

Scorpions from the rainforest canopy of Laos, with the description of a new species of *Lychas* C.L. Koch, 1845 (Scorpiones: Buthidae)

Скорпионы из крон деревьев дождевого леса Лаоса с описанием нового вида рода *Lychas* C.L. Koch, 1845 (Scorpiones: Buthidae)

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KEY WORDS: scorpion, Buthidae, *Lychas*, new species, Laos, rainforest, canopy.

КЛЮЧЕВЫЕ СЛОВА: скорпион, Buthidae, *Lychas*, новый вид, Лаос, дождевой лес, кроны деревьев.

ABSTRACT. A new species, *Lychas aberlenci* sp.n., is described from the rainforest canopy of Khammouane Province in Laos. The new species is characterized by a moderate size as compared to the congeners, the total length of the male measuring 49.8 mm. The coloration is pale yellowish to reddish-yellow with a conspicuous, inverted triangular, blackish spot at the anterior margin of the carapace. The pectines are with 29–30 teeth in the male, the highest number so far observed in a *Lychas* species; fulcra are present, being conspicuous. With the description of *L. aberlenci* sp.n., the number of known *Lychas* species in Laos is increased to three.

РЕЗЮМЕ. Описан новый вид, *Lychas aberlenci* sp.n., из крон деревьев дождевого тропического леса в провинции Хаммуан в Лаосе. Новый вид характеризуется умеренными размерами по сравнению с другими видами рода, у самцов достигая общей длины в 49,8 мм. Окраска бледно желтоватая до красновато-желтой с явственным черноватым пятном в форме обращенного вершиной вниз треугольника у переднего края карапакса. Пектины у самца с 29–30 зубами, и это самое высокое их число среди видов *Lychas*; фулькры имеются, явственные. С описанием *L. aberlenci* sp.n. число видов *Lychas*, известных из Лаоса, выросло до трех.

Introduction

As discussed in previous publications [Lourenço & Qi, 2007], scorpions from tropical rainforest canopies are little-known, with only very few examples documented yet. Lourenço [1997] provided a checklist of such examples, mainly relating to species of the genus *Tityus* C.L. Koch, 1836 (Buthidae) from the tropical rainforest of South America. Subsequently, other species of *Tityus* have also been reported from

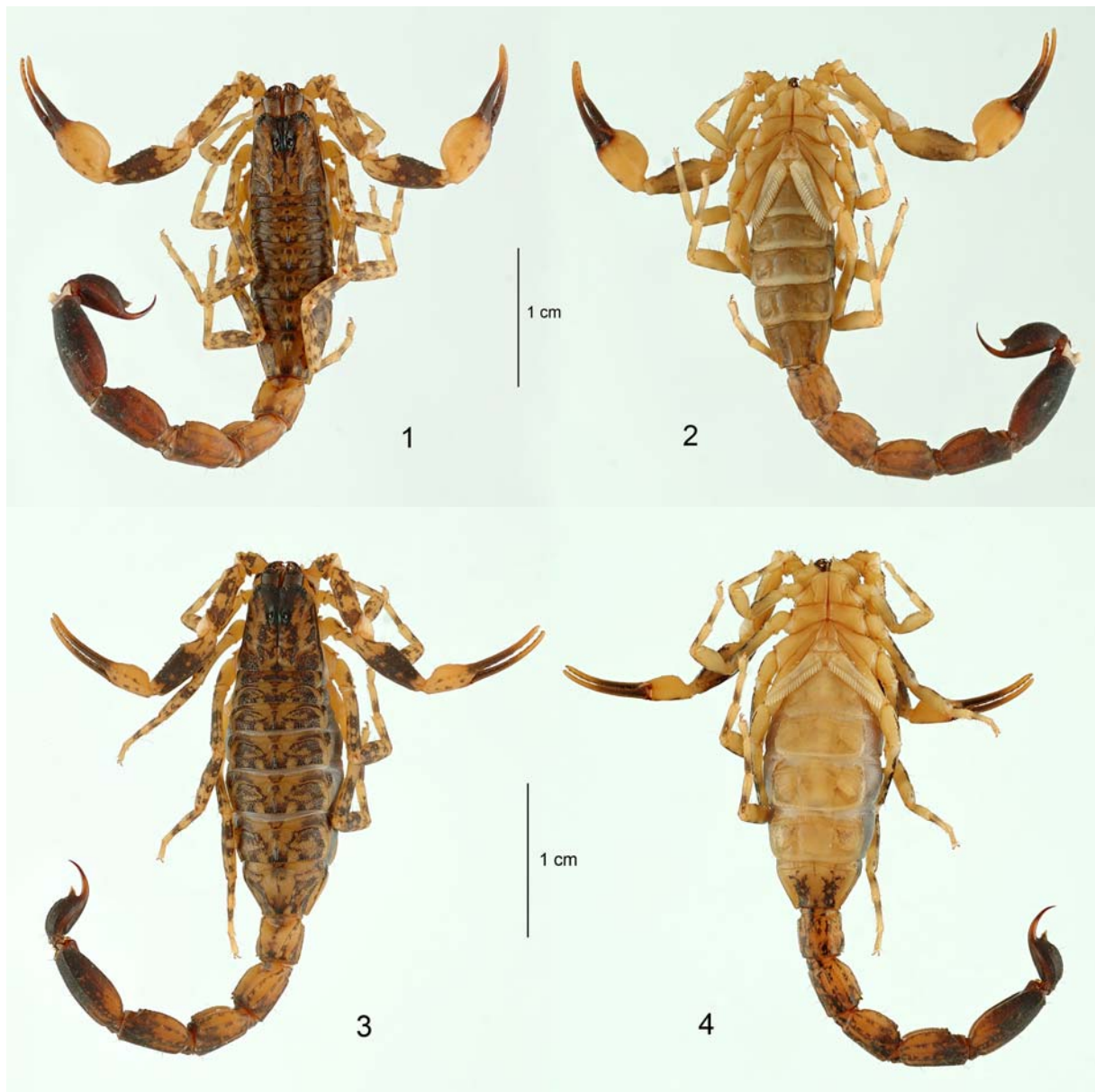
the canopy of the Amazon forest [Lourenço & Pézier, 2002] and a new species, *Tityus canopensis* Lourenço et Pézier, 2002, living exclusively in the canopy has been described.

A few years ago, a survey effectuated in New Guinea included a collection of several scorpion specimens taken from canopy by means of fogging. A study of these scorpions revealed a single species belonging to the genus *Lychas* C.L. Koch, 1845 [Lourenço & Qi, 2007]. The only *Lychas* reported to that date from New Guinea had been *Lychas variatus papuanus* (Thorell, 1888) [see also Fet & Lowe, 2000]. After examining the type material of this latter subspecies the canopy population was identified as a different subspecies, *Lychas variatus canopensis* Lourenço et Qi, 2007, distinct both in its considerably smaller size and its peculiar habitat from *L. variatus papuanus*, a soil-dwelling taxon.

A recent inventory was carried out on rainforest canopy fauna in the Khammouane Province in Laos during the IBCFL, Canopy Operation ('Radeau des Cimes'), which took place during the North Asian spring of 2012. This Canopy Operation led to the collection of a few scorpions, all belonging to the genus *Lychas* C.L. Koch, 1845, family Buthidae C.L. Koch, 1837. All of the specimens but one proved to represent *L. mucronatus* (Fabricius, 1798), a species common in Asia and Southeast Asia. The sole exception, an adult male, was confirmed to belong to a new species, being described here.

The genus *Lychas* in Laos and Vietnam

The genus *Lychas* comprises a complex group of species of buthid scorpions. These show a variety of grades of evolutionary development [Lourenço, 2011].



Figs 1–4. *Lychas mucronatus* (Fabricius, 1798) from the canopy in Laos rainforest: 1–2 — male; 3–4 — female, dorsal and ventral aspects of habitus, respectively.

Рис. 1–4. *Lychas mucronatus* (Fabricius, 1798) из крон деревьев дождевого леса в Лаосе: 1–2 — самец; 3–4 — самка, габитус соответственно сверху и снизу.

The range of geographical distribution of the genus is very large, with different species in Africa, Asia, Australia and some Pacific islands [Fet & Lowe, 2000]. An even greater range of palaeodistribution of *Lychas* or its proto-elements is also suggested by fossil amber evidence from the Baltic region [Lourenço & Weitschat, 1996; Lourenço, 2012].

The different grades of evolutionary development presented by the species of *Lychas* were originally outlined by Vachon [1986] in his precise diagnosis of the genus. For instance, some characters such as fulcra in the pectines can be either present or absent, depending on species. Variation in the number of pectinal teeth is

also unusually important for diagnostic purposes among the species of the genus.

A number of species have been described and/or reported from Asia. This number is, however, much more limited when it concerns Laos and Vietnam, the countries in which the rainforests of Khammouane Province are distributed. In the 'Catalog of the Scorpions of the World', only *Lychas mucronatus* has been reported from there [Fet & Lowe, 2000]. Very recently, a second species, *Lychas inexpectatus* Lourenço, 2011, was described from northern Laos [Lourenço, 2011]. The evolutionary grade of development shown by *L. inexpectatus* appears to be basal, whereas the features



Figs 5–6. *Lychas aberlenci* sp.n., holotype, dorsal and ventral aspects of habitus, respectively.

Рис. 5–6. *Lychas aberlenci* sp.n., голотип, габитус соответственно сверху и снизу.

of *Lychas mucronatus* and the new species described here can be placed at a much higher evolutionary level.

Material and methods

The holotype is temporarily housed in the collections of the Muséum national d'Histoire naturelle, Paris. It will be subsequently deposited in the collections of the 'future' Natural History Museum of Laos. The studied material of *Lychas mucronatus* is partly deposited in the Muséum national d'Histoire naturelle, Paris; some specimens are in the collections of the CIRAD, UMR CBGP (INRA/IRD/Cirad/Montpellier SupAgro), while some others in the collections of the 'future' Natural History Museum of Laos. Soil material from the same region is deposited in the Zoological Museum, State University of Moscow, Russia. Illustrations and measurements were produced using a Wild M5 stereo-microscope with a drawing tube and an ocular micrometer. Measurements follow Stahnke [1970] and are given in mm. Line drawings and photographs are not executed to scale. Trichobothrial notations follow Vachon [1974], while morphological terminology mostly follows Vachon [1952] and Hjelle [1990].

Taxonomic part

Buthidae C.L. Koch, 1837

Lychas C.L. Koch, 1845

Lychas mucronatus (Fabricius, 1798)
Figs 1–4.

MATERIAL COLLECTED IN THE RAINFOREST CANOPY OF LAOS: Laos, Khammouane Province, Hin Boun Ban Nathan River, 'Camp de l'Igame', 17°59.645'N, 104°49.352'E, 6.V.2012, IBCFL, 'Opération Canopée', leg. H.-P. Aberlenc & S. Collard, 1 ♂; Idem, 13.V.2012, 1 ♂; Idem, 14.V.2012, 1 ♀; Idem, 8.V.2012, 1 ♂, 1 ♀; Idem, 8.V.2012, 1 ♂ (together with the holotype of *Lychas aberlenci* sp.n.), all leg. H.-P. Aberlenc; Idem, 18.V.2012, Ikos 'forêt de pente Karstique', leg. J.-Y. Serein, 1 ♂.

SOIL MATERIAL: Laos, Khammouane Province, N of Boualapha, X.1978, leg. B. Dejenbol, 3 ♂♂, 9 ♀♀.

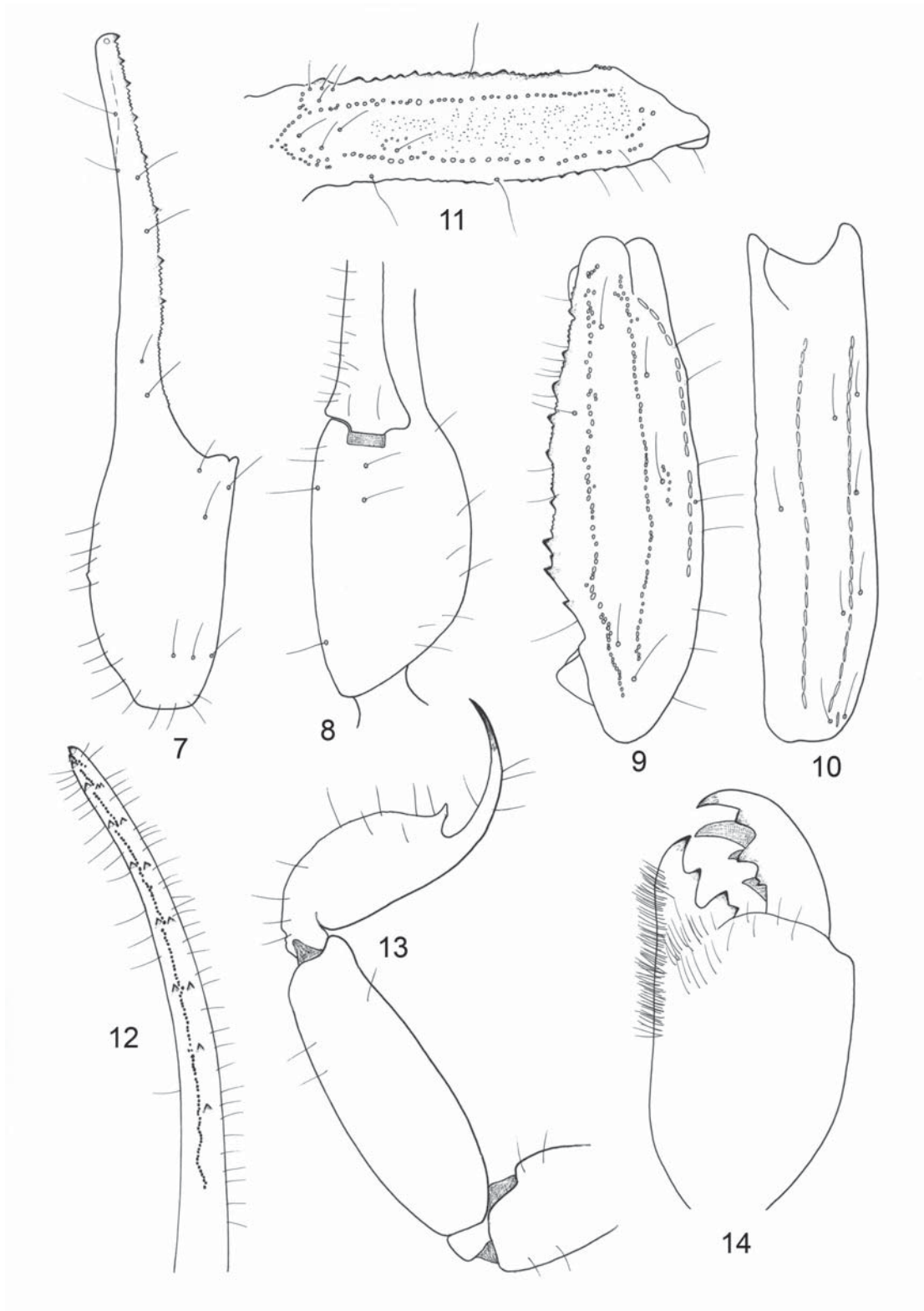
Lychas aberlenci sp.n.

Figs 5–14.

MATERIAL. HOLOTYPE ♂. Laos, Khammouane Province, Hin Boun River, Ban Nathan Village, 'Camp de l'Agame', 17°59.645'N, 104°49.352'E, 8.V.2012, IBCFL, 'Opération Canopée', leg. H.-P. Aberlenc.

NAME. Honours Henri-Pierre Aberlenc, CIRAD, Montpellier, who collected the new species with the help of Jean-Yves Serein and Noui Baïben.

DIAGNOSIS. A scorpion of moderate size as compared to the other congeners, ♂ measuring 49.6 mm in total length. The general coloration is yellowish to reddish-yellow with a conspicuous, inverted triangular, blackish spot at the anterior margin of the carapace, extending from lateral to median eyes. Carinae and granulations are moderately to weakly marked. The carapace is moderately emarginated. The median ocular tubercle is located anterior to the centre of the carapace; the median eyes are moderate and globular. The pectines are large; pectinal teeth count 29–30 for the male holotype, the highest number so far observed for a *Lychas* species; fulcra are present, being conspicuous. Dentate margins of the fixed and movable fingers of the pedipalp chela are with 6 or 7 almost linear rows



Figs 7–14 *Lychas aberlenci* sp.n., holotype: 7–11 — trichobothrial pattern; 7–8 — chela, dorso-external and ventral aspects, respectively; 9–10 — patella, dorsal and external aspects, respectively; 11 — femur, dorsal aspect; 12 — dentate margin of movable finger, showing rows of granules; 13 — metasomal segment V and telson, lateral aspect; 14 — chelicera, dorsal aspect.

Рис. 7–14. *Lychas aberlenci* sp.n., голотип: 7–11 — характер трихоботриотаксии; 7–8 — хела, соответственно одновременно сверху и снаружи, а также снизу; 9–10 — пателла, соответственно сверху и снаружи; 11 — фемур, сверху; 12 — зубчатый край подвижного пальца с рядами гранул; 13 — сегмент 5 метасомы и тельсон, сбоку; 14 — хелицера, сверху.



Fig. 15. Map of Southeast Asia, showing the type locality of *Lychas aberlenci* sp.n. in the Khammouane Province, Laos.

Рис. 15. Карта Юго-Восточной Азии с указанием типового локалитета *Lychas aberlenci* sp.n. в провинции Хаммуан (Лаос).

of granules (see taxonomic remarks); one or two conspicuous external accessory granules are located next to the basalmost row of granules. The chela has an inconspicuous scalloping of the proximal dentate margin of the fixed finger in the male. The subaculear tubercle is strong and spinoid in shape; ventral granules conspicuous.

RELATIONSHIPS. Based on its general appearance, *L. aberlenci* sp.n. is markedly different from all of the other congeners, in particular from *L. mucronatus*, a species also distributed in Laos and Vietnam. It can, however, be characterized by a number of features: (i) an overall yellow to reddish-yellow coloration with a conspicuous, inverted triangular, blackish spot at the anterior margin of the carapace; (ii) a size similar to that of *L. mucronatus*, but with markedly distinct morphometric values (see Table); (iii) very large pectines with 29–30 teeth, the highest number observed so far for a *Lychas* species; fulcra are present, being conspicuous.

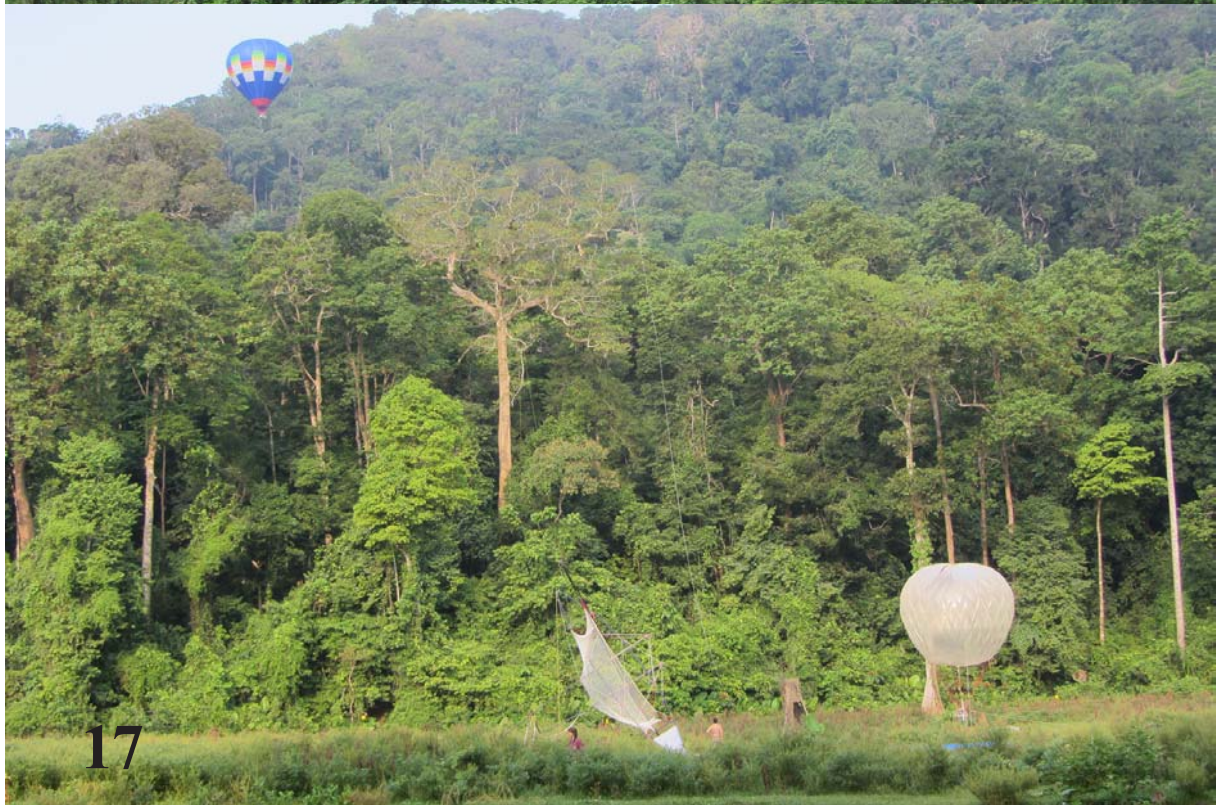
DESCRIPTION. Coloration. Generally yellowish to reddish-yellow with some dark spots on metasoma. Prosoma: carapace reddish-yellow with a conspicuous, inverted triangular, blackish spot at anterior margin, extending from lateral to median eyes; some blackish spots also at lateral edges. Mesosoma: tergites reddish-yellow to slightly brownish. Venter, coxapophysis, sternum and genital operculum yellow; pectines pale yellow; sternites pale brown. Metasomal segments I–IV reddish-yellow, marked with dark spots ventrally; segments IV and V more intensely marked; V reddish-brown. Vesicle reddish-brown; aculeus yellow at base

and dark reddish at its extremity. Chelicerae brownish, intensely marked with dark variegated spots which cover its entire surface; fingers and teeth reddish-brown. Pedipalps yellow, without spots; chela yellow, with rows of reddish granules at dentate margins of fingers. Legs pale yellow.

Prosoma: anterior margin of carapace moderately emarginate. Carapace carinae weak; anterior median and posterior median carinae weak; other carinae obsolete. Intercarinal spaces weakly granular. Median ocular tubercle anterior to the centre of carapace; median eyes of moderate size and globular, separated by 1.5 ocular diameters. Three pairs of lateral eyes. Mesosoma: tergites I–VI with a median carina; weak to obsolete on I, moderate on II–VI. Tergite VII pentacarinat, with lateral pairs of carinae moderate; median carinae present in proximal half, moderately developed. Intercarinal spaces with weakly to moderately marked granulations, slightly stronger than that of carapace. Sternites without granulations, smooth with a moderate setation; spiracles long; sternite VII with four carinae. Pectines very long; pectinal teeth count 29–30; fulcra present and conspicuous. Metasomal segments I and II with 10 carinae, weakly crenulate; III and IV with 8 carinae, weakly crenulate. Segment V with five vestigial carinae, rounded; intermediate carinae on segment II represented by a few granules; any marked posterior spinoid granules on dorsal carinae of segments I–IV absent. Dorsal furrows of all segments very weakly developed, without granulations; intercarinal spaces weakly granular. Telson elongated and non-granular, smooth; aculeus strongly curved and only slightly shorter than vesicle; subaculear tubercle strong and spinoid in shape; ventral granules conspicuous. Chelicerae with dentition characteristic of the buthids [Vachon, 1963]; two small, but well distinct basal teeth on movable finger. Pedipalps: femur pentacarinat; all carinae moderately crenulate. Patella with seven carinae, moderately crenulate; dorso-internal carinae with 7 or 8 slightly spinoid granules. Chela without carinae, smooth. Intercarinal spaces almost smooth on femur and patella. Dentate margins on movable and fixed fingers composed of 6 or 7 linear rows of granules; 1 or 2 conspicuous external accessory granules next to basalmost row of granules. Chela with an inconspicuous scalloping of proximal dentate margin of fixed finger in ♂. Trichobothrial pattern type A, orthobothriotaxic [Vachon, 1974]; dorsal trichobothria of femur in β configuration [Vachon, 1975]. Legs: ventral aspect of tarsi with a brush-like group of setae. Tibial spurs present on legs III and IV, weakly to moderately developed; pedal spurs present on all legs; reduced on legs I and II.

Ecology of the area

The rainforests in which the new species was collected (Figs 15–17) are situated in an area where the Central Indochina Limestone meets the Annamite Chain. As a result, this area has prominent limestone escarp-



Figs 16–17. The rainforest in the Khammouane Province in Laos. In Figure 17, one can observe a field action during the IBCFL, Canopy Operation.

Рис. 16–17. Дождевой лес в провинции Хаммуан (Лаос). На рис. 17 можно увидеть полевые работы во время Операции Кроны Деревьев проекта IBCFL.

Table. Morphometric values (in mm) of the ♂ holotype of *Lychas aberlenci* sp.n. and of the ♂ and ♀ of *Lychas mucronatus* from Laos, also collected in the canopy.
 Таблица. Морфометрические данные (в мм) по ♂ голотипу *Lychas aberlenci* sp.n., а также по ♂ и ♀ *Lychas mucronatus* из Лаоса, тоже собранных в кронах деревьев.

	<i>Lychas aberlenci</i>	<i>Lychas mucronatus</i>	
	holotype	male	female
Total length	43.3(49.8*)	43.8(49.6*)	41.9(47.1*)
Carapace:			
- length	5.3	6.0	5.5
- anterior width	3.6	3.9	3.6
- posterior width	5.3	5.6	5.7
Mesosoma length	11.6	13.4	15.2
Metasomal segment I:			
- length	3.9	3.4	3.1
- width	2.8	3.6	3.2
Metasomal segment V:			
- length	7.5	7.1	6.2
- width	2.5	3.4	2.7
- depth	2.5	2.8	2.5
Telson length	6.5	5.8	5.2
Vesicle:			
- width	2.0	2.4	1.9
- depth	2.1	2.3	1.8
Pedipalp			
- Femur length	6.1	5.7	4.9
- Femur width	1.7	1.9	1.5
- Patella length	6.8	6.2	5.5
- Patella width	2.0	2.3	2.0
- Chela length	10.3	10.5	8.6
- Chela width	2.1	3.3	1.7
- Chela depth	2.0	2.8	1.6
Movable finger:			
- length	6.9	6.3	5.9

* Including telson length

ments and many caves [Mouret, 2001]. The specific zone where the forests are located is placed in the Northern Annamite ecoregion [Mouret, 2001]. The area shows a mosaic of semi-evergreen and mixed deciduous forests, whilst pockets of closed canopy evergreen forest are found within the karstic zones. Further, there are areas of secondary forest, shifting cultivation and bamboo forest. Due to difficult access, much of the forest in the region is free from extensive exploitation, with the exception of areas near roads and villages.

Lychas mucronatus found in the canopy is also common at the ground level, being a typical epigean species. The new species, however, might prove to be a canopy-dweller. Only further collections in the

rainforests of the Khammouane Province may reveal if *L. aberlenci* sp.n. is also present in the soil.

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