

## *Scirpobotys xanthosomalis* gen. nov., sp. nov. – a new genus and species of the Pyraustinae (Lepidoptera, Crambidae) from the Southern Arabian Peninsula

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### ABSTRACT

New taxonomic results on the Pyraustinae of the Southern Arabian Peninsula are presented on the basis of a sample collected in the south-western province Dhofar of the Sultanate of Oman. The specimens are attributed to the tribe Pyraustini of the subfamily Pyraustinae on the basis of synapomorphies in external characters, the male genitalia and the tympanal organs. Examination of the male genitalia and comparison with potentially related genera revealed significant differences, which are classified as autapomorphic character states. These autapomorphies result in the description of the new genus *Scirpobotys* gen. nov. The genus is at present monotypical. Its type species is *Scirpobotys xanthosomalis* gen. nov. sp. nov. The external character states of the new genus and the new species, the male genitalia and the tympanal organs are described and figured. The synapomorphies shared with the closest related congeners and the diagnostic characters of the new genus are listed. The female of the new genus is still unknown.

**KEYWORDS:** Pyraloidea, taxonomy, phylogeny, morphology, Oman, Dhofar.

### 1. INTRODUCTION

The Pyraustinae comprise 1239 described species in 172 genera, 52% of which are monotypical.

The three genera with the highest diversity are *Anania* Hübner, 1823, *Loxostege* Hübner, 1825 and *Pyrausta* Schrank, 1802, each of which comprises more than 50 species [1, 2].

A significant portion of the genera had been described according to typological concepts based on external characters before genital-morphological characters gained importance in the second half of the 20<sup>th</sup> century. The first important morphological studies with descriptions of new genera based on the male and female genitalia were done by Amsel [3-5] on Palearctic and Neotropical Pyraustinae and in a comprehensive series of studies by Munroe, Munroe and Mutuura [6-19] which were focused on the Oriental and Neotropical regions. A first comprehensive partial revision, in which genera sharing homologous morphological character states are synonymized is given in [20]. Numerous further partial revisions on genera in the Oriental region have most recently been done among others in [21-24]. Partial revisions of Afrotropical genera have been given by Shaffer and Munroe, Maes in [25-36].

A first revision of the subfamily as a whole on tribal level has been done most recently in [1]. 56% of the genera remain *incertae sedis*. The tribe Pyraustini makes up 98% of the assigned genera.

For the Arabian Peninsula, the Pyraustinae have been little explored till date, with a total of six genera and six species reported, the occurrence of which are centred on the northern parts - the UAE

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and Northern Oman [37-40]. For the southern parts of the Arabian Peninsula – Yemen, Dhofar, Southern Saudi Arabia only historical records have been known till date [40-41].

In 2018 the author collected a small sample of specimens ( $n = 2$ ) in the coastal mountain chain of Dhofar. The specimens are superficially close to stem borer species of the genera *Scirpophaga* Treitschke, 1832 and *Patissa* Moore, 1886. The latter two genera belong to the subfamily Schoenobiinae. Analysis of the wing venation, the genitalia and tympanal organs revealed synapomorphic character states of the Pyraustinae. Comprehensive study of the Afrotropical, Oriental and Palearctic genera showed significant modifications in the structure of the valva and the phallus apodeme. These differences result in the description of the new genus *Scirpobotys* gen. nov. The genus is monotypical. Its type species is *Scirpobotys xanthosomalis* sp. nov.

## 2. MATERIALS AND METHODS

### 2.1. Sampling

The author did field research on the Pyraloidea fauna of Dhofar from 2016-2019 in a total of six research expeditions in November and January/February. The specimens of the present sample were captured in November 2018 at night by means of a light-trap equipped with a 20 W tube of infra-blue light.

### 2.2. Macro-preparation and dissection

The adults were photographed with a SONY HX400V after relaxation and subsequent preparation. For examining the genitalia and tympanal organs, dissection, preparation and slide-mounting techniques were applied on the specimens on the basis of the protocol described in [42]. The preparation of the tympanal organs and of the genitalia was done under a Motic stereomicroscope (SMZ-171). The slides were photographed with a ToupCam c-mount camera (ToupTek Inc., Zhejiang, China) under a resolution of 18 megapixels. The images were post-processed by means of the imaging software ToupView, Version 1.0.

### 2.3. Morphological analysis

Analyses of wing pattern characters and morphological structures were done on the images.

Structural ratios in external characters, genitalia and tympanal organs were calculated on the images by means of the imaging software ToupView, Version 1.0.

### 2.4. Terminology and abbreviations

The descriptions of wing pattern characters, genitalia and tympanal organs follow the terminology in [43]. The denotations of the veins follow [25]. Descriptions of characters and character states in the genitalia were adopted from [1]. Abbreviations: ZSM = Zoological State Collection Munich, Germany.

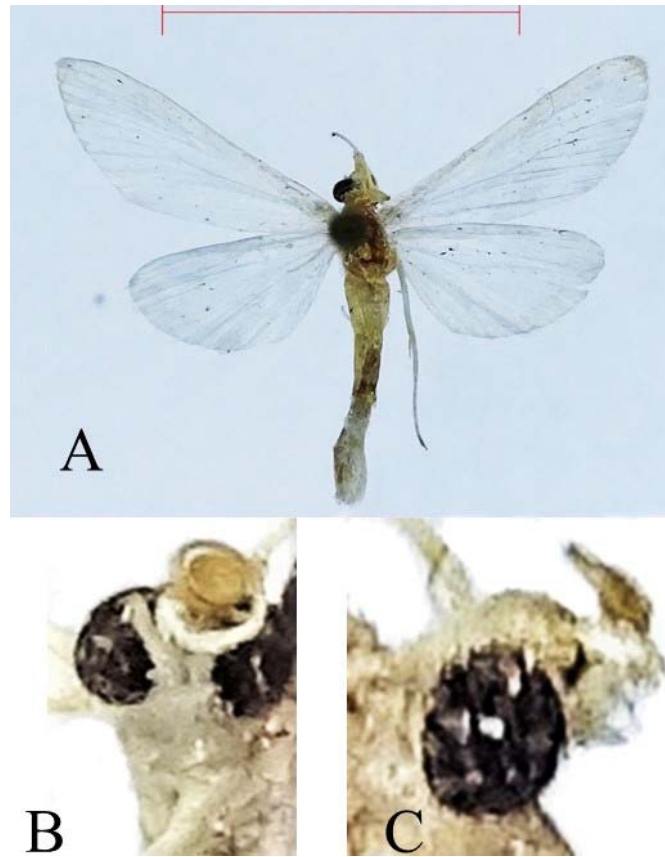
## 3. RESULTS AND DISCUSSION

### 3.1. *Scirpobotys* gen. nov.

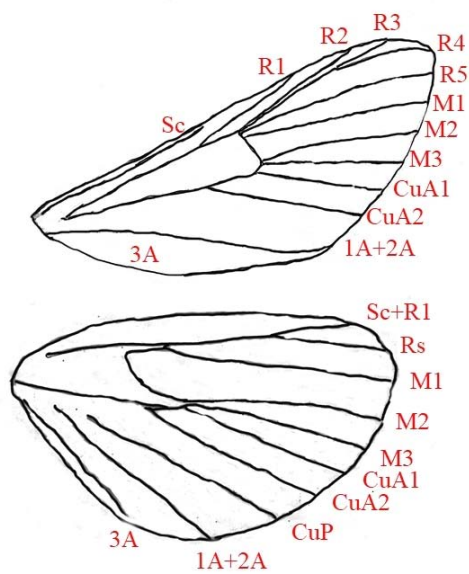
Zoobank: urn:lsid:zoobank.org:act:D57ACE80-0967-4788-93C5-2001ED2795BF

Type species: *Scirpobotys xanthosomalis* sp. nov.

**External characters (Figures 1, 2):** Head: Eye with ocelli present. Chaetosemata present. Frons with an antieriad-directed process of cylindrical shape. Vertex strongly scaled. Proboscis well developed. Labial palpus upright and broadened in segment 1, tapered, oblique and turned dorsad in segments 2 and 3. Maxillary palpus of constant width, labial palpus four times as long as the maxillary palpus. Antenna filiform ciliate, flagellomeres of cylindrical shape, basis dilated, scaled. Thorax: Ventral, dorsal thorax and tegula scaled. Number of spurs on fore-middle-hindlegs 2-0-4 as is typical of the Pyraloidea. Abdomen: elongate, four times as long as the thorax, broadened between A1, A2 and A7, A8, slender, tapered from A2 to A7 with distinct tufts of long hairs on A6 and A8. Forewing: elongate, narrow, triangular-shaped, ratio of maximum width/maximum length 0.3. Costa running straight from the base to R2 with a flat convexity from R2 to the apex. Sc running parallel to the costa and to the upper edge of the cell, equal in length with 90% of the upper edge of the cell. R1 und R2 parallel, both terminating at the termen, R1 running from the posterior fifth of the upper edge of the cell, before the upper angle, terminating at the costa. R2 and R3+4 stem both running from the upper angle of the cell, strongly approximated at their bases, with R2 and R3 terminating at the



**Figure 1.** *Scirpobotys xanthosomalis* gen. nov., sp. nov., adults. A: Holotype, male, Oman, Dhofar, Jebel Al Qamar, Road 47, 20 km E Sarfait, 05-XI-2018, leg. M. Seizmair, coll. ZSM, scale bar = 10 mm, B: Head profile, frontal view, C: Head profile, lateral view.



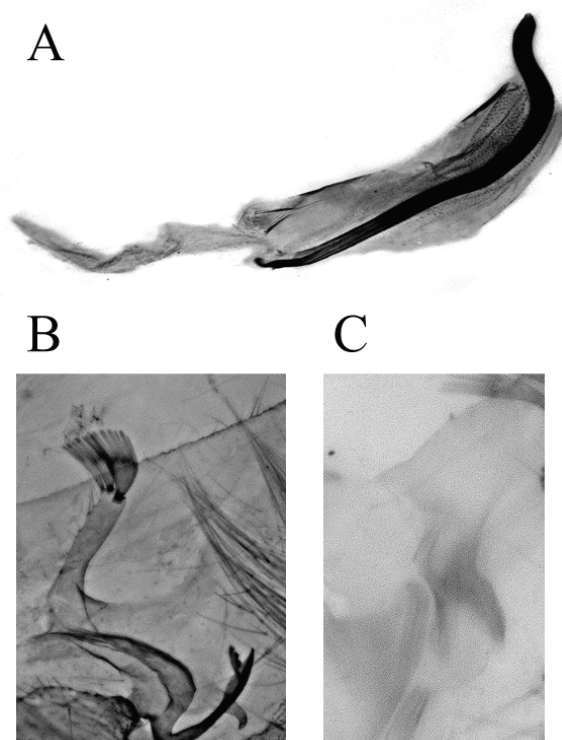
**Figure 2.** *Scirpobotys xanthosomalis* gen. nov., sp. nov., fore- and hindwing venation.

costa and R4 terminating at the termen, shortly below the apex. R4 convex. Ratio of the distance between the terminating points of R2 and R3/distance between the terminating points of R2 and R3 0.7. Bases of R5 and M1 shortly below the upper angle of the cell. Ratio of the distance between the bases of R2 and R3+4/distance between the bases of R3+4 and R5 0.4. Ratio of the distance between the bases of R3+4 and R5/distance between the bases of R5 and of M1 0.9. Base of M2 shortly before the lower angle of the cell. Base of M3 at the lower angle of the cell. Base of CuA1 shortly below the lower angle of the cell. Base of CuA2 wide spaced from the base of CuA1. Ratio of the distance between the bases of M2 and M3/distance between the bases of M3 and CuA1 0.5. Terminating points of R4, R5, M1, M2, M3, CuA1 and CuA2 equidistant. **Hindwing:** Ratio of the maximum width/maximum length 0.6. Costa convex at the base and between Sc+R1 and the apex and running straight from the convexity at the base to Sc+R1. Anastomosing of Rs with Sc+R1 in the distal fourth of the wing, with Sc+R1 terminating at the costa before the apex, Rs terminating at the apex. Connection of M1 with the Rs-Sc+R1 stem distinct, in the proximal third. of the wing. Length of discal cell 75% of total wing length. M2 and M3 connate from the posterior angle, with the bases strongly approximated. Bases of M3 and CuA1 approximated, ratio of the distance between the bases of M3, CuA1/distance between the bases CuA1, CuA2 0.4. Terminating points of M2, M3, CuA1 equidistant. Termen convex between the apex and the tornus. Tornus edged, strongly concave. Dorsum straight. Number of frenulae one in the male, unknown in the female.

**Male genitalia (Figures 3, 4):** Uncus digitiform, constant in width, membranous, devoid of chaetae. Pseudognathos absent. Tegumen triangular-shaped. Vinculum u-shaped with a short saccus. Juxta bifurcate, u-shaped and broad at the base, with elongate and slender lateral arms. Transtilla large, elongate, triangular-shaped, antierad-directed, with transtillum inferior sensu [1, 44, 45] present. Valva broad, oblong, 2.5 times as long as wide, with a bilobed subcostal process, the lobes directed ventrad. Post-basal sacculus inflated, distinct from the basal und distal sacculus. Sella



**Figure 3.** *Scirpobotys xanthosomalis* gen. nov., sp. nov., male genitalia, ventral view, holotype, male, slide no. 21GP003, scale bar = 2 mm.



**Figure 4.** *Scirpobotys xanthosomalis*, gen. nov., sp. nov., male genitalia, close-up views. A: Phallus apodeme (Holotype, slide no. 21GP003), B: Sella (Paratype, slide no. 21GP004), C: Subcostal processes (Holotype, slide no. 21GP003).

present, the ventral part partially articulating with the dorso-distal edge of the post-basal sacculus, with several fibulae differing in directedness. The bases of the fibulae are interconnected, with the connection point near the attachment of the sella with the post-basal sacculus. The dorso-anterior part of the sella is with a neck-shaped extension directed costad, the posterior end multifid, each of the projections with an editum. Chaetae of the edita thin, constant in width, of cylindrical shape, short, equal in length with 60% of the spatulate base. Aedeagus short, broadened, ductus ejaculatorius articulating with the anterior end of the phallus. Ventral phallus apodeme with a distinct sclerite, vesical surface sclerotized.

**Tympanal organs (Figure 5):** Bulla tympani strongly invaginated, shallow. Saccus tympani well developed. Venula prima strongly sclerotized, right-angled, articulating with the venula secunda. Venula secunda well developed, sclerotized, developing beyond the edge of the saccus tympani. Zona glabra tympani with a small u-shaped sclerotization. Fornix tympani shallow, narrowed, recessed in the tympanal frame as is typical of the subfamily.

**Differential diagnosis:** The new genus is assigned to the Pyraustini on the basis of the following shared tribal characters listed in [1]: structure of the uncus – non-capitate, bare from



**Figure 5.** *Scirpobotys xanthosomalis* gen. nov., sp. nov., Tympanal organs, Holotype, slide no. 21GP003, scale bar = 2 mm.

bulbous extensions or head constrictions, inner structure of the valva- presence of a sella with editum, and the structure of the labial palpus - third segment well developed.

The apomorphic characters of the genus with regard to the Pyraustini are the absence of chaetae in the uncus, the costad-directed neck in the dorsal sella, the multifid structure in the ventral sella with several interconnected fibulae developing (Figure 4B), the presence of ventrad-directed subcostal processes in the valva (Figure 4C), the presence of a distinct sclerite in the ventral phallus apodeme (Figure 4A).

The presence of subcostal processes is a character state shared with the unassigned genus *Lirabotys* Schaffer & Munroe, 2007. Yet, the subcostal process in the latter genus is directed apicad, parallel to the costa and ranges into the distal costa and thus differs from that of the new genus in directedness. The presence of subcostal processes is recognized as an autapomorphic character state of the genus *Lirabotys* with regard to the entire subfamily by [25]. The presence of ventrad-directed, bi-lobed subcostal processes in the new genus and the presence of apicad-directed subcostal processes in *Lirabotys* are thus autapomorphic character states with regard to the Pyraustinae.

**Phylogenetic placement:** The antierad-directed projection in the frons is shared with a group of genera comprising *Loxostege* Hübner, 1925, *Powysia* Maes, 2006, *Achyra* Guenée, 1849 and *Sitochroa* Hübner, 1824. This character state is recognized as a synapomorphy of this genus group and as potential evidence for a further tribal subdivision in [1]. With the genera *Achyra*, *Loxostege* and *Sitochroa* the new genus is furthermore related by the antierad-directed (sub-) triangular shaped transtilla. With the genus *Loxostege* the new genus shares the digitiform uncus. Both genera thus differ in the shape of the uncus from the other three genera. In *Achyra* and *Powysia* the uncus is sub-triangular. In *Sitochroa* the uncus is stout, sub-quadrangular-shaped. The genera of the aforementioned group together with the new genus strongly differ in character states with regard to the inner structure of the valva as follows: presence of an editum/edita: absent in *Loxostege* and *Powysia*, present in the new genus, *Achyra* and *Sitochroa*, presence of

fibulae in the ventral sella: absent in *Powysia* and *Achyra*, present in *Loxostege* and *Sitochroa*. The new genus significantly differs from *Achyra* and *Sitochroa* in the structure of the sella. The neck-shaped process in the dorso-anterior sella of the new genus is absent in *Achyra* and *Sitochroa*. *Loxostege* is characterized by one ventrad-directed fibula, *Sitochroa* by a pair of ventrad-directed fibulae. The structure of the valva in the genus *Powysia* is recognized as unique and autapomorphic for this genus in [45]. The structure and the position of the sella is known as autapomorphic for the genus *Achyra* [26].

Further potentially related genera are *Placosaris* Meyrick, 1897, *Demobotys* Monroe & Mutuura, 1969 and the presently unassigned *Spinousuncus* Chen, Zhang & Li, 2018. With these genera the new genus shares the elongate neck-shaped extension of the sella, yet differs in each of them in the directedness of the neck – directed upwards, costad and parallel to the valva base in the new genus, directed basad, orthogonal to the valva base in each of the three comparative genera. Furthermore, the new genus and *Spinousuncus* differ from *Placosaris* and *Demobotys* in the structure of the posterior end of the neck – multifid, with several spatulate processes in the new genus and in *Spinousuncus* and with unifid structures in *Placosaris* and in *Demobotys*.

**Distribution and diversity:** The genus is monotypical. It is presently known to be only from Dhofar, the south-western province of Oman.

**Etymology:** The prefix *Scirpo-* of the genus epitheton refers to the similarity in facies of the type species, namely in its unicolorous white wing pattern with regard to species of the genus *Scirpophaga* Treitschke, 1832 of the subfamily Schoenobiinae. The suffix *-botys* refers to the genus name for the Pyraustinae as was used in the 19<sup>th</sup> century.

### 3.2. *Scirpobotys xanthosomalis* sp. nov.

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**Material:** Holotype: ♂, Oman, Dhofar, Jebel Al Qamar, Road 47, 20 km E Sarfait, 05-XI-2018, leg. M. Seizmair, coll. ZSM, slide no. 21GP003. Paratypes: 1♂, same data as holotype, leg. et coll. M. Seizmair, slide no. 21GP004.

**External characters (Figures 1, 2):** Wing span: holotype: 16.0 mm, paratype 21.0 mm, diameter of the forewing: holotype: 8.0 mm, paratype: 10.2 mm. **Head:** Antennae with the bases, the flagellum and the ciliae white. Vertex yellowish-white, frons yellowish-ochre. Proboscis yellowish-ochre at its base, white from the post-basal region onwards. Labial palpus yellowish-ochre in segment 1, whitish in segment 2 and 3, interspersed with black scales at the anterior tip. Maxillary palpus white in all segments, acuminate. **Thorax:** Tegula yellowish-white. Thorax dorsally and ventrally darkish-ochre, laterally yellowish. Fore-, middle- and hindlegs with the femur and the tibial spurs yellowish-white, the tibia white with the distal end interspersed with darkish-ochre scales. **Abdomen:** Yellowish from A1 to A5, with the distinct hair tufts on A6 and A8 white. **Forewing:** Ground white. Blackish scales along the costa, the posterior edge of the cell and the veins M1-M3, CuA1, CuA2 and A1+2. Area between Sc and anterior edge of the cell sporadically interspersed with yellowish scales. Apical and subapical areas interspersed with darkish-grey scales between R3+4 and M1. Terminal line very fine, blackish. Fringe white. Bare from any further line pattern and maculation. **Hindwing:** Ground concolorous with the ground of the forewing. Costa, termen and dorsum blackish. Postmedial, subterminal areas and space between the costa and the Rs-Sc+R1 stem sporadically interspersed with darkish-grey scales. Blackish scales along Rs, Sc+R1 and A1+2. Fringe white. Fore- and hindwing underside like upper side.

**Male genitalia (Figures 3, 4):** Uncus digitiform as for the genus, 8 times as long as wide, apex constricted, pointed. Tuba analis present, digitiform, posteriorly rounded, elongate, constant in width, 4 times as long as wide, double as wide as the uncus, with sclerotizations at the lateral border and at the base. Distal costa of the valva with a distinct concavity, apex medially constricted and rounded, costal and ventral borders parallel basally and post-basally, distal ventral border concave. Lobes of the subcostal process separated in their bases, of sub-triangular shape. Neck of the sella with three spatulate-shaped extensions, equal in length, differing in width. Ventral part of the sella with three interconnected fibulae directed basad, costad and ventrad, with the basad-directed fibula

thickle-shaped, down-curved, the costad-directed fibula arrow-shaped and acuminate, the ventrad-directed fibula basally broadened, triangular-shaped, down-curved distally. Basal sacculus anteriorly rounded, post basal-sacculus double as high as the basal sacculus, with a deep concave offset in the transition from the basal to the post-basal sacculus, distal sacculus strongly tapered. Transtilla elongate and broad, 1.8 times as long as wide, with the transtillum inferior terminating at the ventral border of the basal sacculus. Arms of the bifurcate juxta elongate and rod-shaped. Saccus with several rod-shaped sclerites. Ventral sclerite in the phallus apodeme ranging over the entire length of the coecum, protruding the posterior end of the phallus by 30% of its total length, with a concave angle ranging over its posterior third. Vesical surface with extensive granulate strips which are overlaid with fine rod-shaped sclerites. Cornuti absent.

**Tympanal organs (Figure 5):** The character states are identical with those listed for the genus.

**Distribution:** Known only from the type locality in Dhofar.

**Bionomics:** The life-cycle and the premature stages are unknown. The type specimens were collected at night on a savannah-type meadow interspersed with shrubs in the montane zone on the southern slopes of the Jebel Al Qamar.

**Etymology:** The species epitheton refers to one of the external characters of the new species, the yellowish scaled anterior abdomen (greek: xanthos = yellow, soma = body).

#### 4. CONCLUSION

A new genus *Scirpobotys* gen. nov. is erected on the basis of a sample collected in the southwestern province Dhofar of the Sultanate of Oman. The genus is monotypical. Its type species is *Scirpobotys xanthosomalis* sp. nov. The genus is differentiated from the closest related genera by autapomorphic character states in the inner structure of the valva - namely the presence of subcostal ventrad-directed processes and the peculiar structure of the sella and in a character state in the ventral phallus apodeme – the presence of a distinct sclerite. The new genus shares synapomorphic character states with two groups

of genera: namely the medial processus on the frons with *Achyra*, *Loxostege*, *Sitochroa* and *Powysia* and the elongate neck-shaped extension of the sella with the genera *Placosaris*, *Demobotys* and *Spinosuncus*. With *Spinosuncus* the new genus shares the multifid structure of the posterior sella neck and the presence of several edita. The diagnostic status of these synapomorphies, in particular the medial processus of the frons and the structure of the editum is in need of further investigation [1]. Comprehensive integrated studies on the phylogenetic relationships between the genera of the Pyraustinae are still to be done.

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#### CONFLICT OF INTEREST STATEMENT

The author declares that there are no conflicts of interests. He does not take any benefits from third parties – neither material nor financial – for the results published in the present paper.

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