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# *Heteropoda tetrica* THORELL, 1897 – variation and biogeography, with emphasis on copulatory organs (Araneae: Sparassidae)

Pascal Eusemann & Peter Jäger

## ABSTRACT

Contrib. Nat. Hist. 12: 499–516.

*Heteropoda tetrica* THORELL, 1897 is revised according to morphological and biogeographical features. The species is distributed in Myanmar, Thailand, Laos, China, Vietnam, Malaysia, Singapore and Indonesia (Sumatra). It is highly abundant in various natural and disturbed habitats. No forms could be separated by biogeographical or by discontinuous morphological traits. Therefore the material examined is considered as belonging to one biospecies with highly variable morphology of copulatory organs. An extended diagnosis and illustrations of variation in copulatory organs are provided.

Keywords: Huntsman spiders, Heteropodinae, morphology, embolus length, SE Asia

## Introduction

Thorell (1897) described *Heteropoda tetrica* from Myanmar from both sexes, but without giving illustrations of copulatory organs. Jäger (2001) designated the male syntype as lectotype and the female syntype as paralectotype and illustrated male and female copulatory organs for the first time. Jäger (2005) illustrated a male as first record from Thailand. No more details on its taxonomy or biology were known so far, until the junior author made three expeditions to Laos where he collected extensive material of this species. Moreover, many specimens from other places in SE Asia were available, including forms similar to the types of *H. tetrica*.

According to Jäger (2006) *Heteropoda* spp. belong to a group of species whose copulatory organs lengthen in the course of evolution. In this genus the embolus is lengthened by shifting its base anticlockwise (in the left palp) around the tegulum ('tegular coil'-type sensu Jäger, 2006). Copulatory ducts

of females become longer by getting more coils. In females, different types of coiling are possible, whereas the type of lengthening in males remains the same. Looking for mechanisms triggering this phenomenon it is important to know whether there is a certain kind of intraspecific variation in length of copulatory organs (embolus, copulatory ducts) which may be the result of or act as a base for female choice or bottlenecking in the course of speciation.

A diploma thesis of the senior author (Eusemann 2006) aimed to answer two questions: 1. To identify *Heteropoda* specimens, to look for diagnostic characters for distinguishing this species from other, morphologically similar species and investigate its distribution range. 2. To identify the strength of variation within the species and within different populations.

## Material and Methods

About 430 specimens of the genus *Heteropoda* from China, Vietnam, Laos, Thailand, Myanmar, India, Nepal, Sumatra, Borneo, Java, Sulawesi, the Philippines, and Papua New Guinea were examined. Of these, about 80 specimens were identified as *Heteropoda tetrica*.

Examination and drawings of specimens were carried out with a Leica MZ 16 stereomicroscope with drawing mirror. Photos were taken with a Canon EOS 300D, equipped with a Sigma 105 macrolens and a Canon MR 14EX ring-light.

All measurements are given in millimetres. Style of description follows Jäger (2005). Leg spination formula follows Davies (1994). Spination of the leg segments is given in the following order: femur, patella, tibia, metatarsus, tarsus. Spination of palp segments: femur, patella, tibia in males, and femur, patella, tibia, tarsus in females. All observed variations in spination are listed and the number of specimens showing the respective variation is given. Variations of spination of the same leg segments are separated by a comma, different leg segments are separated by a slash. Tarsal claw dentition follows Jäger (2004). Primary and secondary teeth are considered, primordial teeth are not. To determine the length of the embolus, a drawing of the bulbus was made and the course of the embolus followed with a thread. The length of the thread was used to calculate the length of the embolus. The embolus does not completely run in a plane, therefore this method does not give exact values. As the goal was to assess intraspecific variation in embolus length, these relative measures can be used for a comparative purpose. Position of the embolus on the tegulum is given as a clock position in the left palp, an embolus arising at 6-o'clock-position therefore means embolus arising proximally from

the tegulum. In illustrations hairs are omitted. A detailed illustration of the RTA is given in an orthogonal view, i.e. the optic axis stands perpendicular to a plane built by the RTA.

Statistic analysis was performed using the software R. To test the relation between embolus length and embolus position at the tegulum, the embolus length was tested for normal distribution within each group. A Kruskal-Wallis test for all groups was employed, followed by pairwise comparison of all groups using the Wilcoxon rank-sum test with Bonferroni correction for multiple testing. Correlation between (1) width of dorsal shield and embolus length and (2) width of epigynal field and embolus length was calculated with a Pearson correlation.

#### Abbreviations used:

ALE	anterior lateral eyes
AME	anterior median eyes
CH	clypeus height
dRTA	dorsal RTA
DS	dorsal shield of prosoma
FE	femur
AW	anterior width of dorsal shield of prosoma
MT	metatarsus
OL	opisthosoma length
OW	opisthosoma width
PA	patella
PH	height of dorsal shield of prosoma
PJ xx	serial number of Sparassidae examined
PL	length of dorsal shield of prosoma
PLE	posterior lateral eyes
PME	posterior median eyes
PP	palpus
PW	width of dorsal shield of prosoma
RTA	retrolateral tibial apophysis
TA	tarsus
TI	tibia
vRTA	ventral RTA
I, II, III, IV	leg I etc.

Museum collections (material is deposited in SMF, if not stated otherwise):

Coll. J. K. H. Koh, Singapore

IOZ	Institute of Zoology, Chinese Academy of Sciences, Beijing (S. Li)
MACN	Museo Argentina de Ciencias Naturales, Buenos Aires (M. Ramirez)
MHNG	Muséum d'histoire naturelle, Genève (P. Schwendinger)
MNHN	Muséum National d'Histoire Naturelle, Paris (C. Rollard)
QMS	Queensland Museum, Brisbane (R. Raven)
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden (E.J. van Nieuwerkerken)
SMF	Research Institute Senckenberg, Frankfurt (P. Jäger)
ZMUC	Zoological Museum of the University, Copenhagen (N. Scharff)
ZMUM	Zoological Museum of the University, Moscow (K. Mikhailov)

## Taxonomy

Family Sparassidae BERTKAU, 1872

Subfamily Heteropodinae THORELL, 1873

### Genus *Heteropoda* LATREILLE, 1804

#### *Heteropoda tetrica* THORELL, 1897 (Figs. 1–7)

*Heteropoda tetrica*; Thorell (1897): 33; 1 ♂ lectotype (PJ 1192), 1 ♀ paralectotype (PJ 1193), Birma, Mons Carin, 900–1400 m, L. Fea leg., ZMUC, examined. Jäger 2001: 22, figs. 16a–g, 67, 71, 83b. Jäger 2005: 99, figs. 1, 46–49.

Further material examined. **Laos: Houaphan Prov.:** 1 ♂ (PJ 2340), Muong You, 17. 11.–8. 12. 1918, Vitalis de Salvaga, N 19.8167°, E 102.8333°, 627 m, MNHN. **Khammouan Prov.:** 1 ♂ (PJ 2349), Jäger leg. 2003, HF, subadult, adult 26. 3. 03, killed 01. 4. 03, Jäger det. 2003. 1 ♂ (PJ 2350), Tham En, 171 m, N 17° 26.672', E 104° 56.921', Jäger leg. 28. 02. 2003, adult 1. 3. 03, rock face, HF, Jäger det. 2003. 3 ♂ (PJ 2351–2353), 2 ♀ (PJ 2354–2355), Ban Thathot, 163 m, N 17° 34.471', E 105° 08.797', village and surrounding area, collected by hand, Jäger leg. 25. 02. 2003, det. 2003. 1 ♂ (PJ 2376), Thakek environment, Sinopod GPS, N 17° 26.936', E 104° 52.499', 159 m, Leaf litter in front of cave, P. Jäger & V. Vedel leg, 30. 11. 2004, Jäger det. 2005, Photos 183\_8338–8350, DNA: 30. 5. 05 (3. li.). 1 ♂ (PJ 2446), 9.5 km NE Thakek, N 17° 26.936', E 104° 52.499', 159 m, foot cave and surroundings, in front of cave, under stone, by hand, P. Jäger & V. Vedel leg. 28. 10. 2004, Photos 175\_7501–7508 (part 1 and 2) 174\_7500. 2 ♂ (PJ 2375, 2380), Ban Tham, GPS 31. 10. 2004, Leaf litter, Rat-

tan, Photos div. + Mating, DV, x. 1+2. 2005. 1 ♀ (PJ 2302), Ban Thathot, 163 m, N 17° 34.471', E 105° 08.797', bamboo tussock, at night, by hand, Jäger leg. 18. 02. 2003 and det. 2003. 1 ♀ (PJ 2365), Thakek Area, Ban Tham, N 17° 25.799', E 104° 51.906', 163 m, Jungle, trees, leaf litter, sieving, sweepnet, by hand, P. Jäger & V. Vedel leg. 31. 10. 2004. 5 ♀ (PJ 2391–2395), Ban Thathot, N 17° 37.471', E 105° 08.797', ca 163 m, rock face, cave entrance, bamboo, P. Jäger leg. 24. 02. 2003, by hand. 1 ♀ (PJ 2459), Thakek, Ban Tham (GPS), 31. 10. 2004 Jäger + Vedel leg., leaf litter, Rattan, Fotos 181\_8169–8185, mated with 2 ♂: SD168, 169, (1.–10. 2. 05), Produced an eggsac - 40 juv. - NZ, DNA (3. li.) + Photo: 26. 4. 05. **Vientiane Prov.:** 1 ♂ (PJ 2366), 1 ♀ (PJ 2369), north of Vang Vieng, Ban Phoxay, N 19° 00.731', E 102° 26.766', 260 m, Vegetation on slopes along the road, at night, by hand, P. Jäger & V. Vedel leg. 17. 11. 2004. 1 ♀ (2381), same as before, but additional label: Mated with *H. venatoria*, 1. 6. 05, Photos, copulation 2–3 hours, 27. 7. 05 produced empty eggsac, killed 27. 7. 05. 1 ♂ (PJ 2379), Vang Vieng, Nam Song, riverbank, on a wall, V. Vedel & P. Jäger leg. 16. 11. 2004, Photos 175\_7556–7565, DNA-Sample: 1. 02. 05. 1 ♂ (PJ 2452), Vang Vieng Distr., Ban Phoxay, bush, 17. 11. 2004, Jäger & Vedel leg., Photos: 184\_8441–8453, 14. 06. 05 right palp for cross sections. 2 ♀ (PJ 2386–2387), Vang Vieng, Tham Phadeng, N 18° 55.486', E 102° 26.143', 282 m, Cave and surrounding, at night, by hand, P. Jäger & V. Vedel leg. 19. 11. 2004. 1 ♀ (PJ 2367), Vang Vieng, near Ban Nadao, N 19° 02.354', E 102° 25.455', 258 m, Tham Hoi, second cave, by hand, P. Jäger & V. Vedel leg. 18. 11. 2004. **Luang Nam Tha Prov.:** 1 ♂ (PJ 2373), Muang Sing, Nam Ha Protected Area, 745 m, N 21° 08.075', E 101° 11.991', secondary forest, slope at street, leaf litter, bank at stream, under stones, day and night, P. Jäger & V. Vedel leg. 04. 11. 2004, together with *H. dagmarae* (1w SD 123, PJ 2130). 1 ♂ (PJ 2378), Muang Sing, Nam Ha 1 GPS, slope, at night, P. Jäger & V. Vedel leg. 06. 11. 2004, Photos 178\_7801–7811, mated with SD162: 22. 2. 05, DNA Sampling 24. 4. 05 (4. li.). 1 ♂ (PJ 2445), Luang Nam Than district, Ban Tavan 1, 09. 11. 2004, at night, adult 01. 01. 05, killed 03. 01. 05, Photos 174\_7464–7467. 1 ♂ (PJ 2453), Muang Sing, Nam Ha Protected Area, Nam Ha 1 GPS, Vincent Vedel No. 10, Jäger & Vedel leg. 06. 11. 2004, mated with SD 162 (24.02.05) (DV!), Photos 178\_7826–7832. 1 ♂ (PJ 2455), Muang Sing, Nam Ha Protected Area, Nam Ha 1 GPS, at night, Jäger & Vedel leg. 04. 11. 2004, mated with SD 162 (25.02.05, DV + photos), Photos 178\_7833–7847 (+SD 162w). 1 ♂ (PJ 2457), Luang Nam Tha, Ban Tavan 1–2, Jäger & Vedel leg. 09. 11. 2004, Photos 177\_7775–7790. 1 ♂ (PJ 2443), Muang Sing, Nam Ha 1, 04. 11. 2004, at night, adult 12. 04, killed 03. 01. 05, Photos 175\_7509–7520. 1 ♂ (PJ 2444), Nam Ha 1, leg. 04. 11. 2004. 1 ♀ (PJ 2374), Muang Sing, Nam Ha 1 GPS, On rocks and leaves near the ground along a road, P. Jäger und V. Vedel leg. 04. 11. 2004, DNA-Sample

26. 4. 05 (4. li.), Photos 181\_8186–8200. 1 ♀ (PJ 2377), Muang Sing, Nam De 2 – Nam De 3, Leaf litter, P. Jäger & V. Vedel leg. 06. 11. 2004, DNA-Sample: 22. 2. 05 (3. li.). 1 ♀ (PJ 2442), Muang Sing, Nam Ha Protected Area, 745 m, N 21° 08.075', E 101° 11.991', secondary forest, along path, at night, by hand, P. Jäger & V. Vedel leg. 06. 11. 2004. 1 ♀ (PJ 2447), 5 km N of Luang Nam Tha, 597 m, N 21° 01,201', E 101° 24,632', secondary forest, vegetation, rocks, soil, beside road, at night, by hand, P. Jäger & V. Vedel leg. 7. 11. 2004. 1 ♀ (PJ 2448), Muang Sing, Nam Ha P. A. (1), at night, 04. 11. 2004, Killed 03. 01. 05. 1 ♀ (PJ 2456), Muang Sing, Nam Ha Protected Area, N 21° 08.075', E 101° 11.991', 145 m, at night, on rocks, Jäger & Vedel leg. 04. 11. 2004, DV, Photos 181\_8145–8156. **Luang Prabang Prov.:** 1 ♀ (PJ 2454), between Ban Don Khae and Ban Haeo, leaf litter, Jäger & Vedel leg. 14. 11. 2004, Photos 8066–8079.

**Thailand:** 1 ♂ (PJ 2407), Chiang Mai Prov., Chomthong Distr., Doi Inthanon NP, Site 2, 1000 m (dry dipterocarp + pine forest), pitfall trap, 15. 06.–20. 07. 1999, leg. P. Dankittipakul, MHNG. 1 ♀ (PJ 191), Chiang Dao, 400 m, 13. 11. 1986, QMS 28043, QMS. 1 ♀ (PJ 2403), Chiang Mai Prov., Doi Pha Hom Pok, ca. N 20° 02' 42.9", E 99° 08' 42.8", 1520 m, remnant patch of evergreen montane forest, W of Fang, 16. 12. 2002, P. Dankittipakul leg., Jäger det. 2003, MHNG. 1 ♀ (PJ 2405), Chiang Mai Prov. + Distr., Doi Sutheppui NP, Chiang Khian Agricultural Station, 1450 m, 27. 01. 2001, leg. P. Dankittipakul, Jäger det. 2003, MNHG. 1 ♂ (PJ 2406), Nan Prov., Doi Wao, 1380–1550 m, N 19° 08' 12.7", E 100° 38' 28.8", W of Tha Wang Pha, evergreen hill forest, 17.–19. 12. 2002, P. Dankittipakul leg., Jäger det. 2003, MHNG. 1 ♂ (PJ 2410), Thammarat Prov., Nakhon Si, Khao Luang NP, N 8° 43' 25.2", E 99° 40' 7.7", 355 m, 10.–12. 10. 2003, ATOL Expedition 2003, MACN. 1 ♂ (PJ 2432), Kraburi, Tham Phrakayana, P. Leclerc 23. 07. 1987. 1 ♂ (PJ 2449), Kanchanaburi, Wang Badan Cave, 180 m, S. Huber leg., NZ ex eggsac, hatched 4. 2005, adult and killed 12. 2005, Photos 216\_1665–1672. 1 ♀ (PJ 2408), Kanchanaburi, Wang Badan Cave, ca. 180 m, N 14° 15' 11.5", E 99° 04' 01.0", colour in life choc-olate brown, eggsac in early 02. 05, killed 18. 02. 05, juveniles from the eggsac reared, Coll. Siegfried Huber #L+21, S. Huber leg. 15. 11. 2004. 1 ♀ (PJ 2409), Satun Prov., Thale Ban National Park, N 6° 42' 37.0", E 100° 10' 9.2", 15.–18. 10. 2003, 270 m, ATOL Expedition 2003, MACN. 1 ♀ (PJ 2431), Kanchanaburi Prov., Erawan, on bank, riverside, C. L. en P. R. Deeleman leg. Coll. Deeleman 16. 11. 1987, RMNH. 1 ♀ (PJ 2433), Hua Hin, Tham Mai Lap Lae, Ban Hua Lap, P. Leclerc 28. 07. 1987, RMNH.

**China: Yunnan Prov.:** 1 ♂ (PJ 2411), 3 ♀ (PJ 2412–2414), Jing Hong, Nian Jing, Jäger det. 2000, IOZ. 1 ♂ (PJ 2417), Jing Hong, Nian Jing (Xishuangbanna), Jäger det. 2000, 04. 08. 1966, IOZ. 1 ♀ (PJ 2422), Yunnan Prov., Ning Xian, Bo Dao Zhen, 17. 04. 1998 Wu Ming, WM98 GX Sp33, IOZ. **Guangxi Prov.:** 1 ♂ (PJ

2420), Guang Xi Prov., Napo Xian, Fu De Reserve, 1350 m, Chen Jun, CG 065, 18. 06. 2000, IOZ. **Province questionable:** 1 ♂ (PJ 2415), Hainan, Meng La, Jäger det. 2000, IOZ. 1 ♂ (PJ 2421), Fong Zhong Gi, Jäger det. 2000, IOZ. 1 ♂ (PJ 2419), Xiao Meng Yang Chen Zi Zai, 15. 09. 1966 Jäger det. 2000, IOZ.

**Singapore:** 1 ♂ (PJ 2423), Upper Peirce Reservoir, 90.11.23.000, Coll. J. K. H. Koh. 1 ♂ (PJ 2424), Petaling, 04.08.18.368, Coll. J. K. H. Koh. 1 ♂ (PJ 2425), MacRitchie Reservoir, Terentang Trail, Forest Floor, 04.08.29.032, Coll. J. K. H. Koh. 1 ♀ (PJ 2426), Bukit Timah Hill Nature Reserve, Forest Floor, South View Trail, 04. 01. 2002, "Spotted BT", Coll. J. K. H. Koh.

**Indonesia:** 1 ♂ (PJ 2427), N-Sumatra, Bohorok B. Sink, trail 4, 10. 10. 1983, leg. Suharto, RMNH. 1 ♀ (PJ 2434), N-Sumatra, Bohorok A, along the river, 12. 3. 1983, RMNH.

**Malaysia:** 1 ♂ (PJ 2429), Selangor, Gombak, D. Kovac leg. "Heteropoda DK-22", 91.07.30.00, RMNH. 1 ♀ (PJ 149), Kuala Lumpur, Klingel leg. 14. 10. 1961. 1 ♀ (PJ 2430), Selangor, Gombak, U. M. Field Study Center, Heteropoda "Black Jaws", 91.06.15.32, RMNH. 1 ♀ (PJ 2435), Gombak, Coll D. Kovac, Heteropoda DK-1, 91.11.11.00, RMNH.

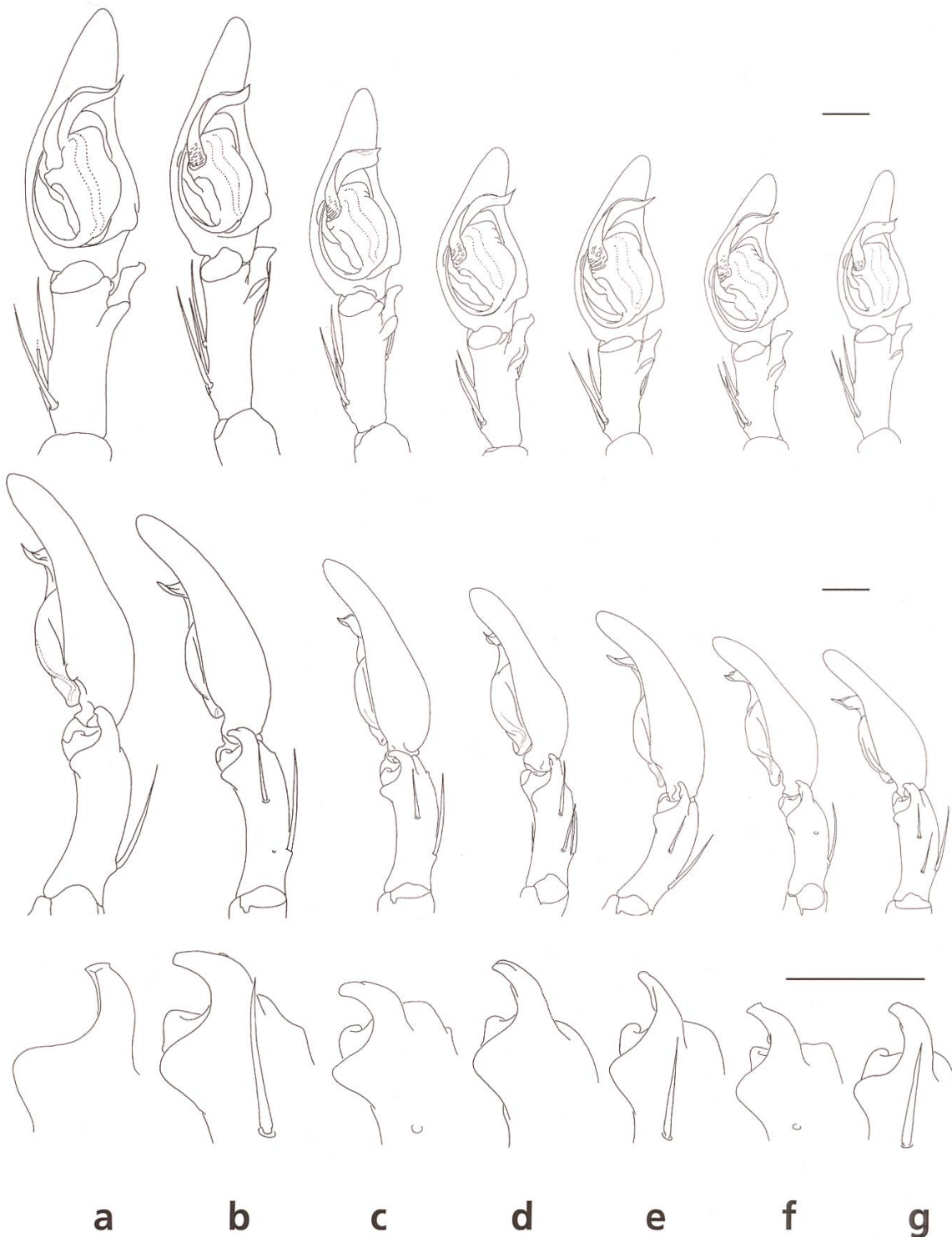
**Vietnam:** 1 ♀ (PJ 286), Cat Ba Island near Haifon, 28. 12. 1988, under stone, V. V. Yanushev leg., ZMUM. 1 ♀ (PJ 2383), Quang Binh Prov., Phong Nha-Ke Bang National Park, primary forest, riverside of stream, T. Ziegler leg. + ded. 2004. 1 ♀ (PJ 2416), Cao Bang Prov., Sac Ha Village, 16. 12. 2000 (068), IOZ.

Additional material examined (not included in measurements):

**Laos: Luang Prabang Prov.:** 1 ♂ (PJ 2481), SE Luang Prabang, Nam Khan, Ban Keng Koung, 372 m, N 19° 40.963', E 102° 18.442', Along stream, disturbed forest, cultivated land, at night, sweepnet, by hand, P. Jäger & J. Altmann leg. 07. 03. 2006. 1 ♂ (PJ 2483) 2 ♀ (PJ 2482, 2484), S Luang Prabang, Ban Ean, Nam Khan, That Se, 304 m, N 19° 50.562', E 102° 13.118', Waterfall, along stream, secondary forest, at night, Sweepnet, sieving, by hand, P. Jäger & J. Altmann leg. 05. 03. 2006. 1 ♀ (PJ 2485), NE Luang Prabang, Nam Ou, Nong Khiao, Tham Pathok, 373 m, N 20° 33.082', E 102° 37.925', outside cave, paddy fields, bananas, at night, sweepnet, by hand, P. Jäger & J. Altmann leg. 11. 03. 2006.

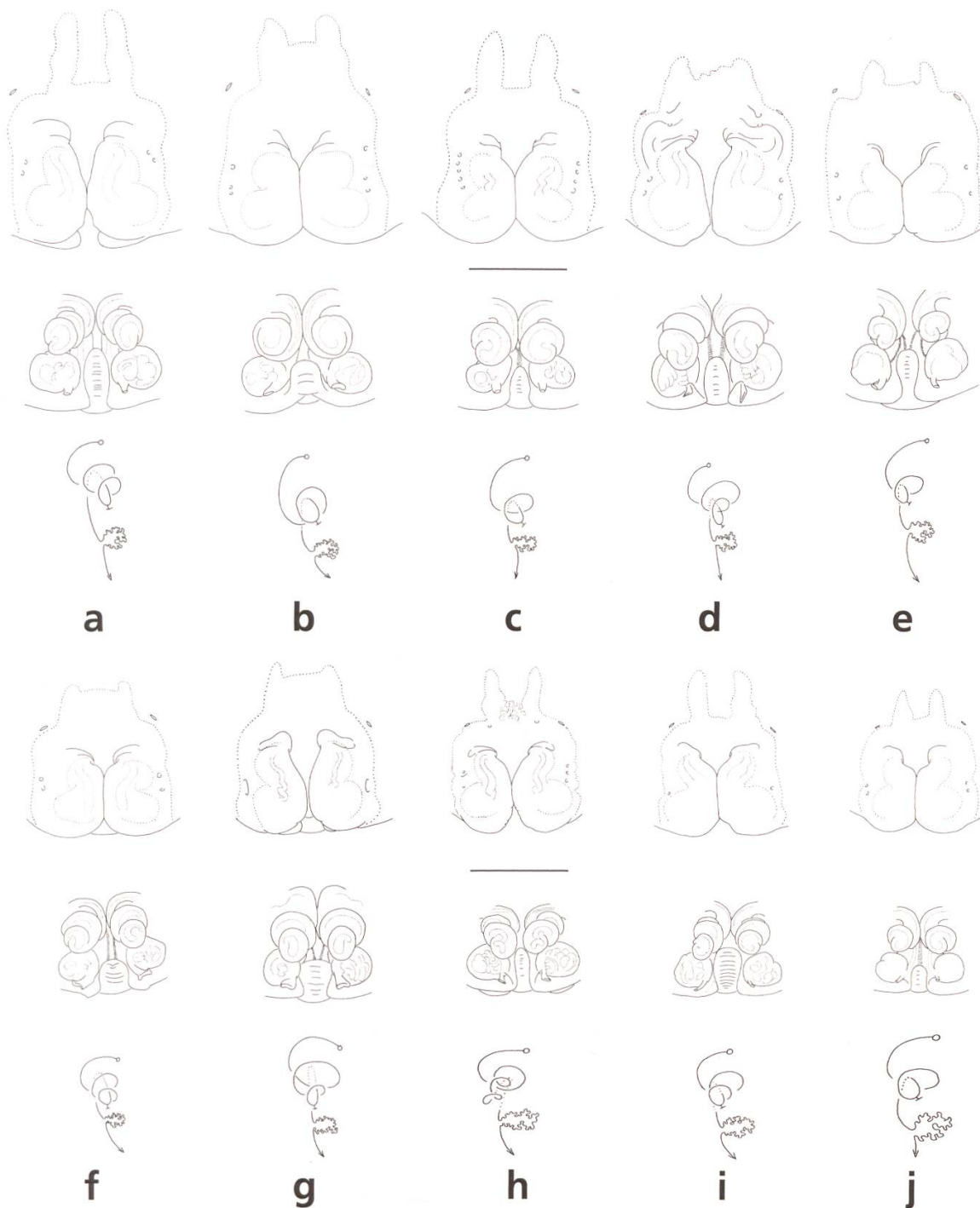
Extended diagnosis: Large spiders with a legspan of up to 196 mm in males and 170 mm in females. Males: Course of sperm duct relatively straight. Conductor slightly S-shaped. dRTA strongly pronounced and formed like a club. Cymbium not elongated (as in *H. schwendingeri* JÄGER, 2005 or other cave-dwelling *Heteropoda* spp.) (Fig. 1). Prolateral tarsal claw of leg II in prolateral view with six to eight teeth. Females: Shape of epigynal field roughly quad-





**Fig. 1.** *Heteropoda tetrica*: Left male palps. – Top: ventral view. – Middle: retrolateral view. – Bottom: RTA, orthogonal view. Scale bars 1 mm. – a: PJ 2366, Laos: Vientiane Prov. – b: PJ 2432, Thailand: Kraburi. – c: PJ 2427, Indonesia: Sumatra. – d: PJ 2415, China: Yunnan Prov. – e: PJ 2423, Singapore. – f: PJ 2420, China: Guangxi Prov. – g: PJ 2446, Laos: Khammouan Prov.

angular. Copulatory openings oriented in lateral to antero-lateral direction. Rims close to copulatory openings slit-like or slightly rounded. Anterior margins of lateral lobes running in antero-lateral direction. Anterior part of vulva with two or three coils. Apex of coils of internal duct system postero-mediad,



**Fig. 2. *Heteropoda tetrica*: Female copulatory organs. – Top: Epigyne, ventral view. – Middle: Vulva, dorsal view. – Bottom: Schematic course of internal duct system. Scale bars 1 mm. – a: PJ 2408, Thailand: Kanchanaburi. – b: PJ 2365, Laos: Khammouan Prov. – c: PJ 2386, Laos: Vientiane Prov. – d: PJ 149, Malaysia: Wilayah Persekutuan. – e: PJ 2459, Laos: Khammouan Prov. – f: PJ 2377, Laos, Luang Nam Tha Prov. – g: PJ 2434, Indonesia: Sumatra. – h: PJ 2447, Laos: Luang Nam Tha Prov. – i: PJ 2403, Thailand: Chiang Mai Prov. – j: PJ 2392, Laos: Khammouan Prov.**

posteriad, or postero-laterad (Fig. 2). Prolateral tarsal claw of leg II with four to eight teeth.

Extended description and variation. For original description see Thorell (1897).

Position of embolus	Tegulum length [mm]	Embolus length [mm]	N
5.30 o'clock	1.44–2.17 (1.77; 0.25; 1.76)	3.22–5.44 (4.02; 0.69; 3.89)	11
6.00 o'clock	1.44–2.11 (1.75; 0.19; 1.78)	3.12–4.97 (3.89; 0.47; 3.94)	11
6.30 o'clock	1.50–2.08 (1.68; 0.24; 1.63)	2.88–4.49 (3.30; 0.67; 2.99)	5

**Tab. 1.** Relation between position of the embolus at tegulum and embolus length. Position of embolus: see text for description. N = number of specimens examined. In parenthesis: mean; standard deviation; median.

Male. Legspan 59.1–195.7. PL 4.5–10.8, PH 1.7–3.8, PW 4.3–9.9, AW 2.2–4.9, OL 5.0–11.9, OW 2.9–7.8. Eye diameters: AME 0.30–0.59, ALE 0.49–0.73, PME 0.35–0.56, PLE 0.47–0.71. Eye interdistances: AME–AME 0.16–0.32, AME–ALE 0.02–0.17, PME–PME 0.19–0.51, PME–PLE 0.44–0.72, AME–PME 0.20–0.53, ALE–PLE 0.27–0.56, CH AME 0.43–1.03, CH ALE 0.29–0.84. Leg formula: 2143 or 2413. Leg spination: PP 131 (n=36) / 101 (n=35), 102 (n=1) / 2121 (n=17), 2111 (n=11), 1121 (n=3), 1210 (n=1), 2210 (n=1), 2310 (n=1) / FE I 323 (n=32), 223 (n=1), 333 (n=1) / II 323 (n=35), 223 (n=1) / III 323 (n=28), 322 (n=6), 312 (n=1), 322 (n=1) / IV 331 (n=32), 341 (n=2), 332 (n=1), 321 (n=1), 351 (n=1) / PA I 101 (n=33) / II 101 (n=35), 001 (n=1) / III 101 (n=30), 001 (n=6) / IV 101 (n=32), 001 (n=3), 000 (n=1) / TI I 2226 (n=30), 2326 (n=3), 2022 (n=1), 2222 (n=1) / II 2226 (n=30), 2126 (n=1), 2022 (n=1), 2326 (n=1), 2225 (n=1), 2124 (n=1) / III 2226 (n=20), 2126 (n=13), 2326 (n=1) / IV 2126 (n=32), 2226 (n=3), 2136 (n=1) / MT I 1014 (n=32), 1012 (n=1), 1013 (n=1) / II 1014 (n=31), 1012 (n=2), 1013 (n=1) / III 2014 (n=30), 1024 (n=2), 2013 (n=1), 2114 (n=1) / IV 3036 (n=35), 3136 (n=2), 3034 (n=1). Leg and palp measurements: PP 6.9–16.9, I 24.0–62.0, II 26.7–67.3, III 19.4–46.5, IV 20.4–56.2. Cheliceral furrow with three anterior and four posterior teeth.

Palp (Fig. 1). Embolus arising from the tegulum at 5.30- to 6.30-o'clock-position, conductor at 10-o'clock-position. Sperm duct straight or slightly curved. dRTA stronger than vRTA. Tip of dRTA in ventral view often forming a hook. Embolus length 2.88–5.44 (average length = 3.68).

Palp varying in course of sperm duct, position of embolus at tegulum, shape of conductor, embolus length (Tab. 1), and shape of dRTA and vRTA.

Colour (Fig. 3a–d). DS, PP and legs greyish beige to yellowish beige. DS with black markings around fovea. Two parallel, elongated black markings posterior to the eyes, not always distinct. Light transversal band along posterior margin of the DS present, but not always distinct. Prosoma in ventral view reddish brown. Colour of chelicerae same as DS or black. OS greyish beige to light brown, marbled. Sigillae marked black. Markings of the poster-

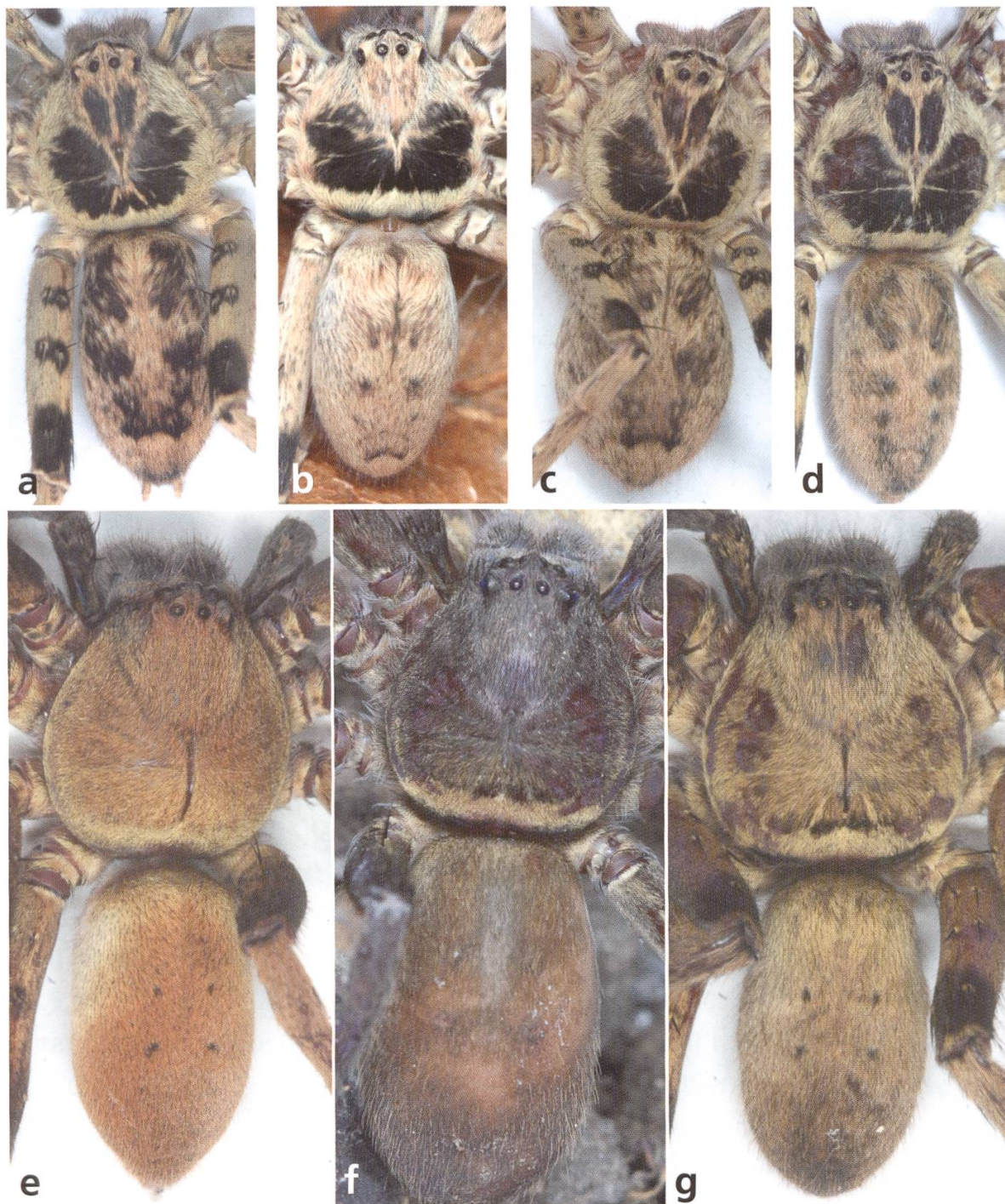


Fig. 3. *Heteropoda tetrica*: Colouration of live specimens (males: a–d; females: e–g).

ior pair of sigillae often fused to a broad, anteriorly oriented "V". FE with black spine patches, these not in all specimens distinct. Spine patches sometimes fusing, but without forming true annulations around femur. Distal part of FE often black. PA with a dorsal black patch in proximal position. All other leg segments without markings.

Female. Legspan 56.0–169.3, PL 6.2–12.9, PH 1.6–4.7, PW 5.8–11.7, AW 3.3–6.7, OL 6.7–16.3, OW 4.3–11.8. Eye diameters: AME 0.32–0.55, ALE 0.51–0.89, PME 0.39–0.72, PLE 0.48–0.90. Eye interdistances: AME–AME 0.19–0.39, AME–ALE 0.04–0.15, PME–PME 0.27–0.57, PME–PLE 0.46–0.86, AME–

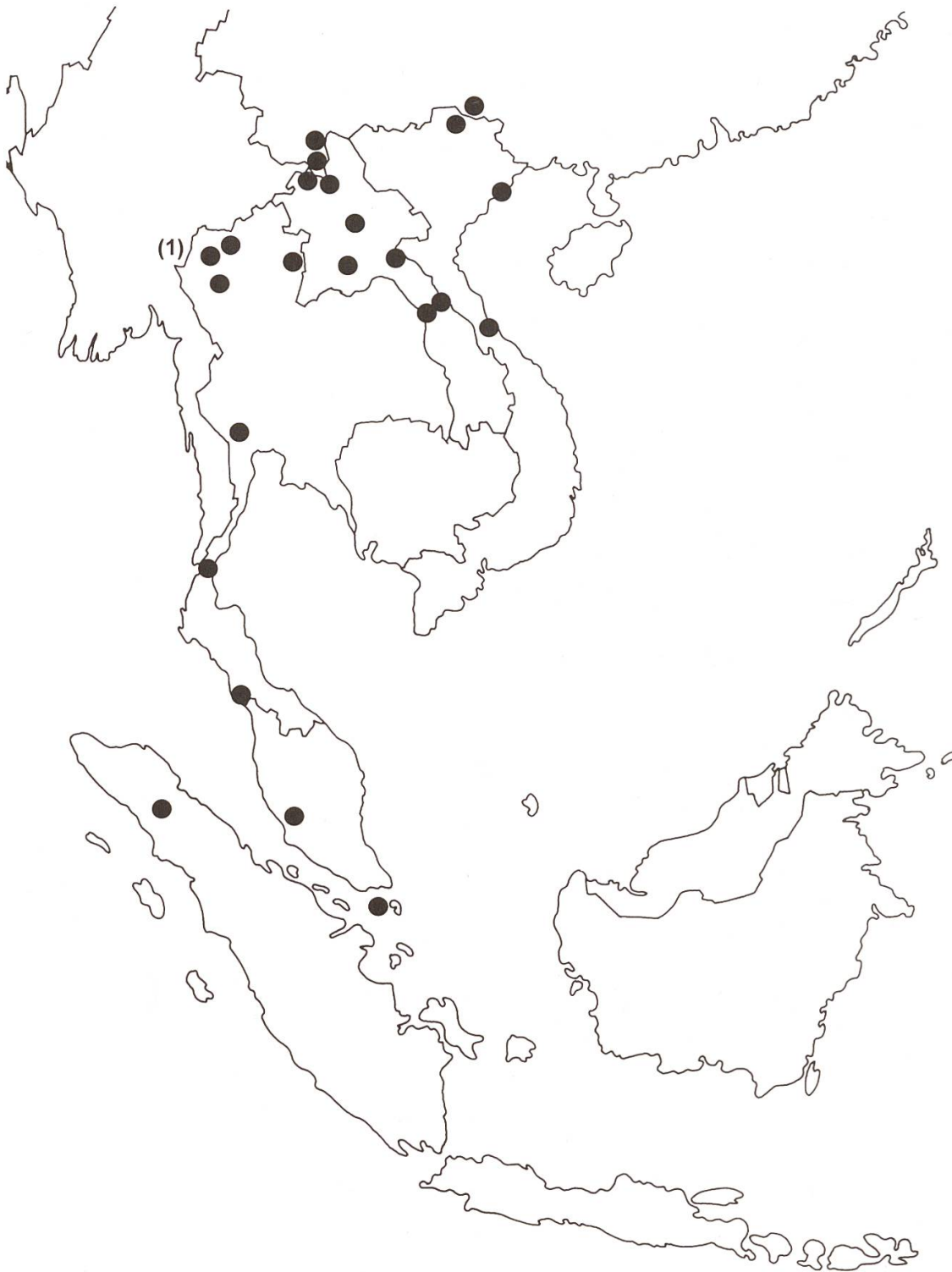
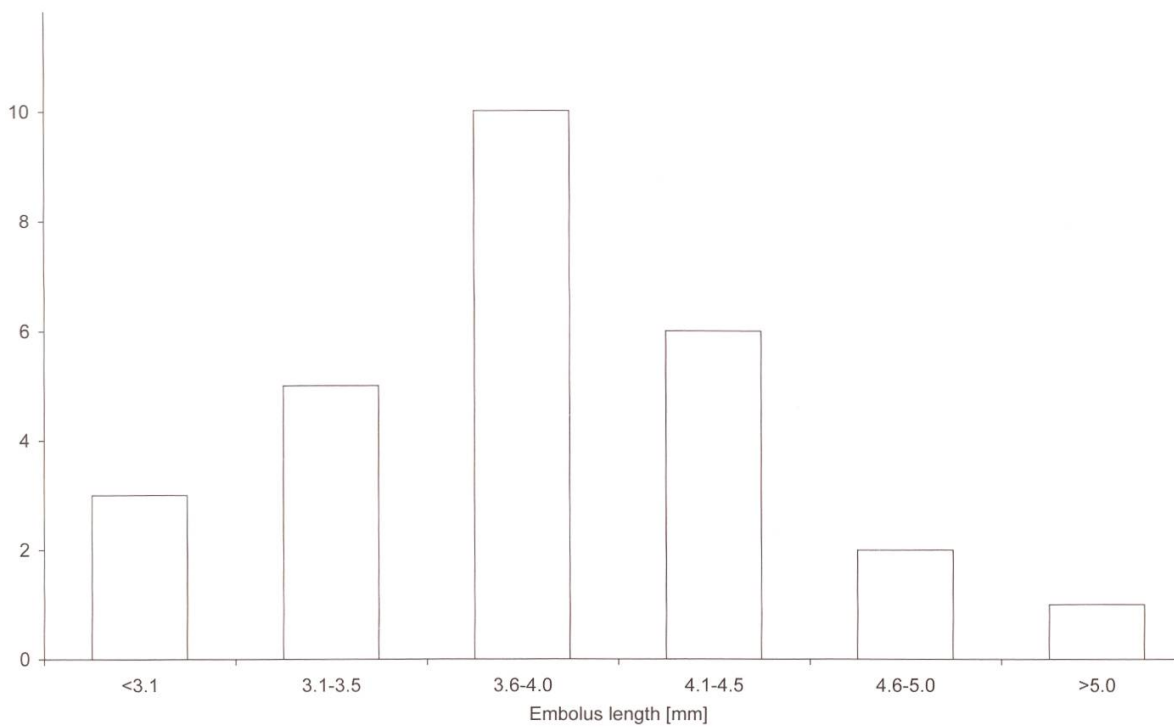


Fig. 4. Distribution of *Heteropoda tetrica*. (1) indicates the type locality. Some collection sites are combined into one spot.

PME 0.27–0.69, ALE–PLE 0.32–0.76, CH AME 0.47–1.64, CH ALE 0.42–1.25.  
 Leg formula: 2143 or 2413. Leg spination: PP 131 / 101 / 2121 (n=37), 2131  
 (n=1) / 1014 / FE I–II 323 / III 323 (n=33), 233 (n=1), 322 (n=1), 332 (n=1),  
 333 (n=1), 232 (n=1) / IV 331 / PA I 001 (n=29), 000 (n=7), 101 (n=1) / II  
 001 (n=26), 000 (n=8) / III 001 (n=18), 101 (n=10), 000 (n=3), 100 (n=1) /  
 IV 101 (n=35), 001 (n=1) / TI I 2026 (n=36), 2024 (n=1) / II 2026 (n=334),



**Fig. 5. Frequency of embolus length within the material examined.**

1026 (n=1) / III 2026 (n=27), 2126 (n=10), 2125 (n=1) / IV 2126 / MT I 0004 (n=23), 1014 (n=10), 0014 (n=3), 1004 (n=1) / II 0004 (n=14), 1014 (n=14), 1004 (n=5), 0014 (n=1) / III 2014 (n=33), 1014 (n=1), 2004 (n=1), 1014 (n=1), 3036 (n=1) / IV 3036 (n=36), 2036 (n=1), 3036 + one small median ventral distal spine (n=1). Leg and palp measurements: PP 8.9–34.3, I 22.6–55.5, II 25.1–60.7, III 20.2–49.3, IV 21.9–55.6. Cheliceral furrow with three anterior and four posterior teeth. Palpal claw with four to eight teeth.

Epigyne (Fig. 2). Epigynal field roughly quadrangular. Anterior edges sometimes rounded. Anterior bands not in all specimens distinct. Slit sense organs situated inside or outside the epigynal field. Lateral lobes usually covering median septum. Septal pocket 0.81–3.5 times longer than wide. Course of internal duct system as shown in Fig. 2. Posterior part of duct system wider than anterior part. Epigyne varying regarding shape of epigynal field, shape of rims close to copulatory openings, and anterior bands. Width of epigynal field = 1.0–1.65. Vulva varying in number, shape, and orientation of coils in anterior part of internal duct system, shape of septal pocket and course of internal duct system.

Colour (Fig. 3e–g). DS, PP and legs dark brown to almost black. Rarely brown or beige. Light transversal band along posterior margin of DS usually distinct. Ventral side of prosoma reddish brown. Chelicerae black. Colour of OS same as DS. OS sometimes with reddish hairs. Sigillae marked black. FE with indistinct spine patches. In animals with brown or beige legs, distal part of FE black.

Width of DS [mm]	Embolus length [mm]	N
4.0–4.9	3.89	1
5.0–5.9	3.2–3.68 (3.36; 0.21; 3.31)	4
6.0–6.9	3.12–4.19 (3.66; 0.54; 3.68)	3
7.0–7.9	2.97–4.97 (3.78; 0.66; 3.96)	12
8.0–8.9	3.55–5.44 (4.24; 0.83; 3.72)	5
9.0–9.9	4.21–4.49 (4.35; 0.20; 4.35)	2

**Tab. 2.** Relation between embolus length and width of dorsal shield of prosoma. N = number of specimens examined. In parenthesis: mean; standard deviation; median.

Distribution (Fig. 4). **Myanmar:** Kayah State (type locality). **Laos:** Houaphan Prov., Khammouan Prov., Vientiane Prov., Luang Nam Tha Prov., Luang Prabang Prov. **China:** Yunnan Prov., Guangxi Prov. **Thailand:** Nan Prov., Chiang Mai Prov., Thammarat Prov., Krabi Prov., Satun Prov. **Vietnam:** Quang Binh Prov., Cao Bang Prov. **Malaysia:** Wilayah Persekutuan. **Singapore.** **Indonesia:** Sumatra.

Statistic analysis: Relation of embolus length and position of embolus at tegulum (arising point): Embolus length is not significantly different between groups 5.30/6.00 o'clock (p-value for Wilcoxon rank-sum test: 0.7178), but significantly different between groups 6.00/6.30 o'clock (p-value: 0.0011) and 5.30/6.30 o'clock (p-value: 0.0007). Width of dorsal shield and embolus length show a weak positive correlation (correlation coefficient: 0.4369, p-value: 0.0227). Width of epigynal field and embolus length are not significantly correlated (correlation coefficient: 0.4297, p-value: 0.1633).

## Discussion

The examination of some eighty specimens of *Heteropoda tetrica* showed that this species is highly variable, both in males and females. We believe that only one species is concerned, as the variation between different populations and forms, especially in males, is continuous. Furthermore, no geographical separation between different forms could be found. Finally, within one population copulatory structures usually are similar both in males and females. High intra-specific variation is shown in characters of the copulatory organs as well as in somatic characters, such as leg spination. Despite the high variability of the latter character it generally fits in the basic spination pattern for Heteropodinae (Jäger 2001). Exceptions are mostly due to malformations in regenerated legs. Some character states, however, for example metatarsus I–II 0004 in females, possess almost diagnostic character.

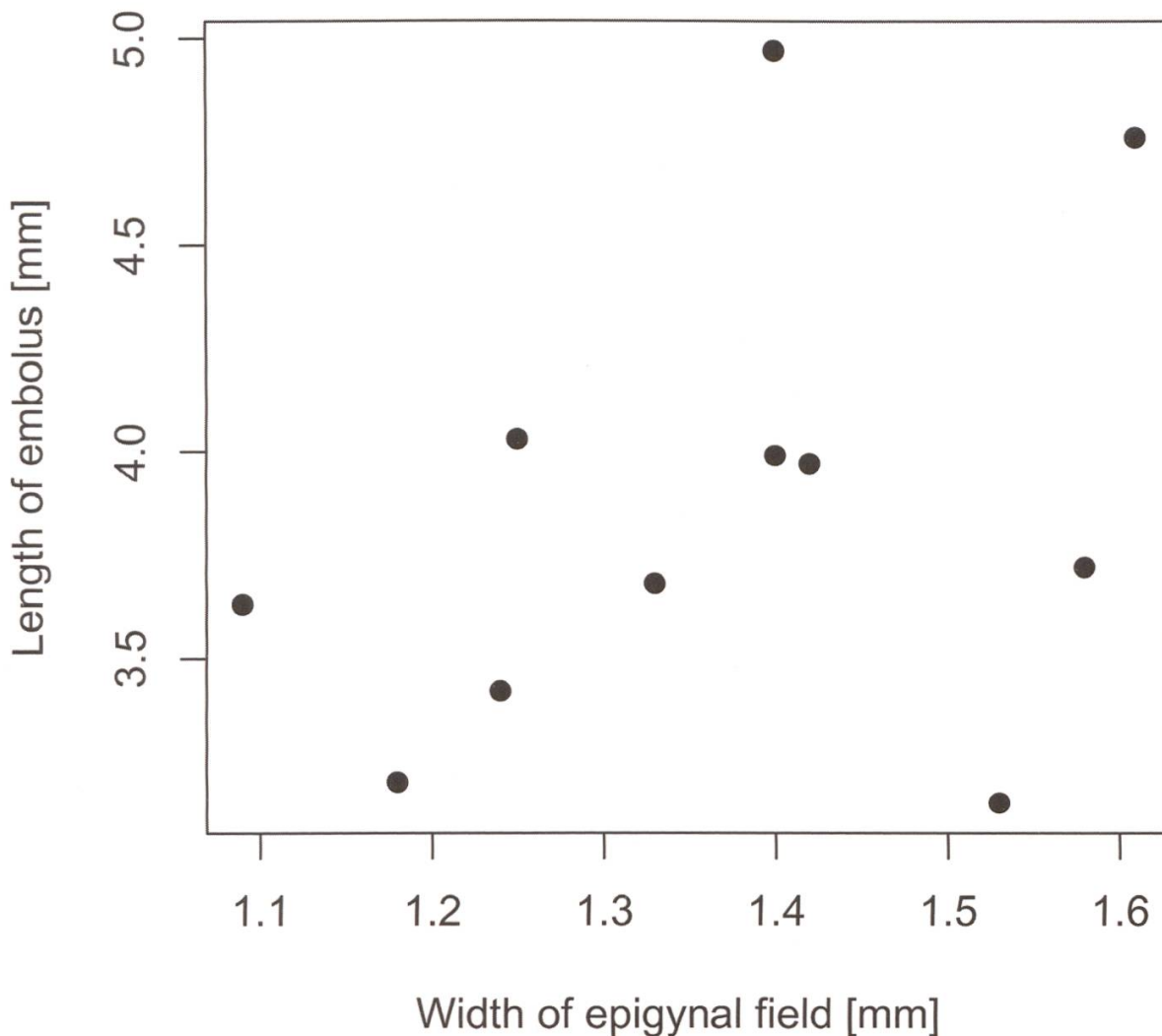


Fig. 6. Relation between width of epigynal field and embolus length.

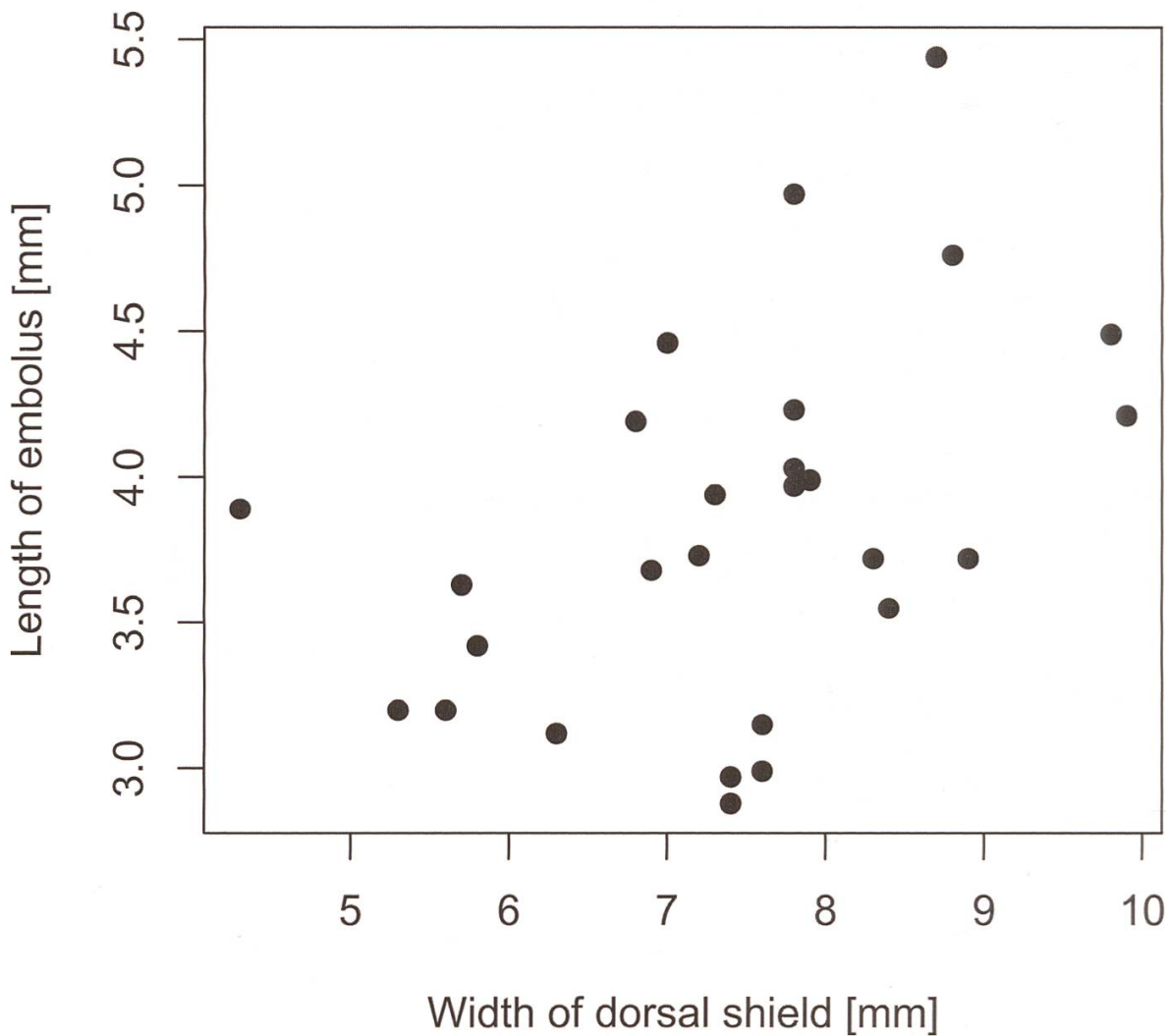
Variation in copulatory organs is generally high, both in embolus length and copulatory duct length.

Frequency of different size classes or the embolus length shows a Gaussian distribution (Fig. 5, Tab. 2). Embolus length is not correlated to width of the epigynal field (Fig. 6, Tab. 3) and only slightly correlated to body size (Fig. 7). Some populations show tendencies towards shifted ranges in length of embolus and copulatory ducts (Tab. 3). Embolus length shows partly a positive correlation to the point of origin, i.e. the embolus is in fact lengthened at its base, as the tip of the embolus remains in more or less the same position as shown by Jäger (2006). If the length of copulatory structures is important in the process of speciation, then this highly variable species offers a good basis for further splitting. Furthermore, examination of the collection material as well as observations of the junior author in the field in Laos show that *H. tetrica* is one of the most abundant species in its distribution range, both in natural and in disturbed habitats.



Population	Width of epigynal field [mm]	Embolus length [mm]
China: Jing Hong	1.09–1.37 (n=3)	3.68–3.94 (n=2)
Laos: Muang Sing	1.25–1.53 (n=5)	3.68–4.97 (n=5)
Laos: Ban Tham	1.53–1.58 (n=2)	3.12–3.63 (n=2)
Laos: Ban Thathot	1.00–1.38 (n=7)	3.20–3.42 (n=3)
Thailand: Wang Badan Cave	1.61 (n=1)	4.76 (n=1)
Indonesia (Bohorok)	1.40 (n=1)	3.99 (n=1)

**Tab. 3.** Relation between embolus length and width of epigynal field in populations with both sexes present (number of specimens examined in parentheses).



**Fig. 7.** Relation between width of dorsal shield and embolus length.

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