On the remarkable find of *Pelecystola fraudulentella* (Zeller, 1852) in Sweden (Lepidoptera: Tineidae)

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The tineid moth *Pelecystola fraudulentella* (Zeller, 1852) has been discovered in Sweden, Småland, Bäckebo, Grytsjön. This is the second known specimen of this species. The type specimen was found in Slovenia, Ljubljana around 1850. The external appearance and the genitalia are described and illustrated. The systematic position is briefly considered but cannot be established for the present as the genitalia morphology does not fit to any recognized subfamily in Tineidae. A lectotype is selected and published for the first time. The biology of *P. fraudulentella* is unknown but the larval host might be bracket fungi like other species regarded closely related.

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On the10th of June 2007 the first author (ML) caught an unrecognized microlepidopteron at mercury vapour light in the nature reserve Grytsjön, Bäckebo parish, Nybro, situated in the southeastern part of the province Småland in Sweden.

During the winter 2007-2008 the authors together tried to examine the specimen but it was impossible to identify it with accessible literature. Not even genitalia examination could shed light on the problem.

The specimen and its genitalia were first sent to the tineid specialist Reinhard Gaedike, Bonn, who was unable to recognize it. Then Ole Karsholt, Copenhagen, received the material but he could not identify it either. Parallel with this, pictures were sent to Don Davis, Smithsonian Institution in Washington and to Gaden Robinson, Natural History Museum in London. After having received a sharper picture of the moth, Robinson solved the mystery and his answer was "It is quite a discovery!" It turned out to be *Pelecystola fraudulentella* (Zeller, 1852), a tineid moth, only known from one male specimen caught in Slovenia, Laibach (Ljublana) by Fischer v. Röslerstamm before 1851. The moth has never been recorded since that time.

The site of the discovery

Grytsjön is a well-known entomological locality in Sweden (Fig. 1). It has high ecological values with a unique insect and bird fauna and 139 hectares of forest, previously almost untouched by man. These were the primary reasons for the County Administrative Board establishing a nature reserve in 1995.

In the past, a lake probably extended over the greater part of the reserve. The lake was drained at the turn of the 18th/19th centuries. Several forest fires affected the area in the 19th century, and also later, which laid bare a number of open stony areas. The last forest fire probably occurred at the beginning of the 20th century. From the early part

Figure 1. The nature reserve Grytsjön, Bäckebo, Småland, Sweden where the Swedish specimen of ***Pelecystola fraudulentella*** *was found. Photo: Bengt Å. Bengtsson.*

Naturreservatet Grytsjön i Småland, Bäckebo. Lokalen där det svenska fyndet av ***Pelecystola fraudulentella*** *gjordes.*

of the last century there are signs in the area of small crofts and enclosed spaces, meadows and cultivated grounds, long since abandoned and overgrown. On the poor soil in Grytsjön, cattle grazed the sparse grass, as evidenced by rusty fence wires, now almost hidden by vegetation. After the railway was driven through the area, a small linesman's cottage was built and the man who lived there and monitored the railway grew crops in very small fields.

Today the locality is mixed woodland with the appearance of a primeval forest, unique for this part of Sweden. In the bouldery area there is a large number of aspen (*Populus tremula*) of all ages, as well as birch (*Betula pendula*), pine (*Pinus sylvestris*), and spruce (*Picea abies*). Furthermore, oak (*Quercus robur*), rowan (*Sorbus aucuparia*), alder (*Alnus glutinosa*), and willows (*Salix spp.*) are common. There are also lots of standing and fallen dead trunks.

It is a favourable habitat for woodpeckers, and once the white-backed woodpecker *Dendrocopus leocotos* lived here, but it disappeared at the beginning of the 1990s. Some species of owl, *e.g.* Tengmalm's owl *Aegolius funereus*, and also the capercaillie *Tetrao urogallos* breed here. The elk *Alces alces* is common, as evidenced by heaps of droppings and gnaw marks on the aspen bark.

Typical or interesting Lepidoptera occurring in the area are *Scardia boletella, Agnathosia mendicella, Caloptilia falconipennella, Euhyponomeuta stannella, Semioscopis strigulana, Semioscopis oculella, Heinemannia laspeyrella, Hypatopa segnella, Pseudatemelia subochreella, Xysthophora carchariella, Acleris roscidana, Acleris obtusana, Cydia corollana, Wockia asperipunctella, Lamellocossus terebra, Limenitis populi, Cosmotriche lobulina, Phyllodesma ilicifolia, Leucodonta bicoloria, Odontosia sieversi, Pygaera timon, Clostera anachoreta, Notodonta torva, Harpyia milhauseri, Acronicta cuspis, Schrankia costaestrigalis, Lygephila viciae, Catocala pacta, Litophane ornitopus, Litophane furcifera, Amphipyra perflua, Apamea rubrirena, Papestra biren* and *Nycteola degenerana*.

Unlike the Lepidoptera, the Coleoptera fauna is poorly investigated on the site. However, the Hornsö-Allgunnen area some kilometers north of the site has a well documented Coleoptera fauna, and it is recongnized among the richest in wood-living beetles in north Europe (Nilsson & Huggert 2001). On the site in Grytsjön, the forest contains a mixture of tree-specis, great quantities of dead wood and bracket fungi, and thus undoubtedly exhibits very good potential for an interesting beetle fauna. Species found here thus far include *Agathidium nigrinum, Agrilus*

Figure 2. ***Pelecystola fraudulentella*** *(Zeller 1852), male, lectotype, leg. Fischer v. Röslerstamm ([Slovenia,] Laibach) ca 1850, coll. Natural History Museum, London. Courtesy Martin Honey, Natural History Museum, London.*

Hane av ***Pelecystola fraudulentella*** *(Zeller 1852). Lektotypen insamlad av Fischer v. Röslerstamm i Slovenien, Laibach (=Ljubljana) ca 1850. Exemplaret förvaras i Natural History Museum, London.*

subauratus, Calvia decemguttata, Chrysolina graminis, Cis castaneus, Cis lineatocribatus, Corticaria saginata, Corticaria serrata, Eurysa castanoptera, Mycetophagus fulvicollis, Obrium cantharium, Osphya bipunctata, Ptinus villiger, Rhinocyllus conicus, Rhizophagus cribratus, Saperda perforata, Tillus elongatus and *Triplax rufipes*.

Description of male (lectotype)

Wingspan 16.5 mm. General appearance as in female (Fig. 2., described below). Bristles on antennal segments slightly longer.

Male genitalia

The structure is difficult to interpret and here only preliminarily described (Fig. 4). Uncus a pair of big lobes. Gnathos not well defined but may be described as a heart-shaped field of spines. Valva complex, consisting of an anterior, digitate extension with small, lateral beak at tip; basal half of valva abruptly widened with spinose area terminally; at base of basal extension a third outgrowth with ring of a comb of setae at tip and close to this a sclerotized extension with tips bent backwards. Aedeagus a simple tube without cornutus or any other significant structure.

Figure 3. ***Pelecystola fraudulentella*** *(Zeller 1852), female, leg. et coll. Mats Lindeborg (Suecia, Sm, Bäckebo, Grytsjön) 10.VI. 2007. Photo: Bengt Å. Bengtsson.*

Hona av ***Pelecystola fraudulentella*** *(Zeller 1852). Det svenska exemplaret från Småland, Bäckebo, Grytsjön 10.VI. 2007. Leg. et coll. Mats Lindeborg.*

Description of female

Fig. 3: Wingspan 18 mm. Head covered by ochreous yellow hairs. Antenna in female about 0.5 of forewing length with about 48 antennal segments; scape and pedicel ochreous yellow, antennal segments dark brown with collar of obliquely raised scales making flagellum appear serrate; each segment with brush of 5-7 setae on front surface. Labial palpi rather short, flat laterally, fuscous on outer surface and there with few small bristles sticking out from the scales, and yellow ochreous on inner side; second segment 1.5 as long as diameter of eye, terminal segment *ca*. 0.6 of eye diameter. Legs on outer surface fuscous, inner surface ochreous, tarsal segments with more or less distinct dark ring. Forewing dark brown with slight irroration and reticulation, in some parts with peculiar purple gloss, also on the underside of forewing. In fold 1/3 from base an ochreous spot edged outwardly by a tuft of erect, black scales, a few such scales also inwardly. At end of disc a similar spot, costally and dorsally margined by black, erect scales. At apex a small ochreous spot and some further spots inwardly creating a reticulate pattern. Small ochreous spots also at mid-termen and tornus. Fringes dark brown, with ciliary line. From pale spot at disc end a distinct purple streak extending to termen, this pattern consisting of scales deviating from the rest of the wing.

Hindwing as broad as forewing, fuscous with purplish shine, especially apically, basally paler. Fringes short compared with other tineids, dark greyish with blackish brown base, hence with distinct ciliary line. Abdomen greasy but obviously fuscous dorsally and greyish beige ventrally. The abdominal segments are remarkably leathery and without any conspicuous structure.

Female genitalia

Fig. 5: Papillae anales weak; lobes bristled. Segment 8 a rectangular plate with shallow incurvation medioposteriorly and three or four stout bristles on each side of this. Sterigma conical with base extended laterally and united with apophyses anteriores. Ostium at top of sterigma. Ductus bursae of even width, membranous, as long as apophyses anteriores. Apophyses posteriors 1.8 mm and apophyses anteriores 1.1 mm in length. Corpus bursae oval with huge, strongly sclerotized, V-shaped signum, each shank inwardly finely serrated.

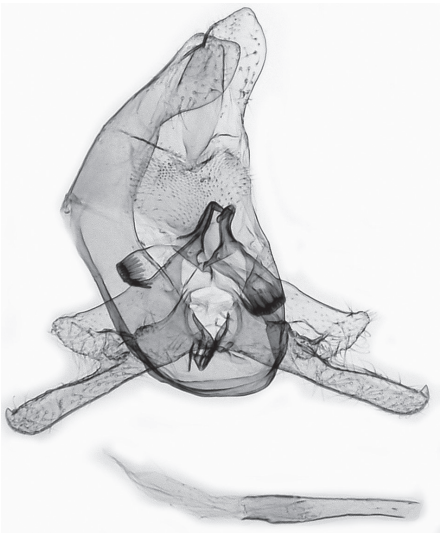

Figure 4. Male genitalia of ***Pelecystola fraudulentella*** *(Zeller 1852), lectotype; genitalia on slide BM 12195. Courtesy Martin Honey, Natural History Museum, London.*

Hangenitalier av lektotypen av ***Pelecystola fraudulentella*** *(Zeller 1852); genitalpreparat BM 12195. Foto Martin Honey, Natural History Museum, London.*

Designation

The type specimen is preserved in the Natural History Museum, London and has been examined by Gaden Robinson. He designated the specimen as a lectotype as it was not stated in the original publication if more than one specimen were found (Robinson, pers. comm.). It is here published for the first time to establish the specific identity. The lectotype carries eight labels:

1: [small blue square]
2: LECTOTYPE [BMNH mauve circular label]
3: H.-S. Coll./ Hfm. Coll./ Wlsm 1910-427 [*i.e.*, provenance is Herrich-Schaeffer, Hofmann, Walsingham]
4: Laibach / fraudulent. / HS [in manuscript]
5: Tinea fraudulentella HS / 1/1 / Hofmann det. In Hofmann coll.
6: Hofm. Coll. / Wlsm Coll. / 1910-427
7: LECTOTYPE / Tinea fraudulentella / Zeller, 1852 / teste G.S. Robinson, 2008
8: B.M. [male symbol] Genitalia slide / 12195

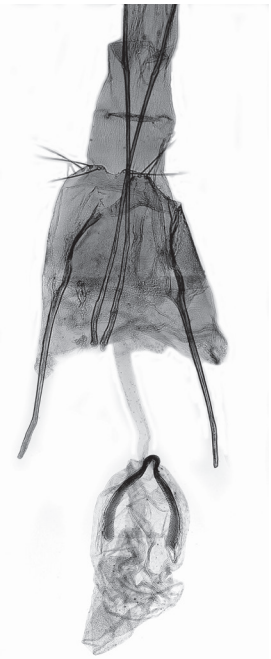

Figure 5. Female genitalia of ***Pelecystola fraudulentella*** *(Zeller 1852); genitalia on slide BÅB 1231X. Photo: Bengt Å. Bengtsson.*

Hongenitalier av det svenska exemplaret av ***Pelecystola fraudulentella*** *(Zeller 1852); genitalpreparat BÅB 1231X.*

There is an additional grey paper manuscript label beside the specimen that reads "Fraudulentella / HS. 318. Z. LE. 6. 110."

Nomenclatural citations

Tinea fraudulentella Zeller, 1852, *Linn. Ent.*, **6**:110

Tinea fraudulentella Herrich-Schaeffer, 1853, *Syst. Bearb, Schmett. Eur.,* **5**: 70; Suppl., **5**, pl. 46, fig. 318 (1851 – non-binominal).

?*Nemapogon fraudulentellus* (H.-S. 1851); Petersen, 1957, *Beitr. Ent.* **7:** 70.

Pelecystola fraudulentella (Zeller, 1852); Robinson, 2007.

Assignment of *Pelecystola fraudulentella*

Herrich-Schäffer (1851) gave a short description and illustrated the moth but as his description was non-binominal it is invalid (ICZN 1999: 11.9.3). Zeller (1852) referred to Herrich-Schäffer but placed the species in the genus *Tinea*, even if he compared *fraudulentella* with *Tinea rusticella* (Hübner, 1796), a junior synonym of *Monopis laevigella* (Denis & Schiffermüller, 1775). Zeller undoubtedly attached great importance to the pale spot on the cell end but that is not of the same nature as the hyaline spot in the species of *Monopis*.

For the moment *Pelecystola fraudulentella* is not assigned to any subfamily (Robinson, 2007). A suggestion has been made to place the genus *Pelecystola* in Scardiinae (Gozmany & Vári, 1973) but several characters contradict this. The labial palps are porrect, very short and not ascending or as long as in the species in Scardiinae. The venation (Fig. 6) of the Swedish specimen was studied by photographing the underside of the wings and also by dropping a small amount of xylene on the wings, thus not "destroying" wings by severing them from the body, removing the scales and mounting them in Euparal. In the forewing the distance between the points on R from where R_{1+2} and R_3 begin is greater than in Scardiinae. There seems to be no trace of more than one anal vein and a chorda in the disc is absent, thus deviating from Scardiinae. In the hindwing the cell is only partially delimited posteriorly by a short transverse vein, and Rs and M_2 seem to have no fixed connection to other veins at the inner end. The frenulate bristle is simple in female, an unusual character

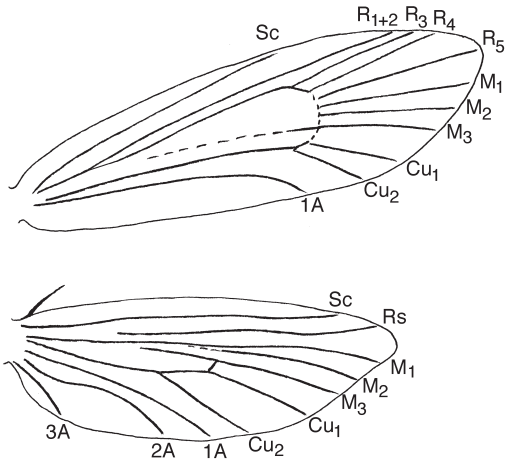

Figure 6. Wing venation of the female of ***Pelecystola fraudulentella****.*

Vingribbornas struktur på det svenska exemplaret av ***Pelecystola fraudulentella****.*

in the tineid assemblage. The authors therefore believe that *Pelecystola* might belong to a subfamily not yet defined and erected.

The distribution of the genus

To date, the genus *Pelecystola* Meyrick, 1920 embraces seven known species (Robinson, 2007). Apart from *P. fraudulentella* there is one further species in the Palaearctic region (Japan), *P. strigosa* (Moore, 1888). From Africa four species are recognized, viz. *P. decorata* Meyrick, 1920 (type species of the genus) from Kenya, *P. polysticha* (Meyrick, 1938) from Zaire, *P. melanchares* (Meyrick, 1937) and *P. tephrinitis* (Meyrick, 1912), both from South Africa, and finally *P. hierophanta* (Meyrick, 1916) from India. Don Davis, Smithsonian Institution, Washington, D.C. (in litt.) has recently discovered a species from Mississippi with similar external appearance and genitalia.

As the species of the genus *Pelecystola* were supposed to belong to the tropical regions, *P. fraudulentella* has been omitted from the lists of the European Lepidoptera fauna. Because no more specimens have been observed since the type specimen was found, it was believed that the specimen in the Natural History Museum in

Figure 7. Distribution map of the existing records of ***Pelecystola fraudulentella****.*

Prickkarta över de kända fyndplatserna för ***Pelecystola fraudulentella****.*

London might be incorrectly labelled. Now it seems beyond any doubt that the first specimen really was caught in Europe.

Biology

The habitat requirements for this species is not known. The moth probably occurs in deciduous or mixed ancient forests. The larva may feed in the same way as many other species in the family, viz. on fungi, rotten wood, bird's nests, *etc*.

The phenology is also unknown, but the flight period is, at a guess, June. However, at the time of the discovery of the Swedish specimen butterflies and moths were flying earlier than usual because of a mild spring and a heat-wave in Sweden at the beginning of June. *P. fraudulentella* may normally fly later in June and/or in July.

The two records are from Slovenia, Ljubljana 1850 and southeastern Sweden 2007 (Fig. 7). They indicate a distribution in the nemoral zone of central and northern Europe.

Discussion

It is difficult to understand why the species had never previously been found in Europe since 1850. Does it have a very narrow ecological niche, does it behave in a strange way or does it occur in extremely small populations? The two known localities are separated by over 1000 kilometres. Logically, the species ought also to exist somewhere between these sites.

The very few data that are available indicate that *P. fraudulentella* occurs extremely locally in mixed forests with a great quantity of deciduous trees. This presumption is supported by the circumstance that entomologists have visited the locality frequently since it was "discovered" in the year of 1977.

Many tineids are of secretive and retiring habit, may be reluctant to fly and are rarely attracted to light. It is likely that the same applies to *P. fraudulentella*. Therefore, such species may be found by other methods, primarily by rearing the larvae from rotten wood or fungi. This is, however, not an option in a nature reserve where the substrate for different insects must be left. Thus a possible population of *Pelecystola fraudulentella* was revealed only when one moth was accidentally attracted to light.

Some other tineids, which previously were supposed to be rare, have recently been taken in numbers with synthetic newly manufactured non-commercial pheromones , for instance *Triaxomasia caprimulgella* (Stainton, 1851). The rare tineid *Nemapogon falstriellus* (Bang-Haas, 1881) was only known by very few specimens in Sweden, but in the summer of 2007 numerous specimens were captured in pheromone traps in southeastern Sweden and Skåne (Scania) (Ryrholm, oral comm.). At one locality about 15 specimens of *N. falstriellus* were caught by the first author with pheromone only 100 metres from three light-traps that had been constantly running at the spot for 15 years and had never attracted this species.

The authors' suggestion is to seek the species from the end of May throughout June and possibly July in older deciduous or mixed forests. Appropriate methods may be searching at dusk and later with headlight, bee smoker or spraying with water on trunks and in hollows, which may disturb resting imagines.

Acknowledgments

First of all we owe Gaden Robinson (Natural History Museum in London, BMNH) a great debt of gratitude

for identifying the specimen and giving us valuable information about the type specimen and the literature on *Pelecystola fraudulentella*. We thank Martin Honey (BMNH) who photographed the type specimen including the genitalia, Ole Karsholt (Zoological Museum in Copenhagen) who supported us with various data and contacts, Reinhardt Gaedike (Bonn), Don Davis (Washington), Peter Huemer (Innsbruck), Lauri Kaila (Helsingfors), and Nikolajs Savenkov (Latvia) for their opinions on the extraordinary species. We also thank Bengt Andersson (Nybro, Sweden), Håkan Lundkvist (Gösslunda, Sweden) and Christoffer Fägerström (Triberga, Sweden) for information about beetles found in the nature reserve Grytsjön. John Langmaid (Hampshire, UK) is thanked for correcting the English. We thank two referees who contributed valuable improvements to the manuscript.

We especially appreciate the decision of the County Administrative Board in Kalmar to establish a nature reserve, thus saving this important habitat. We also welcome the foresight to allow entomologists to study and collect insects in the reserve, thereby implicitly showing that prohibiting collecting would curtail increasing knowledge of the insect fauna.

References

Gozmany, L. A. and Vári, L. 1973. The Tineidae of the Ethiopian Region. – Transvaal Museum Memoir 18. 238 p.

Herrich-Schäffer, G. A. W. 1851. Systematische Bearbeitung der Schmetterlinge von Europa, vol. 5: pl. 46, fig. 318 – Regensburg.

ICZN 1999. International Code of Zoological Nomenclature. – International Trust for Zoological Nomenclature, The Natural History Museum, London.

Nilsson, S.G. & Huggert, L. 2001. Vedinsektsfaunan i Hornsö-Allgunnenområdet i östra Småland. – Länsstyrelsen i Kalmar informerar, Meddelandeserien 2001: 28.

Robinson, G.S. 2007. Global taxonomic database of Tineidae (Lepidoptera) [v. 7.0] – URL = http://www.nhm.ac.uk/research-curation/projects/tineidae/

Zeller, P. C. 1852. Die Schaben mit langen Kiefertaster. – Linn. ent., 6: 81-197.

Sammanfattning

Den 10 juni 2007 fann ML ett exemplar av en okänd småfjäril vid ljusfångst i det välkända naturreservatet Grytsjön i Bäckebo socken i östra Småland. Under vintern undersöktes fjärilen, som antogs tillhöra familjen äkta malar (Tineidae). Ingen känd europeisk art tycktes passa in och inte heller en genitalundersökning kunde lösa problemet.

Bilder på djur och genitalier skickades ut till olika specialister i Europa, bl.a. till Reinhard Gaedike i Bonn och Gaden Robinson i London. Även många andra kolleger kontaktades men ingen kände igen den mystiska malen. Efter ett förnyat utskick av en högupplöst bild över Internet kunde Gaden Robinson slutligen komma fram till vilken art det rörde sig om. Han meddelade per e-post att exemplaret från Grytsjön var *Pelecystola fraudulentella* (Zeller, 1852), en art som fram tills nu bara var känd genom ett enda exemplar i världen. Typexemplaret, som troligen infångades ca 1850 i Ljubljana i Slovenien, förvarades i Natural History Museum i London. Meddelandet från Robinson åtföljdes av det glada tillropet "It is quite a discovery!".

Ännu har man inte kunnat fastställa till vilken underfamilj arten hör beroende på en del udda karaktärer. Framvingen är mörkbrun med några ljust ockragula fläckar, den i vingvecket och den på diskfältets ytterkant omgivna av resta (!), svarta fjäll. Både över- och undersidan är tydligt rosaaktigt purpurskimrande hos båda vingparen och på framvingens ovansida finns ett stråk av purpurskimrande fjäll med annorlunda struktur från diskfältets tvärribba ut till vingens utkant. Palperna avviker från andra grupper inom Tineidae genom att de är korta och från sidan tillplattade med bara några få (3-4), olika korta borst på mittledens utsida. Även vingribborna i fram- och bakvingen skiljer sig från arterna inom Scardiinae och andra underfamiljer. I synnerhet genitalierna uppvisar säregna karaktärer, som är svåra att tolka. Uncus är uppbyggd av två stora lober och gnathos har omvandlats till ett fält med små taggar. Valvan är uppdelad i tre olika partier där den översta är kort och i spetsen försedd med en krans av långa, jämnbreda tänder. Hos honan är utseendet hos åttonde segmentet och sterigma utmärkande men det mest särpräglade är ett enormt stort signum, som ser ut som ett uppochnervänt V med fina taggar på skänklarnas insida.

Med tanke på omständigheterna kring fyndet kan förmodas att *P. fraudulentella* är en art som ytterst sällan kommer till ljus och som hör hemma i den gamla, opåverkade naturblandskogen. Upptäckten av *fraudulentella* har emellertid ökat möjligheterna att göra ytterligare fynd av arten i framtiden, både i Grytsjön och i andra delar av Europa. Författarna uppmanar kolleger att också pröva andra samlingsmetoder än ljus, t.ex. bipust och sökning med pannlampa på stammar och tickor.