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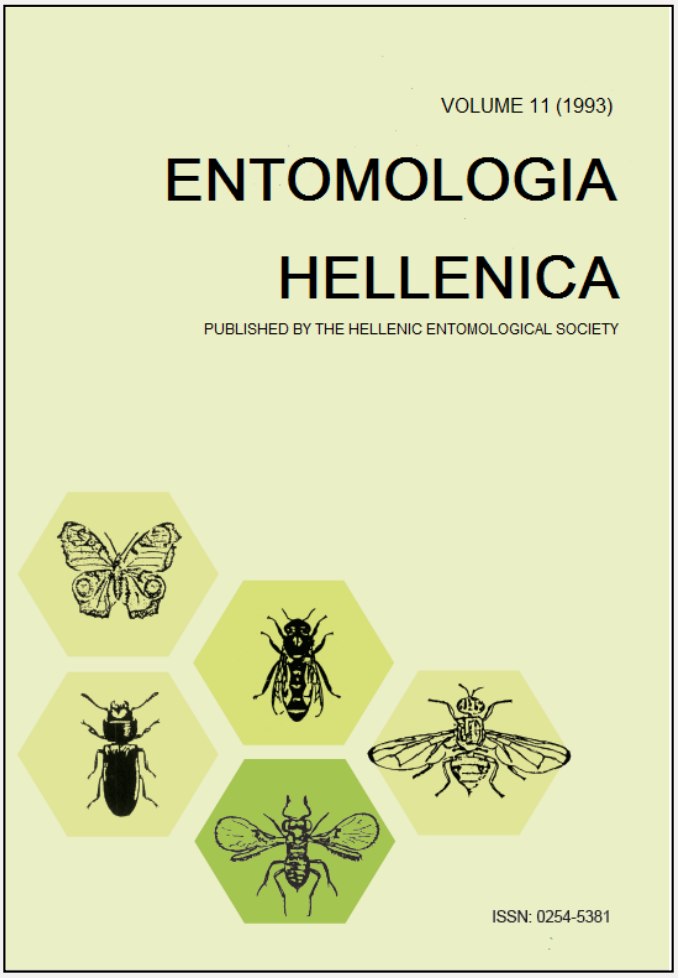

Dominance and Frequency of Coleoptera Found on Stored Cereals and Cereal Products in Central Greece

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Dominance and Frequency of Coleoptera Found on Stored Cereals and Cereal Products in Central Greece[1]

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ABSTRACT

Thirty Coleoptera taxa belonging to 14 families were found during samplings conducted in 4 different storage facilities at Farsala district, Central Greece, from January 1991 to February 1992. Among the most frequently found, *Sitophilus oryzae, S. granarius and Rhysopertha dominica* were more numerous on grain, *Tribolium confusum*, *T. castaneum* and *Cryptolestes ferrugineus* on flour, while *Oryzaephilus surinamensis* and *O. mercator* showed no significant preference to any commodity. An analysis of the results was performed, based on the «dominance» and «frequency» criteria. The population fluctuation of the 8 most significant species is given in graphs.

Introduction

The great majority of insects found in storage facilities belong to the order Coleoptera with the Lepidoptera coming next in order of frequency (Aitken 1975). Many species are feeding directly on the product itself causing its quantitative and qualitative degradation; the rest may do no direct damage having mycetophagous, predatory and parasitic habits. Their presence is often indicative of mouldy or infested condition (Cotton 1960, Mallis 1982, Sinha and Watters 1985).

The major importance of cereals in Greece makes imperative the need for constant surveillance on storage, handling and processing facilities by specialists, in order to avoid - or at least minimize-quantitative and qualitative loss caused by insects and other secondary degradations.

Apparently, Coleoptera are also the most important pests of stored cereals and other relevant products in Greece (Buchelos 1981). The present work was considered worthwhile to be undertaken therefore.

Materials and Methods

a. Storage facilities.

The storage rooms in which this study took place are located in at the plain of Farsala, in Thessaly, Central Greece. The samplings were conducted in four kinds of storage facilities referred to hereinafter as Rooms 1, 2, 3 and 4. Room 1 is a State warehouse with large quantities of wheat, barley and maize permanently stored. Room 2 is an old traditional flour mill, with quantities of wheat, flour and bran. Room 3 is a private warehouse containing wheat, maize, flour, bran and livestook feed. Room 4 is also a private warehouse containing wheat and flour.

b. Sampling.

The sampling was conducted from January 1991 to February 1992. From each Room and approximately every 10 days, samples weighing about 200 g were taken from the surface and depths up to 30 cm of the bulk, corners, machinery and residues. In total 160 samples, 40 from each Room, were examined.

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c. Dominance and Frequency.

Analysis of the data was made according to the criteria used by Curry (1973).

The term «dominance» signifies the percentage of individuals belonging to a particular species compared to the individuals of all the species indentified in total. Thus, species can be classified as:

«Dominant»: 5% or more of the total number of individuals found, «Influent»: 2-5% of the total number of individuals found and «Recendent»: less than 2% of the total number of individuals found.

A species «frequency» is measured by the percentange of samples in which the particular species was detected. Thus, species can be classified as:

«Constant»: detected in more than 50% of the total number of samples, «Accessory»: detected in

TABLE 1. Total number of adults of each species found in every Room in the survey.

SPECIES	ROOMS				TOTAL
	1	2	3	4	
Anobiidae					
Lasioderma serricorne (F.)	26	48	10	109	193
Stegobium paniceum (L.)	–	–	13	–	13
Anthicidae					
Anthicus floralis L.	3	–	–	–	3
Bostrychidae					
Rhyzopertha dominica (F).	1769	411	172	293	2645
Cleridae					
Necrobia rufipes (Degeer)	24	–	–	–	24
Cryptophagidae					
Cryptophagus sp.	48	–	–	–	48
Cucujidae					
Cryptolestes ferrugineus (Steph.)	682	2087	362	44	3175
Cryptolestes spp.	25	81	30	–	136
Curculionidae					
Sitophilus granarius (L.)	5703	489	2622	1731	10545
Sitophilus oryzae (L.).	5324	58	2937	2018	10827
Dermestidae					
Anthrenus spp.	9	12	–	–	21
Attagenus sp.	15	10	8	–	33
Trogoderma sp.	16	8	21	–	39
Histeridae					
Carcinops pumilio (Erichson)	23	–	–	–	23
Mycetophagidae					
Typhaea stercorea (L.)	11	–	–	–	11
Silvanidae					
Oryzaephilus surinamensis (L.)	942	1371	384	552	3.249
Oryzaephilus mercator (Fauvel)	733	1228	292	332	2.585
Staphylinidae					
Oligota granaria Erichson	8	–	–	–	8
Tenebrionidae					
Tribolium confusum Duval	678	2.134	362	582	3.756
Tribolium castaneum (Herbst)	642	1.809	213	437	3.101
Palorus subdepressus (Wollaston)	21	88	9	–	118
Palorus ratzeburgii (Wissmann)	42	23	–	–	65
Alphitobius diaperinus (Panzer)	47	–	22	–	69
Alphitobius laevigatus (F.)	7	–	–	–	7
Tenebrio molitor L.	29	5	11	–	45
Tenebrio obscurus F.	5	–	–	–	5
Latheticus oryzae Waterhouse	128	–	–	–	128
Alphitophagus bifasciatus (Say)	146	–	–	–	146
Blaps mucronata L.	9	1	5	–	15
Trogositidae					
Tenebroides mauritanicus (L.)	118	8	67	16	209
TOTAL	17224	10360	7535	6114	41242

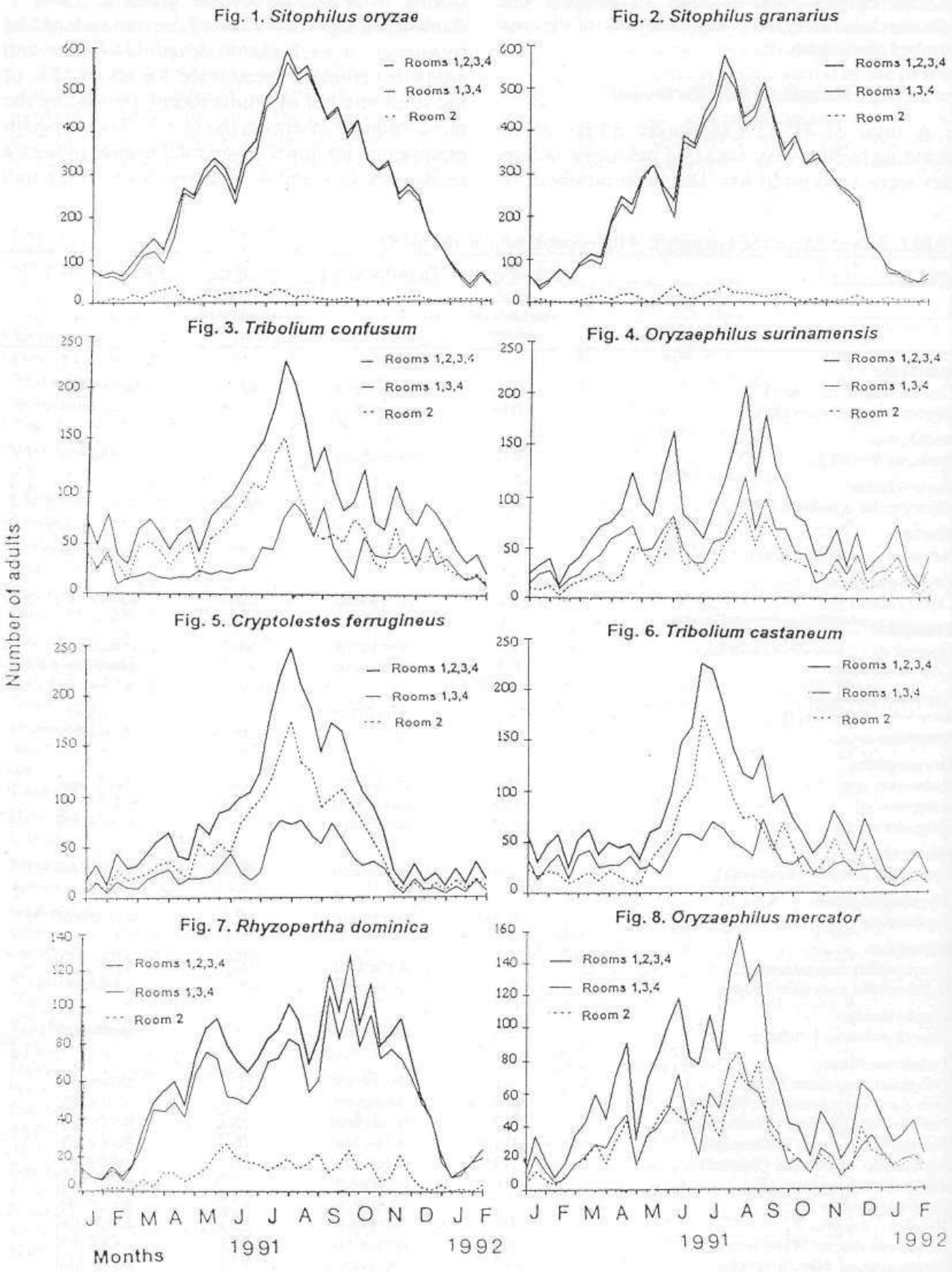
25-50% of the total number of samples and «Accidental»: detected in less than 25% of the total number of samples.

Results and discussion

A total of 41242 Coleoptera adults corresponding to 30 at least taxa that belong to 14 families were accounted for. The total numbers resulting from the survey are given in Table 1. Table 2 is a representation of the dominance and frequency of each taxon. *Sitophilus oryzae* and *Sitophilus granarius* accounted for about 52% of the total number of adults found, thus being the most frequent insects in the survey. These species maintained an impressive and constant presence in Rooms 1, 3 and 4 whereas in the flour mill

TABLE 2. Dominance and Frequency of the species found in the survey.

SPECIES	% of the total number of adults	DOMINANCE	% of the total number of samples	FREQUENCY
Anobiidae				
Lasioderma serricorne (F.)	0.46	recendent	43.7	accessory
Stegobium paniceum (L.)	0.03	recendent	6.2	accidental
Anthicidae				
Anthicus floralis L.	0.01	recendent	1.8	accidental
Bostrychidae				
Rhyzopertha dominica (F.)	6.4	dominant	95.6	constant
Cleridae				
Necrobia rufipes (Degeer)	0.06	recendent	8.7	accidental
Cryptophagidae				
Cryptophagus sp	0.1	recendent	20.6	accidental
Cucujidae				
Cryptolestes ferrugineus (Steph).	7.7	dominant	94.3	constant
Cryptolestes spp	0.3	recendent	47.5	accessory
Curculionidae				
Sitophilus granarius (L.)	25.6	dominant	100	constant
Sitophilus oryzae (L.)	26.3	dominant	100	constant
Dermestidae				
Anthrenus spp	0.05	recendent	9.3	accidental
Attagenus sp	0.08	recendent	11.8	accidental
Trogoderma sp	0.09	recendent	13.7	accidental
Histeridae				
Carcinops pumilio (Erichson)	0.05	recendent	12.5	accidental
Mycetophagidae				
Typhaea stercorea (L.)	0.03	recendent	2.5	accidental
Silvanidae				
Oryzaephilus surinamensis (L.)	7.9	dominant	100	constant
Oryzaephilus mercator (Fauvel)	6.3	dominant	100	constant
Staphylinidae				
Oligota granaria Erichson	0.02	recendent	3.7	accidental
Tenebrionidae				
Tribolium confusum Duval	9.1	dominant	100	constant
Tribolium castaneum (Herbst)	7.5	dominant	100	constant
Palorus subdepressus (Wollaston)	0.3	recendent	38.7	accessory
Palorus ratzeburgii (Wissmann)	0.16	recendent	26.2	accessory
Alphitobius diaperinus (Panzer)	0.16	recendent	28.1	accessory
Alphitobius laevigatus (F.)	0.02	recendent	3.7	accidental
Tenebrio molitor L.	0.1	recendent	27.5	accessory
Tenebrio obscurus F.	0.01	recendent	3.1	accidental
Latheticus oryzae Waterhouse	0.3	recendent	13.1	accidental
Alphitophagus bifasciatus (Say)	0.35	recendent	17.1	accidental
Blaps mucronata L.	0.04	recendent	6.7	accidental
Trogositidae				
Tenebroides mauritanicus (L.)	0.5	recendent	51.8	constant



Figs. 1-8. The population fluctuation of the 8 most numerically significant species of the survey.

(Room 2) their population was significantly lower (Table 1). *Tribolium confusum* and *Tribolium castaneum* dominated in the flour mill compared to *Sitophilus*, while the situation was reversed in stores. This is obviously due to species feeding preferences rather than the condition of the stores (Aitken 1975). *Oryzaephilus surinamensis* and *Oryzaephilus mercator* proportionally seem to be more balanced in terms of population in all 4 different Rooms being more numerous in the flour mill, in which case the incident must also be related to these species' feeding preferences (Howe 1956). The highest *Cryptolestes ferrugineus* population (66%) was found in the flour mill (Table 1), mainly in flour and bran although the insect is capable of infesting products of higher moisture content such as damaged seeds and has generally obtained a great adaptability to varius humidity levels (Bishop 1959). On the contrary, 67% of the total number of *Rhysopertha dominica* individuals was found inside Room 1, where cereal seeds were stored over a long period of time. Given that its reproductive rate is rather slow, it didn't have many population outbursts and recessions and its population steadily increased mainly while infesting products were left immovable during the sampling period (Howe 1950, Breese 1962) such as in Room 1. All 8 aforementioned species, representing about 97% of the total number of Coleoptera species found in all Rooms, are the ones classified as «dominant» (Table 2). The remaining 22 species are classified as «recedent» given that none of them overtop 0.5% of the total number; furthermore, these species simply play other roles in all 4 Rooms studied as predators (*Necrobia rufipes, Carcinops pumilio, Oligota granaria*), mycetophagous (*Anthicus floralis, Cryptophagus sp., Typhaea stercorea, Alphitobius diaperinus, Alphitophagus laevigatus, A. bifasciatus*) etc. although they are often observed in Greek storage facilities (Buchelos 1985).

Among the recedent species, *Tenebroides mauritanicus* was found mostly in Room 1 where hygienic conditions were poor and the infestation heavy enough to satisfy the insect's partly predatory habits (Sinha and Waters 1985). *Lasioderma sericorne* is a principal pest of stored tobacco feeding at the same time on an extremely large variety of material including weeds (Howe 1957); the fact that the windows in Room 4 remained open for long periods of time, can explain its large numbers. *L. oryzae* and *Palorus* spp. were found mainly in warm grain spots where they compete with success *T. confusum* and *T. castaneum* (Halstead 1967). The presence of *Cryptolestes* spp. was almost continuous mainly on the microflora of the flour mill (Room 2) where their development is favored compared to that of *C. ferrugineus* (Lefkovich 1962). The population fluctuation of the 8 most numerically significant species of the survey is given in Figs 1-8.

References

Aitken, A.D. 1975. Insect Travellers, I: Coleoptera, Techn. Bull. 31, H.M.S.O. London, pp. 191.

Bishop, G.W. 1959. The comparative bionomics of American *Cryptolestes* (Col. Cucujidae) that infest stored grain. Ann. Ent. Soc. Amer. 52: 657-665.

Breese, M.H. 1962. Studies on the oviposition of *Rhyzopertha dominica* (F.) in rice and paddy. Bull. ent. Res. 53: 621-637.

Buchelos, C.T., 1981. Coleoptera populations at flour mills and related areas. Annls. Inst. Phytopath. Benaki, (N.S.), 13 : 6-29.

Buchelos, C.T., 1985. The Greek insect fauna of stored products: Biologia Gallo-Hellenica, Vol. 10 : 221-227.

Cotton, R.T., 1960. Pests of Stored Grain and Grain Products. Burgess Publishing Co., Minneapolis, U.S.A. pp 306.

Curry, J.P. 1973. The arthropods associated with the decomposition of some common grass and weed species in the soil. Soil Biol. Biochem. 5 : 645-657.

Halstead, D.G.H. 1967. Biological studies on species of *Palorus* and *Coelopalorus* with comparative notes on *Tribolium* and *Latheticus* (Col. Tenebrionidae). J. stored Prod. Res. 2 : 273-313.

Howe, R.N., 1950. The development of *Rhyzopertha dominica* (F.) (Col. Bostrychidae) under constant conditions. Entomol. mon. Mag. 86 : 1-5.

Howe, R.N. 1956. The biology of the two common storage species of *Oryzaephilus* (Col. Cucujidae). Ann. appl. Biol. 44: 341-355.

Howe, R.N., 1957. A laboratory study of the cigarette beetle, *Lasioderma sericorne* (F.) (Col. Anobiidae) with a critical review of the literature on its biology. Bull. ent. Res. 48: 9-56.

Lefkovich, L.P. 1962. The biology of *Cryptolestes turcicus* (Grouvelle) (Col. Cucujidae), a pest of stored and processed cereals. Proc. Zool. Soc. Lond. 138: 23-35.

Mallis, A. 1982. Handbook of Pest Control. Franzak and Foster Co., Cleveland, Ohio, Sixth edition. pp 1101.

Sinha, R.N. and Watters, F.L., 1985. Insect Pests of Flour Mills, Grain Elevators and Feed Mills and Their Control, Research. Branch Agric. Canada: pp 290.

KEY WORDS: Insecta, Coleoptera, stored cereals, survey, dominance, frequency.

Κυριαρχία και Συχνότητα Ειδών Κολεοπτέρων σε Αποθήκες Σιτηρών και Υποπροϊόντων τους στην Κεντρική Ελλάδα

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ΠΕΡΙΛΗΨΗ

Κατά τη διάρκεια συστηματικών δειγματοληψιών που έλαβαν χώρα επί ένα έτος, σε τέσσερις αποθηκευτικούς χώρους σιτηρών και υποπροϊόντων τους, στην περιοχή Φαρσάλων, συλλέχθηκαν 41242 άτομα κολεοπτέρων εντόμων. Τα άτομα αυτά αντιστοιχούν σε 30 είδη που ανήκουν σε 14 οικογένειες. Η ανάλυση των μετρήσεων ως προς την «κυριαρχία» και τη «συχνότητα» των ειδών, έδειξε ότι τα είδη *Sitophilus oryzae* και *S. granarius* κυριαρχούν σε χώρους όπου αποθηκεύονται σπόροι σιτηρών ενώ υστερούν στον αλευρόμυλο. Τα *Tribolium confusum* και *T. castaneum* υπερισχύουν σε πληθυσμό του *S. granarius* στον αλευρόμυλο ενώ συμβαίνει το αντίθετο στις αποθήκες. Άλλα είδη που βρέθηκαν σε μεγάλους πληθυσμούς είναι τα: *Oryzaephilus surinamensis* και *O. mercator, Cryptolestes ferrugineus* και *Rhysopertha dominica* ενώ τα υπόλοιπα 22 είδη υπήρχαν σε σημαντικά μικρότερους πληθυσμούς και στους τέσσερις χώρους.