

Revision of the genus *Xanthopimpla* Saussure, 1892 (Hymenoptera, Ichneumonidae, Pimplinae) from Japan

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Abstract

Japanese species of the genus *Xanthopimpla* Saussure, 1892 are revised. A total of 15 species are recorded from Japan, including three new species, *X. nipponensis* sp. nov., *X. sylvicola* sp. nov., and *X. yoshimurai* sp. nov. and three species, *X. honorata* (Cameron, 1899), *X. minuta* Cameron, 1905 and *X. trias* Townes & Chiu, 1970, newly recorded from Japan. Host, habitat, overwintering and distribution patterns of Japanese *Xanthopimpla* species are discussed.

Key Words

Asia, biogeography, bionomics, new species, parasitoid wasp, Ryukyu Islands, taxonomy

Introduction

Xanthopimpla Saussure, 1892 is a large genus belonging to subfamily Pimplinae and containing 265 species from all zoogeographical regions (Yu et al. 2016). Wasps of this genus have a bright-yellow-coloured body, usually with black spots, which makes this genus one of the most easily recognisable taxa amongst the Ichneumonidae. The distribution of this genus is strongly biased toward tropical or subtropical areas (Townes and Chiu 1970, Gómez et al. 2014) and it is one of the major representatives of tropical ichneumonids in Asia (Townes and Chiu 1970). Wasps of this genus are known as solitary koinobiont endoparasitoids of lepidopterous larvae and pupae (Trehan and Butani 1950, Smith et al. 1993, Paull and Austin 2006) and are, therefore, potentially important natural enemies of crop and forest pests (Momoi 1966, Yasumatsu 1967, Townes and Chiu 1970). This genus is one of the well-studied groups of tropical ichneumonids and, thus, the distributional data of each species may be useful for biogeographical discussions.

Momoi (1970) reviewed the species of this genus collected from Ryukyu Islands and recorded eight for Japan.

However, a taxonomic study of Japanese species has not been conducted. In this research, the Japanese species of this genus is reviewed and their diversity from a biogeographical standpoint is discussed.

Materials and methods

In this study, the dried specimens deposited in the following collections were examined:

- AEIC** American Entomological Institute, Logan, Utah, USA;
- KPMNH** Kanagawa Prefectural Museum of Natural History, Odawara, Kanagawa, Japan;
- MU** Meijo University, Nagoya, Aichi, Japan;
- NIAES** Institute for Agro-Environmental Sciences, NARO, Tsukuba, Ibaragi, Japan;
- NSMT** National Museum of Nature and Science, Tsukuba, Ibaragi, Japan;
- OMNH** Osaka Museum of Natural History, Osaka, Japan;
- SEHU** Systematic Entomology, Hokkaido University, Sapporo, Japan;

- TARI** Taiwan Agricultural Research Institute Council of Agriculture, Executive Yuan, Taichung, Taiwan;
- TUA** Tokyo University of Agriculture, Atsugi, Kanagawa, Japan.

A stereomicroscope (SMZ800: Nikon, Tokyo) was used for observation. Photographs (Figs 1, 2) were taken by digital camera (TG-4: Olympus, Tokyo) attached to the stereomicroscope. Digital images (Figs 1–6) were edited using Adobe Photoshop CC 2020.

Morphological terminology follows Broad et al. (2018). The following abbreviations are used in the description: holotype (**HT**), segment of antennal flagellum (**FL**), diameter of lateral ocellus (**OD**), ocello-ocular line (**OOL**), postocellar line (**POL**) and metasomal tergite (**T**). The following abbreviations are used for material data: female (**F**), male (**M**), Malaise trap (**MT**) and yellow pan trap (**YPT**). As the descriptions of the known species were already given by Townes and Chiu (1970) in detail, we, thus, omitted their description in this paper.

Molecular analysis

There was some variation in the black maculation on the body amongst specimens identified as *X. clavata*

Krieger, 1914. To clarify the variability amongst species, molecular phylogenetic analysis was conducted for *X. clavata* and some closely-related species, based on the partial sequences of the mitochondrial gene, cytochrome c oxidase subunit I (COI) and the nuclear gene, 28S rDNA (28S). All specimens used for DNA analysis were collected adults and preserved in 99.5% ethanol. Total genomic DNA was extracted from the right middle legs using a DNeasy Blood and Tissue Kit (Qiagen, The Netherlands) according to the manufacturer's protocol for animal tissues. Voucher specimens and their extracted genomic DNA were deposited in the Osaka Museum of Natural History. The DNA samples were stored in a freezer (at -40 °C) and the voucher specimens were dried and mounted. The partial sequences of one mitochondrial gene, cytochrome c oxidase subunit I (COI) and one nuclear gene, 28S rDNA (28S), were amplified using the primers designed by Folmer et al. (1994) for COI and Campbell et al. (1993) for the 28S D2 region. These primer sets amplified approximately 640 and 580 bp products, respectively. An overview of the DNA samples is given in Table 1.

Polymerase chain reactions (PCRs) were conducted in 30 µl final volumes using ExTaq Hot Start (Takara Bio Inc., Japan). The PCR programme for COI comprised initial denaturation for 5 min at 94–95 °C followed by 35–40 cycles of denaturation at 94 °C for 15 s, annealing at 46 °C for 15 s, extension at 72 °C for 15 s and a final

Table 1. Information on the individual ID, accession numbers, collecting date, site and depository of each DNA-sequenced specimen of Japanese *Xanthopimpla* (*X. clavata*, *X. yoshimurai* sp. nov., *X. trias*, *X. naenia* and *X. nipponensis* sp. nov.) shown in Fig. 7.

Voucher ID	Species	Accession number		Sex	Date	Information on collecting sites, person and depository
		COI	28S			
Pol083	<i>Xanthopimpla yoshimurai</i>	LC632431	LC633946	♀	30.XII.2011	Koyodai, Matsuyama, Ehime, R.M. (OMNH)
Pol145	<i>Xanthopimpla clavata</i>	LC632432	LC633947	♀	8.V.2013	Yona, Okinawajima, Okinawa, R.M. (OMNH)
Pol192	<i>Apechthis rufata</i> , outgroup	LC632433	LC633948	♂	1.VIII.2013	Bekanbeushi, Akkeshi, Hokkaido, R.M. (OMNH)
Pol311	<i>Xanthopimpla clavata</i>	LC632434	LC633949	♀	31.XII.2014	Koyodai, Matsuyama, Ehime, R.M. (OMNH)
Pol372	<i>Xanthopimpla clavata</i>	LC632435	LC633950	♀	15.V.2015	Yatacho, Yamatokoriyama, Nara, R.M. (OMNH)
Pol378	<i>Xanthopimpla clavata</i>	LC632436	LC633951	♀	1.VI.2015	Byakugouji, Nara, Nara, R.M. (OMNH)
Pol379	<i>Xanthopimpla clavata</i>	LC632437	LC633952	♀	1.VI.2015	Byakugouji, Nara, Nara, R.M. (OMNH)
Pol386	<i>Xanthopimpla clavata</i>	LC632438	LC633953	♂	21.VI.2015	Urabudake, Yonagunijimai, Okinawa, R.M. (OMNH)
Pol388	<i>Xanthopimpla clavata</i>	LC632439	LC633954	♂	24.VI.2015	Shirahama, Iriomotejima, Okinawa, R.M. (OMNH)
Pol401	<i>Xanthopimpla clavata</i>	LC632440	LC633955	♀	25.XII.2015	Kasugajinja, Sanda, Hyogo, R.M. (OMNH)
Pol557	<i>Xanthopimpla trias</i>	LC632441	LC633956	♀	12.I.2017	Amakashinooka, Asuka, Nara, R.M. (OMNH)
Pol657	<i>Xanthopimpla naenia</i>	LC632442	LC633957	♂	7.IX.2017	Heijo Palace site, Nara, Nara, R.M. (OMNH)
Pol664	<i>Xanthopimpla clavata</i>	LC632443	LC633958	♀	4.XII.2017	Arimafuji, Sanda, Hyogo, R.M. (OMNH)
Pol665	<i>Xanthopimpla yoshimurai</i>	LC632444	LC633959	♀	4.XII.2017	Arimafuji, Sanda, Hyogo, R.M. (OMNH)
Pol711	<i>Xanthopimpla nipponensis</i>	LC632445	LC633960	♀	19.I.2019	Yatacho, Yamatokoriyama, Nara, R.M. (OMNH)
Pol712	<i>Xanthopimpla clavata</i>	LC632446	–	♀	19.I.2019	Yatacho, Yamatokoriyama, Nara, R.M. (OMNH)
Pol713	<i>Xanthopimpla yoshimurai</i>	LC632447	LC633961	♀	13.I.2019	Taishoike, Ide, Kyoto, R.M. (OMNH)
Pol718	<i>Xanthopimpla nipponensis</i>	LC632448	LC633962	♀	21.I.2019	Arimafuji, Sanda, Hyogo, R.M. (OMNH)
Pol719	<i>Xanthopimpla clavata</i>	LC632449	LC633963	♀	21.I.2019	Arimafuji, Sanda, Hyogo, R.M. (OMNH)
Pol720	<i>Xanthopimpla yoshimurai</i>	LC632450	LC633964	♀	21.I.2019	Arimafuji, Sanda, Hyogo, R.M. (OMNH)
Pol721	<i>Xanthopimpla clavata</i>	LC632451	LC633965	♀	28.I.2019	Hirae, Ishigakijima, Okinawa, R.M. (OMNH)
Pol724	<i>Xanthopimpla clavata</i>	LC632452	LC633966	♂	29.I.2019	Hirae, Ishigakijima, Okinawa, R.M. (OMNH)
Pol726	<i>Xanthopimpla clavata</i>	LC632453	LC633967	♀	30.I.2019	Hirae, Ishigakijima, Okinawa, R.M. (OMNH)
Pol732	<i>Xanthopimpla clavata</i>	LC632454	LC633968	♂	27.IV.2019	Arakawa, Ishigakijima, Okinawa, R.M. (OMNH)
Pol738	<i>Xanthopimpla naenia</i>	LC632455	LC633969	♂	12.V.2019	Aonogahara, Ono, Hyogo, R.M. (OMNH)
Pol826	<i>Xanthopimpla trias</i>	LC632456	LC633970	♀	14.I.2020	Amakashinooka, Asuka, Nara, R.M. (OMNH)
Pol827	<i>Xanthopimpla trias</i>	LC632457	LC633971	♀	5.II.2020	Hattori-ryokuchi, Osaka, Osaka, R.M. (OMNH)
Pol851	<i>Xanthopimpla trias</i>	LC632458	LC633972	♀	20.V.2020	Kasugayama, Nara, Nara, R.M. (OMNH)
Pol923	<i>Xanthopimpla naenia</i>	LC632459	LC633973	♂	3.XI.2020	Heijo Palace site, Nara, R.M. (OMNH)

extension at 72 °C for 10 min. The reaction conditions for the 28S rRNA fragment were the same, except the annealing temperature was modified to 50 °C and 57 °C and the extension time was modified to 30 s and 60 s, respectively. The PCR products were purified using Illustra Exo-ProStar (GE Healthcare, USA). The purified PCR products were mixed with primers and sent to the CDM Center (Takara Bio Inc.) and run on an ABI 3730xl DNA Analyzer (Applied Biosystems). All sequences generated in this study were submitted to INSD under accession numbers LC632431–LC632459 and LC633946–LC633973, as summarised in Table 1.

The forward and reverse sequences were checked, assembled and edited using Seaview (Gouy et al. 2010). Alignment of the protein-coding COI gene was straightforward and performed manually. The 28S rRNA was aligned according to the secondary structure models (Gillespie et al. 2005). All sequence alignments were concatenated using MacClade 4.08a (Maddison and Maddison 2005). The molecular dataset was analysed using Maximum Likelihood (ML) and Bayesian approaches. For Maximum Likelihood (ML) analyses, MEGA X (Kumar et al. 2002) with the Tamura 3-parameter model and a neighbour-joining (NJ) starting tree was used. For Bayesian analysis, the COI characters were separated into three partitions (first, second and third codon positions). The best-fit model was estimated independently for each partition using hLRTs as implemented in the model test (Nylander 2004), resulting in the 28S (GTR+I) and COI first and second positions (GTR+G) and the COI third position (HKY+G). Bayesian analysis was conducted using MrBayes (Ronquist and Huelsenbeck 2003) with two runs of four chains each for 2,000,000 generations, and trees were sampled every 1,000 generations. The first 50% of the trees were discarded as burn-in and a 50% majority consensus tree from the remaining trees was used to calculate posterior probabilities.

Results

In total, 15 species of *Xanthopimpla* were identified in Japan (Table 2), whereas no *X. brullei* Krieger, 1899 (including a voucher specimen used in Schulz (1906)) were found. Twelve species were re-described and three of them, *X. honorata* (Cameron, 1899), *X. minuta* Cameron, 1905 and *X. trias* Townes & Chiu, 1970, are newly recorded from Japan. The other three are new to sci-

ence. Although the molecular analysis did not resolve the phylogenetic relationships amongst the analysed species (*X. clavata* and closely-related species) because of the low bootstrap values and posterior probabilities, several clades were clearly recognised (Fig. 7A, B). *Xanthopimpla trias*, *X. naenia* Morley, 1913 and *X. nipponensis* sp. nov. were recovered as distinct clades. The individuals that were treated as *X. clavata* were found to comprise two distinct clades with high bootstrap values in ML and posterior probabilities in Bayesian Inference (except those in the 28S analysis that were low for *X. clavata*). Due to slight, but stable differences in body maculation (see description), we considered these as distinct species and described one of them as *X. yoshimurai* sp. nov.

Taxonomy

Subfamily Pimplinae Wesmael, 1845

Tribe Pimplini Wesmael, 1845

Genus *Xanthopimpla* Saussure, 1892

- Xanthopimpla* Saussure, 1892 in Grandidier: pl. 13, figs. 1, 2, 3. Type: *Xanthopimpla hova* Saussure, 1892. Designated by Ashmead (1900).
Chloropimpla Saussure, 1892 in Grandidier: pl. 13, fig. 5. Type: *Chloropimpla dorsigera* Saussure, 1892. Monotypic.
Notopimpla Krieger, 1899: 106. Type: *Pimpla terminalis* Brullé, 1846. Monotypic.
Neopimploides Viereck, 1912: 151. Type: *Neopimploides syleptae* Viereck, 1912 (= *Ichneumon punctatus* Fabricius, 1781). Original designation.
Austrapophua Girault, 1926: 135. Type: *Austrapophua xanthopimploides* Girault, 1925 (= *Xanthopimpla rhopaloceros* Krieger, 1915). Designated by Walkley (1963).

Diagnosis. This genus can be distinguished from other pimpline genera by the following character states: clypeus divided into dorsal and ventral parts by a transverse suture (Fig. 3A, B); mandible, short, broad basally, strongly tapered to the apex, its apex turned ca. 90°; lower tooth of mandible smaller than upper tooth; propodeum largely smooth, with or without carinae (Figs 2I, 4A–N); middle and hind tarsal claws without a large tooth and with a conspicuous large bristle (Fig. 5A–R); body largely to entirely yellow with some black markings, spots and/or areas (Figs 1A–H, 2A–I).

Key to Japanese species and subspecies of *Xanthopimpla*

- 1 Mesosoma and metasoma entirely yellow (Fig. 1B, F)..... 2
- Mesosoma and metasoma with some black markings (e.g. Fig. 1A, C–E, G and H)..... 3
- 2 Area between oceller area and eye without black markings (Fig. 1B). Ovipositor sheath 0.55–0.65 × length of hind tibia..... *X. flavolineata* Cameron, 1907
- Area between oceller area and eye with large black markings (Fig. 1B). Ovipositor sheath 1.1–1.2 × length of hind tibia..... *X. modesta modesta* (Smith, 1860) (in part)

- 3 Areolet absent (vein 3rs-m completely absent) (Fig. 3O)..... *X. naenia* Morley, 1913
 – Areolet present (vein 3rs-m at least partly present) (Fig. 3P)..... 4
- 4 Scutellum subconically elevated in lateral view (Fig. 3J). Propodeum with a conical elevation before its spiracle (Fig. 4D, I). Face with a pair of longitudinal convexities (Fig. 3B). Large species, body length longer than 14 mm 5
 – Scutellum not subconically elevated in lateral view (Fig. 3K–M). Propodeum without a conical elevation before its spiracle (Fig. 4A, C, E, F, H and J–N). Face without a pair of longitudinal convexities (Fig. 3A). Small to large species, body length usually shorter than 14 mm 7
- 5 Punctuation on T III to T V relatively dense, i.e. T IV having the punctures on its sublateral black spots separated by 0.3–1.3 × their diameter and T III having numerous punctures between its black spots (Fig. 6E)
 *X. pedator* (Fabricius, 1775)
 – Punctuation on T III to T V sparser i.e. T IV having the punctures on its sublateral black spots separated by 1.3–6.0 × their diameter and T III having few or no punctures between its black spots (Fig. 6D)..... 6
- 6 Black spots on T IV each with about 20 punctures (Fig. 6D). Hind tibia with 0 to 4 pre-apical bristles, most or all of them scattered close to apex of tibia (Fig. 5D) *X. konowi* Krieger, 1899
 – Black spots on T IV each with about 10 punctures. Hind tibia with 1 to 4 pre-apical bristles, scattered from apex towards middle of tibia *X. brullei* Krieger, 1899
- 7 Hind tibia entirely yellow, without a basal black area (Fig. 5F, L) 8
 – Hind tibia with a narrow, but conspicuous basal black area (Fig. 5A, C, E, I and M–O)..... 9
- 8 Area between oceller area and eye black (Fig. 3C). Propodeum without black markings (Fig. 4F)
 *X. modesta modesta* (Smith, 1860) (in part)
 – Area between oceller area and eye yellow (Fig. 3E). Propodeum with a pair of black markings (Fig. 4K).....
 *X. stemmator* (Thunberg, 1822)
- 9 Propodeum without carinae and black spots (Fig. 4M). T I, IV and VII with black spots (Fig. 2G). Ovipositor straight, its sheath shorter than hind tibia *X. trias* Townes & Chiu, 1970
 – Propodeum at least partly with carinae and sometimes with black spots (Fig. 4A, C, E, H, J, L and N). Colouration of metasomal tergites various. Ovipositor various in shape and length 10
- 10 Propodeum with lateral section of anterior transverse carina joined to area superomedia at or near posterior angle of the area (Fig. 4J). T II and IV usually without black markings (Fig. 2D). Ovipositor decurved and long, its sheath 1.7–2.0 × length of hind tibia *X. punctata* (Fabricius, 1775)
 – Propodeum with lateral section of anterior transverse carinae joined to area superomedia anterior to posterior angle of the area (Fig. 4A, C, E, H, L and N). T II and IV usually with black markings (e.g. Fig. 1A). Ovipositor straight and short, its sheath shorter than hind tibia..... 11
- 11 Notauli long, extending posteriorly beyond centre of mesoscutum, their posterior ends joined with each other (Fig. 3I). Propodeum without a posterior transverse carina (Fig. 4E). Mesoscutum with a black spot on median lobe and a transverse black band on scuto-scutellor groove (Fig. 1E), covered with setaceous punctures. T I, III, IV, V and VII with black spots (Fig. 1E). Ovipositor sheath very short, 1.0 × length of hind tarsal claw *X. minuta* Cameron, 1905
 – Notauli short, not extending posteriorly beyond centre of mesoscutum, their posterior ends not joined with each other (Fig. 3H). Other character states various..... 12
- 12 Posterior transverse carina of propodeum incomplete medially (Fig. 4C). Propodeum with a pair of black spots (Fig. 4C). Ovipositor sheath 0.8 × length of hind tibia. T I, III and V with a pair of black spots (Fig. 1C)
 *X. honorata honorata* (Cameron, 1899)
 – Posterior transverse carina of propodeum complete (weak in *X. sylvicola*, but this species has black spots on propodeum) (Fig. 4A, H, L and N). Ovipositor sheath 0.6 × length of hind tibia or shorter. Propodeum with or without a pair of black spots (Fig. 4A, H, L and N) 13
- 13 Longest bristle on hind tarsal claw distinctly widened next to apex, with a mucronate apex (Fig. 5Q). T IV without black spots. T I, III, V and VII with black spots (Fig. 2F) *X. sylvicola* sp. nov.
 – Longest bristle on hind tarsal claw slender, not widened next to apex (Fig. 5P, R). T IV with black spots (Figs 1A, 2A, H). Colouration of remainder tergites various 14
- 14 Mesoscutum smooth in front of scuto-scutellor groove (Fig. 2B). Propodeum without black markings (Fig. 4H). Hind tibia with 1–2 pre-apical bristles (Fig. 5I). T II and VI without black markings (Fig. 2A). Ovipositor sheath 0.4 × length of hind tibia *X. nipponensis* sp. nov.
 – Mesoscutum with fine punctures in front of scuto-scutellor groove. Propodeum with a pair of black markings (Fig. 4A, N). Hind tibia with 3–8 preapical bristles (Fig. 5A, O). T II and VI sometimes with black markings (Figs 1A, 2H). Ovipositor sheath 0.6–0.65 × length of hind tibia 15
- 15 Black spots of propodeum triangular (Fig. 4A). Lateral sides of black spot of T I extending forwards (Fig. 1A). T II usually with a pair of black spots (Fig. 1A). Basomedian part of T II usually with some punctures *X. clavata* Krieger, 1914
 – Black spots of propodeum semicircular (Fig. 4N). Lateral sides of black spot of T I not extending forwards (Fig. 2H, I). Basomedian part of T II always impunctate..... *X. yoshimurai* sp. nov.

***Xanthopimpla brullei* Krieger, 1899**

Xanthopimpla brullei Krieger, 1899: 88; Schulz 1906: 114; Townes et al. 1961: 51; Townes and Chiu 1970: 51; Momoi 1970: 335; Watanabe 2011: 15.

Comparative diagnosis. This species belongs to the *regina* species group *sensu* Townes and Chiu (1970). This species is very similar to *X. konowi* and can be distinguished by two character states in combination: black spots on T IV each with about 10 punctures; pre-apical bristles on hind tibia 1 to 4, slender, scattered from apex towards the middle of tibia.

Distribution. Japan (Okinawa Is.?). Outside Japan, this species has been recorded from Indonesia, Malaysia and Philippines (Yu et al. 2016).

Bionomics. Unknown in Japan.

Remarks. Although Schulz (1906) recorded this species from Japan, based on a single specimen collected from Nago, Okinawa Island, no additional material was available to us. Townes and Chiu (1970) pointed out that this species occurs in the Greater Sunda Islands. Momoi (1970) also noted that “This species is unknown to me. No new material from Ryukyus is available”. Thus, the distribution record of this species from Japan may be based on misidentification.

***Xanthopimpla clavata* Krieger, 1914**

Figs 1A, 3A, 4A, 5A

Xanthopimpla clavata Krieger, 1914: 40, 91; Uchida 1928: 66; Townes and Chiu 1970: 188; Momoi 1970: 334; Watanabe 2011: 16.

Xanthopimpla minomensis Uchida, 1932: 157; Esaki et al. 1938: 342; Momoi 1958: 120; Iwata 1958: 73; Iwata 1960; Townes et al. 1961: 52; Townes et al. 1965: 61. Synonymised by Momoi (1970).

Comparative diagnosis. This species belongs to the *brachycentra* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other members of this species group by the following combination of character states: antenna dark yellowish-brown; mesoscutum with three black spots or a black band, plus a median black spot in front of scutellum (Fig. 1A); scutellum convex; area superomedia of propodeum wider than long, bounded by strong carinae (Fig. 4A); black spots of propodeum triangular (Fig. 4A); middle and hind tibiae with three to eight pre-apical bristles (Fig. 5A); hind femur entirely yellow (Fig. 5A); ventral edge of hind coxa rounded in lateral view; lateral sides of black spot of T I extending forwards (Fig. 1A); T II usually with a pair of black spots (Fig. 1A); basomedian part of T II usually with some punctures (Fig. 1A); T VI usually without a

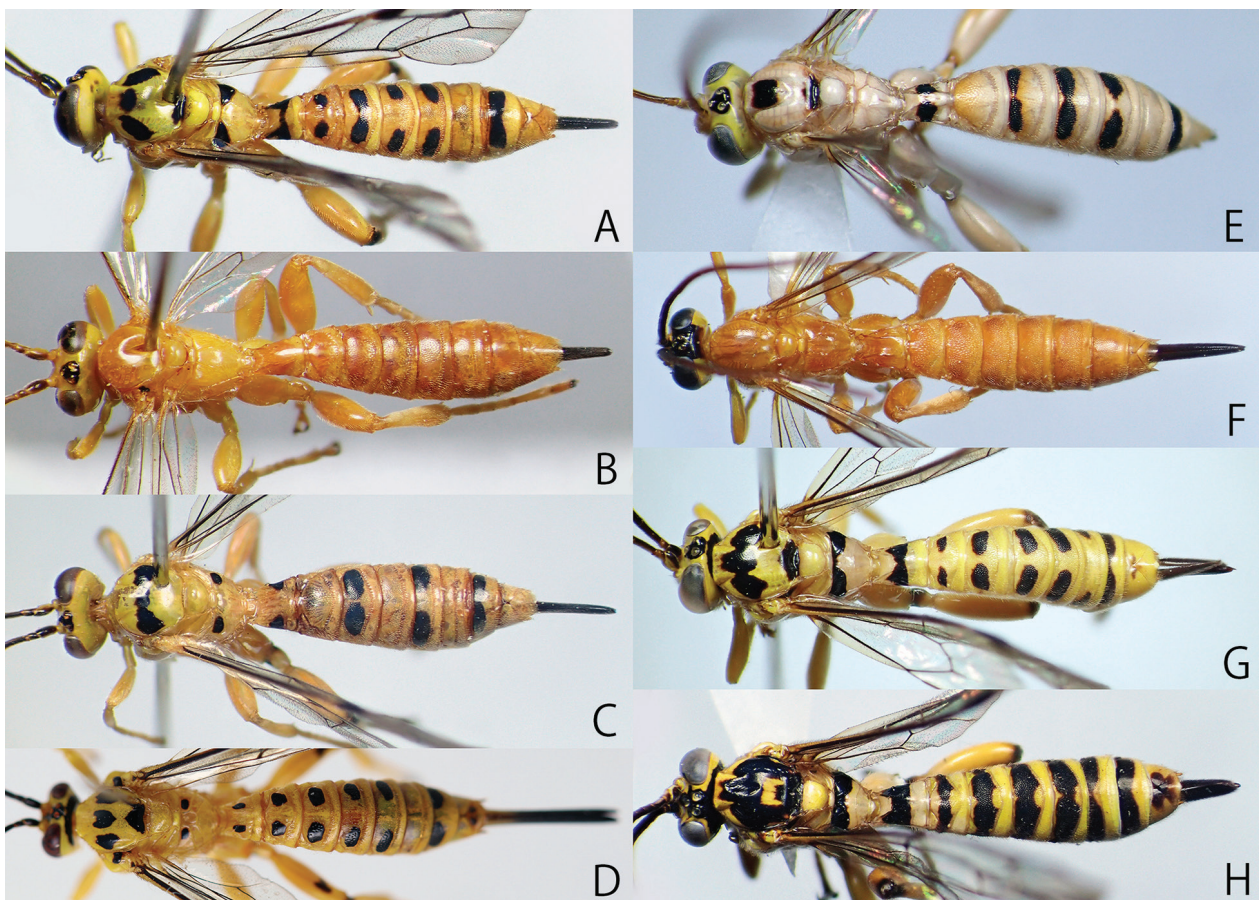


Figure 1. Dorsal habitus of Japanese *Xanthopimpla* A. *X. clavata* Krieger, 1914; B. *X. flavolineata* Cameron, 1907; C. *X. honorata honorata* (Cameron, 1899); D. *X. konowi* Krieger, 1899; E. *X. minuta* Cameron, 1905; F. *X. modesta modesta* (Smith, 1860); G, H. *X. naenia* Morley, 1913.

pair of black spots; apex of ovipositor cylindrical; ovipositor sheath $0.6\text{--}0.65 \times$ length of hind tibia.

Materials examined. Type series: [Honshu] 1 F (*holotype* of *X. minomensis*), Osaka Pref., Mt. Minoo, 1 Jul 1920, C. Teranishi leg. (SEHU); 1 F (*paratype* of *X. minomensis*), Kyoto, 18 May 1930, K. Takeuchi leg. (SEHU). **Non-types: JAPAN:** [Honshu] 1 F, Tochigi Pref., Otawara City, Sakuyama, Gotenyama Park, 22 Jul 1999, E. Katayama leg. (KPMNH); 1 F, Tokyo, Machida City, Noduta Town, 8 Jun 2008, Y. Otsuka leg. (KPMNH); 1 F, Kanagawa Pref., Yokosuka City, Mt. Miurafuji, 21 Jun 2007, K. Watanabe leg. (KPMNH); 1 F, ditto, 13 Jul 2008 (KPMNH); 2 F, Kanagawa Pref., Kamakura City, Kamakura, 16 May 1946, H. Nagase leg. (KPMNH); 1 F, Kanagawa Pref., Shonan-tomioka, 20 Aug 1933, T. Shimizu leg. (SEHU); 1 F, Kanagawa Pref., Yokohama City, Midori-Ku, Niiharu, 28 Mar 2007, M. Konishi leg. (KPMNH); 1 F, Kanagawa Pref., Hiratsuka City, Tsuchiya, Kanagawa University, 23 Jul 2017, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Hadano City, Naganuki, 21 Oct 2009, T. Muraki leg. (KPMNH); 1 F, ditto, 2 Oct 2010, K. Watanabe leg. (KPMNH); 2 F, Kanagawa Pref., Hadano City, Mt. Koubou-yama, 12 Jun 2007, K. Watanabe leg. (KPMNH); 1 F, ditto, 13 Oct 2008, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Odawara City, Hayakawa, Sarusawa-rindo, 8 Aug 2013, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Odawara City, Iriuda, 22 Dec 2016, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Odawara City, Kamisoga, 29 Jun 2015, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Yugawara Town, Miyakami, 20 Apr 2018, K. Watanabe leg. (KPMNH); 1 F, Kanagawa Pref., Hakone Town, Yumoto, Souunji, 8 Jul 2013, K. Watanabe leg. (KPMNH); 1 F, Nagano Pref., Komagane, Akaho, 27 Aug 2011, S. Fujie leg. (KPMNH); 1 F, Gifu Pref., Gifu City, Mitahora, Dodogamine, 9 Apr 2004, M. Tanaka leg. (OMNH); 1 F, ditto, 1 May 2005 (OMNH); 1 F, ditto, 12 May 2006 (OMNH); 1 F, ditto, 24 May 2006 (OMNH); 1 F, Gifu Pref., Motosu City, Orikosji-touge, 9 Aug 2013, S. Okusa leg. (OMNH); 1 F, Aichi Pref., Toyota City, Mitsumata, 9 Aug 2011, S. Okusa leg. (OMNH); 1 F, Aichi Pref., Toyota City, Oridaira, 20 May 2011, S. Okusa leg. (OMNH); 1 F, Fukui Pref., Obama City, Nakanohata, 1 Jul 2017, R. Matsumoto leg. (OMNH); 1 M, Mie Pref., Ise City, Ise-jingu, 23 Aug 2003, B. Tanaka leg. (OMNH); 1 F, Shiga Pref., Otsu City, Minakoyama, 22 May 1999, R. Matsumoto leg. (OMNH); 1 F, Kyoto Pref., Maizuru City, Nyuu, 20 Jun–10 Jul 2011, T. Murao leg. (MT) (OMNH); 1 F, Kyoto Pref., Ayabe City, Mikatacho, 28 Jun–10 Jul 2004, S. Kugo leg. (MT) (OMNH); 1 F, Kyoto Pref., Uji City, Uji, 30 May 2016, R. Matsumoto leg. (OMNH); 1 F, Kyoto Pref., Kizugawa City, Kamo-cho, Mori, 16 Apr 2020, R. Matsumoto leg. (OMNH); 2 F (DNA-Pol-378, DNA-Pol-379), Nara Pref., Nara City, Byakugouji-cho, Takamadoyama, 1 Jun 2015, R. Matsumoto leg. (OMNH); 1 F, ditto, 5 Aug 2014 (OMNH); 1 F, ditto, 30 Apr 2016 (OMNH); 1 F, ditto, 2 May 2016 (OMNH); 1 F, ditto, 7 May 2016 (OMNH); 1 F, ditto, 25 May 2020 (OMNH);

1 F, Nara Pref., Nara City, Nakamachi, 5 May 2020, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Yamatokouriyama City, Yamada-cho, 10 Apr 2018, R. Ito leg. (OMNH); 1 F, ditto, 20 Jul 2018 (OMNH); 1 M, ditto, 25 Jun 2018 (OMNH); 1 F (DNA-Pol-372), Nara Pref., Yamataokouriyama City, Yata-cho, 15 May 2015, R. Matsumoto leg. (OMNH); 2 F (DNA-Pol-712, DNA-Pol-717), ditto, 19 Jan 2019, R. Matsumoto leg. (OMNH); 1 F, ditto, 9 Mar 2008, R. Matsumoto leg. (OMNH); 1 F, ditto, 22 Aug 2008, R. Matsumoto leg. (OMNH); 1 F, ditto, 17 Aug 2009, R. Matsumoto leg. (OMNH); 1 F, ditto, 22 Oct 2009, R. Matsumoto leg. (OMNH); 1 F, ditto, 17 May 2010, R. Matsumoto leg. (OMNH); 1 F, ditto, 28 Mar 2014, R. Matsumoto leg. (OMNH); 1 F, ditto, 27 Jun–17 Jul 2014, R. Matsumoto leg. (MT) (OMNH); 1 F, ditto, 7–27 Jun 2014, R. Matsumoto leg. (MT) (OMNH); 1 F, ditto, 17 May 2009, R. Matsumoto leg. (OMNH); 1 M, ditto, 7 Dec 2009, R. Matsumoto leg. (OMNH); 2 F, ditto, 6 May 2010, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Ikoma City, Higashiikoma, 3 Feb 2020, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Takatori Town, Youraku, 18 Mar 2020, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Katsuragi City, Hiraishi-toge, 22 May 2006, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Katsuragi City, Nijozan, 23 May 1980, E. Nishida leg. (OMNH); 1 F, ditto, 28 May 1980 (OMNH); 1 F, Nara Pref., Kashihara City, Amanokaguyama, 14 Jan 2020, R. Matsumoto leg. (OMNH); 2 F, Nara Pref., Sakurai City, Hase, 30 May 2004, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Takatsuki City, Ponponyama, 1 Jun 2014, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Ibaraki City, Shimootowa, 10 Jun 1999, R. Matsumoto leg. (OMNH); 1 F, Hyogo Pref., Hamasaka, 14 Aug 1930, I. Okada leg. (SEHU); 1 F, Osaka Pref., Mino City, Minoo, 28 Sep 1918, N. Tosawa leg. (OMNH); 1 F, ditto, 31 May 1930, N. Tosawa leg. (OMNH); 1 F, ditto, (no date), N. Tosawa leg. (OMNH); 1 M, ditto, 31 Jul 1921, N. Tosawa leg. (OMNH); 1 M, Osaka Pref., Minoo City, Saigahara, 23 Sep 2003, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Higashiosaka City, Hiraoka Park, 15 Jan 2012, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Yao City, Koudachi, 4 Jul 2000, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Kawachinagano City, Oyamada-cho, 28 Jun 2018, S. Fujie leg. (OMNH); 1 F, Osaka Pref., Izumi City, Makiosan, 11 Jun 1999, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Kaizuka City, Baba, 22 Apr 2004, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Kaizuka City, Izumikatsuragi-san, 27 Sep 2000, R. Matsumoto leg. (OMNH); 1 F, Osaka Pref., Sennan City, Horigodani, 26 Apr 2000, R. Matsumoto leg. (OMNH); 1 F, Wakayama Pref., Wakayama City, Hirai-toge, 18 Jul 2000, R. Matsumoto leg. (OMNH); 1 F, Wakayama Pref., Hashimoto City, Koyoudai, 27 Jun 2004, R. Matsumoto leg. (OMNH); 1 M, Wakayama Pref., Susami Town, Mirouzu, 3 Jun 1980 em. (em. from lepidopterous pupa), T. Sato leg. (OMNH); 1 F, Hyogo Pref., Inagawa Town, Kashihara, 11 Apr 2009, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-664), Hyogo Pref., Sanda City, Ohara, 4 Dec 2017, R.

- Matsumoto leg. (OMNH); 1 F, ditto, 20 Dec 2008 (OMNH); 1 F, ditto, 24 Aug. 2012 (OMNH); 1 F, ditto, 16 Jan 2020, (OMNH); 5 F (incl. DNA-Pol-719), Hyogo Pref., Sanda City, Ohara, 21 Jan 2019, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-401), Hyogo Pref., Kobe City, Doujyo-cho, Ikuno, 11 Aug 2015, R. Matsumoto leg. (OMNH); 1 F, Hyogo Pref., Kobe City, Aina, 6 May 2001, H. Yoshida leg. (OMNH); 1 F, Hyogo Pref., Yabu City, Kotobiki-touge, 5 Aug 2003, R. Matsumoto leg. (OMNH); 1 F, Hyogo Pref., Shisou City, Akasai-keikoku, 4 Aug 2003, R. Matsumoto leg. (OMNH); 1 F, Tottori Pref., Aotani Town, Tsuyutani, 26 May 1982, H. Aoki leg. (OMNH); 1 F, Tottori Pref., Tottori City, 2 Jul 1968, H. Aoki leg. (OMNH); 1 M, Okayama Pref., Chuka Vil., Tsuguro, 10 Jul 1993, R. Matsumoto leg. (OMNH); 1 F, Okayama Pref., Niimi City, Kusama, 26 May 1996, R. Matsumoto leg. (OMNH); 1 F, Okayama Pref., Niimi City, Nishio, 19 Aug 1998, R. Matsumoto leg. (OMNH). [Izu Isls.] 2 F, Tokyo, Izuoshima Is., Motomachi, Mt. Omaru, 17 Aug–5 Oct 2012, K. Tsujii leg. (MT) (KPMNH). [Awajishima Is.] 1 F, Hyogo Pref., Nojima-tokiwa, 4 Sep 2008, S. Okusa leg. (OMNH). [Shikoku] 1 F, Ehime Pref., Saijo City, Higashinokawa, 19 Sep 2006, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-311), Ehime Pref., Matsuyama City, Koyoudai, 31 Dec 2014, R. Matsumoto leg. (OMNH); 1 F, Ehime Pref., Kumakougen Town, Nakagaichi, 8 Aug 2008, R. Matsumoto leg. (OMNH); 2 F, Ehime Pref., Oda Town, Miyanotani, 11 Aug 1998, R. Matsumoto leg. (OMNH); 1 F, Kochi Pref., Kochi City, Engyouji, 27 Mar 1931, Y. Sugihara leg. (SEHU); 1 F, ditto, 3 May 1931 (SEHU); 1 F, ditto, 22 May 1933 (SEHU); 1 F, Kochi Pref., Umaji Vil., 4 Aug 2010, Y. Matsubara & K. Fukuda leg. (MT) (KPMNH). [Kyushu] 2 F, Fukuoka Pref., Fukuoka City, Hakomatsu, 17 Jul 1994, Wasano leg. (OMNH); 1 F, Fukuoka Pref., Maebaru City, Kaminoharu, 25 Apr 1994, R. Matsumoto leg. (OMNH); 1 F, Kumamoto Pref., Asagiri Town, Uenishi, 24 Aug 2012, R. Matsumoto leg. (OMNH); 1 F, Miyazaki Pref., Miike, 29 Apr. 1979, K. Tsuda leg. (SEHU); 1 F, Miyazaki Pref., Kobayashi City, Inokodani, 4 Sep 2004, K. Mitai leg. (OMNH); 1 F, ditto, 23 May 2003 (OMNH); 1 F, ditto, 28 Sep 2003 (OMNH); 8 F, Miyazaki Pref., Kobayashi City, Inokodani, (F1 of a female collected on 28 Sep 2003, reared using supplied pupae of *Galleria mellonella* (Linnaeus, 1758) as host) (OMNH); 1 F, Miyazaki Pref., Miyazaki City, Kaeda-keikoku, 31 Oct 2019, R. Matsumoto leg. (OMNH); 1 F, Kagoshima Pref., Ookuchi City, Fuke, 6 Aug 1967, A. Tanaka leg. (SEHU); 1 F, Kagoshima Pref., Ookuchi City, 4 Jul 2012, Y. Matsubara & K. Fukuda leg. (MT) (KPMNH); 2 F, Kagoshima Pref., Kanoya City, Kamiharaigawa, 29 Apr 1970, A. Nagatomi leg. (SEHU); 1 F, Kagoshima Pref., Kagoshima City, Toso, 8 Jan 1975, K. Takahashi leg. (SEHU); 1 M, Kagoshima Pref., Takachihonome, 22 Aug 1974, K. Kusigemati leg. (SEHU); 1 M, ditto, 12 Jul. 1979, K. Tsuda leg. (SEHU). [Tsushima Is.] 1 M, Nagasaki Pref., Kamiagata Town, Ina, 20 Jun 2001, R. Matsumoto leg. (OMNH); 1 F, Nagasaki Pref., Kashitaki, 6 Jun. 2004, R. Matsumoto leg. (OMNH); 1 F, Nagasaki Pref., Miyahara, 1 Jun. 1996, R. Matsumoto leg. (OMNH); 1 F, Nagasaki Pref., Shiratake, 5 Jun 2004, R. Matsumoto leg. (OMNH); 1 M, Nagasaki Pref., Kamisaka Park, 7 Jul 2014, S. Fujie leg. (OMNH); 1 F, Nagasaki Pref., Kamisaka, 23 Jul 1994, R. Matsumoto leg. (OMNH). [Ryukyu Isls.] 1 F, Kagoshima Pref., Yakushima Is., Anbo, 31 May 1969, K. Kusigemati leg. (SEHU); 1 F, Kagoshima Pref., Yakushima Is., Miyaounoura, 7 May 1972, K. Hashimoto leg. (SEHU); 1 F, ditto, 4 Jun 1975, K. Kusigemati leg. (SEHU); 1 F, ditto, 3–20 Apr 1999, T. Murata leg. (MT) (MU); 1 F, ditto, 21 Apr–12 May 1999 (MU); 3 F, ditto, 1–20 Jun 1999 (MU); 1 M, ditto, 21 Jun–11 Jul. 1999 (MU); 1 F, Kagoshima Pref., Yakushima Is., Shiratani, 6 May–20 Jun 2000, T. Murata leg. (MT) (MU); 1 F, ditto, 21 Jun–9 Jul 2000 (MU); 2 F & 4 M, ditto, 10 Jul–8 Aug 2000 (MU); 3 F, ditto, 9 Aug–2 Sep 2000 (MU); 1 F, Kagoshima Pref., Yakushima Is., Kankake, 22 Jul–22 Aug 2006, T. Yamauchi leg. (MT) (KPMNH); 1 F, ditto, 25 Aug–2 Sep 2006 (KPMNH); 3 F, ditto, 31 Mar–28 Apr 2007 (KPMNH); 4 F, ditto, 28 Apr–1 May 2007 (KPMNH); 40 F, ditto, 1 May–5 Jun 2007 (KPMNH); 1 F, ditto, 5 Jul–8 Jul 2007 (KPMNH); 6 F & 1 M, ditto, 8–28 Jun 2007 (KPMNH); 1 F, ditto, 30 Jul–25 Aug 2007 (KPMNH); 1 F, ditto, 25 Aug–28 Sep 2007 (KPMNH); 1 F, Kagoshima Pref., Yakushima Is., Han-yama, 25 Aug–2 Sep 2006, T. Yamauchi leg. (MT) (KPMNH); 1 F, ditto, 26 Sep–24 Oct 2006 (KPMNH); 1 F, ditto, 28 Apr–1 May 2007 (KPMNH); 5 F, ditto, 1 May–5 Jun 2007 (KPMNH); 1 F, ditto, 5–8 Jul 2007 (KPMNH); 1 F, ditto, 8–28 Jun 2007 (KPMNH); 1 F, Kagoshima Pref., Yakushima Is., Arakawa, 22 Jul–22 Aug 2006, T. Yamauchi leg. (MT) (KPMNH); 1 F, ditto, 28 Jun–29 Jul 2007 (KPMNH); 1 F, Kagoshima Pref., Yakushima Is., Aikodake, 30 Mar–29 Apr 2007, T. Yamauchi leg. (MT) (KPMNH); 5 F, ditto, 30 Mar–29 Apr 2007 (KPMNH); 7 F, ditto, 29 Apr–2 May 2007 (KPMNH); 7 F, ditto, 2–10 May 2007 (KPMNH); 11 F, ditto, 2 May–5 Jun 2007 (KPMNH); 1 F, ditto, 5–8 Jul 2007 (KPMNH); 2 F & 2 M, 8–28 Jun 2007 (KPMNH); 4 F, ditto, 28 Jun–29 Jul 2007 (KPMNH); 1 F, ditto, 29 Jul–25 Aug 2007 (KPMNH); 1 F, ditto, 25 Aug–28 Sep 2007 (KPMNH); 11 F & 10 M, Kagoshima Pref., Tokara Is., Nakanoshima Is., Otake, 17 Jun 2005, T. Mita leg. (KPMNH); 1 M, ditto, 7. VI.2005 (OMNH); 1 M, Kagoshima Pref., Amamioshima Is., Setouchi Town, 20 May 1979, H. Nagase leg. (KPMNH); 1 M, Kagoshima Pref., Amamioshima Is., Kasari Town, 26 Jun 2001, T. Nambu leg. (KPMNH); 1 M, Kagoshima Pref., Amamioshima Is., Yamato Vil., Ookaneku, 25 May–15 Jun 2019, A. Yoshikawa leg. (OMNH); 2 F & 2 M, ditto, 11–25 May 2019 (OMNH); 2 M, Kagoshima Pref., Amamioshima Is., Yamato Vil., Yuwangama, 11–25 May 2019, A. Yoshikawa leg. (OMNH); 1 M, Kagoshima Pref., Amamioshima Is., Mt. Yuidake, 2 Jul 2004, H. Makihara leg. (MT) (KPMNH); 1 M, ditto, 12–16 Sep 2004 (KPMNH); 2 F, ditto, 19 Sep 2004 (KPMNH); 1 F, Kagoshima Pref., Amamioshima Is., Uken Vil., Yuwan, 26 Sep 1984, A. Nagatomi leg.; 13 M, ditto, 6 Jun 2007, K. Watanabe &

- M. Gunji leg. (KPMNH); 5 M, Kagoshima Pref., Amami-oshima Is., Sumiyou Vil., Kinkawadake, 7 Jun 2007, K. Watanabe leg. (KPMNH); 1 M, Kagoshima Pref., Amami-oshima Is., Sumiyo Vil., Santarou-touge, 2 Jul 2011, S. Fujie leg. (OMNH); 4 M, Kagoshima Pref., Amami-oshima Is., Yamato Vil., Oodana, 1 Jun 2007, K. Watanabe leg. (KPMNH); 3 F & 3 M, ditto, 3 Jun 2007, K. Watanabe & M. Gunji leg. (KPMNH); 1 F, ditto, 29 Jun 2011, K. Watanabe leg. (KPMNH); 1 F, ditto, Odana, 29 Jun 2011, S. Fujie leg. (OMNH); 1 M, ditto, 4 Jul 2011 (OMNH); 1 F & 5 M, Kagoshima Pref., Amami-oshima Is., Nase, Sato-rindo, 5 Jun 2007, K. Watanabe & M. Gunji leg. (KPMNH); 2 M, Kagoshima Pref., Amami-oshima Is., Nase, Uragami, 9–11 May 2009, T. Soyama leg. (KPMNH); 1 F, Kagoshima Pref., Amami-oshima Is., Nase, Chuo-rindo, 26–28 Jun 2011, K. Watanabe leg. (KPMNH); 1 M, Kagoshima Pref., Amami-oshima Is., Nase City, Asato, 26 Jun–2 Jul. 2019, T. Hatayama leg. (OMNH); 1 F, Kagoshima Pref., Kakeroma Is., Shiba, 25 Sep 1984, A. Nagatomo leg. (SEHU); 2 F, Kagoshima Pref., Kakeroma Is., Akitoku, 28 Jun 2014, K. Watanabe leg. (KPMNH); 2 M, Kagoshima Pref., Kakeroma Is., Nishiamuro, 28 Jun 2014, K. Watanabe leg. (KPMNH); 28 M, Kagoshima Pref., Tokunoshima Is., Kedoku, 20 May 2008, K. Watanabe leg. (KPMNH); 14 M, ditto, 21 May 2008 (KPMNH); 3 M, ditto, 22 May 2008 (KPMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Tete, 27 Aug 2008, H. Ootsubo leg. (KPMNH); 1 F & 4 M, Kagoshima Pref., Tokunoshima Is., Amagi Town, Amagi, 25 May 2007, K. Watanabe & T. Ban leg. (KPMNH); 6 M, ditto, 18 May 2008, K. Watanabe leg. (KPMNH); 3 M, Kagoshima Pref., Tokunoshima Is., Mt. Yamatogusukuyama, 26 May 2007, K. Watanabe & M. Gunji leg. (KPMNH); 4 M, ditto, 17 May 2008, K. Watanabe leg. (KPMNH); 1 F, ditto, 17–22 May 2008 (MT) (KPMNH); 1 M, Kagoshima Pref., Tokunoshima Is., Hanatoku, 2 Jul 2013, S. Fujie leg. (OMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Mikyo pass, 19 Jun 2006, O. Tominaga leg. (OMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Mikyo, 29 Apr 1996, R. Matsumoto leg. (OMNH); 1 M, Kagoshima Pref., Tokunoshima Is., Isen Town, Nakayama, 21 May 2008, K. Watanabe leg. (KPMNH); 2 M, Kagoshima Pref., Tokunoshima Is., Itokina, 27 May 2007, K. Watanabe leg. (KPMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Benoki, 7 Apr 1979, K. Kusigemati leg. (SEHU); 2 F, ditto, 8 Apr 1979, K. Kusigemati & K. Ohara leg. (SEHU); 2 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Yonaha-dake, 6 Apr 1979, K. Ohara leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Uka, 23 Aug 2001, H. Irei & H. Makihara leg. (MT) (KPMNH); 1 M, Okinawa Pref., Okinawa Is., Kunigami Vil., Okuni-rindo, 9 May 2016, K. Asano leg. (OMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Yona, 6 Oct 1987, A. Nagatomo leg. (SEHU); 1 F, ditto, 11 Oct 1987 (SEHU); 1 M, ditto, 21 Oct 1994, R. Matsumoto leg. (OMNH); 1 M, ditto, 1 Apr 1999, T. Saigusa leg. (OMNH); 1 M, ditto, 20 May 2006, K. Watanabe leg. (KPMNH); 1 F & 4 M, ditto, 21 May 2007 (KPMNH); 1 F & 2 M, ditto, 22 May 2007, K. Watanabe leg. (KPMNH); 1 F & 1 M, ditto, 20–23 May 2007 (MT) (KPMNH); 5 M & 2 F, ditto, 8 May 2013, R. Matsumoto leg. (OMNH); 4 F (incl. DNA-Pol-145), ditto, 9 May 2013 (OMNH); 1 M & 2 F, ditto, 10 May 2013 (OMNH); 1 F, ditto, 28 Jun 2013, S. Fujie leg. (OMNH); 3 F, ditto, 29 Jun 2013 (OMNH); 2 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Aha, 8 May 2013, R. Matsumoto leg. (OMNH); 1 M, ditto, 21 Apr 2016, Y. Fukuda leg. (KPMNH); 2 M, Okinawa Pref., Okinawa Is., Ogimi Vil., Nuha, 28 Nov 2008, R. Matsumoto leg. (OMNH); 2 F, Okinawa Pref., Okinawa Is., Motobu, Izumi, 29 Jun 1982, K. Kusigemati & K. Ohara leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Nakijin Vil., Nakijin, 1 Jul 2006, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Okinawa Is., Nago, 7 Apr 1979, K. Ohara leg. (SEHU); 3 F, ditto, 9 Apr 1979, K. Kusigemati leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Nago City, Nago, 3 Apr 1982, E. Nishida leg. (OMNH); 1 F, ditto, 5 Apr 1982 (OMNH); 1 F, Okinawa Pref., Okinawa Is., Nago City, Nangusuku, 29 Apr 2019, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Okinawa Is., Nago City, Sedake, 25 Jun 2013, S. Yoshizawa leg. (KPMNH); 1 M, Okinawa Pref., Taketomi Is., Nishiyashiki, 24 Jan 2006, H. Suda leg. (KPMNH); 1 F, Okinawa Pref., Ishigaki Is., Hirakubo, 26 Apr 2019, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Akaishi, 17 May 2009, H. Inoue leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Yonehara, 2 Jul 1978, S. Tsukaguchi leg. (OMNH); 1 F, ditto, 9 Sep 1978 (OMNH); 1 F, ditto, 21 Oct 1978, E. Nishida leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Kabira, 11 Feb 1953, T. Shiraki leg. (NIAES); 1 F, Okinawa Pref., Ishigaki Is., Mt. Kara, 16 Aug 1965, K. Kanmiya leg. (SEHU); 1 M, Okinawa Pref., Ishigaki Is., Sakieda, 22 Mar 2004, T. Toita leg. (NIAES); 2 M, Okinawa Pref., Ishigaki Is., Maesato, 9 Jul 2007, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Omotodake, 20 Mar 1993, Y. Okushima leg. (OMNH); 1 F, ditto, 18 Nov 1980, E. Nishida leg. (OMNH); 1 F, ditto, 31 Mar 1982 (OMNH); 1 F, ditto, 1 Apr 1982 (OMNH); 1 M & 1 F, ditto, 24 Apr 2004, T. Toita leg. (OMNH); 1 M (DNA-Pol-724), Okinawa Pref., Ishigaki Is., Hirae, 29 Jan 2019, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-721), ditto, 28 Jan 2019 (OMNH); 1 F (DNA-Pol-726), ditto, 30 Jan 2019 (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Shiramizu, 15 May 2008, T. Mita leg. (KPMNH); 2 M (DNA-Pol-732), Okinawa Pref., Ishigaki Is., Arakawa, 27 Apr 2019, R. Matsumoto leg. (OMNH); 1 F, ditto, 10 Jul. 2007 (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Fusaki, 12 May 1999, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Ohara, 2 May 1982, A. Nagatomi leg. (SEHU); 1 F, ditto, 24 Jul 1985 (SEHU); 2 F, ditto, 16 Apr 1978, E. Nishida leg. (OMNH); 3 F, Okinawa Pref., Iriomote Is., Otomi, 17 Apr 1978, E. Nishida leg. (OMNH); 2 F, Okinawa Pref., Iriomote Is., Ootomi-rindo, 1 Jun 2006, K. Watanabe leg. (KPMNH); 1 M, ditto, 29 Dec 2006, T. Ishizaki leg. (KPMNH); 1 F, Okinawa Pref., Iriomote Is., Funaura, 5 May 1980, E. Nishida leg. (OMNH); 2 M, ditto, 28 Mar 1982 (OMNH);

1 F, ditto, 16 Mar 2002, T. Yoshida leg. (OMNH); 1 F, ditto, 2 Apr 1999, T. Saigusa leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Rv. Shiiminato, 11–24 Jan 1996, T. Muroi leg. (MT) (MU); 1 M, ditto, 25 Jan–7 Feb 1996 (MU); 1 F, ditto, 8–21 Feb 1996 (MU); 1 M, 7–20 Mar 1996, K. Ebi leg. (MU); 4 F & 2 M, ditto, 21 Mar–3 Apr 1996 (MU); 1 F, ditto, 13–26 Jun 1996 (MU); 1 F, ditto, 5–18 Sep 1996 (MU); 1 M, Okinawa Pref., Iriomote Is., Hishidate, Hoshizuna-kaigan, 20 May 2007, T. Ban leg. (KPMNH); 1 F (DNA-Pol-388), Okinawa Pref., Iriomote Is., Funauki, 24 Jun 2015, R. Matsumoto leg. (OMNH); 3 F & 1 M, Okinawa Pref., Iriomote Is., Shirahama-rindo, 10 May 2008, K. Watanabe & T. Mita leg. (KPMNH); 1 F, ditto, 19 May 2018, T. Ban leg. (KPMNH); 2 F, Okinawa Pref., Iriomote Is., Komi, 6 Jul 1982, K. Kusigemati leg. (SEHU); 1 M, ditto, 9 May 1999, R. Matsumoto leg. (OMNH); 4 M, Okinawa Pref., Iriomote Is., Komi, Airagawa-rindo, 11 May 2008, K. Watanabe leg. (KPMNH); 2 M, ditto, 14 May 2008 (KPMNH); 2 M, ditto, 2 Apr 2011, K. Kawano leg. (KPMNH); 1 M & 3 F, Okinawa Pref., Iriomote Is., Mariudo-falls, 23 Jul 1995, R. Matsumoto leg. (OMNH); 6 F, ditto, 7 Aug. 1995 (OMNH); 1 F, Okinawa Pref., Iriomote Is., Nr. Kampir-falls, 1 Jul 1988, K. Kusigemati leg. (SEHU); 1 F & 5 M, ditto, 12 May 2008, K. Watanabe et al. leg. (KPMNH); 1 F, Okinawa Pref., Iriomote Is., Urauchigawa, 11 Jun 1978, S. Tsukaguchi leg. (OMNH); 1 F & 1 M, Okinawa Pref., Iriomote Is., Riverside of Urauchigawa riv., 12 May 2008, K. Watanabe leg. (KPMNH); 2 F & 11 M, ditto, 13 May 2008 (KPMNH); 1 F & 5 M, ditto, 14 May 2008 (KPMNH); 1 F, Okinawa Pref., Iriomote Is., Sonai, 13 Apr 1978, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Yonaguni Is., Anngaimidocchi 24 Jun 2012, E. Nishida leg. (OMNH); 1 M (DNA-Pol-386), Okinawa Pref., Yonaguni Is., Urabudake, 24 Jun 2015, R. Matsumoto leg. (OMNH); 1 M, ditto, 22 Jun 2015 (OMNH). **TAIWAN:** 1 F (det. Townes & Chiu, as *X. clavata*), Tarmaru, Rato, 3 Aug 1923, J. Sonan leg. (TARI); 1 M (det. Townes & Chiu, as *X. clavata*), Karenko, 20 Jul–4 Aug 1919, T. Okuni & J. Sonan leg. (TARI). **CHINA:** 1 F (det. Townes, as *X. minomensis*), [Fujian Prov.] Shaowu Hsien, 8–12 Aug 1945, T. C. Maa leg. (TARI).

Distribution. Japan (Honshu, Izuoshima Is., Shikoku, Kyushu, Tsushima Is., Yakushima Is., Amamioshima Is., Kakeroma Is., Tokunoshima Is., Okinawa Is., Miyako Is., Ishigaki Is., Taketomi Is., Iriomote Is. and Yonaguni Is.). Outside Japan, this species has been recorded from China, Malaysia and Taiwan (Yu et al. 2016).

Bionomics. In Japan, adults were collected in all months, except for November. In Honshu, winter is passed in the stage of adult (Fig. 8A). The wintering adults were resting under the leaf of broad-leaved, evergreen trees, such as *Castanopsis cuspidata*, *Ilex pedunculosa* and *Camellia japonica*. Sometimes, multiple individuals were observed under the leaves of a single tree or even on a single leaf. All wintering specimens observed were female exclusively. This species is one of the common species of Japanese *Xanthopimpla* and adults are frequently

found flying in or along the forest edge including somewhat open habitat. Although the host of this species is unknown, a female was observed to lay eggs into experimentally supplied cocoons of *Galleria mellonella* (Linnaeus, 1758) and its offspring emerged successfully. One male was reared from an unidentified small lepidopterous pupa.

Remarks. This is the first record of this species from Nakanoshima Is., Kakeroma Is., Tokunoshima Is., Taketomi Is. and Yonaguni Is. Both Momoi (1970) (published on 20 July 1970) and Townes and Chiu (1970) (published in 1970, but without data for month and day) synonymised *X. minomensis* under *X. clavata* and, in this study, we accept the former treatment, based on the ICZN 21.3.

Xanthopimpla flavolineata Cameron, 1907

Figs 1B, 4B, 5B

Xanthopimpla flavolineata Cameron, 1907a: 48; Momoi 1966: 4; Townes et al. 1961: 55; Townes and Chiu 1970: 114; Watanabe 2011: 15.

Xanthopimpla emaculata Szépligeti, 1908: 256; Townes et al. 1961: 54; Momoi 1970: 335. Synonymised by Townes and Chiu (1970).

Xanthopimpla immaculata Morley, 1913: 115. Synonymised by Townes and Chiu (1970).

Xanthopimpla hyaloptila Krieger, 1915: 35; Townes et al. 1961: 56. Synonymised by Townes and Chiu (1970).

Xanthopimpla xanthostigma Giraut, 1925: 38; Townes et al. 1961: 72. Synonymised by Townes and Chiu (1970).

Xanthopimpla xara Cheesman, 1936: 179; Townes et al. 1961: 72. Synonymised by Townes and Chiu (1970).

Metopius sesamiae Rao, 1953: 184. Synonymised by Townes and Chiu (1970).

Xanthopimpla sesamiae: Townes et al. 1961: 67.

Comparative diagnosis. This species belongs to the *citrina* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of this species group by the following combination of character states: stigma light brown; area superomedia receiving lateral section of anterior transverse carina behind the centre (Fig. 4B); ovipositor sheath 0.55–0.65 × length of hind tibia.

Materials examined. JAPAN: [Ryukyu Isls.] 1 F, Okinawa Pref., Ishigaki Is., Yonehara, 15 Oct 1981, K. Konishi leg. (NIAES); 1 F, Okinawa Pref., Ishigaki Is., Mt. Omotodake, 19 Jan 1998, K. Takahashi leg. (NIAES); 1 M, Okinawa Pref., Iriomote Is., Otomi-rindo, 20 Nov 1980, E. Nishida leg. (OMNH); 1 F, ditto, 7 Oct 2004, T. Ishizaki leg. (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Urauchi, 11 Oct 2004, T. Ishizaki leg. (KPMNH); 1 F, ditto, 28 Dec 2004 (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Oohara, Fusatoruba, 29 Dec 2006, J. Kantou leg. (KPMNH); 1 M, ditto, 10 May 2008, T. Mita leg. (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Funaura, 26 Mar 1982, E. Nishida leg. (OMNH); 1 M, ditto, 8 May 1999, R. Matsumoto leg. (OMNH); 1 M, ditto, 11 May 2008, T. Mita leg. (KPMNH); 2 F & 5 M, Okinawa Pref., Iriomote Is., Sonai, 20 Mar 2015, K. Watanabe & M. Ito leg. (KPMNH);

1 M, Okinawa Pref., Yonaguni Is., Tarumai, 29 May 2003, T. Mita leg. (Light trap) (KPMNH); 1 M, Okinawa Pref., Yonaguni Is., Minamibokujyou, 30 May 2003, T. Mita leg. (KPMNH). TAIWAN: 1 F (det. Townes & Chiu), Heichin, 14 Dec 1933, J. Sonan leg. (TARI).

Distribution. Japan (Ishigaki Is., Iriomote Is. and Yonaguni Is.). Outside Japan, this species has been recorded from Australia, Bangladesh, China, India, Indonesia, Laos, Malaysia, Nepal, New Caledonia, Pakistan, Palau, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Taiwan, Truk Islands, Vanuatu and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in January, March, May and from October to December. Townes and Chiu (1970) noted that the greatest number of this species were collected from November to February (the cooler months) in Taiwan and this trend is also recognisable in Japan. In Iriomote Is., the first author collected this species in the meadows around paddy fields. The host is unknown in Japan whereas some lepidopterous pests have been recorded as hosts in Taiwan (Sonan 1944).

Remarks. In Japan, distribution of this species is restricted in Yaeyama Islands of Ryukyus.

Xanthopimpla honorata (Cameron, 1899)

Comparative diagnosis. This species belongs to the *occidentalis* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of this species group by the following combination of character states: mesoscutum with three rounded, transverse continuous black spots (Fig. 1C); propodeum with area superomedia open posteriorly (Fig. 4C); hind tibia with 4–7 pre-apical bristles (Fig. 5C); T I, III, V and VII each with two black spots (Fig. 1C); ovipositor sheath 0.8–0.9 × length of hind tibia.

Remarks. This is the first record of this species from Japan. This species is divided into three subspecies, *X. honorata honorata* (Cameron, 1899), *X. atriculinata* Chao, 1997 and *X. honorata munda* Krieger, 1915. All Japanese materials are identified as *X. honorata honorata*.

Xanthopimpla honorata honorata (Cameron, 1899)

Figs 1C, 4C, 5C

Pimpla honorata Cameron, 1899: 170.

Xanthopimpla cera Cameron, 1908: 38; Townes et al. 1961: 552.

Synonymised by Townes and Chiu (1970).

Xanthopimpla kriegiana Cameron, 1908: 38. Synonymised by Townes and Chiu (1970).

Xanthopimpla binghami Cameron, 1908: 39. Synonymised by Townes and Chiu (1970).

Xanthopimpla erythroceros Krieger, 1915: 32; Townes et al. 1961: 55. Synonymised by Townes and Chiu (1970).

Xanthopimpla erythroceros var. *assamensis* Krieger, 1915: 99. Synonymised by Townes and Chiu (1970).

Xanthopimpla honorata honorata: Townes and Chiu 1970: 206.

Xanthopimpla sp. A: Watanabe 2011: 17.

Comparative diagnosis. This subspecies can be distinguished from other subspecies by the propodeum and T I with black markings and the hind slope of vertex entirely yellow.

Materials examined. JAPAN: [Ryukyu Is.] 2 F, Kagoshima Pref., Amamioshima Is., Mt. Yuwan, 3 May 1953, T. Shiraki leg. (NIAES); 2 F, Kagoshima Pref., Amamioshima Is., Yuwan, 7 May 1953, T. Shiraki leg. (NIAES); 1 F, Kagoshima Pref., Amamioshima Is., Shinokawa, 15 May 1953, T. Shiraki leg. (NIAES); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Mt. Yonahadake, 6 Apr 1979, K. Ohara leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Yona, 6 Oct 1987, A. Nagatomi leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Nakijin Vil., Mt. Oppa-dake, 3 May 1991, M. Hayashi leg. (NIAES); 1 F, Okinawa Pref., Okinawa Is., Higashi Vil., Takae, 11 Oct 2014 em. from a pupa of *Pithecopus corvus ryukyuensis* Shirozu, 1964, A. Miyagi leg. (KPMNH); 1 F, ditto, 23 Oct 2014 em. (KPMNH); 1 F & 1 M, Iriomote Is., Riverside of Urauchigawa, 13 May 2008, K. Watanabe leg. (KPMNH). TAIWAN: 1 F (det. Townes & Chiu), Kuraru, 13 Oct 1926, J. Sonan leg. (TARI); 1 F (det. Townes & Chiu), Kanshurei, 19 Nov 1926, J. Sonan leg. (TARI); 1 M, Kaohsiung, Liouguei, 25–27 May 2006, T. Tsuru leg. (KPMNH). VIETNAM: 2 F, Ninh Binh, Cuc Phuong NP, 24 Apr 1998, R. Matsumoto leg. (OMNH); 1 F, ditto, 29 Apr 1998 (OMNH); 2 F, Vinh Phuc, Tam Dao NP, 8 May 1998, R. Matsumoto leg. (OMNH). INDIA: 1 F (holotype of *X. binghami* by H. Townes), 21 Jun 1946 (AEIC); 1 M (holotype of *X. erythroceros* var. *assamensis* by H. Townes), Uttar Pradesh, Mah., Pratapgad, 15 Nov 1965, Joseph leg. (AEIC).

Distribution. Japan (Amamioshima Is., Okinawa Is. and Iriomote Is.). Outside Japan, this subspecies has been recorded from China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Taiwan, Thailand and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in April, May, June, October and November. In Iriomote Is., the first author collected this species in the forest path with sunlight. We record a host, *Pithecopus corvus ryukyuensis* Shirozu, 1964 (Lepidoptera, Lycaenidae), here.

Remarks. This is the first record of this subspecies from Japan. No characteristics unique to the Japanese population were detected.

Xanthopimpla konowi Krieger, 1899

Figs 1D, 3B, J, 4D, 5D, 6D

Xanthopimpla konowi Krieger, 1899: 87; Townes et al. 1965: 61; Townes and Chiu 1970: 48; Watanabe 2011: 17.

Xanthopimpla iaponica Krieger, 1899: 81; Uchida 1928: 64, misident (in part); Ishii 1932: 409; Iwata 1960: 145; Townes et al. 1961: 56; Townes et al. 1965: 60. Synonymised by Townes and Chiu (1970).

- Xanthopimpla anthereae* Cameron, 1911: 46; Townes et al. 1961: 50. Synonymised by Townes and Chiu (1970).
- Xanthopimpla watsoni* Cameron, 1911: 46; Townes et al. 1961: 72. Synonymised by Townes and Chiu (1970).
- Xanthopimpla princeps* Krieger, 1914: 43; Townes et al. 1961: 62. Synonymised by Townes and Chiu (1970).
- Xanthopimpla dux* Krieger, 1914: 43; Townes et al. 1961: 54. Synonymised by Townes and Chiu (1970).
- Xanthopimpla formosensis* Krieger, 1914: 43. Synonymised by Townes and Chiu (1970).
- Xanthopimpla macrodactyla* Krieger, 1914: 42. Synonymised by Townes and Chiu (1970).
- Xanthopimpla grandis* Cushman, 1925: 43. Synonymised by Townes and Chiu (1970).
- Xanthopimpla theophilae* Rao, 1953: 159; Townes et al. 1961: 70. Synonymised by Townes and Chiu (1970).
- Xanthopimpla japonica* (!): Matsumura, 1912: 138; Kashima 1961: 108; Momoi 1970: 334, misident. (at least in part).

Comparative diagnosis. This species belongs to the *regina* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of the group by the following combination of character states: face with a low, sublateral, vertical ridge on each side (Fig. 3B); front edge of notaulus with a sharp-edged transverse crest; median black mark on mesoscutum well separated from black mark in front of scutellum (Fig. 1D); scutellum subconically elevated (Fig. 3J); pre-apical bristles on hind tibia 0 to 4, moderately slender, most or all of them close to apex of tibia (Fig. 5D); T II to IV each with a pair of black spots (Fig. 1D); T III with relatively sparse, coarse punctures (Fig. 6D); black spots on T IV each with about 20 punctures; ovipositor straight, slightly decurved at tip; ovipositor sheath 1.1–1.3 × length of hind tibia.

Materials examined. JAPAN: [Ryukyu Isls.] 1 F, Okinawa, 7 Jul 329, Matsumura leg. (SEHU); 1 F, Okinawa, III. 1922, S. Sakaguchi leg. (SEHU); 1 M, Okinawa, 18 Jul 1911, Matsumura leg. (SEHU); 1 M, Okinawa, Hira, 11, Matsumura leg. (SEHU); 1 F & 1 M, Okinawa, 1925, S. Sakaguchi leg. (SEHU); 2 F, Okinawa Pref., Ishigaki Is., Mt. Omoto-dake, 1 Apr 1982, E. Nishida leg. (OMNH); 1 F, ditto, 5 Jul 2007, H. Nagase leg. (KPMNH); 1 F, ditto, 14 May 2008, T. Mita leg. (KPMNH); 1 F, ditto, 23–31 Mar 2010, M. Okada leg. (KPMNH); 1 F, Okinawa Pref., Ishigaki Is., Banna-dake, 14 May 1978, S. Tsukaguchi leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is. Ishigaki Is., Shiramizu, 14 Oct 2004, T. Tsuru leg. (KPMNH); 1 F, Okinawa Pref., Iriomote Is., Rv. Shiiminato, 30 May–12 Jun 1996, K. Ebi leg. (MU); 1 F, Okinawa Pref., Iriomote Is., Airagawa-rindo, 4 Jun 2006, K. Watanabe leg. (KPMNH); 1 F, ditto, 14 Mar 2014, Y. Nishimoto leg. (KPMNH). **TAIWAN:** 1 F (det. Townes & Chiu), Taito, 25 Feb–27 Mar 1919, S. Inamura, J. Sonan & M. Yoshino leg. (TARI). **VIETNAM:** 1F, Bac Can, Ba Be NP, 1.V.2006, R. Matsumoto leg. (OMNH).

Distribution. Japan (Okinawa Is., Ishigaki Is. & Iriomote Is.). Outside Japan, this species has been recorded

from China, India, Indonesia, Malaysia, Myanmar, Taiwan, Thailand, Togo and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in March, May, June, July and October. In Iriomote Is., the first author collected this species in the forest edge. *Dendrolimus spectabilis* (Butler, 1877) (Lepidoptera, Lasiocampidae), is recorded as a host of this species in Japan (Kashima 1961).

Remarks. At least part of the records of “*X. iaponica*” and “*X. japonica*” (misspelling of *iaponica*) may be due to misidentification of this species and some of the rest may be of *X. pedator*. We could not examine the voucher specimens of Iwata (1960), Kashima (1961) and Momoi (1970). Re-identification of these specimens is an issue for future study.

Xanthopimpla minuta Cameron, 1905

Figs 1E, 3I, 4E, 5E

Xanthopimpla minuta Cameron, 1905a: 137.

Xanthopimpla ischnoceros Krieger, 1915: 23. Synonymised by Townes and Chiu (1970).

Xanthopimpla ischnoceros var. *assamensis* Krieger, 1915: 135.

Xanthopimpla ischnoceros assamensis: Townes et al. 1961: 57.

Xanthopimpla ischnoceros ischnoceros: Townes et al. 1961: 58.

Xanthopimpla sp. D: Watanabe 2011: 17.

Comparative diagnosis. This species belongs to the *trunca* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of this group by the following combination of character states: notaulus extending to the level of posterior edge of tegula (Fig. 3I); scutellum convex; hind wing with vein 1A indistinct; mesoscutum marked with black (Fig. 1E); propodeum with lateromedian longitudinal carina present behind anterior transverse carina (Fig. 4E); propodeum, T II and VI entirely yellow (Figs 1E, 4E); Ovipositor sheath 0.3 × length of hind tibia.

Materials examined. JAPAN: [Ryukyu Isls.] 1 F, Kagoshima Pref., Yakushima Is., Shiratani, 10 Jul–8 Aug 2000, T. Murata leg. (MT) (MU); 1 M, ditto, 9 Aug–2 Sep 2000 (MU); 1 F, Kagoshima Pref., Amamioshima Is., Kinsakubaru, 2 May 1996, R. Matsumoto leg. (OMNH); 1 F, Kagoshima Pref., Amamioshima Is., Mt. Yui, 28 Sep–28 Oct 2001, T. Murai & Y. Maeda leg. (MT) (MU); 1 F, Kagoshima Pref., Amamioshima Is., Sumiyou, Gusuku, 1 Jul 2013, S. Yoshizawa leg. (KPMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Mt. Yonaha, 19 Nov 1977, I. Hiura leg. (OMNH); 2 M, Okinawa Pref., Okinawa Is., Nakijin Vil., Oppa-dake, 3 Jul 2006, R. Matsumoto leg. (OMNH); 2 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Yona, 29 Jun 2013, M. Ito & S. Fujie leg. (KPMNH).

Distribution. Japan (Yakushima Is., Amamioshima Is. and Okinawa Is.). Outside Japan, this species has been recorded from China, India, Malaysia, Nepal, Philippines, Sri Lanka, Taiwan, Thailand and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected from June to November. Host is unknown.

Remarks. This is the first record of this species from Japan. Although this species is divided into five subspecies, *X. minuta minuta* Cameron, 1905, *X. minuta aurangabadensis* Patil & Nikam, 1995, *X. minuta lita* Townes & Chiu, 1970, *X. minuta lotipes* Townes & Chiu, 1970 and *X. minuta quadrula* Chao, 1997, Pham et al. (2011) commented that “all of these subspecies could readily be synonymised...”. The characteristics of the Japanese specimens match well with the description of *X. minuta minuta* sensu Townes and Chiu (1970), but we refrained from considering subspecies here.

Xanthopimpla modesta (Smith, 1860)

Comparative diagnosis. This species belongs to the *stemmator* species group sensu Townes and Chiu (1970). This species can be distinguished from other species of the group by the following combination of character states: dorsal part of occiput with black area (Fig. 3C); mesoscutum without black mark in front of scutellum (Fig. 1F) or, if present, black mark on median lobe with deep notch anteriorly; hind tibia with 12–18 pre-apical bristles (Fig. 5F); propodeum and T I without black marks (Fig. 4F); ovipositor sheath 1.1–1.2 × length of hind tibia.

Remarks. This species is divided into two subspecies, *X. modesta modesta* (Smith, 1860) and *X. modesta microcephala* Krieger, 1914. All Japanese materials are identified as the former.

Xanthopimpla modesta modesta (Smith, 1860)

Figs 1F, 3C, 4F, 5F

Pimpla modesta Smith, 1860: 64.

Xanthopimpla latebalteata Cameron, 1903: 137; Townes et al. 1961: 58.

Synonymised by Townes and Chiu (1970).

Xanthopimpla kuchingensis Cameron, 1905b: 119. Synonymised by Townes et al. (1961).

Xanthopimpla dohrni Krieger, 1915: 34. Synonymised by Townes et al. (1961).

Xanthopimpla dohrni var. *sukabumensis* Krieger, 1915: 34. Synonymised by Townes et al. (1961).

Xanthopimpla dohrni var. *novarae* Krieger, 1915: 34. Synonymised by Townes et al. (1961).

Xanthopimpla modesta: Momoi 1970: 335.

Xanthopimpla modesta modesta: Townes and Chiu 1970: 106; Watanabe 2011: 17; Watanabe 2012, 70.

Comparative diagnosis. This subspecies can be distinguished from other subspecies by the central part of hind slope of vertex black, the mesoscutum and metasomal tergites usually with black or dark brown markings.

Materials examined. [Ryukyu Is.] JAPAN: 1 F, Okinawa Pref., Ishigaki Is., Omoto-Path, 6 Jul 1998 T. Matsumura leg. (NIAES); 1 F, Okinawa Pref., Iriomote

Is., Nakamagawa-rindo, 8 Aug 1995, R. Matsumoto leg. (OMNH); 18 M & 1 F, Okinawa Pref., Iriomote Is., Funaura, 28 Mar 1982, E. Nishida leg. (OMNH); 1 M, ditto, 5 May 1980 (OMNH); 1 F & 1 M, Iriomote Is., Urauchi, 5 Jul 1982, K. Ohara leg. (SEHU); 2 M, Ootomi, 15–23 Mar 1995, T. Matsumura leg. (MT.) (NIAES). VIETNAM: 1 M, Bac Can, Ba Be NP, 2 May 2005, M. Wakabayashi leg. (OMNH).

Distribution. Japan (Ishigaki Is. and Iriomote Is.). Outside Japan, this subspecies has been recorded from Indonesia, Malaysia, Philippines, Singapore, Thailand, Taiwan and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in March and July. Host is unknown in Japan, whereas Yasumatsu (1967) recorded a host, *Chilo suppressalis* (Walker, 1863) (Lepidoptera, Crambidae).

Remarks. In Japan, distribution of this species is restricted to Yaeyama Islands of Ryukyus. A black spot of mesoscutum is sometimes absent in Japanese specimens.

Xanthopimpla naenia Morley, 1913

Figs 1G, H, 3O, 4G, 5G, H

Xanthopimpla naenia Morley, 1913: 115; Townes et al. 1961: 61; Townes and Chiu 1970: 268; Watanabe 2011: 17; Watanabe 2012, 70.

Xanthopimpla imperfecta Krieger, 1915: 23; Momoi 1958: 120; Townes et al. 1961: 57; Townes et al. 1965: 61; Momoi 1970: 335; Matsumoto and Sugimoto 1998: 467. Synonymised by Townes and Chiu (1970).

Comparative diagnosis. This species belongs to the *incompleta* species group sensu Townes and Chiu (1970). This species can be distinguished from other species of this species group by the following combination of character states: face with moderate-sized punctures; propodeum with area superomedia partly (indistinctly) or completely separate from second lateral area (Fig. 4G); mesoscutum medially with three continuous black spots and these spots sometimes united into a single large black area (Fig. 1G, H); femur entirely yellow or sometimes with black areas (Fig. 5G, H); ovipositor sheath 0.2–0.4 × length of hind tibia.

Materials examined. JAPAN: [Honshu] 1 M (DNA-Pol-657), Nara Pref., Nara City, Saki-cho, Heijo Palace Site, 7. Sep 2017, R. Matsumoto leg. (OMNH); 1 F, Wakayama Pref., Wakayama City, Uchihara, 14 Jun 1993, (em. from case of *Nipponpsyche fuscescens*), M. Murase leg. (OMNH); 1 F, Hyogo Pref., Ono City, Kawainakamachi, 17 Sep 2018, R. Kakeya leg. (OMNH); 22 M & 7 F (incl. 1F: DNA-Pol-738), ditto, 12 May 2019, R. Matsumoto leg. (OMNH); 1 M, Hyogo Pref., ditto, 1 Nov 2019, A. Ichikawa leg. (OMNH). [Kyushu] 1 M & 2 F, Fukuoka Pref., Fukuoka City, Hakozaki, 25 Jul 1997, (em. from case of *Nipponpsyche fuscescens*), M. Sugimoto leg. (OMNH); 1 F, Nagasaki Pref., Nagasaki City, Aburagimachi, 29 May 2012, N. Yamamoto leg. (KPMNH); 1 M, Kumamoto Pref., Asagiri Town, Uenishi, 24 Aug 2012, R. Matsumoto leg. (OMNH); 1 M, Kagoshima Pref.,

Ookuchi Town, 4 Jul 2012, Y. Matsubara & K. Fukuda leg. (KPMNH); 1 F, Kagoshima Pref., Koyama Town, Hoyoshidake, 20 May–20 Jun 2000, T. Muroi & S. Onoda leg. (OMNH). [Ryukyu Isls.] 1 F, Kagoshima Pref., Yakushima Is., Miyanoura, 27 Oct 1972, K. Kusigemati leg. (SEHU); 1 F, ditto, 24 May 1974 (SEHU); 1 M, ditto, 3–20 Apr 1999, T. Murata leg. (MT) (MU); 1 F, Kagoshima Pref., Yakushima Is., Aikodake, 19–22 Jul 2006, T. Yamauchi leg. (MT) (KPMNH); 1 F, 23–26 Oct 2006 (KPMNH); 2 F, ditto, 28 Jun.–29 Jul 2007 (KPMNH); 1 F, 29 Jul–25 Aug 2007 (KPMNH); 1 F, Kagoshima Pref., Yakushima Is., Kankake, 26 Sep–24 Oct 2006, T. Yamauchi leg. (MT) (KPMNH); 1 F, ditto, 27 Oct–28 Nov 2006; 1 ♀, ditto, 28 Jun–30 Jul 2007; 1 F, Kagoshima Pref., Yakushima Is., Shiratani, 22 Jul 2012, T. Kawano leg. (KPMNH); 1 F, Kagoshima Pref., Amamioshima Is., Mt. Yui, 15 Apr–15 May 2001, T. Muroi & Y. Maeda leg. (MT) (MU); 1 F, ditto, 21 Jun–5 Aug 2001 (MU); 1 F, Kagoshima Pref., Amamioshima Is., Tatsugo Town, Ichiribaru, 24–27 Jun 2007, A. Shimizu leg. (YPT) (KPMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Amagi Town, Mt. Yamatogusukuyama, 31 May 2007, K. Watanabe leg. (KPMNH); 4 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Benoki, 7 Apr 1979, K. Kusigemati leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Yona, 7 Apr 1979, K. Kusigemati leg. (SEHU); 1 F, ditto, 28 Apr 2008, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Hentona, 21 May 2007, K. Watanabe leg. (KPMNH); 1 F, Okinawa Pref., Okinawa Is., Motobu Town, Izumi, 20 May 1980 (em. from larva of Psychidae), E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Akaishi, 17 May 2009, H. Inoue leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Maesato, 11 Jul 2007, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Omotodake, 9 Dec 1993, R. Matsumoto leg. (OMNH); 1 F, ditto, 18–19 Mar 2002, T. Yoshida leg. (OMNH); 2 F (DNA-Pol-728, DNA-Pol-729), Okinawa Pref., Ishigaki Is., Hirae, 30 Jan 2019, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Mt. Banna, 15 Apr 1978, S. Tsukaguchi leg. (OMNH); 1 F, ditto, 16 Oct 1981, K. Konishi leg. (NIAES); 1 F, ditto, 13–20 Mar 1995, T. Matsumura leg. (MT) (NIAES); 1 M, Okinawa Pref., Ishigaki Is., 1 km S. of Kuura, 8 Apr 1999 host coll., 15 Apr. 1999 em. from *Manatha* sp., M. Sugimoto & T. Saigusa leg. (OMNH); 1 F, ditto, 28 Apr 1999 em. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Hoshino, 11 Feb 2010, E. Nishida leg. (OMNH); 1 M, Okinawa Pref., Iriomote Is., Otomi, 4 Jun 1977, A. Nagatomi leg. (SEHU); 1 F, Okinawa Pref., Iriomote Is., Rv. Shiiminato, 2–15 Nov 1995, T. Muroi leg. (MT) (MU).

TAIWAN: 1 M (det. Townes & Chiu), Kuanhsi, Sinchu, 31 Oct 1968 (MT) (TARI); 1 F (det. Townes & Chiu), ditto, 3–9 Jun 1969 (MT) (TARI); 1 F (det. Townes & Chiu), Rokkiri, 2 Sep 1927, J. Sonan & K. Shibata leg. (TARI).

Distribution. Japan (Honshu, Shikoku, Kyushu, Yakushima Is., Amamioshima Is., Tokunoshima Is., Okinawa Is., Ishigaki Is. and Iriomote Is.). Outside Japan, this species has been recorded from China, India, Malaysia, Philippines, Taiwan and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected from April to November. In Tokunoshima Is., the first author collected this species along the edge of forest. Matsumoto and Sugimoto (1998) recorded a host, *Nipponopsyche fuscescens* Yazaki, 1926 (Lepidoptera, Psychidae), in Japan. In this study, we record the second host of this species, *Manatha* sp. (Lepidoptera, Psychidae).

Remarks. This is the first record of this species from Ishigaki Is. and Iriomote Is. Townes and Chiu (1970) described the differences in body colouration between materials from Japan and other areas. We recognised these differences as intraspecific variations and concluded that Japanese population should be treated as *X. naenia*.

Xanthopimpla nipponensis sp. nov.

<http://zoobank.org/F3F40B2B-88AA-4978-9750-2C6B3238C5DB>

Figs 2A, B, 3D, K, N, P, 4H, 5I, P, 6A, F

Xanthopimpla brachyparea: Ishii 1932: 409; Esaki et al. 1938: 342. Misident.

Xanthopimpla sp. nov.: Townes et al. 1965: 63.

Xanthopimpla sp. C: Watanabe 2011: 17.

Type series. *Holotype*: F, JAPAN, Honshu, Kanagawa Pref., Odawara City, Iriuda, Mt. Ishigaki-yama, 4 Sep 2014, K. Watanabe leg. (KPMNH). *Paratypes*: JAPAN: [Honshu] 1 F, Saitama Pref., Ranzan Town, Syogunzawa, 9 Sep 2000, T. Nambu leg. (KPMNH); 1 F, Tokyo, Okutama Town, Hikawa, 29 Jun 2007, K. Watanabe leg. (KPMNH); 1 F, ditto, 30 Jun 2007 (KPMNH); 1 F, Kanagawa Pref., Yokohama City, Enkaizan, 13 Oct 2008, K. Kubo leg. (KPMNH); 1 F, Aichi Pref., Mt. Sanage, 21–27 Aug 1992, T. Kanbe leg. (YPT) (MU); 1 M, Kyoto Pref., Maizuru City, Nyo, 20 Jun–10 Jul 2011, T. Murao leg. (OMNH); 1 F, ditto, 10–20 Sep 2011 (OMNH); 1 F (DNA-Pol-711), Nara Pref., Yamataokouriyama City, Yata-cho, 19 Jan 2019, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Asuka Vil., Amakashinooka, 15 Dec 2014, R. Matsumoto leg. (OMNH); 2 F, Osaka Pref., Minomo, 22 May 1932, N. Tosawa leg. (OMNH); 1 F, Osaka Pref., Minoo City, Monou Park, 9 Mar 1996, F. Omiya leg. (OMNH); 1 F, Osaka Pref., Kawachinagano City, Chihayaguchi, 5 Sep 1980, E. Nishida leg. (OMNH); 1 F, Osaka Pref., Kaizuka City, Kibitani, 28 Jun 1999, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-718), Hyogo Pref., Sanda City, Ohara, 21 Jan 2019, R. Matsumoto leg. (OMNH); 1 F, ditto, 16 Jan 2020, R. Matsumoto leg. (OMNH); 1 F, Hyogo Pref., Kobe City, Futatabi-san, 2 Feb 2009, R. Matsumoto leg. (OMNH); 1 F, Tottori Pref., Ketaka, Tsuyutani, 30 Aug 1935, H. Aoki leg. (OMNH); 1 F, ditto, 20 Sep 1937 (OMNH); 1 F, Okayama Pref., Niimi City, Kusama, 31 Aug 1989, R. Matsumoto leg. (OMNH). [Shikoku] 1 F, Kochi Pref., Tosa Town, Jingamori, 22 Aug 2000, R. Matsumoto leg. (OMNH); 1 F, Ehime Pref., Oda Town, 30 Jul 1993, E. Yamamoto leg. (NIAES); 1 F, ditto, 14 Aug 1995 (NIAES).

Comparative diagnosis. This species belongs to the *terebatorix* species group *sensu* Townes and Chiu (1970).

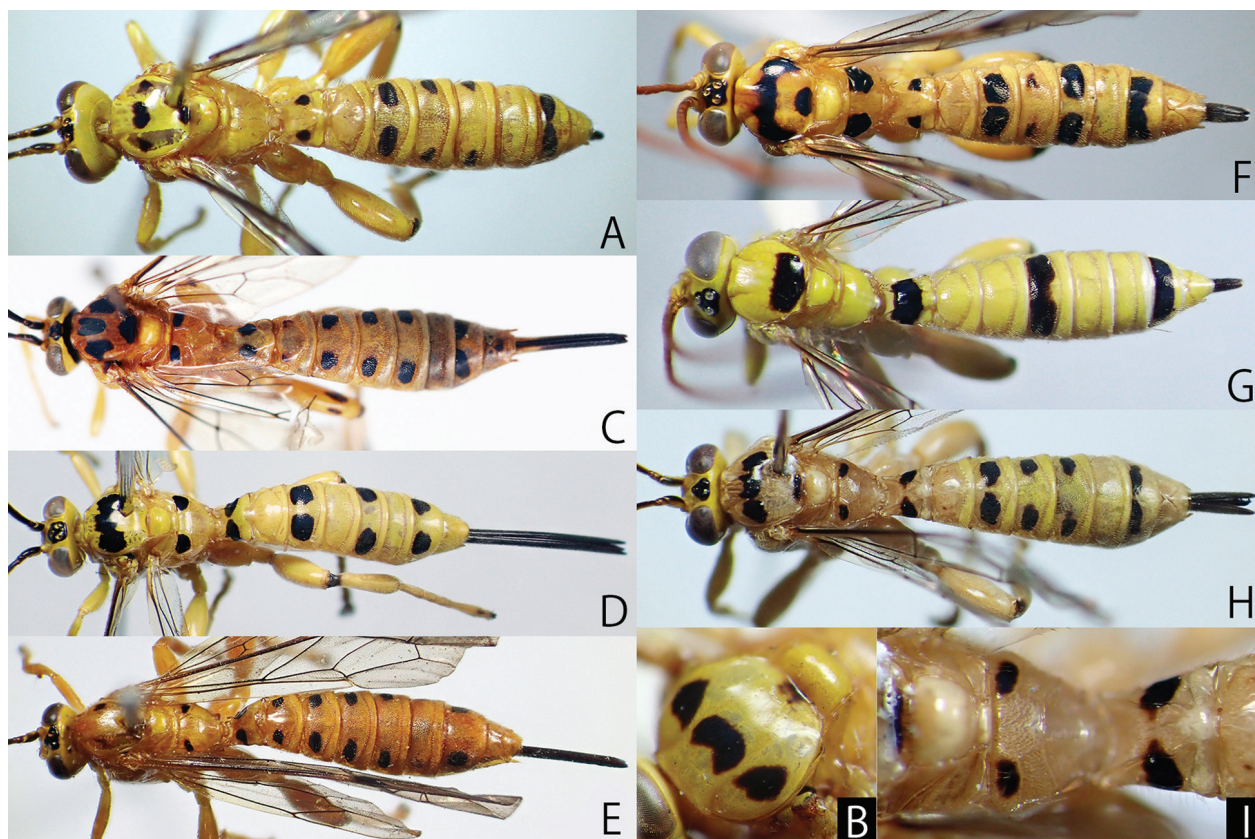


Figure 2. Japanese *Xanthopimpla* A, B. *X. nipponensis* sp. nov.; C. *X. pedator* (Fabricius, 1775); D. *X. punctata* (Fabricius, 1781); E. *X. stemmator* (Thunberg, 1822); F. *X. sylvicola* sp. nov.; G. *X. trias* Townes & Chiu, 1970; H, I. *X. yoshimurai* sp. nov. A, C–H. dorsal habitus; B. mesoscutum, dorsal view; I. propodeum and T I, dorsal view.

This species resembles *X. brevicauda brevicauda* Cushman, 1925 in the body colouration and the short ovipositor, but it can be distinguished by the punctures on the face, separated by more than their diameter, except for punctures on the median part, separated by $0.2 \times$ their diameter (separated by about $0.7 \times$ their diameter in *X. brevicauda brevicauda*), the propodeum with equal width of anterior and posterior margins of area superomedia (anterior margin narrower than posterior margin in *X. brevicauda brevicauda*), the hind trochanter without black marking (with large black marking in *X. brevicauda brevicauda*) and the base of hind fifth tarsomere not yellowish (yellowish in *X. brevicauda brevicauda*).

Description. Female ($n = 18$). Body covered with silver setae, polished, largely smooth, length 7.3–11.2 (HT: 10.5) mm,

Head $0.53 \times$ length of width in dorsal view. Clypeus almost flat in lateral view, sparsely punctate, except for ventral margin, $0.63\text{--}0.67$ (HT: 0.65) \times length of maximum width. Face $1.0 \times$ length of maximum width, sparsely punctate laterally (separated by ca. $1.0\text{--}2.0 \times$ their diameter) and densely punctate medially (separated by ca. $0.2 \times$ their diameter). Frons with a conspicuous convexity medially. Length of malar space $0.3 \times$ length of basal mandibular width. OD: POL: OOL = $1.0: 0.7\text{--}0.75$ (HT: 0.7): $0.75\text{--}0.85$ (HT: 0.85). Antenna longer than fore wing. Flagellum with 33–35 (HT: 34) flagellomeres.

Length of FL I $4.0 \times$ length of maximum depth in lateral view, $1.48\text{--}1.54$ (HT: 1.48) \times length of F II.

Mesosoma. Epomia short. Front end of notaulus with a sharp-edged transverse crest. Notauli not reaching past centre of mesoscutum, their posterior ends not joined with each other. Mesoscutum sparsely and finely punctate anteriorly, smooth posteriorly (Fig. 2B), its anterior end weakly protruding anteriorly. Scutellum smooth, roundly convex, with a lateral carina that reaches apex (Fig. 3K). Mesopleuron sparsely punctate dorsally, densely punctate ventrally. Posterior transverse carina of mesosternum with a roundly produced lamella, which has a shallow median notch (Fig. 3N). Metapleuron smooth, except for a few, fine and sparse setae. Propodeum smooth, except for area spiracularis and area lateralis covered with sparse and fine punctures, with lateral section of anterior transverse carina, anterior and median sections of lateromedian longitudinal carina, lateral longitudinal carina, posterior transverse carina and pleural carina, without hill-like swelling (Fig. 4H). Anterior end of lateral longitudinal carina extending $0.45\text{--}0.5$ (HT: 0.45) length of outer side of area spiracularis in dorsal view (Fig. 4H). Both anterior and posterior margins of area superomedia almost equal in length. Fore wing length 6.7–8.8 (HT: 8.0) mm. Areolet present, receiving vein 2m-cu slightly distant of middle. Hind femur $2.3\text{--}2.4$ (HT: 2.4) \times length of maximum depth in lateral view. Pre-apical bristles of mid- and hind tibiae

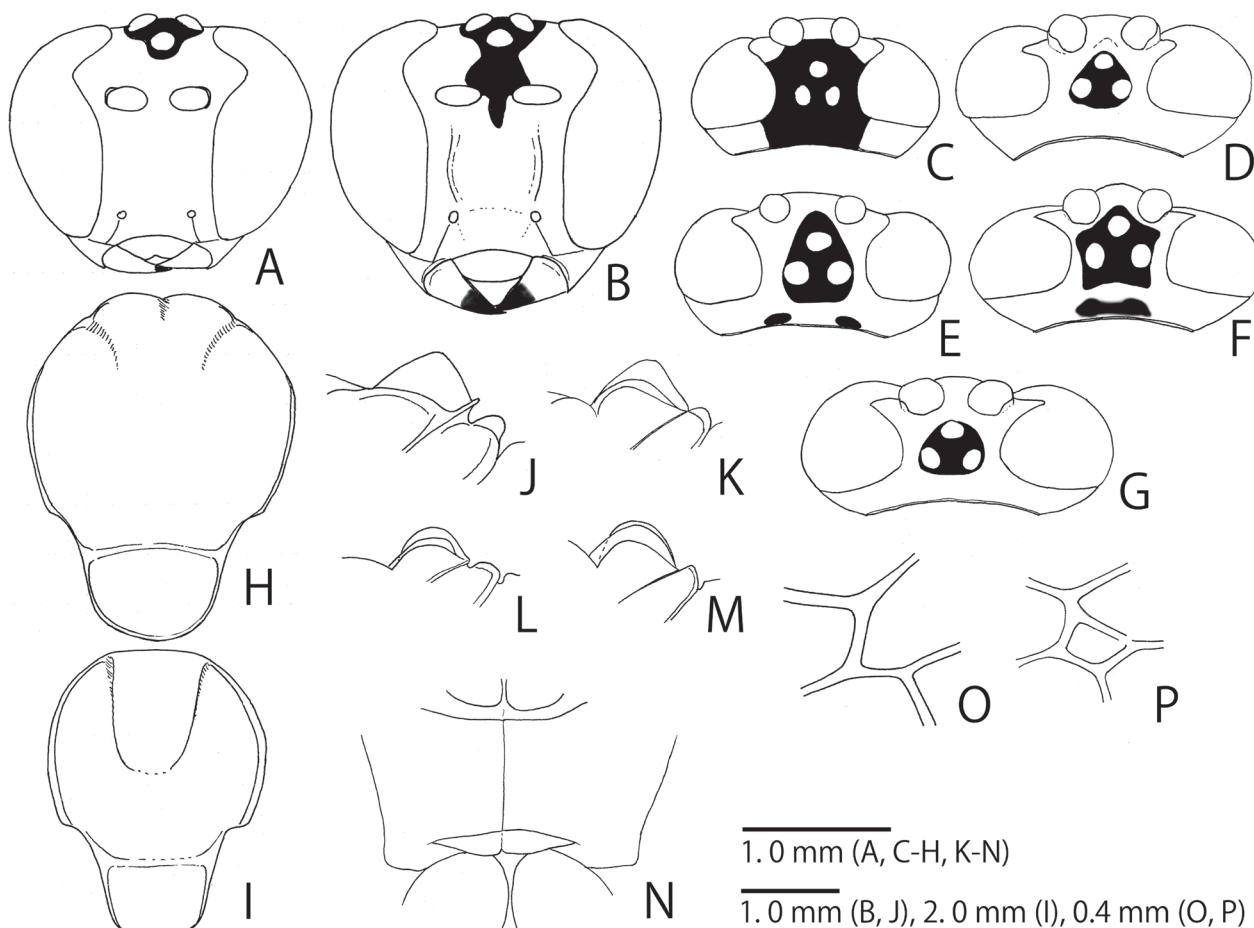


Figure 3. Japanese *Xanthopimpla* **A, H.** *X. clavata* Krieger, 1914; **B, J.** *X. konowi* Krieger, 1899; **C.** *X. modesta modesta* (Smith, 1860); **D, K, N, P.** *X. nipponensis* sp. nov.; **E.** *X. stemmator* (Thunberg, 1822); **F, L.** *X. sylvicola* sp. nov.; **G, M.** *X. yoshimurai* sp. nov.; **I.** *X. minuta* Cameron, 1905; **O.** *X. naenia* Morley, 1913 (**D, F, G, K–M, P.** holotype; **N.** paratype) — **A, B.** head, frontal view; **C–G.** head, dorsal view; **H, I.** mesonotum, dorsal view; **J–M.** scutellum, lateral view; **N.** mesosternum, ventral view; **O, P.** areolet of right wing.

1–2 (HT: 1) (Fig. 5I). Apical bristle of mid- and hind tibiae 2–3 (HT: 2) (Fig. 5I). Ratio of length of hind first to fifth tarsomeres 1.7–1.8 (HT: 1.7): 1.0: 1.0: 0.7: 1.3. Largest bristle on hind and mid-tarsal claws slightly widened next to apex and its apex sharply pointed (Fig. 5P).

Metasoma. T I 1.0–1.1 (HT: 1.1) \times length of maximum width, largely smooth, with a weak transverse depression subapically (Fig. 6A). Latero-median carina of T I complete, except for apex obscured (Fig. 6A). Dorso-lateral carina of T I absent, except for base. T II 0.5–0.55 (HT: 0.55) \times length of maximum width, sparsely punctate. T II to T VI with a posterior transverse foveolate groove. T III to T VIII densely punctate. Ovipositor sheath 0.36–0.4 (HT: 0.38) times as long as hind tibia. Upper valve of ovipositor gradually narrowed towards apex, with dorsal minute teeth apically (Fig. 6F). Lower valve of ovipositor with 6–7 (HT: 7) distinct teeth (Fig. 6F). Ovipositor downcurved apically (Fig. 6F).

Colouration (Figs 2A, B, 3D, 4H, 5I). Body (excluding wings) yellow. Apex of mandible and ocellar area black. Dorsal surface of scape and pedicel blackish-brown. Flagellum dark yellowish-brown to dark brown. Mesoscutum with three black spots anteriorly and a black spot

in front of scutellum. Propodeum without black spots. Wings hyaline. Veins and pterostigma blackishbrown to brown, except for yellowish-brown wing base and base of pterostigma. Base of hind tibia and hind tarsal tarsomere tinged with black. Hind fifth tarsomere darkened. T I, T III to T V and T VII with a pair of black spots. T II sometimes (not including HT) with a pair of very small black spots. Ovipositor dark reddish-brown. Ovipositor sheath black.

Male (n = 1). Similar to female. Length of malar space 0.2 \times length of basal mandibular width. Pre-apical bristles of mid-tibia 3. Apical bristle of mid-tibia 4. T II with a pair of conspicuous black spots.

Distribution. Japan (Honshu, Shikoku and Kyushu).

Bionomics. In Japan, adults were collected in February, May to October and December. In Honshu, winter is passed in the stage of adult (Fig. 8C). The wintering habit of this species is similar to that of *X. clavata* and these species are sometimes found wintering sympatrically, adults resting under the leaf of broad-leaved, evergreen trees, such as *Castanopsis cuspidata*, *Ilex pedunculosa* and *Camellia japonica*. All wintering specimens observed were female exclusively. Host is unknown.

Etymology. The specific name is from Nippon (= Japan).

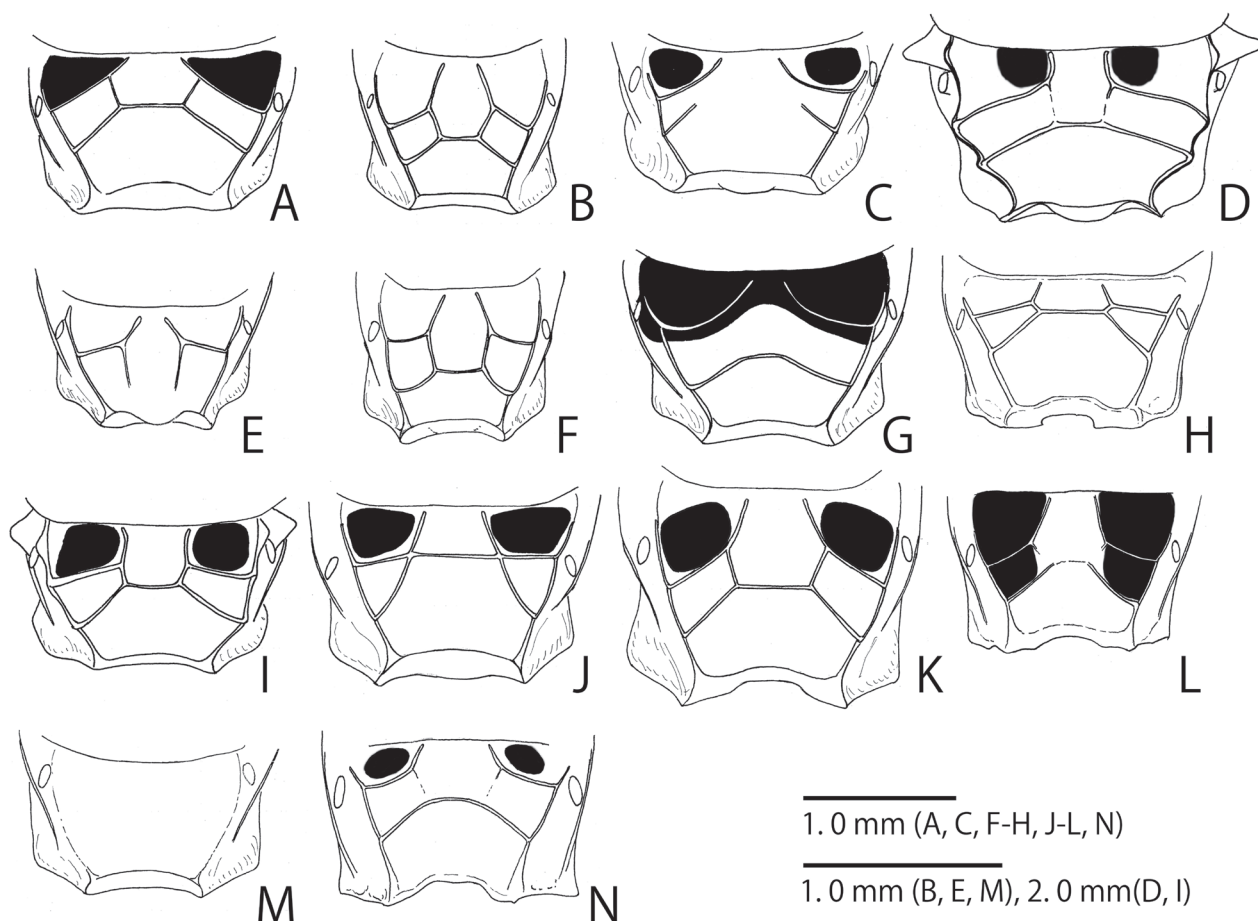


Figure 4. Propodeum of Japanese *Xanthopimpla*, dorsal view **A.** *X. clavata* Krieger, 1914; **B.** *X. flavolineata* Cameron, 1907; **C.** *X. honorata honorata* (Cameron, 1899); **D.** *X. konowi* Krieger, 1899; **E.** *X. minuta* Cameron, 1905; **F.** *X. modesta modesta* (Smith, 1860); **G.** *X. naenia* Morley, 1913; **H.** *X. nipponensis* sp. nov.; **I.** *X. pedator* (Fabricius, 1775); **J.** *X. punctata* (Fabricius, 1781); **K.** *X. stemmator* (Thunberg, 1822); **L.** *X. sylvicola* sp. nov.; **M.** *X. trias* Townes & Chiu, 1970; **N.** *X. yoshimurai* sp. nov. (**H, L, N**, holotype).

Remarks. Ishii (1932) recorded this species from Nagasaki (Kyushu) as *X. brachyparea* with an illustration, which was referred to by Esaki et al. (1938). We could not find the voucher specimen, but we concluded that it belongs to *X. nipponensis* sp. nov. judging from the illustration and added Kyushu to the distribution of this species.

Xanthopimpla pedator (Fabricius, 1775)

Figs 2C, 4I, 5J, 6E

Ichneumon punctator Linnaeus, 1767: 935. Name preoccupied by Müller 1766. Synonymised by Fabricius (1793).

Ichneumon pedator Fabricius, 1775: 828.

Ichneumon multipunctor Thunberg, 1822: 262. Synonymised by Townes and Chiu (1970).

Xanthopimpla scutata Krieger, 1899: 85; Townes et al. 1961: 67. Synonymised by Townes and Chiu (1970).

Xanthopimpla punctatrix Schulz, 1906: 114. Synonymised by Yu and Horstmann (1997).

Xanthopimpla braueri Krieger, 1914: 43; Townes et al. 1961: 51; Townes et al. 1965: 60. Synonymised by Townes and Chiu (1970).

Xanthopimpla manilensis Krieger, 1914: 43; Townes et al. 1961: 59. Synonymised by Townes and Chiu (1970).

Xanthopimpla multipunctor: Townes et al. 1961: 61.

Xanthopimpla iaponica: Uchida 1956: 92.

Xanthopimpla japonica (!): Momoi 1970: 334, misident. (at least in part); Kusigemati 1976: 127, misident.

Xanthopimpla punctator: Townes et al. 1961: 65; Townes et al. 1965: 62.

Xanthopimpla pedator: Matsumura and Uchida 1926: 74; Townes and Chiu 1970: 39; Watanabe 2011: 17.

Comparative diagnosis. This species belongs to the *regina* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of the group by the following combination of character states: face with a low, sublateral, vertical ridge on each side; scutellum conical; front edge of notaulus with a sharp-edged transverse crest; median black mark on mesoscutum well separated from black mark in front of scutellum (Fig. 2C); T II to IV each with a pair of black spots (Fig. 2C); T III to V densely, coarsely punctate (Fig. 6E); female without black spots on T VI (Fig. 2C); ovipositor sheath 1.05–1.25 × length of hind tibia.

Materials examined. JAPAN: [Kyushu] 1 F, Kagoshima Pref., Kagoshima City, Uearatacho, 21 Aug 1964, K. Hashimoto leg., 24 Aug. em. from *Melacosoma neustria testacea* Motsch. (SEHU); 1 F, same locality, 4 Jul 1973, H.

Kamiwada leg. (SEHU). [Ryukyu Isls.] 1 F, Kagoshima Pref., Kuchinoerabujima Is., 29 Jul–13 Aug 1963, Heian leg. (NSMT); 3 F & 2 M, Kagoshima Pref., Tokara Isls., Takarajima Is., 15 Jul 1964, A. Tanaka & H. Shima leg. (SEHU); 1 M, ditto, 17 Jul 1964, A. Tanaka leg. (SEHU); 1 M, ditto, M. Nishikawa leg. (TUA); 1 M, ditto, 20 Jul 1964, H. Shima leg. (SEHU); 2 M, Kagoshima Pref., Amamioshima Is., IV. 1954, T. Kumata leg. (SEHU); 1 F, Kagoshima Pref., Amamioshima Is., Nishinakama, 25 Jul 1958, R. Kano leg. (NSMT); 1 F, Kagoshima Pref., Amamioshima Is., Yuwan-Isyara, 12 Jul 1959 (NSMT); 1 F, Kagoshima Pref., Amamioshima Is., Uragami, 12 Apr 1980, K. Kusigemati leg. (SEHU); 1 M, Kagoshima Pref., Amamioshima Is., Kamiya, 30 Jun 1992, R. Noda leg. (NIAES); 1 F, Kagoshima Pref., Amamioshima Is., Tatsugo Vil., Ikuri, 28 Mar 2001, H. Yoshida leg. (OMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Isen, 11 Apr 1954, R. Ishikawa leg. (KPMNH); 1 M, Kagoshima Pref., Tokunoshima Is., Higashiamagi, 16 May 1954, S. Taniguchi leg. (SEHU); 1 F & 1 M, Kagoshima Pref., Tokunoshima Is., Kametsu, 19 May 1954, S. Taniguchi leg. (SEHU); 1 ex. (apex of metasoma broken), Kagoshima Pref., Tokunoshima Is., Boma, 23 Apr 1954, T. Oku leg. (SEHU); 2 M, Kagoshima Pref., Okinoerabu Is., Koshiyama, 27 Jul 1964O. Sato leg. (OMNH); 1 F, Kagoshima Pref., Okinoerabu Is., Oyama-Kamihirakawa, 28 Jul 1964, O. Sato leg. (OMNH); 2 M, Kagoshima Pref., Okinoerabu Is., Tokutoki, 27 Jul 1964O. Sato leg. (OMNH); 1 F, ditto, 28 Jul 1964 (OMNH); 1 F, Kagoshima Pref., Okinoerabu Is., Wadomari, 27 Jul 1992, R. Matsumoto leg. (OMNH); 11 M & 2 F, Kagoshima Pref., Okinoerabu Is., 14 Nov 2009, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Benoki, 19 Sep 2008, H. Inoue leg. (OMNH); 1 M, Okinawa Pref., Okinawa Is., Nago City, Suku, 21 Oct 1990, M. Hayashi leg. (NIAES); 1 F, Okinawa Pref., Okinawa Is., Nago City, Mt. Nago-dake, 10 Oct 2001, H. Irei & H. Makihara leg. (MT) (KPMNH); 1 F, Okinawa Pref., Miyako Is., Onosanrin, 21 Aug 2011, Y. Fujisawa leg. (KPMNH); 1 M, Okinawa Pref., Ishigaki Is., Sakieda, 26 Apr 2006, T. Toita leg. (OMNH); 13 M, Okinawa Pref., Ishigaki Is., Arakawa, 27 Apr 2019, R. Matsumoto leg. (OMNH). **TAIWAN:** 1 F, Nantou, Nanshanchi, 12 Jul 1966, T. Tano leg. (KPMNH). **VIETNAM:** 1 F, Bac Can, Ba Be National Park, 2 May 2006, R. Matsumoto leg. (OMNH); 1 F, Ninh Binh, Cuc Phuong National Park, 24 Apr 1998, R. Matsumoto leg. (OMNH).

Distribution. Japan (Kyushu, Nakanoshima Is., Amamioshima Is., Tokunoshima Is., Okinawa Is., Miyako Is. and Ishigaki Is.). Outside Japan, this species has been recorded from Bangladesh, China, France, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Taiwan and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected from April to August and October. Kusigemati (1976) recorded a host, *Malacosoma neustria testaceum* (Motschulsky, 1861) (Lepidoptera, Lasiocampidae) from Japan. Townes and Chiu (1970) also recorded two hosts,

Dendrolimus punctatus (Walker, 1855) and *D. spectabilis* (Butler, 1877) (Lepidoptera: Lasiocampidae), based on the materials from Hong Kong and Taiwan.

Remarks. This is the first record of this species from Kyushu, Kuchinoerabujima Is., Takarajima Is., Tokunoshima Is. and Miyako Is. We examined the voucher specimens of “*X. japonica*” used in Uchida (1956) and Kusigemati (1976) and confirmed that all of them are identified as this species.

Xanthopimpla punctata (Fabricius, 1781)

Figs 2D, 4J, 5K

Ichneumon punctatus Fabricius, 1781: 437.

Ichneumon punctator Thunberg, 1822: 262. Synonymised by Roman (1912).

Pimpla transversalis Vollenhoven, 1879: 146. Synonymised by Krieger (1914).

Pimpla ceylonica Cameron, 1899: 165. Synonymised by Morley (1913).

Xanthopimpla ruficornis Krieger, 1899: 103. Synonymised by Townes and Chiu (1970).

Xanthopimpla (!) *appendiculata* Cameron, 1902: 51. Synonymised by Krieger (1914).

Xanthopimpla brunneiornis Cameron, 1903: 139. Synonymised by Morley (1913).

Xanthopimpla kandyensis Cameron, 1905b: 136. Synonymised by Krieger (1914).

Xanthopimpla maculiceps Cameron, 1905c: 37. Synonymised by Roman (1913).

Xanthopimpla lissonota Cameron, 1906: 115. Synonymised by Townes et al. (1961).

Xanthopimpla kriegeri Szépligeti, 1908: 255. Synonymised by Krieger (1914).

Neopimploides syleptae Viereck, 1912: 151. Synonymised by Cushman (1922).

Xanthopimpla tibialis Morley, 1913: 124. Synonymised by Townes et al. (1961).

Xanthopimpla szepligetii Krieger, 1914: 131. Synonymised by Townes et al. (1961).

Phygadenon (!) *punctator* Ishida, 1915: 106. Synonymised by Townes et al. (1961).

Xanthopimpla pyraustae Rao, 1953: 163; Townes et al. 1961: 66. Synonymised by Townes and Chiu (1970).

Xanthopimpla trimaculata: Matsumura 1912: 145, misident.

Xanthopimpla punctata: Matsumura and Uchida 1926: 74; Uchida 1928: 66; Ishii 1932: 409; Uchida 1956: 92; Iwata 1960: 146; Townes et al. 1961: 62; Townes et al. 1965: 61; Momoi 1966: 4; Townes and Chiu 1970: 222; Momoi 1970: 334; Kusigemati 1987: 2; Watanabe 2011: 17.

Comparative diagnosis. This species belongs to the *punctata* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of the group by the following combination of character states: propodeum with area superomedia 0.5–0.6 × width (Fig. 4J); T I, T III, T V and T VII always with two black spots (Fig. 2D); ovipositor sheath long, about 1.7–1.8 × length of hind tibia.

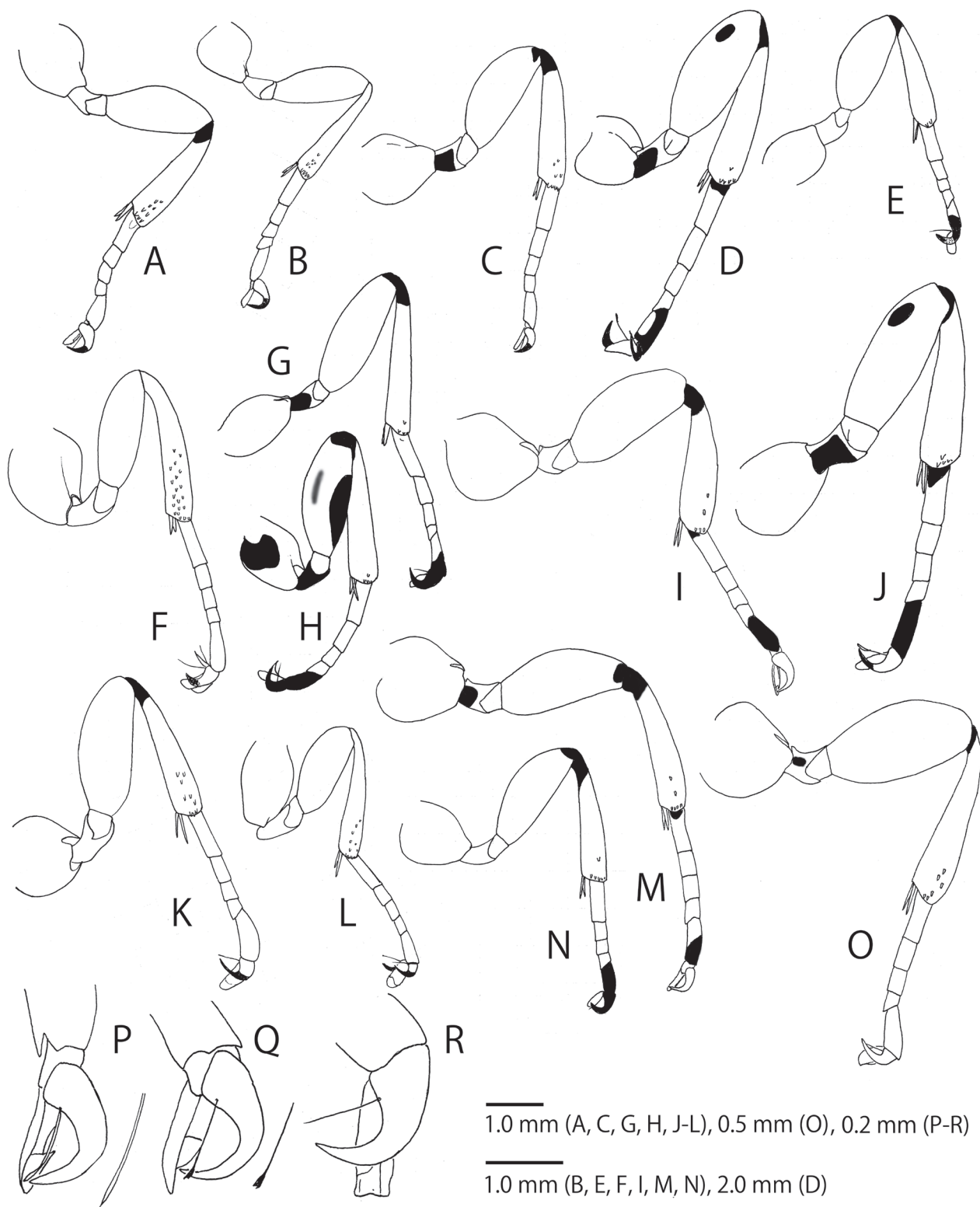


Figure 5. Japanese *Xanthopimpla* — **A.** *X. clavata* Krieger, 1914; **B.** *X. flavolineata* Cameron, 1907; **C.** *X. honorata honorata* (Cameron, 1899); **D.** *X. konowi* Krieger, 1899; **E.** *X. minuta* Cameron, 1905; **F.** *X. modesta modesta* (Smith, 1860); **G, H.** *X. naenia* Morley, 1913; **I, P.** *X. nipponensis* sp. nov.; **J.** *X. pedator* (Fabricius, 1775); **K.** *X. punctata* (Fabricius, 1781); **L.** *X. stemmator* (Thunberg, 1822); **M, Q.** *X. sylvicola* sp. nov.; **N.** *X. trias* Townes & Chiu, 1970; **O, R.** *X. yoshimurai* sp. nov. (**I, M, O–R.** holotype) **A–O.** left hind leg, lateral view; **P–R.** left hind tarsal claw, lateral view.

Materials examined. JAPAN: [Ryukyu Isls.] 1 M, Kagoshima Pref., Tokara Isls., Nakanoshima Is., Satomura, 5–8 Jun 2005, T. Mita leg. (YPT); 1 F, Kagoshima Pref.

Amamioshima Is., Apr 1954, T. Kumata leg. (SEHU); 1 F, Kagoshima Pref. Amamioshima Is., Shinmura, 30 Jul 1972, T. Nambu leg. (KPMNH); 3 M, Kagoshima Pref.

Amamioshima Is., Uragami, 21 Jul 1979, K. Kusigemati leg. (SEHU); 1 F & 1 M, Kagoshima Pref. Amamioshima Is., Yamato Vil., 5 Jul 1980, H. Nagase leg. (KPMNH); 1 M, Kagoshima Pref., Amamioshima Is., Kinsakubaru, 24 Oct 1994, R. Matsumoto leg. (OMNH); 1 M, Kagoshima Pref., Amamioshima Is., Sumiyo Vil., 31 Jul 1964, O. Sato leg. (OMNH); 1 F, Kagoshima Pref., Amamioshima Is., Yuwandake, 25 Apr 1996, T. Tachi leg. (OMNH); 1 F, Kagoshima Pref., Amamioshima Is., Mt. Yui, 21 Jun–5 Aug 2001, T. Muroi & Y. Maeda leg. (MT) (MU); 2 F, Kagoshima Pref., Amamioshima Is., Mt. Yuidake, 2 Jul 2004, H. Makihara leg. (MT) (KPMNH); 1 F, ditto, 15 Jul 2004 (KPMNH); 4 F, ditto, 27 Jul 2004 (KPMNH); 1 F, ditto, 24 Aug 2004 (KPMNH); 4 F & 1 M, ditto, 19 Sep 2004 (KPMNH); 1 F, Kagoshima Pref., Tokunoshima Is., Isen, 11 Apr 1954, R. Ishikawa leg. (KPMNH); 2 F, Kagoshima Pref., Tokunoshima Is., Higashiamagi, 16 May 1954, S. Taniguchi leg. (SEHU); 1 F, Kagoshima Pref., Tokunoshima Is., San, 1 Aug 1972, T. Nambu leg. (KPMNH); 3 F, Kagoshima Pref., Tokunoshima Is., Amagi Town, Asama, 16 Jul 2012, (em. from Pupa of *Parnara gutata*), H. Fukuda leg. (OMNH); 1 F, Kagoshima Pref., Okinoerabu Is., China Town, Shimojiro, 26 Apr 2016, K. Watanabe leg. (KPMNH); 1 M, Kagoshima Pref., Okinoerabu Is., China Town, Tamina, 15 Sep 2016, K. Watanabe leg. (KPMNH); 1 F, Kagoshima Pref., Yoron Is., Gusuku, 5 Aug 1972, T. Nambu leg. (KPMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Benoki, 8 Apr. 1979, K. Kusigemati leg. (SEHU); 2 F, Okinawa Pref., Okinawa Is., Yona, 5 Apr 1979, K. Kusigemati leg. (SEHU); 1 F, ditto, 6 Apr. 1979 (SEHU); 1 F, Okinawa Pref., Okinawa Is., Nakijin, Shoshi, 6 Apr 1979, K. Ohara leg. (SEHU); 1 M, ditto, 29 Jun 1982, K. Kusigemati leg. (SEHU); 3 M, Okinawa Pref., Okinawa Is., Nakijin Vil., Oppa-dake, 3 Jul 2006, R. Matsumoto leg. (OMNH); 2 F & 3 M, Okinawa Pref., Okinawa Is., Motobu, Izumi, 29 Jun 1982, K. Ohara leg. (SEHU); 1 F & 1 M, ditto, 30 Jun 1982, K. Kusigemati leg. (SEHU); 1 F, Okinawa Pref., Okinawa Is., Nago, 7 Apr 1979, K. Ohara leg. (SEHU); 1 F, ditto, 9 Apr 1979, K. Kusigemati leg. (SEHU); 1 F, ditto, 4 Oct 1987, A. Nagatomi leg. (SEHU); 1 M, Okinawa Pref., Okinawa Is., Naha, 9 Aug 1972, T. Nambu leg. (KPMNH); 1 M, Okinawa Pref., Okinawa Is., Naha City, Sueyoshi Park, 29 Nov 1993, R. Matsumoto leg. (OMNH); 1 F, ditto, 18 Oct 1994 (OMNH); 2 M & 1 F, ditto, 16 Jul 1995 (OMNH); 1 F, ditto, 30 Nov 2008 (OMNH); 5 F, Okinawa Pref., Okinawa Is., Hyakuna, 10 Apr 1979, K. Kusigemati & K. Ohara leg. (SEHU); 2 M, Okinawa Pref., Okinawa Is., Itoman, VI. 1966, K. Mizusawa leg. (at light) (TUA); 2 F, Okinawa Pref., Okinawa Is., Itoman City, Kyan, 29 Apr 2019, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Miyako Is., Hora, 23 May 1974, H. Makihara leg. (SEHU); 2 F, Okinawa Pref., Ishigaki Is., Hirakubo, 26 Apr 2019, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Akaishi, 17 May 2009, H. Inoue leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Mt. Omoto-dake, 17 Nov 1980, E. Nishida leg. (OMNH); 1 F, ditto, 23 Mar 1982 (OMNH); 1 M &

1 F, ditto, 8 May 1999, R. Matsumoto leg. (OMNH); 2 F, ditto, 13 May 1999 (OMNH); 1 F, ditto, 14 May 2008, T. Mita leg. (KPMNH); 1 F & 1 M, ditto, 23–31 Mar 2010, M. Okada leg. (KPMNH); 1 M, Okinawa Pref., Ishigaki Is., Maesato, 9 Jul 2007, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Shokubutsuen, 10 Jun 1974, H. Makihara leg. (SEHU); 1 F & 2 M, Okinawa Pref., Ishigaki Is., Ishigaki, 4 Jul 1982, K. Kusigemati leg. (SEHU); 1 F & 1 M, Okinawa Pref., Ishigaki Is., 1 F, Okinawa Pref., Ishigaki Is., Shiraho, 28 Dec 2002, R. Matsumoto leg. (OMNH); 2 M, Okinawa Pref., Ishigaki Is., Hirae, 1 Nov 1978, S. Tsukaguchi leg. (OMNH); 1 F (DNA-Pol-722), 1M (DNA-Pol-723), ditto, 28 Jan 2019, R. Matsumoto leg. (OMNH); 1 M, ditto, 29 Jan 2019 (OMNH); 1 F (DNA-Pol-727), ditto, 30 Jan 2019 (OMNH); Mt. Banna-dake, 2 Jul 1982, K. Ohara leg. (SEHU); 1 F, ditto, 7 Jul 1982, K. Kusigemati leg. (SEHU); 1 F, ditto, 29 Mar 2010, H. Sawada leg. (KPMNH); 1 M, Okinawa Pref., Ishigaki Is., Maise-dake, 29 Jul 1995, R. Matsumoto leg. (OMNH); 1 M & 1F, ditto, 8 May 1999 (OMNH); 2 F, ditto, 11 May 1999 (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Miyara, 14 Aug 1995 em., (host: Pyralid on *Rhizophora mucronata*), F. Komai leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Ohama, 24 Feb 1994, K. Masunaga leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Miyara, 29 Apr 1978, E. Nishida leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Sakieda, 5 Aug 1995, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Hoshino, 19 Jun 2008, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Fusaki, 27 Aug 1990, H. Nagase leg. (KPMNH); 1 F, ditto, 3 Dec 1993, R. Matsumoto leg. (OMNH); 1 F, ditto, 5 Aug 1995 (OMNH); 1 M, ditto, 8 May 1999 (OMNH); 18 M & 9 F, ditto, 12 May 1999 (OMNH); 9 M & 5 F, ditto, 11 May 1999 (OMNH); 2 M, ditto, 13 May 1999 (OMNH); 2 M & 1 F, Okinawa Pref., Ishigaki Is., Arakawa, 10 Jul 2008, R. Matsumoto leg. (OMNH); 13 M & 1 F, ditto, 27 Apr 2019 (OMNH); 1 F, Okinawa Pref., Iriomote Is., 3 Apr 1971, N. Sakane leg. (SEHU); 1 M, Okinawa Pref., Iriomote Is., Ohara, 10 Aug 1972, T. Nambu leg. (KPMNH); 1 F, ditto, 13 Aug 1972 (KPMNH); 2 F, ditto, 19 Aug 1978 (KPMNH); 1 F, ditto, 16 Apr 1978, E. Nishida leg. (OMNH); 1 F, ditto, 19 Nov 1980 (OMNH); 1 M, ditto, 28 Apr 1982, A. Nagatomi leg. (SEHU); 1 F, Okinawa Pref., Iriomote Is., Otomi, 11 Aug 1972, T. Nambu leg. (KPMNH); 1 F, ditto, 17 Apr 1978, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Otomi-rindo, 1 Jun 2006, K. Watanabe leg. (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Nakamagawa rindo, 8 Aug 1995, R. Matsumoto leg. (OMNH); 2 M & 1 F, Okinawa Pref., Iriomote Is., Komi, 21 Nov 1980, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Uehara, 22 Aug 1978, T. Nambu leg. (KPMNH); 3 M, ditto, 22 Jul 1995, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Iriomote Is., Funaura, 13 May 1980, E. Nishida leg. (OMNH); 1 F, ditto, 26 Mar 1982 (OMNH); 1 M, ditto, 20 Apr 1995, R. Matsumoto leg. (OMNH); 1 M, ditto, 10 May 1999 (OMNH); 1 F, ditto, 9 May 2008, K. Watanabe

leg. (KPMNH); 3 F, Okinawa Pref., Iriomote Is., Tsukigahama, 7 Aug 1995, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Riverside of Urauchigawa, 12 May 2008, K. Watanabe leg. (KPMNH); 2 F, ditto, 13 May 2008; 1 F, ditto, 14 May 2008 (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Urauchi, 4 May 1980, E. Nishida leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Mariudonotaki, 23 Jul 1995, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Iriomote Is., Miyara, 29 Apr 1978, E. Nishida leg. (OMNH); 2 F, Okinawa Pref., Iriomote Is., Sonai, 11 Apr 1978, E. Nishida leg. (OMNH); 1 M & 1 F, ditto, 13 Apr 1978 (OMNH); 1 F, ditto, 14 Apr 1978 (OMNH); 1 M, ditto, 5 Jul 1982, K. Ohara leg. (KPMNH); 2 F, Okinawa Pref., Iriomote Is., Shirahama-rindo, 10 May 2008, K. Watanabe leg. (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Haimi, Fusatoruba, 9 Oct 2004, T. Ishizaki leg. (KPMNH); 1 F, Okinawa Pref., Iriomote Is., Shirahama, 25 Jun 2015, T. Yamada leg. (OMNH); 6 M & 5 F, Okinawa Pref., Hateruma Is., 6 Aug 1995, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Yonaguni Is., Anngaimidocchi, 26 Jun 2010, E. Nishida leg. (OMNH); 1 M (DNA-Pol-387), Okinawa Pref., Yonaguni Is., Mantabaru, 22 Jun 2015, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Yonaguni Is., Sonai, 5 Jun 2010, E. Nishida leg. (OMNH); 1 M, ditto, 6 Jun 2010 (OMNH); 1 M & 1 F, ditto, 28 Jul 1999, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Yonaguni Is., Urabudake, 13 May 2006, E. Nishida leg. (OMNH); 1 M, ditto, 3 Jun 2011 (OMNH); 1 M, ditto, 4 Jun 2011 (OMNH); 1 F & 1 ex. (apical part of metasoma lost), Yaeyama, 519., Matsumura leg. (SEHU); 1 M, Okinawa, IX. 1920, Sakaguchi leg. (SEHU); 1 F, Okinawa, 1911 (112), Matsumura leg. (SEHU). **TAIWAN:** 1 F (det. Townes & Chiu), Taipei, 8 Jul 1968, K. S. Lin leg. (TARI); 1 F, Kaohsiung City, National Sun Yat-sen University, 4 May 2009, T. Ebihara leg. (KPMNH). **PHILIPPINES:** 1 F, Luzon Is., San Fernando, pr. La Union, 27 Mar 1978, C. Nozaka leg. (KPMNH). **MALAYSIA:** 2 F, Terangganu st., UMT campus, 16 Nov 2010, T. Maeda leg. (KPMNH). **INDONESIA:** 1 F & 1 M, Java Is., Parangtritis Beach, 12 Aug 2009, K. Takasuka leg. (KPMNH). **VIETNAM:** 1 F, Ninh Binh, Cuc Phuong National Park, 6 Jun 1997, R. Matsumoto leg. (OMNH); 1 F, Bac Can, Ba Be National Park, R. Matsumoto leg. (OMNH).

Distribution. Japan (Shikoku, Nakanoshima Is., Amamioshima Is., Tokunoshima Is., Okinoerabu Is., Yoron Is., Okinawa Is., Miyako Is., Ishigaki Is., Iriomote Is. and Yonaguni Is.). Outside Japan, this species has been recorded from Afghanistan, Bangladesh, China, Guam, India, Indonesia, Laos, Malaysia, Mariana Is., Mauritius, Myanmar, Nepal, Nigeria, Pakistan, Papua New Guinea, Philippines, Poland, Russia, Singapore, Sri Lanka, Taiwan, Thailand, Togo and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected from March to October. In Iriomote Is., the first author collected this species in the open forests around crop fields of sugar cane, the forest edge and the forest path in sunlight. Kusigemati (1987) recorded a host, *Omphisa anastomosalis*

(Guenée, 1854) (Lepidoptera, Crambidae) in Japan. *Parnara guttata guttata* (Bremer & Grey, 1852) is recorded as a host of this species in Japan, based on materials from Tokunoshima Is. A female emerged from an immature individual of Pyralidae on *Rhizophora mucronata*. Outside Japan, many pests of crop and paddy fields have been recorded (e.g. Yasumatsu 1967).

Remarks. This is the first record of this species from Nakanoshima Is., Yoron Is. and Yonaguni Is.

Xanthopimpla stemmator (Thunberg, 1822)

Figs 2E, 3E, 4K, 5L

Ichneumon stemmator Thunberg, 1822: 262.

Pimpla integrata Smith, 1860: 140. Synonymised by Townes et al. (1961).

Xanthopimpla thoracalis Krieger, 1899: 95. Synonymised by Krieger (1915).

Xanthopimpla maculifrons Cameron, 1903: 138; Townes et al. 1961: 59. Synonymised by Townes and Chiu (1970).

Xanthopimpla bimaculata Cameron, 1906: 116. Synonymised by Roman (1913).

Xanthopimpla nursei Cameron, 1907b: 592; Matsumura and Uchida 1926: 75. Synonymised by Krieger (1915).

Xanthopimpla maculifrons Cameron, 1907b: 591. Name preoccupied. Synonymised by Krieger (1915).

Xanthopimpla facialis Szépligeti, 1908: 256. Synonymised by Krieger (1915).

Xanthopimpla stemmator var. *confluens* Krieger, 1914: 27. Synonymised by Townes et al. (1961).

Xanthopimpla stemmator var. *doleschali* Krieger, 1915: 34. Synonymised by Townes and Chiu (1970).

Xanthopimpla transfuga Krieger, 1915: 38; Townes et al. 1961: 70. Synonymised by Townes and Chiu (1970).

Habropimpla sesamiae Rao, 1953: 166. Synonymised by Townes et al. (1961).

Xanthopimpla sesamiae: Townes et al. 1961: 67.

Xanthopimpla stemmator: Uchida 1928: 64; Ishii 1932: 409; Townes et al. 1961: 68; Townes et al. 1965: 63; Townes and Chiu 1970: 108; Momoi 1970: 335; Watanabe 2011: 17.

Comparative diagnosis. This species belongs to the *stemmator* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of the group by the following combination of character states: dorsal part of occiput with two black spots (Fig. 3E); hind tibia with 9–11 preapical bristles (Fig. 5L); propodeum and metasomal tergites each with two black spots (except for T VI entirely yellow) (Fig. 2E); ovipositor sheath 1.1 × length of hind tibia.

Materials examined. **JAPAN:** [Ryukyu Is.] 1 M, Okinawa Pref., Ishigaki Is., Yoshihara, 17 Sep 1967, K. Mizusawa leg. (TUA); 1 F & 1 M, Okinawa Pref., Ishigaki Is., Yonehara, 28 Aug 1978, T. Nambu leg. (KPMNH); 1 M, Okinawa Pref., Ishigaki Is., Takeda, 24 Jun 1972, S. Yamaguchi & T. Aoki leg. (NIAES); 1 M, Okinawa Pref., Ishigaki Is., Banna, 22 Oct 1981, K. Konishi leg. (NIAES); 1 M, ditto, 30 Nov 1993, R. Matsumoto leg.

(OMNH); 1 M, Okinawa Pref., Ishigaki Is., Maise-dake, 8 Jul 2007, R. Matsumoto leg. (OMNH); 1 F, Okinawa Pref., Ishigaki Is., Mt. Omoto-dake, 2 Nov 1988, K. Nakamine leg. (NIAES); 1 M, ditto, 30 Mar 1982, E. Nishida leg. (OMNH); 1 M, ditto, 11 May 1999, R. Matsumoto leg. (OMNH); 1 M, Okinawa Pref., Ishigaki Is., Fusaki, 11 May 1999, R. Matsumoto leg. (OMNH); 1 F, Iriomote Is., Funaura, 22 Mar 1971, Y. Uemura leg. (NIAES); 1 F, ditto, 22 Aug 1978, T. Nambu leg. (KPMNH); 1 M, ditto, 3 May 1980, E. Nishida leg. (OMNH); 1 F, ditto, 24 Mar 1982 (OMNH); 1 M, ditto, 11 May 2008, T. Mita leg. (KPMNH); 1 M, Okinawa Pref., Iriomote Is., Sonai, 13 Apr 1978, E. Nishida leg. (OMNH); 1 M & 2 F, Okinawa Pref., Iriomote Is., Komi, 21 Nov 1980, E. Nishida leg. (OMNH); 1 F, Iriomote Is., Funaura, Ohara, 13 Aug 1972, T. Nambu leg. (KPMNH); 1 M, Iriomote Is., Funaura, Uehara, 27 May 1975, Y. Yoshiyasu leg. (SEHU); 1 M, ditto, 9 May 2008, K. Watanabe leg. (KPMNH); 1 F, Otomi-rindo, 5 Sep 2006, H. Katahira leg. (KPMNH); 1 M & 2 F, Okinawa Pref., Hateruma Is., 6 Aug 1995, R. Matsumoto leg. (OMNH). **TAIWAN:** 1 M, Chiayi, Chuchi, 21 Jul 1966, T. Tano leg. (KPMNH); 1 F (det. Townes & Chiu), ditto, 20 Jul 1968, K. H. Chang leg. (TARI); 1 M, Liugui, Kaohsiung, 30 Apr 2015, S. Fujie leg. (KPMNH).

Distribution. Japan (Ishigaki Is., Iriomote Is. and Hateruma Is.). Outside Japan, this species has been recorded from China, India, Indonesia, Laos, Malaysia, Mauritius, Pakistan, Philippines, Reunion, Singapore, South Africa, Sri Lanka, Taiwan, Thailand and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in March, May to November. In Iriomote Is., the first author collected this species in the open forests around crop fields of sugar cane. Uchida (1928) recorded a host, *Scirpophaga nivella* (Fabricius, 1794) (Lepidoptera, Crambidae), based on material(s) from Japan and/or Taiwan. Outside Japan, many pests of crop and paddy fields have been recorded (e.g. Townes and Chiu 1970).

Remarks. This is the first record of this species from Hateruma Is. In Japan, distribution of this species is restricted to Yaeyama Islands of Ryukyus.

Xanthopimpla sylvicola sp. nov.

<http://zoobank.org/BC28E590-921E-4B0D-8F38-ED046A7DC3B7>

Figs 2F, 3F, L, 4L, 5M, Q, 6B, G

Xanthopimpla sp. E: Watanabe, 2011: 18.

Type series. Holotype: F, JAPAN, Kagoshima Pref., Amamioshima Is., Yamato Vil., Oodana, 29 Jun 2011, K. Watanabe leg. (KPMNH). **Paratypes:** JAPAN: [Honshu] 1 F, Mie Pref., Inabe Daian, Ishigureminami, Ugakei, 9 Jul 2017, S. Ohkusa leg. (KPMNH); 1 F, Toyama Pref., Toyama City, Kamegai, 21–28 Jul 2009, M. Watanabe et al. leg. (MT) (KPMNH). [Kyushu] 1 F, Miyazaki Pref., Kobayashi City, Inokodani, 4 May 2003, R. Matsumoto leg. (OMNH); 1 F, Kagoshima Pref., Kirishimayama, 8 Dec 1975, K. Ohara

leg. (SEHU). [Ryukyu Is.] 1 F, Kagoshima Pref., Amamioshima Is., Mt. Yui-dake, 27 Jul 2004, H. Makihara leg. (MT) (KPMNH); 1 F, ditto, 19 Sep 2004 (OMNH); 1 F, Kagoshima Pref., Amamioshima Is., Nase, Chuo-rindo, 26–28 Jun 2011, K. Watanabe leg. (KPMNH).

Comparative diagnosis. This species belongs to the *terebatrix* species group *sensu* Townes and Chiu (1970). This species resembles *X. brevicauda brevicauda* in the density of punctures on mesoscutum, the shape of lateral carinae of scutellum, the shape of area superomedia of propodeum and the colouration, but it can be distinguished by the ovipositor sheath $0.5\text{--}0.55 \times$ length of hind tibia ($0.37 \times$ length of hind tibia in *X. brevicauda brevicauda*) and the propodeum with a pair of black spots (without the spots in *X. brevicauda brevicauda*).

Description. Female ($n = 7$). Body covered with silver setae, except for some dark brown setae on mesoscutum, polished, largely smooth, length 7.8–9.4 (HT: 9.2) mm.

Head 0.54–0.56 (HT: 0.56) \times length of width. Clypeus almost flat in lateral view, sparsely punctate, except for ventral margin, $0.56\text{--}0.59$ (HT: 0.56) \times length of maximum width. Face $0.91\text{--}0.95$ (HT: 0.91) \times length of maximum width, densely punctate. Frons with a slight convexity medially. Length of malar space $0.2\text{--}0.25$ (HT: 0.2) \times length of basal mandibular width. OD: POL: OOL = 1.0: 0.7–0.8 (HT: 0.8): 0.55–0.6 (HT: 0.6). Antenna longer than fore wing. Flagellum with 33–35 (HT: 35) flagellomeres. Length of FL I $3.3\text{--}3.6$ (HT: 0.3) \times length of maximum depth in lateral view, $1.43 \times$ length of F II.

Mesosoma. Epomia very short. Front end of notaulus with a sharp-edged transverse crest. Notauli not reaching past centre of mesoscutum, their posterior ends not joined with each other. Mesoscutum sparsely and finely punctate, its anterior end protruded anteriorly. Scutellum sparsely and finely punctate, roundly convex, with a lateral carina that reaches apex (Fig. 3L). Mesopleuron sparsely punctate dorsally, densely punctate ventrally. Posterior transverse carina of mesosternum with a roundly produced lamella, with a shallow median notch. Metapleuron smooth. Propodeum smooth, except for area spiracularis and area lateralis covered with sparse and fine punctures, with lateral section of anterior transverse carina, anterior and middle sections of lateromedian longitudinal carina, lateral longitudinal carina and pleural carina, without hill-like swelling (Fig. 4L). Anterior end of lateral longitudinal carina extending $0.3\text{--}0.4$ (HT: 0.3) length of outer side of area spiracularis in dorsal view (Fig. 4L). Anterior part of pleural carina partly indistinct. Middle section of lateromedian longitudinal carina usually (including HT) absent (Fig. 4L). Middle section of posterior transverse carina weak and sometimes narrowly indistinct (Fig. 4L). Fore wing length $6.3\text{--}8.0$ (HT: 7.6) mm. Areolet present, receiving vein 2m-cu near middle. Hind femur $2.4\text{--}2.5$ (HT: 2.4) \times length of maximum depth in lateral view. Pre-apical bristles of mid-tibia 2–3 (HT: 3) and of hind tibia 2–3 (HT: 2) (Fig. 5M). Apical bristle of mid-tibia 2–3 (HT: 3) and of hind tibia 1–3 (HT: 3) (Fig. 5M). Ratio of length of hind first to fifth tarsomeres

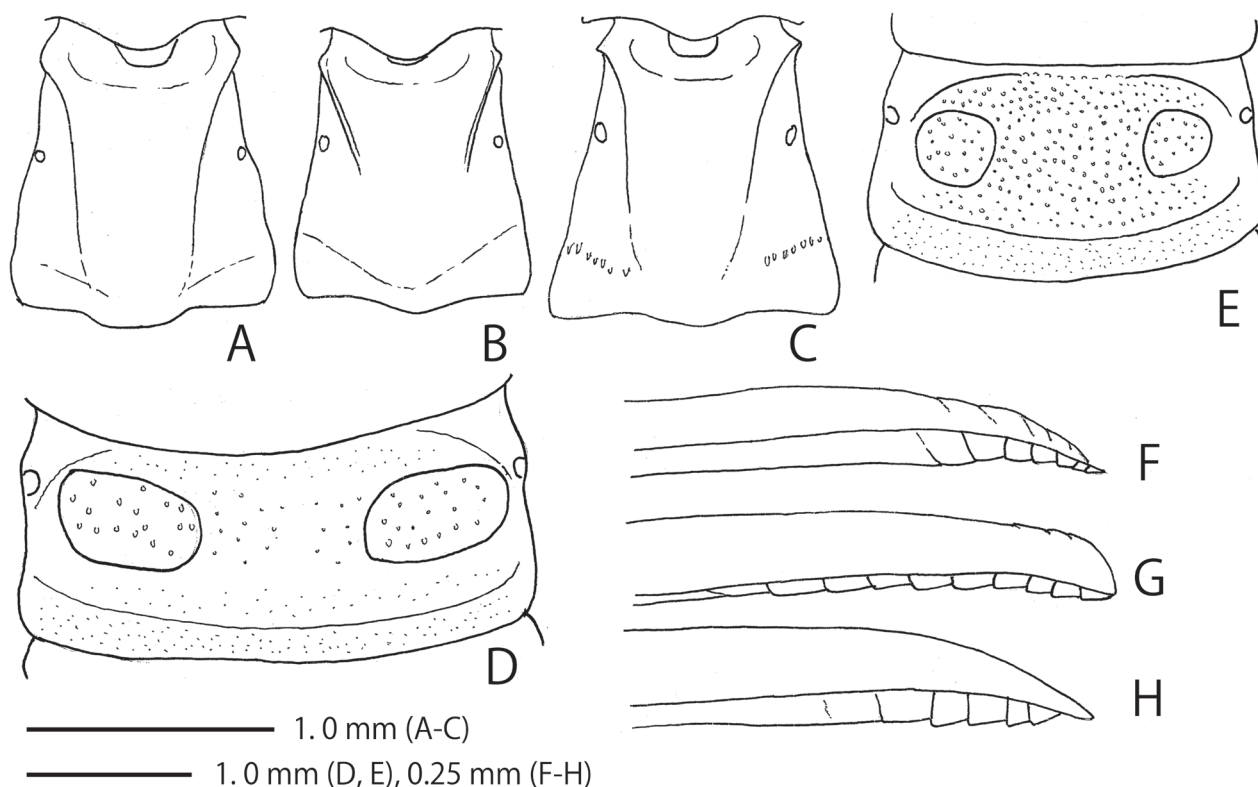


Figure 6. Japanese *Xanthopimpla* A, F. *X. nipponensis* sp. nov.; B, G. *X. sylvicola* sp. nov.; C, H. *X. yoshimurai* sp. nov.; D. *X. konowi* Krieger, 1899; E. *X. pedator* (Fabricius, 1775) (A–C, F, holotype; G, H, paratype) A–C. T I, dorsal view; D, E. T III, dorsal view; F–H. apex of ovipositor, lateral view.

1.7: 1.0: 1.0: 0.7: 2.05–2.2 (HT: 2.2). Largest bristle on hind tarsal claws distinctly widened next to apex, with a mucronate apex (Fig. 5Q).

Metasoma. T I 1.0–1.1 (HT: 1.1) \times length of maximum width, largely smooth, with a weak transverse depression subapically (Fig. 6B). Latero-median carina of T I complete, except for apical part obscured (Fig. 6B). Dorso-lateral carina of T I absent, except for base. T II 0.55 \times length of maximum width, sparsely punctate. T II to T VI with a posterior transverse foveolate groove. T III to T VIII densely punctate. Ovipositor sheath 0.5–0.55 (HT: 0.55) times as long as hind tibia. Upper valve of ovipositor strongly narrowed near apex with dorsal minute teeth apically (Fig. 6G). Lower valve of ovipositor with 9–10 (HT: 10) distinct teeth (Fig. 6G). Ovipositor weakly downcurved.

Colouration (Figs 2F, 3F, 4L, 5M). Body (excluding wings) yellow. Apex of mandible and ocellar area black, the latter black area weakly expanded outside of ocellar area. Occiput with a median darkened area. Antenna reddish-yellow, except for a yellow area of scape. Mesoscutum with a transverse black band anteriorly and a black spot in front of scutellum, the antero-median area of the band partly tinged with reddish-brown. Propodeum with a pair of semicircular black spots on combined areas externa and lateralis. Wings hyaline. Veins and pterostigma blackish-brown to brown, except for yellowish-brown wing base and base of pterostigma. Hind trochanter with a pair of small black spots. Apex and base of hind tibia

tinged with black. Base of first tarsomere and apical part of fifth tarsomere of hind leg sometimes darkened. Widened part of longest bristle on hind tarsal claws darkened. T I, III, V and VII with a pair of black spots. T II sometimes (including HT) with a pair of small black spots. Ovipositor dark reddish-brown. Ovipositor sheath black.

Male. Unknown.

Distribution. Japan (Honshu, Kyushu and Amami-oshima Is.).

Bionomics. In Japan, adults were collected from May to July, October and December. The authors collected this species along a path inside the broad-leaved forest in Kyushu and Amamioshima Is. Host is unknown.

Etymology. The species name is from Latin “*silva*” + “*colo*”, which is based on the habitat of this species.

Xanthopimpla trias Townes & Chiu, 1970

Figs 2G, 4M, 5N

Xanthopimpla trias Townes & Chiu, 1970: 242.

Xanthopimpla sp. B: Watanabe, 2011: 17.

Comparative diagnosis. This species belongs to the *trunca* species group *sensu* Townes and Chiu (1970). This species can be distinguished from other species of this group by the following combination of character states: propodeum without carinae, except for apical part of lateral longitudinal carina and small stub of lateromedian

longitudinal carina (Fig. 4M); T I, IV and VII each with black band or sometimes T I and T III with two black spots (Fig. 2G); ovipositor sheath $0.45 \times$ length of hind tibia.

Materials examined. Type series: **TAIWAN:** 1 F (*paratype*), Koshun, 25 Apr–25 May 1918, J. Sonan, K. Miyake & M. Yoshino leg. (TARI). **VIETNAM:** 1 F (*paratype*), Ban Me Thuot, 16–18 May 1960, L. W. Quate leg. (AEIC). **Non-types:** **JAPAN:** [Honshu] 1 F (DNA-Pol-851), Nara Pref., Nara City, Kasugayama, 20 May 2020, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-557), Nara Pref., Kashihara City, Amakashino-oka, 12 Jan 2017, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-826), ditto, 14 Jan 2020 (OMNH); 1 F (DNA-Pol-827), Osaka Pref., Osaka City, Hattori-ryokuchi Park, 5 Feb 2020, R. Matsumoto leg. (OMNH). [Kyushu] 4 F & 1 M, Kumamoto Pref., Asagiri Town, Uenishi, 24 Aug 2012, R. Matsumoto leg. (OMNH); 1 F, Kagoshima Pref., Kagoshima City, Inari-cho, 16 Jul 1964, K. Hashimoto leg. (SEHU). [Ryukyu Is.] 1 M, Kagoshima Pref., Yakushima Is., Shiratani, 6 May–20 Jun 2000, T. Murata leg. (MT) (MU); 1 F, ditto, 21 Jun–9 Jul (MU); 2 M, ditto, 10 Jul–8 Aug (MU); 1 F, Amamioshima Is., Mt. Yui, 28 Sep–28 Oct 2001, T. Muroi & Y. Maeda leg. (MU); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Benoki-dam, 22 May 2007, S. Fujinuma leg. (KPMNH); 1 F, Okinawa Pref., Okinawa Is., Kunigami Vil., Yona, 29 Jun 2013, M. Ito leg. (KPMNH). **VIETNAM:** 1 M, Vinh Phuc, Tam Dao National Park, 8 May 1998 R. Matsumoto leg. (OMNH); 1 F, ditto, 28 Apr 2000 (OMNH).

Distribution. Japan (Honshu, Kyushu, Yakushima Is., Amamioshima Is. and Okinawa Is.). Outside Japan, this species has been recorded from India, Nepal, Taiwan, Thailand and Vietnam (Yu et al. 2016).

Bionomics. In Japan, adults were collected in January, February and from May to October. Although a small number of individuals have been observed, winter is passed in the stage of adult in Honshu (Fig. 8D). The wintering adults were resting under the leaf of broad-leaved, evergreen trees, such as *Quercus glauca* and *Camellia japonica*. All wintering specimens observed were female exclusively. Host is unknown.

Remarks. This is the first record of this species from Japan. No characteristics unique to the Japanese population were detected.

Xanthopimpla yoshimurai sp. nov.

<http://zoobank.org/955D2DCC-88D8-4CF6-B019-9EBBF76D9532>
Figs 2H, I, 3G, M, 4N, 5O, R, 6C, H

Type series. Holotype: F, JAPAN, Honshu, Kyoto Pref., Maizuru City, Nyo, 10–30 Aug 2010, T. Murao leg. (MT) (OMNH). **Paratypes:** JAPAN: [Honshu] 4 F, same data as holotype (3 F, OMNH; 1 F, KPMNH); 1 F, ditto, 20 Jun–10 Jul 2011 (OMNH); 1 F, ditto, 10–20 Sep 2011 (OMNH); 2 F, Kyoto Pref., Ide Town, Tagakataharayama, Taishoike, 13 Jan 2019, R. Matsumoto leg.

(OMNH-Pol-713); 1 F, Nara Pref., Nara City, Byakugouji-cho, Takamadoyama, 19 May 2017, R. Matsumoto leg. (OMNH); 3 F, Nara Pref., Yamatokoriyama City, Yata-cho, 7 Sep 2011, R. Matsumoto leg. (OMNH); 1 F, ditto, 6 Dec 2010 (OMNH); 1 F, ditto, 4 Jan. 2018, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Ikoma City, Ichibu-cho, 19 Feb 2010, R. Matsumoto leg. (OMNH); 1 F, Nara Pref., Tenri City, Shimonigo Town, 9 Feb 2015, R. Matsumoto leg. (OMNH); 2 F, Hyogo Pref., Sanda City, Arimafuji-park, 20 Dec 2008, H. Yoshimura leg. (OMNH); 1 F (DNA-Pol-665), ditto, 4 Dec 2017, R. Matsumoto leg. (OMNH); 1 F (DNA-Pol-720), ditto, 21 Jan 2019, R. Matsumoto leg. (OMNH); 1 F, Yamaguchi Pref., Hirao Town, Nishihara, 31 Aug 2008, K. Ban leg. (OMNH); 1 F, (DNA-Pol-083), Ehime Pref., Matsuyama City, Koyoudai, 30 Dec.2011, R. Matsumoto leg. (OMNH); 4 F, Fukuoka Pref., Fukuoka City, Hakomatsu, 17 Jul 1994, Wasano leg. (OMNH); 1 F, Miyazaki Pref., Kobayashi City, Inokodani, 28 Sep–25 Oct 2003, R. Matsumoto leg. (MT) (OMNH); 1 F, ditto, 27 Sep 2003 (OMNH).

Comparative diagnosis. This species belongs to the *brachycentra* species group *sensu* Townes and Chiu (1970). This species resembles *X. reicherti* Krieger, 1914 in the body colouration, but it can be distinguished by the ovipositor sheath $0.63\text{--}0.65 \times$ length of hind tibia ($0.56 \times$ in *X. reicherti*). This species is also very similar to *X. clavata* in the body structures and colouration. We can recognise only three morphological differences between this species and *X. clavata*, i.e. the black spots of propodeum semicircular (triangular in *X. clavata*), the lateral sides of black spot of T I not enlarged anteriorly (enlarged anteriorly in *X. clavata*) and the basomedian part of T II always without punctures (usually with some punctures in *X. clavata*).

Description. Female (n = 29). Body covered with silver setae, polished, largely smooth, length 7.9–10.4 (HT: 10.4) mm.

Head 0.51–0.53 (HT: 0.51) \times length of width. Clypeus slightly convex in lateral view, sparsely punctate, except for ventral margin, $0.59\text{--}0.61$ (HT: 0.61) \times length of maximum width. Face $0.95\text{--}1.05$ (HT: 0.98) \times length of maximum width, punctate. Frons without a conspicuous convexity medially. Length of malar space $0.15\text{--}0.2$ (HT: 0.2) \times length of basal mandibular width. OD: POL: OOL = 1.0: 0.5–0.7 (HT: 0.7): 0.5–0.75 (HT: 0.7). Antenna longer than fore wing. Flagellum with 31–34 (HT: 34) flagellomeres. Length of FL I $5.0 \times$ length of maximum depth in lateral view, $1.54 \times$ length of F II.

Mesosoma. Epomia very short. Front end of notaulus with a sharp-edged transverse crest. Notauli not reaching past centre of mesoscutum, their posterior ends not joined with each other. Mesoscutum sparsely and finely punctate, its anterior end weakly protruded anteriorly. Scutellum sparsely and finely punctate, roundly convex, with a lateral carina that reaches apex (Fig. 3M). Mesopleuron sparsely punctate. Posterior transverse carina of mesosternum with a roundly produced lamella, with a shallow median notch. Metapleuron smooth. Propodeum

smooth, except for area spiracularis and area lateralis covered with sparse and fine punctures, with lateral section of anterior transverse carina, anterior and median sections of lateromedian longitudinal carina, lateral longitudinal carina, posterior transverse carina and pleural carina, without hill-like swelling (Fig. 4N). Median section of lateromedian longitudinal carina sometimes (including HT) weak and partly absent (Fig. 4N). Anterior end of lateral longitudinal carina extending 0.45–0.5 (HT: 0.45) length of outer side of area spiracularis in dorsal view (Fig. 4N). Fore wing length 6.9–8.8 (HT: 8.8) mm. Areolet present, receiving vein 2m-cu slightly distant of middle. Hind femur 2.3–2.4 (HT: 2.4) × length of maximum depth in lateral view. Pre-apical bristles of mid-tibia 3–5 (HT: 3) and of hind tibia 4–5 (HT: 4) (Fig. 5O). Apical bristle of mid-tibia 3–4 (HT: 3) and of hind tibia 2 (Fig. 5O). Ratio of length of hind first to fifth tarsomeres 1.8: 1.0: 0.7: 1.5: 2.5–2.6 (HT: 2.6). Largest bristle on hind and mid-tarsal claws not widened next to apex (Fig. 5R).

Metasoma. T I 1.0–1.1 (HT: 1.0) × length of maximum width, largely smooth, with a weak transverse depression subapically (Fig. 6C). Latero-median carina of T I complete, except for apex obscured (Fig. 6C). Dorso-lateral carina of T I absent, except for base (Fig. 6C). T II 0.55–0.63 (HT: 0.55) × length of maximum width, sparsely punctate, except for basomedian part smooth. T II to T VI with a posterior transverse foveolate groove. T III to T VIII densely punctate. Ovipositor sheath 0.63–0.65 (HT: 0.65) times as long as hind tibia. Upper valve of ovipositor gradually narrowed towards apex without dorsal minute teeth apically (Fig. 6H). Lower valve of ovipositor with 5–6 (HT: 6) distinct teeth (Fig. 6H). Ovipositor slightly downcurved apically.

Colouration (Figs 2H, I, 3G, 4N, 5O). Body (excluding wings) yellow. Apex of mandible and ocellar area black. Dorsal surface of scape and pedicel blackish-brown. Flagellum dark yellowish-brown to dark brown. Mesoscutum with a transverse black band anteriorly and a black spot in front of scutellum, the band usually (including HT) divided into three black spots. Propodeum with a pair of semicircular black spots on area externa. Wings hyaline. Veins and pterostigma blackish-brown to brown, except for yellowish-brown wing base and base of pterostigma. Hind trochanter with a small dark spot. Base of hind tibia narrowly tinged with black. Hind fifth tarsomere sometimes weakly darkened. T I nearly always (except for a single paratype) with a pair of black spots, its lateral sides not enlarged anteriorly. The black spots of T I united each other (into a single band) in a single paratype. T II rarely (fore paratypes) with a pair of small, weak black spots. T III to T V and T VII with a pair of black spots. Ovipositor dark reddish-brown. Ovipositor sheath black.

Male. Unknown.

Distribution. Japan (Honshu, Shikoku and Kyushu).

Bionomics. In Japan, adults were collected in January, February, June to September and December. Winter is passed in the stage of adult (Fig. 8B). The wintering adults were resting under the leaf of broad-leaved, ever-

green trees, such as *Castanopsis cuspidata*, *Ilex pedunculosa* and *Camellia japonica* as *X. clavata*, *X. nipponensis* and *X. trias*. This species is often found with *X. clavata*. Sometimes multiple individuals composed of these two species were observed under the leaves of a single tree or even on a single leaf. All wintering specimens observed were female exclusively.

Etymology. The specific name is after Hiroyuki Yoshimura (Sanda City), who collected part of the paratypes and first noticed the differences in body maculation from *X. clavata*.

Remarks. Although this species is morphologically very similar to *X. clavata* and these two species can be distinguished from each other by mainly body colouration, the difference in colouration is quite stable. Furthermore, the DNA sequences of COI and 28S rRNA are considerably different from each other and both species formed distinct clades with high supporting values in phylogenetic analysis, respectively (Fig. 7). For these reasons, we concluded this is a distinct species.

Discussion

Host and habitat of Japanese *Xanthopimpla*

The host records of Japanese *Xanthopimpla* remain poorly documented. According to Yasumatsu (1967), Townes and Chiu (1970) and Matsumoto and Sugimoto (1998), the following three patterns of host preference are recognised:

1) Parasitoids of stem borers

Xanthopimpla flavolineata, *X. modesta modesta*, *X. punctata* and *X. stemmator* belong to this category. All these species have a long ovipositor for the genus to attack the lepidopterous borers in plant stems. They are, thus, important or potentially important natural enemies of crop pests. In Japan, *X. flavolineata*, *X. punctata* and *X. stemmator* are collected in somewhat open areas (e.g. meadows, open forest and crop fields).

2) Parasitoids of large moths with exposed habitats

Species of the *regina* group belong to this category, which parasitises the larvae and pupae of larger moths, such as Saturniidae and Lasiocampidae, in cocoons in somewhat exposed habitats. These species are rather large and have a robust body and long ovipositor. In Japan, *X. kono-wi* and *X. pedator* are collected in forest areas (e.g. Mt. Omoto-dake and Shiramizu of Ishigakijima Island) where their hosts are abundant.

3) Parasitoids of bagworm moths

Xanthopimpla naenia seems to be a specialist parasitoid of bagworms (Psychidae). *Nipponopsyche fuscescens* and

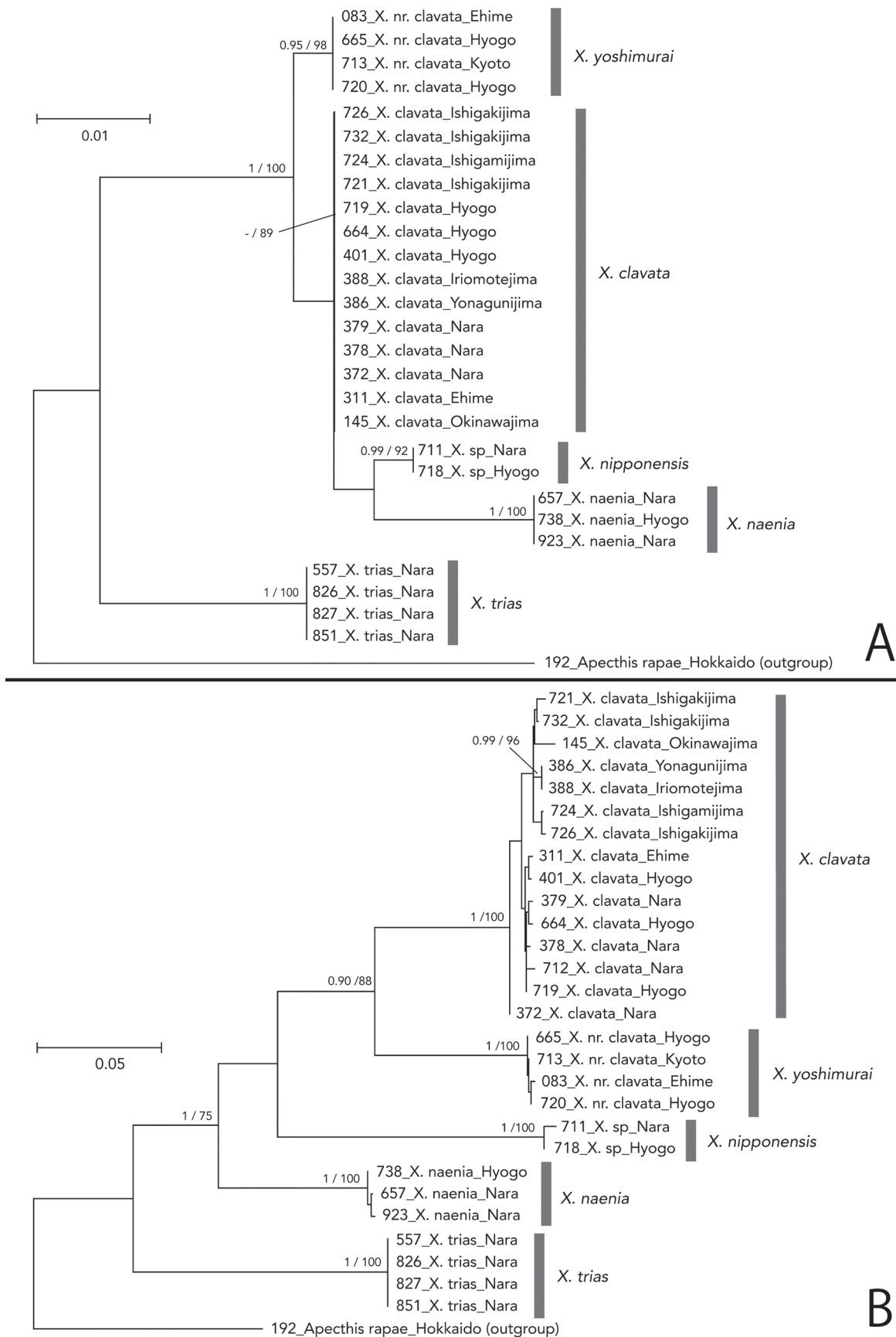


Figure 7. Phylogenetic trees showing the relationships of five species of Japanese *Xanthopimpla* (*X. clavata*, *X. yoshimurai* sp. nov., *X. trias*, *X. naenia* and *X. nipponensis* sp. nov.) See Table 1 for locality of each specimen. Two trees, based on aligned (A.) 28S rRNA and (B.) COI sequences by the Maximum Likelihood (ML) and Bayesian Inference are shown. The numerals at nodes show the bootstrap values (70% and more) in ML and posterior probabilities in the Bayesian approach.

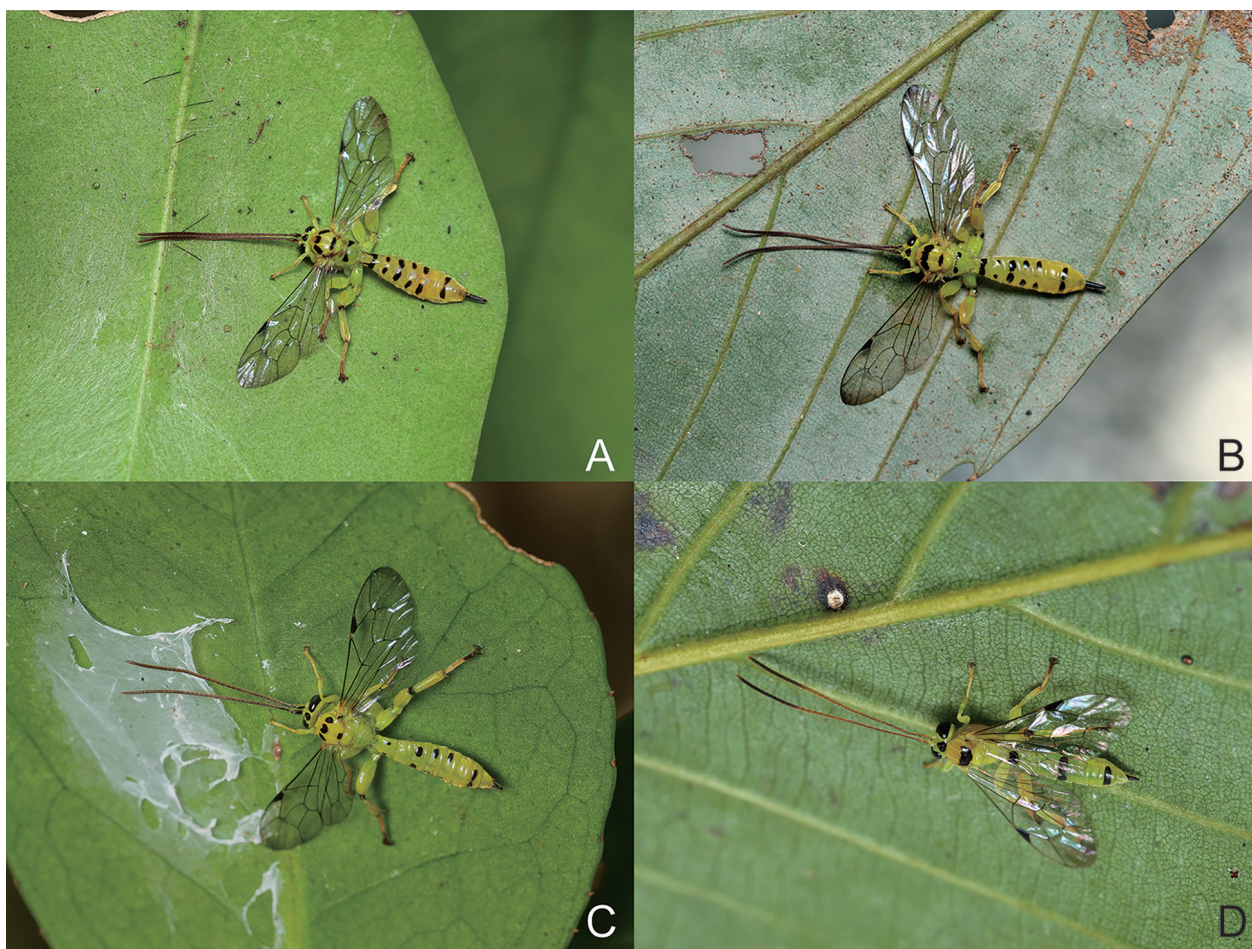


Figure 8. Wintering female of Japanese *Xanthopimpla* spp — A. *X. clavata*; B. *X. yoshimurai* sp. nov.; C. *X. nipponensis* sp. nov.; D. *X. trias*.

Manatha sp. were recorded as the hosts of this species in Japan. Bagworms carry unique portable cases that function as defensive shelters. Possibly because of the difficulty in being utilized as a host, they are attacked by specialised parasitoids (e.g. *Sericopimpla* Kriechbaumer, 1895 and *Paraphylax* Förster, 1869). However, how a few species of *Xanthopimpla* became parasitic on psychids is unclear.

The hosts of other species of Japanese *Xanthopimpla* are almost unknown. Given that most species are found in forest habitats, they possibly use hosts that are abundant in the forest, such as microlepidopterans, in leaf rolls and cocoons. *Xanthopimpla clavata* was observed to lay eggs in cocoons of *Galleria mellonella* (Linnaeus, 1758), which were experimentally exposed to the wasp in a cage. The offspring emerged successfully. Another male was reared from an unidentified small lepidopterous pupa collected in the field. These observations suggest that this species may utilize a wide range of lepidopterans as hosts.

Overwintering females of *Xanthopimpla* in the Palearctic area of Japan

The genus *Xanthopimpla* generally thrives in the tropics and subtropics. Data from collected specimens in the

Ryukyus indicate that the adults are active almost all year round and that many species are possibly multivoltine originally. However, their activity is restricted by the low temperature of winter. To the best of our knowledge, in Honshu, Shikoku and northern Kyushu, which have a winter season, most of the species, including *X. clavata*, *X. nipponensis*, *X. yoshimurai* and *X. trias*, pass the winter in the adult stage. The wintering adults rest under the leaves of broad-leaved evergreen trees (Fig. 8), such as *Quercus glauca*, *Castanopsis cuspidata*, *Ilex pedunculosa* and *Camellia japonica*. Sometimes, multiple individuals belonging to two or three species cluster under the leaves of a single tree or even on a single leaf.

All wintering individuals were female. This is similar to other ichneumonids overwintering as adults under evergreen leaves, such as *Zatypota maculata* (Matsumoto & Takasuka, 2010) (Matsumoto and Takasuka 2010). Males are found in the active season and so, overwintered females and their daughters lay fertilised and unfertilised eggs, of which, the latter grow up as males; however, males never seem to live long enough to overwinter. Some ichneumonids have been found wintering under the bark of a dead tree. In this case, wasps are rather safe because they are settled in a narrow space and will not fall to the ground. In contrast, *Xanthopimpla* clinging to

Table 2. List of Japanese *Xanthopimpla*. P_CHI: Palaearctic part of China; HON: Honshu; IZU: Izu Islands; SHI: Shikoku; KYU: Kyushu (including Tsushima Is.); YAK: Yakushima Is. (including Kuchinoerabu Is.); TOK: Tokara Isls.; AMA: Amami Isls. (including Amamioshima Is., Kakeroma Is. and Tokunoshima Is.); OKI: Okiwana Isls. (including Okinoerabu Is., Yoron Is., Okinawa Is. and Miyako Is.); YAE: Sakishima Isls. (including Ishigaki Is., Taketomi Is., Iriomote Is. and Yonaguni Is.); FOR: Taiwan; O_CHI: Oriental part of China; VIE: Vietnam. “?” is doubtful record.

	Palaearctic region						Oriental region						
	P_CHI	HON	IZU	SHI	KYU	YAK	TOK	AMA	OKI	YAE	FOR	O_CHI	VIE
<i>Xanthopimpla</i> Saussure, 1892													
The <i>brachycentra</i> species group													
<i>clavata</i> Krieger, 1914	○	○	○	○	○	○	○	○	○	○	○	○	○
<i>yoshimurai</i> sp. nov.		○		○									
The <i>citrina</i> species group													
<i>flavolineata</i> Cameron, 1907	○									○	○	○	○
The <i>incompleta</i> species group													
<i>naenia</i> Morley, 1913	○	○		○	○	○		○	○	○	○	○	○
The <i>occidentalis</i> species group													
<i>honorata honorata</i> (Cameron, 1899)								○	○	○	○	○	○
<i>nipponensis</i> sp. nov.		○		○	○								
The <i>punctata</i> species group													
<i>punctata</i> (Fabricius, 1781)	○			○		○		○	○	○	○	○	○
The <i>regina</i> species group													
<i>brullei</i> Krieger, 1899									○?				
<i>konowi</i> Krieger, 1899									○	○	○	○	○
<i>pedator</i> (Fabricius, 1775)					○	○	○	○	○	○	○	○	○
The <i>stemma</i> species group													
<i>modesta modesta</i> (Smith, 1860)										○	○		○
<i>stemma</i> (Thunberg, 1822)										○	○	○	○
The <i>terebatrix</i> species group													
<i>sylvicola</i> sp. nov.		○			○			○					
The <i>trunca</i> species group													
<i>minuta</i> Cameron, 1905						○		○	○		○	○	○
<i>trias</i> Townes & Chiu, 1970		○			○	○		○	○		○		○

leaves are directly exposed to changes in temperature and wind. It thus is possible that they have not adapted to the severely cold winter in northern Japan. This may explain why none of the species of the genus *Xanthopimpla* are distributed in northern Japan.

Distribution patterns of Japanese *Xanthopimpla*

Most Japanese *Xanthopimpla* species are also distributed in Southeast Asian countries, whereas a few species are unknown beyond Japan and provisionally considered as Japanese endemics. The biogeographical border of the Palaearctic and Oriental Regions is called the Tokara Gap (Watase line), which lies between Yakushima Island and the Tokara Islands (the north-eastern islands of Amamioshima Island). Thus, the faunas of Yakushima Island and Amamioshima Island are usually very different from each other. However, the range of distribution of any Japanese *Xanthopimpla* is not limited by this line, except for that of *X. honorata honorata*. A total of seven species, *X. clavata*, *X. minuta*, *X. naenia*, *X. pedator*, *X. punctata*, *X. sylvicola* and *X. trias*, are distributed both in the Palaearctic and Oriental parts of Japan beyond the Gap (Table 2). The reason for this pattern is still unclear, but these data possibly indicate the natural dispersal of the group (e.g. flying by themselves or carried away by a typhoon).

Xanthopimpla nipponensis and *X. yoshimurai* are endemic to Japan at present, but detailed distribution data for many more species are needed for a comprehensive faunal study of this group in Asia.

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