Malaysian Society of Parasitology and Tropical Medicine
(Persatuan Kajiparasit dan Perubatan Tropika Malaysia)

Newsletter

Issue 1, 2008

Malaysian Society of Parasitology
and Tropical Medicine
c/o Institute for Medical Research
Jalan Pahang 50588
Kuala Lumpur, Malaysia.
www.msptm.org

Issue 1, 2008
(for members only)
Editor ~ Reuben Sharma
reuben@vet.upm.edu.my

Inside this Issue

The Society wishes a BIG
"Thank You"
to the
44th Council of the MSPTM
(2007/2008)

The Third ASEAN Congress of Tropical Medicine and Parasitology (ACTMP3)
22-23 May 2008
The Windsor Suites Hotel, Bangkok, Thailand

"Parasites: a hidden threat to global health"

ACTMP3 TOPICS

In this 2-day event, participants will be able to attend presentations by experts in their field, sharing views/ideas, and discussing future collaborations. In the context of economic globalization and intensification of international trade and travel, the health of individuals and nations closely depends on the health conditions existing in other countries. Global warming and environmental change have a direct impact on disease patterns and the health of people around the globe. The topics of the conference will concentrate on these issues, in relation to parasites and other important infectious diseases:

VECTOR-BORNE DISEASES

Global climatic change is an important factor causing change in diseases pattern particularly the vector borne diseases such as malaria, dengue hemorrhagic fever or Japanese B Encephalitis. Rising of temperature induced blooming of vectors leading to influx of patients. There would be lot of information to share among participants from different countries to come up with recent regional/ global current situation.

FOOD-BORNE PARASITIC ZOONOSES

Food-borne diseases take a major toll on health. Millions of people fall ill and some die as a result of eating food contaminated with infective stage of parasites. The session will discuss the causative agents-bacteria, protozoan and helminthes on their biology, epidemiology, as well as food safety and quality control system.

EMERGING INFECTIOUS DISEASES

Recently, avian influenza and other virus represent the major threat to human health. An international surveillance network for immediately reporting the spreading of an epidemic has been set up. There are

a lot of on going research on drugs for better treatment, preparing possible vaccines and rapid laboratory diagnosis. The session will discuss the clinical and laboratory features of the main emerging infections such as avian flu, Nipah virus, West Nile fever, SARS or Ebola virus

PARASITE GENOME

The molecular biology/bio-informatics of parasites and other pathogens have become a major field of interest among researchers.

Other topics, such as vaccines, global health, chemoprophylaxis and therapy, parasite biology, and health education, are welcome. For further information, visit: http://www.ptat.thaigov.net/index3.html

ICTM2008
XVIIth International Congress for Tropical Medicine and Malaria

September 29 - October 3, 2008
International Convention Center Jeju, Jeju Island, Korea

http://www.ictm17.org/index.asp

Morphological or Molecular Identification of Mosquitoes: Think Before You Jump to Conclusions!

~ Bruce A. Harrison ~

Currently there is a widening rift between the perceived need of morphological versus molecular techniques for the identification (ID) of mosquitoes. Generally, the new kid on the block, i.e., molecular ID, is considered the best and most desirable and is capturing more and more funding at the expense of funding basic research and training for morphological ID. This is unfortunate because in reality both methods of ID are needed and enhanced by the other. Wheeler (2008) suggested that 75 percent of invertebrates on the earth remain undiscovered or undescribed. Although mosquitoes are considered better known than most other invertebrate groups Harbach (2007) estimated that 3 to 5 times as many mosquito species remain to be described as the currently recognized 3,497 species (Harbach pers. comm.). These predictions are staggering when you realize that many species are endangered and vanishing each year and that programs for collecting, discovering, and describing new species of fauna and flora are vastly under-funded. Both morphological and molecular methods are necessary to accomplish such tasks and each needs funding, yet their roles, benefits, and differences in the broad scheme of mosquito sciences need better definition. This article is a preliminary attempt to elucidate the roles, benefits, differences, and needs for both methods of ID, and how they are both essential for accomplishing the tasks set before us. There are important considerations that usually are not mentioned when discussing the need for morphological and/or molecular identification of mosquitoes.

(1) Local Control Programs: Roles and Constraints

Applied mosquito control programs rely almost entirely on one or two people trained in morphological ID for routinely identifying large numbers of nuisance pest and vector species to assess the need for control. Tens of thousands of people are involved in these control efforts on a worldwide scale and they vastly outnumber the trained morphological taxonomists in museums and universities, as well as those working on molecular genetics. In my home state (North Carolina) there are over 100 such programs and some conduct weekly surveillance, trapping mosquitoes to determine precise methods and products needed to control problem species. Such efforts are carried out at least 6-7 months per year and they involve the morphological identification of thousands of specimens of up to 60 species. Programs like these rarely have funds to acquire necessary equipment, laboratory space, or personnel for molecular efforts. Nor can many afford to pay the cost for others to test their specimens using molecular techniques. However, most can afford to have one or two personnel periodically trained in morphological identification of their local mosquito species.

With the introduction of invasive or exotic mosquito species and increased numbers of pathogens that are being transported around the world (e.g., West Nile, Dengue, and Chikungunya viruses) and introduced into new areas with susceptible populations of vertebrate hosts, and/or humans, and mosquitoes, the maintenance of morphological identification capabilities at the local program level is essential for detecting newly arrived species and preventing public health threats associated with mosquitoes. Such programs are on the front line of disease prevention. Based on the widespread existence of many mosquito control programs and continuing disease outbreaks from mosquito-borne pathogens around the world, I conclude there will be a continued need to train local personnel in the morphological ID of their local species.

(2) Rapid Field Identification

One of the most valuable assets any program, department, government organization, or country

can have for combating mosquito-borne pathogens is a well trained field team with personnel that can go into remote areas, collect, sort, and identify mosquitoes quickly in the field, with or without the use of a microscope. Without this capability organizations must solicit assistance from other sources for aid in mosquito identification, preserve specimens for later ID, or have untrained personnel try to identify piles of mosquitoes using local identification keys. The latter is very time-consuming and not conducive to rapid assessment. Such teams are essential for government agencies to rapidly assess the mosquitoes responsible for disease risks and outbreaks, or threats of outbreaks, or recovery operations following different types of disasters. Trained ID personnel have acquired those skills over a long period of time (years) and after examining thousands of specimens. They are an exceptionally good investment for any public health organization working on mosquitoes. Not only do they know how to identify the local mosquitoes, but they also understand their adult behavior, where they are found, and the location of the habitats for the immature stages.

In Africa there are currently at least 123 recognized species of *Anopheles* (Giles & Coetzee 1987, Harbach 2004), so who is available that can quickly collect, sort, and provide specimens of the Gambiae Complex or Funestus Group of *Anopheles* so that visiting scientists can conduct their research on malaria? It will be a team from the regional or country malaria control program, an in-country research facility, or a university. Only rarely will it be the visiting scientists. The same question can be asked for ongoing research on many *Anopheles* species complexes that involve malaria vectors in Africa, Asia, South and Central America, Australia, and the South Pacific Region. Many researchers that visit foreign countries to conduct mosquito vector research do not recognize the diversity and complexity of identifying *Anopheles* (and other mosquito) species in the tropics. Harbach (2007) reported 476 recognized species in the subfamily Anophelinae, plus many others that are defined by genetics but have not been described and await formal names, although they are currently known by letter or number designations (e.g., *Anopheles jamesii* A or B, see more below). Moving from the temperate zone to the tropics really complicates ID issues. In North Carolina there are currently 60 recognized mosquito species, including 10 *Anopheles* species, however I'm lucky if I can collect 3 *Anopheles* species in a trap overnight. However, of the 436 recognized mosquito species in Thailand (Rattanarithikul et al. 2005) there are currently 73 *Anopheles* species (Rattanarithikul et al. 2006) and in some areas you can collect 20 or more of those in one night. In adjacent Malaysia, 415 species are recognized (Foley et al. 2007), and many of those are distinct from the species in Thailand. Trained field personnel that can quickly identify the local mosquitoes and sort them into targeted vector groups are worth their weight in gold. Such persons are very deserving of our respect and should be encouraged to train new personnel so that more people will eventually develop these skills and more regional teams can be set up.

(3) Species Concepts

Above, I mentioned the words "recognized species". It is important to understand that this means a species has been described and named based on the rules of the International Code of Zoological Nomenclature (ICZN). Until recently that has been the standard for recognizing species. Thus, suspected or real species distinguished by chromosomes (mitotic or polytene) and/or molecular techniques and designated by letters or numbers but not described morphologically and formally named, are called provisionally described species, not recognized species. Currently there are over 75 provisionally described *Anopheles* species that fit this category. However, the process of how we define and establish "recognized species" is almost certain to change with the advent of molecular techniques and the urgent need to describe species before they become extinct. Examples of recent investigations (Lounibos et al. 1998, Sedaghat et al. 2003, Harbach et al. 2007) that have initiated this process had few or no discernable morphological diagnostic characters but had significant molecular differences, yet both morphological and molecular descriptions were provided. Such descriptions still require an examination of the type specimen (if available) of the species associated with the letter or number designations to determine which designation applies to the type, a thorough morphological examination and description of the target provisional species, an in-depth search to clarify if junior synonyms of the species have priority for naming the provisional species being described, and the designation of a type specimen, the depository, and description of the type-locality.

(4) Identification Accuracy

It is common knowledge that morphological ID is not as accurate as molecular ID. Accuracy of the former is really based on the experience and expertise of the identifier. However, the ultimate name assigned to a specimen, even after molecular ID, is often dependent on the name provided on the specimen by the original identifier because no attempt was made by the molecular researcher to confirm that ID. It is also common knowledge among taxonomists that many identified specimens in collections and museums around the world are misidentified. This is primarily due to the sheer mass of specimens, limited curatorial and expertise

among personnel, age of specimens, and prioritized projects that leave no time for correcting the identifications of specimens in non-target taxa. The problem of specimen misidentifications from both field collectors and museum collections makes it imperative that molecular researchers make every effort to confirm the ID of the species on which they work. Otherwise, incorrectly identified gene sequences deposited in the GenBank that are used by other researchers will misconstrue and compound our understanding of vectors in public health situations and our understanding of mosquito phylogenetic relationships.

(5) Paucity of Available Gene Sequences

In addition to the likely potential that some misidentified materials are deposited in the GenBank, only 635 sequences for mosquito taxonomic entities are currently deposited in the GenBank. Of those only 447 are for formally or provisionally described species, with the rest being duplicates, species groups, subgenera, genera, tribe and subfamily level deposits. Comparing that number with 3,497 currently recognized formal species means genetic material for only 12.8 percent of the known world species is on file in the GenBank. A few researchers that work on very well known sibling species complexes involving known vectors might be able to accept unidentified specimens (provided it was pre-identified to complex level) and identify those specimens to species using only molecular techniques. They would be fortunate that genetic material for all of the species in their target complex is deposited in the GenBank. Otherwise, with genetic material of only 12.8 percent of the known world fauna deposited in the GenBank, requesting and expecting a molecular researcher to provide the molecular ID of unidentified specimens of species other than known vectors would be unlikely, unless the laboratory has someone available to provide morphological identifications.

(6) Contamination and Throughput

Besides the cost of equipment, supplies and laboratory facilities there is another basic reason why molecular ID techniques may not be the right choice for many programs and organizations. This is the fact that molecular techniques are so accurate that they are extremely susceptible to contamination. Thus, they work almost exclusively on single specimens. Any contaminant like a leg or fragment from another specimen or even remnants of another species in the gut of a larva can produce results that are ambiguous or incorrect. Thus, the necessity of testing individual specimens under very controlled conditions is not cost effective and would require a long turn around time for programs/organizations that collect and need rapid identifications for thousands of specimens for routine surveillance or pooling for virus assays. Besides, molecular laboratories cannot afford to test thousands of specimens on a routine basis due to intense labor requirements and limited personnel.

(7) Unique Utility of Molecular Techniques

Molecular identification techniques are essential for assessing, confirming, and/or identifying mosquito species (or higher taxa) in a number of situations. Nearly all of these situations require fresh field collected or museum specimens initially identified by morphological characters. Some of these situations are:

- Confirming or refuting the species status of provisional species recognized on the basis of differences detected by cytogenetic techniques
- Elucidating isomorphic species in suspected sibling species complexes
- Providing precise identifications of confirmed vector species
- Detecting strain differences that might explain differences in vector abilities
- Creating phylogenetic schemes that depict evolutionary relationships at the species level (or higher taxa) based on molecular genetics characters
- Confirming phylogenetic relationships inferred from cladograms based on morphological data from species or higher taxa
- Detecting and defining intraspecies and interspecific genetic introgression
- Developing new molecular genetics techniques for more precise identification of species and higher-level mosquito taxa
- Providing more thorough species descriptions by utilizing both morphological and molecular data for identifying species
- Providing precise species identifications in long-term field investigations targeting known vector species of pathogens to humans or domestic animals that occur in isomorphic sibling species complexes
- Providing precise species identifications for members of a sibling species complex and integrate them with field studies to learn about the behavior, ecological requirements, and disease relations of each member of the complex.

As can be seen from the above, the answer to the question of needing morphology or molecular techniques for mosquito identifications is clear.

It is not an "either/or" situation, BOTH MORPHOLOGICAL AND MOLECULAR ARE ESSENTIAL

Applied mosquito surveillance and control programs will continue to rely primarily on morphological ID, and only rarely need molecular IDs except on species complexes or problematic groups

Public Health oriented organizations working primarily on mosquito-borne pathogens that affect humans and domestic animals must use both ID methods

Basic research and University research organizations developing new techniques and pursing phylogenetic relationships of mosquito taxa will rely primarily on molecular techniques, once they have initially acquired targeted species or other taxa from field collectors and/or museum collections.

Based on the above, it is essential that program directors evaluate their assigned tasks, goals, and personnel and determine whether one or both methods will be needed to provide the most accurate and effective products for their organizations.

In summary, I find such rifts counter productive in scientific endeavors. This rift basically contradicts human nature. Many people are innately curious about organisms, i.e., what they are, how they behave, and where they fit into the "big picture". This is particularly true for those that love the outdoors and are "naturalists". Such people often develop quite accurate visual skills in identifying groups and species of the organisms they encounter (animals, birds, reptiles, amphibians, insects, trees and flowering plants, etc.). These skills are based on an understanding and use of morphology. Many other people are more home or laboratory- oriented and do not particularly enjoy working outdoors or in the field, and some of these are also very adept technologically. The morphology versus molecular split is directly aligned with these two types of humans, respectfully. The field-oriented people will not disappear, nor will the laboratory-oriented people, and both will continue to view their world the way they prefer. Thus, there will be a continuing need for visual morphological skills as well as molecular skills as long as we and other cohabiting species exist on earth. Less commonly you meet people that like both life styles. Those are the truly fortunate people that will benefit from seeing the natural organisms from both aspects and gain a better understanding of our biological species. To accomplish the tasks set before us, we need all three types of individuals. I feel very strongly that with the limited time and funds that we still have to find and describe new species of mosquitoes we should describe those unknown species as whole organisms, including descriptive morphology, biology, and behavior, as well as molecular genetics. That way we will know them as complete biological species that can be observed, studied, and hopefully may be identified by morphological as well as molecular characters.

References Cited

Foley DH, Rueda LM, and Wilkerson RC. 2007. Insight into global mosquito biogeography from country species records. *J. Med. Entomol.* 44: 554-567.

Gillies MT and Coetzee M. 1987. A supplement to the Anophelinae of Africa south of the Sahara (Afrotropical Region). *Publications of the South African Institute for Medical Research* 55: 1-143.

Harbach RE. 2004. The classification of genus *Anopheles* (Diptera: Culicidae): a working hypothesis of phylogenetic relationships. *Bull. Entomol. Res.* 94: 537-553.

Harbach RE. 2007. The Culicidae (Diptera): a review of taxonomy, classification and phylogeny. *Zootaxa* 1668: 591-638.

Harbach RE, Garros C, Nguyen DM, and Manguin S. 2007. Formal taxonomy of species C of the *Anopheles minimus* sibling species complex (Diptera: Culicidae). *Zootaxa* 1654: 41-54.

Lounibos LP, Wilkerson RC, Conn JE, Hribar LJ, Fritz GN, and Danoff-Burg JA. 1998. Morphological, molecular, and chromosomal discrimination of cryptic *Anopheles* (*Nyssorhynchus*) (Diptera: Culicidae) from South America. *J. Med. Entomol.* 35: 830-838.

Rattanarithikul R, Harrison BA, Panthusiri P, and Coleman RE. 2005. Illustrated keys to the mosquitoes of Thailand I. Background; geographic distributions; list of genera, subgenera, and species; and key to genera. *SEA J. Trop. Med. Pub. Health.* 36(suppl.1): 1-80.

Rattanarithikul R, Harrison BA, Harbach RE, Panthusiri P, and Coleman RE. 2006. Illustrated keys to the mosquitoes of Thailand IV. *Anopheles*. *SEA J. Trop. Med. Pub. Health*. 37(suppl. 2): 1-128.

Sedaghat MM, Linton YM, Oshagi MA, Vatandoost H, and Harbach RE. 2003. The *Anopheles maculipennis* complex (Diptera: Culicidae) in Iran: molecular characterization and recognition of a new species. *Bull. Entomol. Res.* 93: 527-535.

Stone A, Knight KL, and Starcke H. 1959. A synoptic catalog of the mosquitoes of the world (Diptera, Culicidae). *Entomol. Soc. America, Thomas Say Foundation* 6: 1-358.

Wheeler Q. 2008. Undisciplined thinking: morphology and Hennig's unfinished revolution. *Syst. Entomol.* 33: 2-7.

Bruce A. Harrison, Ph.D.,
Public Health Pest Management, N.C. Dept. of Environment and Natural Resources 585 Waughtown Street Winston-Salem, NC 27107
<bruce.harrison@ncmail.net>

POSTSCRIPT. The author is a lifetime member of the MSPTM, a trained mosquito morphological taxonomist, and a trained medical entomologist with 43 years of experience working in 14 different countries on mosquito taxonomy as a means for identifying vectors and preventing the transmission of mosquito-borne pathogens to humans. During those 43 years of working in the field, museums, and my present position the number of recognized species of mosquitoes in the world has increased from 2,401 (Stone et al. 1959) to 3,497 (see above), which means a 45.6 percent increase in only 49 years and at least 22 new species described per year for that period. Also during that period experiences taught me to take advantage of any assistance, observations, and techniques that might help differentiate species, whether they are morphology, biology, behavior, habitats, cross-mating studies, cytogenetics, or molecular genetics. So you can consider me a multi-disciplinarian that believes all of the above methodologies have important roles and provide answers to assist us in learning about the real identification of the biological species that we call mosquitoes.

Upcoming Parasitology and Tropical Medicine Conferences 2007/08

31 Mar–03 Apr 2008

British Society for Parasitology's Trypanosome and Leishmania meeting
Newcastle, UK
www.bsp.uk.net/

14–16 Apr

Fourth Annual BioMalPar Conference on Biology and Pathology of Malaria Parasites
Heidelberg - Germany
http://www.biomalpar.org/

21–22 Apr

International Conference on Malaria: Joining Forces, Synergising Action
Bonn, Germany
www.mmv.org/article.php3?id_article=444

22–23 May 2008

The Third ASEAN Congress of Tropical Medicine and Parasitology (ACTMP3)
The Windsor Suites Hotel, Bangkok, Thailand
www.ptat.thaigov.net/index3.html

06–09 Jul 2008

Australian Society for Parasitology Annual Conference
Glenelg, Adelaide, Australia
www.parasite.org.au/Conference.html

06–09 Jul 2008

ASP & ARC/NHMRC Research Network for Parasitology Annual Conference
Glenelg, Adelaide, Australia
www.parasite.org.au/arcnet/conference/index.html

Obituary

It was with much sadness that we received the news of the passing of Dr Peter Waller. He was not only my supervisor, teacher and mentor but also a great friend, always encouraging me and giving me ideas for research. Dr Peter Waller has been the push behind the Novel approaches workshops over the years and we are proud to say that his influence, guidance and ideas have been fully instilled in the control of parasitology in many countries today. He has been an inspiration to many young people in the developing countries like me and we wish to record our deepest gratitude to a great man.

Dr Peter Waller was a world renowned scientist working in veterinary parasitology with emphasis on the applied aspects of worm control and anthelmintic resistance. He loved problems because that gave him an avenue to solve it, which he went all out with full enthusiasm and vigour, looking at novel ways to control helminths. He was one the foremost parasitologists in CSIRO, Australia initiating work on Biological control of helminths and working on the epidemiology and control of helminths in the tropics. He then joined the National veterinary Institute in Uppsala Sweden in 1997 continuing his work with students from the developing countries like Ethiopia, Kenya, South Africa, Cambodia and Malaysia.

His contributions to the field of parasitology will always be remembered by his numerous scientific contributions and his active involvement in WAAVP and other associations. It may surprise you that he was also an ardent member of the Malaysian Society for Parasitology and Tropical Medicine which he has been attending regularly for the past few years.

Dr Peter Waller

The MSPTM conveys its deepest condolences to the family of the late Dr Peter Waller for the loss of such a dedicated scientist and colleague

Dr. Chandrawathani P.
Veterinary Research Institute

06–12 Jul 2008	**The International Congress of Entomology** Durban, South Africa www.ice2008.org.za
13–18 Jul 2008	**5th International Congress of Nematology** Brisbane, Australia www.5icn.org
21–25 Jul 2008	**6thSymposium of European Association of Acarologists** Montpellier, France www.montpellier.inra.fr/CBGP/Montpellier2008/

21–26 Jul 2008	**Protist 2008 : International Society of Protistologists (ISOP), and the International Society for Evolutionary Protistology (ISEP) joint meeting** Halifax, Canada www.protist2008.dal.ca/
24–29 Aug 2008	**Xth European Multicolloquium of Parasitology** Paris, France www.emop10.eu/index.php?option=com_frontpage&Itemid=1
20–25 Sep 2008	**Molecular Parasitology Meeting Marine Biology Laboratory** Woods Hole, Massachussetts, USA www.mbl.edu/mpm/mpm-2007/meetings.php
29 Sep–03 Oct 2008	**XVII International Congress for Tropical Medicine and Malaria** International Convention Center Jeju, Jeju Island, Korea www.ictm17.org/index.asp
30 Oct–1 Nov 2008	**9th International Meeting Molecular Epidemiology and Evolutionary Genetics of Infectious Diseases** Nairobi, Kenya www.th.ird.fr/meegid/meegid.htm
3–7 Feb 2009	**4th International Congress on *Leishmania* & Leishmaniasis (WorldLeish 4)** Lucknow, India www.worldleish.org/

Notice Board

Advance Notice

ICOPA 2010

Understanding the Global Impact of Parasites – from Genomes to Function and Disease

Melbourne, Australia
15th to 20th August 2010
http://www.icopaxii.org/

Contribution of Articles

The MSPTM Newsletter thrives on the support of its members. Everyone is invited to contribute articles, photographs, comments and vacancy adverts which may be of interest to the Society. We also encourage researchers to submit updates on research projects and publications, so that this newsletter may serve as a portal for disseminating current information on parasitology and tropical medicine in Malaysia.

Researchers Wanted (Alive)

Post-graduate fellowships in the field of molecular parasitology and wildlife diseases are available for enthusiastic & dedicated young researchers.
Please contact:

Reuben Sharma
Faculty of Veterinary Medicine
Universiti Putra Malaysia
reuben@vet.upm.edu.my

MSPTM Website

Visit the MSPTM website for updates and online access to current issues of ***Tropical Biomedicine***

www.msptm.org/