Taxonomic Key of *Lucanus* spp. (Coleoptera: Lucanidae) Found in Turkey[1]

Sakine Serap Avgin[2] and Arno Thomaes[3]

Kahramanmaraş Sütçü İmam University, Faculty of Education, Division of Science Education, Avşar Campus, 46100 Kahramanmaraş, Turkey

J. Entomol. Sci. 49(1): 70-77 (January 2014)

Abstract Within the West-Paleartic, Turkey is home to many taxonomic groups and is critically located at a cross-point of geographical regions with large climatic and topographical gradients contributing, at least in part, to the rich diversity of habitats, ecosystems, and biodiversity therein. Loss of deadwood habitats is but one major concern in conservation or biodiversity efforts in the region. An emblematic group, such as Lucanus spp. of the family Lucanidae, may prove to be a critical component of these conservation efforts. Eight taxonomic groups of Lucanus spp. are found in Turkey. A taxonomic key for these species and subspecies was developed and should serve as a basis for gathering needed data on the distribution, ecology, biology, and occurrence of Lucanus spp. in Turkey and surrounding areas.

Key Words *Lucanus* spp., stag beetles, Turkey, taxonomic key

The dead wood habitat of native broadleaf trees is severely threatened in Turkey (Avcı et al. 2010, Coşkun et al. 2010, Gürkan et al. 2010). Loss of this habitat will negatively impact biodiversity in the region. One such group of beetles that could be impacted is *Lucanus* spp. of the family Lucanidae. *Lucanus cervus* (L.) is a conspicuous and emblematic beetle of this group and is protected in many countries (Harvey et al. 2011, Thomaes et al. 2008a). It is listed as 'near-threatened' in the European Red List of Saproxilic Beetles (Nieto and Alexander 2010) and is protected by a habitat directive in the European Union (Luce 1996). Its numbers are also apparently declining in Russia (RDBRF 2001). Atay and Oğur (2011) note that it is also threatened in Turkey.

Larvae of *L. cervus* live underground in deadwood of broadleaf tree species, mainly *Quercus* spp. oaks, in forests and wooded areas (Thomaes et al. 2008b, Harvey et al. 2011). Adults reportedly feed on overripe fruit and sap runs of trees. However, little is known on how the other species within the genus differ ecologically and in their adaptations to unique niches. Indeed, there are only a few studies on the distribution, rarity, and ecology of *L. cervus* and related species in Turkey (Atay and Oğur 2011, Schenk and Fiedler 2011).

The genus *Lucanus* has 98 described taxa worldwide with only 8 of those taxa found in Turkey (Krajcik 2001, Bartolozzi and Sprecher-Uebersax 2006). Each of these species could potentially be an emblematic species used in safeguarding and

[1]Received 11 May 2013; accepted for publication 22 July 2013.
[2]Corresponding author: e-mail: ssavgin@ksu.edu.tr
[3]Sint-Niklaas, Belgium.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

protecting the deadwood habitats and their biodiversity in Turkey. Therefore, the objective of this study was to provide taxonomic information and a taxonomic key of Turkish *Lucanus* spp. We are hopeful that this information will serve as a basis for further studies on the occurrence, biology, and ecology of these beetles in Turkey. Studies reporting the habitat requirements and the protection of *L. cervus* in those deadwood habitats (Thomaes et al. 2008a, Thomaes 2009, Campanaro et al. 2011, Harvey et al. 2011) also will provide critical information for formulating protection objectives and protocols for *L. cervus* and similar species in Turkey.

Materials and Methods

A taxonomic key of the 8 Turkish taxa was developed using specimens collected between 2009 and 2012 from various regions of Turkey as well as information and keys provided by Baraud (1993), Paulian and Baraud (1982), Planet (1899), Didier and Seguy (1953), Schenk and Fiedler (2011), and Schenk (2012) and the websites by Fiedler (2013) and Galant (2008).

Mandibular and antennal morphology was used extensively in the key with drawings made using the above sources and from observation of specimens collected in Turkey. Identifications are primarily based on the shape of the male mandible and antennae; therefore, this key can be used to identify only the male beetles. Measurements included in the key were made from available specimens. Body length was measured from anteriormost point of the head to posteriormost apex of the elytra. Given that there are some differences among the various sizes of specimens within the same taxa, multiple mandibular drawings are provided for some selected taxa.

Results and Discussion

Eight taxa of Lucanidae have been identified from Turkey. These are *L.* (*Lucanus*) *ibericus* Motschulsky, *L.* (*Lucanus*) *cervus* L., *L. (Lucanus*) *laticornis* Deyrolle, *L. (Lucanus*) *cervus judaicus* Planet, *L. (Lucanus) cervus akbesianus* Planet, *L. (Lucanus*) *cervus cervus* L., *L. (Pseudolucanus) busignyi* Planet, and *L. (Pseudolucanus) macrophyllus* Kraatz. Descriptive information is listed below with the taxonomic key.

***Lucanus* (*Lucanus*) *ibericus* Motschulsky, 1845** Type locality: Georgia (Krajcik 2001).

Material examined: Hatay-İskenderun, 02.VIII.2012, 1 specimen.

Geographical range: Armenia, GA, Caucasus, Turkmenisten, Iran, Asia minor (Baraud 1993).

Ecology and Conservation: The specimens were collected with light at night at 890 m. *Fagus* sp. and *Quercus* sp. were dominant in the region.

***Lucanus* (*Lucanus*) *cervus* Linnaeus, 1758** Type locality: Europe (Krajcik 2001).

Geographical range: Europe (Baraud 1993).

Biology, Ecology, and Behavior: Male longevity is only a few weeks, whereas females live up to 2 months. Female adults have a very limited dispersal capacity often crawling only a few hundred meters from point of emergence, whereas males may fly a maximum of several kilometers (Rink and Sinsch 2007). Males and females are often found together feeding on sap runs of sick and wounded trees. They also feed on the juice of over-ripened fruit. Males use there stags to fight with rivals and when trying to protect a sap run. Besides these fights, stags are used during mating to keep the female in place and to impress potential predators like woodpeckers, crows, owls

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

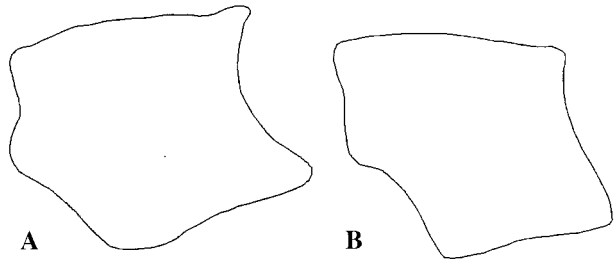

Fig. 1. Right-lateral views of the pronotum of adult males of the *Lucanus* (A) and *Pseudolucanus* (B) subgenera of the genus *Lucanus*.

and cats. Females dig into the ground before laying their eggs against underground woody debris. Several tree and shrub species are reported as hosts for the larvae. The larvae live approximately 3 - 5 yrs (maybe shorter in the warmer climate, as found in Turkey) before they pupate within a cocoon of bonded earth. Adults emerge the following spring. Breeding sites are not always found in large forest complexes but also in gardens, old orchards, parks, and rows of trees. However, a long continuity of deadwood seems to be typical of these localities.

***Lucanus (Lucanus) laticornis* Deyrolle, 1864** Type locality: Syria, Ararat (Krajcik 2001).

Material examined: Hatay, Dörtyol, 26.VIII.2009, 2 specimens; Hatay, Dörtyol, 21. VIII.2012, 1 specimen; Hatay, Dörtyol, 10.VIII.2012, 1 specimen.

Ecology: The specimens were collected with light at night at an elevation between 870 and 1300 m. Moreover, the specimens were obtained from the forests dominated by the Turkey oak, *Quercus cerris* L.

***Lucanus (Lucanus) cervus judaicus* Planet, 1902** Type locality: Syrie, Taurus, Antioche de Taurie, Ain Tab. (Krajcik 2001).

Material examined: Azerbeidzjan-Sadarak (Date unknown); Turkey-Osmaniye (Date unknown); both hand capture

***Lucanus (Lucanus) cervus akbesianus* Planet, 1896** Type locality: d'Akbes (Krajcik 2001).

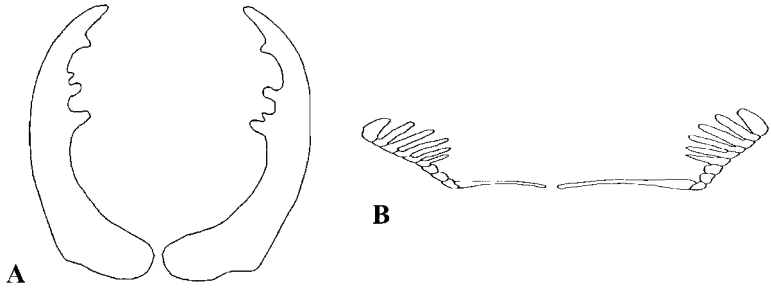

Fig. 2. Mandibles (A) and antennae (B) of adult male *L. (Lucanus) laticornis*.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

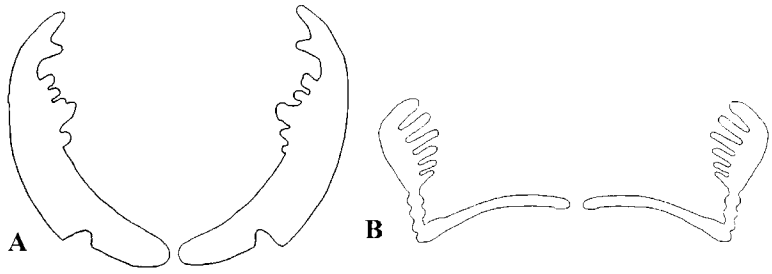

Fig. 3. Mandibles (A) and antennae (B) of adult male *L. (Lucanus) ibericus.*

Material examined: Hatay, İskenderun, 25.VIII.2010, 2 specimens; Hatay, İskenderun (N 36°33'07"; E 36°13' 00" E; elevation 580 m), 23.VII. 2009, 1 specimen; Adana, Kozan, 04.VI.2012, 1 specimen; Adana-Saimbeyli, 10.VII.2012, 1 specimen; Kahramanmaraş, Andırın, 18.VIII.2012, 1 specimen.

Ecology: The specimens were collected with light traps at night and in pitfall traps. Specimens were collected from region dominated by *Pinus* sp. and *Quercus* sp. on steppes.

***Lucanus (Lucanus) cervus cervus* Linnaeus, 1758** Type locality: Probably unknown.

Material examined: Hatay-Dörtyol, 22.IX.2011, 1 specimen; Hatay-Dörtyol (N 36°49' 48"; E 36°20' 20" E; elevation 1306 m), 02.VIII.2012, 1 specimen.

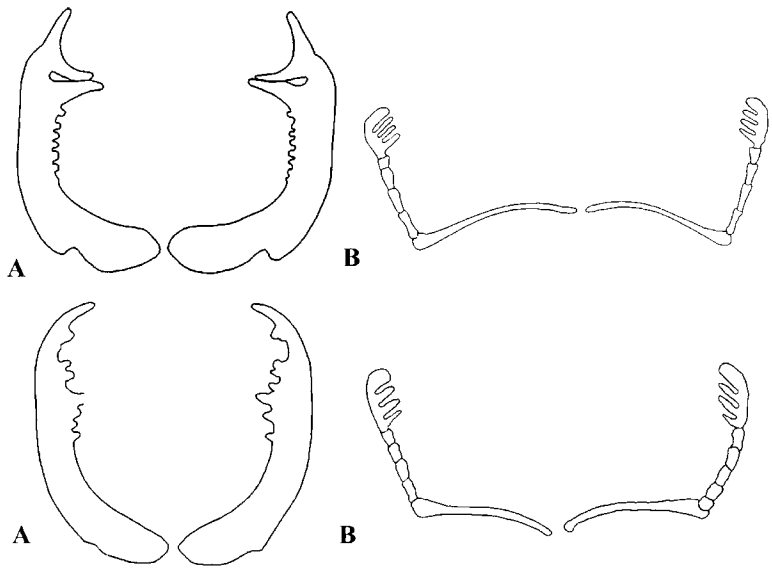

Fig. 4. Mandibles (A) and antennae (B) of morphological variants of adult male *L. (Lucanus) cervus* subsp. *judaicus.*

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

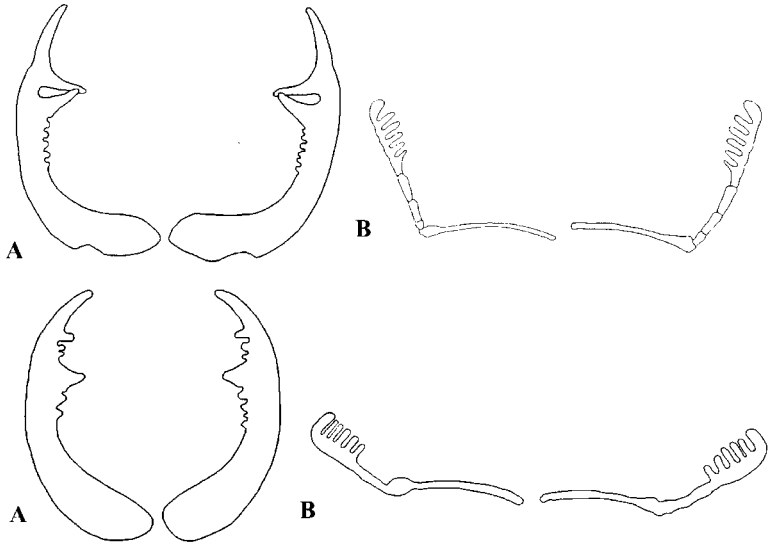

Fig. 5. Mandibles (A) and antennae (B) of morphological variants of adult male *L. (Lucanus) cervus* subsp. *akbesianus.*

Ecology and Conservation: The species was collected in pitfall traps. *Pinus* sp. and *Quercus* sp. were the dominant tree species in this region.

***Lucanus (Pseudolucanus) busignyi* Planet, 1909** Type locality: Asie mineure (Krajcik 2001).

Material examined: Mersin Erdemli, Güzeloluk, Harfili (N 36°45' 47"; E 34°04' 04", elevation 1335 m), 06.VIII.2010, 1 specimen.

Ecology: The species was collected in pitfall traps from an old-growth cedar forest.

***Lucanus (Pseudolucanus) macrophyllus* Kraatz, 1860** Type locality: Asia minor, Caramania (Krajcik 2001).

Material examined: Hatay, İskenderun, 19.VIII.2012, 2 specimens.

Ecology: The specimens were collected from latitude (N 36°37' 41"; E 36°14' 13"; elevation 200 m). Specimens were collected in pitfall traps from areas dominated *Quercus* sp.

Key to the subgenera of genus *Lucanus* 1. Body 33 - 46 mm long and approx. 2.5 times longer than wide. Integument stippled. Male mandibles with several small denticles in addition to 1 large denticle and the apex is mostly forked (bifid) and rarely simple. Antennal club holds 4 or 6 (rarely 5 or 7) segments, lamellae are clearly shorter than the length of the antennal club. Posterior of the pronotum is slightly sinuate before the posterior angle (Fig. 1A) ....***Lucanus* Scopoli 1763**

2. Body 31 - 32 mm long and only 2.2 - 2.4 times longer than wide. Integument relatively smooth with scattered and superficial punctuation. Male mandibles are sickle-shaped with a single denticle at the inner edge and a simple apex. Apex of the mandibles has a shallow longitudinal furrow at the upper side. The antennal club has 6 long lamellae, the lamellae are as larger or larger than the length of the antennal

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

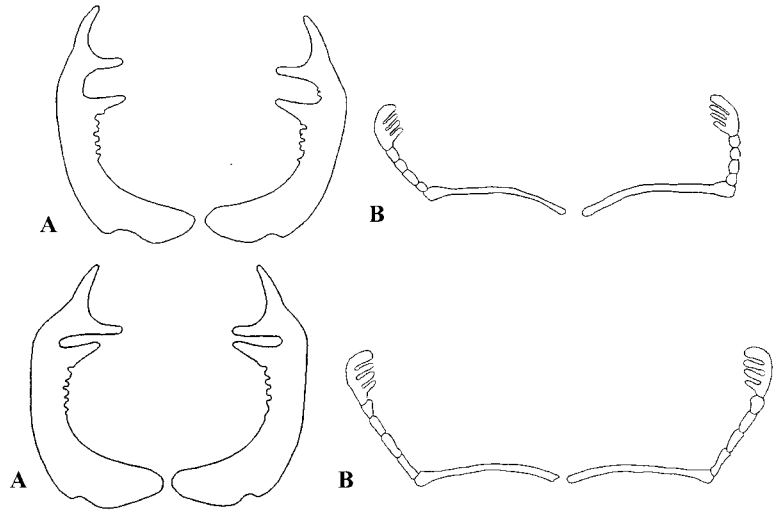

Fig. 6. Mandibles (A) and antennae (B) of morphological variants of adult male *L. (Lucanus) cervus* subsp. *cervus*.

club. Posterior of the pronotum is strongly sinuate before the posterior angle (Fig. 1B) .....***Pseudolucanus* Hope & Westwood 1845**

Key to the species of subgenus *Lucanus* 1a. Median tooth large, with small teeth before and after the median tooth. The inner tooth of the apex of the same size or smaller than the outer tooth. Antennae have 4 or 6, rarely 5 or 7, short lamellae. Posterior angles of the head strongly developed..... .....**2**

1b. Median tooth small with 2 or 3 small teeth posterior to the median tooth. The inner tooth of the apex is strongly reduced. Antennae with 6 lamellae are larger than other subspecies. Posterior angles of the head feebly produced only in very big males (Fig. 2) .... ***Lucanus (Lucanus) laticornis* Deyrolle 1864**

2a. Body 34 - 46 mm long and 2.4 times longer than wide. Posterior angles of the head strongly developed. Pronotal sides not sinuate before the blunt posterior angle. Males have long slender mandibles, with many denticles, and the large median tooth located over the middle of the mandible, more rarely in the middle. Four or 6, rarely 5 or 7, lamella on the antennal club (Figs. 4 - 6) .... ***Lucanus* (*Lucanus*) *cervus* Linnaeus 1758**

2b. Body 33 mm long, 2.4 times longer than wide, and reddish-brown in color. Posterior angles of the head feebly produced only in very big males. Pronotal sides sinuate before the sharp posterior angle. Mandibules are shorter and stouter when compared with *L. cervus* of the same size. The large median tooth is positioned around the middle of the mandible. Six, rarely 5, lamella on the antennal club (Fig. 3) .....***Lucanus* (*Lucanus*) *ibericus* Motschulsky 1845**

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

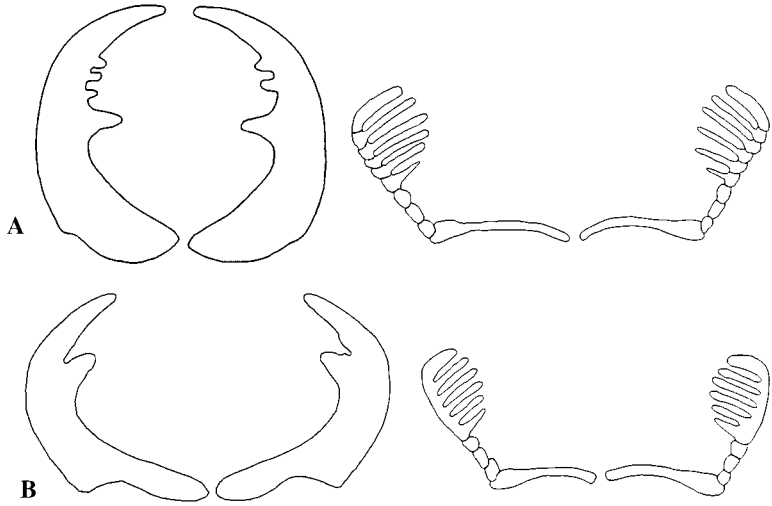

Fig. 7. Mandibles and antennae of adult males of *L. (Pseudolucanus) busignyi* (A) and *L. (Pseudolucanus) macrophyllus* (B).

Key to the subspecies of *Lucanus* (*Lucanus*) *cervus* Linnaeus 1758 1a. Body uniformly reddish-brown in color. Median tooth not pointed upwards (profile view) with small denticles before and after. Antennae with 4 lamellae (Fig. 4) ....***Lucanus (Lucanus) cervus judaicus* Planet 1902**

1b. Head and thorax black; mandibles and elytra reddish-brown. Median tooth pointing upwards in profile view..... .....**2**

2a. Inner tooth of the apex pointing backward to the head (dorsal view) and down (profile view), whereas the outer tooth points upwards. In dorsal view the angle between the teeth is greater than 90°. Antennae with 6 lamellae (Fig. 5)..... ***Lucanus (Lucanus) cervus akbesianus* Planet 1896**

2b. Inner tooth of the apex pointing sideway (dorsal view) and not down (profile view), whereas the outer tooth does not or only slightly points upwards. In dorsal view the angle between the teeth is about 90°. Antennae with 4 or 6 lamellae (Fig. 6).....***Lucanus (Lucanus) cervus cervus* Linnaeus 1758**

Key to the species of subgenus *Pseudolucanus* 1. Mandibles with a simple tip at the apex and a few small denticles. Body is reddish-brown in color with red macula on the elytra (Fig. 7A).....***Lucanus* (*Pseudolucanus*) *busignyi* Planet 1909**

2. Mandibles with bifid apex and lacking small denticles. Body is dark brown in color (Fig. 7B) .....***Lucanus* (*Pseudolucanus*) *macrophyllus* Kraatz 1860**

References Cited

Atay, E. and E. Oğur. 2011. The adverse effects of changing environmental conditions on the stag beetle (*Lucanus cervus*: Coleoptera: Lucanidae). Karadeniz Fen Bilimleri Dergisi / The Black Sea. J. Sci. 1(3): 114-123.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access

Avcı, M., O. Sarıkaya, N. Jansson and M. Coşkun. 2010. The Beetle Fauna on Old Oaks (*Quercus* spp.) in Kasnak Forest East of Isparta in Turkey. The Oak – Ecology, History, Management and Planning II. 01-03 June. Suleyman Demirel University, Isparta/TURKEY. Pp.126.

Baraud, J. 1993. Les Coleopteres Lucanoidae de l'Europe et du Nord de l'Afrique. Bull. Mens. Soc. Linn. Lyn. 62(2): 42-64.

Bartolozzi, L. and E. Sprecher-Uebersax. 2006. Lucanidae. Catalogue of Palearctic Coleoptera, Vol. 3 (ed. by I. Löbl and A. Smetana), pp. 63–76. Apollo Books, Stenstrup, Denmark.

Campanaro, A., I. Toni, S. Hardersen and D.A. Grasso. 2011. Monitoring of *Lucanus cervus* by means of remains of predation (Coleoptera: Lucanidae). Entomol Gener. 33 (1/2):079-089.

Coşkun, M., N. Jansson, M. Avcı and O. Sarıkaya. 2010. Rich and Unique Beetle Fauna Found On Pollarded (Coppice) Oaks (*Quercus* spp.) In Southern Turkey. The Oak – Ecology, History, Management and Planning II. 01-03 June. Suleyman Demirel University, Isparta/TURKEY. Pp.120.

Didier, R. and E. Seguy. 1953. Catalogue illustré des Lucanides du Globe. Texte. Encyclopedie Entomologique. Paul Lechevalier, Editeur. Paris-VI- 12, Rue de Tournon, 12- Paris- VI.

Fiedler, F. 2013. *Lucanus cervus cervus* Linné, 1758. Wonderful-Insects. WordPress url: http://frankfiedler.com/category/lucanus/lucanus-cervus-cervus/.

Galant, A. 2008. Lucanes of the World. http://lucanesdumonde.skynetblogs.be/archives/category/lucanus/index-4.html.

Gürkan, T., E. Atay and N. Jansson. 2010. The Beetle Fauna on Old Oaks (*Quercus* spp.) in a Cemetery In Adana Region, South Turkey. The Oak – Ecology, History, Management and Planning II. 01-03 June. Suleyman Demirel University, Isparta/TURKEY. Pp.122.

Harvey, D. J., A. C. Gange, C. J. Hawes and M. Rink. 2011. Bionomics and distribution of the stag beetle, *Lucanus cervus* (L.) across Europe. Insect Conserv. Div. 4: 23-38.

Krajcik, M. 2001. Lucanidae of the World. Catalogue – Part.I. Checklist of the Stag Beetles of the World (Coleoptera: Lucanidae). Czech Republic, 108 pp.

Luce, J.-M. 1996. *Lucanus cervus* (Linnaeus, 1758). Background information on invertebrates of the Habitat Directive and the Bern Convention (ed. P.J. Van Helsdingen, L. Willems & M.C.D. Speight). Council of Europe Publishing, Strasbourg.

Nieto, A. and K. N. A. Alexander. 2010. European Red List of Saproxilic Beetles. Publication Office of the European Union, Luxembourg.

Paulian, R. and J. Baraud. 1982. Lucanoidea et Scarabaeoidea. Faune des Coléoptères de France 2. Lechevalier, Paris.1-23.

Planet, L. 1899. Essai monographique sur les Coléoptères des genres Pseudolucane & Lucane. Deyrolle, Paris. 2nd volume, 76 pp.

RDBRF. 2001. Red Data Book of the Russian Federation. Krasnaya kniga Rossijskoi Federatsii (Zhivotnye). Moscow, ACT Press & Astrel Press. 863 p. Hardback. [In Russian with English Preface].

Rink, M. and U. Sinsch. 2007. Radio-telemetric monitoring of dispersing stag beetles: implications for conservation. J. Zool. (Lond.) 272: 235-243.

Schenk, K.-D. and F. Fiedler. 2011. Ein neuer Fund von Lucanus (Pseudolucanus) busignyi in der Türkei. A new discovery of Lucanus (Pseudolucanus) busignyi in Turkey. Beetles World. 5: 11-16.

Schenk, K.-D. 2012. Taxonomical notes to the family Lucanidae (Coleoptera: Lucanidae). Beetles World 6: 9-15.

Thomaes, A., T. Kervyn and D. Maes. 2008a. Applying species distribution modelling for the conservation of the threatened saproxylic stag beetle (*Lucanus cervus*). Biol. Conserv. 141: 1400-1410.

Thomaes, A., T. Kervyn, O. Beck and R. Cammaerts. 2008b. Distribution of *Lucanus cervus* (Coleoptera: Lucanidae) in Belgium: surviving in a changing landscape. Rev. Ecol. Terre Vie 63: 139-144.

Thomaes, A. 2009. A protection strategy for the stag beetle (*Lucanus cervus*, (L., 1758), Lucanidae) based on habitat requirements and colonisation capacity. Saproxylic Beetles - Their role and diversity in European woodland and tree habitats. Proc. 5th Symp.Workshop Conserv. Saproxylic Beetles. Pensoft Publishers Sofia–Moscow. pp. 149-160.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-07-05 via free access