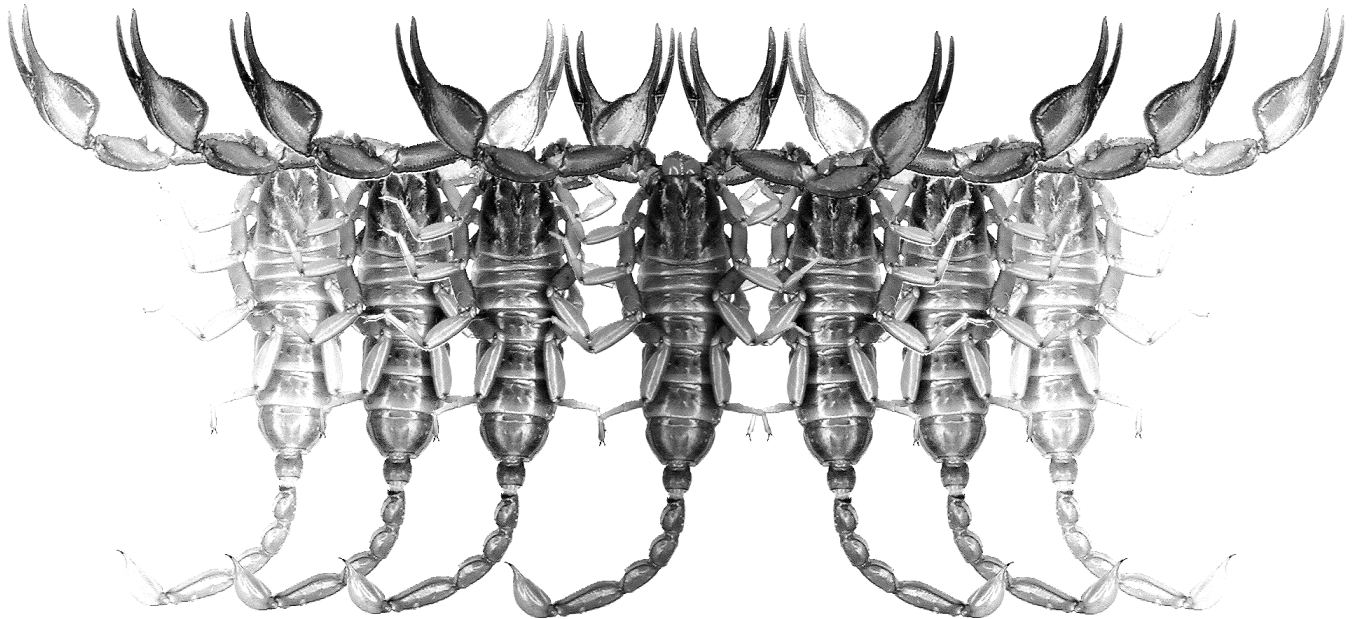


Euscorpius

Occasional Publications in Scorpiology



Scorpions 2011

John L. Cloudsley-Thompson 90th Birthday Commemorative Volume

**On Fabre's Traces: an Important Contributor to the
Knowledge of *Buthus occitanus* (Amoreux, 1789)**

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Euscorpius

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On Fabre's traces: an important contributor to the knowledge of *Buthus occitanus* (Amoreux, 1789)

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Summary

Jean-Henri Casimir Fabre (1823–1915) has probably been one of the most important entomologists of the world in the last two centuries, leaving to posterity a huge amount of manuscripts and books. The Languedoc yellow scorpion, *Buthus occitanus* (Amoreux, 1789), has been one of his objects of study: many of its behaviours, including the famous “*promenade a deux*”, have been described by the careful eye of the French entomologist, giving an interesting contribution to modern scorpiology.

Introduction

Jean-Henri Casimir Fabre (1823–1915; Fig. 1) has been one of the most important entomologists of the world in recent times, and has left to the scientific community a huge amount of observations. While not very standardized, they were written with passion and accuracy during a lifetime of naturalistic research work in France; his particular writing style, on the border between poetry and narration, was combined with inquisitiveness, passion and the continuous search of “scientific truth”, things that made him also popular among non-scientists.

His objects of entomological studies were mainly insects, such as hard-working dung beetles, solitary parasitic wasps, strangely shaped curculionids, and interesting fireflies (e.g. Fabre, 1911, 1923). At the same time, he also wrote about arachnids, such as garden spiders and Narbonne wolf spiders (Fabre, 1928) and scorpions, primarily the Languedoc yellow scorpion *Buthus occitanus* (Amoreux, 1789), leaving important contributions about this interesting European species (Fabre, 1905).

Jean-Henri Fabre: life of an entomologist across two centuries

Jean-Henri Fabre was born in Saint Léons on December 22nd, 1823. Since his childhood he was attracted by nature and invertebrates in particular; after a few years spent in Malaval, he came back to Saint Léons in order to study. His school path made him become a teacher at the age of nineteen, with an obvious preference for natural history lessons; he taught in Ajaccio (Corsica), where he had possibility to admire Mediterranean insular species, and then obtained in 1853

a place as teacher in Avignon, where he also studied the way to improve the use of the common madder (*Rubia tinctoria* L.), a plant used for colorants, succeeding in depositing three brevets in 1860.

During his formation, Fabre made several excursions in the field, observing plants, fossils and his beloved insects; although he was mostly autodidact, he made a huge amount of observations, wrote dozens of manuscripts and popular books that have been translated from French to many languages, including Chinese, Danish, Italian, and Swedish (Fig. 2). His writing style made his works fascinating also for a large public, so that he was called “entomological philosopher” (he was, among other things, also a poet); his precision also earned him the definition of “inimitable observer” no less than from Charles Darwin, with which he had a short mail correspondence in 1880. His most famous and complete work, begun in 1879, is the collection of “*Souvenirs Entomologiques*” (Fabre, 1923), including observations and descriptions of experiments within the magnificent world of invertebrates, published in several volumes and then in a comprehensive collection in 1923, after Fabre's death in 1915 at the age of ninety-two. A good number of Fabre's biographies has been written and published, already when he was still alive (Delange, 1981; Fabre, 1929; Legros, 1913).

During his studies Fabre gave an interesting contribution to scorpiology, describing in detail several aspects of life history of *Buthus occitanus*.

The Languedoc yellow scorpion: observations in a nutshell

The Languedoc yellow scorpion, *Buthus occitanus* (Amoreux, 1789) is a species of Buthidae, distributed in southwestern Europe (Iberian Peninsula and France;



Figure 1: Fabre's portrait with his daughters and house (after Fabre, 1920a).

Lourenço & Vachon, 2004). Its average size is comprised between 45 and 60 mm of length, although it can grow up to 80 mm (Stockmann & Ythier, 2010). The coloration of the body is yellowish with darker tergites and prosoma (Lourenço & Vachon, 2004), and the latter bears two well visible lyriform carinae (Fig.3). This nocturnal species inhabits xeric habitats such as Mediterranean forests, maquis, and garrigue (Lourenço & Vachon, 2004; Figs. 4–5), and is considered of medical importance (Castilla & Herrel, 2009; Gantenbein & Largiadèr, 2003). Its diet includes a wide range of invertebrates (it is considered a quite generalist species; Skutelsky, 1995), including other scorpions (Bejarano & Pérez-Bote, 2002), but also small vertebrates such as juvenile terrapins (Bejarano & Pérez-Bote, 2002) and lizards, especially when insects are scarce (Castilla et al., 2009).

Fabre first encountered the Languedoc yellow scorpion while looking for chilopods for his doctoral dissertation; turning stones, it sometimes happened that he did not find a centipede he was looking for, but “another hermit, no less unpleasant. It was him. A convoluted tail on the back, a drop of venom beading in the end of the dart, it spread its pinchers out of a burrow” (Fabre, 1905).

Many years later, he begun collecting scorpions in the surroundings of his house, where he found their burrows under stones; he collected them with the aid of pincers, and put specimens in small cones of heavy paper for the transport (Fabre, 1905).

After an accurate morphological description of the species (mainly metasoma, pedipalps, legs, pectines, and eyes), Fabre described his attempts to keep and study them “en plein air”, but due to some problems he finally decided to keep them “under a bell”, that is in a terrarium. He ordered the construction to some craftsmen and obtained a huge cage of glass, with a sandy bottom, where he put several tiles as shelters (Fig. 6). Almost all behavioural observations were then made by him in captivity. However, he would have liked to observe them in the wild, as he stated: “*If I were not afraid to break my legs at night, between the congestion of their rocky hills, I would like to attend their wedding festival in the delights of freedom. What are they doing up there on their bald slopes?*”

The terrarium permitted him to observe, for example, feeding habits in this species: he observed that scorpions practically did not eat from October to April, and was initially disappointed from their apparently shy temperament: “*It is a coward*” he wrote “[...] *A large*



Figure 2: The cover of *The Life of Insects*, Italian translation.



Figure 3: *Buthus occitanus*, female's closeup showing lyriform carinae near eyes (photo by Marco Colombo).

white [butterfly] makes it escape just beating its amputated wings on the ground" (Fabre, 1905).

After various trials in order to find the right prey kind or size (Fig. 7.1), he observed scorpion predation upon the beetle *Omophlus lepturoides* (Fabricius, 1787) (Tenebrionidae: Alleculinae), and then upon butterflies and other insects. During his nocturnal observations "at the light of the lamp", Fabre begun finding cases of cannibalism among adults, that he immediately associated to a post-mating behaviour, as it happens in some praying mantids (however, he also observed cannibalism perpetrated by adults against juveniles; Fabre, 1905).

Fabre was also interested in the duration of fasting: in one of his experiments, he put four specimens in different jars without giving them any food, and they survived for about nine months without eating (from autumn to May-June); he assumed that they used their reserves to survive (Fabre, 1905).

During his observations, Fabre underlined that, when attacking its prey, *Buthus occitanus* does not use

its sting and venom, unless the prey is large, or it effectively tries to escape or defend itself; this is true also for other scorpion species (e.g. genus *Euscorpium* Thorell, 1876; M.Colombo, pers. obs.). The sting, according to Fabre, is mostly used for defense. In order to verify this, Fabre set up a small "arena" where he put scorpions together with big terrestrial spiders (*Lycosa narbonensis* Walckenaer, 1806). He observed that pedipalps helped scorpions in blocking the opponents and keeping them away, while the sting was used to kill wolf spiders. The same experiment was made with praying mantids, which could be a prey of the scorpions when laying eggs in autumn under big stones, and also rhinoceros beetles, dragonflies, and many other insects (Fabre, 1905). Nowadays, however, this kind of experiments would hardly be acceptable and would be neither useful nor informative, since Fabre conducted them in captivity conditions that had little in common with natural situations. However, these experiments were in line with Fabre's concept of a naturalist: "the



Figure 4: *Buthus occitanus*, a specimen in the dark (photo by Marco Colombo).



Figure 5: *Buthus occitanus* habitat in Provence (photo by Giorgio Colombo).

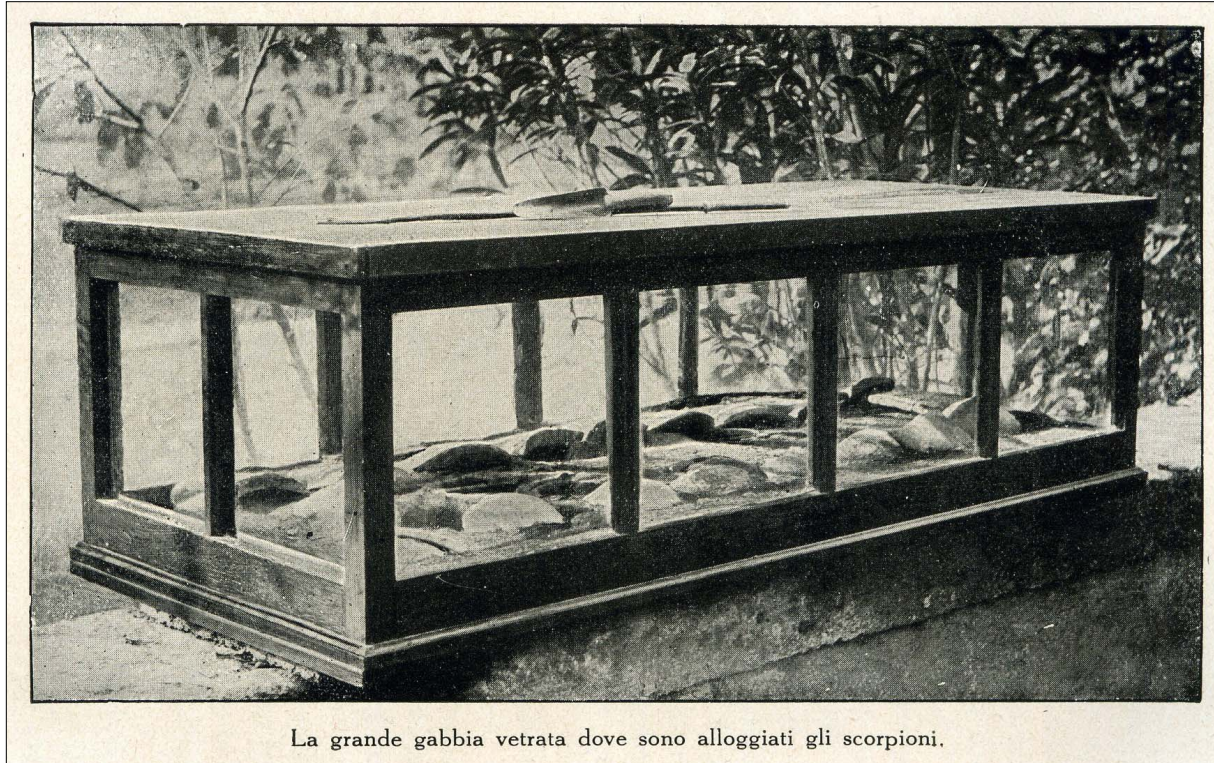


Figure 6: A big terrarium in Fabre’s courtyard, where he made his observations on scorpions (caption: “A big glass cage where the scorpions are kept”; after Fabre, 1920a).

naturalist interrogating beasts is inevitably a torturer; there is no other way to make them talk” (Fabre, 1905).

Particularly interesting were Fabre’s observations about reproductive behaviour in *Buthus occitanus*: these were the results of hours spent with the lamp near a big terrarium in the courtyard, sometimes together with other family members.

In April, the scorpions in his terrarium were very active, and Fabre often found cases of cannibalism (Figs. 7.2, 8), noticing, however, that those were the females (“darker coloration, paunchy belly”) eating males (“pale coloration, belly less paunchy”) and not vice versa, linking this phenomenon not to territoriality but to breeding aspects (this kind of cannibalism, however, does not apply always and to all scorpion species; Lourenço, 2002). In fact, he later observed that during the night many specimens formed couples. With his careful eye, Fabre described how the male takes the female from pedipalps and brings her to a shelter (Fig. 9; the famous *promenade a deux*, in order to bring the female to a spermatophore placed before; Lourenço, 2002), and the moment in which the pair puts chelicerae and the frontal part of prosoma in contact, comparing it to a kiss (“*We say that dove invented the kiss, but it has a precursor: the scorpion*”). For many days, he attempted to see the exact moment of mating, but for many reasons (for example long duration of preliminary

phases, late hour, tiredness, and rain) he could not observe this particular behaviour, and thought that scorpions mate in the same way as crickets (Fabre, 1905).

Finally, Fabre succeeded in observing the most spectacular event of the courtship complex behaviour: the pair lifts tails together, undertaking a position called “*arbre droit*”: “*To declare his love*” he wrote “*the scorpion does the arbre droit*” (Fabre, 1905).

In the end, the French entomologist also observed, during summer months, the birth of the offspring and their permanence on the mother’s back (Fig. 7.3), making also experiments, such as transferring some juveniles from one female to another and verifying that they also accept offspring other than their own (Fabre, 1905).

Conclusions

Jean-Henri Fabre has been one of the living examples of the fact that passion, combined with knowledge even if autodidactic, can lead to a huge amount of observations, data and interesting results. During his research of the “scientific truth”, he conducted experiments (notable the ones with moths in order to understand how females attract males; Fabre, 1930) and left to the scientific community very inter-

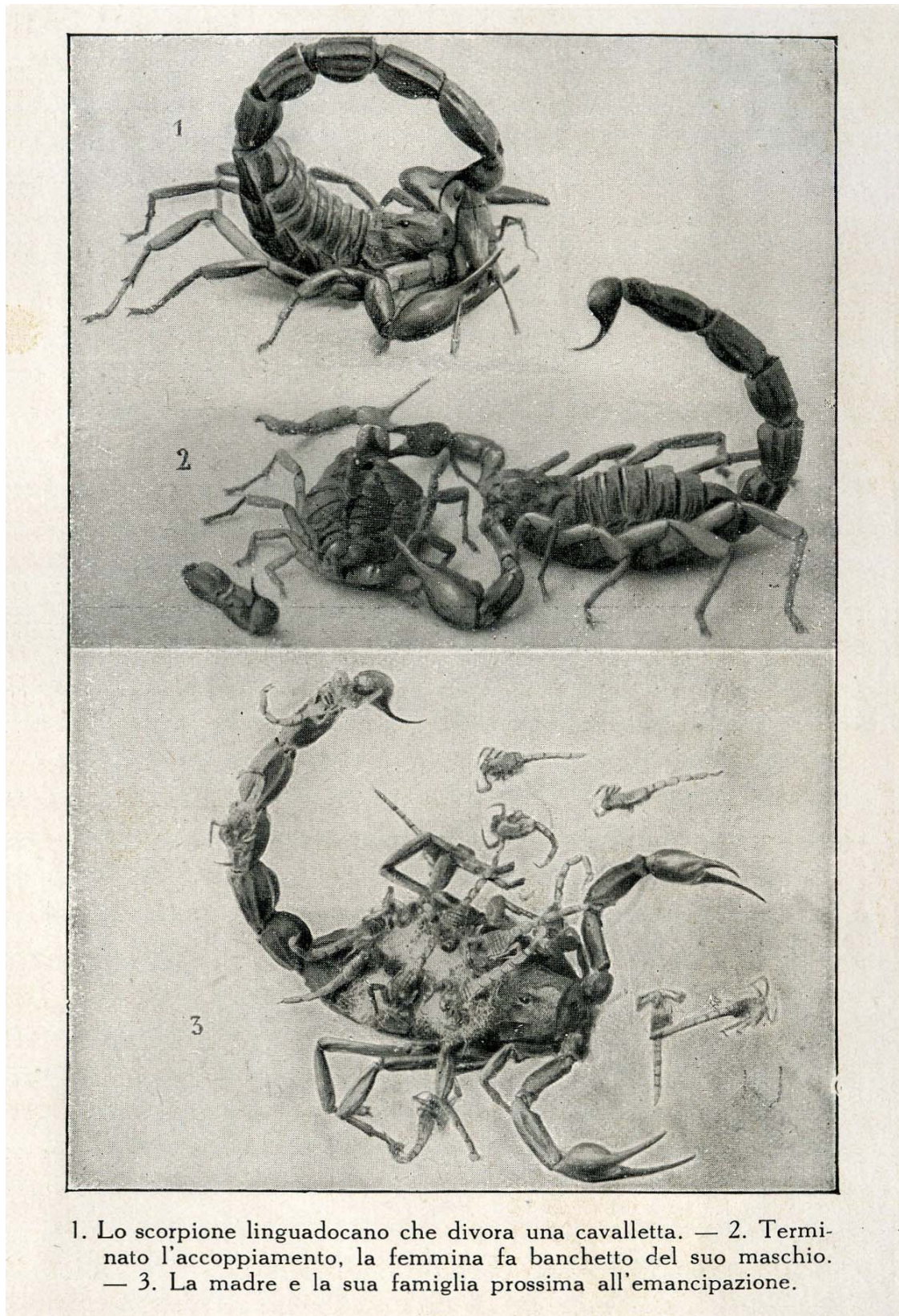


Figure 7: A plate from *The Life of Insects*, depicting predation, cannibalism and offspring in the Languedoc yellow scorpion. 1. Languedoc scorpion devouring a grasshopper. 2. After mating, the female eats the male. 3. The mother and her family ready for emancipation (after Fabre, 1920a).



Figure 8: Cannibalism can be observed in *Buthus occitanus* both in the field and in captivity (photograph by Marco Colombo).

esting data. With regard to scorpions, he observed many aspects of life history of the French *Buthus occitanus*. As he had wrote referring to his predecessors, “*the chisel of the masters revealed to us the organic structure [of the scorpion], but no observer, as far as I know, investigates its intimate habits. Gutted after alcohol maceration, it is very well known; active in the domain of its instincts, it is ignored. Nobody, however, would deserve more than it, among segmented animals, the details of a biography*” (Fabre, 1905). Many things have changed since his publications: for example, new species belonging to this genus have been described from Iberian populations, previously thought to belong to *B. occitanus* (Gantenbein & Largiadèr, 2003; Lourenço & Vachon, 2004). Furthermore, the discovery of fluorescence in scorpion cuticle in 1954 has revolutionized the way of looking for and studying scorpion behaviour with the aid of UV lamps, without disturbing them (Fig. 10; Lowe et al., 2003).

However, Fabre’s contribution to the knowledge of the most intimate aspects of the Languedoc yellow scorpion’s life is unquestionable and has to be recognized.

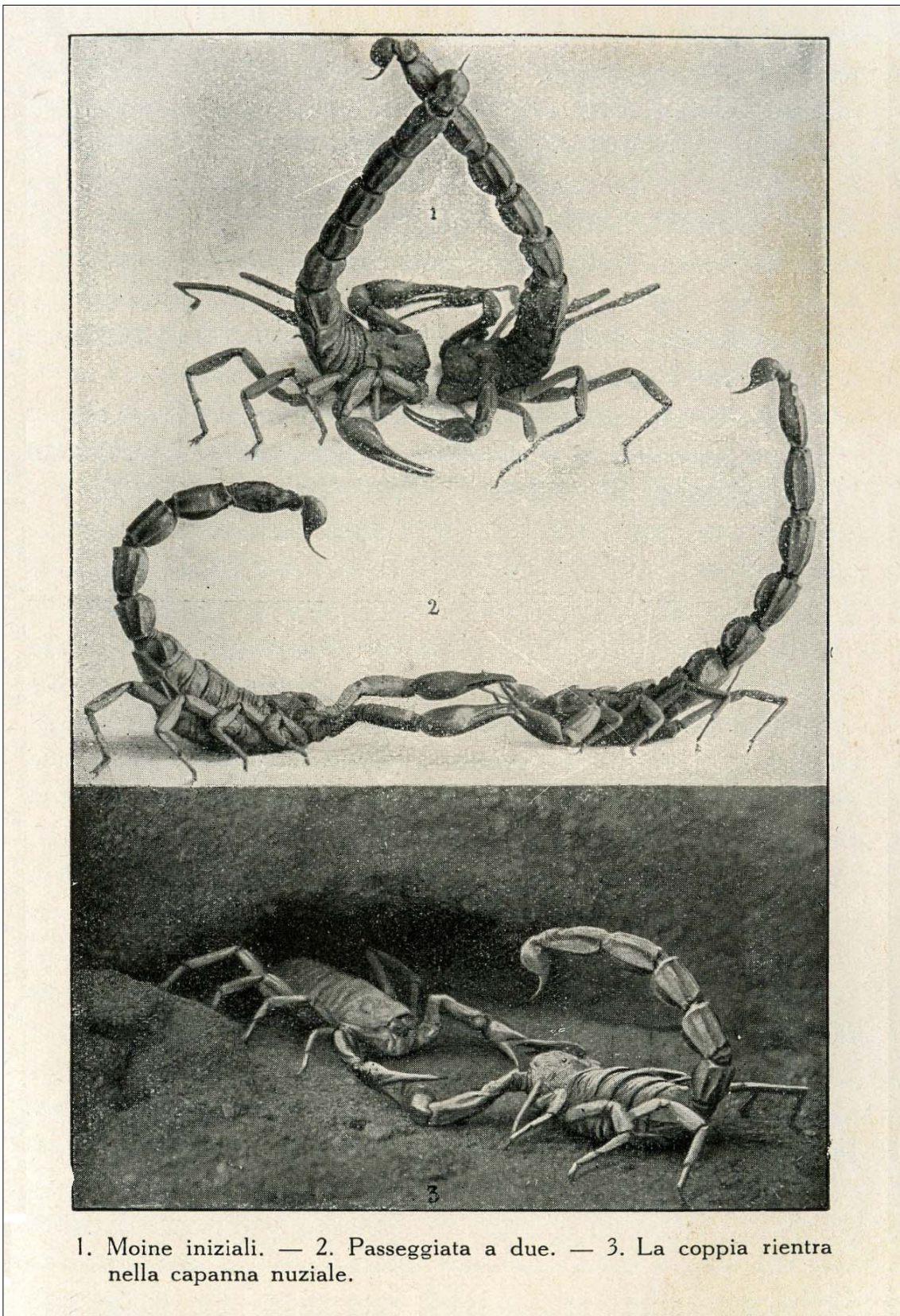
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References

- BEJARANO, I. & J. L. PÉREZ-BOTE. 2002. Determinación de una presa atípica en la dieta de *Buthus occitanus* (Amoreaux, 1789) (Scorpiones: Buthidae). *Revista Ibérica de Aracnología*, 5: 59–60.
- CASTILLA, A. M. & A. HERREL. 2009. The scorpion *Buthus occitanus* as a profitable prey for the endemic lizard *Podarcis atrata* in the volcanic Columbretes islands (Mediterranean, Spain). *Journal of Arid Environments*, 73: 378–380.
- CASTILLA, A. M., A. HERREL & A. GOSÁ. 2009. Predation by scorpions (*Buthus occitanus*) on *Podarcis atrata* from the Columbretes islands. *Munibe (Ciencias Naturales-Natur Zientziak)*, 57: 299–302.
- DELANGE, Y. 1981. *Fabre, l’homme qui aimait les insectes*. Lattés, 347 pp.



1. Moine iniziali. — 2. Passeggiata a due. — 3. La coppia rientra nella capanna nuziale.

Figure 9: Another plate from the same book, depicting courtship behaviour. 1. Initial courtship. 2. *Promenade-a-deux*. 3. The pair enters the nuptial hut (after Fabre, 1920a).

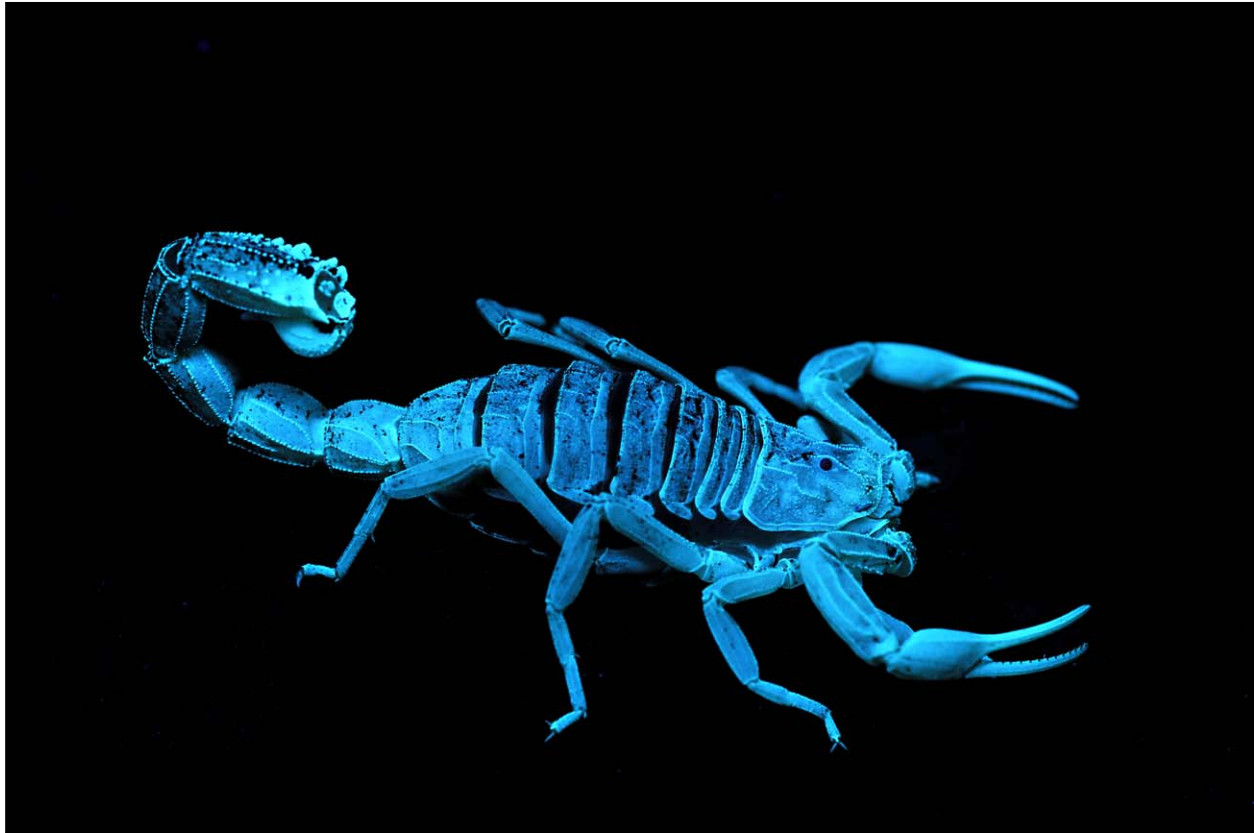


Figure 10: A *Buthus occitanus* under UV light (photo by Marco Colombo).

- FABRE, A. 1929. *Jean-Henry Fabre le naturaliste*. Rodez, 513 pp.
- FABRE, J.-H. 1905. *Souvenirs Entomologiques (9ème Série)*. Librairie Delagrave, 376 pp.
- FABRE, J.-H. 1911. *Le meraviglie dell'istinto degli insetti*. Sonzogno Ed., 238 pp.
- FABRE, J.-H. 1920a. *La vita degli insetti*. Sonzogno Ed., 252 pp.
- FABRE, J.-H. 1920b. *Le meraviglie dell'istinto negli insetti*. Sonzogno Ed., 240 pp.
- FABRE, J.-H. 1923. *Souvenirs Entomologiques (Edition Definitive)*. Librairie Delagrave, 2784 pp.
- FABRE, J.-H. 1928. *La vie des Araignées*. Bibliothèque Juventa, 248 pp.
- FABRE, J.-H. 1930. *I costume degli insetti*. Sonzogno Ed., 316 pp.
- GANTENBEIN, B. & C. R. LARGIADÈR. 2003. The phylogeographic importance of the Strait of Gibraltar as a gene flow barrier in terrestrial arthropods: a case study with the scorpion *Buthus occitanus* as a model organism. *Molecular Phylogenetics and Evolution*, 28: 119–130.
- LEGROS, G.-V. 1913. *La vie de J.-H. Fabre naturaliste par un disciple*. Librairie Delagrave, 297 pp.
- LOURENÇO, W. R. 2002. Reproduction in scorpions, with special reference to parthenogenesis. Pp. 71–85. In: Toff, S. & N. Scharff (eds.). 2002. *European Arachnology 2000*. Aarhus: Aarhus University Press.
- LOURENÇO, W. R. & M. VACHON. 2004. Considerations sur le genre *Buthus* Leach, 1815 en Espagne, et description de deux nouvelles espèces (Scorpiones, Buthidae). *Revista Iberica de Aracnologia*, 9: 81–94.
- LOWE, G., S. R. KUTCHER & D. EDWARDS. 2003. A powerful new light source for ultraviolet detection of scorpions in the field. *Euscorpius*, 8: 1–7.
- SKUTELSKY, O. 1995. Flexibility in foraging tactics of *Buthus occitanus* as a response to above-ground activity of termites. *Journal of Arachnology*, 23: 46–47.
- STOCKMANN, R. & E. YTHIER. 2010. *Scorpions of the World*. Verrières-le-Buisson: N.A.P. Editions, 572 pp.