

Description of *Mustha izmirensis*, New Species (Heteroptera: Pentatomidae: Halyini) From Bornova, Izmir, Turkey with Key to its World Species

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Abstract.- *Mustha izmirensis* described from Bornova, Izmir, Turkey is distinguished from all species of *Mustha* in general and its closest ally *M. spinosula* (Lefebvre) in particular on the basis of dorso-posterior margin of pygophore without median projection and L- shaped paramere instead of F- shaped, which is a usual character of the genus. The description and illustration of female genitalia including spermatheca in addition to other important morphological characters like metathoracic scent auricle and male genitalia inflated aedeagus of *Mustha* species are given for the first time. A key to all nine world known species of *Mustha* is presented here including new species, which appears to be a new record of the genus *Mushta* from Turkey in the existing literature.

Key words *Mustha izmirensis* new species, Turkey, Hemiptera, Pentatominae.

INTRODUCTION

Although *Mustha* Amyot and Serville (1843) is one of the richest Palaearctic genus in the tribe Halyini but still it is difficult to find new record or new species. Out of eight species six were described till 1952 and only two species have been added in the genus during the last fifty four years *M. spinosus* (Abbasi and Ahmad) from Pakistan, and *M. vicina* Hoberlandt (1995) from Iran. Among these, *spinosus*, initially was placed in the genus *Orthoschizops* Spinola by Abbasi and Ahmad (1971), based on female specimen only and was transferred to *Mustha* by Ahmad and Kamulddin (1979) without mentioning that it was the first record from Indo-Pak sub-continent of either genus. Later on Hoberlandt (1995) synonymized *spinosus* with *M. gigantea* Horvath. Therefore, in the last fifty four years we are fortunate to describe and add one more new species in the genus.

Here we have described our new species *M. izmirensis* on the basis of those characters that are diagnostic in the genus *Mustha* and are helpful in the identification of species such as external morphological characters like distance between the paraclypei which may be wider apart or entirely enclosing the clypeus; number, size and shape of spines (on head, pronotum and abdomen), length of

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labium, metathoracic scent auricle, male genital characters including pygophore (dorso- posterior margin, ventro- posterior margin and lateral lobes), paramere (particularly shape of stem and blade) conjunctival appendages of inflated aedeagus, and the ratio of commonly fused penial lobes with vesica. Female genitalia including spermatheca which is being described and illustrated here for the first time for any *Mushta* species (external terminalia was damaged in allotype). Previous workers like Abbasi and Ahmad (1971) described and illustrated only female terminalia although their species was based on only female specimen. Ahmad and Kamaluddin (1984) and Hoberlandt (1995) also completely ignored the characters of spermatheca although they have examined the female specimens, which they mentioned under material examined.

MATERIALS AND METHODS

We used dried and pinned specimens from Bornova, Izmir, Turkey for our taxonomical work. We dissected the male genitalia of Holotype and Allotype of new species in order to compare these with the genitalia of its closest ally *M. spinosula* (Lefebvre). The male genitalia was dissected by removing and boiling the pygophore in 10% KOH for 25-30 minutes following the methods described

by Ahmad (1986) and Ahmad and McPherson (1998). After eliminating excess KOH with water, the paramere and aedeagus were removed, then latter inflated, and studied under a dissecting stereomicroscope. For examining the female genitalia, the abdomen was removed and boiled in 10% KOH for 15 minutes, and the spermatheca was exposed by partially removing the terga as described in Ahmad and Memon (2001) and Memon and Meier (2006). The external genital plate was studied as described in Schaefer (1968). All the measurements are in millimeters. The measurements of various parts of the body were taken with the help of an ocular micrometer following the technique of Memon and Ahmed (2001). All the illustrations were made by ocular graticule stereo-binocular microscope.

Terminology for the inflated aedeagus and paramere follows that of McPherson and Ahmad (2005) and Memon and Meier (2006) and for the pygophore generally follows that of Schaefer (1981).

Mustha izmirensis new species
(Figs. 1, 2)

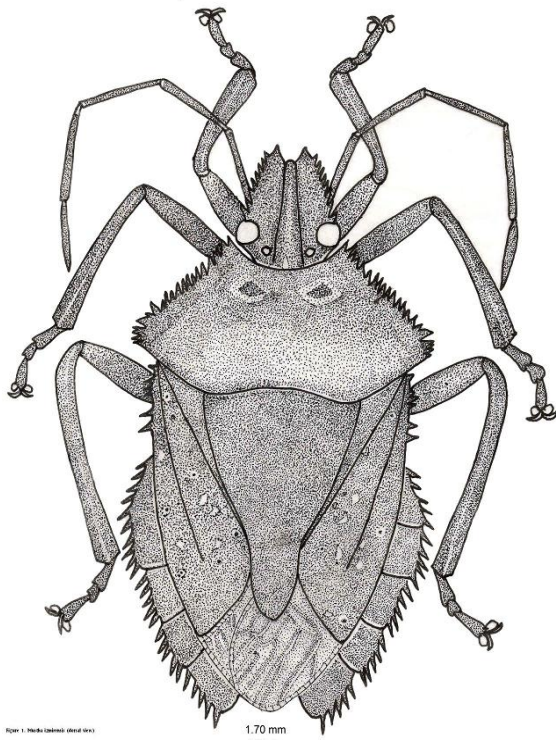


Figure 1. *Mustha izmirensis* (dorsal view).

Fig. 1. *Mustha izmirensis*, new species.

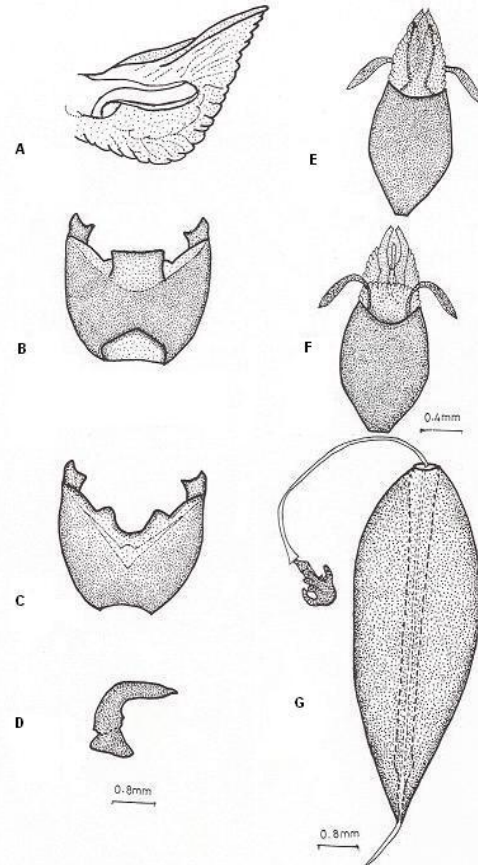


Fig. 2. *M. izmirensis*, new species: dorsal view, A, metathoracic scent gland ostiole, ventral view; B, pygophore, dorsal view; C, same, ventral view; D, paramere, inner view; E, inflated aedeagus, dorsal view; F, same, ventral view; G, female spermatheca, inner view.

Colour

Head, antennae, entire pronotum, entire scutellum except a little portion of apex, corium and connexiva jet black, thickly and densely punctuate with black tinge; eyes brown; ocelli dark pink; apex of scutellum, three basal spots of head, two small and one longitudinal median spot, ochraceous; labium brown except basal segment ochraceous; legs brown with dark brown spots and punctures except middle of hind tibiae reddish brown; hemelytra blackish brown with few light brown spots except middle of hind tibiae reddish brown; membrane of hemelytra dark brown; venter of

abdomen light brown, with ochraceous margin in middle along whole length of abdomen.

Head

Head as long as broad, almost triangular, tapering upward, lateral margins armed with long eight upward directed spines; paraclypeal lobes acute at apex, much longer than clypeus, apices wider a part, leaving clypeus free; antecular distance more than remainder of head, antecular distance 2.1 mm, remainder of head 1.5 mm, width across eyes 3.7 mm; interocellar distance 1.1 mm; interocular distance 2.1 mm; antennae five segmented, 1st antennal segment not reaching apex of head, length of antennal segments I 2.0 mm, II 2.5 mm, III 2.8 mm, IV 3.0 mm, V 2.2 mm, antennal formula I < V < II < III < IV; labium long, reaching up to base of fourth abdominal sternite, length of labial segments I 2.1 mm, II 2.8 mm, III 2.2 mm, IV 2.3 mm, labial formula I < III < IV < II, basal labial segment longer than bucculae.

Thorax

Pronotum broad, more than 2.5 X as wide as long and distinctly longer than head, lateral margins convergent, distinctly spinose, armed with nineteen, almost all long except few very short spines, humeral angles spinose, length of pronotum 4.1 mm, width 10.1 mm; corium with six short but distinct teeth on each side; scutellum distinctly longer than its width at base, apex sub-rounded, length of scutellum 7.5 mm, width 5.3 mm; distance, apex scutellum-apex abdomen including membrane 4.7 mm; evaporatoria of metathoracic scent gland (Fig. 2A) well defined with outer margin sinuate, ostiolar peritreme large, thick with anterior margin concave, anterolateral lobe of evaporating area spine-like, broad at base; membrane of hemelytra almost equal to last segment of abdomen both in male and female.

Abdomen

Connexiva well exposed at repose with joints acutely produced and lateral margins armed with about twenty six long acute spines, abdomen with deep sulcation on ventral side, accommodating long labium.

Male genitalia

Pygophore with dorso posterior margin with

shallow, broad cavity without median projection (Fig. 2B), ventro posterior margin sinuate with shallow, cup shaped cavity with distinct U-shaped median excavation (Fig. 2C), lateral lobes of pygophore distinctly projecting upward with prominent demarcation, apex concave with both apices acutely produced (Figs. 2B-C); paramere L-shaped, comprising three parts, foot, stem and blade, stem short, narrow and without inner thumb like process, blade elongate, narrow, almost rectangular with apex slightly thinly lobed, outer upper margin almost straight (Fig. 2D); inflated aedeagus with highly sclerotized theca, pair of thecal, highly sclerotized, thin, long, finger-like ventrolateral appendages, pair of dorsal membranous conjunctival appendages thick, slightly tapering upward with a much narrower and very small apical lobe, pair of sclerotized medially fused penial lobes, distinctly longer than dorsal conjunctival appendages, a tube-like vesica, shorter than penial lobes (Figs. 2E-F).

Female genitalia

Female terminalia damaged in allotype, spermathecal bulb small, proximally round with three processes, two small, finger-like and almost of equal size, third large, thick and forked at apex (Fig. 2G).

Comparative note

M. izmirensis is closely related to *M. spinosula* in having, middle of hind tibiae reddish brown, head relatively broad, as broad as long with eight upwardly directed spines on each lateral margin, paraclypei wider apart, leaving clypeus free. However it is different from *M. spinosula* in having, entire body jet black except few ochraceous spots, corium black, lateral margins of pronotum with nineteen spines (Fig. 1), labium relatively long, reaching 4th abdominal sternite, peritreme long and thick (Fig. 2A). The male pygophore that has dorso posterior margin with shallow, broad cavity and without dorso-median projection (Fig. 2B) which is also a diagnostic character of the genus, ventro posterior margin sinuate with shallow cup-shaped cavity and with distinct u-shaped excavation (Fig. 2C), lateral lobes of pygophore distinctly, narrowly produced with clear demarcation, distinctly lobed with apex concave and apices distinctly acute (Figs. 2B, C); paramere L-shaped with stem short,

relatively narrow, almost as narrow as blade and without thumb process, blade narrow rectangular and with outer upper margin almost straight without small round projection, apex thinly lobed. *M. spinosula* is dark brown, corium with yellowish spots, pronotum with sixteen spines, labium short extending to 2nd abdominal sternite, peritreme short and slim, The male pygophore of spinosula that has dorso posterior margin with deep cavity and distinct dorso-median projection, ventro posterior margin with quite deep and narrow V- shaped cavity, lateral lobes projecting upward without distinct demarcation, with apex convex and a little bifid, paramere F-shaped, stem with prominent inner thick thumb- like process and blade relatively broad, tapering acutely towards apex and outer upper margin with a little sub-round, hump-like projection near apex and other characters as noted in description and key.

Type material

Holotype (1 male), Bornova, Izmir, Turkey, 29 June 1978, host plant unknown, Allotype (1 female), same locality, 12 July 1978 with same data as holotype, deposited at Natural History Museum, University of Karachi, Sindh, Pakistan, NHMUK.

Etymology

This species is named for its distribution in Bornova, Izmir, Turkey.

KEY TO THE NINE WORLD SPECIES OF *MUSTHA* AMYOT AND SERVILLE

1. Head slightly narrowed at posterior part, nearly parallel sided, broadly round at apex, lateral margins of head serrate or dentate, size of body moderate 2
- Head conspicuously narrow along whole length, more or less triangular with sides slightly round or sharply triangular with expressively straight margins, lateral margins of head entirely armed with distinct spines, size of body relatively large 3
2. Head 1.06 times as long as broad across eyes; apex of paraclypei broad and sinuate, lateral margins of head armed anteriorly with 4 -5 distinct irregular spine and posterior margin with few scarcely visible tubercles; lateral margins of pronotum nearly straight with 11 unequal long acute spines; margins of connexiva with comb- like thin spines of almost equal length; body length 17.3 -18.7 mm *M. vicina* Hoberlandt
- Head 1.11 times as long as broad across eyes; paraclypei narrow at apex, lateral margins of head serrate irregularly along whole length; lateral margins of pronotum rather flattened, straight with regularly arranged short back wardly directed flat teeth; lateral margins of connexiva with similar teeth, five on each connexivum; length of body, 21mm *M. serrata* (F)
3. Apices of paraclypeal lobes wider apart, leaving clypeus free, lateral margins of head armed with 8 distinct spines..... 4
- Apices of paraclypeal lobes touching each other, entirely enclosing clypeus, lateral margins of head armed with eight -eleven spines..... 5
4. Body dark brown; pronotum with 16 regularly arranged spines; corium without dentine; male pygophore with lateral lobes a little produced with apex convex, ventro median cavity narrow and v-shaped; paramere F-shaped, stem relatively thick with well-developed thumb-like inner projection, blade acutely tapering towards apex with outer upper margin hump-like and a sub-round projection near apex, body length 22-25
..... *M. spinosula* (Lefebvre)
- Body jet black with few yellow spots on hemelytra; pronotum with nineteen long spines, except few very short; corium with six short teeth of unequal size; male pygophore with lateral lobes narrowly produced with distinct demarcation and apex concave with apices acute, ventromedian cavity with distinct U- shaped excavation; clasper L- shaped, stem thin, almost as thin as blade, without thumb process, blade narrow, somewhat, rectangle with apex a little lobed; body length 19.9 mm *M. izmirensis* n.sp.
5. Head sub triangular, distinctly narrow at apex, lateral margins of head moderately round; antennae black; connexival segments narrow 6
- Head sharply triangular, strongly narrowed at apex, lateral margins of head straight; Connexival segments broad 8
6. Pronotum very broad, trapezoid 2.9 times as broad as long, lateral margins of pronotum straight, flattened and distinctly raised with fifteen long, acute, upwardly projecting spines of unequal length; pronotal disc in anterior third with very distinct sharply delimited transverse elevation; costal margin of hemelytra yellow; callous with three short stout yellowish teeth, connexiva black, with exterior margin along whole length yellow, moderately raised, armed with 5-6 teeth on each connexivum; length of body 18.5 mm
..... *M. longispinis* Reuter
- Pronotum transverse, not more than 2.3 times as broad as long; pronotal disc without any distinct transverse elevation, lateral margins of pronotum less numerous armed with 12 irregularly arranged spines; costal margins of hemelytra and entire connexiva black or dark brown; teeth on connexiva not as above 7
7. Head 1.4 times as long as broad across eyes; bucculae broad, conspicuously bisinuate, anteriorly projecting in short acute spine, posteriorly widened in broad rounded lobe, body length 28-35 mm *M. gigantea* Horvath

- Head 1.1 times as long as broad across eyes; bucculae narrow with straight margin, anteriorly projecting in small acute process, but posteriorly round; body length 22-24*M. baranovi* Kiritschenko
- 8. Lateral margin of head armed with 11 upwardly directed spines of medium size which diminish anteriorly; pronotum trapezoid, 2.4 times as broad as long across eyes, lateral margins of pronotum slightly elevated with 18-21 short teeth which diminish on distal half; corium smooth surfaced without short dense depressed whitish hair; body length 19-23 mm.....*M. incana* Stal
- Lateral margins of head straight, armed with stout projecting spines along whole length; pronotum trapezoid, 2.2 times as broad as long, lateral margins of pronotum sinuate with 15-16 medially long acute spines, some very short; corium reddish brown with short dense depressed whitish hair, body length 20-24 mm*M. morgani* Horvath.

Remarks

The genus consists of nine Palearctic species including new species. This is the first record of *Mushta* from Turkey, although some species were recorded from Middle Eastern countries even from its neighboring countries such as Iran, Syria and Egypt etc. Within the genus *Mustha* this species can be placed with *M. spinosula* because both of these species have paraclypei wider apart, leaving clypeus free while all remaining species have entirely enclosed clypeus by paraclypei. This is the only species of *Mustha* that has very distinguished male genitalia like paramere, L-shaped, instead of F-shaped, stem short relatively narrow and without inner thumb like process (Fig. 2D), that seems a diagnostic character of the genus and play an important role in the phylogenetic relationship of the genus within the tribe Halyini, pygophore which has dorso posterior margin with shallow, broad cavity and without dorso-median projection (Fig. 2B) (which is also a diagnostic character of the genus), ventro posterior margin sinuate with shallow cup-shaped cavity and with distinct u-shaped excavation (Fig. 2C), lateral lobes of pygophore distinctly, narrowly produced with clear demarcation and with apex concave and apices distinctly acute (Figs. 2B, C). This particular combination of characters indicates that these states probably are synapomorphic and not only separate it from its closely allied species *M. spinosula* but gives it a very unique position in the genus from all

existing species of *Mustha*. We are first fortunate authors who have illustrated and described female spermatheca (Fig. 2G).

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