

DROSOPHILIDS FROM DAGHESTAN (RUSSIA) WITH DESCRIPTION OF A NEW SPECIES (DIPTERA)

A. G. IMASHEVA (*), O. E. LAZEBNY (*), M. L. CARIOU (**),
J. R. DAVID (**) & L. TSACAS (**)

(*) N. I. Vavilov Institute of General Genetics, Russian Acad. Sci., Gubkin St. 3, Moscow 117809, Russia

(**) Laboratoire de Biologie et Génétique Évolutives, CNRS F-91198, Gif-sur-Yvette, Cedex

Résumé. – **Drosophilides du Daghestan (Russie) et description d'une nouvelle espèce.** – Une mission de terrain dans trois localités du Daghestan a permis de récolter 28 espèces de Drosophilides parmi lesquelles 8 sont cosmopolites et liées aux activités humaines. Quatre espèces n'avaient jamais été identifiées dans l'ex-URSS et deux taxons sont nouveaux pour la science. L'un d'eux, *D. altukhovi*, proche de l'espèce cosmopolite *D. funebris* (Fabricius), est décrit ici. Au total, la diversité spécifique du Daghestan paraît assez faible, ce qui est sans doute en relation avec un climat plutôt sec. Une observation intéressante concerne l'absence totale de l'espèce cosmopolite *D. simulans*, en dépit de conditions climatiques et écologiques favorables.

Abstract. – A collecting trip to three localities in Daghestan provided 28 different drosophilid species, of which 8 are man-linked cosmopolitan. Four species were not noted previously in ex-USSR, and two taxa are new for science. One of them, *D. altukhovi*, which is close to *D. funebris* (Fabricius), is described here. Altogether, the species diversity of Daghestan appears to be quite low, probably due to an overall dry climate. An interesting observation is the complete absence of the cosmopolitan *D. simulans*, in spite of favorable climatic and ecological conditions.

The Palearctic region which extends from the Atlantic to the Pacific ocean covers a vast area of temperate habitats. Until recently, the drosophilid species from this region were mostly known from Europe and Japan (Bächli & Rocha-Pité, 1984 and 1985) while the territories of the ex-USSR and China were basically unexplored. Recently, papers by Gornostaev (1989) and Sidorenko (1989, 1991, 1992) have increased the number of recorded species from 62 to 101. However, our knowledge of drosophilid faunistics of this region is far from complete, especially considering its climatic and geographic diversity. Some parts of it, for example the Caucasus, are known to harbour numerous endemic species in a variety of taxonomic groups, but very few drosophilids have been collected there. In order to fill this gap, an expedition (A.G. Imasheva, O.E. Lazebny, M.L. Cariou, J.R. David; July 1992) was organised with the assistance of the Russian Academy of Sciences to explore some localities of the Republic of Daghestan (Russia); the results are presented in this paper.

Altogether, 28 species have been collected including one new species which is

described below. Four species from this number were not included in the Gornostaev's review. Some comments are provided on the geographical distribution of these species.

Localities and methods of collection

Three Daghestan localities - Makhachkala, Gherghebil and Gunib - were explored (see map in figure 1).

Makhachkala. The capital of Daghestan is situated at sea level and has many gardens and parks. Collections were made using four techniques: banana traps; sweeping with a net over grass and shrubs in shadowed places; collecting by sight with an aspirator on various fungi, especially those growing on dead wood; aspirating on sap exudates and slime fluxes.

Gherghebil. The village of Gherghebil is located at an altitude of about 700 m in a valley along a small river. Collections were made either by sweeping in different places or with traps baited with fermenting apricots and on fallen apricots; another collection site was a fruit processing factory near Gherghebil.

Gunib. The collecting sites were in the mountains above this locality, at altitudes ranging from 1 000 to 1300 m. Habitats were a mixed forest and an montane meadow with numerous flowering plant species. Collections were made by sweeping or with fermenting apricot traps.

List of collected species

A summary of the species collected in Daghestan including localities and some information on the habitats is given in Table 1. Some comments are added in the list of species that follows.

Subfamily STEGANINAE

Genus *Amiota* Loew

Subgenus *Phortica* Schiner

1. – *Amiota (Phortica) variegata* (Fallén) (determination Jan Mácá) : Makhachkala (banana traps and slime flux). Species widespread in the Palearctic region.

Genus *Gitona* Meigen

2. – *Gitona distigma* Meigen : Gherghebil (sweeping on grass). Widespread in the Palearctic region.

Genus *Stegana* Meigen

Subgenus *Steganina* Wheeler

3. – *Stegana (Steganina) similis* Laštovka & Mácá. Makhachkala (sweeping on grass). Distribution : Western Europe. New for Asia.

Subfamily DROSOPHILINAE

Genus *Chymomyza* Czerny

4. – *Chymomyza amoena* (Loew). Gherghebil (sweeping). Distribution : Central and Eastern Europe, North America. A species of American origin which was recently introduced to Europe (see Discussion).

Genus *Drosophila* Fallén

Subgenus *Dorsilopha* Sturtevant

5. – *Drosophila (Dorsilopha) busckii* Coquillet. Makhachkala, Gherghebil, Gunib, abundant on apricot traps. Widespread domestic cosmopolitan species.

Subgenus *Drosophila*

The *funnebris* group

6. – *Drosophila (Drosophila) funnebris* (Fabricius). Abundant in Makhachkala and in a fruit-processing factory in Gherghebil but not recorded in Gunib. In Makhachkala it was often found on fungi mixed with the newly found related species, *D. altukhovi*. Widespread domestic cosmopolitan species.

7. – *Drosophila altukhovi*, n. sp. Makhachkala, collected on fungi (see description in the next section).

The *immigrans* group

8. – *Drosophila (Drosophila) immigrans* Sturtevant. Gherghebil (fruit-processing factory and sweeping). Widespread cosmopolitan species.

The *quinaria* group

9. – *Drosophila (Drosophila) kuntzei* Duda. Gunib, (sweeping). Widespread in the Palearctic region, mainly in Western Europe and in South Korea.

TABLE I

Drosophilid species from daghestan.

1. mushrooms ; 2. slime flux ; 3. fruit trap ; 4. sweeping ; 5. fruit processing factory ;+. less than 5 individuals ; ++. from 5 to 25 individuals ; +++. more than 25.

	Makhachkala				Gherghebil		Gunib	
	1	2	3	4	4	5	3	4
1. <i>Amiota variegata</i>		+	+	+				
2. <i>Gitona distigma</i>					++			
3. <i>Stegana similis</i>				+				
4. <i>Chymomyza amoena</i>					+			
5. <i>D. busckii</i> *	++		++	+	+++	++		
6. <i>D. funebris</i> *	+++		++	+		++		
7. <i>D. altukhovi</i>	++							
8. <i>D. immigrans</i> *	+	+	++		++	+++		
9. <i>D. kuntzei</i>							+	
10. <i>D. phalerata</i>	+			++				
11. <i>D. transversa</i>				++			++	
12. <i>D. hydei</i> *			++					
13. <i>D. repleta</i> *			+					
14. <i>D. testacea</i>	++		++	+	+++		++	
15. <i>D. virilis</i> *					+	+++		
16. <i>D. acuminata</i>				+				
17. <i>D. andalusiaca</i>					+			
18. <i>D. fenestrarum</i>								++
19. <i>D. sp. cf lebanonensis</i>		+++		+	+			
20. <i>D. melanogaster</i> *		+	+++	++	+++	+++	+	
21. <i>D. ambigua</i>					+			
22. <i>D. bifasciata</i>							+	
23. <i>D. obscura</i>					++	+	++	
24. <i>D. subobscura</i>			++		+++		+++	
25. <i>D. tristis</i>					++			
26. <i>Mycodrosophila poecilogastra</i>	+							
27. <i>Scaptomyza pallida</i> *				++	++			+
28. <i>Scaptomyza graminum</i>								+

* Indicates cosmopolitan species

10. – *Drosophila (Drosophila) phalerata* Meigen. Makhachkala, Gherghebil (sweeping on apricot traps). Widespread in the Palearctic region, both in Europe and Asia.

11. – *Drosophila (Drosophila) transversa* Fallén. Makhachkala, Gunib (sweeping and fruit traps). Widespread in the Palearctic region.

The *repleta* group

12. – *Drosophila (Drosophila) hydei* Sturtevant. Makhachkala (on apricot traps); Gherghebil (fruit-processing factory). Widespread cosmopolitan species.

13. – *Drosophila (Drosophila) repleta* Wollaston. Makhachkala (on slime flux). Widespread cosmopolitan species.

The *testacea* group.

14. – *Drosophila (Drosophila) testacea* Roser. Makhachkala (on mushrooms); Gherghebil, Gunib: abundant on apricot traps. Widespread in the Palearctic region.

The *virilis* group

15. – *Drosophila (Drosophila) virilis* Sturtevant. Gherghebil (in fruit-processing factory and on apricot traps). Widespread cosmopolitan species.

Subgenus *Lordiphosa* Basden

The *fenestrarum* group

16. – *Drosophila (Lordiphosa) acuminata* Collin. Makhachkala. Distribution : Great Britain, Eastern Europe (Czechoslovakia, Hungary). New for ex-USSR.

17. – *Drosophila (Lordiphosa) andalusiaca* Strobl. Gherghebil (sweeping). Widespread in Europe; recorded also in Syria, Israel, North Africa. New for ex-USSR.

18. – *Drosophila (Lordiphosa) fenestrarum* Fallén. Gherghebil, Gunib (sweeping). Widespread in Europe.

Subgenus *Scaptodrosophila* Duda

The *victoria* group

19. – *Drosophila (Scaptodrosophila) cf lebanonensis* Wheeler. Makhachkala (slime flux), Gherghebil (sweeping). *D. lebanonensis* is recorded in Europe (Spain and Greece), Asia (Lebanon, Israel) and North America. New for ex-USSR. See discussion for further information on this taxon.

Subgenus *Sophophora* Sturtevant

The *melanogaster* group

20. – *Drosophila (Sophophora) melanogaster* Meigen. Abundant in Makhachkala and Gherghebil, very few in Gunib. Widespread cosmopolitan domestic species.

The *obscura* group

21. – *Drosophila (Sophophora) ambigua* Pomini. Gherghebil (sweeping). Distribution : all over Europe; recorded in Uzbekistan, Iran, Morocco, Tunisia.

22. – *Drosophila (Sophophora) bifasciata* Pomini. Gunib (on apricot traps). Widespread in the Palearctic region.

23. – *Drosophila (Sophophora) obscura* Fallén. Gherghebil and Gunib; abundant on fallen apricots and on traps. Widespread in the West Palearctic region.

24. – *Drosophila (Sophophora) subobscura* Collin. Gherghebil and Gunib; very abundant on apricot traps. Widespread in Palearctic region.

25. – *Drosophila (Sophophora) tristis* Fallén. Gherghebil, Gunib (on apricot traps). Distribution : Europe, also recorded from Iran.

Genus *Mycodrosophila* Oldenberg

Subgenus *Mycodrosophila*

26. – *Mycodrosophila (Mycodrosophila) poecilogastra* (Loew). Makhachkala (on fungi). Distribution: Eastern Europe, Iran, South Korea, Japan.

Genus *Scaptomyza* Hardy

Subgenus *Parascaptomyza* Duda

27. – *Scaptomyza (Parascaptomyza) pallida* (Zetterstedt). Abundant in Makhachkala and Gherghebil; some in Gunib (sweeping on grass). Widespread cosmopolitan species.

Subgenus *Scaptomyza*

28. – *Scaptomyza (Scaptomyza) graminum* (Fallén). Gherghebil and Gunib. Widespread in Palearctic region.

Description of *Drosophila altukhovi*, n. sp.

The species is close to *Drosophila multispina* Okada from which it is distinguished by the structure of the phallus. From *Drosophila funebris*, the only species of the *funebris* group with which it coexists in Daghestan, it differs mainly in genitalia and darker abdomen coloration.

Holotype male and eleven male **paratypes**, Makhachkala (Muséum national d'Histoire naturelle, Paris).

Male. – *Body length* : 2.7 mm.

Head : brown with paler cheeks and lower part of the front. Carina of a whitish colour, narrow in its basal third, globular apically. Eyes reddish brown.

Thorax : Scutum unevenly brown. 2 rows of dorsocentral bristles, 8 rows of achrostichal hair. Scutellum of the same colour as the scutum, posterior scutellar bristles crossing, anterior scutellars slightly convergent. Pleura of the same colour as the scutum but lighter in parts. 2 katepisternal bristles. Legs yellowish. Wings of a very light brown colour; wing length 2.8 mm.

Abdomen : black with the exception of the first tergite and of the anterior part of the second tergite which are yellowish; the anterior border of the third and fourth tergites also yellow in a narrow stripe.

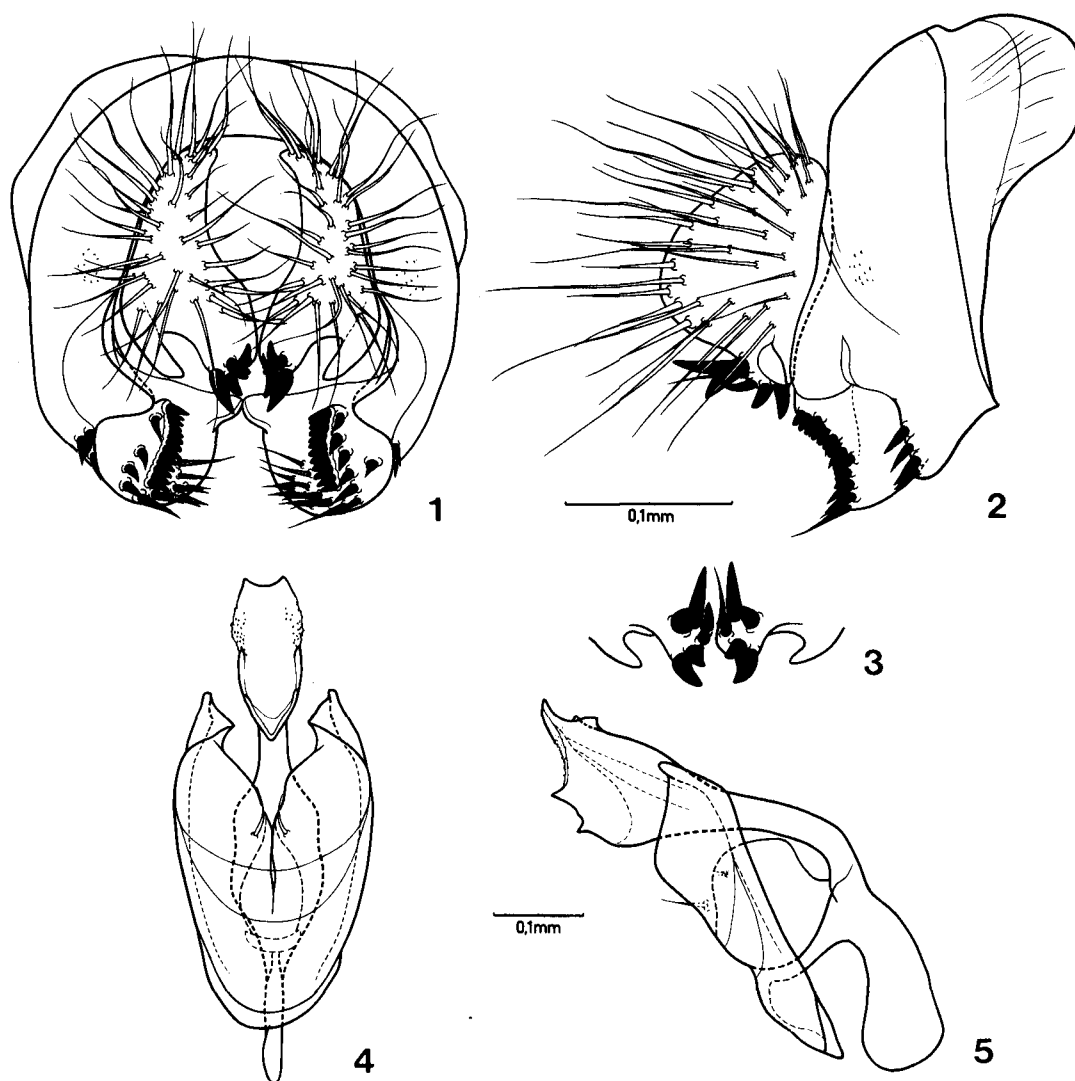


Fig. 1 to 5, male genitalia of *D. altukhovi*, n. sp. – 1, 2, ventral and lateral view of epandrium, surstyli and cerci. – 3, detail of the spines on the cerci. – 4, 5, hypandrium and phallus in ventral and lateral view. (drawings by Mrs M.T. Chassagnard).

Genitalia (fig. 2) : similar to those of *Drosophila multispina* but differing in the following points: epandrium with a large phlegma; the position of spines of the ventral lobes of the epandrium is different; surstylus with a distal curved comb and a row of spines in front of it, with a single isolated spine in front of the row; different number and localisation of spines of the cerci; hypandrium more oval, distiphallus more elongated with a large extremity and concave in the ventral view.

Female unknown.

Geographic distribution. – Russia, Daghestan.

Etymology. – This species is dedicated to Professor Yuri P. Altukhov, Director of N. I. Vavilov Institute of General Genetics.

DISCUSSION

The number of species collected, 28, is not very large. On the other hand, Daghestan is basically a dry country with a submediterranean climate which is not especially favorable to drosophilids. Moreover, we were not able to explore the higher altitude habi-

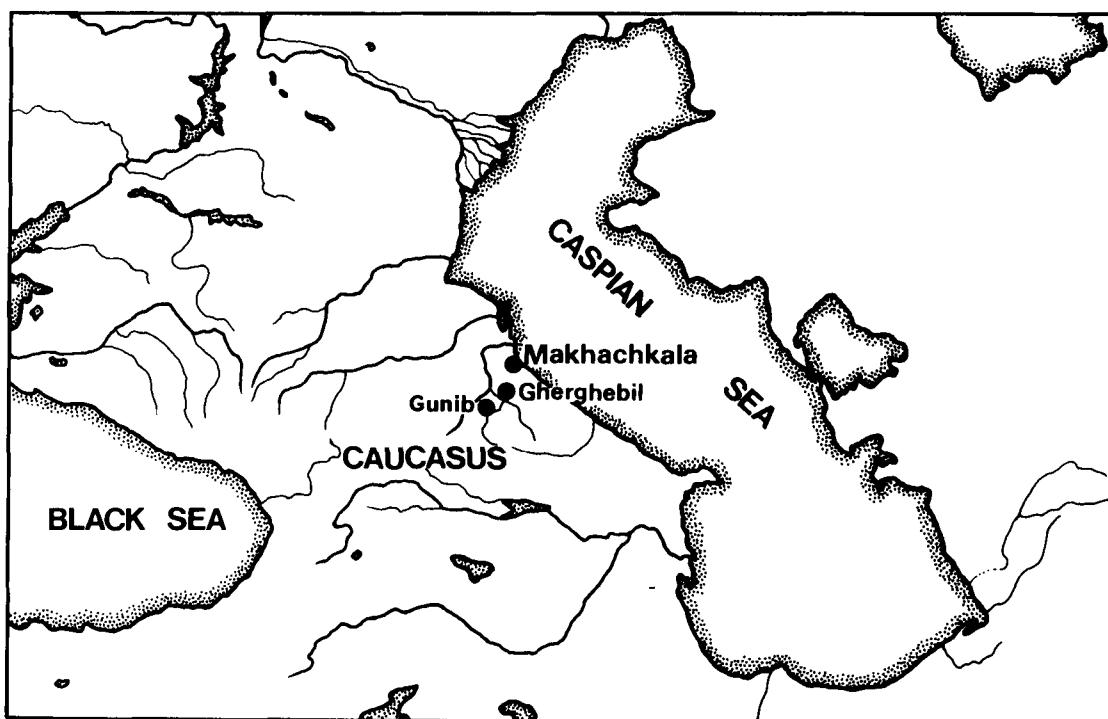


Fig. 6, map of Daghestan with location of the 3 prospected localities.

tats, so it is likely that more extensive investigations would provide more species. Among the species found in Daghestan, two are presumably new to science. One of them, *D. altukhovi*, which is described above, lived in sympatry on fungi with the closely related species *D. funebris*. Only males of this species could be identified. All the females that were kept alive and produced progeny belonged to *D. funebris*. Consequently, we do not know if *D. altukhovi* can be bred under laboratory conditions.

The other new species is very close to *D. lebanonensis*, and the male genitalia are almost identical. On the other hand, the Daghestan flies, that can be reared in the laboratory, exhibit some morphological differences from *D. lebanonensis*. Also, *D. lebanonensis* is known to be very resistant to alcohol (David *et al.*, 1983) while the Daghestan strain is sensitive to it. Further investigations are under way to decide whether this taxon deserves the rank of a species or a subspecies.

Another interesting species is *Chymomyza amoena*. This species which has an American origin, has been recorded during the last two decades in several European countries. Burla and Bächli (1992) suggested this might be due to its recent invasion of Europe. Its occurrence in Daghestan may also be a consequence of this colonization of the Old World and demonstrates a very rapid extension of this species geographic distribution.

Chymomyza amoena may be considered now as a holarctic subcosmopolitan species.

A remarkable feature of the Daghestan drosophilid fauna is the high proportion of cosmopolitan species - 8 out of 28 (see David & Tsacas, 1981). This is not surprising if we consider that many of them have been transported by man, are more or less domestic and linked to man-made resources. An interesting observation concerns *D. virilis* which is found in many places and very often in beer factories but rarely in outdoor conditions. *D. virilis* was very abundant in Gherghebil, especially in a fruit processing factory where it was found with several other domestic species.

A last point to note is the complete absence in Daghestan of the cosmopolitan species *D. simulans*. This species is very often sympatric with *D. melanogaster* and predominant in Mediterranean countries. From ecological conditions, we expected to find it abundantly in Daghestan, and its complete absence came as a surprise. In Eastern Mediterranean countries, *D. simulans* is very common in Egypt, Greece, Israel, and presumably Turkey. It was also recorded as abundant in Irak. It must, however, be very rare in ex-USSR since Gornostaev (1989) mentions only one capture in Batumi (Georgia). Going to the East, we know that *D. simulans* is, so far, absent from India, Thailand, China and, presumably, all other asiatic continental countries. It is abundant in Japan but as a consequence of a quite recent introduction (Watanabe & Kawanishi, 1976). Collection of a single individual in 1989 in Khingan nature reserve near Khabarovsk is mentioned by Sidorenko (1992). In tropical Africa which harbors ancestral populations (Lachaise *et al.*, (1989) the geographic pattern of this species distribution is also bizarre: the abundance of *D. simulans* decreases continuously from east to west in spite of favourable ecological conditions. Areas around the Black Sea and East Mediterranean region are also very interesting in this respect since going north we can apparently move from a great abundance of *D. simulans* to its complete absence. Further investigations of the area close to the Black Sea might help to understand this ecological and biogeographical mystery.

Acknowledgments

We are greatly indebted to Yu. P. Altukhov and L. A. Zhivotovsky for their help and support for this project. We also thank M. M. Magomedmirzaev, Director of the Mountain Botanical Garden in Makhachkala, for his help in organizing the collecting trips and Felix A. Suranov for excellent technical assistance.

LITERATURE CITED

- BACHLI G. & ROCHA-PITE M.T., 1981. – Drosophilidae of the Palearctic Region, *In* : M. Ashburner, H.L. Carson & J.N. Thompson, Jr (eds), *The Genetics and Biology of Drosophila*. New York & London : Academic Press. vol. 3 a: 169-196.
- BACHLI G. & ROCHA-PITE M.T., 1985. – Family Drosophilidae, *In* : A. Soos & L. Papp (eds.), *Catalogue of Palaearctic Diptera*. Amsterdam, Oxford, New York, Toronto : Elsevier, 10 : 186-220.
- BURLA H. & BACHLI G., 1992. – *Chymomyza amoena* (Diptera : Drosophilidae) reared from chestnuts, acorns and fruits collected in the Canton Ticino, Switzerland. – *Bulletin de la Société Entomologique de Suisse*, 65 : 25-32.
- DAVID J.R., VAN HERREWEGE J., MONCLUS M. & PREVOSTI A., 1979. – High ethanol tolerance in two distantly related *Drosophila* species: a probable case of recent convergent adaptation. – *Comparative Biochemistry and Physiology*, 63c : 53-56.
- DAVID J.R. & TSACAS L., 1981. – Cosmopolitan, subcosmopolitan and widespread species: different strategies within the Drosophilid family (Diptera). – *Compte Rendu des Séances de la Société des Sciences de Biogéographie*, 51 : 11-26.
- GORNOSTAEV N.G., 1989. – Materials on the fauna of the *Drosophilidae* (Diptera) of the USSR. – *Revue d'Entomologie de l'URSS*, 68 : 422-431 [in Russian].
- LACHAISE D., CARIOU M.L., DAVID J.R., LEMEUNIER F., TSACAS L., & ASHBURNER M., 1988. – Historical Biogeography of the *Drosophila melanogaster* species subgroup. – *Evolutionary Biology*, 22 : 159-225.
- SIDORENKO V.S., 1989. – Drosophilid flies of the genus *amiota* (Diptera, Drosophilidae) from Primorie territory. – *Zoologiceskij Zurnal*, 3 : 59-66 [in Russian].

- 1991. – New and little known species of *Leucophenga* Mik, 1886 (Diptera : Drosophilidae) from Soviet Far East and Japan. - *Annales de la Société Entomologique de France (N.S)*, **27** : 401-405.
 - 1992. – New and unrecorded species of Drosophilidae from Soviet Far East (Diptera, Brachycera). - *Spixiana*, **15** : 93-95.
- WATANABE T.K. & KAWANISHI M., 1976. – Colonization of *D. simulans* in Japan. – *Proceedings of the Japan Academy*, **52** : 191-194.