

Prionispa houjayi (Coleoptera: Chrysomelidae: Cassidinae: Oncocephalini), a Newly Recorded Genus and New Species from Taiwan, with a Description of Its Immature Stages and Notes on Its Bionomy

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Chi-Feng Lee, Jolanta Świętojańska, and Charles L. Staines (2009) *Prionispa houjayi* (Coleoptera: Chrysomelidae: Cassidinae: Oncocephalini), a newly recorded genus and new species from Taiwan, with a description of its immature stages and notes on its bionomy. *Zoological Studies* **48**(4): 558-568. The larva, pupa, and adult of *Prionispa houjayi* sp. nov., a new species in the Oncocephalini are described and illustrated in detail. Some autapomorphies of the immature stages of this new species are proposed by comparing it to *Chaeridiona picea* Baly, *C. thailandica* Kimoto, and *Oncocephala quadrilobata* (Guérin), including the quadrate abdominal apex and prominent labial palpi in the larva, and the lateral scoli of the pronotum in the pupa. *Prionispa houjayi* sp. nov. larvae mine the leaves of *Disporum* Salisbury (Liliaceae). This is the first host record of the Liliaceae for the subfamily Cassidinae. http://zoolstud.sinica.edu.tw/Journals/48.4/558.pdf

Key words: Morphology, Larva, Pupa, Liliaceae, Disporum.

Leaf beetles of Taiwan were intensively studied by Chûjô (1930s-1960s) and Kimoto and Takizawa (1960s-1990s). Kimoto and Takizawa (1997) arranged all species of Taiwanese chrysomelids systematically into a book, including descriptions, keys, larvae, and host plants. Recently the Taiwan Chrysomelid Research Team (TCRT) was initiated to inventory all species of the Chrysomelidae found in Taiwan, especially species which were not recorded by Kimoto and Takizawa (1997). One book, The Chrysomelidae of Taiwan I, published by this team (Lee and Cheng 2007) is the first book of the series introducing the chrysomelids of Taiwan. In the course of investigating Taiwanese chrysomelids, a member of the TCRT, Mr. Hou-Jay Chen found 1 population of a strange hispine species in Wulai, northern Taiwan. It turned out to be a new species of the genus *Prionispa* Chapuis, 1875 which was never previously recorded from

Taiwan.

The genus Prionispa belongs to the tribe Oncocephalini Weise, 1911 which can be distinguished from other tribes by the lateral margin of the pronotum and elytra without spines, the elytra having a scutellar row, by the large triangular clypeus, by the base of the elytra being wider than the base of the pronotum, and by the elytra being strongly expanded apically (Würmli 1975). The tribe contains 2 other genera: Oncocephala Agassiz, 1846 with 38 species (Staines unpubl. data) and Chaeridiona Baly, 1869 with 9 species (Staines 2007) (Seeno and Wilcox 1982). Prionispa contains 28 described species and has never been revised (Staines unpubl. data). Prionispa species are recorded from Bangladesh, China, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, the Philippines, Thailand, and Vietnam (Staines unpubl. data). The genus

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can be distinguished from other oncocephaline genera by the following combination of characters: the head without a protuberance and carinate between the antennal bases; the labial palps having 3 palpomeres; the antennae not striate, with antennomere III longer than I and II combined; and the pronotum not tuberculate (Würmli 1975).

Immature stages of only 5 species in two of these genera have been described. Uhmann (1956) described the larva and pupa of O. tuberculata Pic, 1926 from Indonesia. Świętojańska et al. (2006) described the larvae and pupae of C. picea Baly, 1869 and O. quadrilobata (Guérin, 1844) from India, and Świetojańska and Kovac (2007) described the larva and pupa of Ch. thailandica Kimoto, 1998 from Thailand. Only those of *Prionispa* remain unknown. In the present study, we diagnose and propose a new species, Prionispa houjayi sp. nov., and describe the adult and immature stages. The egg stage in the Oncocephalini was previously unknown and is described here for the first time. We propose possible autapomorphies of the genus Prionispa.

MATERIALS AND METHODS

The population was first found in Apr. 2007 in Wulai Township (Taipei County, northern Taiwan), in a deciduous forest at an elevation of 120-500 m, 121'33°E 24'52°N. Field observations investigating the life history were made over 1 yr, and records were taken monthly. Liliaceae leaves infested with *Prionispa houjayi* sp. nov. were cut and taken to the laboratory for rearing. One host plant was transferred to the laboratory to observe pupation. The immatures were preserved in 70% ethyl alcohol, and the adults were mounted on cards.

To prepare drawings of the adult reproductive systems, the abdomens of adults were separated and boiled in a 10% KOH solution, cleared in distilled water, and then mounted on slides with glycerin. Slides were examined using a Leica M165 stereomicroscope (Japan), and figures were drawn using a Nikon ECLIPSE 50i microscope (Japan).

To study and illustrate the mouthparts, larvae were boiled in a 10% KOH solution, cleared in distilled water, and then mounted on slides with Swan's liquid (20 g distilled water, 15 g gum arabic, 60 g chlorhydrate, 3 g glucose, and 2 g glacial acetic acid) and glycerin. Heads of larvae were separated from the rest of the body, and then the mouthparts were dissected. Slides were made using a Nikon SMZ 1500 stereomicroscope, and figures were drawn using a Nikon ECLIPSE 80i microscope with phase contrast.

Uhmann (1943 1949) was the first author to notice that spines and tubercles on the elytra of adults can be diagnostic and developed the nomenclature system of acanthotaxy. On the elytra, labels "I-VI" indicate that the tubercle or spine is located in the interval between that stria and the next. Arabic numerals indicate how close tubercles are to the base of the elytra. Terminology of the reproductive system follows Chaboo (2007). Descriptions of immature stages follows Świętojańska et al. (2006). Terminology of the chaetotaxy of the head follows Borowiec and Świętojańska (2003).

The holotype, paratypes, and immatures (14 adults, 6 larvae, and 5 pupae) are deposited at the Taiwan Agricultural Research Institute, Taichung, Taiwan. Paratypes (12 specimens) are also deposited in the Department of Biodiversity and Evolutionary Taxonomy, Zoological Institute, University of Wrocław, Poland; and the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA. Host plant vouchers were identified by Chih-Kai Yang and are deposited at the Herbarium, Research Center for Biodiversity, Academia Sinica, Taipei, Taiwan.

RESULT

Prionispa houjayi sp. nov.

Materials: Holotype ♂: Taiwan: Taipei, Wulai. 9 May 2007, leg. H.C.(J.) Chen.

Paratypes (25 specimens): 5 examples (exs.), same data as for holotype; 4 exs., same locality and collector, 22 June 2007; 13 exs., same locality and collector, 20 July 2007; 2 exs., same locality, 15 June 2007, leg. C.F. Lee; 2 exs., same locality, 19 June 2007, leg. S.F. Yu.

Adult (n = 5): Length 3.9-4.6 mm; width 2.0-2.5 mm (as the maximum width of the elytra). Color blackish-brown (Figs. 1-3); antenna whitish-yellow but antenomeres I and II and VII-XI dark brown; legs whitish-yellow but tarsi darkened.

Head: Wedge-shaped; acutely produced between antennal bases; vertex deeply and densely punctate; intervals between punctures with mesh-shaped depressions. Antenna 1.2x length of head and pronotum combined; slightly thickened apically; antennomere I robust, thicker than others, subequal to II in length; II shorter and thicker than III; III-VI subequal in width, each decreasing in length; VII shorter and thicker than VI; VIII-X transverse, subequal in length; XI longer than X, pointed at apex; VIII-XI setose.

Pronotum: Convex; 1.3x wider than long; lateral margin bisinuate, rounded in middle; anterior and posterior angles with 2 teeth; disc deeply and densely punctate, intervals between punctures with a mesh-shaped depression; with 1 feeble tubercle near anterior margin at each side.

Elytra (Figs. 4, 5): Lateral margin expanding to apex, slightly dentate; exterior apical angle rounded, laminate; apical margin slightly dentate, laminate; disc with 6 prominent tubercles: II1, II3, III2, IV4, VI1, and VI3; VI3 less prominent, VI1 projecting laterally.

Venter: Prosternum deeply punctate; mesoand metasternum, and 1st visible abdominal sternum with punctures only present near anterior margin.

Male genitalia (Figs. 6-8): Aedeagus moderately curved, apex narrowly rounded; internal sac elongate, about 0.52 times as long



Figs. 1-3. *Prionispa houjayi* sp. nov. 1. Dorsal view; 2. lateral view; 3. ventral view. (photos by H.T. Cheng).



Figs. 4, 5. *Prionispa houjayi* sp. nov., left elytron. 4. Dorsal view; 5. lateral view (with punctures omitted).



Figs. 6-9. *Prionispa houjayi* sp. nov., reproductive system. 6. Aedeagus, lateral view; 7. apex of aedeagus, dorsal view; 8. basal piece, ventral view; 9. spermatheca.

Table 1. Comparison of diagnostic characters of immature stages of *Prionispa houjayi* sp. nov., *Chaeridiona picea*, *C. thailandica*, and *Oncocephala quadrilobata*

	<i>P. houjayi</i> sp. nov.	C. picea	C. thailandica	O. quadrilobata
Larva				
Lateral scoli on meso- and metathorax	present	absent	present	absent
Abdominal apex	quadrate	tapering	tapering	rounded
Labial palpi	prominent	absent	obscure	obscure
Pupa				
Prominent processes on head	present	present	absent	absent
Processes on pronotum	lateral scoli	2 small ones	2 small ones	none

as aedeagus. Basal piece subtriangular, with 1 medial, elongate, longitudinal sclerite.

Spermathecae (Fig. 9): Pump subequal to receptacle in length, with apical appendix oriented longitudinally to axis of pump; receptacle as wide

as pump, with averted insertion and single duct insertion on 1 side.

Variation: Less-prominent tubercles outside 8th stria in some individuals.

Adult diagnosis: This new species is



Figs. 10-13. Prionispa houjayi sp. nov. 10. Larva, dorsal view; 11. ditto, ventral view; 12. pupa, dorsal view; 13. pupa, ventral view. (photos by H.T. Cheng).

characterized by the rounded shape of the exterior apical angles of the elytra. All other *Prionispa* species have either a triangular lamina such as *P. champaka* Maulik, 1919 (illustrated by Chen et al. 1986) and *P. sinica* Gressitt, 1950 or a sharply pointed exterior apical angle such as *P. dentata* Pic, 1938 (illustrated by Chen et al. 1986) and *P. opacipennis* Chen and Yu, 1962 (in Chen et al. 1962).

Etymology: The new species name honors Mr. Hou-Jay Chen, who discovered this interesting new species and continues observing its biology in the field.

Mature larva (n = 2): Length (without head): 4.4-5.0 mm, width across mesonotum (excluding scoli): 1.4-1.6 mm.

Body (Figs. 10, 11) strongly flattened dorsoventrally, elongate, widest across 4th abdominal segment. Color yellowish-brown. Prothorax without lateral scoli; meso- and metathorax and abdominal segments I-VIII with 1 lateral scolus on each side. Posterior tip of body quadrilateral.

Spiracles: 9 pairs; 1 pair on mesonotum and 8 on abdominal segments I-VIII. First and last pair of spiracles elongated. Spiracles on abdominal segment VIII most prominent, projecting posteriorly.

Head (Figs. 14, 15) well sclerotized, prognathous, partially retracted into pronotum. Epicranial stem absent; median endocarina wide, extending between frontal arms; frontal arms

V-shaped, fronto-clypeal suture present; clypeus flat and with 1 pair of setae and 1 pair campaniform sensilla. Frons with 3 short setae (Fc3, Fd1, and Fe2) placed anteriorly, 2 short setae (Fc1 and Fc2) and 1 campaniform sensillum close to median endocarina and frontal arm, 3 short setae (Fb2, Fb3, and Fb4) and 1 campaniform sensillum laterally close to frontal arm, 1 short seta on median endocarina (Fe1); vertex with 5 short setae (Fb1, V1-4) and 1 campaniform sensillum. Three long setae (Fa1, Fa2, and Fa3) close to stemmata. Temporal side with 5 setae and 1 campaniform sensillum: 4 setae shorter (T1, T2, T3, and T5), 1 longest (T4).

Six stemmata on each side (Figs. 14, 15). Antenna 3 segmented (Fig. 19); 1st segment transverse, distinctly wider than remainder with 2 campaniform sensilla on dorsal and ventral sides, respectively; 2nd segment stout, with 2 small setae on sides slightly below apex, prominent sensory appendix (sa) at apex and small peg-like sensillum between sensory appendix and 3rd antennal segment. Sensory appendix as long as 3rd antennal segment. Third antennal segment slightly longer than wide, with 3 small peg-like sensilla at apex.

Labrum free (Figs. 16, 17), wider than long, anterior margin not emarginated. Anterior margin with 8 long, stout, pointed setae on each side dorsally. Dorsal side of labrum with 4 setae and 4 campaniform sensilla. Anterior part of ventral surface (epipharyngeal area) with numerous



Figs. 14, 15. Prionispa houjayi sp. nov., larva, head. 14. Dorsal view; 15. ventral view.

spines; mid and lateral parts with tiny spines. Ventromedial part with a pair of pointed setae, 2 pairs of campaniform sensilla, and 2 groups of a few sensilla.

Mandibles (Fig. 18) heavily sclerotized, with 4 prominent teeth, followed by tiny teeth; 2 setae and 2 campaniform sensilla on dorsal side (1 campaniform sensillum placed close to setae).

Maxillae and labium connate (Fig. 21). Each stipe with 3 short pointed setae and 1 campaniform sensillum. Palpiger distinct, heavily sclerotized on basal part, with 2 setae and 2 campaniform sensilla ventrally, and numerous short spines dorsally (Fig. 20). Maxillary palp 2 segmented. First segment of maxillary palp with 1 campaniform sensillum ventrally, and 1 pointed seta dorsolaterally. Second segment with a group of peg-like sensilla at apex, 1 campaniform sensillum below apex, and 1 blunt digitiform sensillum at base. Mala with 1 campaniform sensillum, 1 short blunt seta at apex, 1 peg-like sensillum, and 9 pointed setae: 4 long and 5 short ventrally. Dorsally mala with 1 long pointed seta and numerous long spinules. Ligula covered with spines. Prementum (pre) with 3 pairs of campaniform sensilla medially and a pair of setae at base. Labial palpi distinct, each



Figs. 16-21. *Prionispa houjay*i sp. nov., larva. 16. Labrum, dorsal view; 17. labrum, ventral view; 18. mandible, ventral view; 19. antenna; 20. palpiger and maxillary palp, ventral view; 21. maxilla and labium.

with a group of peg-like sensilla at apex and 1 campaniform sensillum below apex. Postmentum with 3 pairs of setae.

Pronotum (Fig. 22) with 1 min seta at anterolateral margin, 3 min setae and 1 campaniform sensillum near lateral margin, 3 min setae and 2 campaniform sensilla at anterior part, 6 min setae and 1 campaniform sensillum at posterior part of each side; meso- and metanotum with 3 min setae laterally, 2 min setae and 1 campaniform sensillum medially; abdominal segments I-VII with 2 or 3 min setae close to spiracle, 1 min seta and 1 campaniform sensillum medially.

Dorsal and ventral side of body with short pointed setae and slightly shorter minute setae placed at anterior margin of segments. Mesoand metanotum, and first 7 abdominal segments possessing a transverse fold across middle (plical area).

Lateral scoli armed apically with 1 pointed seta (sometimes with 2), besides scoli with 1 seta placed dorsally and 1 ventrally.

Pronotum with 14 pointed setae and 4 campaniform sensilla on each side (Fig. 22). Anterior border of meso- and metanotum with 2 pairs of very minute setae. Moreover, meso- and metanotum with 3 setae at base of scoli, and a row of 10 setae and 2 campaniform sensilla placed posteriorly. Anterior border of abdominal segments I-VII with 2 pairs of minute setae. Dorsal side of abdominal segments I-VII with 2 pairs of setae close to anterior margin medially, a row of 4 setae and 2 campaniform sensilla posteromedially, and 2 setae on each side close to spiracle. Last abdominal segment (a complex of segments VII and IX) with a different shape from the remaining ones: quadrilateral, with elongated spiracles



Figs. 22, 23. Prionispa houjayi sp. nov., larva. 22. Dorsal view; 23. ventral view.

placed in posterior corners of each quadrate. Last segment with a pair of minute setae at anterior border; a pair of setae in middle anteriorly; 2 campaniform sensilla and 2 pairs of setae in middle of segment; 3 setae and 2 campaniform sensilla at posterior border; 4 setae on each lateral side. Dorsally each posterior corner of last segment with 3 setae at top, 3 setae and 1 campaniform sensillum below top. Chaetotaxy of dorsal side of body as in figure 22.

Prosternum with 1 pair of minute setae anteromedially, 4 pointed setae posteromedially,



Fig. 24. Prionispa houjayi sp. nov., larval leg.

1 seta on each lateral side and 3 setae at base of each leg (Fig. 23). Meso- and metasternum with 2 pairs of minute setae at anterior margin, 4 pointed setae in middle of sternite, 1 seta on each lateral side and 3 setae at base of each leg. Abdominal segments I-VII with a pair of minute setae at anterior border, a row of 8 setae anteriorly, 1 seta on each anterolateral side, and 1 seta on each posterolateral side. Last abdominal segment with a pair of minute setae at anterior border and 2 rows of setae anteriorly: 1st with 8 (or 6) and 2nd with 4 setae. Ventrally each posterior corner of last segment with 2 setae. Chaetotaxy of ventral side of body as in figure 23.

All legs stout (Fig. 24), with similar chaetotaxy, 3-segmented; tibiotarsus apically with heavily sclerotized, short, curved, single, simple claw, armed basally with a pointed seta; tibiotarsus with 9 long pointed setae and 2 campaniform sensilla: a complex of 3 setae and 2 sensilla surrounding claw, 4 setae in ventromedial part and 2 setae in dorsomedial part. Femur with 10 long setae and 1 short seta dorsally. Basally, on internal side, a group of 5 campaniform sensilla and 1 short pointed seta, 1 campaniform sensilla at base ventrally, 2 campaniform sensilla at base externally. Setae of coxa arranged in 3 groups: 1st with 3, 2nd with 2, and 3rd with 1 seta.

Pupa: Length: 5.3-5.4 mm, width (across abdominal segment V): 2.5-2.8 mm. Body (Figs. 12, 13) flattened dorsoventrally, elongate, widest across abdominal segment V. Color light yellow.

Head with 2 distinct processes at anterior margin and 2 small ones below 1st one visible only in ventral view. Prothorax with a pair of lateral scoli, and meso- and metathorax with no lateral scoli. Abdominal segments I-V with a pair of lateral scoli, each scolus with 1 short lateral branch placed ventrally. Abdominal segments VI-VIII with 1 simple and 1 two-branched scolus on each side (Figs. 25, 26). Eighth segment additionally with a



Figs. 25, 26. Prionispa houjayi sp. nov., pupa, last 4 abdominal segments. 25. Dorsal view; 26. ventral view.

pair of 2-branched scoli at posterior margin. Each process, scolus, and lateral branch armed apically with a pointed seta.

Abdominal segments with a pair of spiracles. Spiracles of first 4 segments similar in size.

Spiracles of segments VI and VII similar and smaller than those of segments I-IV. Spiracles of segment VIII larger than those of segments VI and VII and similar to those of segments I-IV. Spiracles of 5th segment most prominent, elongate, directed



Figs. 27-34. 27. *Disporum kawakamii* Hayata, the host plant for *Prionispa houjayi* sp. nov.; 28. adult *P. houjayi* sp. nov. and its feeding marks; 29. an egg of *P. houjayi* sp. nov. which was laid in a boring into the underside of a leaf; 30. a leaf with a blotch-mine of a *P. houjayi* sp. nov. larva; 31. feeding area of *P. houjayi* sp. nov., with a larva visible on the left side and dark larval feces in the feeding canal; 32. arrow indicates location of the pupa of *P. houjayi* sp. nov.; 33. 2 pupal chambers of *P. houjayi* sp. nov. near the stem on the underside of a leaf; 34. abdominal part of *P. houjayi* sp. nov. pupa protruding from the pupal chamber. (Figs. 29, 34 by M.H. Tsou; others by H.J. Chen).

posteriorly. Abdominal tergites I-VII with 2 rows of 4 tubercles.

Habitat and biological notes: Larvae of P. houjavi sp. nov. were found mining leaves of Disporum kawakamii Hayata (Fig. 27). The life history is univoltine based on field observations. Most eggs were found in May inside the leaf of the host plant (Fig. 29), with usually 1 egg in 1 leaf, but in a few cases, with more than 3 eggs in the same leaf. The feeding areas were usually oblong, starting close to the apex and moving towards the stem. The larvae deposited their feces in the feeding canals (Fig. 31). Mature larvae left their own feeding canal and walked toward the stem on the underside of the leaf. Subsequently, they bored into the leaves with the head oriented towards the stem (Figs. 32, 33). The pupae usually hid in their pupal chamber, but the apical part of the abdomen could be seen at the entrance of the chamber (Fig. 34). The larval stage lasted about 31-33 d, and the pupal stage lasted about 9 d. Adults were usually inactive and rested on the underside of the leaves (Fig. 28). Their feeding marks were irregular. They are long-lived, sometimes living up to 1 yr in the laboratory. The laboratory temperature ranges from 22°C to 28°C.

DISCUSSION

There is little published biological information on species of *Prionispa*. Taylor (1937) reported *P. fulvicollis* (Guérin-Méneville, 1830) to be associated with *Pollia thyrsiflora* Sndl. ex. Hassk. (Commelinaceae) from Indonesia. Hua (2002) reported *P. champaka* Maulik, 1919 to be associated with an unidentified member of the Zingiberaceae from China. In neither report is it clear if the plant was the larval food plant. Our rearing of *P. houjayi* sp. nov. on *Disporum* is the first larval host plant association for the genus. It is also the first host association of the Cassidinae of the Liliaceae (Jolivet and Hawkeswood 1995).

The larva of *P. houjayi* sp. nov. differs from those of *C. picea* and *O. quadrilobata* (Świętojańska et al. 2006) by the presence of lateral scoli on the meso- and metathorax, but this character was found in *C. thailandica* (Świętojańska and Kovac 2007). This indicates that the presence or absence of the lateral scoli on the meso- and metathorax in larvae are variable between genera or within a genus. However, the shape of the abdominal apex seems to be constant within the genus. *Prionispa houjayi* sp. nov. larvae are characterized by the quadrate abdominal apex. The comparison of diagnostic characters of the immature stages in *P. houjayi* sp. nov., *C. picea*, *C. thailandica*, and *O. quadrilobata* are summarized in table 1.

The body shape and chaetotaxy of larvae of P. houjavi sp. nov. are most similar to those of C. picea and C. thailandica. However P. houjavi sp. nov. differs from C. picea in possessing lateral scoli on the meso- and metanotum (until now this character was observed only in C. thailandica; Świętojańska and Kovac 2007), and the posterior tip of the body (abdominal segments VIII and IX) looks completely different in these 2 genera (Świetojańska et al. 2006: figs. 1, 2; Świetojańska and Kovac 2007: figs. 13, 14). Moreover P. houjayi sp. nov. has prominent labial palpi, one of the most prominent in all known larval hispines and the most prominent within known larvae in the Oncocephilini tribe. Oncocephala gudrilobata has small labial palpi, not as prominent as those of P. houjayi sp. nov. (Świętojańska et al. 2006: fig. 20). In C. thailandica, small processes in place of labial palpi were also observed (Świętojańska and Kovac 2007: fig. 25). Palpi observed in O. quadrilobata and C. thailandica are not as prominent as those in P. houjayi sp. nov.

The pupa of *P. houjayi* sp. nov. is most similar to that of *C. picea*. Both species have a pair of prominent processes on the head, the body is distinctly widened posteriorly; and the lateral scoli of the abdominal segments look very similar. The difference is that *P. houjayi* sp. nov. possesses lateral scoli on the pronotum, whereas *C. picea* has only 2 or 3 small processes on each lateral margin. Two small processes on each lateral margin of the pronotum were also observed in *C. thailandica* but not in *O. quadrilobata*.

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