

Redescription of *Parapoynx rectilinealis*
(Lepidoptera: Crambidae) based on the specimens
from type locality

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Synopsis : A crambid moth, *Parapoynx rectilinealis*, from Midorogaike pond, Kyoto (type locality) was redescribed, with female genitalia illustrated for the first time. The forewing size of female was not different from that of male. The species was estimated to have multivoltine life cycles in a year from the collection data of adults by light trap in Central to Western Japan.

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Key words : Acentropinae, aquatic moth, female genitalia, Kyoto

Introduction

An acentropine species, *Parapoynx rectilinealis* Yoshiyasu, 1985 was described based on one male specimen collected in Midorogaike (=Mizorogaike) pond (35°03' N, 135°50' E, 9 ha, 75 m asl), Kyoto City, Kyoto Prefecture (Yoshiyasu, 1985). Thereafter, the species has been known from other prefectures in Honshu (Iwate, Aichi, Mie and Shiga) and Kyushu (Saga and Miyazaki) islands in Japan (Asahi, 1990; Mano, 1996; Nakamura *et al.*, 1996; Iwate Prefecture, 2001; Shiga Prefecture, 2006; Yoshiyasu, 2013; Mori, 2016), though no morphological comment has been offered. In spite of efforts of the first author to find this species, it has not been found in Midorogaike pond, type locality of this species. In 2014, the second author collected many specimens of this species at this pond by box-type light traps. We redescribe *P. rectilinealis* based on these specimens, including female genitalia which will be presented for the first time. Life cycle of this species is discussed together with previous collection data in Japan.

Material and methods

Thirty-two specimens used in this study were collected by box-type light traps, using 20W blue fluorescent lamp. Light traps were set at 5 points (P1-P5) along the pond shown in Fig. 1 and this survey was performed for 4 times, June 28-29, July 20-21, August 30-31 and September 13-14, 2014.

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On the examination of the genitalia, abdomen of each specimen was removed from the adult. The abdomen was macerated in 10% aqueous KOH for 10 hours at 25°C, then transferred to the petri dish with water to remove scales. The abdomen was dissected in another petri dish with 80% ethanol. For examination of wing venation, fore and hind wings were removed from the thorax, then they were put in a petri dish with 80% ethanol. The examination and drawing were done under binocular stereomicroscope (M205 C, Leica). Morphological terms are basically after Yoshiyasu (1985). For examination of the difference in the forewing size between female and male, Mann-Whitney *U* test (JMP 13.0, SAS Institute, Japan) was performed based on 15 males and 15 females collected in August and September, assumed to be the same generation.

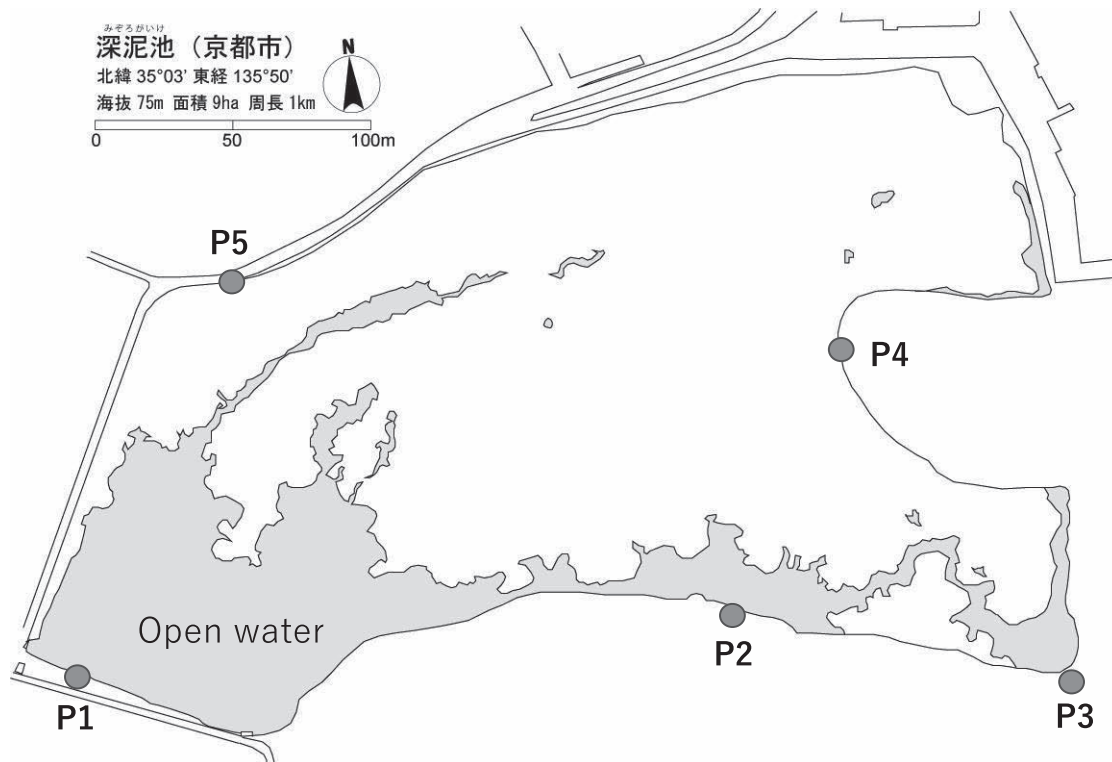


Fig. 1. Five light traps (box-type) set in Midorogaike pond

Results

Redescription

Parapoynx rectilinealis Yoshiyasu, 1985

Parapoynx rectilinealis Yoshiyasu, 1985: 73, fig. 48 (male genitalia), pl. 9, fig. 4 (adult male).

Female (Fig. 2A) and male. Forewing length in mean: female, 5.9 mm (n=15); male, 5.8 mm (n=17).

Head small; vertex with whitish scales with some dark brown scales dorsally, frons gently rounded, whitish. Chaetosema sparse, whitish. Antenna of female filiform, nearly as long as forewing, with fulvous scales dorsally; antenna of male ciliate, ca 5/6 as long as forewing length, with a group of whitish to fulvous scales in fan-shaped on each flagellomere dorsally. Labial palpus long and upturned, with 3rd palpomere narrow, curved to reach up to a height of vertex. Thorax above whitish, partly with fuscous scales on mesothorax below whitish. Foreleg whitish except for fuscous anterior surface

of coxa to tibia; midleg as long as foreleg, whitish; hindleg long, whitish, with inner spur longer than outer one. Abdomen above whitish to pale fulvous dorsally, with a fuscous band along posterior margin of each segment; abdomen below whitish.

Tympanal organ (Fig. 2B). Tympanal organ almost V-shaped, with several long scales midventrally. Venula secundale developed, slightly curved to posterior margin of 2nd sternum.

Wing shape and venation (Fig. 3). Forewing: costa almost straight, apex broadly rounded, termen slightly incised at vein M1, then weakly curved to tornus; vein Sc reached at proximal 2/3 of costa; bases of R2 and R3 approximated each other; R4 from upper angle of discoidal cell; R5 near to R4 at base; M1 from middle of discoidal cell; M2 and M3 approximated each other, from posterior angle of discoidal cell; CuA1 a little apart from base of M3; CuA2 from discoidal cell at 2/3; 1A+2A curved from base to near tornus. Hindwing: costa sinuate, concave at middle; apex rounded; termen incised behind vein Rs, then weakly curved to broad tornus; vein Sc+R1 anastomosed with Rs for 1/2 distance from anterodistal angle of discoidal cell; Rs ended to wing apex; M1 and M2 curved, approximated to each other at base, running from posterodistal angle of discoidal cell; CuA1 from just behind base of M2; CuA2 almost straight, from distal 4/5 of discoidal cell.

Wing marking (Fig. 3): Ground color bright orange on silvery white area. Forewing with proximal 2/3 area white; costal area pale orange suffused with fuscous scales; two inwardly oblique bands, of which anterior one is running from anterior distal angle of discoidal cell to base of wing, and posterior one is running from lower angle of the cell to inner margin. Postmedial line from costa running at right angles to costa to vein CuA1, formed a characteristic wedge-shaped white band as a distal line. Submarginal line parallel to termen, forming subterminal white band as a distal margin. Marginal line absent. Cilia pale fuscous, with proximal 1/3 darker and forming a blackish dot at extension line of each wing vein. Hindwing with ground color as in forewing; proximal 2/3 white, with a dark brown band, inwardly oblique, from around base of vein Rs to inner margin; postmedial line running from near base of R1 to inner margin innerly. Submarginal line a little undulate from cell Rs to cell 1A+2A, running parallel to termen, forming a subterminal white band as a distal line. Submarginal area near apex with a greyish dot on vein R1. Marginal line narrow, represented as a separate dog-legged mark on each vein. Cilia as in forewing, but a group of proximal darker scales more distinct, especially at extension line of veins Rs, M1, M2 and CuA1 which appear as remarkable blackish dots.

Female genitalia (Fig. 4). Ostium bursae wide, tapering to narrow antrum. Ductus bursae narrow, coiled once (Fig. 4B), or twisted (Fig. 4C) medially. Corpus bursae swollen, elliptical to spherical in shape, with a pair of signa representing as two darker parallel lines dorsally, which have several small, suppressed spines innerly. Eighth tergum short, with some setae at posterior margin. Eighth sternum area weakly sclerotized, with some setae latero-ventrally. Apophysis anterioris 0.65 as long as 7th tergum. Papilla analis well developed, pear-shaped in ventral view, with several long and short setae along lateral margin. Apophysis posterioris a little longer than apophysis anterioris.

Seventh sternum about 2/3 the length of 7th tergum, as in other *Parapopynx* species.

Male genitalia (Fig. 5). Referred to Yoshiyasu (1985), revised characteristics are as follows. Tegumen short, with its height ca 1/2 as long as uncus. Vinculum rather narrow. Saccus rounded laterally, with anterior portion narrowing to apex ventrally. Uncus long and narrow, rather strongly curved downwards, with some short and thin setae dorsally at apical 1/2. Gnathos long, almost as long as uncus, weakly dentate on dorsal surface at apex. Valva long rectangular, with many setae on inner surface; costa undulate with some long and stout setae along dorsal edge to distal margin. Sacculus with a papillate projection with a few setae at apex. Juxta nearly trapezoidal in shape. Phallus short, with coecum penis developed, narrowing to apical portion, slightly curved downwards; vesica with cornuti consisting of many minute and fine spinules; burbus ejaculatorius complex in shape, coiled twice.

Specimens examined. 1 ♂, June 28-29; 1 ♂, July 20-21; 12 ♀ 11 ♂, August 30-31; 3 ♀ 4 ♂, September 13-14, 2014.

Size difference between female and male adults. Female was not significantly different from male in forewing size ($P=0.1321$ ($Z=-1.506$)).

Immature stage. Unknown, but the larva is assumed to feed on submerged aquatic plants as in other *Parapoynx* species.

Distribution. Japan (Honshu [Northern and Central]) and Kyushu [Northern]).

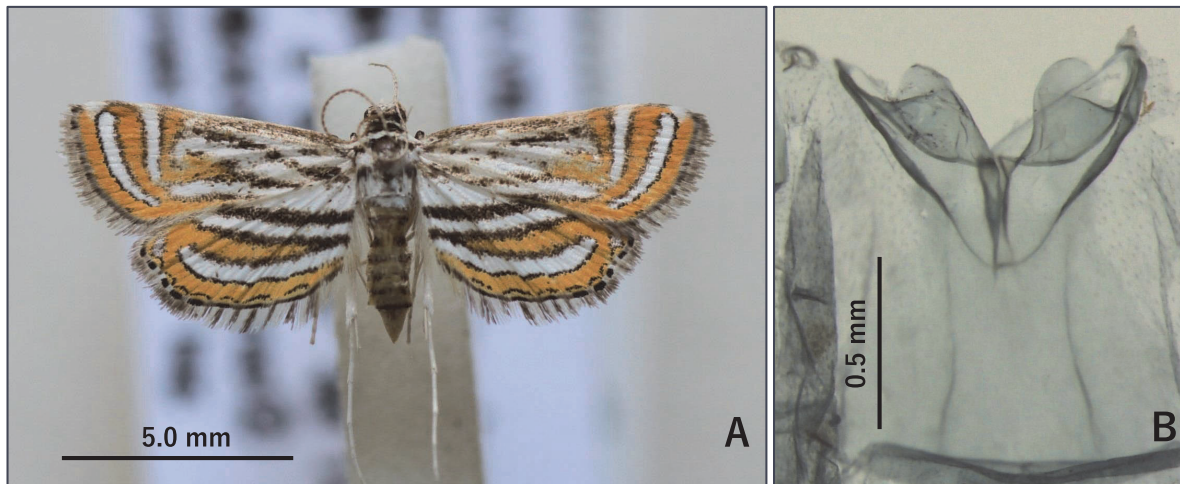


Fig. 2. *Parapoynx rectilinealis*. A. Adult female; B. tympanal organ (male), ventral view.

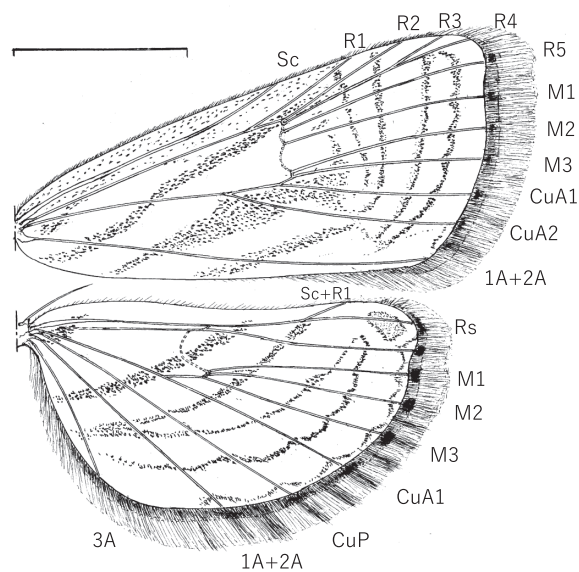


Fig. 3. Wing venation and marking of *P. rectilinealis*. Scale: 2.0 mm.

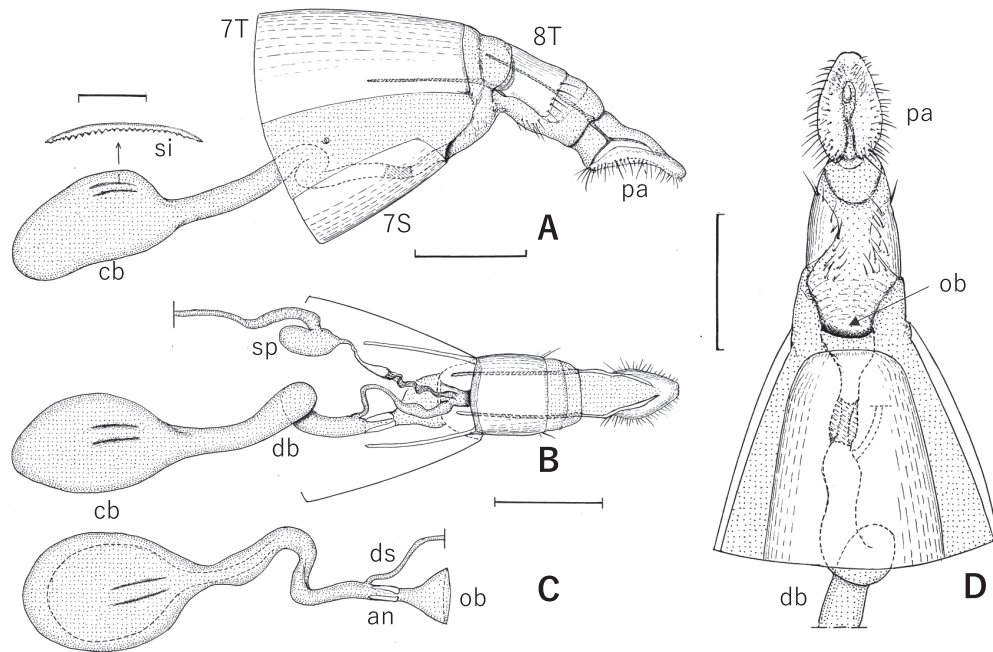


Fig. 4. Female genitalia of *P. rectilinealis*. A. Lateral view; B. dorsal view, 7th tergum removed; C. ductus bursae and corpus bursae, dorsal view; D. 7th to 10th abdominal segments, ventral view. Abbreviation: an: antrum; cb: corpus bursae; db: ductus bursae; ds: ductus seminalis; ob: ostium bursae; pa: papilla analis; si: signum; sp: spermatheca. Scale: 0.5 mm (except for signum: 0.1 mm)

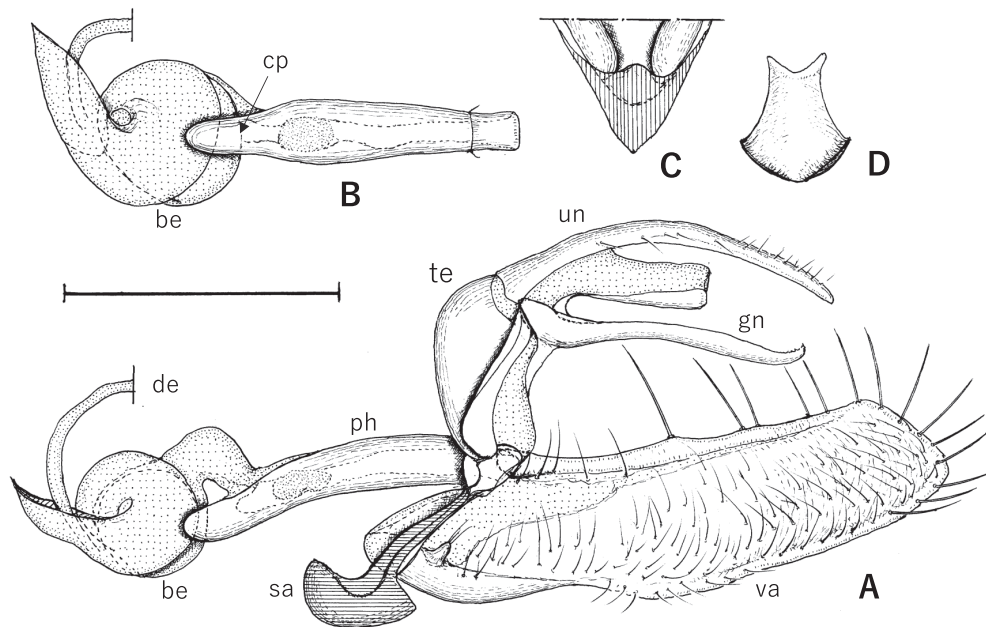


Fig. 5. Male genitalia of *P. rectilinealis*. A. Lateral view; B. phallus, ventral view; C. saccus, ventral view; D. juxta, ventral view. Abbreviation: be: burbus ejaculatorius; cp: coecum penis; de: ductus ejaculatorius; gn: gnathos; ph: phallus; sa: saccus; te: tegumen; un: uncus; va: valva. Scale: 0.5 mm.

Discussion

In Japanese *Parapoynx* species, *P. rectilinealis* is much close to *P. vittalis* (Bremer, 1864) in having the coiled ductus bursae and a pair of signa in two rows in the female genitalia (Fig. 4), together with the similar wing marking except for the distinct postmedial line running obliquely and other characteristics mentioned in Yoshiyasu (1985). However, *P. rectilinealis* is distinct from the latter in the male genitalia: the tegumen is much shorter; uncus is longer and more strongly curved downwards than those of the latter species; the phallus has minute spinules of cornuti (Fig. 5B), not seen in *P. vittalis* (Yoshiyasu, 1985).

The size of female is usually larger than that of male in *Parapoynx* species. In *P. vittalis* (Bremer, 1864), close to *P. rectilinealis*, the forewing length of the male is 6.7 mm and that of the female is 7.2 mm in mean (Yoshiyasu, 1985). On the specimens of *P. rectilinealis* examined in in this time, the forewing size of female was not different from that of male. By this result we could assume that the adult appearance of both sexes would be almost the same time. This assumption can be supported in the light trap collection in this time, i.e. 12 females and 11 males in late August, 3 females and 4 males in middle September. By this result it is further expected that the larval developmental period is almost same in both sexes. This is unique not only in *Parapoynx* species, but also in the other acenropine species. In another acenropine species, *Elophila turbata* (Butler, 1881), the male is much smaller than female (Yoshiyasu, 2013), and the larvae of male requires shorter developmental time than those of the females (Yoshiyasu, unpublished data). This biological feature of *P. rectilinealis* should be surveyed and confirmed by the rearing of immature stages in the future time.

Parapoynx rectilinealis was collected at 3 points (P2, P3 & P4) among 5 points, situated along west edge of low mountainous slope, with trees around it. These 3 points are located at the place where the water plants are relatively abundant in Midorogaike pond and the possible host plants are growing. It is also estimated that the flight of this species relatively restricted in narrow area, because no adult was caught at P1 and P5. The adults were collected in June to July and late August to middle September. This data indicate that the adults of this species appear twice during the collecting period (June to September) in Midorogaike pond. According to Asahi (1990), a female was collected in spring, April 3, 1989, northern part of Miyazaki Prefecture, Kyushu. In the same island, the species was reported to occur from July to September in Saga Prefecture (Mori, 2016). Meanwhile, Mano (1996) caught 3 males in autumn, October 16, 1993, at light trap in Iga City, Mie Prefecture, adjacent to Kyoto Prefecture. Considering these previous collection data together with the result of this time, *P. rectilinealis* is multivoltine in Central to Western Japan. Further investigation is necessary to clarify the voltism of this species in future.

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References

- Asahi, E., 1990. Little known moths taken at northern part of Miyazaki Prefecture VI. *Yugato*, (120): 63-64. (in Japanese.)

- Iwate Prefecture, 2001. Red data book of Iwate Prefecture. 613 pp. Iwate Prefecture. (in Japanese.)
- Mano, T., 1996. Moths collected at a boggy site in the Ueno basin, Mie Prefecture. *Japan Hetrocerists' J.*, (187): 184-188. (in Japanese, with English summary.)
- Mori, N., 2016. Report on the crambid moths collected from Kashibaru marsh, Saga Prefecture, Japan. *Japan Hetrocerists' J.* (278): 87. (in Japanese, with English summary.)
- Nakamura, M., Kudo, K. and K. Naito, 1996. A list of moths collected during survey to the boggy area at Imou, Aichi Prefecture. *Japan Hetrocerists' J.*, (189): 223-230. (in Japanese, with English summary.)
- Shiga Prefecture, 2006. Red data book of Shiga Prefecture, 2005. 563 pp. Shiga Prefecture. (in Japanese.)
- Yoshiyasu, Y., 1985. A systematic study of the Nymphulinae and the Musotiminae of Japan (Lepidoptera: Pyralidae). *Sci. Rep. Kyoto Pref. Univ., Agric.*, 37: 1-162.
- Yoshiyasu, Y., 2013. Acentropinae. In Nasu, Y., Hirowatari, T. & Y. Kishida (eds.): *The Standard of Moths in Japan. IV*: 400-408. Gakken Education Publication, Tokyo. (in Japanese.)

