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Redescription of *Andrena* (*Graecandrena*) *schwarzi* WARNCKE, 1975 and *A.* (*G.*) *walishanovi* OSYTSHNJUK, 1994 (Hymenoptera: Apoidea: Andrenidae)

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ABSTRACT. *Andrena* (*Graecandrena*) *schwartzi walishanovi* OSYTSHNJUK, 1994 is raised to species rank. *Andrena* (*Graecandrena*) *schwarzi* WARNCKE, 1975 and *A.* (*G.*) *walishanovi* OSYTSHNJUK, 1994 are redescribed and new faunistic data for both species are given.

Key words: entomology, taxonomy, redescription, *Hymenoptera, Andrenidae*, *Andrena walishanovi*, *Andrena schwartzi*, Kazakhstan, Ukraine.

INTRODUCTION

A. schwarzi walishanovi was originally described by OSYTSHNJUK (1994) from Kazakhstan and placed in subgenus *Graecandrena* WARNCKE, 1968.

OSYTSHNJUK (1994) remarked on the considerable differences between the females as well as males of the nominotypical and new subspecies. She laid special emphasis on the great differences between the males of these subspecies.

We examined the type and collection material of both above mentioned subspecies, analyzed the data on ecology and geographical distribution and came to conclusion that *A. walishanovi* and *A. schwarzi* WARNCKE, 1975 are closely related but distinct species. Redescription of both species with comparative notes, new locality data, and biological notes are given below.

RESULTS

Andrena walishanovi OSYTSHNJUK, 1994 n. stat.

A. schwarzi walishanovi OSYTSHNJUK, 1994: 23 ♂♀.

REDESCRIPTION

Female. Length: 6-7 mm. Very similar to female of *A. schwarzi* WAR., but differs in some respects (Tab. 1). Basal area of labrum 2.5 times as broad (its basal broadth) as long with thick abrupted apex, usually without mid-emargination, with transversal impression in the middle (fig. 3). Clypeus shiny polished, sparser punctate, without impunctate mid-line, apical margin broadly impressed (fig. 2); supraclypeal area longitudinally wrinkled, denser punctate. Facial foveae longer, extending to level of the middle of lateral ocellus and clypeal base; narrower above, dispose about 1/2 distance between eye and lateral ocellus (fig. 1). Mesoscutum usually polished, more or less regularly finer punctuate. Propodeal triangle rugulose-foveate on half part or somewhat over dorsal surface, with distinct borders, its sculpturing as in propodeum outside (fig. 4) or somewhat coarser. Metasomal terga granulate coarser punctate with distinct punctures; tergum 1 denser punctate than in female A. schwarzi, rest terga with scattered punctures; marginal zone of terga 2-4 narrower; tergum 2-3 with marginal zone which equals about 1/3 of tergal length, dilated medially to over 1/3 of tergal length; marginal zone of tergum 4 nearly as in female *A. schwarzi*. Pygidial plate narrowly triangular, with weakly concave mid-area and narrow impressed lateral margins.

Black; wings yellowish, stigma and veins brownish-yellow. Antennal flagella from second segment yellowish-brown. Hind tibiae and all tarsi brownish; marginal zone of terga brownish with whitish hyaline posterior margin narrower than in female *A. schwarzi*. Head and mesosoma with short sparse whitish hairs; facial foveae with whitish velvet pubescence. Propodeal corbicula and trochanteral flocculus with short sparse whitish hairs. Metatibial scopa whitish more or less dense. Metasomal terga 2-4 with broad apical fascia of dense whitish hairs, interrupted on terga 2-3. Prepigidial fimbria yellowish with whitish hairs above.

Male. Length: 6,5-7 mm.Similar to male of *A.schwarzi*, but differs in many respects (Tab.1). Similar to female in sculpturing,coloration and pubescence. Basal area of labrum with nearly rectangular distinctly emarginate in the middle apex (fig. 6). Clypeus shiny granulate basally, sparser punctate than in male of *A. schwarzi*, with scattered punctures medially. First flagellar segment shorter than second and third segments taken together; 2nd segment equal in length to 2/3 of its broadth, 3rd segment somewhat longer than broad (fig. 5). Sculpturing of clypeus, supraclypeal area, mesoscutum, propodeal triangle nearly as in female. Gonocoxites with short acute well developed dorsal lobe, penis valvae narrower basally and longer than in male of *A. schwarzi*, gonostyles dilated apically, broader distally and narrower proximally than in male of *A. schwarzi*

(fig. 8). Sternum 7 with deep triangular emargination apically, sternum 8 rounded apically with shallow emargination in the middle or without it.

Body coloration as in female, but clypeus yellow entirely or partly, with small black lateral macula, occasionally paraocular area with small yellow macula. Body pubescence as in female, but metasomal terga 2-5 with indistinct sparse fimbrialike fascia.

Variability: In females the following characters vary: shape and dimention of basal area of labrum, shape and length of facial foveae, clypeal and supraclypeal sculpturing, sculpturing of propodeal triangle and metasomal terga. In males vary the coloration of clypeus from yellow with black lateral macula and apical narrow strip to black with large yellow macula, nearly yellow, occasionally paraocular area with yellow small macula. It is interesting to note that in female specimens from Volgograd and Aktyubinsk overlapping of morphological characters was found, they show characters of both species – *A. walishanovi* and *A. schwarzi*. Earlier this phenomenon was recorded by A. Z. OSYTSHNJUK (1994).

When we examined all specimens from different localities of *A. walishanovi* area, we found that females of peripherical populations differed from the typical form by recombination of some characters. The females from c. Kikvidze (Volgograd region, Russia) have, as the female of *A. schwarzi*, denser and finer punctate clypeus, finely reticulate and sparser punctate supraclypeal area, broader marginal zone of terga. The females from c. Emba, c. Berchogur (Aktybinsk region, Kazakhstan) have, as females of *A. schwarzi*, entirely rugose-foveate or rugulose-foveate dorsal surface of propodeal triangle, finely punctate metasomal terga with broader marginal zone, in some cases the females had denser and finer punctate clypeus, shorter facial foveae.

DISTRIBUTION

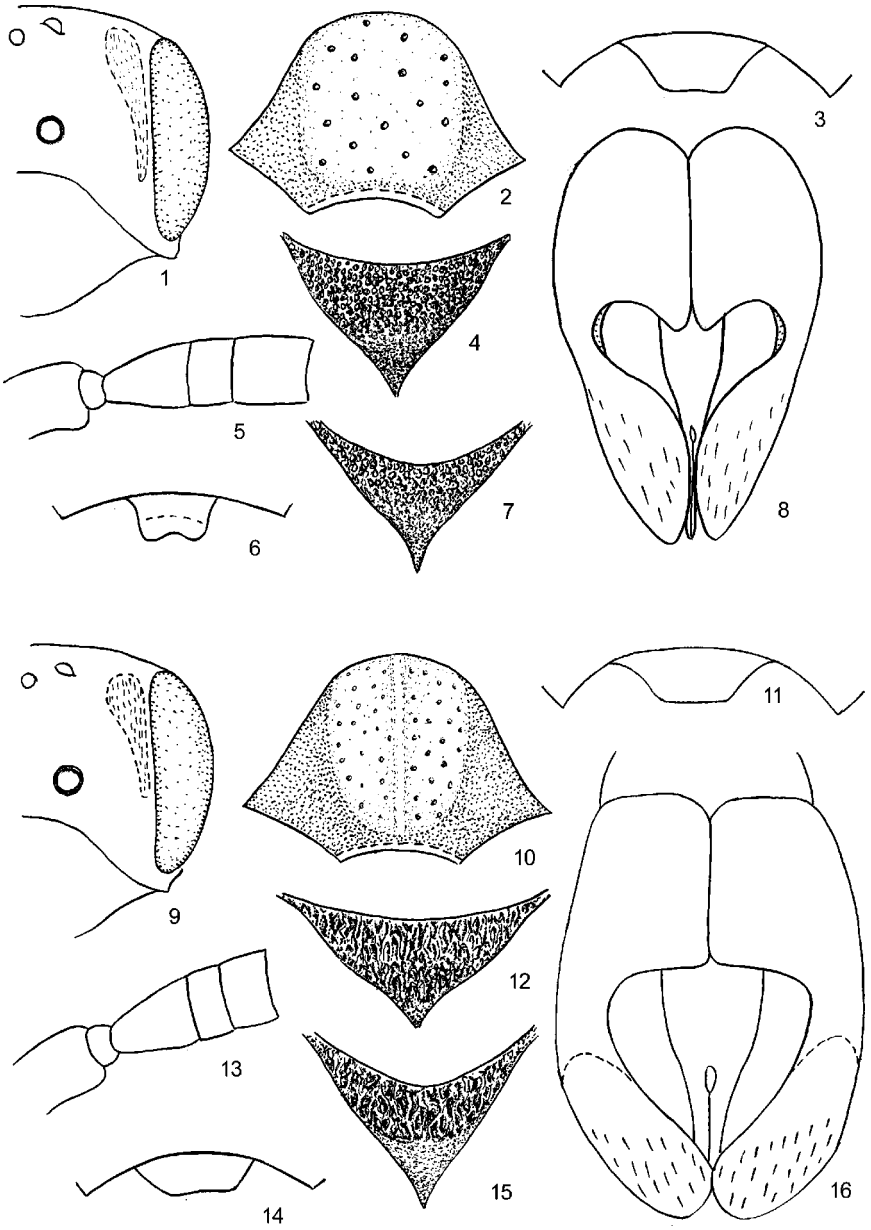
Russia: Volgograd reg., c. Kikvidze; Kazakhstan: Aktyubinsk reg., Mugodzary, sur. c. Emba; c. Berchogur, c. Borly; Mangyshlak reg., c. Schevchenko; Celinograd (Akmolinsk) reg., sur. Celinograd (Akmola), Kurgaldzinskiy Reserve, Kokshetau, Zharkol Lake; Karaganda reg., , Shapshane, Kinely, Koksengir;Dzhambul reg., Betpak-Dala.

BIONOMY

Flight period: May-June. The females collect pollen from the flowers of Brassicaceae and Apiaceae preferably. They were recorded on flowers of Rosaceae, Asteraceae, Euphorbiaceae. This species occurrs in varied biotopes, prefers the xeric one.

MATERIAL EXAMINED

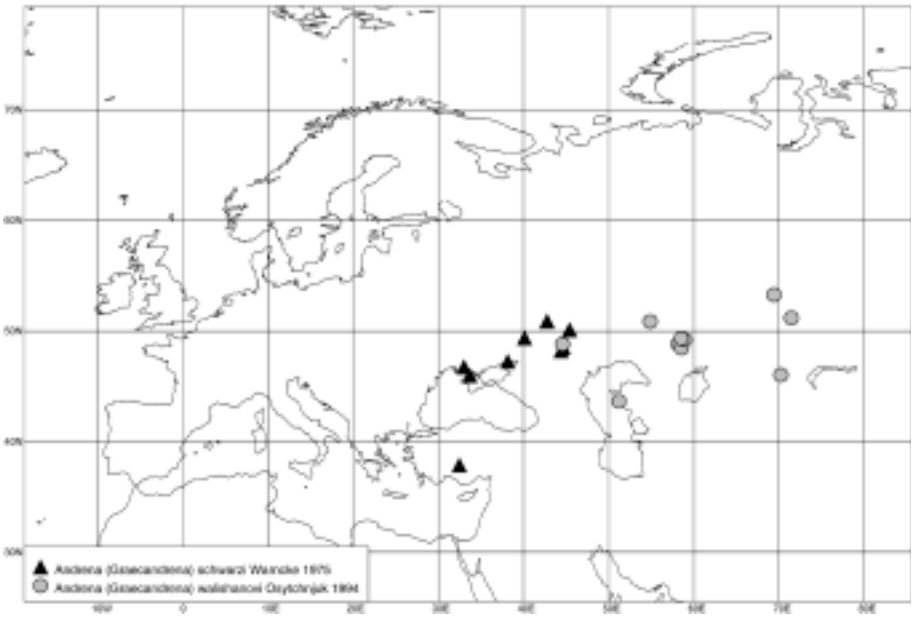
Holotype and paratypes: M, Andrena schwarzi walishanovi Osytshnjuk/ Kazakhstan, Aktyubinsk reg., m. Mugodzhary, sur. Emba river plain, 10.06.1985, leg. Nesterov. 7F 2M - labeled as holotype; 35F 3M - the same locality, 6-



1-8. *Andrena walishanowi*: female (1-4), 1 – facial fovea, 2 – clypeus, 3 – basal area of labrum, 4 – propodeal triangle; male (5-8), 5 – flagellar segments 1-3, 6 – basal area of labrum, 7 – propodeal triangle, 8 – genital capsule. 9-16. *Andrena schwarzi*: female (9-12), 9 - facial fovea, 10 – clypeus, 11 - basal area of labrum, 12 - propodeal triangle; male (13-16), 13 - flagellar segments 1-3, 14 - basal area of labrum, 15 - propodeal triangle, 16 - genital capsule

12.06.1985, leg. Nesterov, Kotenko; 1M- the same locality, 25 km N of Borly, rock Bymen, 13.06.1985, leg. Kotenko; 2F - Russia , Volgograd reg., Kikvidze, schelterbelt, 31.05.1974, leg. Muchin; 1F - Kazakhstan, Kokshetau, Akmolinsk reg., fl. *Ranunculus***,** 14.05.1957, leg. Tobias; 1M - the same locality, fl. *Ferula*, 3.06.1957, leg. Tobias; 1F - [Kazakhstan] 10 km N of Zharcol Lake, Akmolinsk reg., 17.06.1957, leg. Tobias; 1M - Kazakhstan, Kokshetau, near the r. Tersakkan, W of Akmolinsk, 5.06.1957, leg. Tobias; 1M - Kaz. SSR, Emba, flood plain r. Emba, 7.06.1985, leg. Kotenko; 1M - Kaz. SSR, Mugodzhary, r. Berchogur, N-W slopes of m. B. Baktybay, 9.06.1985, leg. Kotenko; 1M – Kazakhstan , 4 km E of c. Shevchenko, 15.06.1985,leg. Kotenko.

Collection material: 14F 13M, Kazakhstan, Aktyubinsk reg., m. Mugodzhary, sur. Berchogur, steppe slopes, 9.06.1985, leg. Nesterov, Kotenko, 1F 7M, Kazakhstan, Aktyubinsk reg., town Emba, flood plain of the river Emba, fl. *Euphorbia,* 10.06.1985, leg. Ermolenko; 11F 11M, Kazakhstan, Aktyubinsk reg., sur. t. Emba, steppe, 8.06-18.06.1985, leg. Nesterov; 2F 2M, the same locality, fl. *Euphorbia*, 11.06.1985, leg. Nesterov; 2F 8M, Kazakhstan, Aktyubinsk reg., c. Schevchenko, steppe, sandy, 14.06.1985, leg. Nesterov; 2M, Kazakhstan, Aktyubinsk reg., Auljinsk reservoir, m. Dva Brata, slopes, 10.06.1985, leg. Kotenko; 1F - the same locality, forest edge, 8.06.1985, leg. Kotenko; 12F18M, Kazakhstan, Aktyubinsk reg., m. Mugodzhary, sur. c. Borly, 8.06-12.06.1985, leg. Nesterov, Kotenko.



17. Distribution of *Andrena walishanowi* and *Andrena schwarzi*

Andrena (*Graecandrena*) *schwarzi* WARNCKE, 1975

Andrena schwarzi WARNCKE, 1975: 64-66 ♂♀ (Holotype: F, Sarepta (Krasnoarmejsk, Volgograd reg., Russia; leg. BECKER. Coll. Landesmuseum, Linz, Austria).

REDESCRIPTION

Female. Length: 6-7 mm. Basal area of labrum trapezoidal, 3 times as broad as long, shiny (fig. 11). Clypeus weakly convex, polished, irregularly scatterly punctate with small punctures, usually with narrow impunctate longitudinal mid - line (fig. 10). Supraclypeal area finely reticulate, with sparse punctures. Facial foveae dispose half distance between eye and lateral ocellus, extending to level of upper margin of eye and somewhat lower of antennal sockets, 2 times narrowed below (fig. 9). Mesoscutum finely granulate laterally, remaining surface polished, irregularly punctate with small punctures. Scutellum convex polished, sparser punctate than mesoscutum. Propodeal triangle longitudinally rugose-foveate on whole dorsal surface, with indistinct borders, its sculpturing somewhat coarser than propodeum outside (fig. 12). Forewing nervulus from weakly antefurcal to interstitial. Metasomal terga shiny granulate, tergum 1 with indistinct singular punctures apically, terga 2-4 with singular minute punctures subapically and laterally; marginal zone of terga 2-3 equal to 1/3 of tergal length laterally and 1/2 of tergal length medially, marginal zone of tergum 4 broader, equal to 1/2 of tergal length laterally and over 1/2 of tergal length medially; terga 2-5 with shiny broad whitish hyaline posterior margin of marginal zone. Pygidial plate broadly triangular brown to dark-brown. Black; wings light-yellow, stigma and veins yellowish. Antennal flagella from third segment fulvous. Hind tibiae and all tarsi brownish; marginal zone of terga light-reddish with broad whitish posterior margin. Head and mesosoma with short sparse whitish hairs; facial foveae with yellow velvet pubescence. Propodeal corbicula and trochanteral flocculus weakly developed; metatibial scopa whitish. Metasomal terga 2-4 with broad apical fascia of dense white hairs interrupted on terga 2-3. Prepygidial fimbria light-yellow with white hairs laterally.

Male. Length: 6,5-7 mm. Similar to female in sculpturing, coloration and pubescence. Basal area of labrum with broad slightly emarginated apex (fig. 14). Clypeus very shiny granulate basally, densely punctate, with scattered punctures medially. First flagellar segment as long as second and third segments taken together; second segment 2 times as broad as long, third segment somewhat shorter than broad (fig. 13). Mesoscutum finely granulate, very shiny, irregularly punctate with small punctures. Propodeal triangle with longitudinal rugae, occupying 1/2-2/3 of dorsal surface (fig. 15). Metasomal terga 2-4 granulate irregularly distinctly punctate; marginal zone of terga narrower and more impressed than in female. Gonocoxites without dorsal lobe, penis valvae basally as broad as gonostyles, narrowed apically, gonostyles moderately dilated distally and proximally (fig. 16). Sternum 8 with abrupted apical margin. Body pubescence as in

female, but clypeus with long white hairs, metasomal terga with sparse whitish hairs, terga 2-5 with indistinct sparse fimbrialike fascia.

DISTRIBUTION

Turkey: Konya, Ulukisla; Ukraine: Lugansk reg., Milovsk d., Reserve "Streletskaya step", Donetsk reg., Novoazovsk reg., Reserve "Khomu-tovskaya step", Kherson reg., c. Nova Tyaginka; the Crimea, Krasnoperekop d., c. Tavricheskoye; Russia: Volgograd reg., Krasnoarmejsk (the former Sarepta), Kamyshin, Dubovaya Balka, Tinguta.

BIONOMY

Flight period: April-June. The females visit the flowers of Brassicaceae (*Lepidium draba*), Rosaceae (*Potentilla humifusa*, *Prunus stepposa*), Salicaceae (*Salix triandra*), Euphorbiaceae (*Euphorbia*). This species prefers steppe landscape.

MATERIAL EXAMINED

Paratypes: 1F – Ukraine, Stalino [Donetsk] reg. Reserve "Khomutovskaya step", fl. *Prunus stepposa,* 3.05.1963, leg. Osytshnjuk; 1F – Ukraine, Lugansk reg., Reserve "Streletckaya step", plateau, fl. *Potentilla humifusa,* 16.04.1962, leg. Osytshnjuk (det. Warncke).

Collection material: 1F, Donetsk reg., Reserve "Khomutovskaya Steppe", limestone slopes, fl. *Prunus stepposa,* 2.05.1963, leg. Osytshnjuk; 2F, 2M, the same locality, plateau, meadow, fl. *Lepidium draba,* 9-10.05.1962; 2F, the same locality, plateau, country road side, fl. *Lepidium draba* ; 1F - the Crimea, Krasnoperecopskiy d., c. Tauricheskoye, 9.05.1972, leg. Ivanov.

DISCUSSION

As indicated above *A. walishanovi* is very close to *A. schwarzi*, from which it differs in the morphological characters (tab.1), ecological peculiarities and character of distribution (see fig. 17). Morphologically the female of typical *A. walishanovi* differs from the female of *A. schwarzi* as follows: facial foveae longer, clypeus sparser and coarser punctate, supraclypeal area with coarser sculpturing, mesoscutal and propodeal triangle sculpturing finer, metasomal terga coarser punctate, marginal zone of terga narrower. The differences between the males of these species are considerable.The male of *A. walishanovi* can be readily distinguished from the male of *A. schwarzi* by the yellow clypeus with short sparse pubescence, dimension of flagellar segments 1-3; shiny polished sparser punctate mesoscutum, rugose-foveate propodeal triangle, coarser sculpturing of metasomal terga, more impressed maginal zone of terga, distinct premarginal line, by the structure of genital capsule.

In spite of the insufficient ecological data there are some differences in flight period, floral and biotopical preferences. *A.walishanovi* has flight period from May to late June. It has been collected from May 5 to June 29. In A.schwarzi flight period was from middle April to late June. It was collected from April 16 to June 29. The female *A. walishanovi* collected pollen preferably from the flowers of Brassicaceae (*Berteroa spatulata*) and Apiaceae (*Ferula tatarica*, *F. songorica*, *F. caspica*, *Chaerophyllum prescotti*, *Trinia*). Occasionally they visited the flowers of *Achillea nobilis*, *Euphorbia virgata*, *Euphorbia* sp., *Spiraea*. The females of *A.schwarzi* prefered the flowers of Brassicaceae (*Lepidium draba*), occasionally visited flowers of Rosaceae, Salicaceae, Euphorbiaceae.

Biotopical distribution of both species differs in some respects. *A. walishanovi* is a semidesert species, occurring in various biotopes, prefers xeric ones. *A. schwarzi* is a steppe species. The distribution areas of these species are

Tab. 1. Diagnostic characters of *Andrena walishanovi* and *A. schwarzi*

A. schwarzi War.	*A. walishanovi* Osytsh.
Females	
1. Facial fovea dispose half distance between eye and lateral ocellus, extending to level of upper margin of eye and somewhat below of antennal sockets (fig. 9).	1. Facial dispose about half distance between eye and lateral ocellus, extending to level of the middle of lateral ocellus above and clypeal base below (fig. 1)
2. Clypeus shiny polished, irregularly sparsely punctate with small punctures usually with narrow impunctate mid-line; apical margin narrowly impressed (fig. 10). Supraclypeal area finely reticulate, with sparse punctures.	2. Clypeus shiny polished, sparser punctate with more large punctures, without impunctate mid-line; apical margin broadly impressed (fig. 2). Supraclypeal area longitudinally wrinked, denser punctate
3. Basal area of labrum 3 times as broad as long at base with rounded or abrupted apex, with emargination in the middle (fig. 11)	3. Basal area of labrum 2.5 times as broad as long at base with thickening abrupted apex in the middle usually without emargination, with transversal impression in the middle (fig. 3)
4. Mesoscutum finely granulate, in the middle polished irregularly, punctate with small punctures.	4. Mesoscutum usually polished, m. or l. regularly finer punctuate.
5. Propodeal triangle longitudinally rugoso-foveate on whole dorsal surface, with indistinct borders; its sculpturing somewhat coarser than propodeum outside (fig. 12).	5. Propodeal triangle rugulose-foveate on half part or somewhat over dorsal surface, with distinct borders, its sculpturing as in propo-deum outside (fig. 4) or somewhat coarser.
6. Metasomal terga finely punctate with indistinct punctures; tergum 1 with singular punctures, rest of terga with widely scattered punctures.	6. Metasomal terga coarser punctate with distinct punctures; tergum 1 denser punctate, rest of terga with scattered punctures.

Table 1 (continuation)

Males	
1. 1-st flagellar segment equals or subequals second and third segments taken together; second segment 2 times as broad as long third segment somewhat shorter than broad (fig. 13).	1. 1-st flagellar segment shorter than second and third segment taken together; second segment equals in length 2/3 of its broadth; third segment somewhat longer than broad (fig. 5).
2. Clypeus entirely black, densely punctate with small deep punctures, finely granulate basally, with dense long white hairs.	2. Clypeus yellow with black minute lateral macula and narrow apical strip, sparser punctate with large shallow punctures, with short sparser hairs, occasionally paraocular area with small yellow macula
3. Supraclypeal area finely reticulate, sparser punctate.	3. Supraclypeal area longitudinally wrinkled densely punctate.
4. Basal area of labrum usually broad, thickening, with shallow broad emargination apically (fig. 14).	4. Basal area of labrum narrower, thickening, with distinct narrow emargination apically, with transversal impression in the middle (fig. 6).
5. Genal area shagreened granulate with indistinct sparse punctures.	5. Genal area shiny finely densely punctate.
6. Mesoscutum finely granulate, densely punctuate; scutellar sculpturing nearly as in female.	6. Mesoscutum shiny polished, sparsely punctate; scutellar sculpturing nearly as in female.
7. Propodeal triangle with longitudinal rugosities, disposed 1/2-2/3 of dorsal surface (fig. 15).	7. Propodeal triangle with foveate rugose sculpturing, disposed 1/2-2/3 of dorsal surface (fig. 7), occasionally whole dorsal surface.
8. Metasomal terga granulate; sparser indistinctly punctate; marginal zone weakly impressed; premarginal line indistinct.	8. Metasomal terga granulate, denser distinctly punctate; marginal zone impressed, premarginal line distinct.
9. Genital capsule as figured (fig. 16); gonocoxites without dorsal lobe, gonostyles moderately dilated, penis valvae shorter and broader.	9. Genital capsule as figured (fig. 15); gonocoxites with well developed dorsal lobe, gonostyles longer, narrow in proximal part and dilated distally, penis valvae narrower and longer.

different, too. *A. walishanovi* is known chiefly from Kazakhstan, from Low Volga (Kikvidse, Volgograd region, Russia) 3 females were collected, but these specimens were hybrid. The hybrid specimens were found also in Aktyubinsk region. Their distribution area ranges from Karaganda region across Akmolinsk and Aktyubinsk regions to Volgograd region in the west, it reaches Betpak-Dala of Dzambul in the south region and Mangyshlak region (t. Schevchenko) in the

south-west, its north border is t. Akmola. This type of distribution area can be considered middleasiatic. *A.schwarzi* is known from South Ukraine and Russia (Low Volga)(OSYTSHNJUK 1977; WARNCKE 1975),Turkey (Konya, Ulukisla) (WARNCKE 1974). This species ranges from Kherson region and the Crimea across Donetsk and Lugansk regions to Volgograd region in the east. The southern border of its distribution are Konya and Ulukisla (Turkey). This type of distribution area can be considered pontic.

The evidence presented here have shown that *A. walishanovi* OSYTSHNJUK is a distinct species closely related to *A. schwarzi* WARNCKE.

Special attention should be paid to the hybrid swarms on the outlying area of *A.walishanovi*. There are Volgograd region, Russia (Kikvidze), and Aktyubinsk region, Kazakhstan (sur. Emba, Berchogur). It is interesting to note that Volgograd region (Krasnoarmejsk, Kamyshin, Dubovaya Balka, Tinguta) is the eastern border of range of *A. schwarzi* and western border (Kikvidze) of range of *A. walishanovi*. Analysis of the morphological characters of the specimens of *A. walishanovi* within range from east to west has shown the absence of differentiation of this species into subspecies and varieties, but the presence of the hybrid population on the peripheral area. In our preliminary estimation, the probable schematic expansion of *A. walishanovi* from Asia to Europe is as follows: from Karaganda region to south of Akmolinsk region, Turgaisk, Aktyubinsk region (Emba, Berchogur, Borly), Uralsk region, crossing the border of Volgograd region probably between the lakes Elton and Baskunchak, reaches c. Kikvidze. Migration of *A. walishanovi* from east to west took place until the ecological factors became unfourable for its further distribution. Such periferal population of parental species can be considered a geographical isolater. It seems likely that it is turned out in the extreme conditions on the western border of the range(Volgograd region).Under these conditions a separated small population is influenced by strong selection pressure, genetic drift and inbreeding. Integrate genetic system of parental population of *A. walishanovi* is destroyed. After the daughter population comes to the stage of low quantity (effect of bottle neck) genetic system of a new species *A. schwarzi* is formed. In connection with this we can suppose that the probable kind of specific formation of *A. schwarzi* is explosive speciation.

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