

Studies on Adelestini (Hymenoptera, Tenthredinidae), particularly the long-tongued *Nipponorhynchus* Takeuchi of Japan

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Abstract

Nipponorhynchus brevis Smith & Naito, **sp. n.**, is described from Hokkaido, Japan. It is characterized by shorter mouthparts than those of the other two species of the genus, *N. bimaculatus* Naito and *N. mirabilis* Takeuchi. The previously unknown female of *N. bimaculatus* is described. Larvae of *N. bimaculatus* and *N. mirabilis* feed on *Chrysosplenium macrostemon* var. *shiobarensis* (Saxifragaceae), and notes on the life history are given. *Nipponorhynchus* is compared with the Nearctic *Adelesta* Ross, the only other genus of Adelestini. A key to the genera and species of Adelestini is provided.

Keywords

Sawflies, Selandriinae, *Adelesta*, *Chrysosplenium*

Introduction

Nipponorhynchus was described by Takeuchi (1941) for a single unusual sawfly species, *N. mirabilis* Takeuchi, 1941, in which the maxillolabial complex is extremely elongated forming a proboscis-like structure. The mouthparts are so unique that Jervis and Villhelmsen (2000) proposed an additional type, “Type 8,” to the known seven

functional types of elongated proboscises previously recognized among Hymenoptera. Type 8 was solely for *Nipponorhynchus*, and it differs from the other types by the greatly elongated prementum and stipes, together forming a structure with two food conduction channels.

A second species of *Nipponorhynchus*, *N. bimaculatus*, was added by Naito (1973), which, among other structural features, the mouthparts are elongated, but not quite as long as those of *N. mirabilis*. Here, we describe a third species with elongated mouthparts, but much shorter than the two previously described species, thus showing a gradient in length of the mouthparts from moderately to extremely long. Additionally, we also describe the female of *N. bimaculatus* for the first time.

Nipponorhynchus, known only from Japan, and the Nearctic *Adelesta* Ross are the only members of what is recognized as the tribe Adelestini in the Selandriinae. Though the two genera have a number of characters in common which distinguishes the tribe, we prefer to keep the two genera separate. A brief history of the tribe and key to the genera and species of the Adelestini is presented.

Materials and methods

Images for Figures 1–26 were acquired through an EntoVision micro-imaging system. This system included a Leica M16 or Leica DRMB compound microscope with an attached JVC KY-75U 3-CCD digital video camera or a GT-Vision Lw11057C-SCI digital camera, that fed image data to a notebook or desktop computer. The program Cartograph 6.6.0 was then used to merge an image series into a single in-focus image. Figures 27, 28, 30, and 31 were taken by TN using a Nikon D200 digital camera with AF Micro Nikon 200 mm lens. Figure 29 was taken by T. Saito using a Canon Power Shot S5 IS digital camera with a Canon Zoom 12XIS 6.0–72.0 mm lens.

Abbreviations used are: NSMT, National Museum of Nature and Science, Ibaraki, Japan; TN, collection of T. Naito, Himeji-shi, Hyogo Prefecture, Japan; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

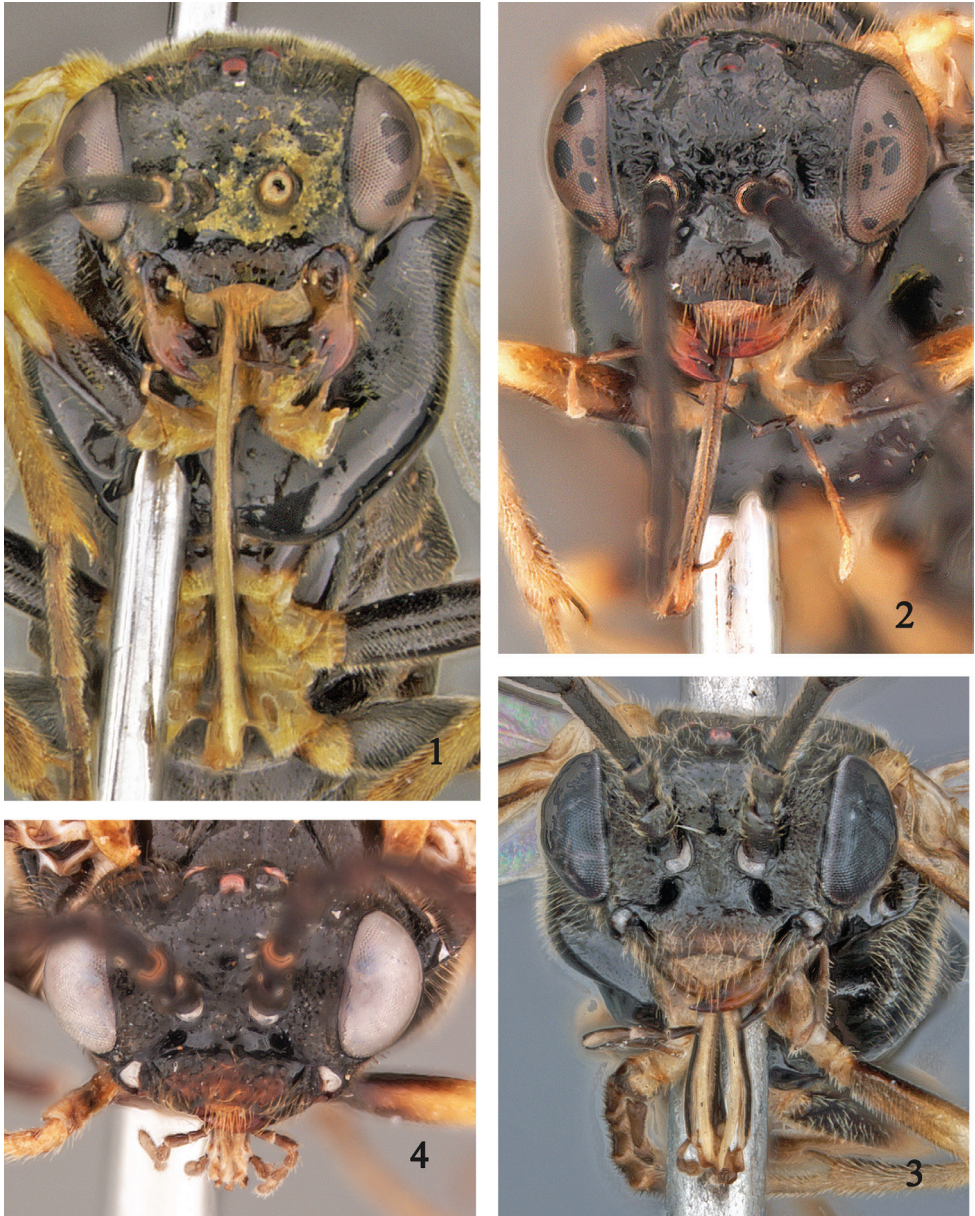
Results

Nipponorhynchus bimaculatus Naito

Figs 2, 6, 10, 14, 19, 23, 24, 27–29

Nipponorhynchus bimaculatus Naito, 1973: 95, fig. 1.

Description. Female: Length, 5.0 mm. Antenna and head black; anterior half of clypeus dark brown, labrum and upper surface of maxillolabial complex whitish; palpi and undersurface of maxillolabial complex dark brown. Thorax black with tegula and posterior corners of pronotum whitish. Legs black with apices of coxae, trochanters,



Figures 1–4. Head, front view. **1** *Nipponorhynchus mirabilis* **2** *N. bimaculatus* **3** *N. brevis* **4** *Adelesta nova*.

apical quarter of femora, tibiae except apical quarter with black stripe on inner surface and basitarsomeres whitish. Abdomen black (terga 2 and 3 often with yellow mark in male); center of apical tergum and cercus whitish. Wings hyaline; veins and stigma black. Head very shiny, almost impunctate; inner orbits, gena and clypeus with fine irregular punctures. Thorax and abdomen very shiny, sometimes terga 3–9 finely reticulate; posterior margin of mesoscutellum with several large punctures.

Antenna length $1.7\times$ head width, with scape and pedicel each longer than broad; 3rd antennomere length $1.3\times$ 4th, 4th to 9th antennomeres gradually decreasing in length. Clypeus slightly broadly, circularly emarginated, about $3\times$ broader than long. Malar space about equal to diameter of median ocellus. Lower interocular distance $1.3\times$ eye height; eyes only slightly converging below. Maxillolabial complex about $1.0\text{--}1.1\times$ head width and about $2.2\times$ eye height; maxillary palpus about $0.6\times$ length of proboscis, longer than distance between maxillary palpus and labial palpus. Distances between eye and lateral ocellus, between lateral ocelli, and between lateral ocellus and hind margin of head as $1.0:0.8:0.5$. Interocellar furrow represented by small pit. Postocellar furrow defined. Postocellar area $1.5\times$ broader than long. Posttergite distinct, length:width as $1:4$, triangular behind. Tarsal claws simple. Hind basitarsomere subequal to length of following 3 tarsomeres combined. Sheath in lateral view straight above, rounded at apex and below; from above, equally wide throughout. Lancet in Fig. 19; 10 or more annular spines in two or three rows.

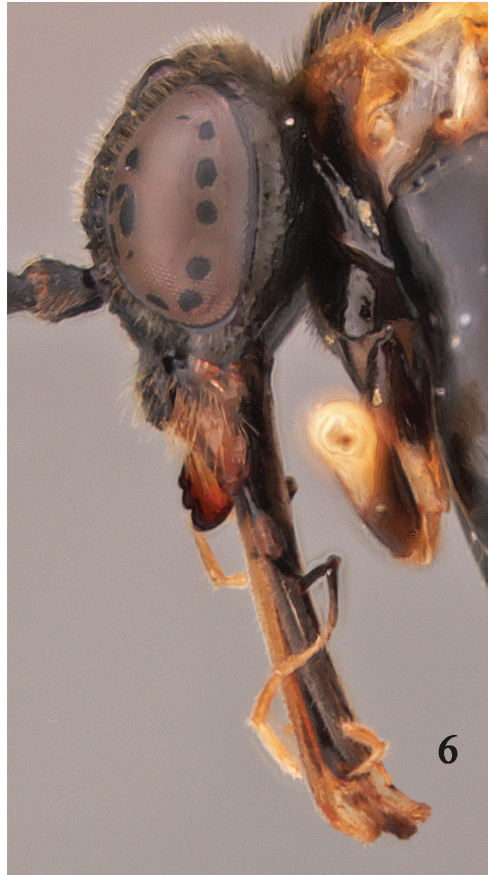
Male: Described by Naito (1973). Genitalia (Figs 23, 24), penis valve with valviceps almost round and apex somewhat flattened, dorsal spine slender.

Specimens examined. JAPAN: Honshu, Bicchuzawa, Bato, Tochigi Pref. 15.IV.2004, K. Katayama (1♀); same locality, 23.IV.2005, T. Naito (2♂); same locality, 24–30.IV.2005, S. Ibuki (4♀), same locality, 23, 29.IV.2005, A. Shinohara (2♀); same locality, 16–17.IV.2012, S. Ibuki (3♀); same locality, 29.III.2012, S. Ibuki (emerged from *Chrysosplenium macrostemon* Maxim var. *shiobarense* (Franch. Hara)) (2♀); Akazai-keikoku, Hyogo Pref. 20.V.1999, T. Okushima (1♀); Onzui-keikoku, Hyogo Pref., 21.IV.2008, T. Naito (1♀); Mt. Ooginosen, Hyogo Pref., 22.V.2006, T. Naito (1♀, 1♂); same locality, 7.V.2012, T. Naito; Mt. Hachibuseyama, Hyogo Pref., 5.V.2013, T. Naito (1♀); Honshu, Oodaigahara, Nara Pref., 7.VI.1976, T. Naito (1♂ paratype); Honshu, Bicchuzawa, Bato, Tochigi Pref., 23.IV.2005, T. Naito (2♀, 1♂); Hyogo Pref., Onzui-keikoku, 700 m, 21.IV.2008, T. Naito (1♀).

Distribution. Japan (Honshu).

Host and biological notes. TN observed adult habits on the host plant in April 2005 at Bicchuzawa, Tochigi Pref., Japan. Later, Saito and Ibuki (2010) succeeded in rearing this sawfly. Adults appear in early spring and fly on the flowers of the host plant, *Chrysosplenium macrostemon* Maxim var. *shiobarense* (Franch. Hara) (Saxifragaceae). They insert the long proboscis into the flower and absorb the nectar (Fig. 27). Females cut the seed capsule of the host plant with the sawlike ovipositor and lay their eggs into the capsule (Fig. 28). Larvae mainly eat young seeds and bracts (Fig. 29). Mature larvae fall to the ground, enter it, and make a fragile cocoon of soil particles held together by saliva (similar to *N. mirabilis*, Fig. 31). They overwinter in the prepupal stage.

The life cycle of *N. mirabilis* is quite similar to *N. bimaculatus*, and the host plant is the same for both species. The two species coexist in Honshu, Japan, where *N. mirabilis* appears somewhat earlier than *N. bimaculatus*. The body of the larva is light brown in both species, but the head is light brown in *N. bimaculatus* (Fig. 29), whereas it is black in *N. mirabilis* (Fig. 30) (Saito and Ibuki 2010).



Figures 5–8. Head, lateral view. 5 *Nipponorhynchus mirabilis* 6 *N. bimaculatus* 7 *N. brevis* 8 *Adelesta nova*.

***Nipponorbynchus brevis* Smith & Naito, sp. n.**

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Figs 3, 7, 11, 15, 17, 20, 25, 26

Description. Female: Length 4.3 mm. Antenna and head black; anterior half of clypeus light brown, labrum and upper surface of maxillolabial complex white; palpi and undersurface of maxillolabial complex black. Thorax black with tegula and posterior corners of pronotum white. Legs black with apices of coxae, trochanters, apical quarter of femora, most of tibiae except about apical quarter with black stripe on inner surface; tarsi mostly black with inner surface of first two tarsomeres paler to white. Abdomen black; apical tergum and cercus white. Wings hyaline; veins and stigma black. Head shiny but roughened with scattered fine punctures, denser on genae, postocellar area, clypeus, and above toruli. Thorax and abdomen shiny; posterior margin of mesoscutellum with several large punctures.

Antennal length 1.3× head width, with scape and pedicel each longer than broad; 3rd antennomere slightly longer than 4th, 4th to 9th antennomeres gradually decreasing in length. Clypeus slightly broadly, circularly emarginated, about 3× broader than long. Malar space about equal to diameter of median ocellus. Lower interocular distance 1.3× eye height; eyes only slightly converging below. Maxillolabial complex about 0.6× head width and about 1.3× eye height; maxillary palpus subequal to length of proboscis, longer than distance between maxillary palpus and labial palpus. Distances between eye and lateral ocellus, between lateral ocelli, and between lateral ocellus and hind margin of head as 1.0:0.8:0.5. Postocellar area 1.5× broader than long. Posttergite distinct, long, rounded behind. Tarsal claws simple. Hind basitarsomere subequal to length of following 3 tarsomeres combined. Pulvilli minute on tarsomeres 1–4. Sheath in lateral view straight above, rounded at apex and below (Fig. 17); from above, equally wide throughout. Lancet (Fig. 20) with about 10 spines on basal two annuli and single row of about 6 spines on remaining annuli.

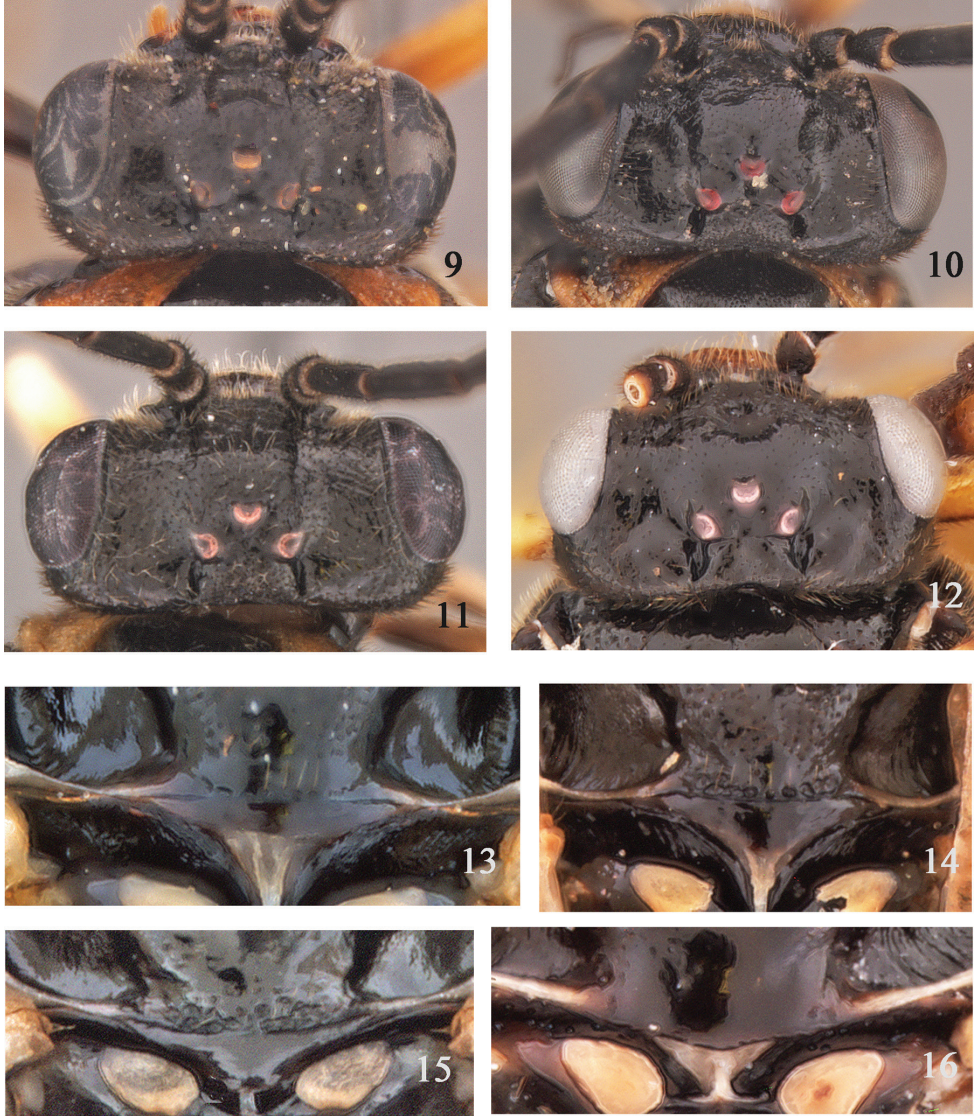
Male: Length 4.1 mm. Color and structure similar to female. Genitalia (Figs 25, 26) penis valve with valviceps elongate and rounded at apex, dorsal spine broad.

Type material. Holotype female “Japan: Hokkaido, Usubetsu, Sapporo, Ishikari, 42.9348°N, 141.1206°E, 29.IV–24.V.2012, small stream, Mal. trap, N. Kuhara” (NSMT). Paratypes: 4 ♀, 5 ♂, same data as holotype (NSMT, TN, USNM).

Distribution. Japan (Hokkaido).

Etymology. From the Latin *brevis*, meaning short, referring to the shorter mouthparts compared to the other species.

Comments. The new species is separated from both *N. mirabilis* and *N. bimaculatus* by its shorter mouthparts. In *N. mirabilis*, the mouthparts are about 1.3× head width and 3.0× eye height (Fig. 1) and in *N. bimaculatus*, the mouthparts are about 1.0–1.1× head width and 2.2× eye height (Fig. 2). In *Adelesta nova*, the mouthparts are about 0.3× head width and 0.4× eye height (Fig. 4). It is also separated from *N. mirabilis* by the long maxillary palpus, which is longer than the distance between the maxillary palpus and labial palpus, and the longer more triangular posttergite, and



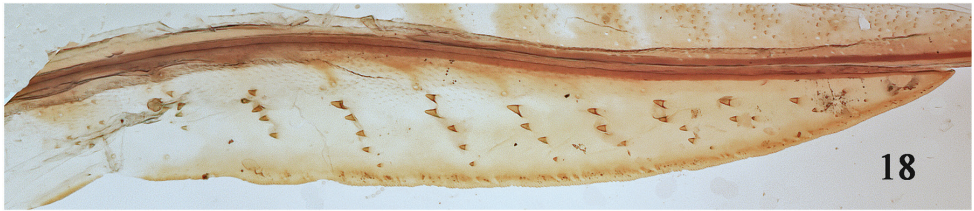
Figures 9–16. 9–12 Head, dorsal view. 13–16 Apex of mesonotum showing posttergite 9, 13 *Nipponorhynchus mirabilis* 10, 14 *N. bimaculatus* 11, 15 *N. brevis* 12, 16 *Adelesta nova*.

from *N. bimaculatus* by the finely punctate head, which is very shiny in *N. bimaculatus*. The female lancet and male genitalia appear close to *N. bimaculatus* (Figs. 19, 20, 23–26). In *N. brevis*, the lancet has the basal annuli more slanted and the annuli have fewer spines, and the male penis valve is more slender and has a broader dorsal spine. All females and males of *N. brevis* studied are of the same length.

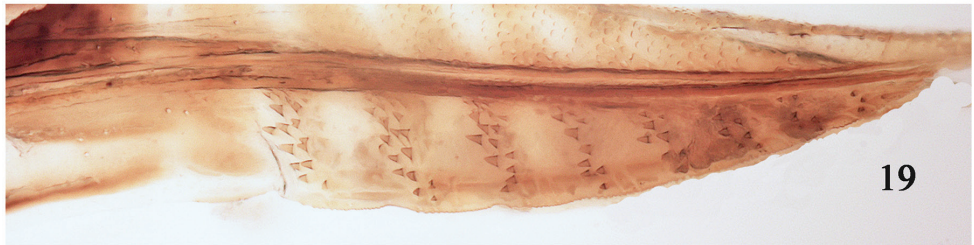
This is the first record of *Nipponorhynchus* from Hokkaido. The host plant is unknown.



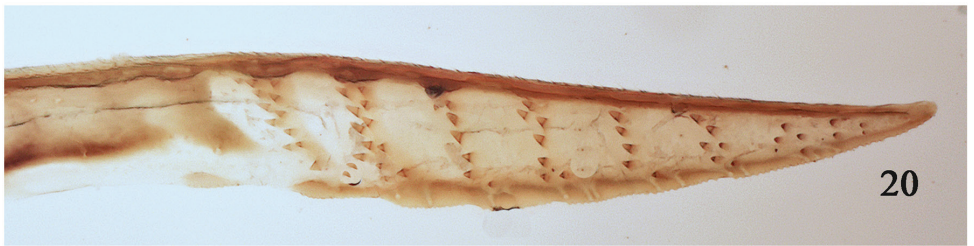
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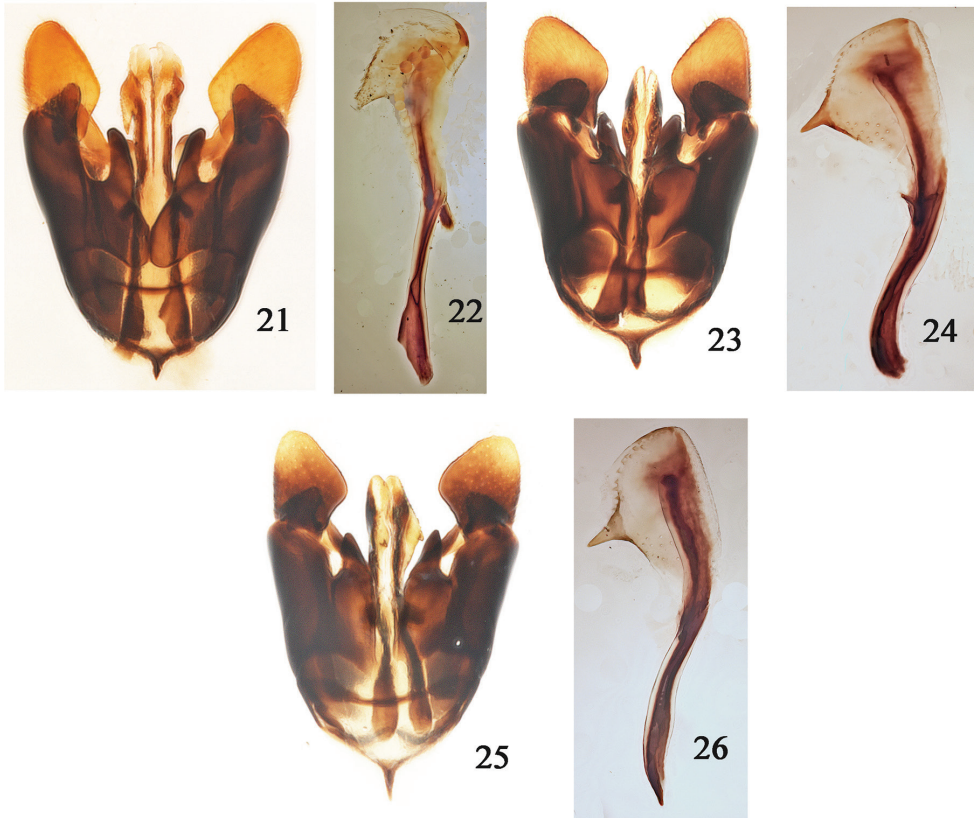


19



20

Figures 17-20. 17 *Nipponorhynchus brevis*, lateral view 18-20 Female lancets 18 *N. mirabilis* 19 *N. bimaculatus* 20 *N. brevis*.



Figures 21–26. Male genitalia. **21, 23, 25** Genital capsule, ventral view **22, 24, 26** Penis valve, lateral view **21, 22** *N. mirabilis* **23, 24** *N. bimaculatus* **25, 26** *N. brevis*.

***Nipponorhynchus mirabilis* Takeuchi**

Figs 1, 5, 9, 13, 18, 21, 22, 30, 31

Nipponorhynchus mirabilis Takeuchi, 1941: 233; Takeuchi and Tokunaga 1941: figs 1–7; Malaise 1963: 169, 213, figs 138–140; Naito 1973: 96, fig. 2; Jarvis and Vilhelmsen 2000: 134, fig. 5 (mouthparts).

Diagnosis. Head roughened, with punctures. Maxillolabial process about 1.4× head width and 3× eye height (Figs 1, 5). Malar space longer than diameter of median ocellus. Posttergite short, narrow, of equal width throughout (Fig. 13). Lancet with single row of annular spines, not more than 4 or 5 spines on basal annuli (Fig. 18). Male genitalia (Figs 21, 22) with valviceps of penis valve round.

Specimens examined. JAPAN: Mt. Ooginosen, Hyogo Pref., 900 m, 22.V.2006, T. Naito (3 ♀, 1 ♂); Hyogo Pref., Akazai-keikoku, 600 m, 21.IV.2008, T. Naito (2 ♂).

Distribution. Japan (Honshu).

Host and biological notes. The host and life history are similar to those of *N. bimaculatus*. The larva (Fig. 31) also feeds on *Chrysosplenium macrostemon* Maxim var. *shiobarense*, but *N. mirabilis* occurs somewhat earlier in the season, and the head of the larva is black (Fig. 30). See notes under *N. bimaculatus*.

Adelestini

Ross (1937) first proposed the family-group name Adelestinae, including only *Adelesta* described at the same time, with the single species *A. nova* (Norton, 1867). He differentiated the subfamily by the absence of the epicnemium, the posttergite not differentiated, propleurae with the mesal margins narrow and pointed, the distal anal cell of the forewing almost as long as the proximal anal cell, and 1r-m joining Rs near separation from R in the hind wing.

Benson (1938) did not agree with Ross, indicating that the characters Ross used did not justify a separate category because of fluctuating morphological characters in the Selandriinae. However, his treatment as “?Adelestini” left the door open to accepting it as a possible tribe.

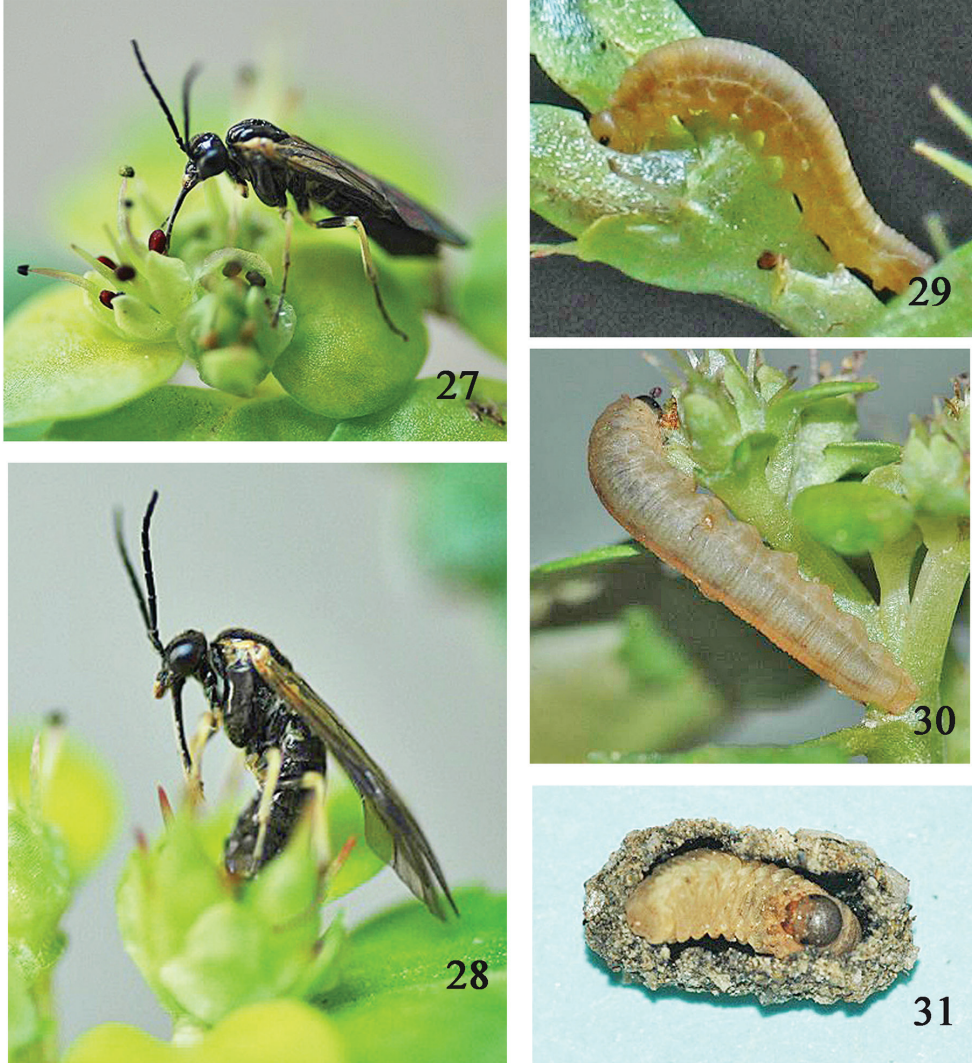
Takeuchi (1941) described *Nipponorhynchus* and Takeuchi and Tokunaga (1941) were the first to recognize that characters of *Adelesta* almost perfectly coincided with those of *Nipponorhynchus*. They placed both genera in Adelestini, one of three tribes in the Selandriinae. Their conclusion was based on Ross’ (1937) description of *Adelesta* and not on comparison of actual specimens. The main character for the tribe was the absence of an epicnemium on the anterior part of the mesopleuron.

Ross (1951) and Smith (1969, 1979) continued to recognize the tribe Adelestini, mainly characterized by the subserrate antennae, forewing with an anal crossvein, long distal anal cell and constriction of the basal anal cell of the forewing, absence of an epicnemium, and indistinctly defined posttergite on the mesoscutellum. Both authors based their concept only on *Adelesta*.

Malaise (1963) did not recognize tribes, but keyed *Adelesta* and *Nipponorhynchus* to the same couplet, separated from other genera by the scutellar appendage (posttergite) not differentiated or very narrow, front wings with short anal crossvein at about the middle of the anal cell, labrum narrow and triangular, and antennae filiform or, slightly serrated. He recognized *Adelesta* as having a very short perpendicular anal crossvein in the forewing and antennae stout with the pedicel about as long as wide and *Nipponorhynchus* with an oblique anal crossvein in the forewing and antenna slender with pedicel longer than wide. In addition, though not mentioned for *Adelesta*, he gave the elongated mouthparts and broadly emarginated propodeum as additional characters for *Nipponorhynchus*.

Naito (1975) proposed a phylogeny of some related genera in Selandriinae and concluded that *Nipponorhynchus* and *Adelesta* belong to a distinct clade. However, he did not assign tribal names.

Sinonerva, with the single species *S. albipes*, was described by Wei (1998). He compared *Sinonerva* with *Adelesta* and *Nipponorhynchus* and mentioned that *Sinonerva* differs from the two by the bidentate mandibles, second segment of the antenna longer



Figures 27–31. *Nipponorhynchus* spp. and the host plant, *Chrysozplenium macrostemon* var. *shiobarense*. **27** *N. bimaculatus*, adult drinking honey of the host plant **28** *N. bimaculatus* adult female ovipositing into a seed capsule of the host plant **29** *N. bimaculatus* larva eating young seeds of host plant **30** *N. mirabilis*, larva eating young seeds of host plant **31** *N. mirabilis* pupa in cocoon in soil.

than wide, developed epicnemium and posttergite, tarsal claws with a long inner tooth and small basal lobe, and the hind wing with cell Rs remote from vein Sc+R and the anal cell shortly petiolate. Later, Wei and Nie (1998) placed *Sinonerva* in the Adelestini with *Adelesta* and *Nipponorhynchus*. We have not seen *Sinonerva*, but it differs from *Adelesta* and *Nipponorhynchus* in several ways. The latter two genera have tridentate mandibles, antenna with flagellum gradually reduced towards apex, epicnemium absent, tarsal claws simple, and cell Rs in hind wing elongate and very near or touching vein Sc+R. Thus, we do not include *Sinonerva* in Adelestini.

We continue to recognize the Adelestini as a category in Selandriinae, separated from other Selandriinae by the presence of a short almost perpendicular anal cell in the forewing near the center of the anal cell, absence of an epicneium, an elongated maxillolabial process (the long proboscis), tridentate mandibles, lateral halves of first tergum widely separated on the meson thus exposing a broad membranous area, and simple tarsal claws. The indistinct posttergite, as mentioned by Ross (1937), Malaise (1963), and Smith (1969), is present only in *Adelesta*; it is well developed in *Nipponorhynchus*. Though not mentioned by previous authors, *Adelesta* does have somewhat elongated mouthparts, though not nearly as long as those in *Nipponorhynchus*. Though we see a gradient from the short proboscis in *Adelesta nova* to the unusually elongated proboscis in *Nipponorhynchus mirabilis*, and *Adelesta* and *Nipponorhynchus* share many characters in common, they can still be distinguished from each other by the shape of the posttergite, length of the mouthparts, antennae, placement of the anal crossvein in the forewing, and the shape of clypeus, and we choose to continue to keep them separate. The two genera and species can be separated by the following key.

Key to genera and species of Adelestini

- 1 Posttergite very narrow, of equal width throughout (Fig. 16); mouthparts short, less than eye length and about 0.3× head width (Figs 4, 8); apical labial palpomeres enlarged, palpi appear capitate; anal cell of forewing perpendicular, placed basally of the middle of the anal cell; antenna stout, antennomeres 4–9 at most 2× longer than broad; clypeus about 2× broader than long; eastern North America *Adelesta nova*
- Posttergite distinct, long, longer at center than at sides (Figs 13–15); mouthparts exceptionally developed, half or more head width and longer than eye height (Figs 1–3, 5–7); labial palpomeres about equal in size; anal cell of forewing slightly slanted, placed at center of anal cell; antenna slender, antennomeres 4–9 more than 2× longer than broad; clypeus about 3× broader than long; Japan; *Nipponorhynchus*..... **2**
- 2 Maxillolabial complex short, about 0.6× head width and about 1.3× eye height (Figs 3, 7); maxillary palpus long, longer than distance between maxillary palpus and labial palpus *N. brevis*
- Maxillolabial complex longer, 1.1 to 1.4× head width and 2× or more eye height (Figs 1, 2, 5, 6); length of maxillary palpus various **3**
- 3 Posttergite long, triangular, longer at center than at sides (Fig. 14); head shiny; maxillolabial process subequal to head width and about 2× eye height (Figs 2, 6); malar space about equal to diameter of median ocellus *N. bimaculatus*
- Posttergite short, narrow, of equal width throughout (Fig. 13); head roughened, with punctures; maxillolabial complex about 1.4× head width and 3× eye height (Figs 1, 5); malar space longer than diameter of median ocellus..... *N. mirabilis*

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