

Taxonomic notes on the paper wasps of the subgenus *Polistes* (*Gyrostoma*) (Hymenoptera, Vespidae, Polistinae) occurring in Vietnam, with description of a new species

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Abstract

Taxonomy of the paper wasps of the subgenus *Gyrostoma* of the polistine genus *Polistes* from Vietnam is treated, with a key to all the five species occurring in Vietnam, including one described herein as new to science under the name *Polistes longus* **sp. nov.** Nests of *P. gigas* and *P. longus* **sp. nov.** are also described.

Keywords

Polistes, *Gyrostoma*, distribution record, key, nest description, new species

Introduction

The paper wasp genus *Polistes*, with more than 200 species worldwide, is divided into four subgenera (Carpenter 1996a). The subgenera *Gyrostoma* Kirby 1828, *Polistella* Ashmead 1904, and *Polistes* Latreille 1802 are distributed in the Old World (including

Australasia), and a few species of the subgenera *Gyrostoma* and *Polistes* s. str. have been accidentally introduced into the New World; the subgenus *Aphanilopterus* Meunier 1888 is distributed exclusively in the New World. Of the three Old World subgenera, *Gyrostoma* presently has 22 species, of which four have been recorded from Vietnam: *P. gigas* Kirby, 1826, *P. olivaceus* (DeGeer, 1773), *P. rothneyi* Cameron (1900) and *P. tenebricosus* Lepeletier, 1836 (Nguyen and Kojima 2013).

In this paper, based on specimens deposited in the Institute of Ecology and Biological Resources (IEBR), a taxonomic study on the subgenus *Gyrostoma* from Vietnam is presented: a species is described as new to science together with its nest, and the nest of another species is also described.

Methods

All material including the holotype of the new species is deposited in the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam. The adult morphological and color characters were observed using pinned and dried specimens under a stereoscopic microscope. Measurements of body parts were made with an ocular micrometer attached to the microscope. “Body length” indicates the length of head, mesosoma and the first two metasomal segments combined. The parts measured for the morphometric characters referred to in the descriptions are defined as in Nguyen et al. (2011). Photographic images were made with Nikon SMZ 800N Digital Stereo Microscope, using Helicon Focus 7 software; the plates were edited with Photoshop CS6.

In the descriptions of adult morphology, the following abbreviations are used: The abbreviations F, S and T refer to numbered flagellomeres, metasomal sterna and metasomal terga, respectively; POD, distance between the inner margins of the posterior ocelli; OOD, distance between the outer margin of the posterior ocellus and the inner margin of the eye at vertex; Od, transverse diameter of a posterior ocellus; IED-c and ISD-c refer to collectors of the Insect Ecology Department and Insect Systematic Department, IEBR.

Taxonomic accounts

Subgenus *Gyrostoma* Kirby

(1) *Polistes gigas* (Kirby)

Figs 1–3, 19, 20

Cyclostoma gigas Kirby, 1826, 1, 3: 36.

Polistes gigas: Sonan, 1943, 33: 469.

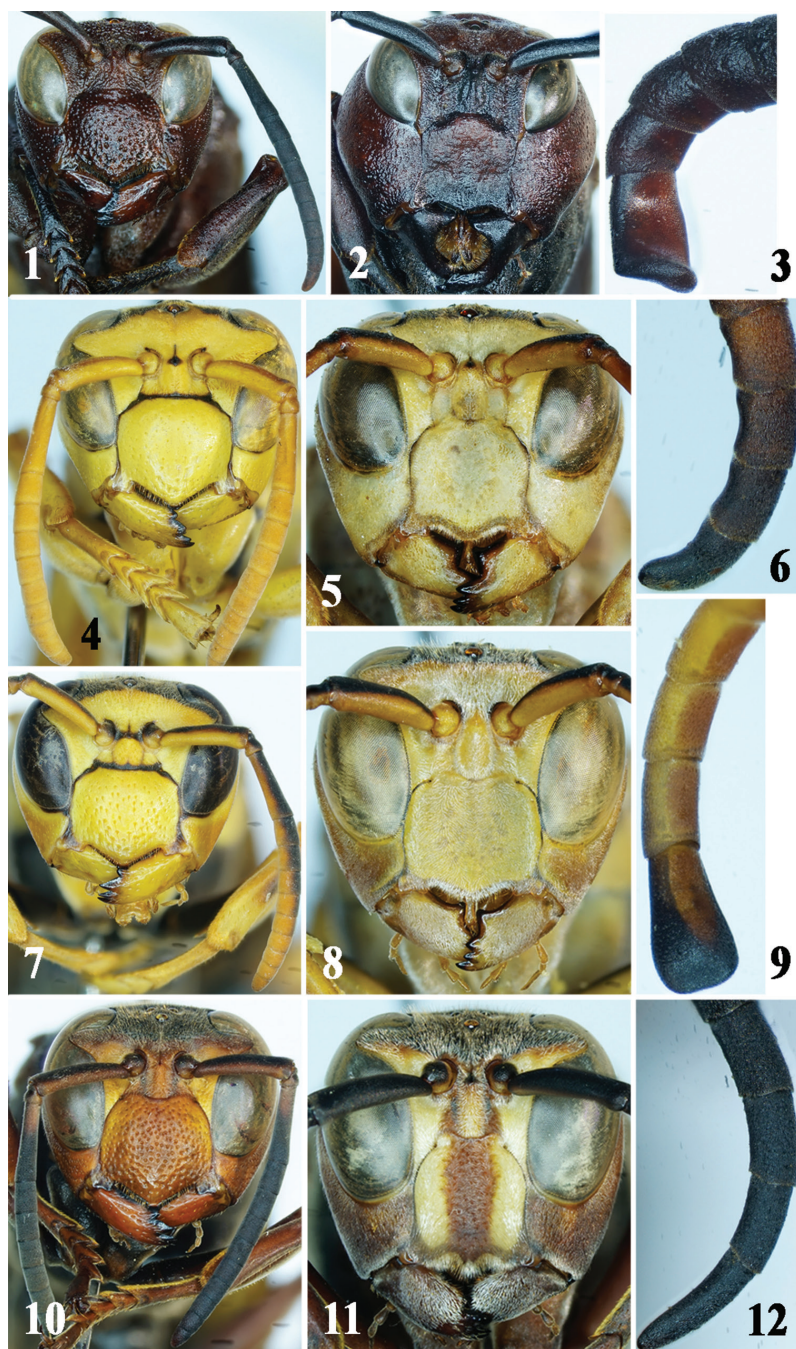
Notes. This is the biggest species among polistine wasps, with female body length being about 25–30 mm, and male body length even bigger, about 32–35 mm. Its distribution is restricted to one area in the northeastern part of India (Sikkim),

southern China including Hong Kong, and Taiwan (Das and Gupta 1989; Tan et al. 2014). In Vietnam, this species has been recorded from many localities in the northern part of the country (Nguyen et al. 2005). In this study, some new localities in the northern part are added to the distribution range of the species, and a record of one locality in the southern part is also added.

Material examined. VIETNAM. Cao Bang [2 ♀, Nguyen Binh, Thanh Cong, 22°34'14.2"N, 105°52'51.7"E, 9 Aug. 2012, J Kojima, H Nugroho & IED-c leg.; 2 ♀, Nguyen Binh, Thanh Cong, 23°32'29"N, 105°52'52.7"E, 8 Aug. 2012, J Kojima, H Nugroho & IED-c leg.; 1 ♀, Nguyen Binh, Thanh Cong, 23°32'37"N, 105°52'10.4"E, 7 Aug. 2012, J Kojima, H Nugroho & IED-c leg.; 6 ♀, Nguyen Binh, Tam Kim, Na Va, 22°36'17"N, 106°01'47"E, alt. 320m, 18 Oct. 2015, LPT Nguyen, DD Nguyen, MP Nguyen leg.; 1 ♀, Nguyen Binh, Thanh Cong, Phia Oac, 11 Aug. 2012, ISD-c leg.; 2 ♀, Trung Khanh, Dam Thuy, Nguom Ngao cave, 28 Apr. 2015, LPT Nguyen leg.]; 1 ♀, Bac Kan. Na Ri, Lan San, Kim Hy NR, 3 Jun. 2014, 22°14'N, 106°5'E, SV Tran leg.; 1 ♀, Thai Nguyen, Dai Tu, Phuc Xuyen, 23 Apr. 2012, LD Khuat leg.; 1 ♀, Thai Nguyen, Dai Tu, 29 Sep. 2006, LD Khuat leg.; 3 ♀, Phu Tho, Xuan Son NP, alt. 500–600 m, 12–13 Jun. 2004, LTP Nguyen leg.; 1 ♀, Thai Nguyen, Xuan Dai, Tan Son, 20 May 2011, HP Pham leg.; Bac Giang [5 ♀, Son Dong, An Lac, Keo Vang, 21°18'46"N, 106°56'E, 4 Jun. 2014, LTP Nguyen, DD Nguyen, DD Tran leg.; 1 ♀, Son Dong, Tuan Dao, Khe Dan, Tay Yen Tu NR, 4 Jul. 2010, DD Tran leg.; 1 ♀, Son Dong, Khe Vang, 16 May 2013, DD Nguyen leg.; 1 ♀, Son Dong, An Lac, Dong Bay, 12 Aug. 2012, J Kojima, H Nugroho & IED-c leg.]; 1 ♀, Quang Ninh, Yen Tu mountain, 4 Mar. 2002, LPT Nguyen leg.; Hoa Binh [1 ♀, Yen Thuy, Da Phuc, 27 Apr. 2012, HT Dang leg.; 1 ♀, Mai Chau, Chieng Chau, Lac village, alt. 600m, 10 Jun. 2008, LPT Nguyen & PH Pham leg.; Ha Noi [1 ♀, Ba Vi, Van Hoa, 03 Jun. 2001, LPT Nguyen leg.; 3 ♀, Ba Vi, Yen Bai, Suoi Mo, alt. 100 m, 01 Jun. 2001, LPT Nguyen leg.]; Hai Phong [4 ♀, Cat Ba NP, 20°47'58"N, 106°59'93"E, Nest#-CB-2013-Po-01, 26 Jul. 2013, LTP Nguyen leg.; 1 ♀, Cat Ba NP, 10 Jun. 2003, DL Khuat leg.]; Vinh Phuc [1 ♀, Me Linh, Ngoc Thanh, 02 Aug. 2000, LX Truong leg.; 6 ♀, Tam Dao NP, 2005, 21°26'N, 105°37'E, alt. 400 m, 20 Aug., J. Kojima leg.; 1 ♀, Me Linh, Ngoc Thanh, 13 Jun. 2001, LX Truong leg.; 8 ♀, Tam Dao, alt. 900–1200m, 30 Jul.-3 Aug. 2012, DT Tran leg.; 6 ♀, 21 ♂, Phuc Yen, Me Linh, Nest# 2012-ML-P-01, 11 Nov. 2012, J Kojima, DT Dang & LPT Nguyen leg.]; Thanh Hoa, Thuong Xuan, Van Xuan, Hon Can, Xuan Lien NR [1 ♀, 23–24 Aug. 2012, LPT Nguyen & TV Hoang leg.; 1 ♀, 19°51'41.2"N, 105°14'6"E, alt. 175 m, 27 Aug. 2012, LPT Nguyen leg.]; 1 ♀, Nghe An, Con Cuong, Khe Bu, 16 Apr. 2006, ISD-c leg., light trap; 1 ♀, Ha Tinh, Huong Son, Son Kim, alt. 400 m, 06 May 2004, LPT Nguyen leg.; 1 ♀, Quang Binh, Quang Ninh, Truong Son, U Bo, alt. 650–800 m, 10 Jun. 2006, LTP Nguyen leg.; 1 ♀, Thua Thien Hue, Phu Loc, Bach Ma NP, 30 May 2001, LD Khuat leg.; 1 ♀, Quang Nam, Dong Giang, Macoih, 27 May 2006, ISD-c leg.

Distribution. India: Sikkim; southern China; Vietnam.

Nest. A nest (Nest# 2012-ML-P-01) collected in Me Linh station, Vinh Phuc on 11 November 2012 was examined. The nest (Fig. 19) was collected inside an old toilet, on the wall about 2 m from the ground, together with 8 females and 25 males.



Figures 1–12. *Gyrostoma* species. 1–3 *Polistes gigas* 1 female head, frontal view 2 male head, frontal view 3 antennal flagellomeres 1–4. 4–6 *Polistes olivaceus* 4 female head, frontal view 5 male head, frontal view 6 antennal flagellomeres 1–4. 7–9 *Polistes rothneyi* 7 female head, frontal view 8 male head, frontal view 9 antennal flagellomeres 1–4. 10–12 *Polistes tenebricosus* 10 female head, frontal view 11 male head, frontal view 12 Antennal flagellomeres 1–4.

Nest structural characters are as follows. Single comb, nearly round in shape with diameter of the comb nearly 10cm and 10cm in height, tough paper-like in texture, bicoloured, almost all dark brown mixed with reddish gray, expanded from the petiole to form fan-shape in ventral view, with dorsal surface slightly concave. One-third of the cell length from the bottom at outside covered with sharp thorns (Fig. 20). The cell where the petiole is placed is longest, about 88 mm in length, and the length of the other two next cells is 71 mm (while only 51.8 mm and 45.5 mm deep respectively). Outside of those cells with a fold at about one-third of the length from the bottom implying that the wasps may have reused the nest. Petiole single, terminal, with thick central core of plant fibers, 8.7 mm long and 4.6×4.7 mm thick. Cells generally arranged in regular rows, round at open end; cell gradually expanded towards open end, 8.4 mm (range 7.0–10.3; $n=10$) wide at bottom and 14.8 mm (rang 13.5–16.7; $n = 10$) wide at open end, 49.7 mm (range 43.6–52.9; $n=10$) deep; cell wall about 0.25 mm thick; cocoon cap strongly domed beyond level of cell opening, whitish gray.

(2) *Polistes olivaceus* (DeGeer)

Figs 4–6

Vespa olivacea DeGeer, 1773, 3: 582.

Polistes olivaceus: de Saussure, 1853: 89.

Notes. This species has been recorded from Vietnam (Das and Gupta 1984; Carpenter 1996b) but the details of localities were not given. Later, the species was recorded from provinces in the northeastern part of the country such as Ha Giang, Cao Bang, Tuyen Quang, Bac Kan, Thai Nguyen, Lang Son and Bac Giang (Nguyen et al. 2015, Nguyen 2016). The present study gives records from some localities in the northern part including the northwestern part, and a single locality in the southern part of the country.

Material examined. VIETNAM. 1 ♀, Dien Bien, Dien Bien city market, 25 Aug. 2006, LTP Nguyen, F Saito & J Kojima leg.; Lao Cai [10 ♀, Bao Yen, Thuong Ha, Nest # VN-P-2006-1, 18 Aug. 2006, LTP Nguyen, F Saito & J Kojima leg.; 11 ♀, Nam Cuong, alt. 120 m, 19 Aug. 2006, LTP Nguyen, F Saito & J Kojima leg.]; 2 ♀, Yen Bai, Yen Bai city, 18 Aug. 2006, LTP Nguyen, F Saito & J Kojima leg.; 1 ♀, Son La, To Hieu farm, 7 Sep. 1993, XL Truong leg.; Vinh Phuc [1 ♀, Tam Dao NP, 21°27'N, 105°38'E, alt. 890 m, 4 May 2000, JM Carpenter leg.; Tam Dao, Me Linh, Ngoc Thanh [2 ♀, 20 Jul. 2000, DL Khuat leg.; 1 ♀, 24 May 2000, LTP Nguyen leg.]; 1 ♀, Tam Dao, Tam Dao NP, alt. <50 m, 21 Aug. 2005, LTP Nguyen & J Kojima leg.; Hanoi [2 ♀, Cau Giay, Nghia Do, 29 May 2000, LTP Nguyen leg.; 2 ♂, 23 ♀, Cau Giay, Nghia Do, Nest# VN-P-2005-1, 1 Aug. 2005, LTP Nguyen & J Kojima leg.; 9 ♀, Thong Nhat park, 7 Sep. 2006, J Kojima leg.; 1 ♀, Quoc Oai, 14 Aug. 1998, XL Truong leg.; 1 ♀, Ba Vi, Van Hoa, Yen Bai, 15 Aug. 2006; ISD-c leg.; 1 ♀, Thuong Tin, 11 Jul. 2005, XT Nguyen leg.]; Hoa Binh, Yen Thuy [1 ♀, Lac Thinh, 30 Apr. 2002, DL Khuat leg.; 4 ♂, Da Phuc, 30 Aug. 2000, LTP Nguyen; 5 ♀, Da Phuc,

5 Jul. 2000, XL Truong leg.; 1 ♀, Bao Hieu, 9 Aug. 2000, LTP Nguyen leg.; Lac Thinh, 6 May 2002, VT Hoang leg.]; Nghe An [2 ♀, Khe Bo, 19°03'N, 104°43'E, alt. 120 m, 25–28 Apr. 1998, JM Carpenter leg.; 2 ♀, Con Cuong, Mon Son, Pha Lay, 11 Mar. 2002; 5 ♀, Con Cuong, Mon Son, Bung village, 7–9 Sep. 2005; 2 ♀, Pu Mat NP office, 17 Nov. 2005; 1 ♀, Con Cuong, Khe Bu, 16 Jul. 2006; 1 ♀, Co Phat, alt. 200 m, 22 Jul. 2006; 2 ♀, Chau Khe, Khe Choang, 14 Jul. 2005, leg. ISD-c; 4 ♀, Pu Mat NP office, 21 Jul. 2004], LTP Nguyen leg.; 1 ♀, Con Cuong, Mon Son, 22–24 Jul. 2004, LTP Nguyen leg.; 4 ♀, Quang Binh, Bo Trach, 17 Aug. 2005, LTP Nguyen & J Kojima leg.; 9 ♀, Thua Thien Hue, Hue City, 16 Aug. 2005, LTP Nguyen & J Kojima leg.; 1 ♀, Kien Giang, U Minh Thuong NP, 30 Sep. 2003, LTP Nguyen leg.

Distribution. Madagascar; Réunion; Mauritius (including Chagos Archipelago); Tanzania: Zanzibar; Seychelles (including Amirantes); Egypt; Oman; Iran; Afghanistan; India: Gujarat, Rajasthan, Jammu and Kashmir, Jharkhand, Assam, Himachal Pradesh, Arunachal Pradesh, Karnataka, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Odisha, Manipur, Meghalaya, Nagaland, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal; Sri Lanka; Nepal; Myanmar; China; ? Japan: Okinawa; Vietnam; Laos; Cambodia; Thailand; Malaysia; Singapore; ? Indonesia: Kalimantan; Marianas; New Caledonia; Fiji; Tonga; Samoa; French Polynesia: Tahiti, Tuamotu Archipelago, Marquesas; adventive in Chile: Easter Is.; U.S.A.: Hawaii; Australia: Queensland; New Zealand.

(3) *Polistes rothneyi* Cameron

Figs 7–9, 23, 24

Polistes rothneyi Cameron, 1900, (7) 6: 410.

Notes. In Vietnam, van der Vecht (1968) recorded this species from a single locality in the southern part of the country. The species has been recorded from some provinces in the northern part such as Ha Giang, Cao Bang, Bac Kan, and Lang Son (Nguyen et al. 2015, Nguyen 2016). This study adds records from other localities in the northern part of the country, and one southern record has been also added.

In previous study in Vietnam, this species has only one color form and it agrees with the color form that van der Vecht (1968: 106) referred to as subspecies *quatei* (Fig. 23). In this study, the specimens from the southern part of the country have ground color darker than the specimens from the northern part (Fig. 24).

Material examined. VIETNAM. Cao Bang [2 ♀, Nguyen Binh, Phia Oac NR, alt. 1590 m, 23°02'49"N, 104°59'35.6"E, 5 Nov. 2016, NN Tran, MP Nguyen, TV Luong leg.; 1 ♀, Nguyen Binh, Thanh Cong, Phia Oac, 11 Aug. 2012, leg. ISD-c leg.; 3 ♀, Nguyen Binh, Thanh Cong, 22°32'37"N, 105°52'10.4"E, 7 Aug. 2012, J Kojima, H Nugroho & IED-c leg.; 1 ♀, Bang Giang river, 21 Aug. 2001, XL Truong leg.]; Lang Son [1 ♀, Bac Son, 1 Jul. 2003, XL Truong leg.; 1 ♀, Huu Lung, Cai Kinh, alt. 85m, 16 Jul. 2016, 20°31'37.6"N, 105°00'24.2"E, LPT Nguyen, DD Nguyen, NT Tran leg.]; Bac Giang [1 ♀, Son Dong, Khe Ro, 18 May 2013, DD Nguyen leg.; 1 ♀, Son Dong, Thanh Son, alt. 300m, 1 Jul. 2010, HP Pham leg.]; 3 ♀, Ha Noi, Ba Vi, 16 Jun. 2016,

TV Tran leg.; 4 ♀, Phu Tho, Xuan Son NP, alt. 400 m, 12–13 Jun. 2004, LTP Nguyen leg.; Vinh Phuc [3 ♀, Tam Dao NP, alt. 800 m, 01 Jul. 2003, LTP Nguyen leg.; 6 ♂, 7 ♀, Tam Dao NP, alt. 900 m, 21 Aug. 2005, LTP Nguyen & J Kojima leg.; 26 ♂, Tam Dao NP, alt. 800 m, Nest# VN-P-2006-19, 1 Sep. 2006, F Saito & J Kojima leg.; Hoa Binh, Mai Chau, Pa Co [1 ♀, alt. 1100 m, 28 Apr. 2002; ISD-c leg.; 1 ♀, alt. 900 m, 1 Aug. 2004, XL Truong leg.]; 1 ♀, Hoa Binh, Yen Thuy, 1 May 2002, VT Hoang leg.; 1 ♀, Ninh Binh, Cuc Phuong NP, 8 May 2002, VT Hoang leg.; 1 ♀, Nghe An, Quy Hop, Chau Thanh, 16 Jul. 2004, XH Le leg.; 4 ♀, Gia Lai, Kon Chu Rang NR, Son Lang, Kbang, 14°28'27"N, 108°32'24.3"E, alt. 830 m, 13 Apr. 2015, LTP Nguyen leg.

Distribution. Pakistan; Nepal; India: Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh; Uttarakhand, West Bengal, Sikkim, Bihar, Assam, Delhi, Karnataka, Kerala, Tamil Nadu, Manipur, Meghalaya; Laos; Malaysia; Myanmar; Vietnam; Indonesia: Sumatra, Java; China; Japan; Korea.

(4) *Polistes tenebricosus* Lepeletier

Figs 10–12, 25, 26

Polistes tenebricosus Lepeletier, 1836, 1: 529.

Notes. This species has been recorded from the northern part of Vietnam (Nguyen et al. 2005) (Fig. 25). Specimens from the southern part are examined, which are new records for that region of the country. Those specimens have the metasoma more yellow than the specimens from the northern part (Fig. 26).

Material examined. VIETNAM. 1 ♀, Bac Kan, Ba Be NP, 17 Jul. 2004, DH Nguyen leg.; Bac Giang [2 ♀, Son Dong, Khe Vang, 16 May 2013, DD Nguyen leg.; 1 ♀, Son Dong, Thanh Son, alt. 300 m, 1 Jul. 2010, HP Pham leg.]; 5 ♀, Phu Tho, Xuan Son NP, alt. 400–600 m, 12–16 Jun. 2004, LTP Nguyen leg.; Vinh Phuc [1 ♀, Tam Dao NP, alt. 1000 m, 3 Jul. 2003, LTP Nguyen leg.; 1 ♀, Tam Dao NP, alt. 900 m, 19 Aug. 2005, LTP Nguyen & J Kojima leg.; 7 ♀, Tam Dao NP, Nest # VN-P-2006-18, alt. 800 m, 31 Aug. 2006, F Saito & J Kojima leg.]; Hoa Binh [1 ♀, Yen Thuy, Lac Thinh, alt. 130 m, 30 Apr. 2002, DL Khuat leg.; 3 ♀, Kim Boi, Thuong Tien, 5 Aug. 2012, LD Khuat leg.]; 2 ♀, Thanh Hoa, Thuong Xuan, Van Xuan, Hon Can, Xuan Lien NP, 23 Aug. 2012, LTP Nguyen leg.; Nghe An [1 ♀, Con Cuong, Mon Son, 22–24 Jul. 2004, LTP Nguyen leg.; 1 ♀, Quy Hop, Chau Cuong, 14–19 Jul. 2004, XH Le leg.; 1 ♀, Ha Tinh, Huong Son, 18°21'N 106°15'E, alt. 450 m, 14–21 Apr. 1998, Malaise Trap, J M Carpenter, DL Khuat, Grimaldi, Herman, Silva leg.; 1 f#, Quang Nam, Dong Giang, Prao district, alt. 500–600 m, 28 May 2006, ISD-c leg.; 1 ♀, Gia Lai, Mang Yang, A Yun, Kon Ka Kinh NP, alt. 881 m, 04 Jun. 2011, ISD-c leg.; 2 ♀, Ninh Thuan, Ngoan Muc pass, 4 Aug. 2005, LTP Nguyen & J Kojima leg..

Distribution. India: Jammu and Kashmir, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Assam, Meghalaya, Mizoram, Nagaland, Tripura; Nepal; China; Vietnam; Myanmar; Indonesia: Sumatra, Java, Bali, Lombok, Flores, Sumba, Kalimantan; Sulawesi; Philippines: Negros, Sibuyan.

(5) *Polistes longus* Nguyen & Carpenter, sp. nov.<http://zoobank.org/AEFFF8F9-6207-4C73-9BE6-175D9E45C8F1>

Figs 13–18, 21, 22

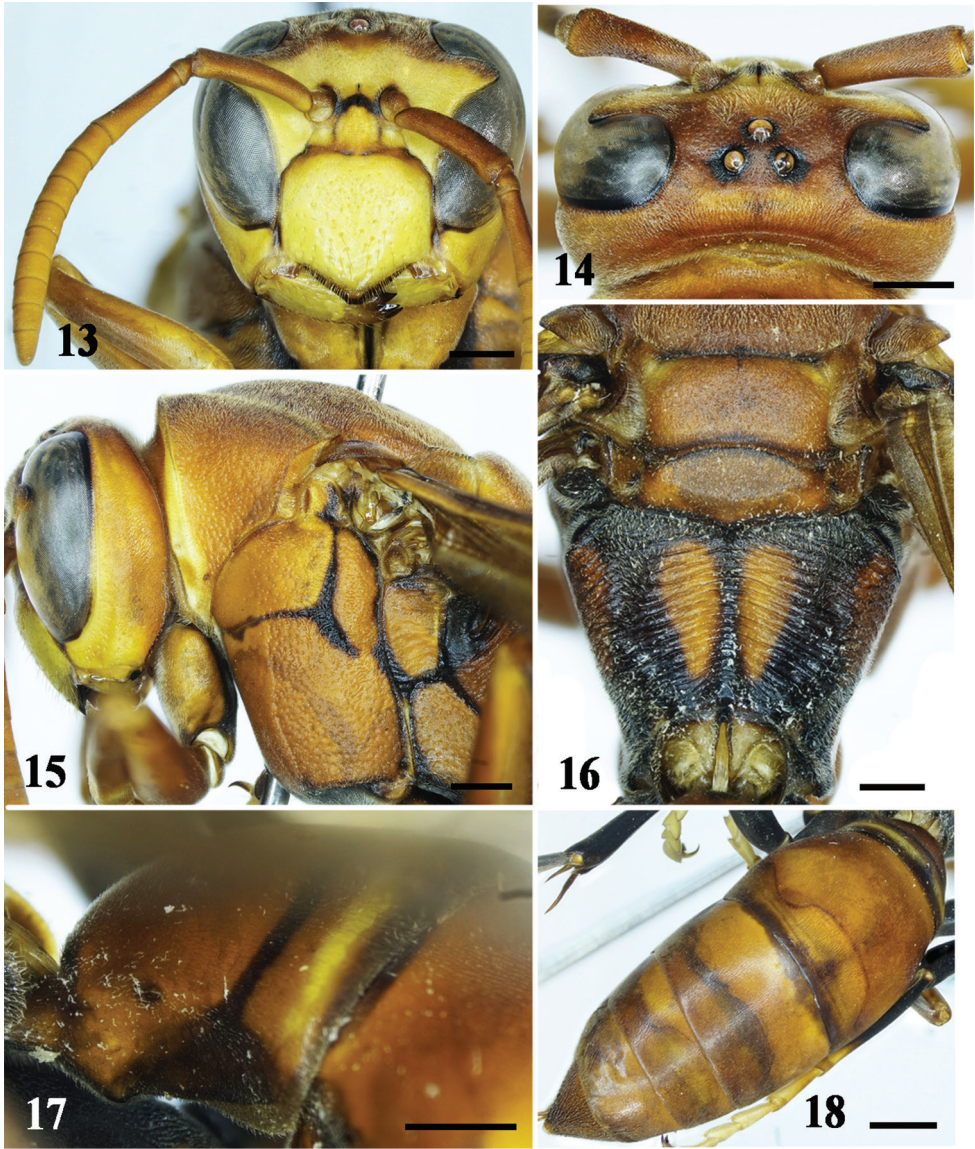
Material examined. Holotype, ♀, Vietnam: Ia Pal, Chu Se, Gia Lai, 13°39'46.2"N, 108°08'04.2"E, alt. 370 m, Nest#2012-TN-P-04, 25 Jul. 2012, LTP Nguyen leg., deposited in IEBR. Paratypes: 30 ♀, same data as holotype.

Other material examined. 3 ♀, Binh Thuan, Ham Thuan Nam, 10°51'07.7"N, 109°53'59.8"E, 11 Aug. 2005, LTP Nguyen & J Kojima leg.; 2 ♀ Kon Tum, Kon Tum City, 20 Jul. 2012, LPT Nguyen leg.; Gia Lai [10 ♀, Ia Pal, Chu Se, 13°39'46.2"N, 108°08'04.2"E, alt. 370 m, Nest#2012-TN-P-04, 3 ♀, Ia Pal, Chu Se, 21–25 Jul. 2012, ISD-c leg.; 3 ♀, Chu Se, 14 Apr. 2013, LTP Nguyen leg.; 1 ♀, Ayun Pa, Ia Rto, 13°21'49.6"N, 108°30'06.4"E, alt. 200 m, 1 May 2016, LPT Nguyen, DD Nguyen, NT Tran leg.; 8 ♀, Chu Se, Ia Pal, 13°39'46.2"N, 108°08'04.2"E, alt. 370 m, 21 Jul. 2012, LTP Nguyen leg.]; 1 ♀, Dak Lak, Nam N Jang, 24 Jul. 2012, ISD-c leg.

Description. Female. Body length 17.7–19.5 mm (holotype 19 mm); fore wing length 19.5–21.5 mm (holotype 21 mm).

Head in frontal view about $1.12 \times$ as wide as high (Fig. 13); in dorsal view weakly swollen laterally behind eyes, then narrowed posteriorly, with posterior margin shallowly and broadly emarginate. Vertex (Fig. 14) slightly raised in area among ocelli, slightly sloped down behind posterior ocelli towards occipital carina; POD: OOD = about 1:1.7; POD about 1.5 times Od. Gena wider than eye, in lateral view $1.2 \times$ as wide as eye (Fig. 15). Occipital carina complete, clearly present along entire length of gena. Inner eye margins slightly convergent ventrally, in frontal view distance of inner eye margins at clypeus $1.1 \times$ than those at vertex (Fig. 13). Antennal sockets closer to inner eye margin than to each other; anterior tentorial pit slightly further apart from inner eye margin than from antennal socket; interantennal space strongly raised. Clypeus in frontal view (Fig. 13) nearly as wide as high, produced ventrally into blunt angle, in lateral view weakly swollen anteriorly (Fig. 15); length of lateral margin of clypeus lying along inner eye margin longer than diameter of antennal socket and slightly shorter than the length of malar space. Antennal scape $3 \times$ as long as its maximum width; FI $3.1 \times$ as long as its maximum width, FII–IV as long as wide, FV–IX wider than long, FX bullet-shaped, $1.3 \times$ as long as its basal width.

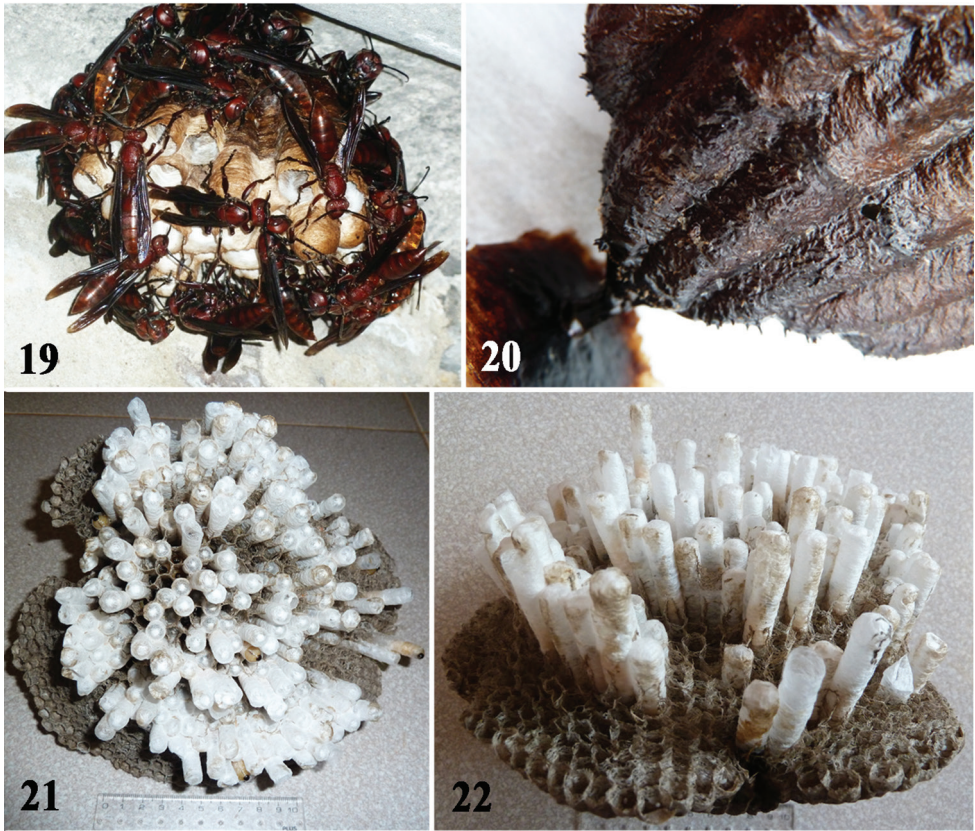
Pronotal carina raised, produced dorsally into lamella in dorsal part, slightly sinuate backward on lateral side, reaching ventral corner of pronotum. Mesoscutum in lateral view weakly convex, about $1.16 \times$ as long as wide between tegulae; anterior margin broadly rounded. Scutellum flattened, slightly depressed in the middle, in lateral view slightly higher at the level of mesoscutum, strongly depressed along anterior margin. Metanotum weakly convex, disc nearly flat but strongly depressed anterior margin. Propodeum short (Fig. 16); posterior face narrowly (about one third the maximum width of propodeum) and strongly excavated medially, more or less smoothly passing into lateral faces; propodeal orifice elongate, about 2.8 times as long as wide (measured at widest part), somewhat narrowed in dorsal half. Wings hyaline.



Figures 13–18. *Polistes longus* sp. nov., holotype female **13** head, frontal view **14** head, lateral view **15** vertex, dorsal view **16** propodeum, dorsal view **17** T1, lateral view **18** abdomen, dorsal view. Scale bars: 1 mm.

TI short and thick, about 0.9 times as long as its apical width, in lateral view abruptly swollen dorsally just behind basal slit for reception of propodeal suspensory ligament; corner between anterior and dorsal faces bluntly angled (Fig. 17). SII in lateral view swollen ventrally in smoothly curved line from base to apical margin.

Clypeus with scattered large punctures, each bearing sharply pointed golden bristle. Mandible with several small and shallow punctures at base and deep punctures at anterior margin. Frons covered with small and shallow punctures. Vertex and gena with minute punctures, area around ocelli with minute punctures; ventral one third



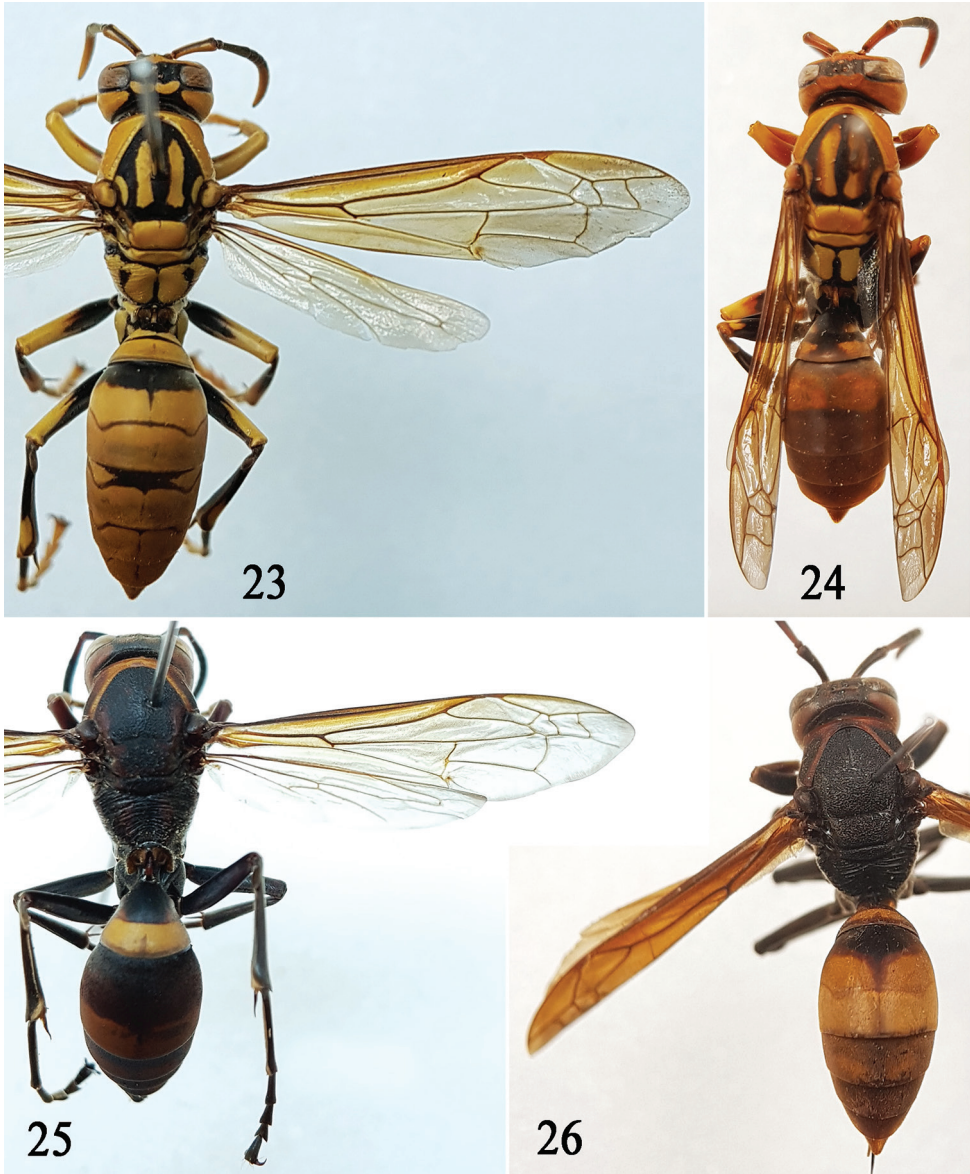
Figures 19–22. Nest of *Gyrostoma* species. **19, 20** Nest of *P. gigas* **21, 22** Nest of *P. longus* sp. nov.

of gena with large and shallow punctures. Pronotum with medium deep punctures. Mesoscutum sparsely with deep punctures; punctures on scutellum and metanotum similar to those on mesoscutum. Mesepisternum with sparse large and deep punctures in posterodorsal part, scattered shallow punctured in anteroventral part; border between posterodorsal and anteroventral parts indistinct. Dorsal metapleuron with some strong striae and shallow large punctures; ventral metapleuron with sparse strong punctures. Propodeum with strong transverse striae. Metasomal segments (Fig. 18) covered with minute punctures. Dark reddish brown; following parts yellow to orange-yellow: clypeus up to front except black strip between antennal socket, mandible except apical and lateral margins, lower part of gena near mandible; apical margin of pronotum along pronotal carina, a narrow transverse band near apical margin of T1, all tarsae; following parts black: propodeum except 4 large reddish brown mark, valvula, a narrow transverse strip at two third from base of T1, some mark on T2-6; hind leg (except yellow tarsi).

Male. Unknown.

Distribution. South Vietnam.

Remarks. This species comes close to *P. rothneyi* but it is different from the latter by the female clypeus nearly as wide as high (slightly wider than high in *P. rothneyi*),



Figures 23–26. Color variation in *Gyrostoma* species. **23, 24** *P. rothneyi* **23** typical form **24** darker form in the southern part **25, 26** *P. tenebricosus* **25** typical form **26** brighter form in the southern part.

dorsal two thirds of the gena without medium punctures (dorsal two thirds of the gena with sparse and medium punctures in *P. rothneyi*), propodeum with posterior face narrowly and strongly excavated medially (propodeum with posterior face widely and more shallowly excavated medially in *P. rothneyi*).

Etymology. The specific name refers to the very long cells of the nest.

Nest. A nest (Nest#2012-TN-P-04) (Figs 21, 22) collected in Ia Pal, Chu Se, Gia Lai was examined.

The nest was attached to a thin branch of a shrub about 0.5 m above the ground. The nest characteristics are as follows: Petiole lost during collecting, but the remaining part showed that it is single, nearly central. Comb rather tough, pliable paper-like in texture, more or less uniformly brown in cell walls, subcircular (about 22 mm × 20 mm) in view from side of cell opening, dorsal surface dome shape. Cells arranged in regular rows and round at open end; cell expanded towards open end, 6.3 mm (range 6.0–6.9 mm; n = 10) wide at bottom and 7.3 mm (range 7.0–7.5 mm; n = 10) wide at open end, 16.3 mm (range 16.1–16.9 mm; n = 10) deep; cell wall about 0.03 mm thick. Cocoon caps very long (range 20–42mm), white.

Key to species of *Gyrostoma* from Vietnam

The characters used are applicable to both sexes unless the sex is specified.

- 1 Prestigma longer than the length of the pterostigma measured along ventral part; mesepisternum without dorsal episternal groove; interantennal carina toothed; pronotum with striations; hind trochanter toothed. In male, clypeus as wide as high, separated from eye by a gap on both sides, mandible tridentate. Body color entirely dark brown, clypeus brown..... ***Polistes gigas* (Kirby)**
- Prestigma about equal to or shorter than the length of the pterostigma measured along ventral part; mesepisternum with dorsal episternal groove; interantennal carina blunt; pronotum without striations; hind trochanter smooth..... **2**
- 2 Mesepisternum without epicnemial carina. Clypeus dark brown, metasomal terga yellow with black or dark brown bands or entirely dark brown ***Polistes tenebricosus* Lepeletier**
- Mesepisternum with epicnemial carina..... **3**
- 3 Mesopleuron weakly and sparsely punctate medially. In male, clypeus touching eye, wider than high, SVII with lateral process. Clypeus yellow, metasomal terga yellow with reddish-brown bands..... ***Polistes olivaceus* (DeGeer)**
- Mesopleuron strongly and densely punctate medially..... **4**
- 4 Female clypeus nearly as wide as high. Prestigma shorter than the length of the pterostigma; dorsal two thirds of gena without medium punctures; propodeum with posterior face narrowly (about one third the maximum width of propodeum) and strongly excavated medially. Body color dark reddish brown, clypeus yellow ***Polistes longus* sp. nov.**
- Female clypeus slightly wider than high. Prestigma about equal to the length of the pterostigma; dorsal two thirds of gena with sparse and medium punctures; propodeum with posterior face widely (about half the maximum width of propodeum) and shallowly excavated medially. Body color yellow with black marks, clypeus yellow ***Polistes rothneyi* Cameron**

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