Contribution to the knowledge of the stag beetles of the genus *Lucanus* from Southeastern Asia (Coleoptera Lucanidae)

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Three new species and two new subspecies of *Lucanus* Scop. from Myanmar and Thailand are described: *L. hansi* n.sp., *L. werneri* n.sp., *L. aungsani* n.sp. and *L. laminifer lucidulus* nssp. from Myanmar, *L. laminifer coronatus* nssp. from Thailand. From Vietnam the so far unknown female of *L. kazumiae* Zilioli, 1998 is also described. Their diagnostic characters and relationships are discussed.


Recently in studying the material of the genus *Lucanus* Scop. sent to me for determination from my colleagues Mr. K. Fukinuki and Mr. A. Kirchner, I have identified three very interesting and impressive new species: *L. hansi* n.sp., close to *L. dohertyi* Boileau; *L. werneri* n.sp., close to *L. manai* Bomans & Miyashita; *L. aungsani* n.sp., close to *L. fortunei* Saunders, 1854 all from Myanmar; and two new subspecies of *L. laminifer* Waterhouse, 1890: *L. laminifer lucidulus* nssp. from Myanmar and *L. laminifer coronatus* nssp. from Thailand. Further material, among which I have also identified the so far unknown female of *L. kazumiae* Zilioli from Vietnam, was obtained from Mr. T. Miyashita. The discovery of all these new taxa proves once again our poor knowledge of the fauna of the Indo-Chinese mountain areas and the extraordinary biodiversity of this region. All the new taxa are here described and figured.

*Lucanus hansi* n.sp.

Paratype: 1♂ same data of the holotype, in coll. A. Kirchner.

Size (size of holotype in brackets; that of paratype approximate): length including mandibles: 43-(68,80) mm; length without mandibles: 35-(52,42) mm; maximum width (elytra): 15-(21,48) mm.

Description of the ♂: general form stout. Body, head, mandibles, antennae and palpi black, elytra blackish brown with bronze lustre, legs deep reddish brown with blackish tarsi and coxae, femora with black base, apex, ventral surface and dorsal stripe, tibiae blackened at base and with narrow black longitudinal stripe on both dorsal and ventral edge. Head transverse (W/L ratio 1.26-1.30), finely and rugosely punctured throughout, covered with a sparse long yellowish pubescence; frons concave, frontal ridge produced backwards in a feebly elevated carina, clypeal ridge elevated and feebly excised in the middle, epistoma tri-
angular, sharply pointed, feebly convex in the middle, lateral ridge strongly sinuate behind the anterior angles with rounded, dilated, feebly convex posterior angles; anterior angles barely projecting laterally beyond the prominent eyes. Mandibles stout, straight until the strongly curved apex, deeply punctured throughout, their upper surface from base to inner tooth covered with sparse long yellowish hairs, inner tooth strong, apically rounded and clearly posterior to middle, followed halfway to the apical teeth by a small rounded tooth. Upper apical tooth longer than inferior one, stout, strongly curved inwards and feebly bent upwards. Inferior apical tooth strong and apically truncated. Inferior tooth of the mandibular base absent. Antennal club formed by joints 7-10. Prothorax transverse (W/L ratio 1.86-1.88), finely and uniformly punctured, covered by a long sparse yellowish pubescence, with a narrow median depression and posterior angles distinctly produced. Scutellum transverse, rounded,

![Fig. 1-2. Lucanus hansi n.sp. – 1, Gonosome. – 2, Aedeagus; a, dorsal view; b, ventral view; c, apex of flagellum.](image-url)
deeply punctured throughout and covered with yellowish hairs. Elytra finely and densely punctured and finely microreticulate, shoulders indistinctly toothed. Legs slender, fore tibiae with three big and two small preapical spines, middle and hind tibiae with three preapical spines. Aedeagus (fig. 2a-2b), flagellum very developed, strongly enlarged at tip (fig. 2c); gonosomite (fig. 1) with spiculum gastrale gradually enlarged from base to apex.

Female unknown.

Derivatio nominis. This species is cordially dedicated to Hans Kirchner, son of my colleague A. Kirchner (Reichertshofen, Germany), owner of a huge Lucanidae collection.

Remarks: this species is closely related to L. dohertyi Boileau, 1911, of the L. westernmani group, among which it can be easily distinguished at glance from any other species by the bigger size. It differs greatly from L. dohertyi especially through the general shape of the mandibles which are stronger and more straight in L. hansi, the presence of a big and stout tooth at the mandibular base, the more shining head and prothorax, the well developed clypeal ridge which is absent in L. dohertyi and the different aedeagus.

Lucanus werneri n.sp.


Size: length including mandibles: 34,9 mm; length without mandibles: 24,8 mm; maximum width (elytra): 10,4 mm.

Description of the ♂: general form slender. Body, head and antennae, mandibles blackish brown, palpi reddish brown, legs black with middle and hind tibiae reddish brown, gradually blackened at base, elytra black, with feeble bronze metallic lustre and a reddish, elongated and not sharply delimited spot in the distal third of each elytron. Head transverse (W/L ratio 1.45). Frons strongly concave, totally fused with epistoma, the latter apically subtruncate and densely fringed with golden hairs. Frontal ridge uniformly concave and feebly marked, lateral ridge feebly sinuate behind anterior angles, with feebly rounded posterior angles. Vertex strongly flattened, finely and densely rugose, with feeble and sparse punctures and covered with sparse and short whitish hairs, anterior angles barely projecting laterally, eyes not prominent.
Mandibles slightly curved outwards in the basal third, then almost straight till the strongly curved and simply pointed apex, along the internal margin with only two teeth, one very long and strong in the proximal third and one much smaller in the distal one, the basal teeth very stout and strongly asymmetrical: the right one horizontal and perpendicular to the axe of the body, the left one evidently bent upwards and forwards. Inferior tooth of mandibular base absent. Antennal club formed by joints 7-10. Prothorax transverse (W/L ratio 1.93), with posterior angles not at all prominent and widely obtuse, sides in dorsal view regularly and distinctly curved. Surface of pronotum laterally with dense rugosity, on disc much smoother and sparsely punctured, with longitudinal median furrow shallow but well marked, at each side of this with a shallow depression in the anterior third. Scutellum slightly tapering backwards and with almost straight sides, widely and sub- angularly rounded at apex, its surface sparsely punctured, almost smooth along posterior edge, with sparse but rather long yellowish adpressed hairs. Elytra finely punctured and with very fine reticulation, covered with sparse and long yellowish adpressed hairs. Shoulders indistinctly toothed. Legs slender, fore tibiae with small and irregular denticles along the external margin, middle tibiae with two preapical spines, hind tibiae with a weakly angulate preapical tooth. Aedeagus (fig. 5a-5b), flagellum very short and weakly enlarged at tip (fig. 5c); gonosomite (fig. 4) with spiculum gastrale feebly constricted in the basal portion, basal apex forked.

Female unknown.

Variatio nominis: the species is cordially dedicated to my friend Karl Werner from Peiting, Germany, owner of a very rich collection of tiger-beetles and well known specialist of the group, as well as excellent explorer of tropical areas and discoverer of several new species.

Remarks: this species is closely related to *L. manai* Bomans & Miyashita, 1997, with whom it forms a small and isolated group, well characterized through the particular structure of mandibles, which end into a simple tip. From the latter species it is however easily distinguishable through the widely obtuse and not prominent posterior angles of prothorax and through the much more developed basal teeth of the inner margin of mandibles, of which the right one is horizontal and the left one is evidently bent upwards.

**Lucanus aungsani** n.sp.


Paratypes: 4 ♂♂ and 2 ♀♀ same data of the holotype, respectively in coll. K. Fukinuki (3 ♂♂ and 1 ♀), in coll. M. Zilioli, (1 ♂ and 1 ♀) and in coll. J. Piskala, Swidnica, Poland,(1 ♂).

Size (the size of holotype in brackets): length including mandibles: ♂ 40.3-(53.2) mm, ♀ 29.6-34.3 mm; length without mandibles: ♂ 30.8-(36.3) mm, ♀ 26.6-30.3 mm; maximum width (♂ head without mandibles, ♀ elytra): ♂ 10.2-(16.4) mm, ♀ 12.0-13.2 mm.

Description of the ♂: general form stout. Body, head, mandibles, antennae and palpi black; elytra dark reddish brown, legs yellowish with blackish tarsi and coxae, femora and tibiae with base, apex and longitudinal stripes on both dorsal and ventral edge black; metasternum with long and thick pubescence, the remaining surface uniformly covered with short and thick yellowish adpressed pubescence. Head transverse (w/l ratio 1.75-1.82), finely and rugosely punctured throughout; frons trapezoidal, fused with epistoma, clypeal ridge ab-
sent, epistoma with straight sides, its overall shape triangular. Frontal ridge bisinuate, raised and strongly protruding medially, lateral ridge strongly sinuate behind the anterior angles with rounded and dilated posterior angles; anterior angles barely projecting laterally. Mandibles slender, curved at base, then rather straight to apex, deeply punctured throughout, their upper surface from base to median tooth covered with sparse pubescence, median tooth slightly anterior to middle, feebly bent upwards, preceded by 4-6 and followed by 5-6 lesser teeth (respectively 3-4 and 1-2 in small specimens). Inferior apical tooth slightly bent downwards and clearly shorter than upper one, inferior tooth of the mandibular base conical. Antennal club formed by joints 7-10. Prothorax transverse (W/L ratio 1,80-1,84), finely and uniformly punctured with a feebly impressed narrow median depression, posterior angles slightly produced. Scutellum transverse, rounded but with a small median point, deeply punctured and covered with long yellowish hairs throughout except on a narrow lateral margin. Elytra finely and densely punctured and finely micromedulate, shoulders feebly although distinctly toothed, legs slender, fore and middle tibiae with three preapical spines, hind tibiae with two small preapical spines.Aedeagus (fig. 7a-7b), flagellum strongly enlarged at tip (fig. 7c); gonosomite (fig. 6) with spiculum gastrale gradually enlarged from base to apex. The Aedeagus differs from the one of L. fortunei through the shorter parameres and the wider apex of the flagellum.

Description of the ♀: form stout Body, head, mandibles, antennae and palpi black, legs completely black with the exception of a small dark red spot on femora and a thin reddish line on the upper surface of tibiae, reduced to a small spot on the fore ones. Head transverse (W/L ratio 1,80-1,86), densely and coarsely rugose, covered with sparse and yellow pubescence, frontal ridge concave, frons strongly protruding, produced into a stout, strongly punctured canthus, penetrating less than half a diameter into the eye. Eyes globular, temples short and not prominent, vertex rounded and well delimited. Mandibles short, strongly punctured, uniformly curved from base to the pointed apex, with a sharp marginal carina and a stout carina on the upper surface. Inner left tooth big and laminar, right tooth obtusely triangular. Mentum trapezoidal with large but shallow and partially fused punctures, covered with sparse long yellowish hairs and with strongly rounded anterior angles. Submentum with well impressed but less strong and dense punctuation, with long yellowish hairs. Antennae: scape curved, club formed by joints 7-10. Pronotum transverse (W/L ratio 1,80-1,82), its punctuation strong and rugose at sides, gradually finer and more sparse towards middle, covered with short yellowish pubescence; anterior edge of pronotum strongly bisinuate, anterior angles rather sharp, lateral edges strongly sinuate until the sharply produced median angles, then strongly excised before the protruding posterior angles, posterior edge slightly bisinuate. Prosternal process distinctly protruding. Scutellum rounded, slightly pointed in the middle, deeply punctured and covered with yellowish hairs throughout except on a narrow lateral margin. Elytra densely and finely punctured, covered with a short adpressed pubescence; elytral base straight, shoulders indistinctly toothed, lateral edges uniformly curved from base to apex, with well marked lateral groove. Sutural angle feebly pointed. Fore tibiae strongly flattened and widened towards apex, the latter with two sharp teeth preceded by two strong and one very small triangular teeth, middle tibiae with three sharp preapical teeth, the two distal large, the proximal small. Hind tibiae with two sharp teeth.

Derivatio nominis: the species is named in honour of the late great patriot U Aung San, father of Myanmar independence.

Remarks: this species is closely related
Fig. 4-5. *Lucanus werneri* n.sp. - 4, Gonosomite. – 5, Aedeagus; a, dorsal view; b, ventral view; c, apex of flagellum.

Fig. 6-7. *Lucanus aungsa* n.sp. – 6, Gonosomite. – 7, Aedeagus; a, dorsal view; b, ventral view; c, apex of flagellum.
to L. fortunei, from which it can be distinguished at glance by the stouter overall shape and particularly by the wider prothorax, by the presence of an adpressed pubescence on the whole surface of the body and by the more slender and less curved mandibles.

The female is very well distinguished from L. fortunei by the sharp and well produced lateral angles of prothorax and by the yellow pubescence which covers the whole surface of the body.

Lucanus kazumiae Zilioli 1998

This species was described on a single male from North-east Vietnam (Caobang). Among the material recently collected by colleague T. Miyashita during his entomological expedition to Vietnam, I have identified some further males specimens and the so far unknown female of this species, here described.


Size: length including mandibles: 29,7-30,5 mm; length without mandibles: 26,5-27 mm; maximum width (elytra): 11,2-11,5 mm.

Description: form slender, body and head blackish brown, antennae and palpi black,
mandibles black with brown base, elytra reddish brown with suture and lateral edges black; femora yellowish with base, apex and longitudinal stripe along both ventral and dorsal edge black, tibiae with a median thin reddish line reduced to a small spot on the front ones. Head transverse (w/l ratio 1.54-1.55), densely and coarsely rugose, covered with sparse and yellow pubescence; frontal ridge concave, frons strongly sloping, produced into a short rounded epistoma; superior angle blunt, produced into a stout punctured canthus, the latter penetrating less than half a diameter into the eye. Eyes globular, temple short and not prominent; vertex slightly rounded. Mandibles short, strongly punctured and covered with yellowish pubescence, uniformly curved from base to the pointed apex, with a sharp lateral and a strong dorsal keel, inner left tooth big and laminar, right tooth obtusely triangular. Mentum trapezoidal with large shallow punctures, covered with sparse long yellowish hairs and with strongly rounded anterior angles. Submentum with fine microsculpture and sparse long hairs. Antennal scape weakly curved, club formed by joints 7-10. Pronotum transverse (w/l ratio 1.68-1.70), uniformly and finely punctured, covered with short yellowish pubescence; anterior edge strongly bisinuate, anterior angles subtruncate; lateral edges feebly bi-
sinuate until the sharply produced median angles, then almost straight and strongly constricted towards the feebly protruding posterior angles; posterior edge slightly bisinuate. Prosternal process distinctly protruding. Scutellum rounded but at tip distinctly pointed, in the middle deeply punctured and covered with yellowish hairs throughout except on a narrow lateral margin. Elytra densely and finely punctured, covered with short adpressed pubescence and with a well marked lateral groove; elytral base feebly oblique; shoulders with a small conical tooth; lateral edge uniformly curved from base to apex, sutural angles feebly pointed. Fore tibiae strongly flattened and widened towards apex, the latter with two sharp teeth preceded by three further triangular ones (two strong and one very small), middle tibiae with two sharp preapical teeth, hind tibiae with a preapical tooth.

Remarks: the female can be easily distinguished from *L. fortunei* by the much more slender overall shape, by the evidently produced lateral angles of prothorax, by the stronger pubescence and by the different elytral coloration.

*Lucanus laminifer* Waterhouse, 1890

This species, described on a small series of specimens from Munipur (Assam, 6000 ft) was so far known from Assam (typical locality), Northern Thailand, Yunnan (Mizunuma & Nagai, 1994) and the very northern part of Burma (Arrow, 1950) with the typical form, and from northern Vietnam and Laos with its subspecies *vitalisi* Pouillade 1913, formerly considered as a proper species and recently downgraded by Mizunuma & Nagai (1994). Recently, I had the chance to study a population from north-western Myanmar (Chin Hills), whose unusual peculiarities make it even at a glance easily distinguishable from all other so far known populations of the species. A careful study of all the material at my disposal allowed me to recognize this population as belonging to a
well characterized new subspecies. At the same time I ascertained that the population from Northern Thailand can be distinguished at subspecific level from the typical form, to which it was so far attributed, so that at present *L. laminifer* can be divided into four well characterized subspecies, two of which new to science. I do not know in nature specimens from Yunnan, which on the base of biogeographic considerations, might well belong to a further, so far undescribed subspecies. The external characters that allow to separate the four subspecies of *L. laminifer* are well marked, and might seem stabilized enough to characterize different species, but the rather uniform structures of male genitalia (fig. 13a-13b) indicate the subspecific level as more proper for these taxa. Some little differences can be observed in the shape of paramera and flagellum, but the overall structure is substantially the same in all of them.

*Lucanus laminifer coronatus* n.ssp.


Paratypes: 3 ♂♂ same data as holotype, preserved respectively in Coll. Marazzi, Bollate, Milano, (1 ♂) and in author’s collection (2 ♂♂); 3 ♂♂ Nord Thailand, Chiang Mai, 3-5.VII.1998, in author’s collection.

Size (the size of holotype in brackets): length including mandibles: (74,19)-79,40 mm; length without mandibles: (47,12)-50,20 mm; maximum width: (18,72)-20,40 mm.

Description of ♂: general form slender, body reddish brown, head dark reddish brown, mandibles blackish brown, antennae and palpi black, legs yellowish brown with black tarsi and coxae, femora with base, apex, inner surface and dorsal stripe black, tibiae narrowly blackened at base and apex or widely blackened on most surface. Head moderately transverse (W/L ratio 1,18-1,23), finely and rugously punctured on the whole surface, covered with a long yellowish pubescence, frons concave, frontal ridge produced backwards in a strong and apically rounded laminar elevation, clypeal ridge excised in the middle, epistoma triangular and sharply pointed, lateral ridges strongly sinuate behind the anterior angles, produced backwards into rounded and elevated occipital crests. Inner posterior margins of the occipital crests strongly converging. Anterior angles sharply produced laterally. Mandibles long and slender, deeply punctured throughout, feebly produced upwards at base, then slightly curved inwards and strongly downwards before the middle,
basal upper surface with a stout rounded laminar tooth, inner surface of mandibles from base to apex with small denticles, inner tooth absent. Upper apical tooth strongly bent inwards and upwards, inferior apical tooth clearly shorter than upper one. Basal inferior tooth long and sharply produced.

Antennal club formed by joints 7-10. Prothorax transverse (W/L ratio 1.63-1.64), finely and uniformly punctured with a feebly impressed narrow median depression, covered by a long yellowish pubescence, posterior angles slightly produced. Scutellum transverse, rounded, deeply punctured throughout, covered with long yellowish hairs. Elytra ogival, densely and finely punctured with very fine microreticulation, covered with a yellowish, laterally longer pubescence. Shoulders indistinctly toothed. Legs slender, fore tibiae with three or four preapical spines, middle and hind tibiae with two or three preapical spines. Parameres (fig. 12d) with sharper apex and basally narrower.

Female unknown.

**Lucanus laminifer lucidulus** n.ssp.

Preserved in coll. Fukinuki, Fukuyama, Japan.

Paratypes: 1♂, same data of the holotype, in coll. Fukinuki; 2 ♀ 1 ♀, Myanmar, Chin Hills, Tanzing village, 28.V.1999, respectively in coll. K. Fukinuki (1 ♂ 1 ♀) and in author's collection (1 ♂).

Size (the size of holotype in brackets): length including mandibles: ♂ 56,28-(75,36) mm, ♀ 32,6 mm; length without mandibles: ♂ 39,3-(47,49) mm, ♀ 29,75 mm; maximum width: ♂ 15,73-(19,53) mm, ♀ 12,66 mm.

Description of the ♂: general form slender, body reddish brown, head dark reddish brown, mandibles blackish brown, antennae and palpi black, legs reddish brown with black tarsi and coxae, femora with base, apex, ventral surface and dorsal stripe black, tibiae narrowly blackened at base and
apex. Head moderately transverse (W/L ratio 1,17-1,18), finely punctured throughout, covered with sparse yellowish pubescence, frons concave, separated from epistoma through a laminar and strongly elevated, straight or slightly curved clypeal ridge; frontal ridge produced backwards into a strong and apically rounded laminar elevation, epistoma long, triangular and sharply pointed, lateral ridges strongly sinuate behind the anterior angles, produced backwards into rounded strong elevated occipital crests, slightly bent in the middle. Inner margins of the occipital crests subparallel to each other. Anterior angles sharply produced laterally. Mandibles long and slender, deeply punctured throughout, feebly produced upwards and slightly curved at base, strongly curved downwards before middle, then rather straight up to apex, basal upper surface with a rounded laminar tooth, inner tooth slightly anterior to middle, preceded and followed by several small denticles. Upper apical tooth strongly bent inwards, inferior apical tooth clearly shorter than upper one. Basal inferior tooth long and sharply produced. Antennal club formed by joints 7-10. Prothorax transverse (W/L ratio 1,67-1,77), finely and uniformly punctured with a narrow and shallow median depression, hairless except a narrow lateral margin covered with sparse yellowish hairs, posterior angles distinctly produced. Scutellum transverse, rounded but with a short pointed tip, hairless, deeply punctured throughout. Elytra densely and finely punctured with very fine microreticulation, hairless except a narrow lateral margin covered with sparse long yellowish hairs. Shoulders distinctly toothed. Legs slender, fore tibiae with three or four preapical spines, middle and hind tibiae with three preapical spines. Parameres (fig. 12c) with shorter and less developed apex.

Description of ♀: the general form is more slender than in L. laminifer s.str., the lateral margins of prothorax are more angulose, the elytral disc shows a weaker punctuation (much weaker than the scutellar one instead of slightly weaker) and the margins of the canthus are subparallel to each other instead of distinctly converging forwards.

Key of the taxa of the L. laminifer-group

The males of all the taxa so far attributed to the L. laminifer-group (i.e. the different subspecies of L. laminifer, L. planeti Planet, 1899, L. formosanus Planet, 1899, L. hermani De Lisle, 1973, L. ferriei Planet, 1898 and L. angusticornis Didier, 1925) can be determined through the following key:

1. Clypeal crest produced into a long and apically forked apophysis ........................................ 2
   - Clypeal crest not or feebly produced .................................................................................. 4
2. Mandibles with strong and well developed basal tooth ......................................................... 3
   - Mandibles without basal tooth. (China: S.Yunnan; N.Vietnam) planeti ................................
3. Inner margin of mandibles with some little teeth between basis and median tooth.
   (Taiwan) ...................................... formosanus
   - Inner margin of mandibles totally untoothed between basis and median tooth. (China: Fujian, Guangdong, Sichuan, Hainan Isl.) ......................... hermani
4. Inferior apical tooth perpendicularly directed inwards and not at all downwards (Japan: Amamioshima) .............................. ferriei
   - Inferior apical tooth directed forwards and downwards ................................................... 5
5. Frontal crest widely anterior to the occipital crests. (Laos N.Vietnam) ......................... angusticornis
   - Frontal crest placed at the same level of the anterior margin of the occipital crests (la-
minifer s.lat.) .................................................................................................................. 6
6. Inner margin of mandibles with well-marked median tooth ............................................. 7
   - Inner margin of mandibles with no or indistinct median tooth ....................................... 8
7. Denticles of the inner margin of mandibles between basis and median tooth well isolated ........................................... laminifer ssp. lucidulus nov.
- Denticles of the inner margin of mandibles between basis and median tooth partially fused or strongly close to each other .................................... laminifer ssp. vitalisi
- Inner posterior margins of the occipital crests subparallel to each other ................................. laminifer s.str.
- Inner posterior margins of the occipital crests strongly converging .............................. laminifer ssp. coronatus nov.

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References
