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Proposition for the use of Coleoptera as bioindicators in environmental damage expertise

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Abstract

Forensic Entomology is the science that applies the knowledge, especially of biology and ecology, of insects to solve legal questions. The nature of the investigations can be economic or criminal: to estimate the time of death, to point out the cause of death, to attribute responsibility for cases of food contamination, to infer negligence or mistreatment, among others. Identifying changes or crimes against the environment or assessing mitigation processes can be very complex. Some organisms, classified as bioindicators, are considered key elements in the ecosystem because they participate in diverse ecological interactions. For this reason they are used as instruments in the monitoring of degraded areas. The objective of this study is to propose, through ecological analysis, the use of Coleoptera as indicators in environmental damage expertise.

Key words:
Biodiversity, beetles, forensic entomology.

Introduction

Anthropogenic activities in the environment cause changes and impacts on local biodiversity, allowing eventual decline and destruction of the ecosystem and, in more serious cases, the extinction of species[1]. The loss of species, in turn, affects the diversity and stability of the ecosystem, making it more susceptible to disturbances. The species richness and the quantity of animal specimens analyzed in a given study vary according to climatic and phytogeographic conditions in the different regions, generating useful knowledge for forensic analysis [2-4].

The objective of this study is to propose Coleoptera as possible bioindicators for the investigation of crimes of environmental damage, since these insects are considered one of the main promoters of the process of soil fertilization in environments with little or no disturbance[5].

Figure 1. Distinct dominances per family of Coleoptera (Insecta).

Results and Discussion

Adult beetle collections were carried out in areas of preservation of the Mata Atlântica and Cerrado biomes of the state of São Paulo, Brazil, under the authorization of SISBIO/IBAMA. Pitfall traps[6] containing baits (rotten bovine chicken gizzard and kidney and fresh human feces) were exposed for three days in each environment. In the laboratory the samples were separated and identified[7].

A total of 1,696 specimens belonging to 15 Coleoptera families were collected. In order to evaluate the proposal of the use of Coleoptera as a bionicator, the following indices were calculated: diversity, equitability (to measure possible differences and similarities between areas), dominance, Shannon-Wiener, Jaccard coefficient and Berger-Parker.

The diversity was lower in the Atlantic Forest biome (1.32) when compared to the Cerrado (1.44). This is probably due to species dominance: Scarabaeidae, for example, in the Atlantic Forest was more dominant (d= 0.57) than in the Cerrado (d = 0.34) (Fig. 1).
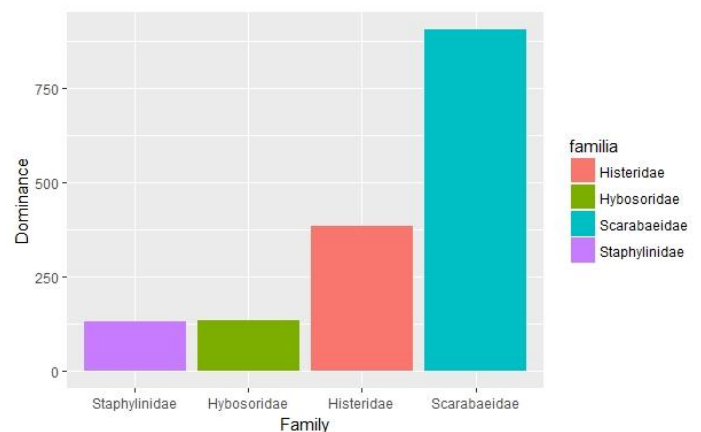
Conclusions

From the analyzes conducted here, it was concluded that given their particularities Coleoptera, as well as other insects[1], can be promising as bioindicators, consequently they can be useful in the forensic field and as an object of expertise to evaluate environmental impact.

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