First record of the subfamily Coelotinae in Laos, with review of Coelotinae embolus morphology and description of seven new species from Laos and Vietnam (Araneae, Amaurobiidae)

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First record of the subfamily Coelotinae in Laos, with review of Coelotinae embolus morphology and description of seven new species from Laos and Vietnam (Araneae, Amaurobiidae)

Xin-Ping Wang* and Peter Jäger

*College of Life Sciences, Hebei University, Baoding, Hebei, China; Arachnology, Research Institute Senckenberg, Frankfurt am Main, Germany

First records of Coelotinae are reported from Laos. Five new species of the genus *Draconarius* are described from the northern Luang Nam Tha Province: *Draconarius bounnami* sp. nov. (male), *D. latidens* sp. nov. (female), *D. postremus* sp. nov. (male, female), *D. songi* sp. nov. (male) and *D. tabularis* sp. nov. (female). In addition, two new Coelotinae species are described from Vietnam: *D. hanoiensis* sp. nov. (female) and *D. huongsonensis* sp. nov. (female). Of the 429 currently valid Coelotinae species, 154 of them have only females described (36%). The embolus characteristics of those with males described (275 species, 64%) are reviewed. Two characters have been found that might be informative for the estimation of phylogeny, and their congruence with the current Coelotinae classification system is discussed. One character is the point from which the embolus arises and another is the embolus shape.

Keywords: *Draconarius*; systematics; southeast Asia; Indochina; Luang Nam Tha Province

Introduction

For a long time, the known southern boundary of the spider subfamily Coelotinae F.O. Pickard-Cambridge, 1893 has been limited to the Himalayas and southern China. The discovery of the species *Draconarius australis* Dankittipakul, Sonthichai and Wang, 2006 from Prachuap Khiri Khan Province in central Thailand now marks the southernmost limit in its distribution. Species diversity in Thailand has proven to be rich, with the discovery of 24 endemic Coelotinae from central and northern Thailand (Dankittipakul and Wang 2003, 2004; Dankittipakul et al. 2005, 2006; Chami-Kranon et al. 2006). There is only one species described from northern Vietnam (Nishikawa 1995; Pham Dinh et al. 2007), *Coelotes yoshikoa* Nishikawa, 1995, which is a junior synonym of *Coronilla gemata* Wang, 1994. The species *Coronilla gemata* is widespread in southern China (Wang JF 1994; Wang XP 2002, 2003). Presently, no Coelotinae have been reported from Laos. In fact, they are the only Amaurobiidae members reported from Vietnam and Thailand. There is no doubt that more species exist in this region, particularly in the northern part of Vietnam and Thailand. Recent expeditions by the authors yielded more Coelotinae, not only from Vietnam but also from central and northern Laos. Similar to Coelotinae from Thailand, the species from Vietnam and Laos also show highly
diversified copulatory organs, and some of them are difficult to place in any of the existing Coelotinae genera. In this paper, five new species from northern Laos and two from northern Vietnam are described as members of the genus *Draconarius* Ovtchinnikov, 1999. One Coelotinae species from central Laos, and another from a far more southern region of northern Vietnam will be described in another paper as members of a new Coelotinae genus, together with two species from Hainan Island, China, and one from northern Thailand (Wang et al. 2008). All five species from Laos treated in the present paper were collected from the Luang Nam Tha Province, which is close to Meng-la County and Xishuangbanna National Nature Reserve in southern Yunnan Province, China. The fauna from southern Yunnan and Luang Nam Tha should be similar, but unfortunately the Coelotinae fauna from both regions is poorly investigated.

**Material and methods**

All measurements are in millimeters. Scale lines are 0.2 mm, except where indicated. Eye diameters are taken at the widest point. The total body length does not include the length of the chelicerae or spinnerets. The terminology used in the text and figures follows Wang (2002). Specimens studied in the current paper are deposited in the American Museum of Natural History, New York (AMNH) and Senckenberg Museum, Frankfurt (SMF). Embolus morphology of most Coelotinae species is based upon the specimens examined by authors, while the rest of the species are judged from published illustrations, particularly those published in recent years from East Asia (Kim 2007; Kim and Lee 2007; Kim et al. 2007; Wang and Jäger 2007; Xu and Li 2007a, 2007b, 2007c, 2007d; Zhang et al. 2007; Dankittipakul and Wang 2008; Xu et al. 2008). The distribution maps were generated using GIS ArcView software and the .dbf files of the studied species are downloadable from http://www.amaurobiidae.com, which is published and maintained by the senior author (Wang 2008). More type specimen photos of the species included in this paper can be viewed from the website http://www.ChineseSpecies.com which was created and is maintained by S-Q. Li and the senior author (Li and Wang 2008). The abbreviations used in the text: AME=anterior median eyes; ALE=anterior lateral eyes; PME=posterior median eyes; PLE=posterior lateral eyes.

**Coelotinae embolus morphology**

The embolus of the male Coelotinae spider palp could have significant implications both in high-level phylogeny and in species diagnosis. Unfortunately, in the past the definition and description of the Coelotinae embolus have been confusing and problematic. Jäger (2006) explored lengthening emboli in the spider family Sparassidae and recognized several types of lengthening in the process of evolution. Inspired by the Sparassidae ‘lengthening hypothesis’, the emboli of Coelotinae species were re-examined by reviewing the publications and examining the available specimens. We define the embolus as the structure that arises from the proximal bulb, pertains to the proximal end of the tegular sclerite, and contains the ejaculatory duct which opens at the apex of the embolus. In Coelotinae the embolus is divided into three parts: embolic base, proximal part and distal part (Figures 1–12). The embolic base is usually triangular or heart-shaped, then recognizably narrowed in most species into the proximal part of the embolus, which runs along the proximal...
and prolateral bulbs. The distal part of the embolus usually runs to the distal bulb, is either directly situated inside the conductor lamella and groove, or coils beyond the distal bulb and then curves back with its apex situated inside the conductor lamella and groove. Currently, a total of 429 valid Coelotinae species are recorded (Platnick 2008; Wang 2008), with about one-third of them described only from females (154 species, 36%). For the 275 species with males described (64%), the emboli are reviewed for the purpose of finding and defining informative characters for future estimation of phylogeny.

Character one: embolus origin

Based on the origin of the embolus, we classified it into three types (Table 1). The type I embolus (Figures 1–5) is short, prolateral in origin, arising in an approximate 7.30 to 9 o’clock position, extending proximally not beyond the tibia/tarsus junction, running about one-half to one quarter of an oval, and ending at the distal bulb, usually with the apex sitting inside the conductor lamella and groove. The type II embolus (Figures 6–10) is long, proximal in origin, arising at approximately 6 o’clock position, extending proximally beyond the tibia/tarsus junction but may not reach the tibia/patella junction, running about one-half of an oval or more, and ending either at the distal bulb or coiling beyond it. The type III embolus (Figures 11, 12) is also long, but retrolateral in origin, arising in an approximately 4 to 5 o’clock position, extending proximally beyond the tibia/tarsus junction and may reach the tibia/patella junction in some species, running about two-thirds of an oval or more, and coiling beyond the distal bulb.

The Type I embolus (144 species) covers more than half of the Coelotinae species for which males have been described (52%) and about one-third (34%) of all
Coelotinae species, and is unique to six genera: Coronilla Wang, 1994, Femoracoelotes Wang, 2002, Longicoelotes Wang, 2002, Tegecoelotes Ovtchinnikov, 1999, Tonsilla Wang and Yin, 1992 and Urocoras Ovtchinnikov, 1999. In five other genera (Alloclubionoides Paik, 1992, Coras Simon, 1898, Eurocoelotes Wang, 2002, Himalcoelotes Wang, 2002 and Pireneitega Kishida, 1955), the type I and II emboli are mixed and may play a role in grouping the species within those genera. For example, all eight Alloclubionoides species with distinctly broad emboli (Table 3) are prolaterally originated, and the distributions of embolic types in Coras are also largely congruent with Muma’s classification of two Coras species groups (Muma 1946). In Pireneitega, all six species from Europe and Central Asia have the prolaterally originated type I embolus, and others from East Asia have the proximally originated type II embolus, with the exception of P. taiwanensis Wang and Ono, 1998 from Taiwan, which might not be congeneric with Pireneitega at all. In fact, the European and Central Asian Coelotinae generally have the prolaterally originated type I embolus (43 type I species compared with only four type II species), while East Asian Coelotinae are divided between having the prolaterally originated type I embolus and the proximally originated type II embolus (Table 2). Although East Asia as a whole has a balance of these types, species from Japan are skewed to the prolaterally originated type I embolus (19 type I species but only six type II species). The genera Coelotes and

<table>
<thead>
<tr>
<th>Genus</th>
<th>Type I (prolateral)</th>
<th>Type II (proximal)</th>
<th>Type III (retrolateral)</th>
<th>Female only</th>
<th>Total no. of species (by genus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alloclubionoides</td>
<td>10</td>
<td>5</td>
<td></td>
<td>9</td>
<td>24 (24%)</td>
</tr>
<tr>
<td>Bifidocoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Coelotes</td>
<td>68</td>
<td>20</td>
<td>2</td>
<td>51</td>
<td>141 (14%)</td>
</tr>
<tr>
<td>Coras</td>
<td>6</td>
<td>6</td>
<td></td>
<td>3</td>
<td>15 (15%)</td>
</tr>
<tr>
<td>Coronilla</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>Draconarius</td>
<td>24</td>
<td>48</td>
<td>5</td>
<td>57</td>
<td>134 (134%)</td>
</tr>
<tr>
<td>Eurocoelotes</td>
<td>8</td>
<td>3</td>
<td></td>
<td></td>
<td>11 (11%)</td>
</tr>
<tr>
<td>Femoracoelotes</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Himalcoelotes</td>
<td>2</td>
<td>4</td>
<td></td>
<td>5</td>
<td>11 (11%)</td>
</tr>
<tr>
<td>Iwogumoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 (6%)</td>
</tr>
<tr>
<td>Leptocoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Longicoelotes</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Pireneitega</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>20 (20%)</td>
</tr>
<tr>
<td>Platacoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Robusticoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Spiricoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Tegecoelotes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Tonsilla</td>
<td>5</td>
<td></td>
<td></td>
<td>3</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>Urocoras</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Wadotes</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>11 (11%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>144 (34%)</strong></td>
<td><strong>121 (28%)</strong></td>
<td><strong>10 (2%)</strong></td>
<td><strong>154 (36%)</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: Total number of coelotinae species 429 (as of January 19, 2008, and the seven species in the current paper are also included).

**Table 2. The number of Coelotinae species versus embolus type, by distribution***.**

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Type I (prolateral)</th>
<th>Type II (proximal)</th>
<th>Type III (retrolateral)</th>
<th>Female only</th>
<th>Total no. of species (by genus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>29</td>
<td>3</td>
<td>8</td>
<td>40</td>
<td>144 (34%)</td>
</tr>
<tr>
<td>Central Asia</td>
<td>14</td>
<td>1</td>
<td>4</td>
<td>19</td>
<td>121 (28%)</td>
</tr>
<tr>
<td>East Asia</td>
<td>95</td>
<td>100</td>
<td>10</td>
<td>139</td>
<td>10 (2%)</td>
</tr>
<tr>
<td>North America</td>
<td>6</td>
<td>17</td>
<td>3</td>
<td>26</td>
<td>154 (36%)</td>
</tr>
</tbody>
</table>

Note: Total number of Coelotinae species 429 (as of January 19, 2008, and the seven species in the current paper are also included).


*Draco*narius* are apparently considered polyphyletic groups. In the true *Coelotes* (i.e. *atropos*-group from Europe and Central Asia, *charitonovi*-group from Central Asia and *pseudoterrestris*-group species from Yunnan, China) all the species have the prolaterally originated type I embolus, whereas the *existilis*-group species from Japan are mixed with type I and II emboli but the prolaterally originated embolus is the dominant type. The true *Draco*narius, i.e., *venustus*-group and *lutulentus*-group species, have the proximally originated type II embolus and other current *Draco*narius with mixed type I, II and III emboli need to be phylogenetically evaluated for their possible new systematic positions. In addition to *Draco*narius, six other genera with unique proximally originated type II embolus are *Iwogumoa* Kishida, 1955, *Leptocoelotes* Wang, 2002, *Platocoelotes* Wang, 2002, *Robusticoelotes* Wang, 2002, *Spiricoelotes* Wang, 2002 from East Asia and *Wadotes* Chamberlin, 1925 from North America. Species with the retrolaterally originated type III embolus are scattered in five different genera and it might be an extreme case of type II embolus, having evolved independently, and containing no significant phylogenetic information. We suggest coding the retrolaterally originated type III embolus as the same state as the proximally originally type II embolus in the phylogenetic analysis.

**Character two: embolus shape**

The shape of embolus could also be informative. “Filiform” and “broad” have been used in descriptions of the embolus and also in character coding (Wang 2002). Studies on all Coelotinae species reveal that there is a continuous change in the shape of the embolus between slender and broad (Figures 13–24). At least 13 Coelotinae species show the intermediate condition between filiform and broad, we call them “slightly broad” in this case, while at least 15 other species show the intermediate condition between “slightly broad” and “distinctly broad” (Table 3). This kind of continuous character hinders character coding, and in this case it may be preferable to code those 13 “slightly broad” species as “?” (ambiguous character), rather than either filiform or broad. For those with an apparently broad embolus (both “broad” and “distinctly broad” in Table 3), all two *Robusticoelotes* species (Figure 23), eight of the 15 *Alloblubionoides* males (Figure 24) and two *Draco*narius species have the “distinctly broad” embolus. We recommend that future phylogenetic analyses...
should code both “broad” and “distinctly broad” as a broad embolus, the 13 “slightly broad” embolus as question marks, and the rest of the Coelotinae as having a filiform embolus. Being homoplastic in current members of Coelotes and Draconarius, the broad embolus did show a strong support for members of genera Alloblubionoides, Robusticoelotes, Femoracoelotes and Urocoras.

The above observations of embolus origin and shape are largely congruent with Wang’s cladogram (Wang 2002) and the current existing Coelotinae classification system, but a further analysis using more characters is needed to justify the system. According to a generic-level study of Coelotinae by Wang (2002), the long, proximally originated embolus is a synapomorphy for the distal-most clade of Coelotinae, including genera *Draconarius* Ovtchinnikov, 1999, *Iwogumoa*, Kishida, 1955, *Bifidocoelotes* Wang, 2002, *Platocoelotes* Wang, 2002 and *Spiricoelotes* Wang, 2002, while the broad-shaped embolus is the synapomorphy for the clade of *Allocubionoides* Paik, 1992 plus *Robusticoelotes* Wang, 2002 (parallel in genera *Femoracoelotes* Wang, 2002 and *Urocoras* Ovtchinnikov, 1999). Unfortunately this study only sampled one representative species, mostly the type species, as the terminal taxon of each genus and the character variations among the species of each

Table 3. Embolus shape in Coelotinae species.

<table>
<thead>
<tr>
<th>Embolus shape</th>
<th>Genus</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slightly Broad</td>
<td>Alloclubionoides</td>
<td><em>Alloclubionoides dimidiatus</em> (Paik, 1974)</td>
</tr>
<tr>
<td>(<em>n=13</em>)</td>
<td></td>
<td><em>Alloclubionoides euini</em> (Paik, 1976)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides jaegeri</em> (Kim, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides kimi</em> (Paik, 1974)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides paikwunensis</em> (Kim and Jung, 1993)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides pseudonariceus</em> (Zhang, Zhu and Song, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides triangulatus</em> (Zhang, Zhu and Song, 2007)</td>
</tr>
<tr>
<td>Coelotes</td>
<td></td>
<td><em>Coelotes bifurcatus</em> Okumura and Ono, 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Coelotes personatus</em> Nishikawa, 1973</td>
</tr>
<tr>
<td>Draconarius</td>
<td></td>
<td><em>Draconarius himalayaensis</em> (Hu, 2001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius agrestis</em> Wang, 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius chaiqiaoensis</em> (Zhang, Peng and Kim, 1997)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius terebratus</em> (Peng and Wang, 1997)</td>
</tr>
<tr>
<td>Broad (<em>n=15</em>)</td>
<td>Coelotes</td>
<td><em>Coelotes brevis</em> Xu and Li, 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Coelotes colosseus</em> Xu and Li, 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Coelotes kintaroi</em> Nishikawa, 1983</td>
</tr>
<tr>
<td></td>
<td>Draconarius</td>
<td><em>Draconarius carinatus</em> (Wang et al., 1990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius curiosus</em> Wang, 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius linxiaensis</em> Wang, 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius neixiangensis</em> (Hu, Wang and Wang, 1991)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius ornatus</em> (Wang et al., 1990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius patellabfidxis</em> Wang, 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius rufulus</em> (Wang et al., 1990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius tryblionatus</em> (Wang and Zhu, 1991)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius uncinnatus</em> (Wang et al., 1990)</td>
</tr>
<tr>
<td>Femoracoelotes</td>
<td></td>
<td><em>Femoracoelotes latus</em> (Wang, Tso and Wu, 2001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Femoracoelotes platnicki</em> (Wang and Ono, 1998)</td>
</tr>
<tr>
<td>Urocoras</td>
<td></td>
<td><em>Urocoras longispinus</em> Kulczynski, 1897</td>
</tr>
<tr>
<td>Distinctly broad</td>
<td>Alloclubionoides</td>
<td><em>Alloclubionoides circinalis</em> (Gao et al., 1993)</td>
</tr>
<tr>
<td>(<em>n=12</em>)</td>
<td></td>
<td><em>Alloclubionoides cochlea</em> (Kim, Lee and Kwon, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides coreana</em> (Paik, 1992)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides lunatus</em> (Paik, 1992)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides mandzhuricus</em> (Ovtchinnikov, 1999)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides napoloovi</em> (Ovtchinnikov, 1999)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides paiki</em> (Ovtchinnikov, 1999)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Alloclubionoides quadrativulus</em> (Paik, 1974)</td>
</tr>
<tr>
<td>Draconarius</td>
<td></td>
<td><em>Draconarius specialis</em> (Xu and Li, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Draconarius tubercularis</em> (Xu and Li, 2007)</td>
</tr>
<tr>
<td>Robusticoelotes</td>
<td></td>
<td><em>Robusticoelotes pichoni</em> (Schenkel, 1963)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Robusticoelotes sammenensis</em> (Tang, Yin and Zhang, 2002)</td>
</tr>
</tbody>
</table>
genus were not considered or reflected in the cladogram. Other characters supporting this distal-most clade include the strongly elongated spermathecal tubes and the long, strongly extended cymbial furrow. The long spermathecal tubes and the long cymbial furrow are related to the long, proximally or retrolaterally originated embolus. Jäger (2006) also found that the long embolus in Sparassidae is related to a strong modification of the retrolateral side of the cymbium.

**Taxonomy**

**AMAUROBIIDAE** Thorell, 1870  
**COELOTTINAE** F.O. Pickard-Cambridge, 1893  
**Draconarius** Ovtchinnikov, 1999

**Draconarius bounnami** sp. nov.  
(Figures 25–31, 75, 76)

**Type material**
Holotype: male, Laos: Luang Nam Tha Province, Nam Ma, 801 m, 21°06.148’N 101°05.571’E, secondary forest, leaf litter, sieving, sweepnet, P. Jäger and V. Vedel leg., 5 November 2004, deposited in SMF.

**Etymology**
The specific name is in honour and memory of Bounnam Pathoumthong (deceased), who steadily supported Peter Jäger’s work in Laos; noun in genitive case.

![Figures 25–27. Draconarius bounnami sp. nov., male holotype from Nam Ma, Luang Nam Tha Province, Laos, male palp. 25. Prolateral. 26. Ventral. 27. Retrolateral view.](image-url)
Diagnosis

Males of this new species can be easily identified by the long, finger-shaped lateral tibial apophysis (retrolateral view), the broad and strongly extending conductor dorsal edge, the absence of a median apophysis, and the embolic base arising retrolaterally (Figures 25–27).

Description

Male holotype. Small spider, total length 4.00 mm (Figures 30, 31). Dorsal shield of prosoma 2.10 long, 1.20 wide; opisthosoma 1.90 long, 1.20 wide. AME smallest, slightly smaller than others which are approximately the same size (AME 0.05, ALE 0.08, PME 0.08, PLE 0.08); AME separated by about half of its diameter, AME and ALE close together, other eyes are separated by slightly less than PME diameter.

(AME–AME 0.03, AME–ALE 0.02, ALE–PLE 0.05, PME–PME 0.06, PME–PLE 0.06, AME–PME 0.06) (Figure 28). Chelicera with three promarginal and two retromarginal teeth. Palp with patellar apophysis; retrolateral tibial apophysis long, occupies most of the tibial length; lateral tibial apophysis strongly modified to a broad base and finger-shaped apophysis; cymbial furrow long, extending more than half of cymbial length; conductor moderately long, with broad, strongly extending dorsal edge and a sharp apex; conductor dorsal apophysis present; conductor lamella well developed; median apophysis absent; embolus (type III) long, retrolateral in origin, arising in a 5 o’clock position and extending proximally slightly beyond the tibia/tarsus junction, running two-thirds of an oval, extending and coiling distally beyond the distal bulb (Figures 25–27).

**Female.** Unknown.

**Relationships**

*Draconarius bounnami* sp. nov. is considered congeneric with *Draconarius* in having two retrolateral cheliceral teeth, a long cymbial furrow and a long, filiform embolus. However, the absence of a median apophysis makes its generic placement questionable. No similar species has been described so far.

**Distribution**

Laos (Luang Nam Tha Province: Nam Ma) (Figures 75, 76).

*Draconarius hanoiensis* sp. nov.  
(Figures 32–33, 75)

**Type material**

Holotype female and one paratype female from Tam Dao Mount Forest Park, Hanoi, Vietnam, 2 May 1999, X. P. Wang leg., deposited in AMNH.

**Etymology**

The specific name refers to the type locality; adjective.
Diagnosis
Females are similar to the *lutulentus*-group species in having similar spermathecal tubes, but can be distinguished by the absence of epigynal teeth, the short, transverse extending atrium, and the unique *Coras*-shaped lateral atrial margins widely open anteriorly and converging posteriorly (Figures 32, 33).

Description
**Female holotype.** Large spider, total length 10.8 mm. Dorsal shield of prosoma 5.62 long, 3.51 wide; opisthosoma 5.20 long, 3.64 wide. AME smallest; ALE and PLE largest, slightly larger than PME (AME 0.15, ALE 0.24, PME 0.20, PLE 0.23); AME separated by its diameter, PME separated from each other by slightly less than its diameter, from PLE by approximately PME diameter; AME, ALE, PLE close together (AME–AME 0.15, AME–ALE 0.08, ALE–PLE 0.11, PME–PME 0.18, PME–PLE 0.20, AME–PME 0.21). Chelicera with three promarginal and two retromarginal teeth. Epigynum without epigynal teeth; atrium short, with width at least four times its length; posterior atrial margin close together with epigastric furrow; lateral atrial margins similar to the *Coras* species being widely open anteriorly, and converging gradually toward posterior margin, with posterior margin width only one-third of anterior margin; copulatory ducts distinct, extending medially and anteriorly between spermathecae, coiled; spermathecae more or less elongated; spermathecal bases widely separated by approximately 1.5 times their width; spermathecal stalks diverging, with distal ends separated by at least three times their width; spermathecal heads distinct, arising from lateral sides of anterior extending copulatory ducts (Figures 32, 33).

**Male.** Unknown.

Relationships
*Dracnonarius hanoiensis* sp. nov. is a member of the *lutulentus*-species group. In addition to the existing four species recorded by Wang (2003), at least four more species belong to this group: *D. abbreviatus* Dankittipakul and Wang, 2003, *D. anthonyi* Dankittipakul and Wang, 2003, and *D. promontorius* Dankittipakul, Sonthichai and Wang, 2006 from Thailand, plus *D. hanoiensis* sp. nov. from Vietnam described here. The distribution of the *lutulentus*-species group ranges from the Himalayas (Bhutan) over southern China, to Laos and Thailand.

Distribution
Vietnam (Hanoi: Tam Dao Mount Forest Park) (Figure 75).

*Dracnonarius huongsonensis* sp. nov.  
(Figures 34–35, 75)

Type material
Holotype female and one paratype female from Huong Son, Vietnam, 19 April 1998, D. Silva leg., deposited in AMNH.
Etymology
The specific name refers to the type locality; adjective.

Diagnosis
Females of this species are similar to the gurkha-group species in having the rounded spermathecae but can be distinguished by the absence of epigynal teeth, the hidden spermathecal heads (from dorsal view), and the closely situated spermathecae (Figures 34, 35).

Description
Female holotype. Small spider, total length 3.70 mm. Dorsal shield of prosoma 1.85 long, 1.30 wide; opisthosoma 1.85 long, 1.27 wide. AME smallest, approximately half the size of other eyes (AME 0.05, ALE 0.11, PLE 0.11, PME 0.10); eyes clustered together (AME–AME 0.04, AME–ALE 0.02, ALE–PLE 0.05, PME–PME 0.05, PME–PLE 0.06, AME–PME 0.10). Chelicera with three promarginal and two retromarginal teeth. Epigynum without epigynal teeth; atrium small, close to epigastric furrow; copulatory ducts invisible from dorsal view; spermathecae large, rounded, close together; spermathecal heads not visible from dorsal view (Figures 34, 35).

Male. Unknown.

Relationships
The presence of simple, rounded spermathecae in D. huongsonensis sp. nov. is similar to that of D. gurkha (Brignoli, 1976) and related species. Species of the gurkha-group species are recorded from Himalayas and neighbouring regions.

Distribution
Vietnam (Huong Son) (Figure 75).
Draconarius latidens sp. nov.  
(Figures 36–43, 75–76)

Type material
Holotype female from Muang Sing, Nam Det, Luang Nam Tha Province, Laos, 821–1097 m, 21°10.193’N 101°14.445’E to 21°09.983’N 101°14.742’E, secondary forest, along path, soil and vegetation, hand, sweepnet, sieving, P. Jäger & V. Vedel leg., 6 November 2004, deposited in SMF.

Etymology
The specific name comes from the Latin words “latus” meaning “broad” and “dens” meaning “tooth”, referring to the broad epigynal teeth; noun in apposition.

Diagnosis
The broad, widely separated epigynal teeth, the anteriorly situated, distinctly separated atria, and the long, anteriorly converging spermathecal stalks allow easy recognition of the females of this new species (Figures 36–39). Posterior margin of chelicerae with four teeth (Figure 43).

Description
Female holotype. Large spider, total length 10.3 mm (Figures 40, 41). Dorsal shield of prosoma 4.80 long, 3.00 wide; opisthosoma 5.30 long, 3.50 wide. AME and PME about the same size, slightly smaller than lateral eyes (AME 0.15, ALE 0.18, PME 0.15, PLE 0.17); AME, ALE, PLE separated by approximately two-thirds of AME diameter, other eyes are widely separated by at least PME diameter (AME–AME 0.09, AME–ALE 0.09, ALE–PLE 0.09, PME–PME 0.15, PME–PLE 0.20, AME–PME 0.18) (Figure 42). Chelicera with three promarginal and four retromarginal teeth (Figure 43). Epigynum with broad, widely separated epigynal teeth; atria distinct, situated anteriorly and separated from epigastric furrow by at least its length; posterior atrial margin extending anteriorly and forming distinct atrial septum; copulatory ducts broad, originating anteriorly; spermathecal bases widely separated by its width and modified into two rounded parts; spermathecal stalks

Figures 36, 37. Draconarius latidens sp. nov., female holotype from Muang Sing, Nam Det, Luang Nam Tha Province, Laos. 36. Epigynum, ventral view. 37. Vulva, dorsal view.
anterior extending and converging, with distal ends close together; spermathecal heads small, situated anteriorly, with bases close together and distal ends laterally extending (Figures 36–39).

**Male.** Unknown.

**Relationships**

The broad, widely separated epigynal teeth and the anteriorly situated atrium distinguish *D. latidens* sp. nov. from all other Coelotinae. Although species of the genus *Tegecoelotes* Ovtchinnikov, 1999 also have a pair of broad epigynal teeth, these are usually situated close together and also they have no distinct anteriorly situated atrium. Neither taxon apparently belongs to the same group.
Distribution
Laos (Luang Nam Tha Province: Nam Det) (Figures 75, 76).

*Draconarius postremus* sp. nov.
(Figures 44–57, 75, 76)

Type material
Holotype female and one paratype male from Muang Sing, Nam Det, Luang Nam Tha Province, Laos, 821–1097 m, 21°10.193’N 101°14.445’E to 21°09.983’N 101°14.742’E, secondary forest, along path, soil and vegetation, hand, sweepnet, sieving, P. Jäger & V. Vedel leg., 6 November 2004, deposited in SMF.

Etymology
The specific name is derived from the Latin adjective “postremus”, meaning “most posterior”, and referring to the posterior extension of the atrium; adjective.

Diagnosis
Females of this new species can be easily recognized by the tiny epigynal teeth situated laterally of the atrium close to the epigastric furrow, the small, posterior extending atrium, and the strongly convoluted, laterally extending spermathecae (Figures 44, 45, 49, 50), and males by the minute patellar apophysis, the short conductor, the simple, broad and not spoon-shaped median apophysis, and the embolic base arising retrolaterally (Figures 46–48).

Description
Female holotype. Small spider, total length 4.25 mm (Figures 51–53). Dorsal shield of prosoma 2.10 long, 1.35 wide; opisthosoma 2.15 long, 1.30 wide. AME

smallest, approximately half the size of other eyes (AME 0.04, ALE 0.09, PME 0.08, PLE 0.09); AME, ALE, PLE close together, separated by slightly less than AME diameter, other eyes are relatively widely separated by slightly less than PME diameter (AME–AME 0.03, AME–ALE 0.03, ALE–PLE 0.04, PME–PME 0.07, PME–PLE 0.06, AME–PME 0.06) (Figure 56). Chelicera with three promarginal and two retromarginal teeth. Epigynal teeth minute, indistinct, situated posteriorly close to epigastric furrow and widely separated by more than atrial width; atrium small, situated and extending posteriorly; copulatory ducts originating posteriorly and extending anteriorly, indistinct from dorsal view; spermathecae large, close together, looping and extending laterally; spermathecal heads small, situated distally of spermathecal lateral extension (Figures 44, 45, 49, 50).

Male paratype. Small spider, total length 4.00 mm (Figures 54, 55). Dorsal shield of prosoma 1.95 long, 1.25 wide; opisthosoma 2.10 long, 1.30 wide. Eyes are similar to female eyes, with AME smallest, approximately half the size of other eyes; AME, ALE, PLE separated by slightly less than AME diameter, other eyes are separated by slightly less than PME diameter (Figure 57). Chelicera with three promarginal and two retromarginal teeth. Palp with a tiny patellar apophysis; retrolateral tibial apophysis slightly longer than half of tibial length; lateral tibial apophysis broad; cymbial furrow long, extending more than half of cymbial length; conductor short, strongly concave, with broad lamella and large dorsal apophysis, its sheath-like part with a subdistal indentation; median apophysis broad, not spoon-shaped; embolus (type III) long, retrolateral in origin, arising in a 5 o’clock position and extending proximally beyond tibia/tarsus junction, running two-thirds of an oval, extending and coiling distally beyond distal bulb (Figures 46–48).
Relationships

The only Coelotinae that might be related to *D. postremus* sp. nov. is *D. rufulus* (Wang et al., 1990) described from Zhejiang and Anhui Provinces in southeastern China. Both species share the small, posteriorly extending atrium and the large, convoluting spermathecal tubes, but *D. rufulus* has no patellar apophysis, exhibits a spoon-shaped median apophysis and the strongly modified conductor and embolus. From the latter characters it is unlikely that they form a sister group relationship.

Distribution

Laos (Luang Nam Tha Province: Nam Det) (Figures 75–76).

*Draconarius songi* sp. nov.

(Figures 58–65, 75, 76)

Type material

Holotype male from Muang Sing, Nam Ha Protected Area, Luang Nam Tha Province, Laos, 745 m, 21°08.075′N 101°11.991′E, secondary forest, leaf litter, bank at stream, under stones, day and night, P. Jäger & V. Vedel leg., 4 November 2004, deposited in SMF.

Figures 58–60. *Draconarius songi* sp. nov., male holotype from Muang Sing, Nam Ha Protected Area, Luang Nam Tha Province, Laos, palp. 58. Prolateral. 59. Ventral. 60. Retrolateral view.
**Etymology**

The specific name is in honour and memory of Daxiang Song (deceased) for his contribution to Chinese arachnological research and for his support of the first author's research on spider systematics; noun in genitive case.

**Diagnosis**

Males of this new species may be recognized by the tiny patellar apophysis, the distally situated lateral tibial apophysis, and the embolus base arising retrolaterally (Figures 58–60). Both the promargin and retromargin of the chelicerae have six teeth. (Figure 62).

**Description**

*Male holotype.* Medium-sized spider, total length 6.55 mm (Figures 63–65). Dorsal shield of prosoma 3.30 long, 2.30 wide; opisthosoma 3.25 long, 2.00 wide. AME smallest, approximately half the size of other eyes (AME 0.06, ALE 0.13, PLE 0.13, PME 0.11); AME separated by its diameter; AME, ALE, PLE close together, separated by about AME radius; PME separated from each other and from AME by approximately AME diameter, from PLE by slightly less than PME diameter (AME–AME 0.06, AME–PLE 0.03, ALE–PLE 0.03, PME–PME 0.06, PME–PLE 0.09, AME–PME 0.07) (Figure 61). Chelicera with six promarginal and six retromarginal teeth (Figure 62). Palp with a tiny patellar apophysis; retrolateral tibial apophysis occupying more than half of tibial length; lateral tibial apophysis small, situated distally; cymbial furrow long, extending more than half of cymbial length; conductor short, with broad lamella; median apophysis long, spoon-shaped, with free prolateral edge; embolus long, retrolateral in origin, arising in a 4 o’clock-position, running two-thirds of an oval, extending and coiling beyond distal bulb (Figures 58–60).

*Female.* Unknown.

**Relationships**

*Dragoconarius songi* sp. nov. exhibits a typical *Dragoconarius* palp in having a patellar apophysis, a lateral tibial apophysis, a long cymbial furrow, a conductor dorsal apophysis, a spoon-shaped median apophysis, and a long, filiform embolus. The presence of six cheliceral teeth on both promargin and retromargin makes a definite generic placement difficult.

**Distribution**

Laos (Luang Nam Tha Province: Nam Ha) (Figures 75, 76).

*Dragoconarius tabularis* sp. nov.

(Figures 66–74, 75, 76)

**Type material**

Holotype female from Ban Tavan, Luang Nam Tha Province, Laos, 20°58.702’N 101°28.686 E 581 m, 20°58.872’N 101°28.875’E 657 m, valley with stream, disturbed primary forest, by hand, sieving, sweepnet, P. Jäger & V. Vedel leg., 9 November 2004, deposited in SMF.

**Etymology**

The specific name comes from the Latin word “*tabularis*” meaning “of plates”, referring to the plate-shaped spermathecal tubes; adjective.

**Diagnosis**

This new species can be easily distinguished from other Coelotinae by the absence of epigynal teeth, the indistinct atrium, the posteriorly situated epigynal hoods, and the
unique spermathecae extending and looping anteriorly and forming plate-shaped spermathecal tubes (Figures 66–69).

**Description**

**Female paratype.** Small spider, total length 4.50 mm (Figures 72–74). Dorsal shield of prosoma 2.35 long, 1.42 wide; opisthosoma 2.15 long, 1.34 wide. AME smallest, approximately half the size of other eyes [AME 0.04, ALE 0.08 (left ALE missing), PME 0.07, PLE 0.08]; AME, ALE, PLE close together, separated by about AME diameter; PME separated from each other and from AME by slightly less than PME diameter, from PLE by slightly more than PME diameter (AME–AME 0.04, AME–ALE 0.04, PME–PME 0.06, PME–PLE 0.08, AME–PME 0.05) (Figure 71). Chelicera with three promarginal and two retromarginal teeth. Epigynum without epigynal teeth; atrium small, situated posteriorly, with barely visible atrial margins; epigynal hoods distinct, situated posteriorly close to epigastric furrow; copulatory ducts indistinct; spermathecae with small bases, separated by approximately its

Figures 66, 67. *Draconarius tabularis* sp. nov., female holotype from Luang Nam Tha between Ban Tavan, Luang Nam Tha Province, Laos. 66. Epigynum, ventral view. 67. Vulva, dorsal view.

Figures 68, 69. *Draconarius tabularis* sp. nov., female holotype from Luang Nam Tha between Ban Tavan, Luang Nam Tha Province, Laos. 68. Epigynum, ventral view. 69. Vulva, dorsal view.
width; spermathecal stalks (could be the heads) extending anteriorly, then strongly looping and forming plate-shaped broad structure (Figures 66–69).

Male. Unknown.

Relationships

*Draconarius tabularis* sp. nov. is considered congeneric with the type species of the genus *Draconarius* as it exhibits two retrolateral cheliceral teeth. However, the
posteriorly situated epigynal hoods and the unique course and shape of the spermathecal tubes make a definite generic placement questionable. No similar species has been described so far.

Distribution
Laos (Luang Nam Tha Province: Ban Tavan) (Figures 75, 76).

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Figures 75, 76. 75. Records of *Draconarius bournami* sp. nov., *D. latidens* sp. nov., *D. postremus* sp. nov., *D. songi* sp. nov., *D. tabularis* sp. nov. from Luang Nam Tha Province, Laos and *D. hanoiensis* sp. nov. from Hanoi, Vietnam and *D. huongsonensis* sp. nov. from Huong Son, Vietnam. 76. Records of five species from Luang Nam Tha Province, Laos, enlarged.
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