SPECIES OF *GUGOLZIA* DELUCCHI & STEFFAN (HYMENOPTERA: PTEROMALIDAE) FROM TURKEY, WITH DESCRIPTIONS OF TWO NEW SPECIES

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ABSTRACT: The species of *Gugolzia* Delucchi & Steffan, 1956 (Hymenoptera: Chalcidoidea: Pteromalidae) from Turkey are reviewed and a new diagnostic key are provided. Two new species, *G. oezdenoerneki* and *G. bandirmae*, were described and diagnostic characters were illustrated.

KEY WORDS: *Gugolzia*, new species, key for species, Turkey

The genus *Gugolzia* (Hymenoptera, Chalcidoidea, Pteromalidae) was described by Delucchi & Steffan (1956) with its type species *G. harmolitae* Delucchi & Steffan, 1956, as a solitary parasite of *Harmolita* (=*Tetramesa*) *romana* (Walker, 1873) which feeds in shoots of *Arundo donax* L. (Graminae) in France. Since its description, several authors have recorded *Gugolzia* as a monotypic genus (Graham, 1969; Dzhanokmen, 1978; Boucek & Rasplus, 1991). Boucek & Rasplus (1991) discussed the generic characteristics of the genus. Doğanlar & Bolu (2004) discovered a second species, *G. bademia* Doğanlar, 2004 in Elazığ province, Turkey, as a parasite of *Eurytoma amygdali* Enderlein, 1907 (Eurytomidae). Later, Doğanlar & Doğanlar (2010) revised the species of *Gugolzia* in Europe and Turkey, and gave additional diagnostic features for the genus and provided an identification key for the species by adding two more species from *Pistacia* spp.. Recently, Doğanlar et al. (2018) found another new species, *G. tuzlucanensis* Doğanlar, Gözüaçık & Subaşı, 2018 reared from fruit of *Sophora alopecuroides* L. **(**Fabaceae) collected in Tuzluca, Iğdır, Turkey.

The aim of the present study is to describe the new species of the genus, reared from fruit of *Pistacia palestina* Boiss. and *Pistacia terebinthus* L. (Anacardiaceae) collected in Tokat, Turkey and to give its diagnostic characters and discussed its placement in the genus, and a new identification key was provided to the species of *Gugolzia* from Turkey.

MATERIAL AND METHODS

This study is based upon examination and identification of the specimens, reared from fruit of *Pistacia palestina* and *P. terebinthus* collected in Tokat, Turkey. The examined specimens and types of the new species were deposited in Insect Museum of Biological Control Station, Yüreğir, Adana, Turkey (IMBC). Specimens were reared from fruits of *Pistacia* spp. and put directly into 96 % ethanol. Later individuals were mounted on cards, and antenna and forewings of the paratype were slide mounted in Canada Balsam for further morphological studies.

The species were identified by Doğanlar & Doğanlar (2010). Photographs of diagnostic characters of the genera were taken by using of Leica DM 500 microscopes with a digital Leica ICC 50 camera attached to it.

Abbreviations used in the key and descriptions are: F1-7 = funicular segments;OOL= Ocello-ocular distance.

RESULTS AND DISCUSSION

Gugolzia Delucchi & Steffan, 1956

Gugolzia Delucchi &Steffan, 1956: 30-34. Type species: *Gugolzia harmolitae* Delucchi & Steffan, 1956 by monotypy and original designation.

Gugolzia: Graham, 1969: 386, 430; Dzhanokmen, 1978: 233, 400; Boucek & Rasplus, 1991: 95, 97; Doğanlar & Bolu, 2004: 75; Doğanlar & Doğanlar 2010: 24.

Diagnosis. Given by Doğanlar &Doğanlar (2010).

Biology. Larval parasitoids of various phytophagous species of the family Eurytomidae (Hymenoptera).

Distribution. Europe and Turkey.

Key to species of *Gugolzia* Delucchi & Steffan, 1956

Female

1-All of funicular segments longer than width.....2

- Some of the funicular segments quadrate or transverse.....5

2-Antenna (Fig. 1a) with F1 4.5x , F5 2.1x as long as width; pedicel plus flagellum 5.44x as long as length of scape, 1.4x width of head, 2.04x width of frons; malar space 0.62x broad of mouth; forewing (Fig. 3a) with pmv 1.74x stigmal vein; space between stigma and post marginal vein 1.43x width of stigma; metasoma with hind margin of tergites entire.....*G. harmolitae* Delucchi & Steffan, 1956

- Antenna with F1 at most 2.55x, F5 at most 1.75x as long as width; pedicel plus flagellum at most 3.0x as long as length of scape, 1.14x width of head, 1.78x width of frons; malar space and metasoma with hind margin of tergites variable.....3

3- Antenna (Fig. 1b) with F1 2.55x, F5 1.75x as long as width; pedicel plus flagellum 3.0x as long as length of scape, 1.14x width of head, 1.78x width of frons; malar space 0.37x broad of mouth; forewing (Fig. 3b) with pmv 1.6x stigmal vein; space between stigma and post marginal vein 1.1x width of stigma; metasoma with hind margin of 1st tergit emarginated.....*G. bademia* Doğanlar, 2004

- Antenna with F1 at most 2.43x, F5 at most 1.29x as long as width; pedicel plus flagellum at most 2.5x as long as length of scape; at most 1.34x width of frons; distinctly shorter than width of head; metasoma with hind margin of tergites variable.....4

4- Metasoma with hind margin of 1st and 2nd tergites emarginated; antenna (Fig. 1c) with F1 2.43x, F5 1.29x as long as width; pedicel plus flagellum 2.5x as long as length of scape, 0.92x width of head, 1.34x width of frons; malar space 0.41x broad of mouth; forewing (Fig. 3c) with pmv 1.6x stigmal vein; space between stigma and post marginal vein 1.9x width of stigma.....*G. karadagae* Doğanlar & Doğanlar, 2010

- Metasoma with hind margin of tergites entire; antenna (Fig. 1d) with F1 2.33x, F5 1.23x as long as width; pedicel plus flagellum 2.36x as long as length of scape, 0.85x width of head, 1.23x width of frons; malar space 0.53x broad of mouth; metasoma with hind margin of tergites entire; forewing (Fig. 3d) with pmv 1.5x stigmal vein; space between stigma and post marginal vein 1.4x width of stigma.....*G. bandirmae* n. sp.

5- Metasoma with hind margin of 1st tergit emarginated; antenna (Fig. 1e) with F5 quadrate; pedicel plus flagellum 0.9-1.06x as long as width of head; 1.4-1.6x width of frons; malar space 0.5-0.56x broad of mouth; forewing (Fig. 3e) with pmv 1.47-1.52x stigmal vein; space between stigma and post marginal vein 2.0x width of stigma.....*G. oezdenoerneki* n. sp.

- Metasoma with hind margin of tergites entire; antenna (Figs. 4f,g) with F5 at least slightly transverse.....6

6- Antenna (Fig. 1f) with F5 0.7x, F1 1.3x as long as width; pedicel plus flagellum 2.54x as long as length of scape, 0.97x width of head, 1.32x width of frons; malar space 0.44x broad of mouth; forewing (Fig. 3f) with pmv 1.26x stigmal vein; space between stigma and post marginal vein 1.85x width of stigma.....*G. melengicia* Doğanlar & Doğanlar, 2010
- Antenna (Fig. 1g) with F5 0.91x, F1 1.6x as long as width; pedicel plus flagellum 2.28x as long as length of scape, 0.89x width of head, 1.28x width of frons; malar space 0.65x broad of mouth; forewing (Fig. 3g) with pmv 1.5x stigmal vein; space between stigma and post marginal vein 1.73x width of stigma.....*G. tuzlucanensis* Doğanlar, Gözüaçık & Subaşı, 2018

Male

1- Antenna (Figs. 3a,b) with F1 at least 2.5x, F6 2x longer than width.....2
- Antenna (Figs. 3c-d) with F1at most 2.0x, F6 1.2x longer than width.....3
2- Antenna (Fig. 3a) with F1 3.6x; F6 3x; club 3.75x as long as width; pedicel plus flagellum 6.04x as long as length of scape, 2.65x width of head, 3.8x width of frons; malar space 0.75x length of eye.....*G. harmolitae*
- Antenna (Fig. 3b) with F1 2.5x, F6 2x; club 4.33x as long as width; pedicel plus flagellum 3.26x as long as length of scape, 1.14x width of head, 1.71x width of frons; malar space 0.55x length of eye.....*G. bademia*
3- Antenna (Fig. 3d) with F6 quadrate; F6 0.37x as long as club, the latter 2.25x as long as width; pedicel plus flagellum 1.65x as long as width of frons; malar space 0.71x length of eye; forewing with pmv 1.9x stigmal vein.....*G. karadagae*
-Antenna with F6 at least 1.2x as long as width; F6 0.46-0.5x as long as club; pedicel plus flagellum about 3.0x as long as length of scape, other characters variable.....4
4-Antenna (Fig. 3c) with pedicel plus anelli almost as long as F1; F6 0.86x; F1 1.14x as long as width; club 1.86x as long as width; pedicel plus flagellum 2.8x as long as length of scape, 1.7x width of head, 2.43x width of frons; malar space 0.72x length of eye.....*G. melengicia*
- Antenna (Fig. 3e) with pedicel plus anelli at least slightly shorter than F1; F6 1.16-1.2x; F1 1.6-2x as long as width; club 2.6x as long as width; pedicel plus flagellum as long as width of head, 1.4-1.5x as long as width of frons; malar space 0.6x length of eye.....
.....*G. oezdenoerneki* n. sp.

Gugolzia oezdenoerneki n. sp.

(Figs. 1e; 2e; 3e; 4a,b)

Etymology: The name is derived from name of the late Admiral, Özden Örnek, 20th Naval commander of Turkey and the architecture of Heybeliada (F-511) Corvette (MILGEM).

Diagnosis: Antenna with some of the funicular segments quadrate, F1 2.33x, F5 1.23x as long as width; pedicel plus flagellum 2.36x as long as length of scape, 0.85x width of head, 1.23x width of frons; malar space 0.53x broad of mouth; metasoma with hind margin of tergites entire; angle between stigmal and post marginal veins 50°; space between stigma and post marginal vein 1.5x width of stigma; metasoma with hind margin of the first tergite emarginated.

Description: Female: Body 4.0-4.5 mm.

Colour. Body black, with slightly bluish- green reflections; scape, venter of pedicel, and first anellus, last two segments of club yellow, dorsum of pedicel, last two anelli, flagellum brown; legs with coxae concolorous with body, femora and basal 2/3 of tibiae brown, ventrally yellow; trochanters, apical tip of tibiae, apical half of femora yellow, tarsi pale yellow, tips of pretarsi black. Wings hyaline, veins brown.

Head in dorsal view as wide as mesonotum, almost 2.3x as wide as long; occiput rounded and slightly incurved; temple about 0.42x eye width; in frontal view width of head 1.3× its height; eye about 1.52x as high as wide, malar space about 0.44x height of eye; margin of clypeus emarginated; OOL 0.7x POL. Antennae (Fig. 1e) inserted closer to median ocellus than to lower margin of clypeus (2.2:3.2), tip of scape reaches slightly above dorsal level of vertex;

combined length of pedicellus and flagellum 0.8x as long as the width of head, scape 0.9x as long as the height of eye and 3.4x length of pedicellus, the latter 1.86x longer than wide; relative measurement of segments as follows (length: width): scape (48:7), pedicel (13:7), A1 (2.5:4.3), A2 (2:5), A3 (4:7), F1 (19:10), F2 (16:10), F3, F4 (14:10), F5 (11:10), and clava (23(10:6:7):13). Anelli transverse, 3rd anellus 1.75x as wide as long; F1 1.9x longer than wide and 0.4× as long as length of scape, F2 0.84x as long as F1, 1.6x as long as width; F3 and F4 equal in size, 1.4x as long as width, F5 1.1x as long as width, F5 1.1x as long as 1st claval segment; club 1.2x longer than F1, and 1.8x as long as width. Sensillae arranged in 3 regular rows on F1, and in 2 rows on F2-F5.

Mesosoma about 1.25x longer than wide, pronotum medially 3.4× as wide as long; parapsidal furrows distinct. Scutellum slightly convex, 1.3x as wide as long, with a fine cross-furrow, differentiating finely reticulate frenum, length of frenum 0.3x the length of scutellum, the latter distinctly margined posteriorly. Propodeum (Fig. 4a) with distinct median carina and raised transverse strip; area between median carina and spiracles smooth; nucha shortly developed, with distinct small foveae medially, posterior margin sharply margined; propodeal callus and supracoxal flanges covered with dense white hairs. Forewing (Fig. 2e) ratio of costal cell: post marginal: marginal: stigmal vein is 70:25:32:18. costal cell 2.8x as long as marginal vein; post marginal vein 0.8x marginal vein, 1.4x stigmal vein; marginal vein 1.77x as long as stigmal vein.

Metasoma (Fig. 4b) 0.9x as wide as mesosoma (32:35), elongated, pointed, its dorsal length about 0.8x combined length of head and mesosoma, and about 2.0x as long as wide. First tergite distinctly shorter than scutellum, terga smooth; last tergum almost 0.7x as long as basal width; ovipositor hardly projecting.

Male: Body 2.6-3.8 mm. Similar to female, except as follows: antennae (Fig. 3e) with scape almost as long as the length of eye; relative measurement of segments as follows (length: width): scape (40:8), pedicel (11:7), A1 (2:4), A2 (1.5:5), F1 (14:9), F2 (13:9), F3 (13:8), F4 (12:8), F5 (11:8), F6 (10:9), and clava (23 (10:7:6):9). Combined length of pedicellus and flagellum almost 1.2× width of head; metasoma 0.9× as long as combined length of head and mesosoma, and almost 2× as long as wide.

Biology: reared from fruit of *Pistacia palestina* Giss. (Anacardiaceae), together with *Eurytoma pistacina* Rondani, and *Megastigmus pistaciae* Walker, 1871.

Materials studied: Holotype female: Turkey: Tokat, Taşlıçiftlik, 40°19′ N, 36°28′ E, 720 m, 24, viii. 1989, reared from fruit of *Pistacia palastina* Boiss. (Anacardiaceae), leg. H. Çam. Cat. No: 165-41. Paratypes: 10 females, 10 males, 17, vii- 24.viii. 1989, same host as the holotype; 2 females, 3 males, Doğancıbağları, 17, vii- 24.viii. 1989, *Pistacia terebinthus* L.

Comments: In female: *Gugolzia oezdenoerneki* n. sp. is similar to *Gugolzia melengicia* Doğanlar & Doğanlar and *G. tuzlucanensis* Doğanlar et al. 2018. But it differs from both of them in having metasoma with hind margin of 1st and 2nd tergites emarginated; F5 quadrate (in both species metasoma with hind margin of tergites entire; F5 at least slightly transverse).

In male: *Gugolzia oezdenoerneki* n. sp. is similar to *Gugolzia melengicia* Doğanlar & Doğanlar in having antennae with F6 longer than width. But it differs from *G. melengicia* in having antennae with F6 1.16-1.2x; F1 1.6-2x as long as width; club 2.6x as long as width; pedicel plus flagellum as long as width of head, 1.4-1.5x as long as width of frons; malar space 0.6x length of eye; forewing with pmv 1.47-1.52x stigmal vein (in *G. melengicia* antennae F6 0.86x; F1 1.14x as long as width; club 1.86x as long as width; pedicel plus flagellum 2.8x as long as length

of scape, 1.7x width of head, 2.43x width of frons; malar space 0.72x length of eye; forewing with pmv 1.27x stigmal vein).

Gugolzia *bandirmae* n. sp.

(Figs. 1d; 2d; 5a,b)

Etymology: The name is derived from name of the Bandırma Ship by which Atatürk and his friends came to Samsun, 19th May, 1919, in order to start of the liberation war of the Republic of Turkey.

Diagnosis: Antenna with all of funicular segments longer than width; F1 2.33x, F5 1.23x as long as width; pedicel plus flagellum 2.36x as long as length of scape, 0.85x width of head, 1.23x width of frons; malar space 0.53x broad of mouth; metasoma with hind margin of tergites entire; angle between stigmal and post marginal veins 50°; space between stigma and post marginal vein 1.5x width of stigma; metasoma with hind margin of the first tergite entire.

Description. Female: Body length 3.4 mm.

Colour. Body black, with slightly bluish- green reflections; scape, venter of pedicel, and first anellus, yellow, dorsum of pedicel, last two anelli, flagellum brown; legs with coxae concolorous with body, femora and basal 2/3 of tibiae brown, ventrally yellow; trochanters, apical 1/3 of tibiae yellow, tarsi pale yellow, tips of pretarsi black. Wings hyaline, veins yellow.

Head in dorsal view 1.17x as wide as mesonotum, almost 2.33x as wide as long; occiput rounded and slightly incurved; temple about 0.33x eye width; in frontal view width of head 1.32× its height; eye about 1.33x as high as wide, malar space about 0.38x height of eye, 0.53x width of mouth; margin of clypeus emarginated; OOL 0.5x POL. Antennae (Fig. 1d) inserted closer to median ocellus than to lower margin of clypeus (11:18), tip of scape reaches slightly above dorsal level of vertex; combined length of pedicellus and flagellum 0.85x as long as the width of head, scape 0.82x as long as the height of eye and 3.25x length of pedicellus, the latter 1.66x longer than wide; relative measurement of segments as follows (length: width): scape (52:8), pedicel (15:9), A1 (2.0:6), A2 (2.5:7), A3 (4:8), F1 (22:12), F2 (18:12), F3, F4 (16:11), F5 (12:10), and clava (26(8:10:8):11). Anelli transverse, 3rd anellus 2x as wide as long; F1 1.83x longer than wide and 0.42× as long as length of scape, F2 0.82x as long as F1, 1.5x as long as width; F3 and F4 equal in size, 1.45x as long as width, F5 1.2x as long as width, and 1.5x as long as 1st claval segment; club 1.18x longer than F1, and 3.25x as long as width. Sensillae arranged in 3 regular rows on F1, and in 2 rows on F2-F5.

Mesosoma about 1.5x longer than wide, pronotum medially 3.7× as wide as long; parapsidal furrows distinct. Scutellum slightly convex, 1.3x as wide as long, with a fine cross-furrow, differentiating finely reticulate frenum, length of frenum 0.36x the length of scutellum, the latter distinctly margined posteriorly. Propodeum (Figure 5 a) 0.43x as long as scutellum; without distinct median carina; with raised strips, near metasoma; area between spiracles with fine reticulations; nucha shortly developed, with distinct small foveae medially, posterior margin sharply margined; propodeal callus and supracoxal flanges covered with dense white hairs. Forewing (Fig. 2d) ratio of costal cell: post marginal: marginal: stigmal vein is 75:38:32:20. costal cell 2.34x as long as marginal vein; post marginal vein 1.19x marginal vein, 1.6x stigmal vein; marginal vein 1.6x as long as stigmal vein.

Metasoma (Fig. 5b) almost as wide as mesosoma (35:33), elongated, pointed, its dorsal length about1.3x combined length of head and mesosoma, and about 2.21x as long as wide. First tergite distinctly shorter than scutellum, terga smooth; last tergum almost 1.07x as long as basal width; ovipositor hardly projecting.

Materials studied: Holotype female: Turkey: Tokat, Taşlıçiftlik, 40°19′ N, 36°28′ E, 720 m, 24, viii. 1989, reared from fruit of *Pistacia terebinthus* L (Anacardiaceae), leg. H. Çam. Cat. No: 165-41.

Comments: *Gugolzia bandirmae* n. sp. is similar to *G. karadagae* Doğanlar & Doğanlar in having antenna with pedicel plus flagellum distinctly shorter than width of head. But it differs from *G. karadagae* in having F1 2.33x, F5 1.23x as long as width; pedicel plus flagellum 2.36x as long as length of scape, 0.85x width of head, 1.23x width of frons; malar space 0.53x broad of mouth; metasoma with hind margin of tergites entire; space between stigma and post marginal vein 1.5x width of stigma; metasoma with hind margin of 1st and 2nd tergites emarginated (in *G. karadagae* F1 2.43x, F5 1.29x as long as width; pedicel plus flagellum 2.5x as long as length of scape, 0.92x width of head, 1.34x width of frons; malar space 0.41x broad of mouth; space between stigma and post marginal vein 1.8x width of stigma; metasoma with hind margin of tergites entire; F5 at least slightly transverse).

Biology: Reared from fruit of *Pistacia terebinthus* L. (Anacardiaceae).

Host: Unknown.

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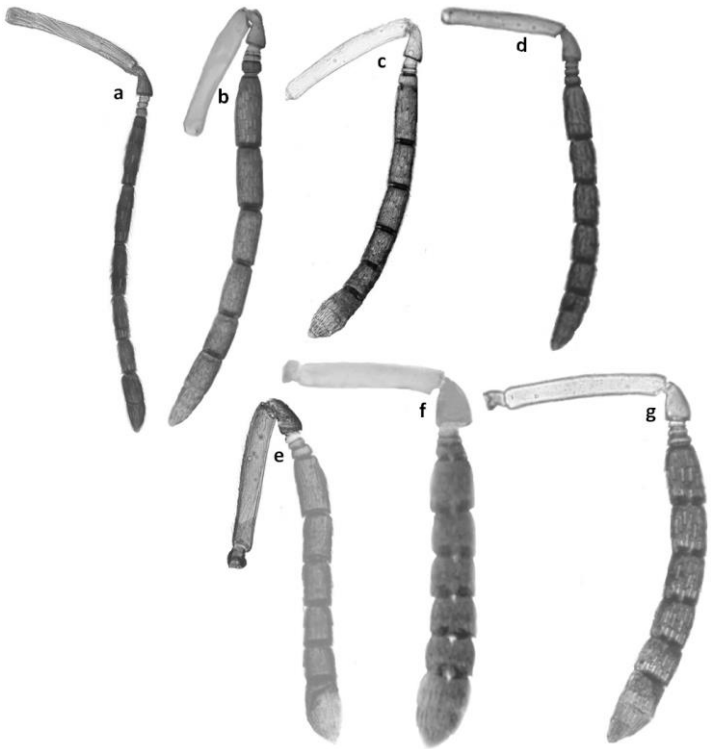

Figure 1. *Gugolzia* spp. Female antennae. a. *G. harmolitae*; b. *G. bademia*; c. *G. karadagae*; d. *G. bandirmae* n. sp.; e. *G. oezdenoerneki* n. sp.; f. *G. melengicia*; g. *G. tuzlucanensis*.

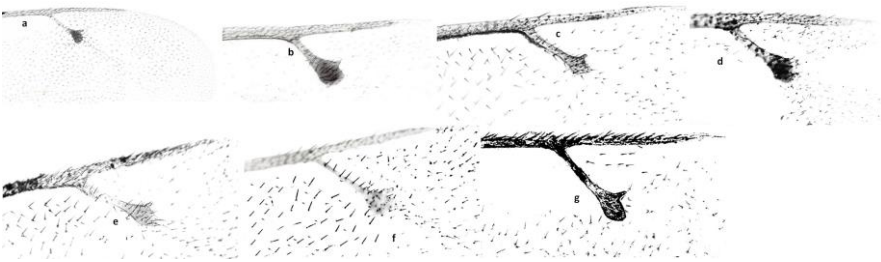

Figure 2. *Gugolzia* ssp., Female. a. area of around stigmal and post marginal veins. a. *G. harmolitae*; b. *G. bademia*; c. *G. karadagae*; d. *G. bandirmae* n. sp.; e. *G. oezdenoerneki* n.sp.; f. *G. melengicia*; g. *G. tuzlucanensis*.

Figure 3. *Gugolzia s*sp., Male antennae. a. *G. harmolitae*; b. *G. bademia*; c. *G. melengicia*; d. *G. karadagae*; e. *G. oezdenoerneki* n. sp.

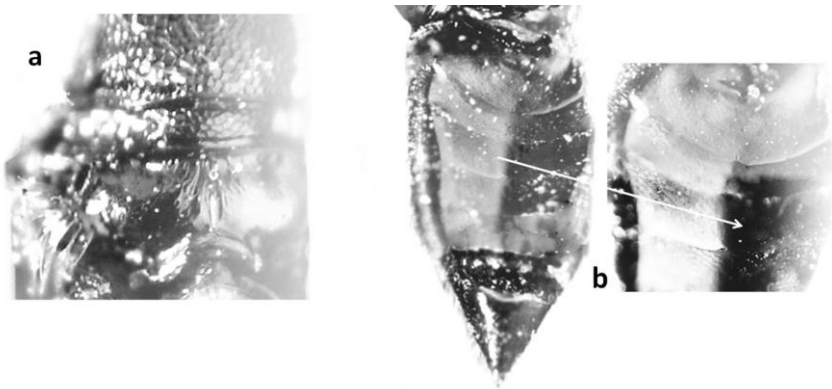

Figure 4. *Gugolzia oezdenoerneki* n. sp., Female. a. propodeum; b. metasoma, in dorsal view.

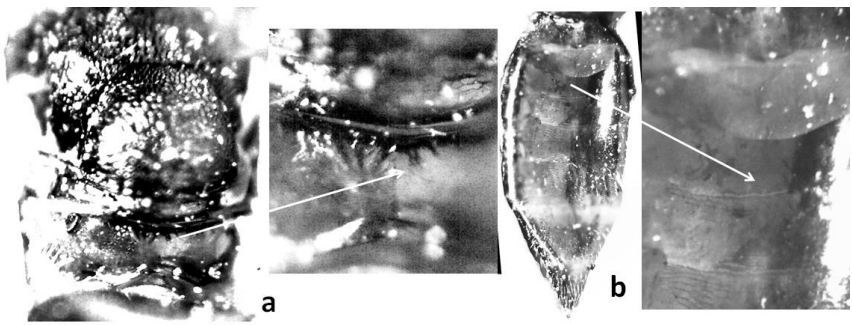

Figure 5. *Gugolzia bandirmae* n. sp., Female. a. propodeum; b. metasoma, in dorsal view.