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Field observation of *Dorcus parallelipipedus* feeding on the remains of *Lucanus cervus cervus* (Coleoptera: Lucanidae)

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Abstract
A male of *Dorcus parallelipipedus* (Linnaeus, 1758) feeding on the remains of a *Lucanus cervus cervus* (Linnaeus, 1758) female, which was probably preyed by a Hooded Crow (*Corvus corone cornix* Linnaeus, 1758) was observed and filmed in a relict oak-hornbeam forest of the Po Plain (N Italy, Lombardy region, Mantua province). This unusual behaviour is discussed and similar activities (cannibalism and entomophagy) of lucanids are highlighted.

Key words: *Corvus*, saproxylic beetles, entomophagy, Po Plain, Nature Reserve, Habitats Directive.

Introduction

The Nature Reserve Bosco Fontana (45.12.02N, 10.44.23E, 25 m, 236 ha) is one of the largest remnants of oak-hornbeam forest in the Po plain; it is located in the municipality of Marmirolo (N Italy, Lombardy region, Mantua province) and is part of the Natura 2000 network (SPA/SAC IT20B0011 "Bosco Fontana") (cf. Campanaro et al. 2014).

This forest hosts large populations of two species of lucanids: the Lesser Stag Beetle, *Dorcus parallelipipedus* (Linnaeus, 1758) (Lucaninae: Dorcini), and the Stag Beetle, *Lucanus cervus cervus* (Linnaeus, 1758) (Lucaninae: Lucanini) (cf. Cornacchia & Scaglioni 2024).

Dorcus parallelipipedus is widespread throughout most of western Palaearctic; in Italy, it is recorded from all regions, including some minor islands, but its effective presence in Sardinia needs to be confirmed (cf. Ballerio et al. 2014; Ceccolini et al. 2015; Bartolozzi et al. 2016a, 2016b; Rattu et al. 2020; Aguiar et al. 2024).

Lucanus cervus cervus occurs in most of Europe, in Anatolia and Kazakhstan, while other subspecies live in Anatolia, Israel, Lebanon, and Syria (Bartolozzi et al. 2016a, 2016b). In Italy, *L. cervus cervus* occurs in northern and central regions, while southward it is replaced by *L. tetraodon* Thunberg, 1806 (cf. Bartolozzi et al. 2016a). These two *Lucanus* species have a sympatric occurrence in central Italy, where in some localities many individuals show a mosaic of morphological traits, which sometimes makes their morphological identification extremely difficult (Solano et al. 2016; Tauzin 2022; Dendi et al. 2023).

The larvae of *Lucanus cervus* and *Dorcus parallelipipedus* are saproxylophagous mainly on broad-leaved trees and they feed on decaying wood colonised by fungi and other microorganisms; instead the adults feed on the flowing sap of oaks and mature fruits, moreover, they are often attracted by fermenting liquid baits of pitfall- and of aerial-traps (cf. Franciscolo 1997; Tanahashi et al. 2009; Fremlin & Hendriks 2011; Bardiani et al. 2017a, 2017b; Tini et al. 2017; Hendriks & Méndez 2018; Huang 2018; Hendriks 2019; Méndez & Thomaes 2021).

Adults of *Lucanus cervus* (mainly males) are frequently preyed by corvids and, at Bosco Fontana, in particular by the Hooded Crow (*Corvus corone cornix* Linnaeus, 1758) (Campanaro et al. 2011). This corvid is a well-known predator of *L. cervus*, and usually, it devours the fleshy parts of the prey (abdomen, meso- and metathorax) leaving the hardest parts (head, pronotum, elytra and legs) on the ground (cf. Franciscolo 1997; Scaccini & Anaclerio 2016).

Material and Methods

Field observation took place during the annual monitoring activity of *Lucanus cervus cervus* at Bosco Fontana (from 5 Jun 2024 to 10 Jul 2024). This monitoring follows the protocol of Bardiani et al. (2017a): visual detection of adults at dusk, by a predefined walk transect (500-meter-long and 10-m wide, during 30 minutes). Each session was performed by personnel of the Reserve and/or volunteers of the project Life 17/ESC/IT/001 "ESC360". The observation was recorded using an Oppo A72 Smartphone. Air parameters have been recorded by a thermohygrometer (Kestrell 4500 NV). The males of the two species were recognized since have larger mandibles and broader heads (Franciscolo 1997; Ballerio et al. 2014).

Results

During the monitoring session of 5 Jun, one of us (MB), together with a volunteer, filmed a *Dorcus parallelipipedus* male (Fig. 1) feeding on the remain of a *Lucanus cervus cervus* female (8:49 PM, clear sky, air's temperature about 23°C, relative humidity around 84%). Such remain consisted only of the head and prothorax, but the legs were still shaken by the movements, suggesting almost certainly a recent predation by a Hooded Crow. The Lesser Stag Beetle was found with its mouthparts inside the prothorax remain of the Stag Beetle, probably grabbing it with its jaws inside and dragging it for a few centimetres, and then abandoning it and moving away, perhaps because it was disturbed by the presence of the observers.

The short video of the observation is available at https://doi.org/10.6084/m9.figshare.28902680.v1

Discussion

The feeding behavior of *Dorcus parallelipipedus* described in the present communication had never been observed at Bosco Fontana, despite the numerous recent studies aimed at monitoring the predation remains of stag beetles (Campanaro et al. 2011; Hardersen et al. 2011; Campanaro & Bardiani 2012; Bardiani et al. 2017a) or occasional observations of the same remains by the staff of the Reserve. The same is valid for the others numerous remains of large beetles, usually founded in the Reserve: *Oryctes nasicornis corniculatus* A. Villa, G.B. Villa, 1833 (Coleoptera: Scarabaeidae: Dynastinae), *Aegosoma scabricorne* (Scopoli, 1763), *Cerambyx cerdo* Linnaeus, 1758, *C. welensii* (Küster, 1846) and *Morimus asper asper* (Sulzer, 1776) (Coleoptera: Cerambycidae).

Fremlin & Hendriks (2011: 65–66, 2013: 54) wrote that "females of *D. parallelipipedus* readily fed on the remains of *L. cervus*: one female started to feed directly on the remains of a female of the latter at dusk and was still thus engaged the following morning. This intensive feeding continued for several days at intervals, while *D. parallelipipedus* adults ignored frequently presented *Tenebrio molitor* Linnaeus, 1758 larvae (Coleoptera: Tenebrionidae) and dead *Bombus* sp. larvae (Hymenoptera: Apidae)".

The feeding ecology of lucanids is poorly understood for the majority of the about 1,500 described species, moreover, some studies show that males and females have different diets (cf. Hangay & De Keyzer 2017; Huang 2018; Reid 2019; Fearn 2020; Maquart et al. 2023; Yi 2023). In any cases, it should be highlighted that only few other cases of entomophagy by lucanids are known: 1) in Asia, the adults of *Figulus binodulus* C.O. Waterhouse, 1873, *F. punctatus* C.O. Waterhouse, 1873 and of *Nigidius miwai* Nagel, 1941 (Lucaninae: Figulini) are carnivorous feeding on tiny insects or other creatures living in the decaying wood, and those of the former species can eat also conspecific larvae (Mori & Chiba 2009; Kim & Kim 2010, 2014; Choi et al. 2022, 2024); 2) in Japan, the larvae of *Nigidius lewisi* Boileau, 1905 would be at least partially carnivorous and feeds on worms (*sensu lato*) but it is unknown whether such diet is exclusive, occasional or opportunistic (*in vitro*, farms are successful due to the supply of meat foods such as dog feed and this could suggest a lack of protein in the natural environment (Bouyer 2020)); 3) in France, a *Dorcus parallelipipedus*, inside the cavity of an oak tree, crushed with its mandibles an adult of *Accanthopus velikensis* (Piller & Mitterpacher, 1783) (Coleoptera: Tenebrionidae), and then fed on the liquids of this prey (Chevrolat 1834, as *Helops caraboides* (V. Petagna, 1786)); 4) in Netherlands, during an experiment in a garden, females of *D. parallelipedus* several times predated on their larvae and (when food is scarce or space is limited) predation amongst larvae of

Fig. 1 – Male of *Dorcus parallelipipedus* feeding on the remains of *Lucanus cervus cervus*.

successive instars also occurs (Hendriks 2019); 5) in Japan, cannibalism has occurred in first- and second-stage larvae of *D. rectus* (Motschulsky, 1858), with cannibals that are heavier and larger in head size than their prey, showing an influence of the food quality (Tanahashi & Togashi 2009); 6) beetle breeders have managed to extend the fertility of the Asian *D. curvidens* Hope, 1840 by feeding the females with a very high protein diet, either using the pupae of the Japanese Rhinoceros Beetle, *Allomyrina dichotoma* (Linnaeus, 1771) (Scarabaeidae: Dynastinae), reared for the purpose, or the squeezed-out contents of the guts of crickets and *Tenebrio molitor* larvae (Fremlin & Hendriks 2013). Finally, it should be remembered that, in nature, the larval growth of *Dorcus rectus rectus* (Motschulsky, 1858) is increased by the consumption of the proteins contained in the saproxylic fungal mycelia (Tanahashi et al. 2009, as *D. rectus*) and that, under laboratory conditions, the obligatory requirement of proteins in the larval diet was observed also in some large saprophagous Scarabaeoidea (Vendl & Šípek 2016).

Conclusions

The above framework seems to indicate that in the adult of *Dorcus* spp., entomophagy might provide the relatively long living females with protein and possibly enables them to oviposit for several years (Hendriks 2019), in fact females and larvae of *D. parallelipipedus* can live together in large numbers in decayed wood, and cannibalism would be an easy way to sustain protein diet to benefit their egg production and longevity (Fremlin & Hendriks 2011, 2013; Hendriks 2019).

Our observation of a male *D. parallelipipedus* feeding on Stag Beetle remains, maybe attracted by the fresh entrails of the Stag Beetle, does not find a clear explanation by the cases cited above in the literature, so further observations, also carried out in captivity, will be necessary to understand this feeding behaviour.

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References

Aguiar A.F., Andrade M., Cravo D., Gonçalves Y. 2024. The Scarabaeoidea Latreille (Coleoptera) of the Madeiran Archipelago. Entomologist's Monthly Magazine, 160(2): 105–118. Doi: 10.31184/M00138908.1602.4229

Ballerio A., Rey A., Uliana M., Rastelli M., Rastelli S., Romano M., Colacurcio, L. 2014. Coleotteri Scarabeoidei d'Italia. Available on line at: https://www.societaentomologicaitaliana.it/Coleotteri%20Scarabeoidea%20d'Italia%202014/index.htm [accessed 2025 January 22].

Bardiani M., Chiari S., Maurizi E., Tini M., Toni I., Zauli A., Campanaro A., Carpaneto G.M., Audisio P. 2017a. Guidelines for the monitoring of *Lucanus cervus*, pp. 37–78. In: Carpaneto G.M., Audisio P., Bologna M.A., Roversi P.F., Mason F. (eds), Guidelines for the Monitoring of the Saproxylic Beetles protected in Europe. Nature Conservation, 20. Doi: 10.3897/natureconservation.20.12687.

Bardiani M., Tini M., Carpaneto G.M., Audisio P., Bussola E., Campanaro A., Cini A., Maurizi E., Mason F., Sabbatini Peverieri G., Roversi P.F., Toni I., Chiari S. 2017b. Effects of trap baits and height on stag beetle and flower chafer monitoring: ecological and conservation implications. Journal of Insect Conservation, 21: 157–168. Doi: 10.1007/ s10841-017-9965-3.

Bartolozzi L., Norbiato M., Cianferoni F. 2016a. A review of geographical distribution of the stag beetles in Mediterranean countries (Coleoptera: Lucanidae). Fragmenta entomologica, 48(2): 153–168. Doi: 10.4081/ f e.2016.182

Bartolozzi L., Sprecher-Uebersax E., Bezděk A. 2016b. Family Lucanidae Latreille, 1804, pp. 58–84. In: Löbl I., Löbl D. (eds), Catalogue of Palaearctic Coleoptera. Volume 3. Revised and Updated Edition. Scarabaeoidea, Scirtoidea, Dascilloidea, Buprestoidea, Byrrhoidea. Brill, Leiden – Boston.

Bouyer T. 2020. Etude des *Nigidius* africains Partie 1: Introduction (Coleoptera, Lucanidae, Figulini). Entomologia Africana, 25(2): 45–64.

Campanaro A., Bardiani M. 2012. Walk transects for monitoring of *Lucanus cervus* in an Italian lowland forest, pp. 17–22. In: Jurc M. (ed.), Saproxylic beetles in Europe: monitoring, biology and conservation. Studia Forestalia Slovenica, 137.

Campanaro A., Hardersen S., Minari M., Toni I., Mason F. (eds). 2014. Piano di gestione della riserva naturale statale e sito natura 2000 "Bosco della Fontana". Aggiornamento 2014 – 2020. Quaderni Conservazione Habitat, 8. Cierre edizioni, Verona, 265 pp.

Campanaro A., Toni I., Hardersen S., Grasso D.A. 2011. Monitoring of *Lucanus cervus* by means of Remains of Predation (Coleoptera: Lucanidae). Entomologia Generalis, 33(1–2): 79–89.

Ceccolini F., Bartolozzi L., Cianfanelli S. 2015. Conferma della presenza di *Dorcus parallelipipedus* (Linnaeus, 1758) nell'isola di Zannone (Isole Ponziane) (Coleoptera: Lucanidae). Onychium, 11: 114–116.

Chevrolat [A.,] 1834. Bulletin entomologique. Séance du 19 mars [...de la forêt de Fontainebleau, un *Lucanus Parallelipipedus*...]. Annales de la Société entomologique de France, 3, xi. [ix–xii]

Choi J.H., Kim C.J., Kim M.S., Kang J.Y., Kim I.K. 2022. The mitochondrial genome of *Nigidius miwai* Nagel (Coleoptera: Lucanidae), a carnivorous lucanid from South Korea. Mitochondrial DNA Part B, 7(8): 1443–1444. Doi:

10.1080/23802359.2022.2105171

Choi J.H., Kim M.S., Kang J.Y., Kim I.K., Kim C.J., Euo S.S. 2024. The mitochondrial genome of a carnivorous lucanid, *Figulus punctatus* Waterhouse, 1873 (Coleoptera: Lucanidae). Journal of Asia-Pacific Biodiversity, 17: 595–600. Doi: 10.1016/j.japb.2024.03.7

Cornacchia P., Scaglioni G. 2024. Coleotteri della provincia di Mantova (Lombardia, Italia settentrionale). I. (Coleoptera: Adephaga. Polyphaga I: Hydrophiloidea, Staphylinoidea, Scarabaeoidea, Scirtoidea, Buprestoidea, Byrrhoidea). Monografie dell'Associazione Romana di Entomologia, 2: 1–646.

Dendi D., Rugiero L., Luiselli R., Fa J.E., Amori G., Luiselli L. 2023. Phenology, sex-ratio and protandry in three stag beetle species (Lucanidae) from central Italy. Journal of Natural History, 57(33–36): 1540–1558. Doi: 10.1080/00222933.2023.2256952

Fearn S. 2020. Sap flow feeding by adult golden stag beetles *Lamprima aurata* (Scarabaeoidea: Lucanidae) in northern Tasmania. The Tasmanian Naturalist, 142: 91–96.

Franciscolo M.E. 1997. Fauna d'Italia. XXXV. Coleoptera Lucanidae. Calderini, Bologna, xi + 228 pp.

Fremlin M., Hendriks P. 2011. Sugaring for stag beetles different feeding strategies of *Lucanus cervus* and *Dorcus parallelipipedus*. Bulletin of the Amateur Entomologists' Society, 70: 57–67.

Fremlin M., Hendriks P. 2013. Lesser Stag Beetle *Dorcus parallelipipedus* (L.) longevity – at least three years. Bulletin of the Amateur Entomologists' Society, 72: 48–56.

Hangay G., De Keyzer R. 2017. A guide to stag beetles of Australia. CSIRO Publishing, Clayton South, Victoria, x + 245 pp.

Hardersen S., Macagno A.L., Sacchi R., Toni I. 2011. Seasonal constraints on the mandible allometry of *Lucanus cervus* (Coleoptera: Lucanidae). European Journal of Entomology, 108(3): 461–468. Doi: 10.14411/eje.2011.059

Hendriks P. 2019. Life cycle length of the lesser stag beetle (Coleoptera: Lucanidae: *Dorcus parallelipipedus*). Entomologische Berichten, 79(6): 208–216.

Hendriks P., Méndez M. 2018. Larval feeding ecology of the stag beetle *Lucanus cervus* (Coleoptera: Lucanidae). Entomologische Berichten, 78(6): 205–217.

Huang T.-I. 2018. Chapter 4. Diversity and ecology of stag beetles (Lucanidae), pp. 149–165. In: Ulyshen M.D. (ed.), Saproxylic insects: diversity, ecology and conservation. Springer, Heidelberg. Doi: 10.1007/978-3-319-75937-1

Kim J.I., Kim S.I. 2014. Insect Fauna of Korea Volume 12, Number 15. Arthropoda: Insecta: Coleoptera: Scarabaeoidea: Lucanidae and Passalidae. Lucanidae and Passalidae. National Institute of Biological Resources Ministry of Environment, Korea, 58 pp.

Kim S.I., Kim J.I. 2010. Review of family Lucanidae (Insecta: Coleoptera) in Korea with the description of one new species. Entomological research, 40 (1): 55–81. Doi: 10.1111/j.1748-5967.2009.00263.x

Maquart P.O., Yamamoto S., Sopha S., Chhorn S., Phak S., Sinovas P., Phauk S., Boyer S. 2023. Stag beetle fauna of Cambodia (Coleoptera: Lucanidae). Journal of Asia-Pacific Entomology 26(1): e102008. Doi: 10.1016/j.aspen.2022.102008

Méndez M., Thomaes A. 2021. Biology and conservation of the European stag beetle: recent advances and lessons learned. Insect Conservation and Diversity, 14: 271–284. Doi: 10.1111/icad.12465

Mori H., Chiba S. 2009. Sociality improves larval growth in the stag beetle *Figulus binodulus* (Coleoptera: Lucanidae). European Journal of Entomology, 106(3): 379–383. Doi: 10.14411/eje.2009.048

Rattu R., Uliana M., Fancello L., Carpaneto G.M. 2020. Aggiornamenti faunistici sugli Scarabaeoidea di Sardegna (Coleoptera) con prima segnalazione di *Anomala devota* (Rossi, 1790). Bollettino del Museo Civico di Storia Naturale di Venezia, 71, 45–50.

Reid C. 2019. 26. Lucanidae Latreille, pp. 391–416. In: Ślipiński A., Lawrence J. (eds), Australian Beetles Volume 2: Archostemata, Myxophaga, Adephaga, Polyphaga (part). CSIRO Publishing, Clayton South.

Scaccini D., Anaclerio M. 2016. *Lucanus cervus* (Coleoptera: Lucanidae) sampling during its flight period in Northern Italy: data from an ongoing survey in an oak forest. In: Proceedings of the 9th Symposium on the Conservation of Saproxylic Beetles, Genk, 22–24 April 2016. Bulletin de la Société royale belge d'Entomologie, 152(2), pp. 163–167.

Solano E., Thomaes A., Cox K., Carpaneto G.M., Cortellessa S., Baviera C., Bartolozzi L., Zilioli M., Casiraghi M., Audisio P., Antonini G. 2016. When morphological identification meets genetic data: the case of *Lucanus cervus* and *L. tetraodon* (Coleoptera, Lucanidae). Journal of Zoological Systematics and Evolutionary Research, 54(3): 197–205.

Tanahashi M., Togashi K. 2009. Interference competition and cannibalism by *Dorcus rectus* (Motschulsky) (Coleoptera: Lucanidae) larvae in the laboratory and field. The Coleopterists Bulletin, 63(3): 301–310. Doi: 10.1649/1143.1

Tanahashi M., Matsushita N., Togashi K. 2009. Are stag beetles fungivorous? Journal of Insect Physiology, 55(11): 983–988. Doi: 10.1016/j.jinsphys.2009.07.002

Tauzin P. 2022. Les spécimens italiens du genre *Lucanus* Scopoli, 1763 près de Rome (Coleoptera, Lucanidae, Lucaninae). Le Coléoptériste, 25(1): 21–24.

Tini M., Bardiani M., Campanaro A., Mason F., Audisio P., Carpaneto G.M. 2017. Detection of stag beetle oviposition sites by combining telemetry and emergence traps, pp. 81–96. In: Campanaro, A., Hardersen, S., Sabbatini, Peverieri, G., Carpaneto, G.M. (eds), Monitoring of saproxylic beetles and other insects protected in the European Union. Nature Conservation, 19.

Vendl T., Šípek P. 2016. Immature stages of giants: morphology and growth characteristics of *Goliathus* Lamarck, 1801 larvae indicate a predatory way of life (Coleoptera, Scarabaeidae, Cetoniinae). ZooKeys, 619: 25–44. Doi: 10.3897/zookeys.619.8145

Yi D. 2023. Entomodiversity Research Volume: 1. Lucanidae of the World. Biodiversity Laboratory, Seoul, 190 pp. Available on-line at: http://kawamo.co.jp/roppon-ashi/sub988.html