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Metaleptea

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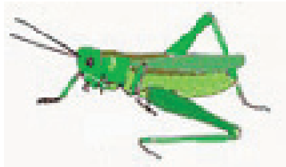

10TH ORTHOPTERISTS' MEETING IN ANTALYA, TURKEY IN 2009

I wish to express my sincere gratitude and thanks to Orthopterists' Society Board members for deciding the 10th International Orthopterists Meeting to be held in Antalya, Turkey in 2009. Our aims are to organize one of the most comprehensive meetings on orthopteroid insects and to establish a platform for interaction of the researchers working in the area to interchange their knowledge and to make some plans for collaborations in the future. We will be glad to see our colleagues all over the world here in Antalya. Please save a page in your agenda of 2009 for 10th International Meeting of Orthopterits' Society. The exact date of the meeting will be decided later after receiving comments of all orthopterists (as much as possible) via e-mails. A web page for the meeting will be constructed as soon as possible. All the progresses related to meeting will be announced regularly on this page. We thank you all in advance for advices and comments on how to make this meeting very well organized.

Where and why is Antalya, Turkey?
Antalya is an extraordinary place by its wonderful nature and rich history. The town is located just on the Mediterranean coast of Anatolia on the slopes of the Western Taurus mountain range. It is possible to benefit from beaches 8 months per year (The 4 km Konyaaltı Beach is just in the centre of the town in addition to numerous other coastal areas nearby). Though Antalya is a coastal town after a 40 km journey you can reach to the 2500 m altitudes. Besides, 12 of the total 23 national parks of Turkey are in the Mediterranean part and of these Termessos, Köprülü Kanyon and Olympos-Beydagları national parks are the widely known ones by the native people or foreign scientists. On the other hand, history is everywhere in Antalya and there are numerous old Greek, Byzantium and Ottoman places. Some are; Patara, Perge, Termessos, Phaselis, Aspendos, Side, Myra, Antalya Castle, Alanya Castle and old Antalya (also called Kaleici). We invite world-wide orthopterists to enjoy this wonderful nature and history in addition to scientific interactions with their colleagues.

Antalya is one of the most famous town of Turkey known world-wide and a considerable number of tourists from all continents visit here per year not only during the summer but also in other seasons. Recently, it becomes a centre for scientific organization throughout the year too. These development provided possibilities of access to Antalya from nearly every town of the world. For this reason the second largest international airport of Turkey is constructed in Antalya. Also, recent developments in tourism area made possible to find cheap-luxury accommodation options from experienced companies. Thus, for the meeting in 2009, participants (and family) will be able to easily find flights to Antalya from all continents and cheap/luxury accommodation during or even after the meeting.

There are further reasons to be in Antalya!
Turkey (especially Anatolia) is considered to be a biodiversity hot-spot because of its species richness both in plants and animals. Up to present approximately 11 000 of plants (roughly 35% of them are endemic) and unknown number of animal (it is suggested to be around 80 000) species were recorded. In addition to being biologically diverse, the peculiarity of this biodiversity is high percentage of endemism, possibly because of its extraordinarily instable geographic evolution within Tethys and being a glacial refugium during Pliocene/Pleistocene in addition to its variable present topography and climate. Orthoptera is one of the marker lineages used in definition of the "natural evolutionary laboratory" characteristics of Turkey. Interestingly roughly 35% of the short-horned and 80% of the long-horned Orthoptera species live in Turkey are endemic, and it is suggested that Anatolian topography (especially the Taurus Mountain ranges in the Mediterranean Turkey) is the most important factor correlating with this diversity and endemism. Antalya province, the place of 10th International Orthopterists' Meeting, is just located besides Southern Taurus ranges on the Mediterranean cost.

Anatolia received a great interest from systematists during the late of 19th and early of 20th century. Although there are numerous orthopterists studied Orthoptera of Turkey, some of the widely known are Fischer de Waldheim, Brunner von Wattenwyl, Ignasio Bolivar, Boris P. Uvarov, Willy Ramme and Tevfik Karabag. Of these Tevfik Karabag, died four years ago, provided a profound contribution to our knowledge of Orthoptera. More importantly he is the founder president of the Turkish Scientific and Research Council. Tenth International Orthopterists' in Antalya, Turkey will provide the opportunity of commemorating Professor Tevfik Karabag in addition to other orthopterists provided contribution to our knowledge on orthopteroid insects and it will be a pleasant nostalgia to visit some parts of their field study area.

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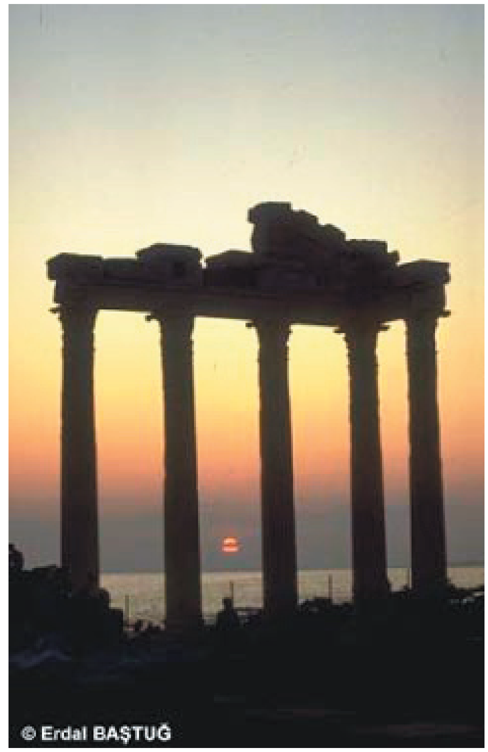
Aspendos threatre featured throughout the newsletter

Appolo temple



Please see page 4 for more images of Turkey.
Picture notes:
1. *Parapholidoptera bolkarensis*
2.Aspendos temple
3. Antalyla harbor
4. Antalya harbor
5. *Poecilimon sp*.
6. Kas
7. Xantos
8. Unidentified Orthoperan

NOW AVAILABLE: A LEAFLET TO PRESENT TO THE ORTHOPTERISTS' SOCIETY AND THE JOURNAL OF ORTHOPTERA RESEARCH

A presentation leaflet for both the society and of JOR has been made available on the society website for the use of any Orthopteran Society member to be able to present the Society and its services in any event, conference, or meeting, It is available in PDF format and it has been revised both by the Executive and by our JOR Editor.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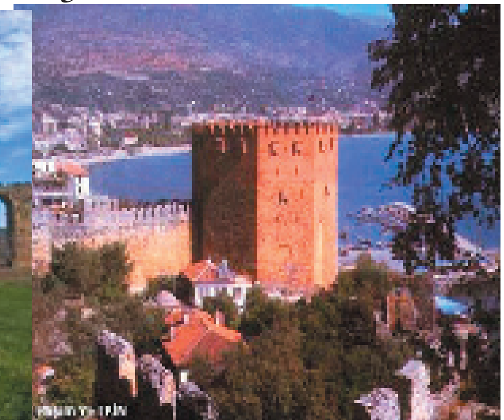
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CONGRATULATIONS TO THE NEW REGIONAL REPRESENTATIVES OF THE ORTHOPTERIST'S SOCIETY

Regional representatives for the Orthopterists' Society (elected 1-1-07)

America	
1. North America (USA and Canada)	Dan Johnson
2. S and C America (including Mexico)	Alba Bentos Pereira
Eurasia	
3. West Europe (including Finland, Estonia, Latvia, Lithuania, Poland, Slovakia, Hungary, Romania, Turkey, Israel)	Karim Vahed
4. East Europe – North and Central Asia [the FSU (excluding Estonia, Latvia, Lithuania) and Mongolia]	Michael Sergeev
5. China, North Korea, South Korea	Zhang Long
6. Japan	Seiji Tanaka
7. South Asia (all countries of South-West, South, South-East and East Asia, excluding Turkey, Israel, China, N and S Korea, Japan)	Rohini Balakrishnan
Africa	
8. North, West and Central Africa (including Congo, Zaire, Central Africa, Chad, Libya)	Mohamed Abdallahi Ould Babah
9. East and South Africa (including Egypt, Sudan, Uganda, Zambia, Angola)	Michael Samways
Australia and Oceania	
10. Australia, New Zealand and Pacific islands	Dave Hunter

The Board decided in 2005 to widen the role of the Regional Representatives. Responsibilities include:

- Reporting special problems from each region
- Recruiting of new members
- Providing articles for Metaleptea
- Recruiting major papers for JOR
- Recommending sponsored membership
- Advertise JOR in the libraries
- Establish links and mutual co-operation agreements with local orthopterological societies
- Consolidating the OS members in each region and developing joint activities (regional bulletins, meetings, projects etc.).

Congratulations and thank you for your dedication to our Society.

D. austalis

UPDATE ON THE PHASMIDA SPECIES FILE

The Phasmida Species File http://phasmida,orthoptera.org (Author: Paul Brock, Database Developer: David Eades) has been fully operational again since November 2006. It contains full synonymic and taxonomic information, initially inputted from Daniel Otte and Paul Brock's 2005 book Phasmida Species File. Catalog of stick and leaf insects of the world.

Reports

Mouse-catching Locust – A Mysterious Creature Revealed

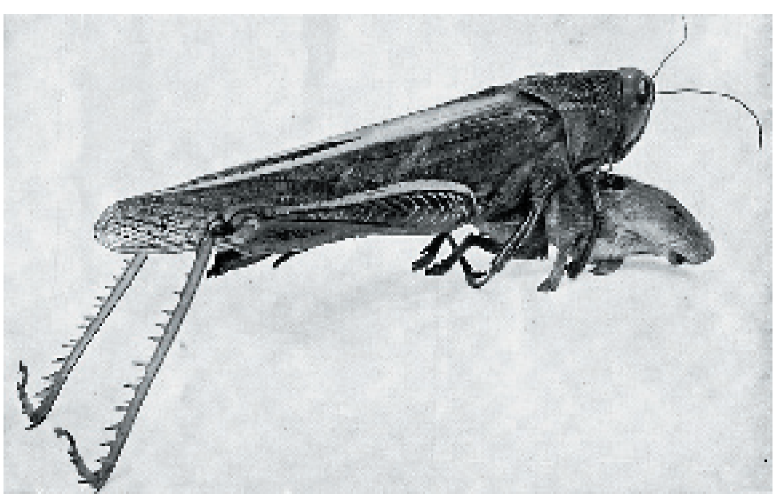
By Hojun Song

Locusts are arguably one of the most feared insects throughout human history. The plague of locusts was one of ten calamities inflicted upon Egypt by God and it was often viewed as a sign of judgment and wrath. Sheer magnitude of locust swarm alone has been a great source of terror, and Hollywood was in no hurry to exploit locusts as a major villain in a classic B-movie, "Beginning of the End." Recently, the U.S. television station CBS made a special TV movie titled, "Locusts" which featured a genetically engineered super locust (an unlikely hybrid between the desert locust and the Australian plague locust) that was accidentally released into the wild. Interestingly, in both movies, the actual species depicted as a locust was a lubber grasshopper, Romalea microptera, and locusts (lubber grasshoppers, really) were always depicted as vicious killers. In fact, I have been frequently asked by non-entomological friends of mine, "Do locusts eat people?" My answer has always been, "No, locusts don't eat people. They are herbivores!" although I often sinisterly wondered what would be like if locusts could indeed eat people.

In early 2006, I received an interesting email from a fellow named John Pelter from England who claimed to have an old book that describes a giant African locust found eating a mouse. I responded that the idea was unlikely because locusts are herbivores and the author must have been confused a large carnivorous katydid with a locust which might chew on a dead mouse on a rare occasion. John soon replied with an actual citation of the book and a low-resolution photograph of a grasshopper holding a mouse. He also supplied with a caption of the photograph that read "A remarkable locust from the Congo, which was caught in the act of catching and eating a mouse, and is now with its victim preserved in the Natural History Museum at South Kensington." The mysterious locust in the photograph was in fact a grasshopper, not a katydid, with a name *Cyrtacanthacris rubella* attributed to it. This curious information came from a book, "Marvels of Insect Life" by Edward Step FLS, published in 1915. Step was an Edwardian naturalist who published many popular books on nature and was known to be quite knowledgeable about insects. Many questions soon boggled my mind. Is this a reliable report of a carnivorous grasshopper? Is there any biological information available for *C. rubella*? Is the actual specimen really stored in the Natural History Museum?

I have been working on the systematics of Cyrtacanthacridinae for quite some time, but it was the first time to see the combination Cyrtacanthacris rubella. I searched the name in the Orthoptera Species File online, but it turned up no such record. Kirby's (1910) Synonymic Catalogue of Orthoptera did list the name, which was originally described as *Acridium rubellum* Serville, 1839 from South and East Africa. In a part of a revisionary series of Cyrtacanthacridinae, Uvarov (1924) briefly mentioned the combination when discussing the taxonomy of a well-known African grasshopper *Ornithacris cyanea*. He argued that cyanea had been frequently called *rubellum*, but the original description of *rubellum* by Serville did not fit cyanea, but agreed better with the red locust Nomadacris septemfasciata. However, the type specimen of *Acridium rubellum* was lost and Uvarov did not feel justified to establish the identity of the species from the description only. OK, the taxonomy of *rubellum* is a bit messy, but what is the identity of the mysterious mouse-catching locust reported in Step's book?

Intrigued, I went out to the library and found the copy of "Marvels of Insect Life." The book was actually a two-volume set full of fascinating stories about insects. Apparently, the idea of mouse-catching locust was so bizarre to Step that he placed the story in the very beginning of the book. Step reported the following: "In the British Museum (Natural History) there is a specimen of one of the largest known locusts, which was received from a missionary in the Congo Free State a few years ago, who had taken it in the act of feasting upon a mouse it had caught. ... The locust in question does not confine its attention to mice; large spiders, beetles and other insects, and probably small nestling birds serve it equally for food." He also included an artist's rendition of this fascinating locust hunting mice and spiders. At this point, I became very suspicious of this claim. Based on the photograph printed in his book, it was obvious that the species in question was *Ornithacris cyanea*, easily identified by the shape of pronotum and tegmina. *Ornithacris cyanea* is probably one of the largest species in Acrididae, and its biology is relatively well-known. It has brightly colored hindwing, either orange-red or violet which deepens throughout sexual maturation. It is a grassland species, feeding on various crops such as maize and millet. I have examined many specimens of this species and it does not have any special modification for carnivory. A careful examination of the photograph in Step's book revealed flaws in Step's claim. To be fair, the grasshopper was indeed much bigger than the



mouse. However, it was obvious that both the grasshopper and the mouse were dead and placed together by someone who wanted to make it interesting. The position assumed by the grasshopper was definitely not imposing as that of a ruthless hunter. Rather it was typical of a carelessly dried specimen. It was clearly a hoax.

Regardless of the truth of the claim, it would be quite amusing if such a specimen indeed exists in the Natural History Museum. I spent a month going through the collection in 2003, but did not find such a specimen although it was before I learned of the story. Sir B.P. Uvarov, V.M. Dirsh, and M.N. Dirsh, who all worked on Ornithacris at the Museum, did not mention anything about a mouse in their publications. In other words, no one has seen the specimen since Edward Step photographed it. Until the actual specimen is located, I would say that the specimen of the mysterious mouse-catching locust with its victim is lost forever.

Now, the identity of the missionary in the Congo Free State remains unknown. It is unlikely that the man of faith brought back the specimens with a fabricated story for no reason. *Ornithacris cyanea* from Congo must have been doing something with the mouse to be noticed by the missionary. Grasshoppers can become cannibalistic and it is unlikely but possible for them to stumble upon a carcass to obtain protein. That must be what the missionary must have witnessed if it weren't Edward Step who fabricated the whole thing. Just to be sure, I googled "mouse eating grasshopper" and the search engine returned a bunch sites about a grasshopper mouse (*Onychomys torridus)*, which is described as the wolf of the mouse world. Apparently, mice can eat grasshoppers, but not the other way around. In any case, the story of mouse-catching locust was one of many examples of how people might misunderstand grasshoppers and locusts, but as for me, I prefer certain mysteries around my favorite insects, however outrageous.

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Research

Weta Chromosomes and Evolution

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I have been using wetas to study the evolution and potential reproductive barriers of chromosome rearrangements for about 15 years.

In New Zealand we have many species of nocturnal Orthoptera that are referred to by the Maori name weta. Maori were the first people to colonise New Zealand about 800 years ago and it is unfortunately we do not know how many different species of weta they recognised. However, the Anostostomatidae (or true weta) are commonly known as giant weta (Deinacrida; 11 species) tree weta (Hemideina; 7 species) and ground weta (Hemiandrus; 35+ species). We group our numerous Rhaphidophoridae species under the umbrella cave weta (cave or camel crickets elsewhere) although the majority of New Zealand species are forest rather than cave dwelling.

Within species chromosome variation
Chromosome rearrangements can cause a reduction in fertility of heterozygotes and thus form a weak barrier to gene flow between populations that have distinct karyotypes. However, many chromosome races remain part of the same species, linked by gene flow across narrow hybrid zones. In Europe the common house mouse (Mus domesticus) has been studied intensively to understand the role of chromosome changes in speciation. Mice have between 40 and 22 chromosomes and the distribution and evolution of the many races of mice have provided an excellent model system for speciation studies. In New Zealand we have few endemic mammals (two rare bat species) but we do have common nocturnal Orthoptera that are proving to be as interesting as mice for their chromosome evolution.

Tree weta (Hemideina) are common in forests and suburban gardens throughout most of New Zealand. They are arboreal nocturnal orthoptera that hide in hollow tree branches during the day and feed on leaves, flowers, fruit and insects at night. Males have elongated mandibles that they use in combat with other males over access to large tree holes where many adult females hide together during the day. Their wide distributions and abundance has made them great study animals.

Tree Weta

Hemideina thoracica has at least eight distinct karyotypes, found in different part of North Island New Zealand (2n = 11 - 23; Morgan-Richards 1997). Although the numbers of chromosomes vary among races, the DNA content does not, so the variation must involve translocations of both large and small chromosome arms (Morgan-Richards 2005).

Chromosome races of *H. thoracica hybridise* at their margins with adjacent races, but the extent of resulting gene flow varies among the various combinations (Morgan-Richards & Wallis 2003). Using the width of the hybrid zone at the crater lake of Taupo and the known time since the last volcanic eruption it was possible to estimate the dispersal abilities of these abundant orthoptera; we calculated that these tree weta move at least 100m per generation (Morgan-Richards et al. 2000). *Hemideina thoracica* has some of the oldest chromosome races found within any single species, anywhere in the world (Morgan-Richards et al. 2001). Using phylogeography we inferred that their chromosome mutations first arose millions of years ago and have since been maintained in spatially separate populations for about five million years. What makes this species unusual is that none of the races has dominated and replaced other races and apparently few races have been lost during climate changes and range contractions of the Pleistocene. Despite this remarkable long history of parapatry the races have failed to speciate – and this makes *H. thoracica* really exciting and unusual. By comparing the widths of the chromosome hybrid zones one can infer the relative fitness of individuals that are chromosome heterozygotes. We found that hybrid zone widths, and therefore fitness levels, differ by almost two orders of magnitude (0.5 km – 50 km; Morgan-Richards & Wallis 2003). Strangely enough, in this species, the hybrid zones where hybrids suffer the greatest disadvantage are marked by tiny chromosome changes, whilst wide hybrid zones where hybrids suffer much less fitness-disadvantage are marked by large chromosome translocations.

Another tree weta species (*Hemideina crassidens*) also has intraspecific chromosome variation that includes B chromosomes in one island population. This species is very unusual in that the B chromosomes are only in the males (Morgan-Richards 2000). *Hemideina crassidens* is also unusual in that the rearrangements that resulted in two of the known chromosome races (2n = 16(XX) 15(XO); 2n= 20(XX) 19(XO)) seem to have arisen from fissions of metacentrics not fusions (Morgan-Richards 2002). Chromosome rearrangements that fuse two acrocentric chromosomes to form one large metacentric chromosome (Robertsonian Translocations) are quite common in mice and shrews and spiders, but fissions of chromosomes have rarely been documented. Captive breeding experiments provided evidence that the rearrangements were simple fission/fusion events and F1 hybrids seemed developmentally normal. Phylogenetic studies with mtDNA sequence data indicate that the 19-chromosome race is probably derived from the 15-chromosome race (Morgan-Richards 2002) via chromosome fissions. In comparison, within *H. thoracica* chromosomes appear to have generally fused to reduce diploid numbers.

Other species of Hemideina are chromosomally more conservative (Morgan-Richards and Gibbs 2001), but one widespread giant weta (*Deinacrida connectens*) also has a good deal of karyotype variation with seven distinct karyotypes recorded (2n = 17-21; Morgan-Richards and Gibbs 1996).

Hybrid Chromosomes

DNA phylogeography

The high level of chromosome variation of *H. thoracica* and *H. crassidens* is matched by some of the highest levels of intraspecific DNA sequence diversity ever reported. For example, haplotypes in the same population of *H. thoracica* can differ by as much as 7.6% (uncorrected P distance, 550 bp COI mtDNA), and among populations the maximum distance is 9.5% (Morgan-Richards et al. 2001). This level is common between different species of the same genus of other taxa but unusual within a species, even among invertebrates. Four factors combine to produce these record levels of genetic diversity. Firstly, New Zealand retained forest flora and fauna during the glacial cycles of the Pleistocene and so unlike the extensively studied faunas of Europe and North America, some New Zealand taxa retained populations and their genetic variation throughout this time. Secondly, *H. thoracica* populations were isolated on islands during the Pliocene which we think led to the fixation of novel chromosome races and distinct mtDNA haplotypes. These islands are now connected and gene flow among chromosome races leads to populations that are polymorphic for very different mtDNA haplotypes. Thirdly, the island populations failed to speciate, perhaps due to the weta's simple mate recognition systems and genetic compatibility. Fourthly, the mtDNA of has extraordinary little base bias. Most insect mitochondrial genomes have many more A + T than C + G bases (typically about 70% A + T), in contrast *H. thoracica* has 58% (A + T). This facilitates a slightly more rapid accumulation of synonymous mutations. Thus we find record levels of genetic diversity within and among populations of tree weta (Hemideina).

The distribution of genetic diversity within *H. thoracica* owes much to isolation on Pliocene islands and recolonisation following volcanic eruptions. Both recent Taupo eruptions (< 2,000 years ago) and older (< 25,000) Taupo eruptions have had major effects on the distribution of mtDNA haplotype diversity (Morgan-Richards et al 2000; 2001) in the central North island, New Zealand. Further north the phylogeographic pattern reflects the Pliocene archipelago. In contrast the centre of genetic diversity of *H. crassidens* seems to be between North and South Island. The two major islands of New Zealand were most recently connected 10,000 – 20,000 years ago when *H. crassidens* populations on each island would have been in contact. *Hemideina crassidens* is more cold tolerant than the more northern *H. thoracica* and during the repeated glacial cycles of the Pleistocene the distributions of these two species probably oscillated up and down the country. On the central north island mountains there are populations of *H. crassidens* entirely surrounded by the lower altitude *H. thoracica* – relicts of a past more northerly distribution of *H. crassidens* (Trewick & Morgan-Richards 1995). The isolation of the mountain *H. crassidens* populations suggests the two species competitively exclude each other, and who wins depends on climate. We plan to study adaptation and mate recognition in these two species to complement our cytogenetic knowledge. In South Island New Zealand the most abundant and widespread of the giant weta (*Deinacrida connectens*) has populations on most mountain ranges. Phylogeographic structure of the scree weta D. connectens indicated matrilineal isolation since the Pliocene when the mountains formed (Trewick et al. 2000).

With a combination of cytogenetics, phylogeography and natural history I hope to spend the rest of my career uncovering the evolutionary history of New Zealand weta.

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Satellite imagery helps to monitor locust habitats in Central Asia

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Locusts, the ancient enemies of agriculturists

Since biblical times locust swarms are a nemesis to agriculturists. Swarms often consist of millions of individual locusts and can wipe out green vegetation over large geographic areas in just few days. Even in the 21st century, locust management remains a costly and environmentally hazardous venture: expenses to control the recent Desert locust upsurge in West Africa in 2003-2005 exceeded US $400 million, with 32 million acres treated with broad-spectrum insecticides in 22 countries. This figure includes the cost of operations (US $280 million), as well as the costs of food assistance and rehabilitation of communities affected by locusts. National and international agencies are working together ways to prevent or minimize the impact of locust outbreaks which do not confine within national boundaries.

This is particularly true for Central Asia where locusts thrive on vast and sparsely populated areas. One of the most serious pests is the Asian Migratory locust *Locusta migratoria migratoria L.* (Figure 1), which inhabits reed beds along rivers and lakes but, as its name suggests, can travel long distances until it finds crop fields to devour. Its large breeding area is located in the River Amudarya delta near the Aral Sea in Uzbekistan, 300 miles east from the Caspian Sea (Figure 2).

Locust monitoring and control.

The Amudarya delta provides favorable conditions for the Asian Migratory locust survival and reproduction. The sandy river banks serve as egg-laying sites, while the reed stands furnish food and shelter for hoppers and adults. Locust outbreaks occur at irregular intervals, last for several years, and devastate the irrigated crops nearby. Locust swarms can disperse in different directions covering distances over 700 miles. The goal of locust control is to prevent the development of swarms capable of emigration flights into the crop areas.

Ground locust surveys remain an extremely difficult task in the wetlands of the Amudarya delta which covers 2.5 million acres. According to the guidelines for the ground locust survey, the average daily area inspected by a professional scout is comprised of between 250 and 375 acres. For a team of 20 scouts (the number of locust personnel working in the Amudarya delta) it will take between 11 and 16 months to survey the entire delta. However, the nymphal survey period is limited to three to four weeks. It is evident that the traditional survey methods are inadequate for efficient locust management. Finding locust-infested areas becomes nothing but guesswork. As a result, vast wetland areas of over one million acres a year become blanketed with broad-spectrum insecticides, which aggravate the negative impact on the fragile wetland ecosystem. Despite all these efforts locust swarms often escape control from the remote delta areas creating havoc to crops nearby. Identification of reed areas as potential Asian Migratory locust habitats is the key to successful management of this pest.

Satellite imagery: a useful tool

The use of satellite imagery has a great potential to improve efficiency of locust habitat monitoring in Central Asia. Certain satellites like NASA's MODIS (http://modis.gsfc.nasa.gov/) collect information on a daily basis, and the data are free of charge. This technology is based on the use of different reflectance from ground features, particularly in the infrared waves which are invisible to human eyes. Land cover features like water, soil or vegetation have unique "signatures" which are collected by satellite sensor and stored in a digital format (Figure 3). A satellite image represents a mosaic of pixels, like a digital photograph. In a MODIS image each pixel corresponds to an area of 300 by 300 yards on the ground. It is assigned a certain number depending on the "spectral signatures" from the land cover features which this pixel contains. Different types of vegetation also create different spectral signatures. Knowing these signatures, the researchers can assign the pixel to a particular land cover class like water, sand, or different types of vegetation. Using MODIS satellite images and combining them with the field data, we were able to generate a map portraying the reed distribution within the delta (Figure 4). We identified large areas of reed beds throughout the delta and estimated areas of various land cover features such as reeds, 3 other types of vegetation, water, and bare ground (Table 1). Through this process we were able to provide the extent (% area occupied) and location of reeds within the delta. Uzbek Plant Protection specialists are now using this information to find areas for conducting locust surveys. Instead of blanketing the entire delta with poisonous insecticides, they are able to target control operations only to the areas of reed stands, which occupy less than 18% of the River Amudarya delta. The result of such targeted treatments is an obvious win-win situation from economic and ecological aspects.

Future prospects.

Migratory locust is one of three locust species threatening agriculture in Central Asia. Satellite technology proved itself as a useful tool in the Asian Migratory locust monitoring, and we expand our expertise to different locust species. Currently we are working with scientists from Novosibirsk State University (Russia) and personnel from the Plant Protection Services in Kazakhstan to map the Italian locust (Calliptamus italicus (L.)) habitats along the border between Russia and Kazakhstan. We also started working with GTZ and Uzbek Plant Protection Services to map the Moroccan locust (*Dociostaurus maroccanus* (Thunb.)) habitats along the border between Uzbekistan and Afghanistan border.

Acknowledgments.

Mapping locust habitats in the Amudarya delta using satellite imagery is an international project funded by German Agency for Technical Cooperation and Development (GTZ) and NASA via Upper Midwest Aerospace Consortium (UMAC). The entire project is coordinated by the Association for Applied Acridology International, a virtual consortium of locust specialists from 21 countries which operates under the auspices of the University of Wyoming. Ground field work in Uzbekistan was conducted in collaboration with Uzbek Plant Protection Services.

To learn more about these projects:

Sivanpillai R., Latchininsky A.V., Driese K.L., & Kambulin V.E., 2006. Mapping locust habitats in River Ili Delta, Kazakhstan, Using Landsat Imagery. – Agriculture, Ecosystems & Environment 117: 128-134.

Sivanpillai R. & Latchininsky A.V. (in press). Mapping locust habitats in the Amudarya River Delta, Uzbekistan with multi-temporal MODIS imagery. –Environmental Management (DOI: 10.1007/s00267-006-0193-y).

Table 1. Areas of land cover classes found in the Amudarya River Delta, based on the MODIS satellite image, and associated risk of locust infestation (modified from Sivanpillai & Latchininsky, in press)

Land cover class	Area in acres (% of total)	Risk of locust infestation
1. Reeds	986,598 (18%)	High
2. Reeds with shrubs	340,264 (6%)	Medium
3. Shrubs	204,612 (9%)	Medium/Low
4. Sparse vegetation	505,607 (22%)	Low
5. Bare ground	2,216,859 (39%)	Low
6. Water	322,796 (6%)	Low

Figure 1. Asian Migratory locust *Locusta migratoria migratoria L.*

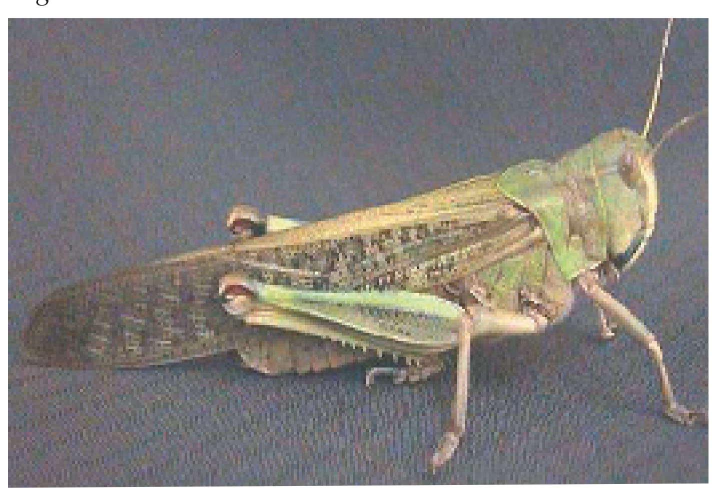


Figure 2. Study are in Central Asia. The River Amudarya delta near the Aral Sea in Uzbekistan (arrow).

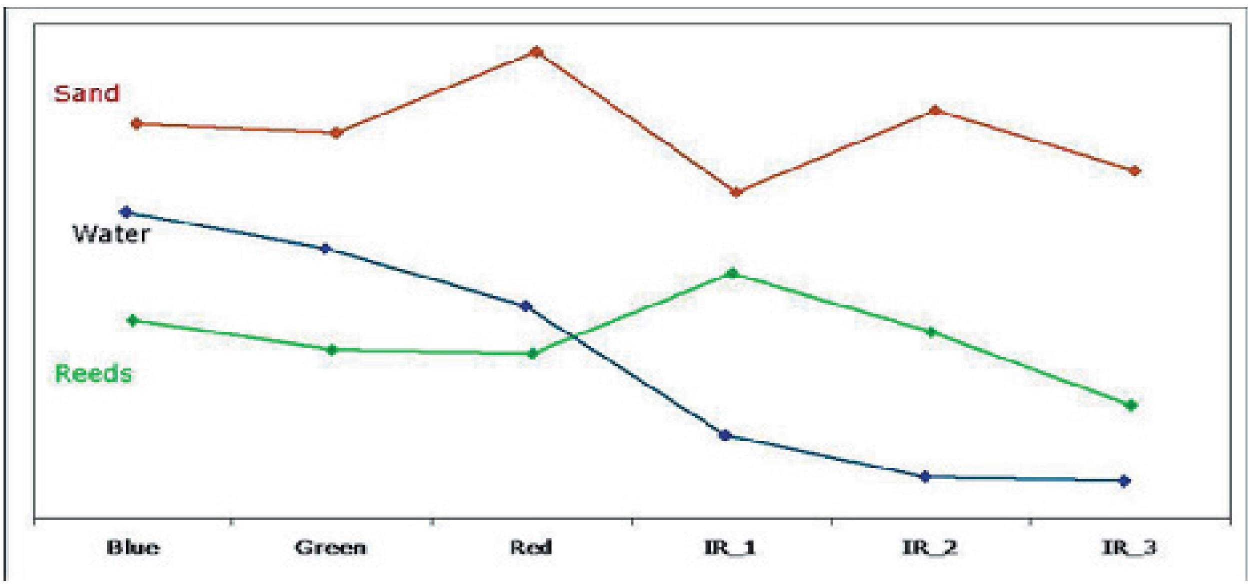


Figure 3. Spectral signatures of different land cover classes obtained from a satellite.

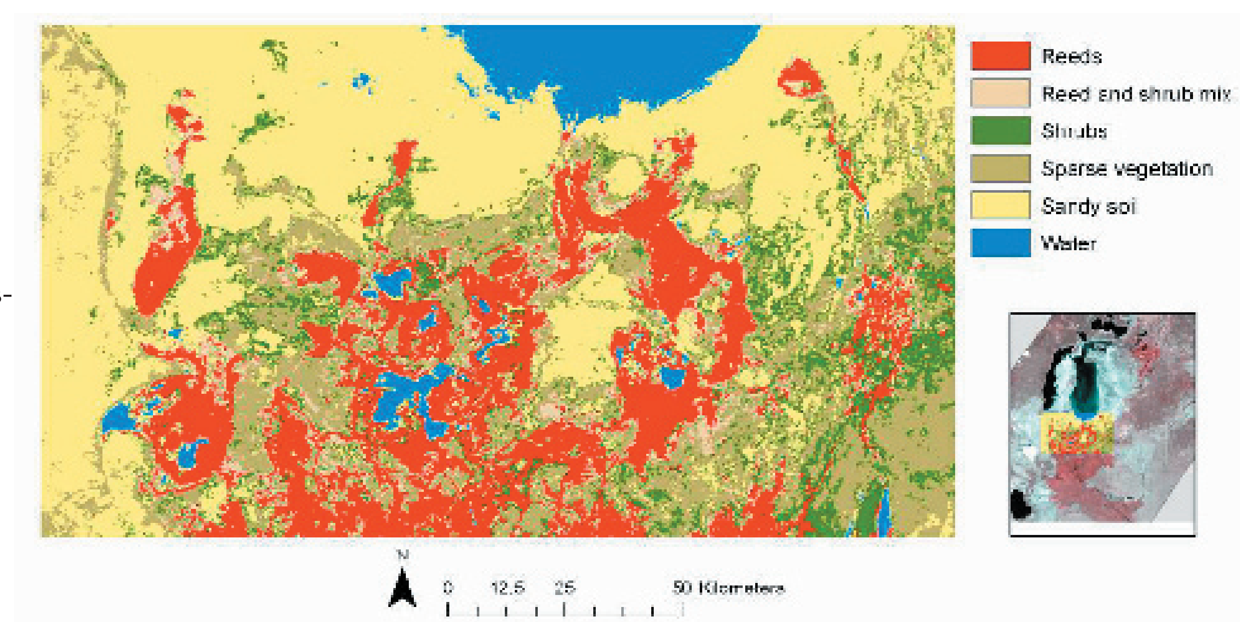
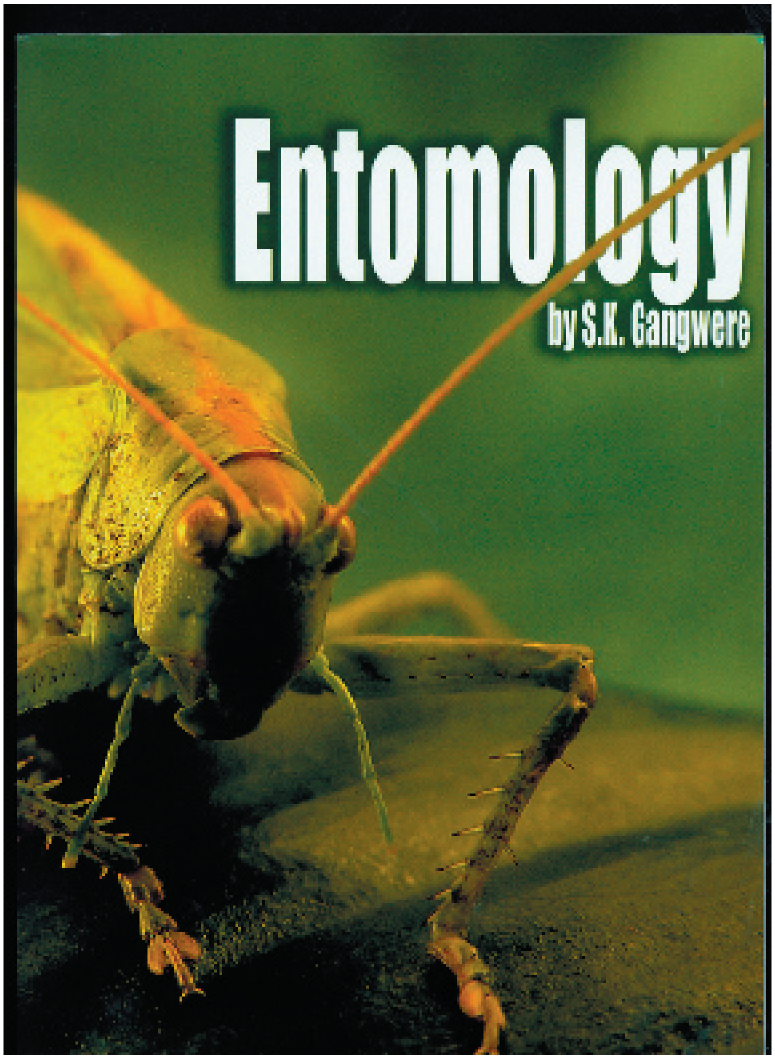


Figure 4. Classified MODIS satellite image of the study area in the Amudarya delta.



This excellent guide to insect biology may be used as a sole text or as a supplementary work source for students enrolled in a formal entomological course. It lends itself to use by those in need of a review of the "essentials," as well as agriculture and veterinary students, teachers at the elementary and secondary school level and others wishing to avail themselves to the opportunity to study insects.

S.K. (Stan) Gangwere is Professor Emeritus, Wayne State University inDetroit. He has traveled worldwide as aresearcher and guest lecturer on the topics of ecology, biogeography and the behavior of orthopteroid insects. He isinvolved in numerous entomological societies and lives in Ann Arbor, MI.

Dr. Gangwere's text was unavailable from the original publishers for some time. Readers will be happy to know that this text can now be ordered from the sources below..

"Entomology" ISBN 1-928623-26-3. Cost is $24.95 US + $2.50 postage. Order on-line @ advantage@Amazon.com, or www.nicolasbooks.com, or order directly from PO Box 2273, Ann Arbor, MI 48106.

Grasshopper Possession

by Jeffrey A. Lockwood

Piercing pulsing, tender flesh,
My steps serrations, I invade.
Slicing open hyaline mesh,
Transformed into a living blade.

Bloodless wound forgives my harm.
Becomes a flawless healing.
Engulfs me within the swarm,
Indifferent and unfeeling.

Pulsing rasp, intense and wary,
Bodies slowly shift inside.
Membrane stretched across the prairie
Draws me deep—enchanting tide.

Self-sense evaporating:
Escape from seething order,
Wandering, seeking, waiting
To find the edgeless border.

A road in-sight. My-self regained
From joyous terror, clinging mesh.
Last fence to cross, a barb red-stained
Pierces pulsing, tender flesh.

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