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**SOCIETY OF MEDICAL ARTHROPODOLOGY: PHILOSOPHY AND OBJECTIVES, AND
THE SCIENCE OF MEDICAL ARTHROPODOLOGY**

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This is an irony that even after more-than-a century of birth the science of medical arthropodology continues to be appreciated and taught in universities all over the world under a wider umbrella of globally recognized discipline of Medical Entomology, albeit the latter being only a branch of the mother science, Medical Arthropodology which comprises, besides medical entomology, also medical acarology, medical myriapodology and medical carcinology. Despite the fact that vectors of human and animal diseases and pests of varied distresses are distributed among all four major classes of Arthropoda, it is however generally the discipline of medical entomology which grabs the centerstage of attention in both university and medical college syllabi, and the non-insectan arthropods such as mites and ticks (medical acarology), which are often serious disease transmitters, are but marginally explained. Medical arthropodology, the mother science at the phylum level, originated when Manson (1878), serving as a medical officer in Taiwan, first hypothesized about the relationship between human lymphatic filariasis and the mosquito, *Culex pipiens*, giving *per se* birth to the great science of 'medical entomology'. Sooner Ross (1897; Tyagi et al., 2020), while serving in British India Medical Service in Secunderabad, discovered for the first time the inextricable link between mosquito (possibly *Anopheles stephensi*) and malaria, and Grassi (1898), a renowned scientist and academician in Italy, independently and unequivocally demonstrated that it was anopheline mosquitoes (*Anopheles sacharovi* and *An. stephensi*) which transmitted the human malaria parasites. These epochal events helped establish the new and novel discipline of medical entomology, a daughter discipline under yet-to-be-born 'medical arthropodology', much in advance! On the other hand, it took some years following Manson's discovery before a non-insectan arthropod, a tick (Acarina; 'medical acarology'), could be pinpointedly associated with an animal where after only, with a comprehensive understanding of the various classes under the phylum, the mother science, "medical arthropodology", was born at the phyletic level, much belatedly though (Table 1).

Table 1. Important arthropod vectors and chronological details of incrimination by disease pathogens they transmit in humans and animals

Human/ animal disease	Pathogen(s) involved	Vector(s) involved	Year of Vector incrimination	Country of Discovery	Authority
Filariasis	<i>Wuchereria</i> and <i>Brugia</i> spp.	Mosquitoes	1886	Taiwan, China	Manson
Texas cattle fever	<i>Babesia gemina</i>	Tick	1891	N. America	Smith & Killbourne
Nagana disease in cattle	<i>Trypanosoma</i> spp.	Tsetse flies	1895	Africa	Bruce
Malaria	<i>Plasmodium</i> spp.	Anopheline mosquitoes	1897	India	Ross
Avian malaria	<i>Plasmodium</i> ?	Mosquitoes	1898	India, UK	Ross
Plague	Bacterium (<i>Yersinia pestis</i>)	Fleas	1898	Karachi (earlier in India, now in Pakistan)	Simond
Human malaria cycle	<i>Plasmodium</i> sp.	Anopheline mosquito (<i>An. sacharovi</i> and <i>An. stephensi</i>)	1898	Italy	Grassi, Bignami and Bastianelli
Yellow fever	Togavirus	Mosquitoes (<i>Aedes aegypti</i>)	1990	Cuba	Finlay/Reed, Carroll, Lazear and Agramonte
Americal Sleeping sickness	<i>Trypanosoma</i> spp.	Tritomine bugs	1895 1908	S. America S. America	Bruce Chagas
African sleeping sickness	<i>Trypanosoma</i> spp.	Tsetse flies	1903	Africa	Bruce & Nabarrow
Dengue	Flavivirus	Mosquitoes	1906	Africa	Graham
Fowl spirochaetes	Spirochaetes (<i>Borrelia conserina</i>)	Tick (<i>Argus persicus</i>)	1903		Marchoux & Salimbeni
Relapsing fever	Bacteria of the genus <i>Borrelia</i>	Lice	1907	Africa	Mackie
Onchocerciasis	<i>Onchocerca</i> spp.	Blackflies	1926	Sierra Leone	Blacklock
Encephalitides	Virus/Bacteria	Mosquitoes, Ticks	1930-1990	Various countries	Various scientists
Zika	Zika Virus	<i>Aedes africanus</i> ; Later mainly <i>Ae. aegypti</i> and <i>Ae. albopictus</i>	1948	Africa	(cf. Dick GW, Kitchen SF, Haddow AJ., 1952).
Chikungunya	Chikungunya Virus	<i>Aedes aegypti</i> and recently <i>Aedes albopictus</i>		Africa	(cf. Ross, R.W., 1956)

Medical Arthropodology is an incredibly exciting discipline integrally associated with public and veterinary health. The Phylum Arthropoda bears within its folds the largest number of species (and individuals) under single specific group of animals that impact human lives either by acting as the vectors for a large number of deadly or debilitating diseases, and as the pest causing loss of tranquility through their bite and sting. They also offer an unfathomable source of novel biomedical, pharmacological and bioengineering products much of which remains to be explored to a very great extent. The concept of medical arthropodology, i.e., exploring and utilizing arthropods for biomedical significance, as the core contributor to public/veterinary health, biomedicine and bio-engineering, is a completely novel and innovative thesis which forms the foundation of Society of Medical Arthropodology. Conventionally the subject of medical arthropodology has been comprehended to deal with only the harmful aspects of arthropod life in public and veterinary health, albeit their infinitely beneficial traits to enhance quality human life. This *de novo* thesis of broad spectrum medical arthropodology make our life interdependent with arthropods as the most voluminous (both in terms of species and individuals) animal group to focus on and extract comprehensively their unique inherent as well as acquired traits of supremacy in time and space that makes arthropods so special a source!

The whole animal kingdom is organized into invertebrates (3-30 million species) and vertebrates (47,000 species); the former constituting over 95% of all animals on the earth. Invertebrates are important in the functions and processes of most ecosystems. They are spectacular, abundant and diverse. They include the Giant Squid (a mollusc) at 18m long and gall mites (an arthropod) which are less than 0.25mm long. There are eight phyla of invertebrates: Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda, and Echinodermata. Over 80% of all invertebrates are grouped into the single phylum Arthropoda that includes insects (six-legged), acarids (eight-legged), crustaceans, and centipedes and millipedes (multiple-legged). Insects, arachnids, and other terrestrial arthropods are important because together they comprise at least 75% of all the species of animals in the world now known to science. Estimates of the actual number of insects and related forms now living range from 3-30 millions; therefore, whatever the total, a great deal of scientific information on life comes only from invertebrates or more precisely the arthropods, the jointed-legs. The dominance of arthropods, particularly insects and arachnids, among the world's animals is a fundamental scientific insight, yet one not widely appreciated in biomedicine. This dominance means that in numbers of species beyond our comprehension these animals permeate diverse and essential natural processes in Earth's terrestrial, aerial and freshwater ecosystems, contributing to the function of the natural world as a self-sustaining biological system. Arthropods are, in fact, an integral and complex part of the terrestrial and freshwater ecosystems with which the future of humans is inextricably linked; therefore having *au fait* about the eco-biological relationships of these animals is a practical necessity.

In the Phylum Arthropoda, insects are generally understood to be the most significant creatures due largely to their remarkable structural and behavioural diversity as well as stupendous number of species; presumably there exist over 2 million described species of insects in the world with possibly several millions still remaining to be described. Born some 400 million years ago in the time-scale, insects have of course achieved, to the utter envy of

all other arthropods, a formidable diversity on Earth so much so that they have virtually stolen the entire show and captivated human attention for centuries. Due to these facts, the eminence of the phylum Arthropoda among animals has also been conventionally thought very much a reflection of the supremacy of insects alone! This is, however, not absolutely true largely due to the bare fact that we have comparatively negligible understanding about such extensively diversified and medically significant non-insect arthropods like spiders, scorpions, mites, ticks, centipedes and millipedes etc. which present, if not as hugely diversified biology as that of insects, a quaintly mystified and much less explored world of information that at times seems to surpass even the genius of insects! A fair insight into public health and biomedical importance of arthropods outside class Insecta would thus reveal that many of them have immense value to human being, particularly from the public health viewpoint.

It is widely acknowledged that some arthropods are dangerous vectors of diseases and or cause much vexation by their sting, bite as well as associated envenomation and injuries. They affect all strata of social groups and both sexes, yet perhaps it is the health of children and women which is most severely affected, both physically and mentally. Vector-borne diseases are particularly rampant in tropical and subtropical countries, and do not limit to only poor or developing nations since many of the developed countries including United States of America and those in Europe are today threatened by some of the most deadly and/or debilitating infections. List of these infections is pretty long, however, as far as India is concerned, seven diseases namely malaria, filariasis, dengue, chikungunya, Zika, Japanese encephalitis and leishmaniasis are considered major public health problems. Emergence and/or re-emergence of some of the vector-borne diseases has been a great worry in India, though a few others are on way to be eradicated/eliminated. With the re-emergence of flea-borne plague disease, as an epidemic after a gap of nearly three decades, in Maharashtra and Gujarat states during 1994, the disease has further spread in some northern states like Himachal Pradesh etc., whereas chigger mites-borne scrub typhus or 'tsutsugamushi disease' has in recent years already assumed an alarming proportion across most states of the country. Similarly, visceral leishmaniasis (VL) is threatening to emerge in States like Kerala, hitherto a *terra incognita* for the infection. More strikingly, *Aedes albopictus*-borne dengue emerged *de novo* in Kerala in mid-1990s, and so did chikungunya in 2006. On the other hand, much to the celebration of the nation, dracunculiasis or guinea-worm disease, an arthropod (copepod)-borne infection of great public health significance, was eradicated in 1999, while at least two of the major arthropod (mosquito)-borne diseases, malaria and filariasis, are targeted for elimination before 2030!

While vector-borne diseases hog most of the government and public attention due solely to heavy morbidity and mortality among humans and animals, very little indeed is known about the injurious arthropods especially in Indian context. Therefore, it will not be surprising to acknowledge the fact that when spider bite-related deaths were reported recently in plantain fields in Assam during 2012 there was an utter confusion on this subject since in past no spider bite was ever related to death in India, or how many of us will appreciate knowing that tabanid flies can potentially transmit anthrax, the deadly bacterium, or some species of edible crabs are the vectors of trematode lung flukes, *Paragonimus*, to inflict integumentary

and respiratory disorders in human! Further, it is needless to re-emphasize that, in the changing food security challenges all over the world, the news that several arthropods (both insects and allies) can serve as a humongous source of food (highly enriched in protein and minerals) to humans! There are over 1,900 known species of arthropods that are edible to humans. Some of the more popular insects and arachnids eaten around the world include crickets, cicadas, grasshoppers, ants, beetle grubs, silkworms, centipedes, scorpions, crabs etc. Crustacean arthropods like crabs, lobsters and shrimp are already a delicacy the world over. Recent assessments of the potential of large-scale entomophagy have led some experts to suggest entomophagy as a potential alternative protein source to animal livestock, citing possible benefits including greater efficiency, lower resource use, increased food security, and environmental and economic sustainability. Interestingly there was already a move to this novel philosophy at the international horizon as the first international conference "*Insects to feed the world*" was organized recently at Wageningen UR, The Netherlands in 2014, to popularize insects for feed (to animals) and food (to human being) as viable solutions for the protein deficit problem across the world.

With above information in mind, a group of medical arthropodology enthusiasts launched the Society of Medical Arthropodology in 2016 (www.soma16.org) with the following;

MISSION: *To enhance knowledge of arthropods of public health and veterinary importance so as to be able to develop effective tools for their control as well as the diseases and other infirmities caused/transmitted by them, and*

VISION: *To make public and animal life free from arthropod-borne infestation, disease and/or parasites – for a better global health and economy.*

The practical recognition to Medical Arthropodology came with the annually organized conferences in India since 2007 (<https://en.wikipedia.org/wiki/Arthropodology>) (Tab. 2).

Table 2. Chronological display of the SOMA Conferences organized so far.

S.N o	Conference	Venue	Year
1	1 st National Conference of Medical Arthropodology	Madurai, TN, India	2007
2	2 nd National Conference of Medical Arthropodology	Madurai, TN, India	2008
3	3 rd National Conference of Medical Arthropodology	Madurai, TN, India	2009
4	4 th National Conference of Medical Arthropodology	Madurai, TN, India	2010
5	5 th National Conference of Medical Arthropodology	Madurai, TN, India	2011
6	6 th National Conference of Medical Arthropodology	Madurai, TN, India	2012
7	7 th National Conference of Medical Arthropodology	Tezpur, Assam, India	2013
8	8 th National Conference of Medical Arthropodology	Tirunelveli, TN, India	2015
9	9 th National Conference of Medical Arthropodology	Hyderabad, Telangana, India	2016
10	10 th National Conference of Medical Arthropodology	Kolkata, West Bengal, India	2017
11	11 th National Conference of Medical Arthropodology	Dehradun, UK, India	2018
12	12 th National Conference of Medical Arthropodology	Kolkata, West Bengal, India	2019

In essence, the SOCIETY OF MEDICAL ARTHROPODOLOGY (SOMA) is a unique scientific association devoted to the enhancement of knowledge in totality about their biomedical,

pharmacological, bioengineering and nutrition aspects to bring under one single umbrella all the possible public/veterinary health and biomedical significance of arthropods.

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A REPORT ON THE SOMA'S 12TH NATIONAL CONFERENCE OF MEDICAL
ARTHROPODOLOGY (KOLKATA; 25-26 NOVEMBER, 2019)
&
MINUTES OF THE 3RD GENERAL BODY MEETING

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The 12th National Conference of Medical Arthropodology (SOMA) was held at the Zoological Survey of India, Kolkata on Nov. 25-26, 2019. The 3rd General Body Meeting of the SOCIETY OF MEDICAL ARTHROPODOLOGY (SOMA) was held on 26th November, 2019, at 9.30 pm, and the following SOMA executive members and other participating arthropodologists attended:

- | | |
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Earlier, on 25th November, the Registration desk for conference opened up at 9 am and the Inauguration commenced at 10 am, with Dr Kailash Chandra, Director, ZSI, Prof. Dr B.K. Tyagi, President, SOMA, Dr Sanyal, Rtd. Jt. Director, ZSI, Prof. Dr B. Reddy Naik, Secry. General, SOMA and Dr Raghunathan, Jt. Director, ZSI seated on the dias (Fig. 1). More than 125 participants attended the conference (Fig. 2).



Figs. 1,2. SOMA's 12th National Conference was organized in ZSI, Kolkata on Nov. 25-26, 2019.

After welcoming gesture to all the participants by the Director, ZSI, the SOMA President (Prof. B.K. Tyagi) introduced about the objectives of the Society (Fig. 3).



Figs.3,4. Dr Kailash Chandra, Director, ZSI welcoming Prof. B.K. Tyagi, President, SOMA who also offered the Presidential address.

Various SOMA Awards and Prizes were given away to the distinguished scientists/medico-arthropodologists (Figs. 5-20), as follows:

1. SOMA Lifetime Achievement Award Dr Kailash Chandra
2. Prof. T.N. Ananthakrishnan Award Prof. Aparna Dutta Gupta &
Prof. N. Chandrasekaran
3. Dr V.P. Sharma Award Prof. Devinder Kaur Kocher &
Dr. D.S. Suman
4. SOMA Young Scientist Award Dr. Souvik De &
Dr Rashmi Bhattacharya

Three Awards/Prizes (carrying cash) intituted by a group of medicaio-arthropodologists in memory of their parents were also given away to worthy winners, as follows:

1. Dr R.S. Sharma's "**Dr H.G. Sharma & Mrs. Kanti Devi Award**" for Medical Entomology. Dr Himmat Singh
2. Dr P.K. Srivastava's "**Vijayshree Award**" for innovative approaches in elimination of lymphatic filariasis. Dr Sagya Singh
3. Prof. Dr B.K. Tyagi & Mrs Ajita Tyagi's Dr Sambashiva Daravath
"**Tyagi Prize**" for novel basic research
In medical arthropodology.

The SOMA took the opportunity to announce and give away certificates to worthy medicaio-arthropodologists the title of Fellow of the Society, 'FSOMA', following a decision taken at the 2nd SOMA Executive Council/General Body Meeting held in the framework of the 11th National Conference of Medical Arthropodology held at the Zoology Department, DAV (PG) Coll., Dehradun on Oct. 26-27, 2018. Currently the total SOMA membership is as follows:

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Figs. 5-7. Felicitation of dignitaries during the 12th SOMA Conference.





Figs. 8-18. SOMA Awards distribution ceremony during the 12th SOMA Conference.

On this occasion, two books, namely (i) **Dr Ronald Ross: mosquito, malaria, India and the Nobel Prize – an untold story of the first Indian Nobel laureate** (authored by: Drs B.K. Tyagi, Sajal Bhattacharya and B. Reddy Naik), and (ii) **Biobibliography of Dr R.S. Sharma: a malarialogist and vector control expert nonpareil** (authored by: Dr B.K Tyagi) as well as some new vector control products developed by the ZSI were released (Figs. 4-20).



Fig. 19-20. Release of SOMA's two books and the ZSI's innovation products during the 12th SOMA Conference.

On the morning of 26th November, the proceedings of the conference began with the SOMA Executive Council/General Body's Plenary Business Meeting at 9.30 am. Dr Tyagi initiated the Meeting by thanking the Organizers, particularly Dr Kailash Chandra, Convener, and his entire team of highly efficient scientists, as well as technical and supportive staff and research scholars for their unparalleled kindness, generosity, camaraderie, support and guidance showered on the participants throughout their sojourn in Kolkata and the conference. He was ecstatic about how the 12th NCMA had nurtured many memorable moments which would remain ingrained in participants' mind for a long time to come. He reminded that the conference had put forward many novel subjects for discussion and the interest shown by participants (>100), especially students and young researchers, was unparalleled in the annals of SOMA conferences. Highlights of the conference included:

- (i) Dr Tyagi recounted by citing reference to the google search that the SOMA is the only scientific society worldwide which has been organizing conferences of medical arthropodology regularly annually (the 1st conference was organized in 2007) (*cf.* <https://en.wikipedia.org/wiki/Arthropodology>). The 12th SOMA Conference has not only surpassed all previous editions in attendance of participants but also proved to be one of the most successful event thus far. All participants gave full support for its novel, innovative and timely approach.
- (ii) A total of 108 Abstracts were received and printed in an exquisite Abstracts Booklet (134 pp.). (Fig. 21)



Fig. 21. Abstracts book of the 12th SOMA Conference.

- (iii) Quite many participating researchers hailed from as many as 12 States/UTs, such as Delhi, Punjab, Rajasthan, West Bengal, Maharashtra, Patna, Haryana, Telangana, West Bengal, Kerala, Tamil Nadu, Jharkhand, Madhya Pradesh etc.
- (iv) First time in the history of science of medical arthropodology 07 prominent Awards and/or Prizes were given away at a conference, incl. a Citation with a Medallion, or prize/award money (*vide supra*).
- (v) After having been formally registered as SOCIETY OF MEDICAL ARTHROPODOLOGY (S.O.M.A.) on 1st March, 2017, it has now commissioned uninterruptedly its Third Executive Council - General Body Meeting here during the 12th NCMA (2019) which is in order since inception of the foundation of the society.
- (vi) A total of 58 lectures, including 10 Keynote/Plenary lectures, were delivered attracting huge interest from audience, particularly younger generation.
- (vii) Release of a research book on Dr Ronald Ross (authored by Drs B.K. Tyagi, Sajal Bhattacharya and B. Reddy Naik), a bio-bibliography of Dr R.S. Sharma (authored by Dr B.K. Tyagi), and, more importantly, a new product for vector control by the ZSI made a novel and unique feature of the SOMA conference.
- (viii) Dr Kailash Chandra, Director, ZSI, Kolkata & Convener, 12th NCMA handed over the newly designed SOMA plaque - as a token of responsibility of organizing the next Conference – to Dr D.S. Shiva, Assistant Professor & i/c Head, Deptt. of Biotechnology, Nizam College, Hyderabad in 2020. Dr Shiva cheerfully announced that the next conference will be an international one which all the participants lauded with full support for this grand development in the SOMA. The First International Conference of Medical Arthropodology will be held on Nov. 26-28, 2020.

Dr Tyagi finally summarized the activities of the SOMA whereupon the SOMA Executive Council/odonatologists approved the following recommendations:

1. The SOMA Constitution and By-Laws, with Minutes of the 11th NCMA, were duly approved.
2. The current Membership Fees Plan was re-visited and approved.
3. The four SOMA Awards, i.e. (i) SOMA Lifetime Achievement Award, (ii) Prof. Dr T.N. Ananthakrishnan, (iii) Prof. Dr V.P. Sharma, and (iv) SOMA Young Scientist Award were duly approved for future conferences. Along with these three personally instituted Awards/Prizes, i.e., (i) Dr R.S. Sharma's "*Dr H.G. Sharma & Mrs. Kanti Devi Award*" for Medical Entomology, (ii) Dr P.K. Srivastava's "*Vijayshree Award*" for innovative approaches in elimination of lymphatic filariasis, and (iii) Prof. Dr B.K. Tyagi & Mrs Ajita Tyagi's "*Tyagi Prize*" for novel basic research in medical arthropodology, were also approved.
4. Prof. Tyagi explained the reasons for lagging behind in bringing out the open access annual e-periodicals, *JOURNAL OF MEDICAL ARTHROPODOLOGY* and the semiannual, SOMA Newsletter, during 2019, as planned earlier during the 11th Conference, and urged to revisit the entire Editorial Board to make journals a reality as follows, with the approval of the participants, subject to annual review of satisfactory performance by those involved (by Prof. B.K. Tyagi, Dr Kailash Chandra, Dr Vijay Veer, Dr Rina Tilak and Prof. B. Reddy Naik).

(1) JOURNAL OF MEDICAL ARTHROPODOLOGY

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(2) SOMA Newsletter

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5. The frequency of SOMA Conferences at annual level will continue till at least 15th Conference where its suitability will be reviewed [preferably the 13th National/1st International Conference at Deptt. of Biotechnology, Nizam College, Hyderabad in 2020 (Dr D. Sambashiva); 14th at Deptt. of Zoology, School of Life Science, IGNOU, Delhi in 2021 (Prof. Neera Kapoor); 15th Deptt. of Zoology, MLS Univ., Udaipur in 2022 (Prof. Arti Prasad); and 16th at Zool. Deptt., Asutosh College, Kolkata in 2023 (Dr Sajal Bhattacharya). Dr Karimbhai Meredia and Dr M. Ruth encouraged to have a conference overseas possibly in Uganda whereupon Dr Ruth would like to coordinate. Professor Tyagi is in correspondence.
6. Dr B.K. Tyagi was unanimously elected to continue to function as the 'Chairman of the Standing Committee for Organization of the National/International Conferences of Medical Arthropodology'.
7. In accordance with the suggestion during the 11th SOMA Conference (Kolkata, 2017) that all arthropodologists who become Life Member by paying fees by Dec. 31st, 2018, should become entitled for "FSOMA" - Fellow of the Society of Medical Arthropodology, duly endorsed by a communication duly attested by its President and the Secretary General of the Society, the following arthropodologists (subject to Secretary General's verification of having paid the Life Membership Fee) were elected FSOMA:
 1. Prof. B.K. Tyagi, SOMA, Dehra Dun
 2. Dr Vijay Veer, Ex-DRDO, Dehra Dun,
 3. Dr Kailash Chandra, ZSI, Kolkata
 4. Prof. B. Reddya Naik, OU, Hyderabad
 5. Dr. Rina Tilak, AFMC, Pune
 6. Prof. Neera Kapoor, IGNOU, Delhi
 7. Dr Sajal Bhattacharya, AC, Kolkata
 8. Dr R.K. Jauhari, DAV Coll., Dehra Dun
 9. Dr R.S. Sharma, ICMR, New Delhi
 10. Dr P.K. Srivastava, Ex-NVBDCP, Delhi
 11. Prof. Karimbhai Meredia, MSU, USA
 12. Dr M. Ruth, MSU, USA
 13. Dr Varun Tyagi, DRL, Tezpur
 14. Dr D.S. Suman, ZSI, Kolkata
 15. Dr A. Daniel Reagan, NVBDCP-ROHF, Bengaluru

The relevant e-certificates are being formulated.

8. Organization of the 13th SOMA Conference which will be SOMA's 1st International Conference on Medical Arthropodology, will be held in Nizam College, Hyderabad (Convener: Prof. Dr B/. Reddya Naik; Org. Secry.: Dr D. Sambashiva) was approved and the SOMA Plaque was passed to Dr Shiva by Dr Kailash Chandra with a formal announcement (Fig. 22).
9. A SOMA website (www.soma16.org) was inaugurated by Dr Kailash Chandra, Director, ZSI, while Prof. Tyagi lauded the efforts of Prof. Reddya Naik and his students including Dr Shiva and Mr Siddaiah in constructing the website so elegantly.



Fig. 22. Transfer of plaque of SOMA's insignia from Dr Kailash Chandra, Director, ZSI & 12th SOMA Conference Convener to Dr Sambashiva, the Org. Secry. for the SOMA's 1st International Conference (Hyderabad; Nov. 26-28, 2020).

10. A SOMA document describing its history, objectives and achievements as well as future programmes will be tabled during the SOMA's 1st International/13th National Conference (Hyderabad, 2020).
11. Dr R.S. Sharma and Dr P.K. Srivastava donated Rs. 1,00,000 (Rs. One Lakh only) and Rs 50,000 (Rs Fifty Thousands), respectively, to the SOMA for giving away annually or biennially an Award (with a commensurate prize money accrued as a bank interest in course) to a medical entomologist in the memory of their parents. The money was already deposited to SOMA account. Prof. Tyagi also institutionalized the "Tyagi Prize" and made an arrangement to pay during each annual/biennial a fixed amount (not less than Rs. 5000.-), in the memory of his parents & parents in-laws.
12. In accordance with the desire of Prof. Karimbhai Meredia to take the future SOMA conferences to other countries in which case Dr Ruth would coordinate with her African links who actually put me in touch with Dr. Louis Mukwaya – the Ugandan face spearheading the anti-mosquito war and the most renowned malaria researcher in the country, Dr Tyagi is undertaking correspondence with the concerned to find out future possibilities to organize conferences overseas. All SOMA Council members were quite happy with the move and wanted to explore the possibilities.

The Meeting concluded with a Vote of Thanks, and with the resolve to meet again in Hyderabad during the 13th SOMA Conference.

CAN WE RESOLVE THE MYSTERY OF SIBLING SPECIES CONCEPT OF ANOPHELES CULICIFACIES MOSQUITO USING MORPHOLOGICAL CHARACTERS?

Dr Varun Tyagi

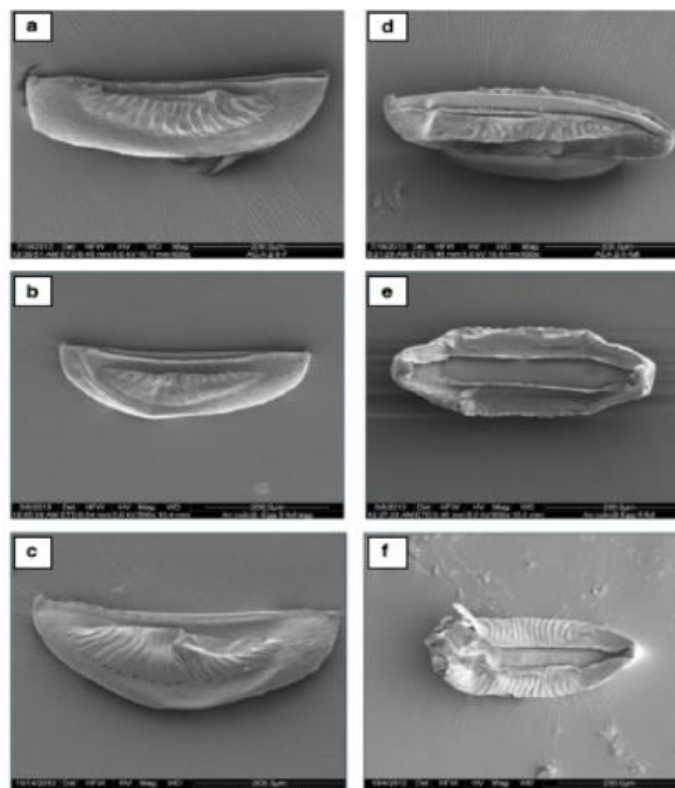
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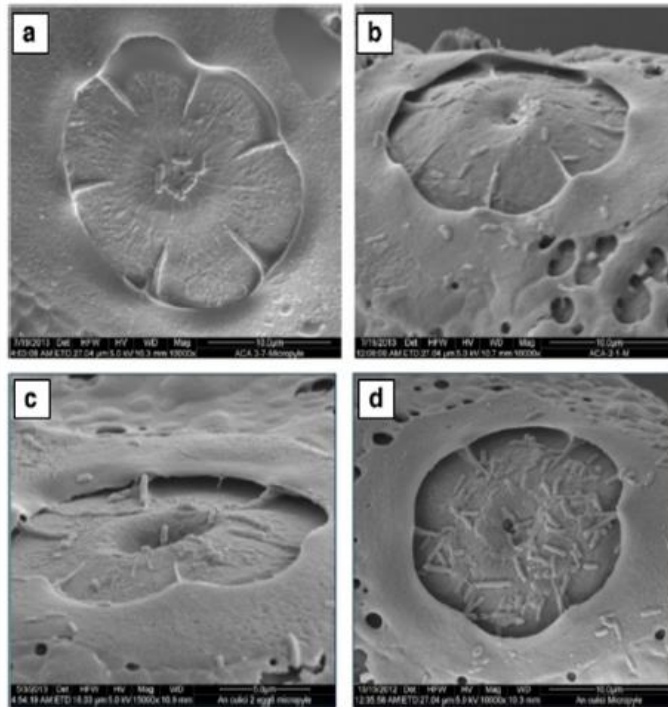
Indian Defence Forces face enormous problems in the frontier areas and difficult terrains rife with malaria and other vector-borne diseases. Proper identification of vector species is required before its management and control. The main vector of malaria, *Anopheles culicifacies* is a sibling species complex and poses great practical difficulties during vector control campaigns. In this brief note an attempt is made to distinguish various sibling species under the complex using morphological characters of eggs.

Anopheles culicifacies is an important malaria vector in Southeast Asia and the sibling species complex comprises five cytologically named taxa, namely A, B, C, D and E. While some of the sibling species are a good vector others do not play any role in the disease transmission. Therefore, it is important to have a proper identification of the taxa before executing their control.

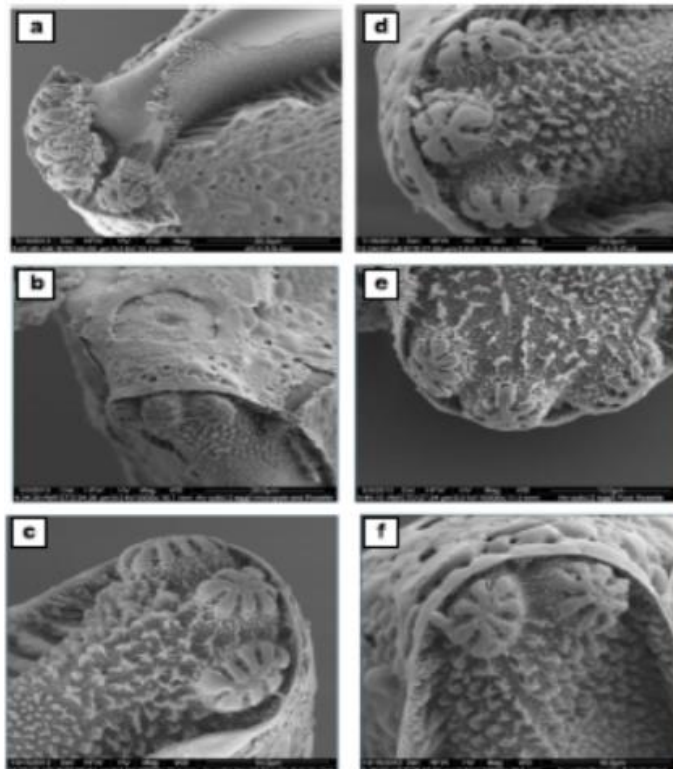
Eggs of three sibling species of *An. culicifacies* (A, D and E) collected from Madhya Pradesh were studied with Scanning Electron Microscopy (SEM) (Fig.1).



Whole eggs of *An. culicifacies* a,b,c- lateral aspect showing egg length and float of *An. culicifacies* sibling species A,D and E respectively; d,e,f- ventral aspect showing deck area of *An. culicifacies* sibling species A,D and E



**Micropyle disc of Eggs of *An. culicifacies* sibling species:
a,b: Species A; c: Species D; d: Species E**



Rosette tubercles of Eggs, a,b,c: anterior rosette tubercles of *An. culicifacies* sibling species A,S and E respectively; d,e,f: posterior rosette tubercles of *An. culicifacies* sibling species A,D and E respectively

Fig.1. Different regions of eggs (Scanning Electron Microscope Images) of *Anopheles culicifacies* sibling species A, D and E. (Source: Varun Tyagi et al. 2016).

Comparative description of eggs of *An. culicifacies* sibling species A, D and E showing morphological differences is given below in the Table 1.

Table.1. Comparative description of eggs of *An. culicifacies* species A, D and E showing morphological differences (*Source*: Varun Tyagi et al. 2016).

	<i>An. culicifacies</i> 'A'	<i>An. culicifacies</i> 'D'	<i>An. culicifacies</i> 'E'
Ventral and dorsal surface	Ventral surface concave, dorsal surface curved	Ventral surface concave, dorsal surface strongly curved	Ventral surface slightly concave, dorsal surface curved
Anterior and posterior ends	Anterior and posterior ends blunt, sometimes pointed	Anterior end blunt, posterior end slightly pointed and sometimes Blunt	Anterior end blunt, posterior end slightly pointed, sometimes blunt
Anterior lobed ventral tubercles	Usually oval	Usually oval or oblong, but occasionally round	Usually oval or oblong
Posterior lobed tubercles	Similar in structure to anterior lobed tubercles	Similar in structure to anterior lobed tubercles	Similar in structure to anterior lobed tubercles but sometimes found to be round
Number of antero-ventral tubercles	3-7	2-3	3-4
Number of postero-ventral tubercles	1-2 No. less from No. of antero-ventral tubercles	2-3 (Similar in No. to No. of antero-ventral tubercles	Only 1 No. less from No. of antero-ventral tubercles
Micropyle	Outline of micropylar collar irregular in shape and well developed	Micropylar collar irregular in outline, with smooth surface	Outline of micropylar collar irregular in shape, with slight striations
Number of sectors of micropylar disc	Bigger micropyle with 6-7 sectors	Only 6 sectors	Only 6 sectors
Floats	Short and closer to ventral than dorsal surface	Relatively short and narrow in dorso-ventral plane	Relatively long and wide in dorsoventral plane
Deck	Continuous, slightly narrows at middle of float, anterior part of deck usually as wide as posterior part	Continuous, anterior part of deck usually wider than posterior part	Continuous and anterior part of deck usually wider than middle part

References Cited

Varun Tyagi, A.K. Sharma, Sunil Dhiman, A.R. Srivastava, Ruchi Yadav, D. Sukumaran, O. P. Agrawal, Vijay Veer (2016). Malaria vector *Anopheles culicifacies* sibling species differentiation using egg morphometry and morphology. *Parasite & Vectors*. 9 (202): 1-13.

PROMOTIONS AND APPOINTMENTS

(1) The following colleagues have been engaged at the NCDC on re-employment basis during April, 2020:

- (i) Dr. Shashi Khare, Ex-Addl. Director
- (ii) Dr W.D Bhutia, EX-CMO
- (iii) Dr R.S. Sharma, Ex-Addl. Director
- (iv) Dr R.S. Rawat, Ex-Joint Director
- (v) Dr Arvind Rai, Ex-Joint Director
- (vi) Dr L.J. Kanekar, Ex-Joint Director

(2) The following colleagues have been promoted to the Scientist 5 level during May, 2020:

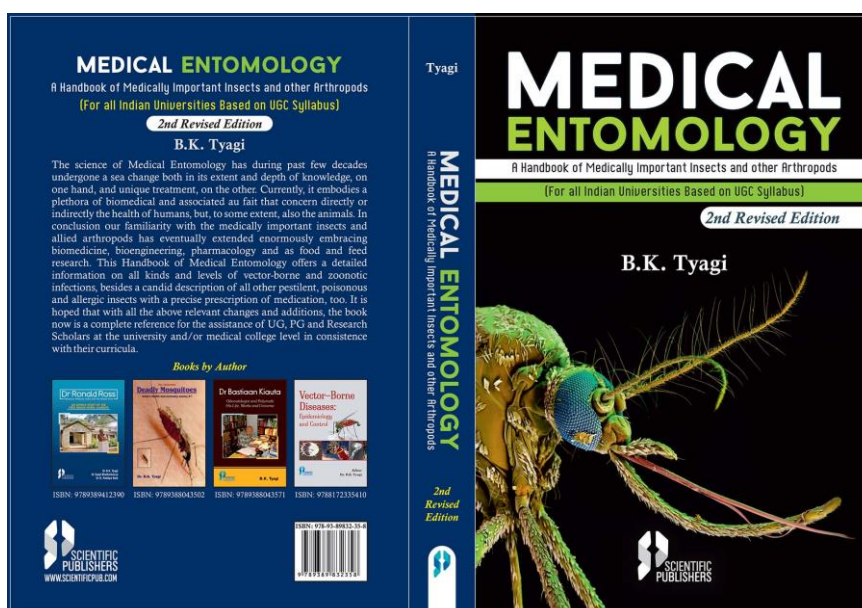
- (i) Dr Ram Singh, NCDC
- (ii) Dr Kalpana Baruah, NVBDCP
- (iii) Dr K. Regu, NCDC

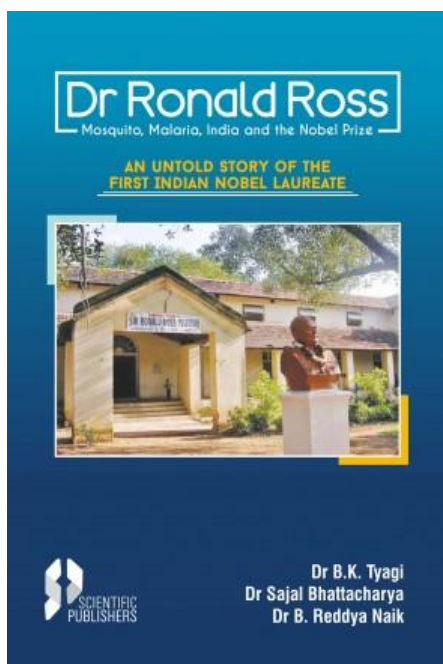
The medico-arthropodological fraternity wish them all heartiest Congratulations!

BOOKS PUBLISHED

(1) Prof. Dr B.K. Tyagi' book (2nd revised edition), "MEDICAL ENTOMOLOGY" (2020) will hit the stand shortly.

(2) A book "Dr Ronald Ross: mosquito, malaria, India and the Nobel Prize - an untold story of the first Indian Nobel Laureate" (Authored by: Dr B.K. Tyagi, Dr Sajal Bhattacharya and Dr B. Reddy Naik) was out in January, 2020.





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NEWS

- (1) The SOMA will be shortly organizing a webinar in lieu of the planned 1st International/13th National Conference of Medical arthropodology during Nov. 2020, in view of the ongoing onslaught by the COVID-19. The Conference will now take place on Aug. 19-20, 2021; a circular will follow shortly.
- (2) A book titled "MEDICAL ARTHROPODOLOGY FOR STUDENTS (*by*: Prof. Dr B.K. Tyagi, Prof. Dr B. Reddy Naik and Prof. Dr Sajal Bhattacharya) is under completion. This book aims to fulfill needs of UG/PG students and research scholars especially in Indian universities and medical colleges.

The Editorial Board wishes to specially thank Dr Rina Tilak, Dr D.S. Suman and Dr Varun Tyagi for their timely help in shaping this inaugural issue of the **SOMA Newsletter**.

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