First records of *Zaprionus indianus* (Diptera: Drosophilidae) from the Basra governorate in Iraq.

Al T'Oma, Zainab Abdul Rahmman Mohammad[1], and Kim van der Linde[2].
[1]Department of Biology, College of Science, University of Basra, Iraq. zabdulrahmman@yahoo.com; [2]Department of Biological Science, Florida State University, Tallahassee, FL 32306-4295, USA. kim@kimvdlinde.com.

Zaprionus indianus Gupta, 1970 (Diptera: Drosophilidae, Figure 1), commonly known as the "African fig fly," is an afrotropical drosophilid (Chassagnard and Tsacas, 1993) native to Africa, the Middle East, and southern Eurasia (Bächli, 1999-2010). It has received special attention because of its recent invasion of South and North America (Vilela, 1999; van der Linde *et al.*, 2006). In the Americas it was first reported from São Paolo, Brazil, in 1998 (Vilela, 1999) and subsequently from Uruguay (Goní *et al.*, 2001; Goní *et al.*, 2002), Northeastern Argentina (Lavagnino *et al.*, 2008), Ecuador (Rafael, 2007), Panama (van der Linde *et al.*, 2006), Mexico (Castrezana, 2007), the USA (van der Linde *et al.*, 2006; Castrezana, 2007), Venezuela and the Cayman Islands (KvdL, unpublished records).

Figure 1. *Zaprionus indianus.*

In the Old World, *Zaprionus indianus* was first recorded from India (Gupta, 1970) and Pakistan (Shakoori and Butt, 1979). Independently, Tsacas described the species as *Z. collerati* in 1980, remarking that it was generally misidentified as *Z. vittiger* and has been recorded from all over Africa for many years before (Tsacas, 1980). Consequently, reidentification of specimens in older collections has resulted in many records earlier than the description of this species from Europe and the Middle East (Austria, Malta, Italy, and Israel; Bächli, 1999-2010). Since then, this species has been recorded from Saudia Arabia (Amoudi *et al.*, 1991; Chassagnard and Kraaijeveld, 1991), Nepal (Paraksh *et al.*, 1989a; Paraksh *et al.*, 1989b), Oman (Global Biodiversity Information Facility, 2007), Spain (Carles-Tolra, 2009), and Azerbaijan (KvdL, unpublished record).

Zaprionus indianus is of African origin, as are all remaining species of the same group (Bächli, 1999-2010), including two recently described cryptic species (Yassin *et al.*, 2008). In Africa, *Zaprionus indianus* is a generalist; it has been recorded there in fruits of 74 plant species (Lachaise and Tsacas, 1983). A similar picture of host use is apparent in the New World (Vilela, 1999; Vilela *et al*., 2001; Santos *et al*., 2003; Leão and Tidon, 2004; van der Linde *et al*., 2006). Its generalist nature and invasive capabilities raise the question of why this species has not been

recorded more widely from the Middle East. One explanation could be that it is limited by ecological conditions in this region.

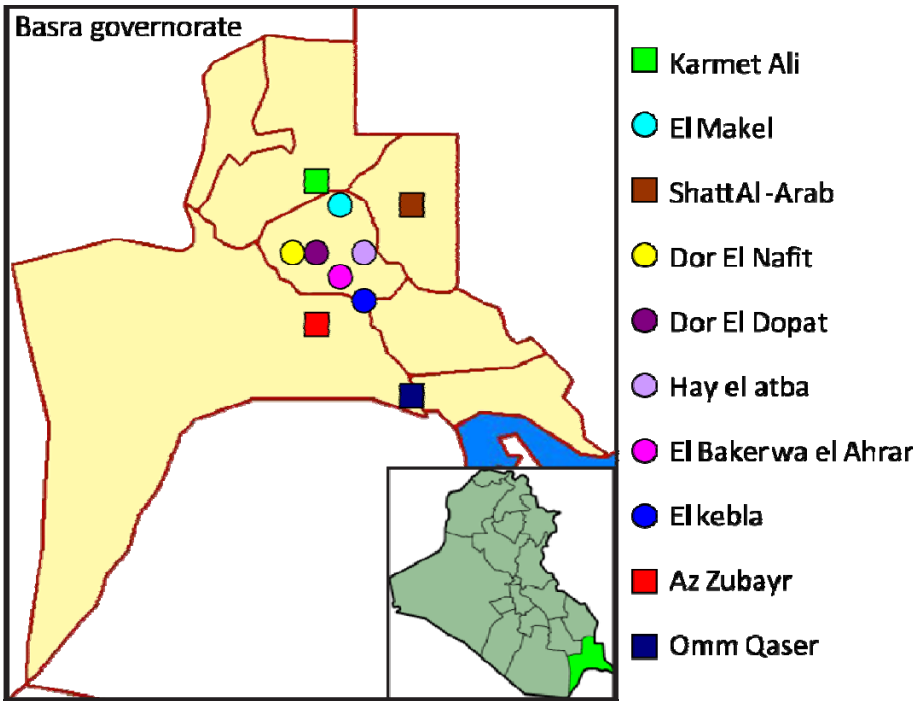

Figure 2. Map of the Basra governorate in southern Iraq, with the locations and occurrence of *Zaprionus indianus*. The squares indicate presence and the circles absence of *Zaprionus indianus*.

To investigate this possibility, we sought this species in southern Iraq. Collections of drosophilid flies were obtained from 10 different locations in Basra governorate: Dor El Nafit, Dor El Dopat, El Makel, Hay el atba, El Baker wa el Ahrar, and El kebla (which are all within Basra), and Karmet Ali, Az Zubayr, Shatt Al-Arab, and Omm Qaser (Figure 2). The flies were collected by net sweeping over fermented banana, orange, and lemon baits. Insects were brought to the lab, anesthetized by freezing in the refrigerator for up to 5 min, examined with a dissecting microscope, and identified by means of a taxonomic key (Chassagnard and Tsacas, 1993). The species is easily identified (Figure 1) by its yellowish body color and two pairs of distinctive white stripes. One pair runs dorsally from the antennae across the head and thorax to the tip of the scutellum, and the second, lateral pair runs from the leading edge of the thorax to the base of the wing. The thoracic white stripes are sandwiched between black stripes of similar width. On the head, the white stripes are bounded by a black stripe medially and the red eye laterally (Steck, 2005).

Adult *Z. indianus* were collected at four of the 10 localities surveyed (Table 1). Higher frequencies of *Z. indianus,* relative to those of other drosophilids, seemed to correspond to greater availability of suitable breeding substrate—highest in the farmland of Shatt Al-Arab (where suitable fruits such as nabq, *Ziziphus zizyphus***;** date palm, *Phoenix dactylifera;* grape, *Vitis vinifera;* fig, *Ficus carica;* and banana *Musa* sp. were abundant), lowest at the urban Omm Qaser site (where breeding substrate was limited to nabq and date palms), and intermediate at Az Zubayr (nabq, date palms, and figs) and Karmet Ali (nabq, date palms, figs, and grapes). All other locations were urban and lacked suitable breeding substrates.

Table 1. Relative frequencies of *Zaprionus indianus* in different regions of Basra governorate in Iraq.

Region	Habitat	Relative frequency	N
Shatt Al-Arab	Farmland	96.9%	1354/1398
Karmet Ali	Farmland	65.1%	828/1272
Az Zubayr	Dessert with date palm and nabq farms	50.0%	56/112
Omm Qaser	Urban	2.3%	6/266
Dor El Nafit	Urban	0%	0/324
Dor El Dopat	Urban	0%	0/100
El Makel	Urban	0%	0/240
Hay el atba	Urban	0%	0/206
El Baker wa el Ahrar	Urban	0%	0/320
El kebla	Urban	0%	0/126

We can only speculate when and how *Zaprionus indianus* arrived in Iraq. The only drosophilid species reported for the Basra area is *Drosophila melanogaster*, and only three drosophilid species have been reported for the whole of Iraq (Bächli, 1999-2010). Previous collection efforts in Iraq are lacking and provide no help. Individuals from the Middle East (Egypt, Israel, Saudi Arabia) are most closely related to the populations from India (Yassin *et al.*, 2008), a result that suggests that the arrival of this species in Iraq is not necessarily recent. As for the how question, we can only speculate again. One possibility is that the species travelled with fruit transports between countries. Alternatively, individuals could have been transported as "aeroplankton" (Dobzhansky, 1973) across the inhabitable stretches of dessert between locations. Combined with the species' adaptive versatility, this form of long-distance dispersal is an effective mode of range expansion (Dobzhansky, 1973).

Acknowledgments: We thank Dr. Gary J. Steck of the Florida Department of Agriculture & Consumer Services for providing us with the relevant taxonomic key.

References: Amoudi, M.A., F.M. Diab, and S.M. Abou-Fannh, 1991, Journal of King Saud University 3: 111-121; Bächli, G., 1999-2010, TaxoDros: The Database on Taxonomy of Drosophilidae, from http://taxodros.unizh.ch/; Carles-Tolra, M., 2009, Boletin de la Sociedad Entomologica Aragonesa 45: 316; Castrezana, S., 2007, Dros. Inf. Serv. 90: 34-36; Chassagnard, M.T., and A.R. Kraaijeveld 1991, Ann. Soc. Entomol. Fr. 27: 495–496; Chassagnard, M.T., and L. Tsacas 1993, Ann. Soc. Entomol. Fr. 29: 173–194; Dobzhansky, T., 1973, Evolution 27: 565–575; Global Biodiversity Information Facility, 2007, http://data.gbif.org/occurrences/81275240/; Goní, B., P. Fresia, M. Calvino, M.J. Ferreiro, V.L.S. Valente, and L. Basso da Silva 2001, Dros. Inf. Serv. 84: 61–65; Goní, B., M.E. Martinez, G. Techera, and P. Fresia 2002, Dros. Inf. Serv. 85: 75–80; Gupta, J.P., 1970, Proceedings of the Indian National Science Academy 36: 62–70; Lachaise, D., and L. Tsacas 1983, Breeding sites in tropical African drosophilids. In: *The Genetics and Biology of* Drosophila. (Ashburner, M., H.L. Carson, and J.N. Thompson, jr., eds.). London, Academic Press. 3D: 221–332; Lavagnino, N.J., V.P. Carreira, J. Mensch, E. Hasson, and J.J. Fanara 2008, Rev. Soc. Entomol. Argent. 67: 189-192; Leão, B.F.D., and R. Tidon 2004, Ann. Soc. Entomol. Fr. 40: 285–290; Paraksh, R., X. Jyoutsna, J.P. Yadav, and M. Sharma 1989a, Curr. Sci. 58: 808-811; Paraksh, R., X. Jyoutsna, J.P. Yadav, and M. Sharma 1989b, Bionature 9: 17-19; Rafael, V., 2007, Revista Ecuatoriana de Medicina y Ciencias Biologicas 28: 30-43; Santos, J.F., T.T. Rieger, S.R.C. Campos, A.C.C. Nascimento, P.T. Felix, S.V.O. Silva, and F.M.R. Freitas 2003, Dros. Inf. Serv. 86: 92–95; Shakoori, A.R., and U. Butt 1979, Pakistan J. Zool. 11: 315-328; Steck, G.J., 2005, *Zaprionus indianus* Gupta (Diptera: Drosophilidae), a genus and species new to Florida and North America,

from http://www.doacs.state.fl.us/pi/enpp/ento/zaprionusindianus.html; Tsacas, L., 1980, Bulletin de la société entomologique de France 85: 141–154; van der Linde, K., G.J. Steck, K. Hibbard, J.S. Birdsley, L.M. Alonso, and D. Houle 2006, Fla. Entomol. 89: 402–404; Vilela, C.R., 1999, Dros. Inf. Serv. 82: 37–39; Vilela, C.R., E.P. Teixeira, and C.P. Stein 2001, Mosca-africana-do-figo, *Zaprionus indianus* (Diptera: Drosophilidae) (in Portuguese). Histórico e Impacto das Pragas Introduzidas no Brasil. E. F. Vilela, R. A. Zucchi and F. Cantor. Ribeirão Preto SP, Holos**:** 48–52; Yassin, A., P. Capy, L. Madi-Ravazzi, D. Ogereau, and J.R. David 2008, Mol. Ecol. Res. 8: 491-501.

Studies on the body melanisation of *D. malerkotliana* of Mysore.

Guruprasad, B.R.[1], Anand K. Tiwari, and S.N. Hegde. [1]Kannadabharthi College, Madekari, Indian Institute of Advanced Research Gandhinagar, and Department of studies in Zoology Manasagangotri, Mysore -570006.

Melanisation is a common phenotypic trait and is conserved in diverse insect taxa and *Drosophilids.* The *Drosophilids* family is composed by 65 genera and more than 3500 described species that occur in a number of ecosystems all over the world (Bachli, 1998; Guruprasad *et al.,* 2009). Body melanisation has been analyzed in about a dozen species. Diverse *Drosophilids* vary in their melanin patterns (continuous or interrupted stripes or even on the wing), but data on geographical populations and their fitness consequences are limited. In the present investigation, we analyzed the four populations of *D. malerkotliana* from diverse attitudinal localities (680-980m) in Chamundi hill Mysore (Guruprasad and Hegde, 2006). It is a small mountain with scrubby forest spread all around. It was an uninhabited area thirty years ago with a small temple at the hilltop, which has now become a famous tourist spot with a small township with a population of 3000. This hill is covered by the scrub layers with small patches of evergreen type forest. *D. malerkotliana* is the most common and abundant species in this hill throughout the hill (Guruprasad *et al.,* 2009) and to address the following question: to study melanisation of *D. malerkotliana* along with altitude gradients and influence of altitude on it.

To study melanisation in *D. malerkotliana*, wild flies were collected by net sweeping from each of the four altitude sites from 680-1000m of Chamundi hill in Sept 2009. The flies collected were transferred to fresh food vials and brought to the laboratory. Males of *D. malerkotliana* were identified and isolated and were directly used for morphometric analysis. As there was difficulty in identifying the females, all females collected were individually placed in separate vials containing food so as to develop isofemale lines. After three days when sufficient eggs are laid each female again was transferred to fresh vials. These eggs were allowed to develop and when the adults emerged, they were used for identification. On the basis of identification of the progeny, their mothers were also identified and *D. malerkotliana* fifty female flies were used to measured body melanisation. Melanisation was estimated from a lateral view of the female abdomen giving values ranging from 0 (no melanisation) to 10 (complete melanisation) for six abdominal segments 12^{th} to 17^{th}, and scores were weighted with relative sizes of the respective segments. Since the abdominal segments differ in size (*i.e*., 0.60, 0.72, 0.81, 0.91, 0.81, 0.61 and 0.33 for 2^{nd} to 7^{th} segments, respectively), these relative sizes were multiplied with segments wise melanisation scores. The present melanisation was calculated as (sum of observed weighted melanisation scores of abdominal segments per fly divided sum of the relative size of each abdominal segment * 10 per fly)* 100 (Ravi