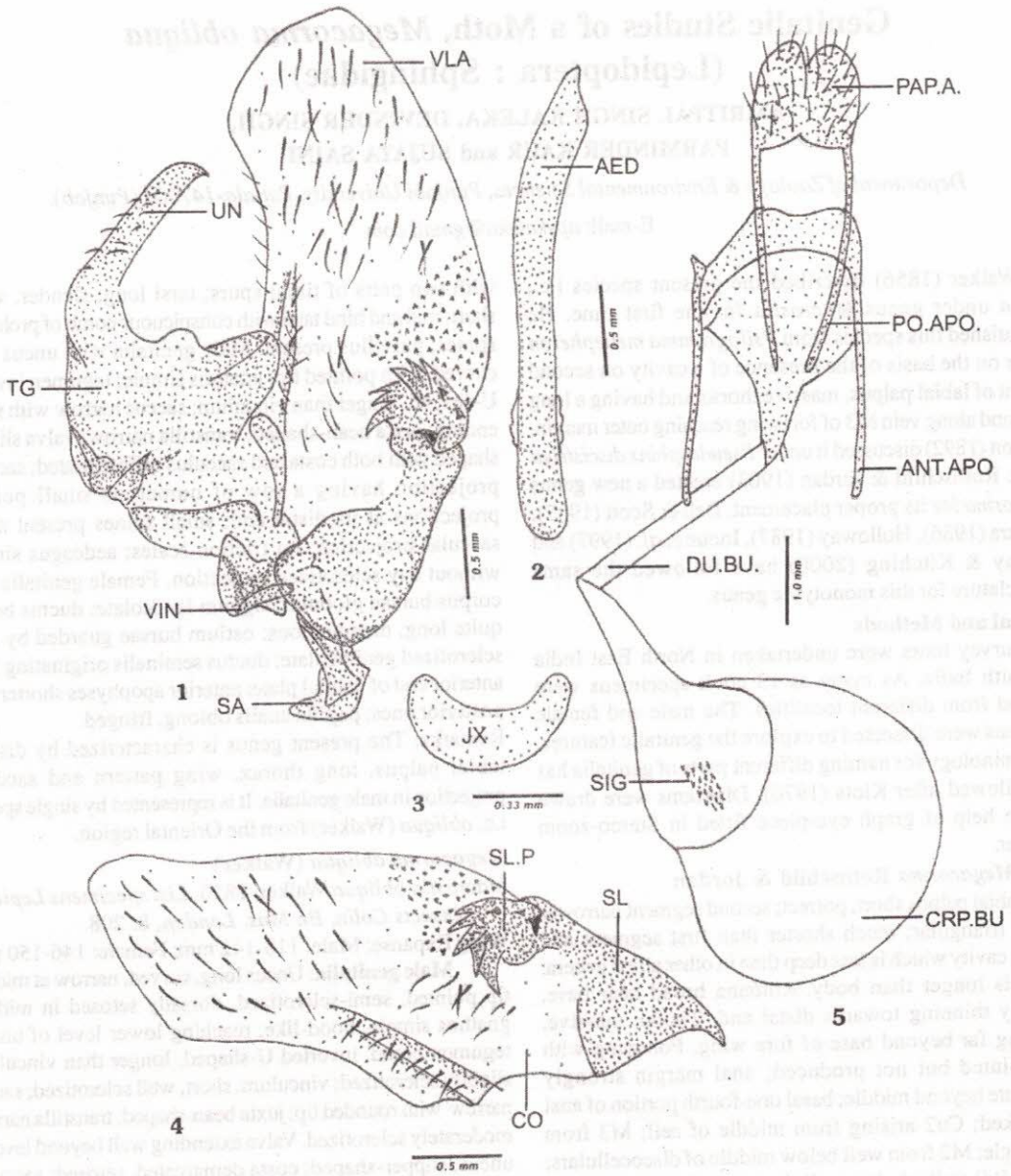

Fig 1. *Megacorma obliqua* (Walker):
1. Male genitalia - lateral view; 2. Aedeagus; 3. Juxta - Ventral view;
4. Valva - Ventral view; 5. Female genitalia.

Abbreviations : AED: Aedeagus; ANT. APO: Anterior apophyses; CO: Costa; CRP. BU: Corpus bursae; DU. BU: Ductus bursae; JX: Juxta; PAP. A: Papilla analis; PO. APO: Posterior apophyses; SA: Saccus; SIG: Signum; SL: Sacculus; SL.P: Saccular projection; TG: Tegumen; UN: Uncus; VIN: Vinculum; VLA: Valva.

long; ostium bursae guarded by semi-sclerotized genital plate; ductus seminalis originating from anterior end of genital plate; anterior apophyses shorter than posterior ones, apices inwardly bent; posterior apophyses narrow, long, apices blunt; papilla analis oblong with rounded tips, setosed with long setae (Fig. 1).

Material Examined: Arunachal Pradesh: West Kameng Distt., Bomdilla, 3.ix.1990, 1♂; 14.ix.1990, 1♂; 17.ix.1990, 1♂. Assam: North Cachar Hills, Jatinga, 3.ix.1991, 1♂; 4.ix.1991, 1♀; 6.ix.1991, 2♂♂, 1♀. Karnataka: Jog Falls; 17.VII.1991, 1♂. Meghalaya: Jowaii, 14.ix.1990, 2♀♀; Mizoram: Mammit, 29.ix.2013, 1♂, 1♀.

Distribution: India: Eastern Himalaya (Arunachal Pradesh, Assam, Meghalaya, Mizoram) and Karnataka. Elsewhere: Borneo, China, Indonesia, Java, Malaysia, Myanmar, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Thailand and Vietnam.

Remarks: The reporting of this species from Jog falls (Karnataka) is its first record from South India. The females are larger than males, with darker wing maculation.

Acknowledgement : First author is thankful to UGC, New Delhi for financial assistance.

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'Bio Clock' Scientists bag Medicine Nobel Prize

US- born scientists Jeffrey C. Hall, Michael Rosbash and Michael W. Young won the 2017 Nobel Prize for Physiology or Medicine for their discoveries of molecular mechanisms controlling our biological clocks, the award giving body said in Stockholm.

The mechanisms help explain issues such as why people travelling long distances over several time zones often suffer jet lag and they have wider implications for health such as increased risk for certain diseases.

"(The three scientists') discoveries exlain how plants, animals and humans adapt their biological rhythm so that it is synchronised with the Earth's revolutions," the Nobel Assembly at Sweden's Karolinska Institute said in a statement.

The laureates used fruit flies to isolate a gene that controls the normal daily biological rhythm and showed how this gene encoded a protein that accumulates in the cell during the night and degrades during the day. "The clock regulates critical functions such as behaviour, hormone levels, sleep, body temperature and metabolism," the Assembly said on awarding the prize of 9 million Swedish crowns ($1.1 million).

Thomas Perlmann, secretary at the Karolinska Institute Nobel Committee, described the reaction of Rosbash when first informed of the award: "He was silent and then he said 'you are kidding me'."

Medicine is the first of the Nobel Prizes awarded each year. The prizes for achievements in science, literature and peace were created in accordance with the will of dynamite inventor and businessman Alfred Nobel and have been awarded since 1901.

Nobel medicine laureates have included scientific greats such as Alexander Fleming, the discoverer of penicillin, and Karl Landsteiner, whose identification of separate blood types opened the way to carrying out safe transfusions.

The prize has not been without controversy, especially with the benefit of hindsight, such as with the 1948 award for discovery of DDT, a chemical that heled battle epidemics but was later banned due to its harmful environmental impact.

Research Notes

DIVERSITY OF EARTHWORMS IN AN ORCHARD AT BARASAT, W. BENGAL (ANNELIDA: OLIGOCHAETA)

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Earthworms belong to Megadrili Oligochaetes and correspond to the orders Moniligastrida and Haplotaxida, excluding suborder Tubificina. Perrier (1872) was first to report of an earthworm species *Perichaeta houlleti* from West Bengal. Stephenson (1923), Gates (1937-1938), Julka (1988), Halder (1998) and Chowdhury et al. (2011) have contributed to the taxonomic studies of earthworms from West Bengal. The present study is to know the diversity of earthworm fauna in a particular habitat of West Bengal.

The study area is situated at Barasat, which is nearly 50 km north-east of Kolkata, in the district of North 24 Parganas of West Bengal. The flora here mainly consists of *Mangifera indica, Cocos nucifera*, and *Musa paradisiaca*. Other notable vegetations are *Bombax ceiba, Terminalia arjuna, Albizzia lebbeck, Bambusa tulda, Colocasia esculenta, Cynodon dactylon, Solanum nigrum, Centella asiatica, Coccinia cordifolia, Marsilea minuta* etc. Soil of this site is alluvium in nature, brown in colour and clay silt loam in texture. Collection, narcotisation and preservation of the earthworm samples were carried out following Julka (1988).

In the present study, 14 species of earthworms belonging to 4 families were recorded (Table 1). Out of 14 species, 6 species belong to family Megascolicidae, 5 species belong to family Octochaetidae, two species belong to family Moniligastridae and family Almidae is represented by single species. Among the earthworm populations, *Metaphire posthuma* showed maximum in numbers, whereas *Drawida papillifer papillifer* showed minimum. Population peak was observed during the monsoon and post-monsoon seasons.

Acknowledgements : Author is grateful to Dr. J. M. Julka, Scientist (Retd.), Zoological Survey of India, Solan (H.P.), for confirming the earthworm species. Author is also indebted to Dr. A. K. Hazra, Emeritus Scientist, Zoological Survey of India, Kolkata, for encouragement.

Table 1. List of earthworm species observed at Barasat.

	Family	Earthworm species
1.	Moniligastridae	*Drawida nepalensis* Michaelsen
2.		*Drawida papillifer papillifer* Stephenson
3.	Octochaetidae	*Eutyphoeus incommodus* (Beddard)
4.		*Eutyphoeus nicholsoni* (Beddard)
5.		*Eutyphoeus orientalis* (Beddard)
6.		*Octochaetona beatrix* (Beddard)
7.		*Octochaetona surensis* (Michaelsen)
8.	Megascolecidae	*Lampito mauritii* Kinberg
9.		*Metaphire posthuma* (Vaillant)
10.		*Metaphire houlleti* (Perrier)
11.		*Perionyx excavatus* Perrier
12.		*Polypheretima elongata* (Perrier)
13.		*Amynthas corticis* (Kinberg)
14.	Almidae	*Glyphidrilus tuberosus* Stephenson

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Most Mammals Pee in 21 secs

All mammals larger than rats take roughly the same amount of time to urinate — 21 seconds — regardless of their size, scientists say. An elephant takes the same amount of time to empty its huge bladder as a cat — despite holding 18 litres of urine. This is because their urethras are appropriately scaled to be a "flow-enhancing device." To compare peeing rates across the animal kingdom. David Hu, of Mechanical Engineering Deptt. at Atlanta's Georgia Institute of Technology, turned to the zoo and the internet.

APHIDS ON SOME MEDICINAL PLANTS IN SALT LAKE, KOLKATA

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Aphids are small homopteran insects of family Aphididae which are of considerable agricultural importance, because of their polyphytophagism, reproductive habits, polymorphism, and remarkable ability of transmitting some viral diseases among various plant species. Out of 4702 aphid species so far known worldwide (Remaudiere & Remaudiere, 1997), about 1015 species occur in the oriental region. Of these, 653 species belonging to 200 genera represent Indian aphids. Indian aphids constitute about 16% of the world fauna including large number of endemic species. Out of the total recorded 650 species, a maximum number of 414 species have so far been known from Northeast India (Ghosh & Ghosh, 2000). It is known that 90 species/subspecies of aphids infest medicinal plants of 95 species under 50 plant families. The present communication includes a list of medicinal plants (arranged alphabetically with family name) infested by aphids in the target area. The plants considered here as medicinal plants, are according to ICMR publication (1976, 1987) and after Chopra et al. (1956).

The Salt Lake area is located in West Bengal at 22.58 degree N 88.42 degree E, adjacent to megacity Kolkata. It has an average elevation of 11 meters (49 feet). Average populated urban area, though being a hub of economic and social expansion; greenery is beautifully planned and can be observed all over the area. It has the most non polluted and eco friendly environment in Kolkata. Climate remains mostly humid; up to 70% to 80%, summer ranges between 27 degree to 37 degree Celsius, rainfall averages between 1,550-1,590mm and winter experiences a minimum of 7 degree to 8 degree Celsius. Maximum infestation of aphids was recorded in the month of February, when temperature lies between 27-28 degree Celsius. Samples were collected from various ecological niches of the study area.

Methodology

Aphids were generally removed from their host plants with a soft brush soaked in alcohol and fixed either in 70% alcohol or in fluid of 2 volumes of 70% alcohol and 1 volume of lactic acid. Another technique is to collect the aphids alive in a rather wide glass with a portion of the host plant. The aphids preserved in alcohol were cleaned for mounting and permanent storage on slides. For this purpose aphids were washed in alcohol and boiled in a water bath for 5-7 minutes, after carefully decanting off alcohol. 10% KOH is added to the tube and specimens boiled for 3-5 minutes for clearing. After removing the KOH, specimens are boiled in chloral-phenol solution (saturated) or in carbolic acid solution (Phenol:Xylene=1:1) for about 10 minutes. After clearing, the specimens are mounted in Berlese medium which is composed of chloral hydrate 20m, Gum Arabica 40cc and Glycerol or may be mounted in D.P.X. Well mounted slides of aphids are observed and studied under light microscope. Slides are preserved in slide box for future study.

Aphids recorded on medicinal plants in W. Bengal are mentioned by several workers, including Basu & Banerjee (1958), Raychaudhuri & Ghosh (1958), Ghosh & Singh (2000, 2004) and Chakrabarti & Sarkar (2001).

Observations

Analysis of field data and published records reveal that a total of 15 species of aphids, belonging to family Aphididae, infest 36 species of plants belonging to 23 families (Table 1). Aphid infested mainly young leaves and tender shoots of the plants. Attempts to find root aphids if any, proved futile, that is aphids prefer shoots to roots. It is evident that aphids play important role in damaging medicinal plants to a great extent. Some of the threatened medicinal plants are associated not only with aphids but also with some other group of insects and mites, in the different area of Salt Lake, Kolkata.

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Table 1. List of aphids found on medicinal plants in Salt Lake, Kolkata.

	Name of the Plant	Family	Name of the Aphid
1	*Adhatoda vasica*	Acanthaceae	*Aphis spiracola, Toxoptera aurantii*
2	*Aegle marmelos*	Rutaceae	*Toxoptera aurantii*
3	*Allium cepa*	Alliaceae	*Aphis gossypii*
4	*Alstonia scholaris*	Apocynaceae	*Aphis spiracola*
5	*Brassica nigra*	Brassicaceae	*Lipaphis erysimi*
6	*Calotropis gigantea*	Asclepiadaceae	*Aphis nerii*
7	*Calotropis procera*	Asclepiadaceae	*Aphis nerii*
8	*Carica papaya*	Caricaceae	*Myzus persicae*
9	*Chrysanthemum*	Asteraceae	*Macrosiphoniella sanborni*
10	*Curcuma longa*	Zingiberaceae	*Pentalonia nigronervosa*
11	*Datura metel*	Solanceae	*Myzus persicae*
12	*Eleusine coracana*	Poaceae	*Rhopalosiphum rufiabdominalis, Sitobion miscanthi, Tetraneura nigriabdominalis*
13	*Foeniculum vulgare*	Umbelliferae	*Lipaphis erysimi*
14	*Elettaria cardamomum*	Zingiberaceae	*Pentalonia nigronervosa*
15	*Eupatorium tripilinensis*	Asteraceae	*Aphis gossypii*
16	*Hibiscus rosasinensis*	Malvaceae	*Aphis craccivora, Aphis gossypii, Aphis spiracola, Myzus persicae, Toxoptera aurantii*
17	*Ichnocarpus frutescens*	Apocynaceae	*Aphis nerii, Aphis spiracola, Rhopalosiphum rufiabdominalis*
18	*Lablab purpurus*	Leguiminosae	*Aphis craccivora*
19	*Mangifera indica*	Anacardiaceae	*Aphis craccivora, Aphis gossypii, Toxoptera aurantii*
20	*Mimosa pudica*	Fabaceae	*Aphis craccivora*
21	*Momordica charantia*	Cruciferae	*Aphis gossypii, Aphis spiracola*
22	*Musa paradisiaca*	Zingiberaceae	*Pentalonia nigronervosa, Tetraneura nigriabdominalis*
23	*Ocimum sanctum*	Lamiaceae	*Aphis gossypii*
24	*Paspalum scorbiculatum*	Poaceae	*Rhopalosiphum maidis*
25	*Pisum sativum*	Fabaceae	*Myzus persicae, Sitobion rosaeformis*
26	*Psidium guajava*	Myrtaceae	*Aphis gossypii, Myzus persicae, Rhopalosiphum rufiabdominalis, Greenidea, Trichosiphum formosana formosana*
27	*Punica granatum*	Punicaceae	*Aphis gossypii, Myzus persicae*
28	*Rosa centifolia*	Rosaceae	*Sitobion rosaeformis*
29	*Saccharum officinarum*	Poaceae	*Aphis nerii, Rhopalosiphum maidis, Rhopalosiphum rufiabdominalis, Sitobion miscanthi, Toxoptera aurantii*
30	*Sesamum indicum*	Pedaliaceae	*Lipaphis erysimi*
31	*Solanum melongena*	Solanaceae	*Aphis gossypii, Lipaphis erysimi*
32	*Solanum nigrum*	Solanaceae	*Aphis craccivora*
33	*Terminalia arjuna*	Combretaceae	*Aphis spiracola, Rhopalosiphum maidis*
34	*Triticum aestivum*	Poaceae	*Rhopalosiphum rufiabdominalis, Sitobion miscanthi*
35	*Veronica cinerea*	Asteraceae	*Toxoptera aurantii*
36	*Zea mays*	Poaceae	*Rhopalosiphum maidis, Sitobion miscanthi, Tetraneura nigriabdominalis*

INSECTS FROM THE *CALOTROPIS GIGANTEA* PLANT IN AND AROUND COASTAL ZONE OF WEST BENGAL

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Calotropis gigantea (L.) W.T. Aiton is commonly known as "milkweed", a native plant of India, grows wild up to 900m throughout the country, on a variety of soils and in different climates, sometimes where nothing else grows. It has been reported that this plant can be used in toothache and earache, sprain, anxiety, pain, epilepsy and in mental disorder. Sikdar et al. (2015) stated that the latex, root and bark of this plant is very harmful for eyes.

Studies on insect association and their role on *Calotropis gigantea* from Assam were made by Saikia et al (2015). However, nothing has been reported on the insect faunal association with this plant species from West Bengal and the coastal belt in particular. Thus, an attempt has been made to identify the insect faunal diversity of this plant species in and around coastal belt of West Bengal.

Coastal zone is the area of interaction between land and sea. West Bengal has a substantially long coastline of almost 325 kilometres (including islands) characterized by high floral and faunal biodiversity, diverse geomorphic features and anthropogenic intrusions (Bhattacharya, 2001; Bhattacharya et al., 2003). The West Bengal coast lies in between 21° 38' N to 22°18' N and 87° 37' E to 89° 8' E along the coast of Bay of Bengal. It is spread over in Purba Medinipur, South 24-Parganas and North 24-Paraganas districts lying on either side of the funnel shaped Hooghly estuary. The coastal belt of Medinipur district represents 27% of West Bengal of coastal tract (60 km) extending along the west bank of Hooghly estuary from New Digha and then curving around Junput, Dadanpatrabar, Khejuri and Haldia on the east to the further north east up to Tamluk or even on the bank of Rupnarayan river (Mandal et al., 2013).

Several surveys have been conducted during 2015-2016 in Tajpur (21°38¹51.490¹¹ N, 87°37¹ 19.111¹¹ E), Contai (21°46¹ 38.7¹¹ N, 87°44.56.1' E), Khejuri (21°52'26" N, 87°58'32" E), Heria (21°57¹30¹¹ N,87°48¹10.586¹¹ E & 21°40¹ 53.3¹¹ N,87°37¹00.3¹¹ E), Kasaria (21°52'19" N, 87°55'56" E), Dakshin Kalagachia (21°48'39" N, 87°55'21" E) Nijkasba (21°47¹37.41¹¹N, 87°53¹35.63¹¹E), Tolla (21°57¹44¹¹ N, 87°49¹21¹¹ E) of Purba Medinipur and Gosaba (22°07¹57.54¹¹ N, 88°49'32.52¹¹ E), Jharkahali (22°03¹ 33¹¹ N, 88°70.193' E), Bali (22°04¹33¹¹ N, 088°42.193' E), Canning (22°18'37.10¹¹N, 88°39¹28.37¹¹E,) and Gangasagar (21°51¹57.06¹¹ N, 88°7¹22.20¹¹ E) of South 24 Paraganas.

Present study reports 14 species belonging to 5 orders of insects from different parts of *Calotropis gigantea* in the coastal belt of West Bengal (Table 1). Of them, Hemiptera

(Contd. on p. 153)

Table1. List of insect species reported from *Calotropis gigantea*.

	Species	Order	Family	Habitat
1	*Balta chopardi* Princis, 1969	Blattodea	Ectobliidae	Stem and under the leaves
2	Unidentified sp.	Coleoptera	Chrysomelidae	Flowers
3	*Platycorynus peregrinus* Herbst, 1783	Coleoptera	Chrysomelidae	Stem, nodes, petiole
4	*Coccinella transversalis* (Fabricius, 1781)	Coleoptera	Coccinellidae	Nodes, petiole, sometimes on leaves
5	*Paramecops farinosus* (Wiedemann, 1821)	Coleoptera	Curculionidae	On and under the leaves
6	*Parasarcophaga* sp.	Diptera	Sarcophagidae	On the leaves
7	*Clovia conifer* (Walker, 1851)	Hemiptera	Aphrophoridae	Nodes, petiole
8	*Cletus punctulatus* (Westwood, 1842)	Hemiptera	Coreidae	Under and above the leaves
9	*Spilostethus hospes* (Fabricius,1794)	Hemiptera	Lygaeidae	Under and above the leaves
10	*Tropidothorax fimbriatus* (Dallas, 1852)	Hemiptera	Lygaeidae	Under and above the leaves
11	*Chrysocoris stolli* (Wolff, 1801)	Hemiptera	Scutelleridae	Under the leaves, above the leaf blade
12	*Eupterote hibisci* (Fabricius,1775)	Lepidoptera	Eupterotidae	Flower and apical bud
13	*Parnara guttatus* (Bremer & Grey, (1852)	Lepidoptera	Hesperiidae	On flower
14	*Ariadne merione* (Crammer, 1777)	Lepidoptera	Nymphalidae	Flower and apical bud

ADDITIONS TO THE MOTH FAUNA (LEPIDOPTERA) OF DISTRICT JABALPUR, MADHYA PRADESH

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District Jabalpur was formerly called Jabbulpore. The word Jabalpur is a combination of Arabic word 'Jabal' means "Rock" and Sanskrit word 'Pur' means "City". Though some people propagate that it was anciently named as Jabalipuram after Saint Jabali, there are no historical, mythological or folklore evidence in support of this. It is one of the most famous cities of Madhya Pradesh. According to the Census of India, 2011 it is the third-largest urban agglomeration in Madhya Pradesh, and the country's 30th largest urban agglomeration. The city is large and growing in all sectors, including one of the major centers for the production of arms and ammunition and one of the famous military bases in India. Besides, administrative headquarters like High Court of Madhya Pradesh, West Central Railway, and army headquarters of five Indian States viz., Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh and Odisha.

The city is also home to the Gun Carriage Factory (GCF). The city is selected as 7th Smart City under Smart City Mission of India. The city is famous for tourism as it attracts tourists across India, even from abroad. Some of the tourist attraction places are Bhedaghat – it provide unique experience, one can find himself/herself mesmerized boating between huge mountains of marble and a beautiful waterfall upstream, Bargi Dam, Dumna Nature Reserve Park, Kachnar city, Tilwara Ghat, Dhuandhar Fall, Rani Durgawati Museum, etc.

The Jabalpur district enjoys typical monsoon climate with three seasons, summer from March to June, rainy season from June to September and winter from November to February. The period from mid-September to October is the post-monsoon period.

Geographically, Jabalpur lies between N 23°10' Latitude and E 79°57' Longitude in the eastern half of Madhya Pradesh in the central region of India, encompassing geographic area of 5211 sq km. It lies in the catchment area of river Narmada, along with its tributaries viz. Hiran, Gour, Ken and Sone. The city is rich in biodiversity, consists of 933 plant species belonging to 585 genera in 139 families (Oommachan & Shrivastava, 1996) and the fauna of Jabalpur district is quite rich and diverse, comprising of 910 species (378 vertebrates and 532 invertebrates) (Chandra, 2008). Among 532 species of invertebrates, moths are one of the important indicator species which designate the habitat disturbance and fragmentation.

While studying the moth composition, attempts have been made to update the moth species known from the district between years 2010 and 2016. The moths were collected with the help of light trap installed at different localities and operated between sunset and sunrise. Moths collected then were studied with the help of identified specimens available at this regional centre and literature like Hampson (1892-1896), and other published research papers. The classification followed here is based on Nieukerken et al. (2011) and Zahiri et al. (2012).

Moths are nocturnal insects, belong to the order Lepidoptera, the second largest group followed by the Order Coleoptera. The diversity of moth species from Jabalpur district has been studied by Chandra et al. (2008) who recorded 42 species belonging to 38 genera in 6 families. Later, Chandra & Nema (2007) added 7 more species. Chandra et al. (2010) recorded 3 more species from this district totalling 52 species belonging to 47 genera in 8 families. In the present study, 22 species belonging to 20 genera in 7 families have been added (Table 1). Thus, a total of 74 species have been recorded till-date.

Acknowledgement: Authors are grateful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata, for providing necessary facilities.

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Table 1. List of moths added from district Jabalpur, Madhya Pradesh.

	Species	Family: Subfamily	Collection locality
1.	*Micronia aculeata* Gueene 1857	Uraniidae: Microniinae	Vijay Nagar, Jabalpur
2.	*Ascotis selenaria* Denis & Schifmuller 1775	Geometridae: Ennominae	Vijay Nagar, Jabalpur
3.	*Trabala vishnou* Lefebvre 1827	Lasiocampidae: Lasiocampinae	Z.S.I. Residential colony, Jabalpur
4.	*Actias selene* Hubner, 1807	Saturniidae: Saturniinae	Z.S.I. Residential colony, Jabalpur
5.	*Acherontia lachesis* Fabricius 1798	Sphingidae: Sphinginae	Z.S.I. Residential colony, Jabalpur
6.	*Daphnis nerii* Linnaeus 1758	Sphingidae: Macroglossinae	Vijay Nagar, Jabalpur
7.	*Macroglossum belis* Linnaeus 1758	Sphingidae: Macroglossinae	Madan Mahal, Jabalpur
8.	*Nephele hespera* Fabricius 1775	Sphingidae: Macroglossinae	Madan Mahal, Jabalpur
9.	*Polyptychus dentatus* Cramer 1777	Sphingidae: Smerinthinae	Z.S.I. Office premises, Jabalpur
10.	*Arctia ricini* Fabricius 1775	Erebidae: Arctiinae	Z.S.I. Residential colony, Jabalpur
11.	*Creatonotos gangis* Linnaeus 1763	Erebidae: Arctiinae	Z.S.I. Residential colony, Jabalpur
12.	*Cyana perigrina* Walker 1854	Erebidae: Arctiinae	Z.S.I. Residential colony, Jabalpur
13.	*Dasychira mendosa* Hubner 1823	Erebidae: Lymantriinae	Near Bargi Dam, Jabalpur
14.	*Digamma hearseyana* Moore 1859	Erebidae: Aganainae	Madan Mahal, Jabalpur
15.	*Eudocema materna* Linnaeus 1767	Erebidae: Erebinae	Madan Mahal, Jabalpur
16.	*Euproctis fraterna* Moore	Erebidae: Lymantriinae	Z.S.I. Residential colony, Jabalpur
17.	*Euproctis lunata* Walker 1855	Erebidae: Lymantriinae	Z.S.I. Residential colony, Jabalpur
18.	*Euproctis similis* Fuessly 1775	Erebidae: Lymantriinae	Z.S.I. Residential colony, Jabalpur
19.	*Pandesma anysa* Guenee 1852	Erebidae: Erebinae	Z.S.I. Residential colony, Jabalpur
20.	*Syntomoides imaon* Cramer 1779	Erebidae: Arctiinae	Z.S.I. Residential colony, Jabalpur
21.	*Agrotis biconica* Kollar 1844	Noctuidae: Notuinae	Z.S.I. Residential colony, Jabalpur
22.	*Leucania loreyi* Duponchel 1827	Noctuidae: Hadeninae	Z.S.I. Residential colony, Jabalpur

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(b.f. from p. 151)

shares highest number of species (5 species & 5 genera) followed by Coleoptera (4 species & 4 genera), Lepidoptera (3 species & 3 genera), Diptera (1 species & 1 genus) and Blattodea (1 species & 1 genus) (Table 1).

Acknowledgements : Authors are thankful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata for providing necessary facilities. Authors are expressing their sincere gratitude to Dr. Bulganin Mitra, Former Scientist-C, Zoological Survey of India, Kolkata for his constant support and encouragement. Authors are also grateful to Shri Sujit Kumar Ghosh, Shri Swapan Kumar Das and Shri Suresh Kumar Shah, Zoological Survey of India, for helping in identification of the materials.

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R.N.I. Registration No. 71669/99 *BIONOTES* Counter Price of this Copy—₹20.00

Vol. 19, Year 2017
(Mar / June / Sep / Dec)

Published and printed by Dr. R.K. Varshney, address : A Biologists Confreric, Raj Bhawan, Manik Chowk, Aligarh. Type setting and printed by Mahima Compu-Printers, Avanti Bai Chauraha, Vatsa Palace, Agra Road, Aligarh. Editors : Dr. R.K. Varshney and Prof. S.K.Saxena.