Literature search, October 18, 2003
File = Clerids.rtf, Clerids.wpd
Database = Biosis and ISI
Search = clerid or cleridae or Thanasimus or Enoclerus (n = 245 records, sorted by date)

Watson, E. J. and Carlton C E. 2003. Spring succession of necrophilous insects on wildlife carcasses in louisiana. Journal of Medical Entomology 40:338-347.

Address: [A] Department of Entomology, Louisiana State University, Baton Rouge, La, Usa; E-Mail: Ewatson@Agctr.lsu.edu Usa. Country Usa

Seven fresh animal carcasses were monitored throughout decomposition in a mixed flatwood forest in East Baton Rouge Parish, LA from 1 April to 1 July 1999. Succession patterns of necrophilous insects were documented for the following: one Louisiana black bear (threatened species), two white-tailed deer, two alligators, and two swine as the experimental reference. Our results suggest variation in the species composition of necrophilous insects among animal carcass types. A total of 93 arthropod species, from 46 families and three classes, were manually collected from the seven carcasses. Only 19 insect species were collected on all four animal types and were represented by eight families: Coleoptera: Histeridae, Nitidulidae, Silphidae, Staphylinidae; Diptera: Calliphoridae, Muscidae, Piophilidae, Sepsidae. Eleven of the 46 families were not collected at either alligator site but were observed at bear, deer, and swine carrion: Coleoptera: Cleridae, Dermestidae, Geotrupidae, ! Sc! arabaeidae; Diptera: Micropezidae, Sarcophagidae, Syrphidae; Hymenoptera: Apidae; Lepidoptera: Nymphalidae; and Odonata: Libellulidae. Residency and succession patterns of necrophilous insects are presented for each animal type with particular emphasis on selected fly (Calliphoridae, Muscidae, Piophilidae, Stratiomyidae) and beetle species (Cleridae, Dermestidae, Histeridae, Nitidulidae, Silphidae, Staphylinidae).

Forensic Entomology; Necrophily; Poaching; Residency; Species Composition; Spring Succession; Wildlife Carcasses [Carrion]: Decomposition

Schroeder, L. M. 2003. Differences in responses to alpha-pinene and ethanol, and flight periods between the bark beetle predators Thanasimus femoralis and t. Formicarius (col.: Cleridae). Forest Ecology & Management 177:301-311.

Address: [A] Department of Entomology, Swedish University of Agricultural Sciences, S-750 07, P.o. Box 7044, Uppsala, Sweden; E-Mail: Martin.schroeder@Entom.slu.se Sweden. Country Sweden

The responses of the bark beetle predators Thanasimus femoralis (Zett.) and Thanasimus formicarius (L.) (Col.: Cleridae) to a combination of alpha-pinene and ethanol, and Pheroprax(R), the aggregation pheromone of Ips typographus (Col.: Scolytidae), were estimated using baited and unbaited flight barrier traps in central Sweden in 1996 and 1998. In addition, the flight periods of the two Thanasimus species were analysed on the basis of trap catches. Egg development and egg loads of T. formicarius were estimated by dissecting females caught on different dates, and counting the number of medium sized and large eggs in the ovaries. T. femoralis was strongly attracted to Pheroprax(R), but almost no individuals were caught in the traps baited with alpha-pinene and ethanol. In contrast, T. formicarius was strongly attracted to both kinds of baits. The flight periods of the two Thanasimus species were markedly different. T. formicarius initiated flight in early spring, at about t! he! same time as the first bark beetle species, Tomicus piniperda and Hylurgops palliatus, began to fly. The flight period of T. femoralis started later in the spring, at about the same time as that of I. typographus. Medium sized and large eggs were not present in the ovaries of T. formicarius in the beginning of the flight period. Thereafter, during the major part of the flight period, most females carried medium sized eggs while large eggs occurred mainly in the first half of the flight period.

Flight Periods

Reeve, J. D., Rojas M Guadalupe, and Morales-Ramos Juan A. 2003. Artificial diet and rearing methods for Thanasimus dubius (Coleoptera: Cleridae), a predator of bark beetles (Coleoptera: scolytidae). Biological Control 27:315-322.

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Clerid beetles are common natural enemies of bark beetles, and could potentially be used as biological control agents if they could be reared in sufficient numbers. We developed an artificial diet devoid of insect components for rearing Thanasimus dubius (Fabricius), a clerid that attacks several economically important bark beetles in eastern North America. We reared larvae of this predator using the artificial diet, and then used either natural or factitious prey to feed the adults so produced. Two different methods of presenting the diet were also examined. We then compared the performance of T. dubius reared on the artificial diet with newly-emerged wild individuals collected from the field. Our results suggest that adult predators reared on the diet are near in quality to wild ones, and high R0 values can be obtained. No difference in prey preference was found between wild and diet-reared individuals after five generations in the laboratory. Sufficient numbers of preda! to! rs could be generated using these techniques to permit limited field trials of augmentative biological control.

Artificial Diet; Factitious Prey; Natural Prey

Opitz, W. 2003. Spermatophores and spermatophore producing internal organs of Cleridae (Coleoptera: clerinae): their biological and phylogenetic implications. Coleopterists Bulletin 57:167-190.

Address: [A] Department of Biology, Kansas Wesleyan University, 100 East Claflin Avenue, Salina, Ks, 67401-6196, Usa; E-Mail: Opitz@Kwu.edu Usa. Country Usa

Apomorphies of the internal reproductive organs relevant to production and utilization of spermatophores, biologic traits associated with anthophily, and presence of afferent peg sensilla on the antennae suggests that a presumed monophyletic assemblage of genera of subfamily Clerinae are descendants of an ancient monophyletic stock linked to early angiosperm evolution. The species examined include all suprageneric categories of Cleridae proposed to date. The ground plan of the internal reproductive organs of Cleridae for the male involved a pair of multifollicular testes, tubular vas deferens, unichambered seminal vesicle, one pair of accessory glands, highly muscular ejaculatory duct, and for the ancestral female, a pair of multifollicular ovaries, non capsular spermatheca, well-developed spermathecal gland and spermathecal gland duct, and a spacious vagina. Based on presumed homologies of the male accessory glands across generic lines, and to a lesser extent on extractio! n ! of contents of the vagina of gravid females, the following clerines are thought to utilize the "mating plug" type of spermatophore as a method of sperm transference: Trichodes, Aulicus, Chilioclerus, Opilo, Dieropsis, Phlogistus, Phlogistomorpha, Scrobiger, Trogodendron, Zenithicola, and Balcus. Many species of several of the noted genera are anthophilic; histological work involving the alimentary canal, and examination of midgut contents, confirm their pollen feeding habits, and their opportunistic predatory nature on flower-visiting insects. The abovementioned genera are morphologically diverse externally, but nine share a peculiar microsetose character of the antennal club that is presumed synapomorphic. Investigations involving electron microscopy show that some of these microsetae are peg sensilla, which in other beetles are known to function as thermoreceptors. It is hypothesized that these thermoreceptors present on the antenna of spermatophoral clerines are afferent ! st! ructures that enable the beetles to avoid fire-death in xeric environments. The widespread distribution, peculiar structure of the internal reproductive organs, substantial diversity of external structure, and anthophilous character invite the speculation that the spermatophoral clerines represent a monophyletic group evolved from an ancient Gondwanan ancestor tied to early Angiosperm diversification. Then, due to tectonic, climatic, and ecological events, the spermatophoral clerines became vicariously distributed onto the North American, Eurasian, African, and Australian plates on which they underwent an extensive radiation in part due to Angiosperm proliferation.

Adaptive Radiation; Anthophily; Apomorphies; Biologic Traits; Climatic Events; Ecological Events; External Morphology; Feeding Habits; Fire-Death; Geographic Distribution; Histology; Homologies; Midgut Contents; Phylogenetic Implications; Plate Tectonics; Predation; Sperm Transference; Vicariance; Xeric Environments; Taxonomic Review

Opitz, W. 2003. Barriella opitz: a new genus of Cleridae from brazil (Coleoptera: Cleridae: clerinae). Coleopterists Bulletin 57:37-42.

Address: [A] Department of Biology, Kansas Wesleyan University, 100 East Claflin Avenue, Salina, Ks, 76401, Usa; E-Mail: Opitz@Kwu.edu Usa. Country Usa

The monotypic new genus Barriella is described on the basis of B. longicornoides Opitz, new species, from Brazil. I postulate that Barriella represents a descendant of a Gondwanian stock that also yielded such Old World genera as Stigmatium Grey and Clerus Fabricius. The potential relationships of B. longicornoides Opitz to Chilean genera such as Natalis Laporte, Notocymatodera Schenkling, Eurymetomorphon Pic, and Ctenoclerus Solervicens, and to the New World genera Placopterus Wolcott and Enoclerus Gahan, is also discussed. A synonymy involving Notocymatodera modesta (Spinola) and Notocymatodera dimidiata (Germar) is suggested.

Geographic Distribution; Morphology

Miller, D. R., Crowe Christopher M, Asaro Christopher, and DeBarr Gary L. 2003. Dose and enantiospecific responses of white pine cone beetles, conophthorus coniperda, to alpha-pinene in an eastern white pine seed orchard. Journal of Chemical Ecology 29:437-451.

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The white pine cone beetle, Conophthorus coniperda, exhibited dose and enantiospecific responses to alpha-pinene in stands of mature eastern white pine, Pinus strobus, in a seed orchard near Murphy, North Carolina, USA. (-)-alpha-Pinene significantly increased catches of cone beetles to traps baited with (+-)-trans-pityol. (+)-alpha-Pinene did not increase catches of beetles to pityol-baited traps and interrupted the response of beetles to traps baited with (+-)-trans-pityol and (-)-alpha-pinene. Maximal attraction of cone beetles to pityol-baited traps was obtained with lures releasing (-)-alpha-pinene at a rate of 103 mg/day at 23degreeC. Lures releasing (-)-alpha-pinene at rates lower or higher than 103 mg/day resulted in reduced catches to traps baited with (+-)-trans-pityol. The sex ratio in all catches was heavily male biased. Attraction of the clerid predator, Thanasimus dubius, to traps baited with (+-)-trans-pityol increased significantly with the presence of alph! a-! pinene, irrespective of enantiomeric composition. Maximal attraction of T. dubius to pityol-baited traps occurred with devices releasing (-)-alpha-pinene at the highest rate tested, 579 mg/d at 23degreeC, a sub optimal rate for cone beetles.

Dose Responses; Pine Seed Orchards; Sex Ratios; Trap Attractiveness

Iannacone, J. 2003. Arthropofauna of forensic importance in pig carcass in callao, peru. Revista Brasileira de Zoologia 20:85-90.

Address: [A] Laboratorio De Ecofisiologia, Facultad De Ciencias Naturales Y Matematicas, Universidad Nacional Federico Villarreal, Calle San Marcos 383, Pueblo Libre, Lima, 21, Peru; E-Mail: Joselorena@Terra.com, Joseiannacone@Hotmail.com Peru. Country Peru

This is the first report of an ongoing study on arthropofauna of forensic importance in Callao, Peru using a baby pig (Sus scrofa Linneaus, 1758) on land as a model to determine the arthropofauna over 84 days of weekly survey between 17 July and 02 October 2 000.A total of 4,405 specimens were collected belonging to five orders and eight families: Cochliomyia macellaria (Fabricius, 1775) (Diptera, Calliphoridae) (81.62%); Dermestes maculatus (De Geer, 1774) (Coleoptera, Dermestidae) (16.35%); Fannia canicularis (Linnaeus, 1761) (Diptera, Muscidae) (0.04%); Saprinus aeneus (Fabricius, 1775) (Coleoptera, Histeridae) (1.48%); Necrobia rufipes (De Geer, 1775) (Coleoptera, Cleridae) (0.45%); Linepithema humile (Mayr, 1868) (Hymenoptera, Formicidae) (0.02%); Porcellio laevis Latreille, 1804 (Isopoda, Porcellionidae) (0.02%) and Hadruroides lunatus (L. Koch, 1867) (Scorpionida, luridae) (0.02%). Larvae accounted for 76%, pupae 14% and adults 10% of the total collected. The arthro! po! ds were into three: necrophages (98.01%), predators (1.95%) and omnivorous (0.04%). C. macellaria were significantly higher during the decayed stage; by contrast D. maculatus was much higher in dry remains stage. The highest diversity with the Shannon-Weaver (H') and Pielou (J) index were found during the advanced decayed stage. The absence of species of genus Chrysomyia Robineau-Desvoidy, 1830 is discussed.

Carcasses: Decay Stages; Forensic Entomology; Necrophagy; Omnivory; Predation

Haberkern, K. E. and Raffa Kenneth F. 2003. Phloeophagous and predaceous insects responding to synthetic pheromones of bark beetles inhabiting white spruce stands in the great lakes region. Journal of Chemical Ecology 29:1651-1663.
Address: [A] Department of Entomology, University of Wisconsin, Madison, Wi, 53706, Usa; E-Mail: Raffa@Entomology.wisc.edu Usa. Country Usa
Tree killing and saprophytic bark beetles exert important ecological and economic roles in North American spruce forests. Chemical signaling among bark beetles, and responses by associate insects such as predators and competitors, have significant effects on the population dynamics and ecology of this community. Synthetic pheromones of primary (tree killing) and secondary (saprophytic) bark beetle species and blank controls were tested using multiple funnel and lower stem flight traps in white spruce forests in Wisconsin, Michigan, and Minnesota. Six phloeophagous and four predaceous species were collected with significant attraction by the bark beetles Dryocoetes affaber, Dryocoetes autographus, and Polygraphus rufipennis, and the predatory checkered beetles (Coleoptera: Cleridae) Thanasimus dubius and Enoclerus nigrifrons. In general, trap catches to synthetic lures resembled the species composition obtained by felling trees and collecting emerging beetles in a companion! s! tudy, although several species showed differing trends. Some cross attraction occurred among bark beetles and between bark beetles and predatory beetles. For example, P. rufipennis was abundant in traps baited with Dryocoetes spp. pheromones. Thanasimus dubius and E. nigrifrons were collected in significant numbers in traps baited with the pheromone of the spruce beetle (Dendroctonus rufipennis), frontalin plus alpha-pinene. This is a new observation for E. nigrifrons. Attraction of T. dubius to the pheromones of at least three bark beetle species in the Great Lakes region, as well as to several southern and western species, reflects its role as a habitat specialist and feeding generalist. Several other important predators and competitors commonly obtained in pine forests in this region were not obtained in these spruce stands, either in response to synthetic pheromones of spruce colonizing beetles, or in host material colonized by these beetles. Potential differences in pre! da! tor prey dynamics between spruce and pine ecosystems in the Great Lakes region are discussed.
Chemical Signaling; Population Dynamics; Predator-Prey Dynamics

Braman, S. K., Sparks B L, Tedders W L, I. Mizell R F, and Hudson W G. 2003. Effects of trap color and bait type on collection of Coleoptera in pyramid traps in commercial nurseries. Journal of Entomological Science 38:254-261.
Address: [A] Department of Entomology, College of Agricultural and Environmental Sciences, Georgia Experiment Station, University of Georgia, Griffin, Ga, 30223, Usa Usa. Country Usa
Pyramid-shaped traps were evaluated in Georgia for capturing potentially harmful coleopterans in ornamental plant nurseries. Beetle response to two colors and four bait types was compared. Four species of Buprestidae, 22 species of Cerambycidae, and three species of Curculionidae were captured in sufficient numbers for analysis during the 2-yr study. Coccinellidae, Carabidae, Trogositidae, Cleridae, and Chrysomelidae were also captured with frequency. Trap color did not have a significant effect on capture of pine-infesting weevils, although these weevil species were as much as five times more abundant in traps containing turpentine alone or a 1:1 mixture of turpentine: ethanol than ethanol alone or unbaited traps. Odontopus calceatus (Say), however, a weevil that attacks the foliage of tuliptree, sassafras and magnolia, was captured five times more frequently in yellow than in gray traps, although no influence of bait was observed for this species. Cerambycidae in general! w! ere not affected by trap color or bait. However, the banded hickory borer, Knulliana cincta (Drury), a cerambycid, was captured more frequently in gray traps as were buprestids in the genus Chrysobothris. Buprestis lineata was more commonly captured in traps baited with turpentine or ethanol/turpentine mixture. Chrysomelids (Altica sp.) were not affected by trap color or bait type. Timing of occurrence of adult beetles of 23 species of beetles are presented. The beneficial Coleoptera captured in the traps were either not affected by color or bait type (Carabidae) or were primarily attracted by yellow traps (Coccinellidae). Traps of the type used in this study can be easily constructed or may be purchased commercially and offer the nursery grower a practical monitoring tool for a variety of Coleoptera that attack woody plants.
Bait Type; Commercial Nurseries; Trap Color

Bharti, M. and D. Singh. 2003. Insect faunal succession on decaying rabbit carcasses in punjab, india. Journal of Forensic Sciences 48:1133-1143.*Insect faunal succession on decaying rabbit carcasses was carried out at Punjabi University, Patiala (Punjab), India, from March 1997 to December 1999. Four stages of decomposition were recognized, i.e., fresh, bloated, decay, and dry. A total of 38 insect species belonging to four orders and 13 families were recorded. Diptera, Coleoptera, and Hymenoptera dominated the carrion fauna. Calliphorids were the first to arrive in all the seasons of the year. Five species of Calliphoridae, four of Sarcophagidae, ten of Muscidae, and one each from Anthomyiidae and Otitidae were observed on rabbit carcasses. Representatives of six Coleopteran families, i.e., Staphylinidae, Histeridae, Cleridae, Dermestidae, Tenebrionidae, and Silphidae, were recorded. Eight species belonging to family Formicidae (Hymenoptera) were also collected during the present studies. Only one species of Lepidoptera was observed on carrion.*
Forensic Science, Forensic Entomology, Insect Fauna, Carrion Decomposition/Arthropod Succession/British-Columbia/Fly Larvae/Exposed Carrion/Diptera/Island/Flies/Time/Oahu

Wermelinger, B. 2002. Development and distribution of predators and parasitoids during two consecutive years of an ips typographus (col., Scolytidae) infestation. Journal of Applied Entomology-Zeitschrift Fur Angewandte Entomologie 126:521-527.*The development of the natural enemy complex, its within-tree distribution and the resulting mortalities imposed on bark beetles were investigated during two consecutive years (1994, 1995) at the peak of an Ips typographus infestation. For this reason bolts from infested spruce trees were incubated until the inhabiting insects had emerged. Some 17 000 antagonists were identified and found to belong to 16 predatory and 14 parasitic insect species. Among the predators the Dolichopodidae (Dip.) were most abundant, while among the parasitoids the Pteromalidae (Hym.) ranked. first. Parasitoids preferred the upper tree parts, while predators were more abundant in the lower parts. Total bark beetle mortality was assessed based on the literature data on the per capita consumption of the antagonistic larvae. In the first year, the most destructive group were the dolichopodid flies, killing three to seven times more bark beetle larvae than the second ranking Lonchaeidae (Dip.) and the Pteromalidae. In the second year, the pteromalid parasitoids killed 2.5 times more larvae than the dolichopodids. Total bark beetle survival was assessed to decrease from 46 to 18% in the course of the 2 years.*
Japonicus Niijima Col/Bark Beetle/Thanasimus-Formicarius/L Coleoptera/Tomicus-Piniperda/Population-Levels/Natural Enemies/Host Tree/Mortality/Densities

Tamisier, J.-P. 2002. [The geographical distribution of paratillus carus (newman, 1840) in france (Coleoptera, Cleridae).]. Bulletin de la Societe Linneenne de Bordeaux 30:149-152.
Address: [A] 2, Rue Des Pavillons, 47300, Villeneuve-Sur-Lot, France France. Country France
The Checkered Beetle Paratillus carus (Newman) has been discovered in the Lot-et-Garonne and Aude departements. A provisional distribution map is given for France.
Geographic Distribution

Tamisier, J.-P. 2002. Additional information on the distribution of paratillus carus (newman, 1840) in france (Coleoptera, Cleridae). Bulletin de la Societe Linneenne de Bordeaux 30:191-192.
Address: [A] 2, Rue Des Pavillons, 47300, Villeneuve-Sur-Lot, France France. Country France

Solervicens, A. Jaime and Ormazabal T Felix. 2002. [Biological data and description of immature stages of inhumeroclerus thomsoni pic, 1955 (Coleoptera: Cleridae: clerinae).]. Acta Entomologica Chilena 26:101-106.
Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Casilla 147, Santiago, Chile Chile. Country Chile
Inhumeroclerus thomsoni Pic, 1955 was found to occur together with xylophagous and parasitoids insects in dead plants of Euphorbia lactiflua (Euphorbiaceae) of the coastal desert region of northern Chile. In laboratory conditions the emergence of all of the insects associated with Euphorbia lactiflua was concentrated in spring time and the permanence of adults was very short. The adult larva and pupa of Inhumeroclerus thomsoni were described. The characters of larva are those of Cleridae discarding any possibility of inclusion in Thanerocleridae. The presence of lateral sclerotized area of the maxilary mala apparently relate Inhumeroclerus thomsoni with two other Clerinae: Natalis laplacii Lap. and Thanasimodes gigas Lap. This character must be investigated as a probable larval apomorphy of the subfamily.
Apomorphies; Biological Data; Coastal Desert Regions; Geographic Distribution; Laboratory Conditions; Morphology

Solervicens, A. Jaime. 2002. Catalog of chilean Cleridae (Coleoptera: Cleridae). Acta Entomologica Chilena 26:81-94.
Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Casilla 147, Santiago, Chile Chile. Country Chile
A catalog of the chilean Cleridae is made. Six subfamilies, 18 genera and 58 species are recognized. Taxonomic data of genera and taxonomic, distributional, ecological and biological data of species are provided. After the revision of types, the following new synonyms are established: Thanasimus gayi Spinola, 1849 = Eurymetopum eburneocinctum (Spinola), 1849. Falsopelonium Pic, 1950c = Corinthiscus Fairmaire y Germain, 1861. Falsopelonium impressipenne Pic, 1950c = Corinthiscus insignicornis Fairmaire y Germain, 1861.
Biology; Ecology; Geographic Distribution; Synonymy; Taxonomic Revision; Taxonomic Review

Sato, S. 2002. Notes on the genus iwawakia, with description of a new species from central japan (Coleoptera, Cleridae). Japanese Journal of Systematic Entomology 8:109-114.
Address: [A] Suka 3-11-5, Suzuka, Mie, 513-0034 Japan. Country Japan
A new checkered beetle, Iwawakia trimaculata sp. nov. from Nagano, Central Japan is described and illustrated. The generic features of the genus Iwawakia MIYATAKE is discussed.
Geographic Distribution; Morphology

Sanchez-Martinez, G. and Wagner Michael R. 2002. Bark beetle community structure under four ponderosa pine forest stand conditions in northern arizona. Forest Ecology & Management 170:145-160. http://www.elsevier.com/locate/foreco.

Address: [A] Inifap - Campo Experimental De Pabellon, Km. 32.5 Carr., Pabellon De Arteaga, Ags, Apdo. Postal 20, Aguascalientes, Zacatecas, Cp 20660; E-Mail: Gsanchez@Pabellon.inifap.conacyt.mx Mexico. Country Mexico

We studied the bark beetle guild (Coleoptera: Scolytidae) in the ponderosa pine forests of northern Arizona to explore if the species assemblages and relative abundance differ between managed and unmanaged stands. Four stand conditions were assessed: (1) unmanaged stands with high tree density, (2) thinned stands, (3) thinned and burned (with prescribed fire) stands and (4) stands that had been burned by stand replacing wildfires. The study was conducted in the ponderosa pine forests of the Coconino Plateau, northern Arizona. For several decades this area has been relatively free of bark beetle outbreaks despite the current overstocked condition of many stands. We found that a similar species assemblage composed of Dendroctonus frontalis, D. brevicomis, D. valens, D. approximatus, D. ponderosae, and Ips pini occurred across all four stand conditions over 3 years of study. The population levels of all these species were endemic across all stand conditions. The non-aggressiv! e ! D. approximatus and D. valens were indicator species for thinned and unmanaged stands, respectively, but this was not consistent among years. The ambrosia beetle Gnathotrichus sp. and the bark beetle predator Enoclerus sp. consistently indicated stands burned by wildfire. In addition to our field experiment, we analyzed the historical pattern of attacks of bark beetles in our area of study. Our findings suggest that the pattern of attack of D. brevicomis (the only Dendroctonus species for which attacks have been reported) and Ips spp. has been through scattered small infestations in groups of 1-10 trees. Whereas small infestations by Ips spp. are increasing, those for D. brevicomis are decreasing. Although we agree that the high density stands in northern Arizona are in an "unhealthy" condition, our results do not show that they were supporting large bark beetle outbreaks. Our results challenge the theoretical assumptions about the relationship between stand structure, tree ! re! sistance and bark beetle performance.

Bark Beetle Community Structure: Relative Abundance, Species Assemblages; Ponderosa Pine Forest Stand Conditions: Burned, Thinned, Unmanaged

Rifkind, J. 2002. New central american and mexican Enoclerus (Coleoptera: Cleridae). Contributions in Science 487:1-16.

Address: [A] Entomology, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, Ca, 90007; E-Mail: Clerid@Aol.com Usa. Country Usa

The status of our knowledge of Enoclerus Gahan, 1910, diversity in Mexico and Central America is summarized. Eleven new species are described from the region: Enoclerus gavagai, E. pacificus, E. regius, and E. tigris from Mexico; E. absconditus, E. giesberti, E. lapierrei, and E. laselva from Costa Rica; E. duttoni and E. spectori from Costa Rica and Panama; and E. tersus from Panama. The presence of abdominal setal "daggers" in the males of some species of Enoclerus is noted for the first time, and the structure is described and illustrated. The possible participation of E. gavagai and E. lapierrei in mimicry complexes is suggested.

Geographic Distribution; Mimicry; Morphology

Reeve, J. D. and Turchin Peter. 2002. Evidence for predator-prey cycles in a bark beetle. Berryman, Alan: Ed. Population cycles: The case for trophic interactions 91-108.

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Cyclic Population Dynamics; Life Cycles; Negative Feedback Cycles; Pine Forests; Population Fluctuations; Predator-Prey Cycles; Time Series Data; Tree Colonization; Tree Infestation Dynamics; Book Chapter; Meeting Paper

Opitz, W. 2002. Flower foraging behavior of the australian species eleale aspera (newman) (Coleoptera: Cleridae: clerinae). Coleopterists Bulletin 56:241-245.

Address: [A] Department of Biology, Kansas Wesleyan University, 100 East Claflin Ave., Salina, Ks, 67401-6196; E-Mail: Opitz@Kwu.edu Usa. Country Usa

Checkered beetles are infrequently encountered in large numbers, perhaps a manifestation of their biologic ties with floral periodicity, prey population density, or climatic factors. What is published about Cleridae biology deals mostly with adult emergence from woody plants and predatory activity of immatures on lignicolous insects. Very little is known about plant foraging behavior of these beetles. They are known to visit flowers to aggregate for mating, secure pollen, or to feed on entomophagous insects. Field and laboratory observations that involve the speciose Australian genus Eleale indicate that E. aspera (Newman) visits flowers to mate, to fortuitously gather pollen for food, and to utilize the flower of Pyracantha crenulata (Roxb. Roemer) as a "watering hole." Eleale aspera beetles and relatives immerse their forebodies deeply into the corolla of the flower to reach nectaries which provide essential moisture when water is at a premium during the Australian dry s! ea! son.

Adult Emergence; Climatic Factors; Floral Periodicity; Flower Foraging Behavior; Prey Population Density

Neid, J. 2002. Korynetes geniculatus klug, 1842, a new species for the fauna of france (Coleoptera, Cleridae). Entomologiste 56:249-250.

Address: [A] 10, Rue Jean Moulin, 95210, Saint-Gratien, France; E-Mail: Neidentom@Aol.com France. Country France

Geographic Distribution; Morphology

Mawdsley, J. R. 2002. Ecological notes on species of Cleridae (insecta: Coleoptera) associated with the prairie flora of central north america. Great Lakes Entomologist 35:15-22.

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The association of eighteen species of Cleridae (Coleoptera) with tallgrass and shortgrass prairie ecosystems in central North America is reported for the first time. New flower visitation, habitat association, distribution, and/or rearing records are reported for Enoclerus analis (LeConte), E. coccineus coccineus (Schenkling), E. cordifer (LeConte), E. rosmarus (Say), E. zonatus (Klug), Placopterus thoracicus pallipes (Wolcott), Trichodes bibalteatus LeConte, T. bicinctus Green, T. nutalli (Kirby), Phyllobaenus dubius (Wolcott), P. knausii (Wickham), P. pubescens (LeConte), P. subfasciatus (LeConte), Isohydnocera albocincta (Horn), I. brunnea (Horn), I. curtipennis (Newman), I. tricondylae (LeConte) and Wolcottia pedalis (LeConte). Diagnostic characters are presented to separate adults of P. dubius, a species endemic to the northern shortgrass prairie region, from the common and widespread P. pubescens.

Endemism; Flower Visitation; Geographic Distribution; Habitat Associations; Morphology; Prairie Ecosystems: Shortgrass, Tallgrass; Rearing Records

Mawdsley, J. R. 2002. Comparative ecology of the genus lecontella wolcott and chapin (Coleoptera: Cleridae: tillinae), with notes on chemically defended species of the beetle family Cleridae. Proceedings of the Entomological Society of Washington 104:164-167.

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The genus Lecontella Wolcott and Chapin currently contains two species, L. brunnea (Spinola) from eastern North America and L. gnara Wolcott from southwestern North America. The results of the author's laboratory and field studies of L. gnara Wolcott are summarized, and this species' biology compared to that of L. brunnea. Larvae of L. brunnea are parasites in nests of solitary bees and wasps (Hymenoptera: Eumenidae, Sphecidae, and Megachilidae); adults have been collected at lights at night. The larva of L. gnara, which preys on immature stages of Cerambycidae and Buprestidae (Coleoptera), was described and illustrated by earlier workers under the name Cymatodera morosa. Adults of L. gnara are commonly collected at lights at night and have been reared from Quercus arizonica Sargent, Prosopis sp., and Juglans sp. Adult feeding, antennal grooming, and copulatory behaviors are described for L. gnara, and the presence of a chemical defense in adults of this species is noted f! or! the first time.

Antennal Grooming; Chemical Defense; Comparative Ecology; Copulatory Behavior; Feeding Behavior; Nest Parasitism; Reproductive Biology

Lindgren, B. Staffan and Miller Daniel R. 2002. Effect of verbenone on attraction of predatory and woodboring beetles (Coleoptera) to kairomones in lodgepole pine forests. Environmental Entomology 31:766-773.

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The response of bark beetle predators and woodboring beetles to the bark beetle anti-aggregation pheromone, verbenone, was tested in the field with multiple-funnel traps baited with attractant kairomones. Catches of the predators Thanasimus undatulus (Say), Enoclerus sphegeus (F.), Enoclerus lecontei (Wolcott) (Coleoptera: Cleridae), and Lasconotus complex LeConte (Coleoptera: Colydiidae) declined significantly with increasing release rates of verbenone. Lasconotus subcostulatus Kraus, and Corticeus praetermissus (Fall) (Coleoptera: Tenebrionidae) (in two of three experiments), showed no significant response to verbenone. In a third experiment, catches of C. praetermissus increased with verbenone dose. Likewise, catches of the striped ambrosia beetle, Trypodendron lineatum (Olivier) (Coleoptera: Scolytidae), increased with verbenone dose in one experiment, but there was no effect in two other experiments. Verbenone had no effect on the response of Spondylis upiformis Manne! rh! eim (Coleoptera: Cerambycidae). We hypothesize that predators specializing on early successional bark beetles are repelled by verbenone since this compound indicates a late stage attack. Generalist predators and woodborers either do not respond to verbenone at all, or they may be attracted by it.

Lodgepole Pine Forests: Habitat; Predation; Wood Boring

Kennedy, A. A. and McCullough Deborah G. 2002. Phenology of the larger european pine shoot beetle tomicus piniperda (l.) (Coleoptera: scolytidae) in relation to native bark beetles and natural enemies in pine stands. Environmental Entomology 31:261-272.

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Tomicus piniperda (L.), a Eurasian scolytid first discovered in North America in 1992, is established in at least 12 north central and northeastern states and the Canadian provinces of Ontario and Quebec. The expanding range of T. piniperda, its ability to develop and shoot-feed in most North American pine species, and its relatively early spring activity have generated questions about its potential interactions with native competitors and natural enemies. Our objectives were to compare phenology of T. piniperda with native phloem-feeding insects and to evaluate phenological synchrony between T. piniperda and native predators in red pine forest stands. We monitored adult beetle activity using baited funnel traps and observations of insect activity on freshly cut red pine logs in four to eight stands in southwestern and northern lower Michigan during two field seasons. Logs were periodically returned to the laboratory and individually caged. Phloem-feeders, predators and pa! ra! sitoids emerging from logs were identified. Tomicus piniperda was collected only in southwestern stands and was consistently the first scolytid collected in funnel traps. Ten native phloem-feeding species were collected in funnel traps or reared from logs; at least two native species were actively colonizing logs concommitently with T. piniperda in early spring. We observed adults of the predatory clerid Thanasimus dubius (F.) actively moving on logs and preying on T. piniperda adults and other scolytids early in spring, roughly 3-4 wk before this species was first collected in funnel traps. Other native scolytid predators including Cucujus clavipes F. and three staphylinids were also active early in spring. Results suggests that T. piniperda is likely to encounter interspecific competitors and natural enemies in North America, but further research will be needed to demonstrate how these interactions affect T. piniperda population dynamics.

Competition; Interspecific Competition; Phenological Synchrony; Phenology; Phloem-Feeding

Gray, D. W. 2002. Field response of ips paraconfusus, dendroctonus brevicomis, and their predators to 2-methyl-3-buten-2-ol, a novel alcohol emitted by ponderosa pine. Journal of Chemical Ecology 28:1583-1597. http://www.kluweronline.com/issn/0098-0331.

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Methylbutenol (MBO) is a major component of the aggregation pheromone of the European spruce beetle Ips typographus and also has been found to be emitted in large amounts by several species of pine native to western North America. This study investigates the influence this signal may have on the behavior of North American bark beetles and examines whether MBO functions as a defensive compound for emitting pines. The response of two North American bark beetles (Ips paraconfusus and Dendroctonus brevicomis) and their predaceous beetles (Trogositidae and Cleridae) to MBO, pheromone, and monoterpenes in varying release rates was investigated in the field using Lindgren funnel traps. MBO exhibited no repellent properties when tested alone, nor did MBO appear to have any effect on the aggregation response of these bark beetles and their predators to their pheromones. These results provide no support for a defensive function of MBO.

Chemical Communication; Field Responses; Plant Defense

Gerstmeier, R. 2002. Trichodes audouini-dubreuili reymond: rediscovery and redescription of an obscure species (Coleoptera: Cleridae). Coleopterists Bulletin 56:273-278.

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Trichodes audouini-dubreuili, poorly described by Reymond (1956), from Morocco is redescribed and figured from one male specimen recently discovered in the Moroccan Anti-Atlas.

Redescription

Gerstmeier, R. 2002. Revision of the genus corynommadius schenkling, 1899, with description of two new species from new guinea (Coleoptera: Cleridae). Oriental Insects 36:423-433.

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The genus Crynommadius Schenkling, 1899 is revised; two new species from New Guinea, Corynommadius hypomelas, sp. nov. and C. riedeli, sp. nov., are described. The following new combinations are established: Omadius bennigseni Schenkling, 1912=Corynommadius bennigseni (Schenkling, 1912), comb. nov.; Omadius brunneus Chapin, 1924=C. brunneus (Chapin, 1924), comb. nov.; Stigmatium inscriptum Gorham, 1876=C. inscriptus (Gorham, 1876), comb. nov. A key to the six known species and a distribution map are provided.

Geographic Distribution; Morphology; Taxonomic Revision; Taxonomic Key; Taxonomic Review

Gerstmeier, R. 2002. Generic concept of clerid taxa related to clerus (Coleoptera: Cleridae: clerinae). Entomological Problems 32:99-111.

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The preliminary generic conception of genera related to the genus Clerus Geoffroy, 1762, yields a so-called Clerus series, which comprises three genetic generic groups: Thanasimus group, Stigmatium group, and Omadius group. For defining generic groups and/or generic rank I relied mainly on structural differences of antennae. A new genus Falsomadius gen.nov. is described. The following new synonyms, new combinations and new statuses are established: Cyclotomocerus Kuwert, 1894, Dasyceroclerus Kuwert, 1894, Microastigmus Pic, 1938, Phaeocyclotomus Kuwert, 1894, Rhytidoclerus Kuwert, 1894 and Xestoclerus Chapin, 1924 are synonymous with Stigmatium Gray, 1832. Astigmus Kuwert, 1894 is in part synonymous with Operculiphorus Kuwert, 1894: Operculiphorus nebulosus (Spinola, 1844) = Astigmus (Omadius) nebulosus (Spinola, 1844), comb.nov. Several Stigmatium species are synonymous with Clerus Geoffroy, 1762: Clerus bimaculatus (Blackburn, 1897) = Stigmatium bimaculatum Blackburn, 18! 97! , comb.nov., Clerus gilberti (White, 1849) = Stigmatium gilberti White, 1849, comb.nov., Clerus mutillaecolor (White, 1849) = Stigmatium mutillaecolor White, 1849, comb.nov., Clerus philippinarus (Gorham, 1876) = Stigmatium philippinarum Gorham, 1876, comb.nov., Clerus pilosellus (Gorham, 1878) = Stigmatium pilosellum Gorham, 1876, comb.nov. Pyrrhostigmatium Kraatz, 1899 is resurrected as a genus. Some Omadius species are synonymous with Falsomadius: Falsomadius aurulentus (Heller, 1921) = Omadius aurulentus Heller, 1921, comb.nov., Falsomadius dohertyi (Kuwert, 1894) = Omadius dohertyi Kuwert, 1894, comb.nov., Falsomadius nitidus (Schenkling, 1898) = Omadius nitidus Schenkling, 1898, comb.nov., Falsomadius prioceroides (Thomson, 1860) = Omadius prioceroides Thomson, 1860, comb.nov. Two Omadius species are synonymous with Corynommadius Schenkling, 1899: Corynommadius bennigseni (Schenkling, 1912) = Omadius bennigseni Schenkling, 1912 comb.nov., Corynommadius brunneus (Chapin! , ! 1924) = Omadius brunneus Chapin, 1924 comb.nov.

Geographic Distribution; Morphology; New Synonymy

Frydrychova, Radmila and Marec Frantisek. 2002. Repeated losses of ttagg telomere repeats in evolution of beetles (Coleoptera). Genetica 115:179-187.

We studied the occurrence of (TTAGG)n telomere repeats in 12 species of beetles, representing main lineages of the Coleoptera phylogenetic tree, by Southern hybridization and fluorescence in situ hybridization (FISH). In contrast to other insect orders, beetles were heterogeneous with respect to the occurrence of TTAGG repeats. In addition, the presence or absence of (TTAGG)n motif was irrespective of phylogenetic relationships. In the suborder Polyphaga, six species displayed positive hybridization signals. These were Silpha obscura, Agrilus viridis, Ampedus sanguineus, Stegobium paniceum, Oryzaephilus surinamensis, and Leptinotarsa decemlineata. Whereas negative signals were obtained in three polyphagan species, Geotrupes stercorarius, Thanasimus formicarius, and Sitophilus granarius. In the suborder Adephaga, the TTAGG sequence was present in one species, Graphoderus cinereus, and absent in two species, Orectochilus villosus and Pterostichus oblongopunctatus. We conclud! ed! that the telomerase-dependent (TTAGG)n motif had been repeatedly lost in different phylogenetic branches of Coleoptera and probably replaced with another mechanism of telomere elongation. This had to happen at least 5-6 times. The results suggest a predisposition or a backup mechanism of telomere maintenance in the genome of beetles that enabled them to make frequent evolutionary changes in the telomere composition.

Phylogeny

Fietz, O., Dettner Konrad, Goerls Helmar, Klemm Kerstin, and Boland Wilhelm. 2002. (R)-(+)-palasonin, a cantharidin-related plant toxin, also occurs in insect hemolymph and tissues. Journal of Chemical Ecology 28:1315-1327. http://www.kluweronline.com/issn/0098-0331.

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Gas chromatographic and mass spectroscopic analyses of extracts of cantharidin-containing meloid, clerid, and staphylinid beetles revealed the presence of minor to significant amounts of palasonin, previously only known from seeds and fruits of the Indian shrub Butea frondosa (Leguminaceae). Unlike (S)-(-)-palasonin (>99% ee) from B. frondosa, the insects produce palasonin of low ee with the (R)-(+)-enantiomer (0-50% ee) prevailing. The ee of palasonin from individual specimens of predatory insects (Trichodes apiarius), which acquire their chemical protection from cantharidin-producing insects, may vary considerably. The absolute configuration of (S)-(-)-palasonin, previously deduced from indirect chemical and spectroscopic methods, was confirmed by X-ray crystal structure analysis of a cyclic imide derived from (S)-(-)-palasonin and (S)-(-)-1-(4-nitrophenyl)-ethylamine.

Erbilgin, N., Nordheim Erik V, Aukema Brian H, and Raffa Kenneth F. 2002. Population dynamics of ips pini and ips grandicollis in red pine plantations in wisconsin: within- and between-year associations with predators, competitors, and habitat quality. Environmental Entomology 31:1043-1051.

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We sampled bark beetle (Coleoptera: Scolytidae) populations in 17 declining and healthy red pine plantations in Wisconsin over 3 yr. We tested for potential relationships among numbers of bark beetles, conspecifics and competitors, and predators within and among flight seasons to help identify factors affecting population densities. The two most common bark beetle species obtained were Ips pini (Say) and Ips grandicollis (Eichhoff). The predominant predators obtained were Thanasimus dubius (F.) (Cleridae), Platysoma cylindrica (Paykull) (Histeridae), and Platysoma parallelum Say. Declining stands contained significantly more Ips than did healthy stands during the early portion of the season. Healthy stands had more predators than declining stands. There were strong delayed inverse relationships between I. pini and predators at the site level, both within and between flight seasons. The number of I. pini caught during the late portion of the season was lower when each of th! e ! above predators was more abundant earlier in the season, during both 1998 and 1999. Likewise, numbers of I. pini and I. grandicollis caught during the early portion of the year were inversely related to numbers of predators caught during the previous year. Although Ips trap counts showed significant correlations with each predator species, simple predator-prey models did not necessarily improve fits based on habitat quality (i.e., Ips numbers regressed on prior Ips numbers). We did not observe evidence for interspecific competition among Ips spp. This pattern is consistent with the view that host plant quality and predation jointly affect I. pini and I. grandicollis population dynamics. These results emphasize the importance of interactions among host tree physiology, predation, and dispersal in the population dynamics of phloeophagous herbivores, and have implications to forest management.

Conifer Stands; Conspecific Interactions; Forest Management Implications; Habitat Quality; Host Tree Physiology; Interspecific Competition; Population Density; Population Dynamics; Predation; Red Pine Plantations; Seasonality; Species Abundance

Erbilgin, N. and K. F. Raffa. 2002. Association of declining red pine stands with reduced populations of bark beetle predators, seasonal increases in root colonizing insects, and incidence of root pathogens. Forest Ecology and Management 164:221-236.*Declining red pine, Pinus resinosa (Aitman), stands in the Great Lakes region appear to arise from a complex of biotic and abiotic factors. We monitored stem and root colonizing beetles in declining and healthy plantations in Wisconsin from 1997 to 1999. We also conducted systematic field excavations and laboratory isolations of various root pathogens, Multiple funnel traps were baited with the synthetic aggregation pheromones of the two most common bark beetle (Coleoptera: Scolytidae) species in the region, Ips pini (Say) and Ips grandicollis (Eichhoff). Lower-stem flight traps were baited with 1:1 (+)-alpha-pinene:75% ethanol, and pitfall traps were baited with 1:1 (-)-alpha-pinene:75% ethanol. Healthy stands had higher populations of predators, particularly Thanasimus dubius (F.) (Coleoptera: Cleridae), Platysoma cylindrica (Paykull) (Coleoptera: Histeridae), and Platysoma parallelum Say than declining stands. Seasonal abundance patterns of predators and Ips also varied between declining and healthy stands. Declining stands had higher numbers of Ips and lower numbers of predators early in the season, whereas healthy stands had higher predator populations in the early season. Declining stands had more lower stem infesting bark beetles Dendroctonus valens LeConte (Scolytidae) and weevils (Curculionidae) Pissodes spp. Surprisingly, healthy stands had more root weevils, Hylobius pales (Herbst) and Hylobius radicis Buchanan, and root bark beetle Hylastes porculus Erichson, over the entire season. However, spatial by temporal patterns again were important. Populations of root colonizing insects were higher in healthy stands early in the season, but higher in declining stands throughout much of the ovipositional period. These results suggest dispersal patterns and overwintering behaviors are important in the interactions among herbivores, predators, and host plant condition in Red Pine Decline. The principal fungi isolated from roots were Leptographium procerum (Kendr.) Wingfield and Leptographium terebrantis Barras & Perry. These were more prevalent in declining than healthy stands. Staining fungi were more frequently isolated from roots of trees at the pocket margin than from trees in the asymptomatic portion of declining stands. Heterobasidion annosum (Fr.) Bref, was not isolated from root samples or stem disks, despite 40% recovery in positive controls using the latter method. Likewise, Armillaria spp. were not associated with declining plantations. Our results further support the view that forest declines are due to complex interactions among multiple biotic and abiotic stresses, and exhibit particular spatial and temporal patterns. (C) 2002 Elsevier Science B.V. All rights reserved.*

Forest Decline, Scolytidae, Hylobius, Predators, Leptographium, Dispersal/Weevil Hylobius-Abietis/Ips-Typographus L/Heterobasidion-Annosum/Pachylobius-Picivorus/Pitfall Traps/Coleoptera/Curculionidae/Pheromone

Dodds, K. J. and D. W. Ross. 2002. Relative and seasonal abundance of wood borers (buprestidae, cerambycidae) and cucujidae trapped in douglas-fir beetle pheromone-baited traps in northern idaho. Pan-Pacific Entomologist 78:120-131.*Wood borers (Buprestidae, Cerambycidae) and flat bark beetles (Cucujidae) were captured in multiple-funnel traps baited with Dendroctonus pseudotsugae Hopkins pheromones in two locations in northern Idaho front May to August, 1997. Captured beetles were identified to species and seasonal abundance was described for the most common species. A total of 43 species of beetles were found throughout the study period. One area had higher species richness and total abundance of beetles than the other. Buprestids were most abundant late in the summer (August-September), while cerambycids exhibited both early (May-June) and late (August) season peaks in abundance. Cucujidae flight occurred early in the summer (May-June). which coincided with D. pseudotsugae flight. Seventy-two percent of wood borers that were captured are known to be associated with Douglas-fir.*

Insecta, Buprestidae, Cerambycidae, Cucujidae, Seasonal Abundance, Pheromones/Dendroctonus-Pseudotsugae Coleoptera/High-Risk Stands/Monochamus-Titillator/Thanasimus-Dubius/Tomicus-Piniperda/Forest Coleoptera/Bark Beetles/Scolytidae/Infestation/Frontalis

Aukema, B. H. and Raffa Kenneth F. 2002. Relative effects of exophytic predation, endophytic predation, and intraspecific competition on a subcortical herbivore: consequences to the reproduction of ips pini and Thanasimus dubius. Oecologia 133:483-491.

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We used a laboratory assay to partition the effects of predation and intraspecific competition on the establishment, mating success, and brood development of an endophytic herbivore. We selected a system in which the same predator feeds both exophytically and endophytically on the same prey, to evaluate the role of herbivore feeding guild on predator numerical and functional responses. The bark beetle, Ips pini (Coleoptera: Scolytidae) reproduces within the stems of conifers. Males establish mating chambers under the bark, produce aggregation pheromones, and are subsequently joined by females that construct ovipositional galleries. Thanasimus dubius (Coleoptera: Cleridae) adults prey on adults alighting on the bark surface. T. dubius females then oviposit at the bark beetles' entrance sites, and their larvae prey on developing bark beetle larvae within the tree. We imposed a controlled 3X3 factorial design of prey and predator adult densities on red pine logs. Both predati! on! and competition decreased I. pini reproduction. However, the per capita effect of predation was greater than competition, with one adult T. dubius reducing herbivore reproduction by an equivalent amount as four to five competing males and their harems. Increased densities of adult T. dubius on the plant surface reduced the number of prey captured per predator. Total predation on adults and larvae was similar. However, adult T. dubius on the plant surface ate approximately 18-35 times more I. pini per day than did their endophytic larvae. Within the plant, cannibalism among T. dubius, low herbivore densities, limited feeding times, and presumably the complex gallery architecture of I. pini reduced the number of predator progeny. The progeny of I. pini showed even sex ratios in the absence of predators, but were female biased when predators were present. We quantified a relatively narrow set of predator and prey densities that can generate replacement rates greater than one f! or! this predator that specializes on endophytic herbivores. We attribute some of the benefits of an endophytic lifestyle not only to escape from generalist predators, but also to relatively low functional and numerical responses of adapted predators.

Brood Development; Cannibalism; Feeding Times; Functional Responses; Gallery Architecture; Herbivore Density; Intraspecific Competition; Laboratory Assays; Mating Success; Numerical Responses; Ovipositional Galleries; Population Establishment; Predation: Endophytic, Exophytic; Predator-Prey Dynamics; Progeny Production

Zhou, J., Ross Darrell W, and Niwa Christine G. 2001. Kairomonal response of Thanasimus undatulus, Enoclerus sphegeus (Coleoptera: Cleridae), and temnochila chlorodia (Coleoptera: trogositidae) to bark beetle semiochemicals in eastern oregon. Environmental Entomology 30:993-998.

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The kairomonal responses of Thanasimus undatulus (Say), Enoclerus sphegeus F., and Temnochila chlorodia (Mannerheim) to semiochemicals used by Dendroctonus pseudotsugae Hopkins, D. rufipennis Kirby, D. brevicomis LeConte, D. ponderosae Hopkins, and Ips pini (Say) to locate hosts were quantified in the field during the period of D. pseudotsugae dispersal in the spring and early summer. Traps baited with frontalin plus seudenol caught significantly more T. undatulus than traps baited with any other lure. Only a few E. sphegeus were collected during the study, suggesting that it might use semiochemicals other than those tested in this study to locate its prey. All of the traps baited with lures containing exo-brevicomin caught significantly more T. chlorodia than traps baited with other lures. These results suggest that T. undatulus uses seudenol primarily to locate its prey habitat, and T. chlorodia uses exo-brevicomin for the same purpose. These predators likely feed upon b! ar! k beetles that produce these compounds or other bark beetles that are found in the same habitats. A secondary pest of ponderosa pine, Pityogenes carinulatus (LeConte), was attracted in significant numbers to the traps baited with I. pini pheromone components. Traps baited with ipsdienol and lanierone caught significantly more P. carinulatus than traps baited with ipsdienol alone.

Dispersal; Feeding Behavior; Forest Management Implications; Kairomonal Responses; Predation; Prey Location

Wolff, M., Uribe Alejandro, Ortiz Adriana, and Duque Patricia. 2001. A preliminary study of forensic entomology in medellin, colombia. Forensic Science International 120:53-59.

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This is the first report of an ongoing study of insect succession on carrion carried out in Medellin, Colombia, using pigs (Sus scrofa) as a model to determine the insect sequence over 207 days. During this period, 2314 insects belonging to the following orders and families were collected: Diptera: Calliphoridae, Muscidae, Piophilidae, Sarcophagidae, Syrphidae, Otitidae; Hymenoptera: Apidae, Formicidae, Halictidae, Mutilidae, Vespidae; Coleoptera: Staphylinidae, Histeridae, Carabidae, Scarabaeidae, Silphidae, Dermestidae, Cleridae, Nitidulidae; Dermaptera: Forticulidae; Hemyptera: Gelastocoridae, Coreidae; Lepidoptera: Hesperiidae. Five decomposition stages were observed (fresh, bloated, active decay, advanced decay, and dry remains) and four insect ecological categories (necrophagous, predators, omnivorous, and incidental). During the fresh stage, the first insects that appeared were flies of the families Sarcophagidae and Muscidae and specimens of Formicidae (Hymenoptera!).! During the bloated period, species of Calliphoridae (Diptera) were predominant and the first to oviposit. During the third and fourth stages (active decay and advanced decay), the most abundant families were Calliphoridae and Muscidae, although Staphilinidae (Coleoptera) also stood out. During the last stage (dry remains), the dominant family was Formicidae (Hymenoptera) followed by Dermestidae (Coleoptera) with a large number of immature insects.

Carrion Entomofauna; Forensic Entomology; Insect Succession

Solervicens, J. 2001. Key for the genera of Cleridae from chile (Coleoptera). Acta Entomologica Chilena 25:41-46.

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Eigtheen genera of Cleridae (Coleoptera) are recognized for the chilean fauna. The genera Eurymetomorphon, Chilioclerus, Eurymetopum and Silviella, synonymyzed by Kolivac (1997-1998), are maintained as valid taxa. An illustrated key of identification of the genera is provided.

Geographic Distribution; Morphology; Synonymy; Taxonomic Key; Taxonomic Review

Solervicens, A. Jaime. 2001. [Taxonomic revision of the genus solervicensia barr, 1979 (Coleoptera: Cleridae: korynetinae).]. Acta Entomologica Chilena 25:77-84.

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A taxonomic revision of the species ascribed to Solervicensia Barr, 1979, is made. Only two species are recognized: Solervicensia ovatus (Spinola, 1849) and S. basipennis (Pic, 1950). The following taxa are established as new synonyms of S. ovatus: Korynetes aeneus Philippi y Philippi, 1864, Lebasiella limbipennis Chevrolat, 1876, Lebasiella lineata Pic, 1950, Lebasiella ruficollis Pic, 1950, Lebasiella ruficollis var. sinuatelineata Pic, 1950, Lebasiella Duboulayi Pic, 1950 and the varieties of Lebasiella subanchoralis Chevrolat, 1976 (species previously synonymyzed with S. ovatus by Schenkling, 1916): L. s. subinterrupta Pic, 1950, L. s. ininterrupta Pic, 1950, L. s. latemetallica Pic 1950, and L. s. apicalis Pic, 1950. A redescription of S. ovatus is provided.

Geographic Distribution; Morphology; Synonymy; Taxonomic Revision; Taxonomic Review

Solervicens, A. Jaime. 2001. New species of exochonotus barr from central chile (Coleoptera: Cleridae: enopliinae). Acta Entomologica Chilena 25:27-29.

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A new species of Cleridae, Enopliinae, Exochonotus transversalis, is described from Central Chile. Particular chromatic and punctuation patterns of the elytra and differences in the structure of the male genitalia distinguish this species from its congeners.

Congeneric Differences; Geographic Distribution; Morphology

Smith, D. R. 2001. World catalog of the family aulacidae (hymenoptera). Contributions on Entomology International 4:262-319.

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The world fauna of the family Aulacidae is cataloged. Three valid genera and 156 valid species are included. Distributions, hosts, and all literature pertaining to each species are presented. The Aulacidae are parasitoids of wood-boring Hymenoptera (Xiphydriidae) and Coleoptera (primarily Buprestidae and Cerambycidae) but also recorded from Bostrichidae, Cleridae, and Scolytidae. Aulactis are found in all regions of the world, with 34 described from the Australian Region, 39 from the Neotropical region, 30 from the Nearctic Region, 21 from the Oriental Region, 27 from the Palearctic Region, and 4 from subsaharan Africa. A host list and a plant list are given, the plant list including recorded plants from which aulacids have emerged. Thirty-three new combinations, two new names (Aulacus forus Smith for Parafoenus formosus Kieffer 1911 and Pristaulacus karinulus Smith for Pristaulacus kiefferi Enderlein 1912), and one new synonym (Interaulacus kiefferi Bradley 1908 = Pristau! la! cus caudatus Szepligeti 1903) are proposed.

Geographic Distribution; New Combinations; Parasitism

Santoro, A. E., Lombardero Maria J, Ayres Matthew P, and Ruel Jonathan J. 2001. Interactions between fire and bark beetles in an old growth pine forest. Forest Ecology & Management 144:245-254.

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Management strategies for old growth pine forests have recently begun to include prescribed burns. Fire could influence interactions between bark beetles and mature pine trees, but we cannot predict the effects because we know too little about the numeric and functional responses of bark beetle populations to fire, and because we do not know how fire affects the oleoresin defense system of pine trees. We estimated population abundance of Ips spp. (Coleoptera: Scolytidae), and the resin flow of mature red pines (Pinus resinosa), before and after a prescribed burn, inside and outside the burn, in an old growth forest at Itasca State Park, Minnesota. Following a prescribed burn in April, the local abundance of Ips pini increased by two-fold during May, decreased by a comparable amount during 6 weeks starting in mid-July, and was otherwise unchanged. The abundance of I. grandicollis and I. perroti were unaffected, while that of a specialist predator, Thanasimus dubius (Coleopt! er! a: Cleridae) increased by 30-90% during May. Many mature trees that sustained no visible crown damage from the fire were attacked by Ips within the scorched region of the lower bole. Oleoresin flow increased substantially in trees with scorched boles, which may limit the probability that trees will be killed by bark beetles following a ground fire. We tested whether fire increases the probability that a healthy tree will sustain bark beetle attacks by locating beetle-infested trees inside and outside the burned area, and comparing their growth history (from growth rings) with paired, unattacked trees. Surprisingly, there was no indication of recently declining growth, or chronically slow growth, in beetle-infested trees, either inside or outside the prescribed burn. Half of the trees attacked by Ips in 1998 were dead in 1999 and the remainder were partly girdled by the attacks, which increases their subsequent vulnerability to fires, insects, and pathogens. Ips bark beetles ! ca! n exert meaningful effects on the survivorship of red pine populations, and their demographic impact is probably increased by ground fires.

Bole Damage; Crown Damage; Defense System Function; Fire Effect; Girdling; Ground Fire; Herbivory; Old Growth Pine Forest; Prescribed Burn; Tree Survivorship

Raffa, K. F. 2001. Mixed messages across multiple trophic levels: the ecology of bark beetle chemical communication systems. Chemoecology 11:49-65.*Chemical, physiological and behavioral components of pheromone communication have been described for a number of bark beetle species, yet our understanding of how these signals function under natural conditions remains relatively limited. Development of ecologically based models is complicated by the multiple functions and sources of variability inherent in bark beetle semiochemistry. This discussion addresses four ecological issues of chemical signaling in bark beetles: the effects of aggregation on individual fitness, the possibility of cheating, how plants can defend themselves against herbivores that employ aggregation pheromones, and the implications of variability in chemical communication systems to predator avoidance.An analysis of published data from thirteen scolytid conifer systems indicates that the net benefit and optimal colonization density vary with host condition and beetle species. When beetles attack live trees, the benefit of cooperative host procurement exceeds losses due to competition for the limited substrate, at least up to moderate densities. When beetles colonize dead tissue, however, the effect of subsequently arriving beetles on initial colonizers is almost entirely negative. This suggests that aggregation originated as exploitation of senders, but evolved into manipulation of receivers. It is also proposed that the optimal colonization density which typifies each species or population may offer a more objective and less value-laden index of behavior than current labels such as "aggressiveness". Beetles can maximize the relative benefits of group attack by incorporating instantaneous measures of host resistance into their colonization behavior, and by adjusting oviposition with colonization density. This system may provide opportunities for cheating. However a number of factors may select against a fixed strategy of cheating, including the linkage between tree allelochemistry and beetle semiochemistry, the reduced quality of substrate available to late arrivers, the short adult lifespans of most bark beetles, differential exposure to some predators, the difficulty of locating signalers during extensive endemic periods, and the low costs incurred during host assessment. However, the possibility that beetles employ flexible, density - dependent strategies deserves heightened attention.The ability of bark beetles to collectively exhaust host defenses poses a particular problem for plant defense. It is argued here that the ideal defense should include both direct resistance mechanisms against invading beetles, and indirect mechanisms that inhibit chemical communication. Evidence for the latter mechanism is explored. The ability of predators to efficiently exploit aggregation pheromones as kairomones in prey finding poses significant risk to bark beetles. It is proposed that minor alterations in pheromone components may provide colonizers with partial escape from such natural enemies while maintaining intraspecific functionality.Traditional interpretations emphasized the fidelity and consistency of pheromones, but under natural conditions chemical signals are modified by unpredictable features of the biotic and abiotic environment. Although we typically view variation in pheromonal signals as experimental noise or simple deviations from a population norm, such variation may reflect evolutionary dynamics. Complex ecological interactions may impose trade-offs between the clarity versus diversity of their signals.*

Pheromones, Scolytidae, Coevolution, Cooperation, Competition, Insecta, Pinaceae/Southern Pine-Beetle/Dendroctonus-Ponderosae Coleoptera/Ips-Calligraphus Coleoptera/Thanasimus-Formicarius Col/Scolytus-Ventralis Coleoptera/Tomicus-Piniperda Col/Green Leaf Volatiles/Pheromone Production/Say Coleoptera/Natural Enemies

Oliva, A. 2001. Insects of forensic significance in argentina. Forensic Science International 120:145-154.

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Records from forensic expertises and trappings with beef baits conducted in Buenos Aires, Argentina (34degree36'S), show that the dominating species are widespread ones (Calliphora vicina and Phaenicia sericata), with different behaviour in each large latitudinal zone. It is suggested that the range of the yearly photoperiod variation has an influence in the behaviour of the blowflies, making up for differences in the succession patterns. The Calliphorid blowflies Cochliomyia macellaria and Chysomya albiceps were found on indoors corpses; the latter also on outdoors corpses when blood was shed, and in that case as primary. Three species of beetles of the genus Dermestes, which had been associated with mummified remains, appeared 10-30 days after death. The Silphid beetle Hyponecrodes sp. cf. erythrura was found on outdoor copses in rural environments. The Nitidulid beetle Carpophilus hemipterus was found in association with the cheese skipper Piophila sp. (Diptera: Piophil! id! ae) in medullar cavities of bones after ca. 30 days; to this association is often added the Clerid Necrobia rufipes. Lepidoptera Tineidae appear on the head of mummified indoors corpses. North of parallel 32degreeS, the Muscid grave-fly Ophyra sp. was found breeding on a corpse outdoors in summer. A division by latitude and climate is proposed for Argentina, and an extended system is proposed for the world.

Forensic Entomology; Photoperiod Variation

Morrill, W. L., D. K. Weaver, N. J. Irish, and W. F. Barr. 2001. Phyllobaenus dubius (wolcott) (Coleoptera : Cleridae), a new record of a predator of the wheat stem sawfly (hymenoptera : cephidae). Journal of the Kansas Entomological Society 74:181-183.*Phyllobaenus dubius (Wolcott) larvae and adults are predatory on larvae of the wheat stem sawfly, Cephus cinctus Norton. Some sawfly larvae are killed before host stems are cut. Phyllobaenus dubius larvae fed on sawfly larvae and survived to the adult stage in the laboratory.*

Mihalciuc, V., Danci A, and Oprean I. 2001. Some remarks about the testing of different pheromone baits and traps necessary and useful for the control of bark beetles ips typographus (l.) And pityogenes chalcographus (l.) In romania. Journal of Forest Science 47:133-135.

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The results of researches carried out in 1994-2000 show a good efficacy of pheromones Atratyp and Atrachalc produced in Romania by the Institute of Chemistry from Cluj-Napoca in comparison with Pheroprax produced in Germany. By tubular and barrier traps baited with these pheromones a lot of bark beetles Ips typographus and Pityogenes chalcographus were attracted. The captures of predators Thanasimus formicarius and Nemosoma elongatum were recorded as well.

Menier, J. J. 2001. Phloiocopus loici sp. N. From malagassy (Coleoptera, Cleridae). Revue Francaise D'Entomologie 23:143-146.

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Phloiocopus loici sp. n. is described from Madagascar. Illustrations of male genitalia and male and female antennae are given.

Geographic Distribution; Morphology

Mecke, R., Galileo Maria Helena M, and Engels Wolf. 2001. New records of insects associated with araucaria trees: phytophagous Coleoptera and hymenoptera and their natural enemies. Studies on Neotropical Fauna & Environment 36:113-124.

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For the recently initiated programs of sustainable forestry with the Brazilian pine, Araucaria angustifolia, knowledge of the insects associated with this tree is of paramount importance. In a forest reserve on the Serra Geral of Rio Grande do Sul, Brazil, a three year monitoring was conducted. Forty coleopteran and 5 hymenopteran species totaling about 6200 specimens were recorded, of which 19 and 4 taxa respectively were previously unknown to live on this conifer. They are the coleopterans Lobopoda dallieri (Alleculidae), Taphroderes sahlbergi (Brentidae), Tithonus virescens (Cerambycidae), Plocamocera sp., Enoclerus sp., sp. indet. (Cleridae), Micromimus sp. (Curculionidae: Cossoninae), Corthylus papulans, Xyleborus catharinensis, Xylechinosomus sp. (Curculionidae: Scolytinae), Dilobitarsus quadrituberculatus, Semiotus intermedius, Ptesimopsia sp. (Elateridae), Eudircaea laticornis, Megapsilaphus sexnotatus (Melandryidae), cf. Copidita sp. (Oedemeridae), Ahasverus sp. (! Si! lvanidae), Temnochila sp., sp. indet. (Trogositidae) and the hymenopterans Eubazus sp. (Braconidae), Ephialtes sp., Epirhyssa cf. celaena, (Ichneumonidae) and Ophrynopus depressatus (Orussidae). Data on their life histories are provided, and also for the coleopterans Taurorcus chabrillacii (Cerambycidae), Araucarius brasiliensis, Eurycorynophorus scabriculus (Curculionidae: Cossoninae), Corthylus praealtus and C. rufopilosus (Curculionidae: Scolytinae) which were already known to occur on Araucaria trees. The results of our survey provide the first records for many insects, especially beetles, as belonging to the araucariofauna. Some of them can be considered potential pest species. Perspectives of applied forest entomology as well as biogeographic aspects are discussed.

Life History; New Records; Pest Populations

Mawdsley, J. R. 2001. Ecology, biogeography, and conservation of checkered beetles (insecta: Coleoptera: Cleridae) in southeastern arizona: a geographic information system (gis) study. Transactions of the American Entomological Society 127:431-449.

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Aspects of the ecology, biogeography, and conservation biology of 57 checkered beetle species (Insecta: Coleoptera: Cleridae, subfamilies Tillinae and Clerinae) in southeastern Arizona were studied using commercial Geographic Information Systems (GIS) software. Clerid beetles previously investigated in this region are known to be restricted to certain well-defined vegetation types. For the 57 species in this study, published distribution records and label data from specimens in four major institutional collections were combined in a single database. Fifty-two of the collecting sites in this database could be identified on standard topographic maps at an appropriate level of precision for use in the GIS portion of this study. The ArcView (R) GIS software program was used to compare points representing these 52 sites with the Arizona Gap Analysis Project's digital vegetation map of Arizona. The vegetation type(s) present at each clerid collecting site was determined, and a s! im! ple habitat model was used to predict the distribution of each clerid species in southeastern Arizona. From these predicted distributions, clerid species richness values were assigned to vegetation polygons in four mountain ranges in southeastern Arizona. A digital map of federally designated wilderness areas in Arizona was used to evaluate the conservation status of vegetation patches with high predicted clerid species richness. The conservation status of eight species of Cleridae (Cymatodera cazierorum Barr, Cymatodera horni Wolcott, Cymatodera knausi Wolcott, Cymatodera schwarzi Wolcott, Cymatodera tricolor Skinner, Priocera catalinae Cazier, Priocera chiricahuae Knull, and Enoclerus bimaculatus (Skinner)) that are endemic to the "Sky Island" mountains of Arizona, New Mexico, Sonora, and Chihuahua was also assessed. In southeastern Arizona, mid-elevation evergreen oak-pine forests and woodlands in the Chiricahua, Huachuca, and Santa Rita Mountains were found to have highe! st! clerid species richness, and to also provide habitat for multiple endemic clerid species. Expansion of existing wilderness areas in these mountain ranges is recommended to conserve important areas for clerid biodiversity.

Conservation Status; Species Richness; Vegetation Patches; Vegetation Polygons

Mawdsley, J. R. 2001. Cladistic analysis of the nearctic checkered beetle genus aulicus spinola (Coleoptera: Cleridae: clerinae). Journal of the New York Entomological Society 109:337-343.

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The results of a computerized cladistic analysis of the Nearctic checkered beetle genus Aulicus Spinola (Coleoptera: Cleridae: Clerinae) are presented. Seventeen adult morphological characters (7 multistate, 10 binary) were used to investigate the cladistic relationships of the fifteen valid species of Aulicus. Two Nearctic species of the genus Trichodes Herbst were used as outgroup taxa. Cladistic analysis with the parsimony computer program NONA yielded three equally parsimonious trees, each with thirteen nodes supported by unambiguous character optimizations, and having length 64, consistency index 50, and retention index 52. The strict consensus of these three trees has eleven resolved nodes.

Morphology; Parsimony Trees

Mawdsley, J. R. 2001. Cladistic analysis of nearctic species of Enoclerus gahan (Coleoptera: Cleridae), with discussion of the evolution of mimicry and cryptic coloration. Transactions of the American Entomological Society 127:459-471.

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Thirty-five external adult morphological characters were used to study patterns of relationships among 38 Nearctic species of Enoclerus Gahan (Coleoptera: Cleridae). Two Nearctic species in closely related genera, Placopterus thoracicus (Olivier) and Perilypus ornaticollis (LeConte), were used as outgroup taxa to root most parsimonious networks resulting from cladistic analysis. Cladistic analysis was performed with the fast parsimony computer program NONA, using the parsimony ratchet search strategy to maximize the number of islands of most parsimonious trees found during analysis. The results of this analysis clearly demonstrate that adult external morphological character systems are highly homoplastic in Enoclerus, as there are few resolved nodes in the strict consensus tree and an overall consistency index of 39 (maximum possible consistency index is 100). Homoplasy in certain adult characters in Enoclerus is probably due to convergent evolution of cryptic and mimetic ! co! loration and body forms. The evolution of two dorsal color patterns (one mimetic, one cryptic), each of which is shared by multiple Nearctic Enoclerus species, is discussed in the context of the cladograms reported here. Each of these color patterns has evolved at least twice in Enoclerus. Despite high levels of homoplasy, several distinct species groups can be recognized in Nearctic Enoclerus on the basis of this analysis.

Cryptic Coloration; Homoplasy; Mimicry; Morphological Characters

Martikainen, P. 2001. Non-target beetles (Coleoptera) in trypodendron pheromone traps in finland. Anzeiger fur Schadlingskunde 74:150-154. http://www.blackwell.de/afs.htm.

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Non-target beetles were surveyed in Trypodendron pheromone traps in 3 localities in Finland. Two window traps baited with Trypolure, containing lineatin dissolved in ethanol, and one control trap without attractant were used in each locality. A total of 1648 specimens belonging to 223 non-target species were recorded. The species were divided into five ecological groups to be treated separately. Hylurgops palliatus and Hylastes cunicularius were abundant in baited traps, whereas other scolytids as a group did not show clear attraction. Other species living in recently dead trees, including bark- and wood-boring species and associated species (predators, scavengers, fungivores, etc.), were clearly attracted by Trypolure. The most abundant ones were Hylecoetes flabellicornis, Thanasimus formicarius, Rhizophagus dispar, and Rhizophagus nitidulus. Although numerous in the samples, saproxylic species inhabiting more decayed wood and non-saproxylic species did not seem to be att! ra! cted. Grouping of species into ecological groups was helpful in the search for attraction patterns among species that usually are scarce in pheromone traps.

Attraction Patterns; Ecological Groupings

Macias-Samano, J. E. and Borden John H. 2001. Semiochemical interactions between scolytus ventralis leconte and pityokteines elegans (swaine) (Coleoptera: scolytidae). Journal of Entomological Science 36:251-258.

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Two experiments evaluated the effect of baiting uninfested grand fir logs and trees undergoing initial attack by Scolytus ventralis LeConte with Pityokteines elegans (Swaine) pheromone, on the subsequent attack by both species. Two more experiments assessed the effect of synthetic bark oil, exo-brevicomin, and P. elegans pheromone on the response by each species to multiple-funnel traps baited with attractants for the other species. The pheromone of P. elegans on unattacked logs did not have an inhibitory effect on the attack by S. ventralis. However, trees attacked by S. ventralis that were baited with P. elegans pheromone just after attack, yielded significantly fewer S. ventralis progeny than the unbaited controls. Neither synthetic bark oil nor exo-brevicomin caused a significant change in the catch of P. elegans in traps baited with its pheromone, but the predator Thanasimus undatulus Say was caught in traps baited with (+-)-ipsenol, (+-)-ipsdienol and synthetic bark ! oi! l, and another predator, Enoclerus sphegeus F., was caught in traps baited with exo-brevicomin alone or in combination with ipsenol and ipsdienol. The results do not support the hypothesis that interference competition based on semiochemical communication occurs between the two species.

Insect Attacks; Interference Competition; Semiochemical Interactions

Levinson, H. and Levinson Anna. 2001. The beginnings of pest control in the ancient orient. Spixiana Supplement 77-106.

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Evidence of pest calamities in the ancient Orient comes from the Old Testament of the Bible (written 10th-6th Pre-Christian Century) and early Assyrian records (dated 8th-7th Pre-Christian Century). These plagues being caused by potential disease vectors including head and body lice (Figs 1a-d, 2a-c), itch mites, biting flies and mosquitoes, were mentioned in the book of Exodus (8, 12-15, 16-28) and probably occurred in the 13th Century BC, while the calamities resulting from devastating swarms of the desert locust (Figs 3a,b,4) were described in the books of Exodus (10, 1-20) and Joel (1, 2-12) and probably occurred in the 13th and 8th Pre-Christian Centuries, respectively. During the above period of time, man believed that his affliction by pest calamities is ordained by divine will and that God alone can help to avert the threatening peril (Figs 5, 6). Their firm belief in resurrection and eternal life motivated the ancient Egyptians to invent mummification during the T! hi! rd Dynasty (apprx 2686-2613 BC), in order to protect the body of the deceased against harmful and destructive organisms. The early Egyptians also warned dangerous snakes and insects (including carrion-feeding clerid and dermestid species and some bostrychid, curculionid, ptinid, silvanid and tenebrionid species) to refrain from damaging the mummified corpses and foodstuffs of the deceased in their tombs by showing threatening messages and drawings to such invaders (Book of the Dead, Chapters 35, 36; Figs 7a-d). Some pest-averting methods employed in the acient Orient were based on mechanical means of protection. Ancient Egyptian priests shaved the hair from their head and body by flint or copper razors and repeatedly washed their body by day and night, in order to prevent infestations by ectoparasitic arthropod species. The Egyptian women often anointed their long hair by lice-averting incense cones (Fig. 2c). The dwellers of the marshy Delta and river region wrapped their b! od! y by close-meshed nets during the night, while the inhabitants of the drier areas slept in high towers, in order to protect themselves against mosquitoe bites. Protection of harvested grain against insect and mite infestations by storage of unthreshed corn ears (Fig. 8) and application of earth dust to the granaries was probably employed for the first time at the end of the Hyksos Period (apprx 1650-1550 BC). Early prescriptions of chemical pest control, based mainly on repulsion rather than extermination of detrimental organisms, were recorded in the medical Papyrus of Ebers (written apprx 1550 BC, Fig. 9). Considerable amounts of fragrant resins and herbaceous drugs were first fumigated in ancient Egypt and Babylon between the 26th and 20th Century BC, and in Palestine since the 13th Pre-Christian Century. Fumigations were mainly performed in sanctuaries by means of larger or smaller censers being either placed on an altar (Fig. 10) or kept by hand (Fig. 11). Thus, worship! pi! ng and pest control went hand in hand and the removal of pest organisms was paralleled by the conciousness that religious obligations have been fulfilled. Sacred premises such as tabernacles, temples and tombs as well as dwelling houses and stores were more or less frequently fumigated by various incense blends. Several ingredients of incense blends and ointments were found to act as repellents, insectistatics or insecticides, in accordance to the air-borne concentration and target species. The more effective ingredients of those incense blends and ointments were the resins of myrrh (Commiphora abyssinica, C. gileadensis) and frankincense (Boswellia sacra, B. carteri) as well as the essential oils of citronella grass (Andropogon nardus, A. winterianus), calamus roots (Acorus calamus), cinnamon bark (Cinnamomum ceylanicum), dill seeds (Anethum graveolens) and juniper berries (Juniperus communis, J. phoenicea). The early dwellers of the Dead Sea region (in southern Palestine) ! we! re certainly acquainted with the stifling smell of burning sulphur during the devastation of the cities Sodom and Gomorra in the 18th Pre-Christian Century. However, the use of sulphur dioxide as a fumigant was first mentioned in Homer's "Odyssey" during the 8th Century BC and eventually recommended for pest control in Roman viniculture during the 2nd Pre-Christian Century.

Bible; Incense Blends; Ointments; Pest Calamities; Pest Control: Chemical, Mechanical; Viniculture

Lachance, M.-A., Bowles Jane M, Diaz Maria Marta Chavarria, and Jansen Daniel H. 2001. Candida cleridarum, candida tilneyi and candida powellii, three new yeast species isolated from insects associated with flowers. International Journal of Systematic & Evolutionary Microbiology 51:1201-1207.

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Three new asexual yeast species were isolated from various floricolous insects. Candida cleridarum sp. nov. was the dominant species in clerid beetles collected in flowers of various cacti in Arizona and Southern California. The sequence of the D1D2 domains of the large-subunit rDNA showed that it is a sister species to Candida fragi (0.9% base difference), a yeast isolated once from fermenting strawberries. Candida tilneyi sp. nov. and Candida powellii sp. nov. were recovered from bees and from nitidulid beetles in flowers of two species of morning glory (lpomoea) in north-western Costa Rica. C. tilneyi sp. nov. is most closely related to Candida geochares, but differs in the D1D2 sequence by 4.7% base substitutions. C. powellii sp. nov. is a relative of Candida batistae and Candida floricola, showing sequence differences of 5.9 and 6.9%, respectively. In all cases, the new species are phenotypically similar to their nearest relatives, but are sufficiently different to al! lo! w conventional identification. The type strains are C. cleridarum strain UWO(PS) 99-101.1T (= CBS 8793T), C. tilneyi strain UWO(PS) 99-325.1T (= CBS 8794T) and C. powellii strain UWO(PS) 99-325.3T (= CBS 8795T).

Kulshrestha, P. and Satpathy D K. 2001. Use of beetles in forensic entomology. Forensic Science International 120:15-17.

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Beetles (Coleoptera) have been recognised as providing significant entomological evidence in the medico-legal field, particularly with reference to dry human skeletal remains in the later stages of decomposition. The Dermestidae (skin beetles) and Cleridae (bone beetles) have been found as the most common types infesting exposed human remains and providing evidence in estimating the minimum postmortem interval (PMI).

Forensic Entomology; Postmortem Interval; Skeletal Remains Decomposition

Joseph, G., Kelsey Rick G, Peck Robert W, and Niwa Chris G. 2001. Response of some scolytids and their predators to ethanol and 4-allylanisole in pine forests of central oregon. Journal of Chemical Ecology 27:697-715.

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Lindgren multiple funnel traps were set up in pine forests of central Oregon to determine the response of scolytid bark beetles to ethanol and 4-allylanisole (4AA). Traps were baited with two release rates of ethanol (4.5 or 41.4 mg/hr) and three release rates of 4AA (0, 0.6, or 4.3 mg/hr) in a 2X3 factorial design. All traps also released a 1:1 mixture of alpha- and beta-pinene at 11.4 mg/hr. Of 13,396 scolytids caught, Dendroctonus valens made up 60%, Hylurgops spp. 18.5%, Ips spp. 16%, Hylastes spp. 1.8%, Ganthotrichus retusus 0.9%, and bark beetle predators another 2.8%. Increasing the release rate of ethanol in the absence of 4AA increased the number of most scolytid species caught by 1.5-3.7 times, confirming its role as an attractant. Ips latidens, Temnochila chlorodia, and clerid predators were exceptions and did not show a response to higher ethanol release rates. Release of 4AA at the lowest rate inhibited attraction of most scolytids, with a significant reductio! n ! in G. retusus, Hylastes macer, and Hylurgops porosus when compared to traps without 4AA. A high release rate of 4AA further inhibited responses for most beetles compared to low 4AA. Seven species were significantly deterred by high 4AA, including the latter three, and Hylastes longicollis, Hylastes nigrinus, Hylurgops reticulatus, and Ips latidens. Exceptions include Hylurgops subcostulatus, which was significantly attracted to both low and high 4AA, and I. pini, which was attracted to low and high 4AA in combination with low ethanol, but unaffected by either release of 4AA with high ethanol. Dendroctonus valens was significantly attracted to low 4AA and unaffected by high 4AA. Predators appeared to be less inhibited by 4AA than most bark beetles. Although 4AA can deter the attraction of some secondary bark beetles to ethanol in combination with alpha- and beta-pinene, this inhibition could be weakened for certain species by increasing ethanol release rates. 4-Allylanisole m! ay! have some utility for managing the behavior of secondary bark beetles sensitive to this compound.

Host Selection; Pine Forests; Primary Attraction

Hemp, C. and Dettner Konrad. 2001. Compilation of cantharipHilous insects. Beitraege zur Entomologie 51:231-245.

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A list of insects attracted to cantharidin is given. Most cantharipHilous insects are found within the heteromeran beetle family Anthicidae with 190 species in the three subfamilies Anthicinae (184), Lemodiinae (1) and Tomoderinae (5). Further cantharidin baited species are known from the beetle families Endomychidae (5), Cleridae (4), Chrysomelidae (3), and Staphylinidae (1). In the beetle family Pyrochroidae 23 species from the subfamily Pedilinae and 6 species of the Pyrochroinae are cantharipHilous. The insect order Diptera is represented by the families Anthomyiidae (3), Cecidomyidae (2), Ceratopogonidae (22) Chloropidae (1), Platystomatidae (1) and Sciaridae (5). Many species from the heteropteran family Miridae (29) are known to be attracted by cantharidin, also one species from the families Lygaeidae and Tingidae respectively. Parasites of the hymenopteran family Braconidae (6) show a positive reaction to cantharidin as well as species from the subfamily Diapriinae! o! f the family Diapriidae. Chemical analyses of a fulgorid and a cicadid species revealed that also species of Homoptera may contain cantharidin.

Garcia, P. M., Bahillo de la Puebla Pablo, and Lopez-Colon Jose Ignacio. 2001. Tillus flabellicornis fairmaire, 1866 (Coleoptera: Cleridae) first record for europa. Biocosme Mesogeen 18:23-26.

Address: [A] Museo Nacional De Ciencias Naturales, C.s.i.c., C/ Jose Gutierrez Abascal, E-28006, Madrid; E-Mail: Mcnp505@Mncn.csic.es, Pbahillo@Mibbva.com Spain. Country Spain

Tillus flabellicornis Fairmaire, 1866 is recorder for the first time in Iberian Peninsula and Europe. Differences between this species and the species of the genus Tilloidea are also given.

Faccoli, M. 2001. Catches of non-target Coleoptera by ips typographus (l.) Trap-trees. Redia 84:105-118.

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An Ips typographus (Coleoptera: Scolytidae) mass-trapping experiment was carried out in north-eastern Italy using different kinds of spruce trap-trees. Particularly, trap-trees baited with pheromone (Pheroprax(R)) and treated with pyrethroids (I+F) were tested versus both only treated (I) and only baited (F) trap-trees. Finally, not treated and not baited trap-trees were used as control (T). The trial was conducted in spring-summer 1997 in clear-cut spruce forests (Picea abies Karsten) in Friuli - Venezia Giulia region (south-eastern Alps). For each type of trap-tree, three wooden boxes, open on the upper side, were set up containing two spruce logs. Starting from May until September, all beetles found on the box floors were weekly collected and stored at 4degreeC until identification. Then, they were examined under a stereo-microscope and identified at the species level. Catches of Ips typographus predators and other non-target coleopterans were analysed. Totally, 36220 b! ee! tles belonging to 90 species and 25 families were trapped. Ips typographus was the mainly species found (32800) representing the 90.5% of the catches. Non-target coleopterans were represented by 3420 (9.4%) specimens, including 233 (0.64%) predators of Ips typographus. Particularly, 10 predator species, belonging to Staphylinidae, Cleridae, Rhizophagidae, Colydiidae, Cucujidae and Nitidulidae families, were found. Other non-target beetles, mainly belonging to Scolytidae, Elateridae, Buprestidae, Coccinellidae and Carabidae families, were found. In addition, the rove-beetle Rugilus mixtus (Lohse) (Coleoptera Staphylinidae), was found for the first time in Italy. Notes on the biology of the main species are also given.

Biology; Geographic Distribution; Mass-Trapping Experiments; Spruce Forests

Erbilgin, N. and Raffa Kenneth F. 2001. Modulation of predator attraction to pheromones of two prey species by stereochemistry of plant volatiles. Oecologia, Berlin 127:444-453.

Address: [A] Department of Entomology, University of Wisconsin, 345 Russell Laboratories, Madison, Wi, 53706: Erbilgin@Entomology.wisc.edu Usa. Country Usa

Predators and parasitoids are known to exploit both plant volatiles and herbivore pheromones to locate their insect prey. However, the interaction of these chemical cues in prey location, and the implications of multiple sources of chemical cues to predator feeding breadth and tracking of herbivore counter adaptations, are less well understood. We evaluated the responses of three coleopteran predators to the pheromones and plant signals associated with two species of common bark beetle prey. Thanasimus dubius, Platysoma cylindrica, and Corticeus parallelus feed exclusively on the fauna within trees colonized by bark beetles. The predominant bark beetles in conifer forests of central Wisconsin are Ips pini and Ips grandicollis. The aggregation pheromone of Wisconsin I. pini contains ipsdienol, which occurs as (+) and (-) enantiomers, and lanierone, and the pheromone of I. grandicollis contains ipsenol. The major hosts of these bark beetles are Pinus resinosa, Pinus banksian! a,! and Pinus strobus, which contain monoterpenes as their predominant phytochemical volatiles. Monoterpenes by themselves did not attract predators. However, some monoterpenes significantly affected predator attraction to aggregation pheromones. Myrcene, and to a lesser extent 3-carene, reduced predator attraction. By contrast, alpha-pinene consistently enhanced attraction by all three predators to the pheromones of their Ips prey. However, the predators' responses were modulated by the stereochemistry of alpha-pinene, and these responses differed when confronted with the different pheromones of the two prey species. (+)-alpha-Pinene synergized predator responses to the pheromone of I. pini, whereas (-)-alpha-pinene synergized responses to the pheromone of I. grandicollis. This pattern occurred for all three predator species. Interactions between herbivore pheromones and host plant compounds may provide an important source of behavioral plasticity in predators, and facilitate ! th! eir ability to track several cryptic species that are distributed across multiple plant species and that show semiochemical variation in space and time.

Behavioral Plasticity; Chemical Cues; Chemical Interactions; Enemy Free Spaces; Feeding Behavior; Herbivore Counteradaptations; Phenotypic Plasticity; Predation; Predator Attraction: Modulation; Prey Location; Semiochemical Variation

Erbilgin, N. and Raffa Kenneth F. 2001. Kairomonal range of generalist predators in specialized habitats: responses to multiple phloeophagous species emitting pheromones vs. Host odors. Entomologia Experimentalis et Applicata 99:205-210.

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We evaluated responses of the predominant predators of pheromone-producing bark beetles (Coleoptera: Scolytidae) to chemical cues associated with other phloeophagous species that colonize the same trees. This study considered the range of chemical signals exploited by a category of predators that may be viewed either as specialists, because they feed almost exclusively within trees killed by bark beetles, or as generalists, because they feed on a diverse fauna of primary and secondary insects within this habitat. It also evaluated one aspect of a broader model of predator-prey coevolution, that proposes altered semiochemistry as a source of partial escape from predators that exploit kairomones. The predators, Thanasimus dubius (F.) (Coleoptera: Cleridae) and Platysoma cylindrica (Paykull) (Coleoptera: Histeridae), were attracted to cues associated with feeding on bark-phloem disks by two scolytids that produce adult pheromones, Ips pini (Say) and Ips grandicollis (Eichhoff!).! These predators were not attracted to beetles that feed on lower stems or roots and are not known to produce adult pheromones, Dendroctonus valens LeConte, Hylastes porculus Erickson (Coleoptera: Scolytidae), and Hylobius pales (Herbst) (Coleoptera: Curculionidae). The predator Tenebroides collaris (Sturm) (Coleoptera: Trogositidae) was attracted to I. pini and I. grandicollis, and also to D. valens, H. porculus, and H. pales. Ips pini was attracted to conspecifics only, but I. grandicollis was attracted both to its conspecifics and to volatiles associated with feeding lower stem and root insects. Lower stem and root insects were not or only weakly attracted to cues associated with their conspecifics. These results are consistent with a dynamic coevolved interaction between T. dubius and P. cylindrica and Ips spp.

Chemical Cues; Colonization; Dynamic Interactions; Feeding Ecology; Host Odors: Emission; Kairomonal Range; Phloeophagy; Predator-Prey Coevolution; Semiochemistry; Specialized Habitats

Dodds, K. J., C. Graber, and F. M. Stephen. 2001. Facultative intraguild predation by larval cerambycidae (Coleoptera) on bark beetle larvae (Coleoptera : scolytidae). Environmental Entomology 30:17-22.*Larvae of the Carolina saw)er Monochamus carolinensis (Olivier) (Cerambycidae) and bark beetle larvae (Scolytidae) often simultaneously feed in phloem of recently killed pine trees. Our investigations reveal that hi. carolinensis lan ae may act as facultative intraguild predators of bark beetle larvae. Phloem sandwiches were used in four experiments to examine inter- and intraspecific interactions. We discovered that all sizes of M. carolinensis larvae killed bark beetle larvae. Seventy six percent of the killed bark beetle larvae were consumed by M, carolinensis, including 58% that were entirely ingested. Cannibalism in M. carolinensis occurred in every experimental trial. Based on this evidence, hi. carolinensis, and possibly related cerambycid species associated with bark beetles, are facultative intraguild predators of larvae of other phloem inhabiting species. The consequences of this behavior may have important implications for bark beetle population dynamics.*

Ips Calligraphus, Ips, Monochamus Carolinensis, Intraguild Predation, Cerambycidae, Scolytidae/Southern Pine-Beetle/Monochamus-Titillator/Dendroctonus-Frontalis/Tomicus-Piniperda/Competition/Forest/Col/Populations/Cannibalism/Cleridae

Ayres, B. D., Ayres Matthew P, Abrahamson Mark D, and Teale Stephen A. 2001. Resource partitioning and overlap in three sympatric species of ips bark beetles (Coleoptera: scolytidae). Oecologia, Berlin 128:443-453.

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The bark beetles Ips pini, I. perroti, and I. grandicollis are sympatric in pine forests of the north-central United States. They share the same limited phloem resource and often coexist within the same host trees. We tested whether phloem resources are partitioned in time and space by measuring spatial and seasonal colonization of logs. Differences among species in flight phenology, development time, voltinism, and spatial colonization patterns within logs reduce, but do not eliminate, species overlap. The bark beetle species share predation by Thanasimus dubius (Cleridae) and Platysoma cylindrica (Histeridae), which exploit pheromone signals for prey location. We employed pheromone traps to test for chemical communication among bark beetle species. Heterospecific signals tend to be deterrents when they are added to conspecific signals but attractants when they are alone, indicating that the communication system can both reduce and increase species overlap in resource use! d! ependingupon relative abundance of the species. Deterrence by heterospecific signals is probably a result of selection for minimizing interspecific competition. However, individuals may sometimes benefit from joining aggregations of other species because of (1) predator swamping, (2) improved success in attacking live trees, and (3) location of suitable, recently dead, trees. These benefits should be greatest for males (which locate and colonize host trees before signalling females) and indeed males tended to be more attracted than females by heterospecific signals. Shared resources, shared predators, and heterospecific pheromone communication all contribute to species interactions in this guild of bark beetles, but predicting whether the removal of one species will tend to increase or decrease the abundance of remaining species remains difficult. Species interactions are likely conditional and coexistence is probably promoted by benefits to rare species of multispecies ass! oc! iations.

Chemical Communication; Colonization; Conditional Interactions; Development Time; Feeding Success; Flight Phenology; Heterospecific Signals; Host Location; Information Theory; Interspecific Aggregations; Interspecific Competition; Pine Forests: Habitat; Predator Swamping; Resource Overlap; Resource Partitioning; Seasonal Patterns; Spatial Patterns; Species Abundance; Sympatry; Voltinism

Allison, J. D., J. H. Borden, R. L. Mcintosh, P. De Groot, and R. Gries. 2001. Kairomonal response by four monochamus species (Coleoptera : cerambycidae) to bark beetle pheromones. Journal of Chemical Ecology 27:633-646.

We investigated the hypothesis that wood-boring beetles in the genus Monochuamus (Cerambycidae) utilize pheromones of sympatric bark beetles as host-finding kairomones. All nine bark beetle pheromones tested electrophysiologically were antenally active for both sexes of M. scutellatus M. clamator and M. obtusus from British Columbia. When held-tested with multiple-funnel traps (British Columbia) or cross-vane traps (Ontario), a blend composed of frontalin, ipsdienol, ipsenol, and MCH, in combination with a blend of host volatiles attracted significant numbers of M. clamator, M. obtusus, M. notatus, and M. scutellatus to baited traps. Traps baited with host volatiles in combination with a second blend composed of endo-brevicomin, exo-brevicomin, cis-verbenol, trans-verbenol, and verbenone caught no more beetles than unbaited traps or traps baited with the host blend alone. In British Columbia, tmp baited with the first blend alone or both blends together captured more M. scutellatus and M. clamator than unbaited traps, demonstrating a response to bark beetle pheromones in the absence of host volatiles. These results suggest that Monochamus spp, are minimizing foraging costs by using the pheromones of sympatric bark beetles as kairomones.

Coleoptera, Scolytidae, Cerambycidae, Buprestidae, Monochamus, Chemical Ecology, Allelochemics, Kairomones, Coevolution/Tomicus-Piniperda/Aggregation Pheromones/Dendroctonus-Frontalis/Thanasimus-Dubius/Ips-Typographus/Predators/Titillator/Verbenols/Cleridae

Solervicens, J. A. 2000. Biological data and description of immatures stages of exochonotus eugeniae (Coleoptera: Cleridae: enopliinae). Acta Entomologica Chilena 24:37-43.

Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Santiago Chile. Country Chile

The association of Exochonotus eugeniae to plants of Euphorbia lactiflua affected by xylophagous insects and their restricted geographic distribution in the Pan de Azucar National Park (26degree08'S), III Region, Chile, are recognized. A probable competitive displacement is suggested between Exochonotus eugeniae and Inhumeroclerus thomsoni in the coastal zone of the desert inhibited by Euphorbia lactiflua. The mature larvae and the pupa of the species are described.

Competitive Displacement; Desert Coastal Zones: Habitat; Geographic Distribution

Solervicens, J. 2000. Curacavi, new genus of Cleridae from central chile (Coleoptera: Cleridae: enopliinae). Acta Entomologica Chilena 24:61-64.

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Curacavi, a new genus of Cleridae from Central Chile is described. Its systematic position in the subfamily Enopliinae is proposed.

Geographic Distribution; Morphology

Miller, D. R. and Lindgren B Staffan. 2000. Comparison of alpha-pinene and myrcene on attraction of mountain pine beetle, dendroctonus ponderosae (Coleoptera: scolytidae) to pheromones in stands of western white pine. Journal of the Entomological Society of British Columbia. 97:41-46.

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Multiple-funnel traps baited with exo-brevicomin and a mixture of cis- and trans-verbenol were used to test the relative attractiveness of myrcene and (-)-alpha-pinene to the mountain pine beetle, Dendroctonus ponderosae Hopkins, in a stand of western white pine, Pinus monticola Dougl. Traps baited with myrcene caught significantly more D. ponderosae than traps baited with (-)-alpha-pinene, irrespective of the presence of exo-brevicomin. exo-Brevicomin was attractive to Thanasimus undatulus (Say) (Coleoptera: Cleridae) whereas Trypodendron lineatum (Olivier) (Coleoptera: Scolytidae) was attracted to (-)-alpha-pinene. Our results support the use of myrcene in commercial trap lures and tree baits for D. ponderosae in stands of western white pine in British Columbia.

Johnson, K. S. and Rabosky Daniel. 2000. Phylogenetic distribution of cysteine proteinases in beetles: evidence for an evolutionary shift to an alkaline digestive strategy in cerambycidae. Comparative Biochemistry & Physiology. Part B, Biochemistry & Molecular Biology 126B:609-619.

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We characterized the digestive proteinases of eight species of beetles to improve our understanding of the phylogenetic distribution of serine and cysteine proteinases. Serine proteinases function optimally under alkaline pH conditions, whereas cysteine proteinases require acidic pH. The phylogenetic distribution of cysteine proteinases suggests that they first appeared in an early cucujiform ancestor, however, data for some groups is patchy, and there has been speculation that they have been lost in at least one group, the long-horned beetles (Cerambycidae). The pattern we found supports the hypothesized origin of the proteinases and extends their distribution to an additional superfamily. In addition, we confirmed the presence of cysteine proteinases in some Curculionoidea. Cysteine proteinases were absent, however, from all three species of cerambycids surveyed, supporting the hypothesis that this group has reverted to the more ancestral serine (alkaline) digestive stra! te! gy. In four species we compared the pH optima for total proteolytic activity to the actual pH of the midgut and found the match between optimal and actual pH to be weaker in the cerambycids. These findings suggest that either a close correlation between midgut pH and the proteolytic pH optimum is not needed for adequate digestive efficiency, or that midgut pH is a more constrained digestive feature and there has been insufficient time for it to shift upwards to maximize serine proteinase activity.

Alkaline Digestive Strategy

Erbilgin, N. and Raffa Kenneth F. 2000. Effects of host tree species on attractiveness of tunneling pine engravers, ips pini, to conspecifics and insect predators. Journal of Chemical Ecology. 26:823-840.

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The effect of host tree species on the attractiveness of tunneling Ips pini to flying beetles and their insect predators in Wisconsin was investigated. Tree species influenced the flight response of both predators and prey in the same rank order. Ips pini and its major predators, Thanasimus dubius and Platysoma cylindrica, were more attracted to I. pini males boring into bark-phloem disks of Pinus strobus L. than Pinus banksiana Lamb, and least attracted to I. pini males boring into bark-phloem disks of Pinus resinosa. Sources of within-tree, between-tree, and between-species variation in the degree of attraction elicited by tunneling beetles were quantified. A bioassay for evaluating host tree effects on pheromone based communication among bark beetles under conditions of controlled beetle entry was developed. Possible mechanisms of host species effects on the dynamics of predator and prey interactions in bark beetle ecology are discussed.

Bark-Phloem Disks; Between-Tree Variation; Flight Response; Host Attraction; Host Species Effects; Interspecific Variation; Pheromone-Based Communication; Predation; Predator-Prey Interactions; Within-Tree Variation

Eliason, E. A. and Potter Daniel A. 2000. Biology of callirhytis cornigera (hymenoptera: cynipidae) and the arthropod community inhabiting its galls. Environmental Entomology 29:551-559.

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Populations of Callirhytis cornigera (Osten Sacken) and its associated community of natural enemies and inquilines were monitored on pin oak, Quercus palustris Muenchhausen, in Lexington, KY, from 1997 to 1999. The gall wasp has alternating agamic and sexual generations that differ morphologically and develop in multichambered galls on branches and single-chambered galls on leaves, respectively. There was a strong association between maximum gall diameter and the number of total stem gall inhabitants, such that proportionately more C. cornigera survived and fewer were parasitized as stem gall diameter increased. The most abundant natural enemies of the agamic generation included the hymenopteran parasitoids Sycophila spp. (Eurytomidae) and Ormyrus labotus Walker (Ormyridae), and the clerid predator Phyllobaenus verticalis (Say). The most abundant inquilines in stem galls were the cynipids Synergus sp. near lignicola and Ceroptres sp., and the dogwood borer, Synanthedon sci! tu! la (Harris) (Lepidoptera: Sesiidae). In leaf galls, Aprostocetus sp. was the most abundant parasitoid, and Ceroptres sp. was the only inquiline. The unique aspects of the C. cornigera gall system are discussed, including the relative abundance, emergence phenology, and host relationships of C. cornigera and its associated natural enemies and inquilines.

Arthropod Community Associations; Gall-Induction; Population Heterogeneity

de, l. P. P. B. and Lopez Colon Jose Ignacio. 2000. The genus opilo on the iberian peninsula (Coleoptera, Cleridae). Boletin de la Asociacion Espanola de Entomologia 24:213-227.

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A set of 118 items of Opilo Latreille, 1802 (Coleoptera, Cleridae) captured in the Iberian Peninsula has been studied. Among the studied material, items belonging to Opilo abeillei Korge, 1960 have been identified. This species is nominated for the first time for Spain. From the obtained data the area of peninsular distribution of these four species is established. Up to now have confirmed its presence in our Peninsula: Opilo domesticus (Sturm, 1837), Opilo mollis (Linnaeus, 1758), Opilo pallidus (Olivier, 1795) and Opilo abeillei Korge, 1960. A synonimic list, each species description and dicotomic keys for its identification have also been included.

De Groot, P. and G. L. Debarr. 2000. Response of cone and twig beetles (Coleoptera : scolytidae) and a predator (Coleoptera : Cleridae) to pityol, conophthorin, and verbenone. Canadian Entomologist 132:843-851.*Field studies were conducted in the United States and Canada to determine the response of the white pine cone beetle, Conophthorus coniperda (Schwarz), and the red pine cone beetle, Conophthorus resinosae Hopkins, to two potential inhibitors, conophthorin and verbenone, of pheromone communication. Trap catches of male C. coniperda and C., resinosae were significantly reduced and generally declined with increasing concentrations of conophthorin in traps baited with the pityol, a female-produced pheromone. Verbenone did not significantly reduce trap catches of C. coniperda. Conophthorin, but not verbenone, significantly reduced cone attacks by C. coniperda when placed near cone clusters. The twig beetles, Pityophthorus cariniceps LeConte and Pityophthorus puberulus (LeConte), responded to traps with pityol and alpha -pincne baits alone or with conophthorin. Thanasimus dubius (E) (Coleoptera: Cleridae) was attracted to the pityol and alpha -pinene, but conophthorin had no effect on attraction of this generalist bark beetle predator. Verbenone significantly reduced trap catches of T. dubius in pityol-baited traps.*

Resinosae Hopkins Coleoptera/Factors Affecting Capture/Coniperda Schwarz/Thanasimus-Dubius/Pheromone Traps/Bark Beetle/Pine

Cronin, J. T., Reeve John D, Wilkens Richard, and Turchin Peter. 2000. The pattern and range of movement of a checkered beetle predator relative to its bark beetle prey. Oikos 90:127-138.

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Theoretical studies of predator-prey population dynamics have increasingly centered on the role of space and the movement of organisms. Yet, empirical studies have been slow to follow suit. Herein, we quantified the long-range movement of a checkered beetle, Thanasimus dubius, which is an important predator of a pernicious forest pest, the southern pine beetle, Dendroctonus frontalis. Adult checkered beetles were marked and released at five sites and subsequently recaptured at traps baited with pine and pine beetle semiochemicals and located at distances up to 2 km away from the release point. While the pattern of recaptures-with-distance at each site provided a modest fit to a simple random-diffusion model, there was a consistent discrepancy between observed and expected recaptures: a higher than expected proportion of beetles were recaptured at the more distant traps. To account for this deviation, we developed a model of diffusion that allowed for simple heterogeneity i! n ! the population of marked beetles; i.e., a slow and fast moving form of the checkered beetle. This model provided a significantly better fit to the data and formed the basis for our estimates of intra-forest movement. We estimated that on average, one half of the checkered beetles dispersed at least 1.25 km, one third dispersed > 2 km, and 5% dispersed > 5 km. The source of the heterogeneous dispersal rates were partially due to differences in beetle size: smaller beetles (for both males and females) were more likely to be recaptured away from the release site than larger beetles. The southern pine beetle (prey for the checkered beetle) exhibited no significant heterogeneity in dispersal ability and provided a very good fit to the simple diffusion model. The only difference in dispersal between these two species was that checkered beetles were undergoing greater long-distance dispersal than the pine beetles (the radius containing 95% of the dispersing individuals was 5.1 km f! or! the checkered beetle and 2.3 km for the pine beetle). Data on the movement of these two species is used to evaluate a general model of spatial pattern formation in a homogeneous environment, and the potential of the checkered beetle as a biological control agent for the southern pine beetle.

Biological Pest Control; Dispersal Rate; Movement Patterns; Predator-Prey Population Dynamics; Simple Random-Diffusion Model

Carvalho, L. M. L, Thyssen P J, Linhares A X, and Palhares F A B. 2000. A checklist of arthropods associated with pig carrion and human corpses in southeastern brazil. Memorias do Instituto Oswaldo Cruz. 95:135-138.

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Necrophagous insects, mainly Diptera and Coleoptera, are attracted to specific stages of carcass decomposition, in a process of faunistic succession. They are very important in estimating the postmortem interval, the time interval between the death and the discovery of the body. In studies done with pig carcasses exposed to natural conditions in an urban forest (Santa Genebra Reservation), located in Campinas, State of Sao Paulo, southeastern Brazil, 4 out of 36 families of insects collected - Calliphoridae, Sarcophagidae, Muscidae (Diptera) and Dermestidae (Coleoptera) - were considered of forensic importance, because several species were collected in large numbers both visiting and breeding in pig carcasses. Several species were also observed and collected on human corpses at the Institute of Legal Medicine. The species belonged to 17 different families, 6 being of forensic importance because they were reared from human corpses or pig carcasses: Calliphoridae, Sarcophagi! da! e, Muscidae, Piophilidae (Diptera), Dermestidae, Silphidae and Cleridae (Coleoptera). The most important species were: Diptera - Chrysomya albiceps, Chrysomya putoria, Hemilucilia segmentaria, Hemilucilia semidiaphana (Calliphoridae), Pattonella intermutans (Sarcophagidae), Ophyra chalcogaster (Muscidae), Piophila casei (Piophilidae); Coleoptera - Dermestes maculatus (Dermestidae), Oxyletrum disciolle (Silphidae) and Necrobia rufipes (Cleridae).

Death Time; Decomposition; Faunistic Succession; Forensic Entomology; Checklist

Beutel, R. G. and Pollock Darren A. 2000. Larval head morphology of phycosecis litoralis (pascoe) (Coleoptera: phycosecidae) with phylogenetic implications. Invertebrate Taxonomy 14:825-835.

Address: [A] Institut Fuer Spezielle Zoologie Und Evolutionsbiologie, Friedrich-Schiller Universitaet, 07743, Jena: Rolf.beutel@Rz.uni-Jena.de, Beetledude@Hotmail.com Germany. Country Germany

The larval head of a Phycosecis species is described and illustrated. Characters are compared to those found in larvae of other groups of Cucujiformia. Monophyly of all cleroid families examined is supported by several apomorphic features at least partly correlated with predacious habits: antennae directed anteriad, absence of the mandibular mola, presence of a pedunculate seta on the mala, presence of a median endocarina, origin of antennal muscles exclusively from the head capsule, and presence of a weakly pigmented, parallel-sided gular plate. A possible apomorphy of Cleroidea excluding Phloiophilidae is the parallel-sided, prognathous head. A sister-group relationship between Phycosecidae and Melyridae is supported by the presence of a plumose lacinia mobilis and secondary loss of the median endocarina. A monophylum comprising Cleridae + Chaetosomatidae is characterised by a strongly elongated, sclerotised larval gula, the strongly protracted position of the ventral mo! ut! hparts, and a cardo as long as or longer than the stipes. Monophyly of Trogossitidae is only weakly supported. Several apomorphies indicate a sister-group relationship between Cleroidea and Nitidulidae. These two taxa are characterised by a fully developed maxillolabial complex, an elongated prepharyngeal tube, and tergal sclerotisation restricted to the prothorax and tergite IX. A tentorial bridge completely separated from the remaining tentorium, and a maxillolabial complex with partly restricted motility of the maxilla are shared derived features of larvae of Cleroidea, Nitidulidae, Coccinellidae and Endomychidae. An unusual attachment of a part of the tentoriostipital muscle to the floor of the prepharyngeal tube is found in all cleroid and cucujoid larvae examined. Cleroidea are a well-defined monophyletic group and may form a monophylum together with a paraphyletic assemblage of Cucujoidea. A close relationship between Cleroidea and Lymexylidae is refuted.

Apomorphic Features; Larval Head Morphology; Monophyly; Phylogenetic Implications; Predacious Habits

Bahillo, d. l. P. P. and Lopez-Colon Jose I. 2000. Necrobinus defunctorum (waltl, 1835; Coleoptera, Cleridae) new to the fauna of france. Entomologiste 56:105-106.

Address: [A] Ibaizabal, 1, E-48901, Barakaldo, Vizcaya Spain. Country Spain

Geographic Distribution; Locality; Morphology

Aukema, B. H. and Raffa Kenneth F. 2000. Chemically mediated predator-free space: herbivores can synergize intraspecific communication without increasing risk of predation. Journal of Chemical Ecology 26:1923-1939.

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Natural enemies of herbivores often locate cryptic insects by responding to volatiles associated with the prey's feeding and mating. For example, predators of bark beetles (Coleoptera: Scolytidae) exploit the aggregation pheromones that their prey use to attract mates and secure hosts. Bark beetles are cryptic insects that feed and develop in the subcortical tissues of trees and spend all but a portion of their life history within this habitat. The pine engraver, Ips pini, produces the pheromone ipsdienol throughout its transcontinental range. Predators of I. pini exploit this chemical as a kairomonal cue. Eastern and Midwestern I. pini populations also produce lanierone, which synergizes their attraction to ipsdienol. We evaluated the effects of varying amounts of lanierone, in combination with a constant amount of racemic ipsdienol, on the relative attraction of I. pini and its major predators in Wisconsin. Higher numbers of I. pini were captured with increasing release ! ra! tes of lanierone. In contrast, the numbers of the major predators, such as Thanasimus dubius, Enoclerus nigrifrons, Platysoma cylindrica, and P. parallelum, did not differ among different lanierone release rates. The response of I. pini but not their predators to lanierone at ecologically realistic release rates may be part of a coevolving interaction between predators and prey and offers new strategies for semiochemically based pest management by selectively removing pests and leaving predators.

Chemical Communication; Coevolution; Intraspecific Communication; Pest Management Strategies; Predation Risk; Predator-Prey Interactions; Synergism

Aukema, B. H., Dahlsten Donald L, and Raffa Kenneth F. 2000. Improved population monitoring of bark beetles and predators by incorporating disparate behavioral responses to semiochemicals. Environmental Entomology 29:618-629.

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Estimating populations of both pest and natural enemy species is important in the planning and implementation of biological control. For example, synthetic pheromone lures are used to sample bark beetles, and sometimes their predators, in forest ecosystems. However, insect attraction to natural pheromone sources may differ from attraction to synthetic pheromone lures. Moreover, these differences may vary systematically between the target pest and some important predators could vary with lure selection. We evaluated a series of synthetic lures to determine which lure gave the closest approximation to actual numbers of Ips pini (Say) and predators arriving at hosts infested with I. pini in Wisconsin. We deployed synthetic lures containing various ratios of the (+) and (-) enantiomers of the principal I. pini pheromone component, ipsdienol, with or without an additional component, lanierone. I. pini showed strong preferences for specific enantiomeric ratios of ipsdienol, and ! th! ese responses were synergized by lanierone. Predators showed equally strong attraction to ipsdienol, but preferred different ratios of the stereoisomers. The addition of lanierone had no effect on predators. The most abundant predator, Thanasimus dubius (F.), showed greater preference for host material infested with I. pini than any synthetic lure. These disparities in responses, combined with strong disparities in seasonal flight patterns, provided estimates of pest to predator ratios that varied by as little as 12% to as much as 12 times, from pest:predator ratios arriving at host material infested with I. pini. These results suggest that variation between herbivores and their natural enemies in their phenology, preferred pheromone blends, and infested host material should be considered when developing estimates of relative pest and predator densities for subsequent management options.

Disparate Behavioral Responses; Forest Ecosystems; Population Monitoring

Aukema, B. H., Dahlsten Donald L, and Raffa Kenneth F. 2000. Exploiting behavioral disparities among predators and prey to selectively remove pests: maximizing the ratio of bark beetles to predators removed during semiochemically based trap-out. Environmental Entomology 29:651-660.

Address: [A] Department of Entomology, University of Wisconsin-Madison, 1630 Linden Drive, 345 Russell Laboratories, Madison, Wi, 53706 Usa. Country Usa

Mass-trapping using semiochemical lures is a potentially useful control measure against bark beetle pests. A serious problem, however, is the inadvertent removal of predators that respond to these baits as kairomones. Ips pini (Say) infests hard pines in the western, Great Lakes, and eastern forests of North America. In Wisconsin, I. pini responds primarily to 50(+)/50(-) and 75(+)/25(-) blends of ipsdienol, its principal pheromone component. Its response is increased by a synergist, lanierone. Its most abundant predators in Wisconsin include Thanasimus dubius (F.), which responds to similar blends of ipsdienol, and Platysoma cylindrica (Paykull) and P. parallelum (Say), which respond to primarily (-) enantiomers of ipsdienol. These predators do not show increased response when lanierone is released in addition to ipsdienol. We conducted a no-choice assay using rotating blends of ipsdienol and lanierone to simulate a trap-out treatment. Lures that contain enantiomers of ip! sd! ienol most preferred by I. pini, in combination with lanierone, can selectively remove up to three to six times more pests than predators during the spring. Moreover, delaying deployment of the same lures until summer can result in removal of up to 39 times more pests than predators. In contrast, lures that contain enantiomers of ipsdienol most preferred by predators can inadvertently remove two or more predators per each bark beetle trapped. Exploiting these behavioral differences between pests and predators can improve biological control by conserving predators during trap-out programs.

Predator Behavioral Disparities; Predator-Prey Interactions

Weslien, J. and Schroeder L Martin. 1999. Population levels of bark beetles and associated insects in managed and unmanaged spruce stands. Forest Ecology & Management. 115:267-275.

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Relative population levels of the spruce bark beetle, Ips typographus (L.) (Coleoptera, Scolytidae) and associated insects were estimated in 12 spruce stands in central Sweden. Spruce bolts and window traps baited with semiochemicals were used for the monitoring. Six stands were unmanaged and had ongoing attacks on standing trees by I. typographus. This had led to an accumulation of dead spruce trees during several years. These six stands were compared pairwise with six old-managed stands with similar forest structure, but with no attacks during the previous years and with low amounts of dead trees. Catches of 17 species were included in a quantitative analysis. Four species, all known to be common predators in I. typographus galleries, were caught in significantly higher numbers in the unmanaged stands (two- to three-fold difference). In contrast, the number of I. typographus caught was almost identical for the two stand types. Our results indicate that predators of the s! pr! uce bark beetle may be more sensitive to certain forestry operations than their prey. Caging or baiting of bolts strongly influenced the colonization of predatory species and the number of I. typographus offspring that emerged. Compared to uncaged, unbaited bolts, offspring production was ca. 30% higher in bolts caged with a fine nylon netting and ca. 30% lower in uncaged bolts baited with ethanol and alpha-pinene. No difference between stand types was found in the production of offspring by I. typographus in the bolts. In a multiple-regression analysis, including the density of certain predators and of I. typographus galleries, one factor, namely 'Thanasimus larvae per bolt', could significantly explain some of the variation in I. typographus offspring production in the 36 bolts.

Strom, B. L., Roton L M, Goyer R A, and Meeker J R. 1999. Visual and semiochemical disruption of host finding in the southern pine beetle. Ecological Applications. 9:1028-1038.

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The importance of visual silhouettes for host finding by the southern pine beetle (SPB), Dendroctonus frontalis (Coleoptera: Scolytidae), and the potential for disruption of this process using visual deterrents were evaluated with multiple-funnel traps, painted white or black, and with clear, white, or black Plexiglas sticky panels. All traps and panels were baited with the SPB attractant frontalure. The effect of combined semiochemical and visual disruption was evaluated in funnel traps by including the antiaggregation pheromone verbenone, or the repellent/inhibitory host compound 4-allylanisole, in addition to the attractant. Visual treatments had a highly significant effect on catch of SPB and the predatory clerid beetle Thanasimus dubius. In attractant-baited traps, white paint alone reduced the average number of SPB caught by 72% in Florida and 68% in Louisiana. The repellent 4-allylanisole reduced catch of SPB by 56% in Florida and 45% in Louisiana. Verbenone was elu! te! d at 25% of the targeted rate and did not affect total catch in either place. White panels trapped 79% fewer SPB than black, and 55% fewer than clear, with both differences significant. Clear panels also caught significantly fewer (-54%) SPB than black panels. Capture of T. dubius was reduced significantly by clear (-61%) or white (-56%) panels compared to black but did not differ significantly between clear and white panels. The percentage of female SPB captured was not significantly changed by visual treatments but was, as expected, reduced by verbenone. Neither visual nor semiochemical treatments influenced the sex ratio of T. dubius. The potential for using visual disruptants for protection of trees was assessed in front of a single SPB infestation by painting trees either white or black to 4.5 m. White trees showed fewer landings by SPB and a reduced density of successful and total SPB attacks within, but not above, the painted area. These results show that both SPB and! T! . dubius can be significantly affected by altering visual silhouettes, and that visual and semiochemical treatments, especially used in combination, may increase effectiveness of bark beetle disruption strategies.

Host Search Disruption; Host Selection; Visual Search

Solervicens, J. and Ormazabal Felix. 1999. Life cycle and description of immature stages of epiclines gayi chevrolat, 1838 (Coleoptera: Cleridae: clerinae). Acta Entomologica Chilena 23:33-40.

Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Santiago Chile. Country Chile

The life cycle of Epiclines gayi under laboratory conditions is studied. The whole cycle is achieved in one year. Oviposition occurs in early spring. Six to eight larval instars are recognized. Mature larvae, of 6degree, 7degree or 8degree instar, overwinter and pupate in the following spring. Egg, mature larva and pupa are described.

Life Cycle; Overwintering; Oviposition; Pupation

Schroeder, L. M. 1999. Population levels and flight phenology of bark beetle predators in stands with and without previous infestations of the bark beetle tomicus piniperda. Forest Ecology & Management. 123:31-40.

Address: [A] Department of Entomology, Swedish University of Agricultural Sciences, S-750 07, Uppsala Sweden. Country Swed

Relative population levels and flight periods of Tomicus piniperda (L.) (Col.: Scolytidae) and two of its main predators, Thanasimus formicarius (L.) (Col.: Cleridae) and Rhizophagus depressus (F.) (Col.: Monotomidae) were monitored in 1995 in eight Scots pine stands in central Sweden using flight barrier traps (five per stand) baited with alpha-pinene and ethanol. In four of the stands (A-stands) T. piniperda and associated species had reproduced the previous year in stumps and slash remaining after thinnings conducted in the winter of 1993/1994. In the remaining four stands (B-stands) no bark beetle breeding material had been available during the five preceding years. In addition, the flight periods of the species were monitored in one stand in 1996. In 1995 the catches of T. piniperda and R. depressus were four to five times higher in the A-stands than in the B-stands, whereas there was no difference in the catch of T. formicarius between the two kinds of stands. The T.! fo! rmicarius/T. piniperda ratio was ca. 50 times higher in the B-stands compared with the A-stands during the period of clerid predation on colonising bark beetle adults and six times higher during the period of clerid oviposition. The R. depressus/T. piniperda ratio was only slightly higher in the A-strands than in the B-stands as a result of the spatial distribution of T. piniperda. Three additional species of bark beetle predators were caught: Glischrochilus quadripunctatus (L.), Pityophagus ferrugineus (F.) (Col.: Nitidulidae) and Rhizophagus ferrugineus (Payk.) (Col.: Monotomidae). Based on their seasonal abundance the bark beetle predators can be divided into three temporal groups: the first species to occur in the spring is G. quadripunctatus, the second group consists of R. depressus and T. formicarius, and the last species to initiate flight are R. ferrugineus and P. ferrugineus.

Flight Phenology; Forest Stands; Infestation Occurrence; Population Level; Predator-Prey Ratio

Mawdsley, J. R. 1999. Review of the genus gastrocentrum gorham 1876 (Coleoptera Cleridae tillinae), with biological notes on species from sri lanka. Tropical Zoology. 12:267-272.

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The described species of the genus Gastrocentrum Gorham 1876 (Coleoptera Cleridae Tillinae) are reviewed. Four species are recognized: G. dux (Westwood 1852), G. nitidum Schenkling 1917, G. unicolor (White 1849), and G. brevicolle (Pic 1940). The first notes are provided on the biology of species of this genus; adults of all three species recorded from Sri Lanka were collected under loose bark of Terminalia arjuna (Roxburgh 1832) (Combretaceae). A redescription of the genus Gastrocentrum, a discussion of its relationships to other genera of Tillinae, a key to the four described species of this genus, and brief diagnoses of each of these four species are presented.

Biology; Geographic Distribution; Loose Bark; Morphology; Taxonomic Review; Taxonomic Key

Mawdsley, J. R. 1999. New records and biological notes on species of Cleridae (Coleoptera) from the adirondack park, new york. Great Lakes Entomologist 32:39-45.

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Eleven species of Cleridae (Coleoptera) have been previously recorded from the Adirondack Park in the state of New York. Three additional species (Placopterus thoracicus, Enoclerus muttkowskii, and Enoclerus nigrifrons) are recorded from the Adirondacks for the first time. Biological notes and collecting records are provided for all species. Characters are given for separating adults and larvae of Enoclerus muttkowskii from those of the superficially similar species Enoclerus ichneumoneus. The relationships of these two species are discussed.

Marotta, E., P. Righi, and G. Rosini. 1999. The bicyclo[3.2.0]Heptan-endo-2-ol and bicyclo[3.2.0]Hept-3-en-6-one approaches in the synthesis of grandisol: the evolution of an idea and efforts to improve versatility and practicality. Organic Process Research & Development 3:206-219.*In this paper we will disclose a chemistry story that started with a single molecule, the monoterpene grandisol, used in protecting cotton crops from an important pest, Anthonomus grandis Boheman, Initially, efforts were aimed at giving ever more practicality, versatility, and efficiency to a synthetic scheme that was centered on the key role of the 2,5- dimethylbicyclo[3.2.0]heptan-endo-2-ol, available from intermolecular photocyclization and methylation or, better and more conveniently, by an intramolecular copper(I) catalyzed photo-bicyclization of the 3,6-dimethylhepta-1,6-dien-3-ol. We have developed an enantiospecific synthesis of both enantiomers of grandisol although some drawbacks would preclude scale up and commercialisation, The major Limits of this original single-target synthetic scheme are pointed out along with the changed landscape resulting from recent developments in the fields of bioorganic chemistry and entomology, These changes prompted the elaboration of a new strategy focused on the conception and the development of a practical and efficient preparation bicyclo[3.2.0]hept-2-en-6-ones. The "bicyclo[3.2.0]hept-2-en-6-one approach" stems from a very convenient and general preparation, without photochemical steps, of bicyclo[3.2.0]hept-2-en-6-ones. These compounds proved to be amenable to selective manipulations to prepare not only grandisol but also other important molecules such as lineatin, filifolone, and raikovenal in multitarget and versatile synthetic schemes. Moreover, through resolution of the bicyclo[3.2.0]hept-2-en-6-ones, the procedures can be used to produce enantiomerically pure products. The bismethylation of the carbon atom adiacent to the carbonyl group as well as the conversion into the corresponding unsaturated bicyclic lactones are two important reactions that amplify the potential utility of bicyclo[3.2.0]hept-2-en-6-ones. Their peculiar reactivity, ascribed to the fact that the carbonyl group and the carbon-carbon double bond are attached to the same bridge-head carbon atom, has been demonstrated by the high chemio-, regio-, and stereoselectivity of the NBS-induced lactonization.*
Stereoselective Total Synthesis/Methyl-Substituted Bicyclo<3.2.0>Hept-3-En-6-Ones/Initiated Polyolefinic Cyclizations/Boll-Weevil Pheromone/Trypodendron-Lineatum/Absolute-Configuration/Racemic Grandisol/Diastereoselective Synthesis/Thanasimus-Formicarius/Radical Cyclization

Larsson, M. C., W. S. Leal, and B. S. Hansson. 1999. Olfactory receptor neurons specific to chiral sex pheromone components in male and female anomala cuprea beetles (Coleoptera : scarabaeidae). Journal of Comparative Physiology a-Sensory Neural and Behavioral Physiology 184:353-359.*Chemical communication in scarab beetles involves female-released long-distance sex pheromone. Electrophysiological recordings using tungsten microelectrodes demonstrated two types of olfactory receptor neurons in the scarab beetle Anomala cuprea, each specific for one of the two pheromone components (R)-buibuilactone and (R)-japonilure, respectively. No neurons were found that responded specifically to enantiomers of the pheromone compounds, i.e. (S)-buibuilactone and (S)-japonilure. Pheromone receptor neurons are present in high numbers on both the male and the female antenna, with a lower sensitivity in the females. As in bark beetles and moths, the pheromone receptor neurons in A. cuprea are very sensitive and selective. The difference in response thresholds between (R)- and (S)-enantiomers is almost three orders of magnitude. Pheromone receptor neurons are found in sensilla placodea located in a defined area on each lamella in the antennal club. (R)-buibuilactone and (R)-japonilure neurons are always found in different sensilla. Both types of sensilla contain two neurons, with the pheromone-sensitive neuron displaying a high spike amplitude and the second neuron, not responding to any of the tested compounds, always with a lower spike amplitude.*
Olfaction, Scarab Beetle, Sex Pheromone, Olfactory Receptor Neuron, Single Sensillum/Grandis Boh Coleoptera/Single Cell Responses/Ips-Pini Coleoptera/Douglas-Fir Beetle/Chemical Communication/Thanasimus-Formicarius/Lasioderma-Serricorne/Trichoplusia-Ni/Boll-Weevil/Scolytidae

Krombein, K. V., Norden Beth B, Rickson Melinda M, and Rickson Fred R. 1999. Biodiversity of the domatia occupants (ants, wasps, bees, and others) of the sri lankan myrmecophyte humboldtia laurifolia vahl (fabaceae). Smithsonian Contributions to Zoology. 0:i-iv;1-34.

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The myrmecophyte Humboldtia laurifolia is endemic to Sri Lanka, where it is a common understory tree in lowland rainforests. It attracts a diversity of invertebrate associates and possesses morphology and phenology, including expanded, hollow, self-opening internodes and a variety of extrafloral nectaries that facilitate a relationship with ants. Fourteen ant taxa were collected on H. laurifolia. Technomyrmex albipes (F. Smith) was dominant at many sites. Other ant taxa included Tetraponera sp., Cataulacus taprobanae F. Smith, three species of Crematogaster, Pheidole sp., Tetramorium pacificum Mayr, Dolichoderus sp., Tapinoma sp., Anoplolepis gracilipes (F. Smith), Camponotus sp., Oecophylla smaragdina (Fabricius), and Polyrhachis bugnioni Forel. Among other invertebrates found on H. laurifolia was the internode-nesting crabronine wasp Krombeinictus nordenae Leclercq. It is unique among Sphecidae in its attentive maternal care, progressive feeding of pollen toa single larv! a ! at a time, and cocoon placement and structure. Also commonly found nesting in Humboldtia was the crabronine Crossocerus mukalanae Leclercq. It makes a typical crabronine nest, constructing a linear series of cells from fragments of the dried, collapsed plant pith within the internode. The paralyzed prey provided for the larvae were predominantly Diptera, the majority of them nematocerous species; other less common prey included chalcidoid wasps and Ephemeroptera. Several species of Perilampus (Chalcidoidea) are pupal parasites of C. mukalanae, and larvae and adults of species of Staphylinidae found in wasp nests are presumed to be brood predators. A much less common hymenopteran nesting in internodes was an undescribed species of the social xylocopine bee Braunsapis. Four nests contained one or two females, an occasional male, and immature brood. A larva of a species of Cleridae, presumably a brood predator, was found in two of the nests. Several invertebrate associates of H! um! boldtia are clearly ant predators. The fly larva of Platyceridion edax Chandler and Matile (Keroplatidae) is primarily predaceous on worker ants. Also recorded were the larvae of Microdon sp. (Syrphidae), which feed on ant brood, and the pseudoscorpion Haplochernes warburgi (Tullgren), which is predatory on worker ants. The relationship of other associates was less clear. These included spiders (Theridiidae, Hadrotarsinae), the bee Nomada wickwari Meade-Waldo (Anthophoridae), the wasps Carinostigmus costatus Krombein (Sphecidae) and Physetopoda fumigata (Turner) (Mutillidae), and numerous specimens of Psocoptera and Collembola. Also, clusters of an arboreal annelid, Perionyx sp. (Megascolecidae), were found in some internodes, and individuals were noted crawling on stems or leaves during light rains. Adults were observed mating on foliage and were never found on the ground. The diapausing larva of Krombeinictus nordenae is described in an appendix by Howard E. Evans. It is n! ot! significantly different from other crabronine larvae of the genera Crossocerus, Crabro, and Rhopalum, even though the larvae were fed pollen rather than paralyzed arthropods.

Domatia; Interspecific Interactions; Lowland Forests: Habitat; Maternal Care; Mating Behavior; Morphology; Nesting Behavior; Phenology; Plant-Insect Interactions

Hemp, C., Hemp Andreas, and Dettner Konrad. 1999. Attraction of the colour beetle species pallenothriocera rufimembris by cantharidin (Cleridae: Coleoptera). Entomologia Generalis. 24:115-123.

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About 50 specimens of the clerid species Pallenothriocera rufimembris Pic 1949 were attracted to cantharidin traps at several locations of Mt Kilimanjaro in Tanzania from 1996-XI to 1997-I. Habitat descriptions are given as well as notes on the biology of P rufimembris. Paired tufts of hairs arising from glandular pores at the elytra surface in the shoulder region of the beetles suggested to play a role in courtship behaviour in connection with cantharidin. The high percentage of males being attracted to cantharidin in contrast to single females gives reason to the assumption that cantharidin has a similar purpose as found within cantharidin-bearing Coleoptera:Anthicidae. Anthicid males use elytral notches as a test system to inform female partners about the amount of cantharidin a male has ingested.

Biology; Courtship Behavior; Habitat; Morphology

Haynes, K. F. and K. V. Yeargan. 1999. Exploitation of intraspecific communication systems: illicit signalers and receivers. Annals of the Entomological Society of America 92:960-970. *We review exploitation of intraspecific communication by illicit signalers or receivers, restricting coverage to examples in which the exploiter or exploited, or both, is an arthropod. Illicit signalers aggressively mimic the chemical, acoustical, or visual signals normally used by their victims in sexual or social communication. Cited examples include bolas spiders that mimic pheromone blends to attract male moths as prey and femme fatale fireflies that mimic the flashing pattern of other species of fireflies to prey upon the responding males. Illicit receivers gain access to resources by eavesdropping on intraspecific signals. For example, several species of predatory beetles respond to the aggregation pheromones of bark beetles to feed on them or their offspring, and some parasitic flies orient to the stridulation songs of orthopteran species. In some cases, functional intraspecific communication systems may have evolved to reduce exploitation by illicit receivers: for example, changes in signal characteristics could make the signaler less apparent to potential exploiters. With rare except-ions, both illicit signalers and receivers tend to exploit the intraspecific communication systems of a limited number of taxa, probably because the production or detection of species-specific signals often requires the evolution of specialized signaling mechanisms or sensitive receptors. To convincingly demonstrate exploitation of intraspecific communication, one must first decipher the signals and responses that are part of the communication system. To date, the intraspecific communication systems of a few taxa (e.g., Lepidoptera, fireflies, crickets) are reasonably well understood, but those of many other groups are unknown or poorly understood. Even with this limitation, it is clear that exploitation of these systems by illicit signalers and receivers is widespread and diverse.*
Predator, Prey, Eavesdropper, Allomone, Kairomone, Communication/Aggressive Chemical Mimicry/Moth Sex-Pheromones/Ips-Pini Coleoptera/Bolas Spiders/Mastophora-Hutchinsoni/Predatory Behavior/Wasps Hymenoptera/Thanasimus-Dubius/Alarm Pheromone/Hunting Tactics

Gerstmeier, R., Halperin J, and Chekatunov V. 1999. An annotated list of Cleridae and thaneroCleridae (Coleoptera) of israel. Phytoparasitica. 27:27-33.
Address: [A] Technische Univ. Muenchen, Angewandte Zoologie, D-85350 Freising Germany. Country Germany
Thirty-five species of Cleridae and Thanerocleridae are recorded from Israel, 15 for the first time. General and local distribution, phenology, prey insect and their host plants are listed.
Geographic Distribution; Host Record; Phenology; Prey Record; Checklist; 35 Species

Gara, R. I., Millegan D R, and Gibson K E. 1999. Integrated pest management of ips pini (col., Scolytidae) populations in south-eastern montana. Journal of Applied Entomology. 123:529-534.
Address: [A] College of Forest Resources, Ecosystem Science and Conservation Division, University of Washington, Seattle, Wa Usa. Country Usa
Second growth ponderosa pine forests of the Northern Cheyenne Reservation of south-eastern Montana sustained a chronic Ips pini outbreak between 1978 and 1994. Studies determined the emergence and seasonal flight patterns of the scolytids with regards to temporal and spatial distribution of host material as well as population changes during the year. These changes related to the dry-down rate of host material (thinning and logging slash) and the availability of slash; an index of population change (IPC) was developed to estimate seasonal changes in the Ips population from spring to autumn. Principal management components of an integrated pest management system included (1) an emphasis on creating thinning and logging slash between August and December, a time that provides quickly degrading host material for the overwintering Ips population while not providing suitable host material for the subsequent spring flight; (2) restrictions on winter logging as slash produced durin! g ! this period provided suitable hosts for the first spring flights of I. pini; and (3) restrictions on the use of trap logs or pheromones to lower Ips populations as these materials provide kairomones for the predators (Enoclerus lecontei, Enoclerus spegeus and Temnochila chlorodia) that partition their I. pini host across the spring, summer and autumn.
Emergence; Population Change; Predation; Seasonal Flight Patterns; Slash Availability; Trap Logs; Winter Logging

Dyer, L. A. and Letourneau D K. 1999. Trophic cascades in a complex terrestrial community. Proceedings of the National Academy of Sciences of the United States of America. 96:5072-5076.
Address: [A] Biology Department, Mesa State College, Grand Junction, Co, 81502 Usa. Country Usa
To test for direct and indirect effects of a top predator on three lower trophic levels, we conducted two multiyear predator addition experiments in a tropical wet forest. Periodic additions of a top predator (predatory clerid beetle) to a wet forest understory shrub caused a reduction in the predatory beetle's prey (a predatory ant), increased herbivory, and reduced leaf area of the plant. These effects occurred whether beetles were added to naturally occurring shrubs or to reproductive fragments, suggesting fitness effects of top predators through three trophic levels. A correlational study showed that trophic effects of top predators also cascaded to nearby conspecifics in the forest understory. We use trends from understory plant surveys to suggest mechanisms by which these cascades could ultimately affect species diversity in the local plant community.
Terrestrial Community; Trophic Cascades; Tropical Wet Forest

Verdcourt, B. 1998. Opilo mollis (l.) (Col.: Cleridae) and other beetles at kimbers, maidenhead, berkshire. Entomologist's Record & Journal of Variation. 110:227-228.

Address: [A] Royal Botanic Gardens, Kew, Surrey Tw9 3ae Uk. Country Uk

Solervicens, J. A. 1998. New species of exochonotus (Coleoptera: Cleridae: enopliinae) from the desertic zone of chile. Acta Entomologica Chilena. 22:79-85.

Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Casilla 147, Santiago Chile. Country Chile

Two new species of Exochonotus, E. barri n.sp. and E. eugeniae n.sp. are described. A redescription of E. varipennis (Spinola 1849) and a key for the chilean species of the genus are provided. The geographical distribution of the species is established.

Desertic Zone: Habitat; Geographic Distribution

Ross, D. W. and Daterman Gary E. 1998. Pheromone-baited traps for dendroctonus pseudotsugae (Coleoptera: scolytidae): influence of selected release rates and trap designs. Journal of Economic Entomology. 91:500-506.

Address: [A] Dep. Forest Sci., Oreg. State Univ., Corvallis, or 97331-7501 Usa. Country Usa

Several different aggregation pheromone release rates and trap designs were evaluated for trapping the Douglas-fir beetle, Dendroctonus pseudotsugae Hopkins. Frontalin:seudenol release rates of 160:80, 80:40, 40:20, 20:10, 10:5, and 1:0.5 mg/d, respectively, with a constant ethanol release rate of 88 mg/d at 24degreeC were tested in multiple-funnel traps. The highest Douglas-fir beetle catches occurred at release rates of 20:10 and 10:5 mg/d. There were significantly fewer catches at higher and lower release rates. The percentage of male Douglas-fir beetles increased significantly with increasing release rates up to a plateau at 80:40 mg/d. Catches of Thanasimus undatulus (Say) (Coleoptera: Cleridae), a predator, increased consistently with higher release rates. Multiple-funnel traps caught significantly more Douglas-fir beetles than slotted-panel traps for both total numbers and number per unit area of trapping surface. There was no difference between the 2 trap types in ! se! lectivity for Douglas-fir beetles relative to T. undatulus. Placing metal screens with 6- or 12-mm openings above the collection cup to filter intercepted insects or providing a strip of metal screen with 1.5-mm openings to serve as an escape route for predators from the collection cup in multiple-funnel traps resulted in capture of a significantly higher ratio of Douglas-fir beetles to predators. These results will contribute to the development of more efficient trapping programs to lessen the impact of Douglas-fir beetle outbreaks.

Pest Control; Release Rate; Trap Design

Opitz, W. 1998. The classification and evolution of apolopha spinola (Coleoptera: Cleridae, enopliinae). Coleopterists Bulletin. 52:5-22.

Address: [A] Kansas Wesleyan Univ., Dep. Biol., 100 Claflin, Salina, Ks 67401-6196 Usa. Country Usa

The genus Apolopha Spinola is redefined to include five species: A. reichei Spinola the type species, A. nitida (Gorham), A. suturalis (Klug), A. fryana (Gorham), and A. eucharis, new species. The nominal species Pelonium apicicorne Chevrolat and Ichnea vitticollis Gorham are considered new junior synonyms of A. reichei Spinola. Apolopha fronticosta (Kuwert) is placed in synonymy with A. suturalis (King). A neotype is selected for A. reichei Spinola. Lectotypes are selected for A. fryana (Gorham), A. suturalis (Klug), and A. nitida (Gorham). The distinctive carina on the frons of the cranium is the most outstanding diagnostic characteristic of the members of the genus. This revision includes a description of the genus, and a key and descriptions of the species. A hypothesis of intrageneric evolution is also provided.

Description; Evolution; Geographic Distribution; Taxonomic Key

Neid, J. 1998. Presence of paratillus carus (newman, 1840) in the herault department (Coleoptera Cleridae). Entomologiste 54:272.

Address: [A] 10, Rue Jean Moulin, F 95210, Saint Gratien France. Country France

Habitat: Temperature, Vegetation; Note

Macias-Samano, J. E, Borden J H, Gries R, J. Pierce H D, Gries G, and King G G S. 1998. Primary attraction of the fir engraver, scolytus ventralis. Journal of Chemical Ecology. 24:1049-1075.

Address: [A] Cent. Pest Manage., Dep. Biol. Sci., Burnaby, Bc V5a 1s6 Canada. Country Canada

In laboratory bioassays, Porapak Q-captured and steam-distilled volatiles from the bark of host trees, Abies grandis, particularly from root-rot-infected trees, attracted 50-70% of male and female fir engravers, Scolytus ventralis. Gas chromatographic-electroantennographic detection (GC-EAD) analyses of Porapak Q-captured bark volatiles revealed 19 EAD-active compounds of which 13 (mostly monoterpenes) were identified by GC-mass spectrometry (GC-MS). In separate field experiments, multiple-funnel traps baited with two blends of these 13 synthetic volatiles released at 280 and 340 mg/24 hr attracted 66 and 93% of the total S. ventralis captured, respectively. The clerid predator, Thanasimus undulatus, also responded strongly to the kairomonal volatiles. Additional experiments produced no evidence for aggregation pheromones in S. ventralis. These included laboratory bioassays and GC and GC-EAD analyses of Porapak Q-captured volatiles from male- and female-infested logs or tr! ee! s undergoing mass attack in the field, GC analyses and/or bioassays of extracts from female accessory glands, extracted volatiles from emerged, attacking and juvenile hormone-treated beetles of both sexes, and videotape analysis of the behavior of attacking beetles on the bark surface. We argue against the hypothesis of pheromone-mediated secondary attraction in S. ventralis and conclude that the attack dynamics of this species can be explained solely by its sensitive primary attraction response to host volatiles.

Attack Dynamics; Behavior; Primary Attraction

Letourneau, D. K. and Dyer L A. 1998. Experimental test in lowland tropical forest shows top-down effects through four trophic levels. Ecology. 79:1678-1687.

Address: [A] Dep. Environ. Stud., Univ. Calif., Santa Cruz, Ca 95064 Usa. Country Usa

Approximately 50% of the variation in productivity in lakes is hypothesized to depend upon the cascading effects of top predators. A relative paucity of evidence for such trophic cascades in terrestrial systems has prompted proposals that resource availability (donor control) is more critical than are top-down forces in structuring terrestrial communities, and that trophic cascades with top-down dominance will be restricted to systems of low species diversity. To test the effects of a fourth trophic level on successive lower trophic levels under different levels of plant resource availability, we used Piper ant-plants and their associated arthropods as a model system in lowland, tropical rain forest. This interacting web of four trophic levels is composed of small trees, various herbivores, predaceous ants, and specialist clerid beetles as predators of ants. Three-hundred-sixty Piper cenocladum cuttings were randomly assigned to 36 plots with a factorial design: predator t! re! atment (three levels), light treatment (two levels), and soil type (two levels). We monitored indicators of ant-colony size (percentage petioles occupied per tree), herbivore loads (leaf area loss), and tree biomass (total leaf area per tree) for 18 mo. When the top predator Tarsobaenus letourneauae was added experimentally to the three-trophic-level ant-plant system, the average abundance of Pheidole bicornis ants was reduced fivefold, average herbivory to Piper cenocladum leaves was increased nearly threefold, and tree leaf area was reduced by nearly half. Direct effects of predatory beetles on ants were more pronounced and more rapid than were indirect effects accumulating to the second and first trophic levels. Bottom-up effects of light and soil quality tended to be mitigated by these top-down cascades. Neither potential leaf-area accumulation by trees nor actual leaf area (left after herbivory) showed a direct response to relatively high or low availability of soil nut! ri! ents or light at different sites.

Lowland Tropical Forest: Habitat; Predation; Top-Down Effects; Trophic Level

Gerstmeier, R. 1998. Checkered beetles: Illustrated key to the Cleridae of the western Palaearctic. Book or monograph. Publisher? 1-242.

Address: [A] Technische Univ. Muenchen, Angewandte Zoologie, Alte Akademie 61, D-85350 Freising Germany. Country Germany

The western Palearctic is bordered by the Ural Mountains, the Caspian Sea and the northwestern part of the Persian Gulf, part of Saudi Arabia, through the Sahara, and the Atlantic Ocean through northern Europe. This field guide, written entirely in both English and German, describes 128 species of checkered beetles or Cleridae of the western palearctic, with definitions of the families Thanocleridae and Cleridae. Keys to families, genera, and species are provided. Each species entry contains a written description, distribution, distribution and a color plate. Diagrams and analytical drawings further supplement the text.

Identification Guide

Dauphin, P. 1998. New locality for paratillus carus gorham (Coleoptera Cleridae) in the gironde department. Bulletin de la Societe Linneenne de Bordeaux. 26:126.

Address: [A] Poitou, 33570, Lussac France. Country France

New Locality; Species Expansion; Note

Wilkens, R. T., Turchin Peter, Reeve John D, and Cronin James T. 1997. A field test of a model for spatial bark beetle-predator interactions. Bulletin of the Ecological Society of America. 78:330.
Address: [A] Univ. Connecticut, Storrs, Ct 06269 Usa. Country Usa

Biological Control; Clerid Beetles; Ecology; Host; Models and Simulations; Pest; Pest Management; Predation; Predator; Spatial Predator-Prey Interaction Model

Valkama, H., Raty Mika, and Niemela Pekka. 1997. Catches of ips duplicatus and other non-target Coleoptera by ips typographus pheromone trapping. Entomologica Fennica. 8:f153-159.
Address: Fac. Forestry, Univ. Joensuu, Po Box 111, Fin-80101 Joensuu, Finland. Country Finland
Catches of non-target Coleoptera in Ips typographus pheromone traps baited with Ipslure were analysed along a geographic gradient running from southwestern Finland to eastern Finland and Russian Karelia. Besides I. typographus, two other bark beetles, Pityogenes chalcographus and Ips duplicatus were caught in high numbers. I. duplicatus occurred on northeastern sites only, suggesting a more restricted distribution than previously known. High numbers of Thanasimus spp. beetles indicate that I. typographus pheromone is also an effective attractant for bark beetle predators. In addition, the originally North American ambrosia beetle Gnathotrichus materiarius, now widely spread in Europe was found for the first time in nature in Finland.
Geographic Distribution; Natural Predator Attractant

Turchin, P., Wilkens Richard T, Reeve John D, and Cronin James T. 1997. Reaction-diffusion dynamics in a host tree-bark, beetle-clerid predator systems. Bulletin of the Ecological Society of America. 78:36.
Address: [A] Univ. Conn., Storrs, Ct 06269 Usa. Country Usa

Clerid Beetle; Congregative Movement; Host; Patchy Distribution; Pest; Predation; Predator; Prey; Reaction-Diffusion Dynamics; Spatial Pattern; Terrestrial Ecology

Solervicens-A, J. 1997. CtEnoclerus, new genus from the mediterranean zone of chile (Coleoptera: Cleridae: clerinae). Acta Entomologica Chilena. 21:69-74.
Address: [A] Inst. Entomol., Univ. Metrop. Ciencias Educ., Casilla 147, Santiago Chile. Country Chile
Ctenoclerus, a new genus and two new species, C. lineatus and C. pectinatus, are described. The genus is classified in the subfamily Clerinae, near Notocymatodera Schenkling; its geographic distribution in the mediterranean zone of Chile is recognized. Figures and a key for identification of the species are provided.
Geographic Distribution

Singh, A. P. and Bhandari R S. 1997. Colonization, succession and preference for tree portion by insects on felled west himalayan spruce, picea smithiana. Indian Forester. 123:656-663.
Address: [A] Conifers Res. Cent., Shimla, Hp India. Country India
Studies on colonization, succession and preference for tree portion by insects were carried out on felled trees of spruce, Picea smithiana trees. A total of 14 species of insects colonized the felled trees. Two species are important wood boring beetles, Tetropium oreinum and Dryocotes indicus which infest freshly felled trees. A sap/fluid feeding bug Mezira tenuicornis also feeds on the tree till the 3rd year followed by a decaying wood boring fly, Eristalis tenax in the 4th year after felling. Five species of predatory beetles were also collected. Thanasimus himalayensis, predating on T. oreinum and D. indicus; Ampedu spp. and Cucujus bicolor predating on D. indicus along with a brenthid and carabid species that are also predatory beetles. Archotermopsis wroughtonii a dead wood termite and a predatory carabid beetle colonize the tree from 5-8 years after felling. However, from 18 to 22 years after felling, 3 species of beetles that are borers of rotten wood, Hemisodrocus ! ne! palensis, Oryctes nasicornis and Blaps socia feed on spruce. Preference for the tree portion by insects showed that during the first 2 years after felling all the three portions of the tree are colonized i.e. bottom, middle and top. While from 3 to 8 years the bottom and middle portions are inhabited by insects. However, from 18 to 22 years after felling insects infest the bottom portion of the tree.
Colonization; Succession; Tree Portion Preference

Schmidt, G. H., Schmidt Ludger, and Fisher Hagen. 1997. Comparison of the captivity of singly and combined baited bark beetle pheromone traps set up of in a heterogenous forest area near hannover, germany. Braunschweiger Naturkundliche Schriften. 5:393-423.

Address: [A] Fg Entomologie, Fachbereich Biol., Univ. Hannover, Herenhaeuser Str. 2, D-30419 Hannover Germany. Country Germany

In the years 1990 and 1991 black THEYSOHN Slit-traps were set up baited with a combination of the synthetic bark beetle pheromones Pheroprax, Chalcoprax and Linoprax. Their captivity was tested in comparison to singly baited traps. Unbaited traps were used as control. In 1991, further traps were tested singly baited with Cembrax, the pheromone of Ips cembrae (HEER). The periods of flight activity of the specially baited Solytidae were ascertained for both years in which the investigations were performed. The periods of dispersal of Xyloterus species took place very early in the years. Compared with singly baited traps the captivity of the combined baited ones was reduced for about 32% for Pityogenes chalcographus, Ips typographus and Xyloterus domesticus. Only Xyloterus lineatus was more abundant in the combined baited traps. These trapping results can be explained by the activities of the various components of the pheromones. A similar explanation was presented for the si! de! -effect of Pheroprax baited traps in which 90% of the trapped Pityogenes chalcographus were malemale. A low population of Ips cembrae was found with the new pheromone Cembrax. Besides the specially trapped species of Scolytidae 251 further species of Coleoptera were registered by the pheromone traps, from which 14 species showed significant, partly specific pheromone preferences. The combined baited traps had a synergistic effect on clerid beetle Thanasimus formicarius (L.) and rooteating beetle Rhizophagus depressus (F.). Totally, about 460 000 beetles were captured in 22 traps during the two years of investigation consisting to about 90% of Pityogenes chalcographus, 3% Ips typographus, 2% of Xyloterus domesticus, 4% Xyloterus lineatus and only to 1% of individuals of various other species of Coleoptera.

Captivity; Dispersal; Fight Activity

Ross, D. W. and Daterman Gary E. 1997. Using pheromone-baited traps to control the amount and distribution of tree mortality during outbreaks of the douglas-fir beetle. Forest Science. 43:65-70.

Address: [A] Dep. Forest Sci., Oregon State Univ., Corvallis, or 97331 Usa. Country Usa

Multiple-funnel traps baited with strong aggregation pheromone lures were placed throughout three 259 ha plots in northeastern Oregon during an outbreak of the Douglas-fir beetle, Dendroctonus pseudotsugae Hopkins. Mean numbers (+- SEM) of Douglas-fir beetles collected per plot for the entire flight periods of 1992 and 1993 were 277,921 +- 40,447 and 268,834 +- 37,088, respectively. Mean numbers (+- SEM) of the most abundant predator, Thanasimus undatulus (Say), collected per plot in 1992 and 1993 were 43,527 +- 3,553 and 35,652 +- 3,514, respectively. Douglas-fir beetle-caused tree mortality was concentrated around the trap sites in the treated plots, even though traps were located an average of 40 m from the nearest host tree. Managers can influence the spatial distribution of tree mortality during an outbreak by selective placement of traps across the landscape. Selective trap placement, plus the removal of trapped beetles from the population, may reduce tree mortality ! wi! thin the general area.

Economic Entomology; Forestry; Pest; Pest Control Method; Pest Management; Pheromone-Baited Trapping; Predator; Tree Mortality

Rifkind, J. 1997. Two new species of Cleridae (Coleoptera) from a costa rican cloudforest. Revista de Biologia Tropical. 45:1117-1124.

Address: [A] Entomol. Sect., Nat. Hist. Mus. Los Angeles Cty., Los Angeles, Ca Usa. Country Usa

Two species of Clerini (Cleridae: Clerinae), Colyphus hansoni and Enoclerus (E.) puravida, are described from malaise trap samples collected in a patch of cloudforest at Zurqui de Moravia, San Jose Province, Costa Rica. Colyphus hansoni is compared to its congeners and to the sympatric Enoclerus (Coniferoclerus) subviolaceus (Gorham). The new species is distinguishable from its congeners on the basis of color, setal pattern and elytral sculpturing. A sympatric, undescribed Colyphus species resembles C. hansoni in details of shape and sculpturing, and may prove to be its sister species. Colyphus hansoni has the elyra tricolorous (red, ivory and black) and thus is easily separated from the undescribed species which has the elytra strictly bicolorous (stramineous and black). The generic status of the latter is discussed in relation to Colyphus. The presence of sexually dimorphic tarsal claws in Colyphus is noted for the first time. Enoclerus (E.) puravida is characterized as ! pa! rt of a complex of several similar and possibly related species distributed in Panama and Costa Rico. It is similar to several other Mexican and Central American Enoclerus species that share small size, ant-like form, shining black or reddish elytral integument and distinctive sculpturing of the elytral base. This group, consisting of E. (E.) tubercularis (Gorham 1882), E. (E.) gibbus Ekis 1976, E. (E.) albosignatus Ekis 1976, E. (E.) puravida and some undescribed species, may eventually prove so form a clade-and thus warrant elevation to subgeneric or generic status. Among described species, E. (E.) puravida is most similar to the Panamanian E. (E.) albosignatus, from which it differs by having the base of each elytron coarsely alveolate-punctate and only incidentally and feebly costate, rather than smooth and "embossed" with three shallow carinae. The two species also differ in details of coloration and pronotal sculpturing. E. (E.) puravida may be mimicking ants.

Cloudforest: Habitat; Comparative Morphology; Geographic Distribution; Morphology

Rifkind, J. 1997. New distributional records for mexican Enoclerus gahan (Coleoptera: Cleridae). Coleopterists Bulletin. 51:319-327.

Address: [A] Entomology Section, Natural History Museum, Los Angeles County, Los Angeles, Ca Usa. Country Usa

New state distribution records are presented for 41 species of Enoclerus Gahan in Mexico. In addition, six species are recorded as new for the Mexican fauna.

Rifkind, J. 1997. Enoclerus (Enoclerus) insidiosus (gorham) (Coleoptera: Cleridae): another likely mimic of camponotus sericeiventris guerin (hymenoptera: formicidae). Coleopterists Bulletin. 51:298-302.

Address: 11322 Camarillo St. No. 304, North Hollywood, Ca 91602, Usa. Country Usa

The Central American clerid Enoclerus (Enoclerus) insidiosus (Gorham) is proposed as a mimic of the ant Camponotus sericeiventris Guerin based on the criteria of shared microhabitat, overall physical resemblance, and species-specific morphological similarity.

Comparative Morphology; Description; Microhabitat; Mimic; Morphology; Physical Resemblance; Species-Specific Morphological Similarity

Reeve, J. D. 1997. Predation and bark beetle dynamics. Oecologia, Berlin. 112:48-54.

Address: Southern Res. Station, Usda Forest Serv., 2500 Shreveport Hwy., Pineville, La 71360, Usa. Country Usa

Bark beetle populations may undergo dramatic fluctuations and are often important pests in coniferous forests. Their dynamics are thought to be primarily driven by factors affecting the resistance of the host tree to attack, i.e., bottom-up forces, while natural enemies are usually assigned a minor role in these systems. I present behavioral experiments that suggest that the clerid beetle Thanasimus dubius may be an important source of mortality for the bark beetle Dendroctonus frontalis during attack of the host tree. and determine the nature of the functional response of T. dubius under conditions close to natural. I also examine the numerical response of T. dubius to large-scale fluctuations in D. frontalis density, and the relationship between bark beetle population trends and predator density, and find that beetle populations tend to decline when predator densities are high. Combined with the effects of clerid larvae on bark beetle broods, these results suggest that t! op! -down forces generated by natural enemies could also be an important component of bark beetle dynamics. The implications of these results for bark beetle dynamics are discussed in relation to the prolonged life-cycle of clerid beetles.

Bottom-up Forces; Clerid Beetle; Functional Response; Mortality; Numerical Response; Population Dynamics; Predation; Predator Density; Terrestrial Ecology; Top-Down Forces

Poland, T. M. and Borden John H. 1997. Attraction of bark beetle predator, Thanasimus undatulus (Coleoptera: Cleridae), to pheromones of the spruce beetle and two secondary bark beetles (Coleoptera: scolytidae). Journal of the Entomological Society of British Columbia. 94:35-41.

Address: [A] Centre Pest Management, Dep. Biol. Sci., Simon Fraser University, Burnaby, Bc V5a 1s6 Canada. Country Canada

The bark beetle predator Thanasimus undatulus Say was captured in statistically significant numbers (total catch = 470, 713, and 137) in three field experiments using multiple-funnel traps baited with various combinations of pheromones for the spruce beetle, Dendroctonus rufipennis Kirby, and the secondary bark beetles Dryocoetes affaber Mannerheim, and Ips tridens Mannerheim. Thanasimus undatulus was attracted to frontalin and alpha-pinene, the commercial spruce beetle lure, alone or combined with the D. affaber pheromones (+)-endo- and (+-)-exo-brevicomin. Ips tridens pheromones, (+-) - and (+)-ipsdienol, significantly increased the numbers of T. undatulus attracted to spruce beetle lures. Additional I. tridens pheromone components, (-)-cis-verbenol and amitinol, did not increase attraction to spruce beetle lures with added (+)-ipsdienol. Attraction to I. tridens pheromones indicates that baiting susceptible hosts with I. tridens pheromones to induce competitive exclusio! n ! of the spruce beetle may also lead to increased densities of the natural enemy, T. undatulus.

Parihar, D. R. and A. V. Kampantzov. 1997. Faunal diversity and associated predators and parasites of wood boring Coleoptera of rajasthan desert. Annals of Arid Zone 36:367-372.*Faunal diversity of three families of coleopterous wood borers inhabiting tree species nas assessed. Its composition was 33.3% in Cerambycidae, 25.9% in Bostrychidae and 40.8% in Buprestidae. Borers maintained host selectivity with maximum preference for Acacia tortilis. Sis species of predators belonging to four families (Trogositidae, Cleridae, Colydidae and Histeridae) and 7 parasitic species of Hymenoptera were also recorded on wood bores.*

Faunal Diversity, Abundance, Predator, Parasite, Wood Borer, Larval Tunnel

Odeyemi, O. O. 1997. Interspecific competition between the beetles dermestes maculatus degeer and necrobia rufipes degeer in dried fish. Insect Science & its Application. 17:213-220.

Address: [A] Dep. Biol., Fed. Univ, Technol., P.m.b. 704, Akure, Ondo State Nigeria. Country Nigeria

Competition between Dermestes maculatus Degeer (Coleoptera: Dermestidae) and Necrobia rufipes Degeer (Coleoptera: Cleridae) in Clarias gariepinus (Burchell), was studied at four Population levels (16, 30,48 and 60), three moisture-content levels (12, 15 and 20%) and three temperatures (20, 27 and 32degreeC). Experiments were carried out using adult insects of both species in mixtures of equal and unequal numbers. Interspecific competition between N. rufipes and D. maculatus was found to have an effect on the population growth of both beetles but to different extents. The intensity of competition is dependent on temperature, moisture content and the initial density ratio. Using the replacement series approach, it was predicted that at high adult population and moisture content, N. rufipes becomes extinct and D. maculatus dominates a mixed culture. At a temperature of 20degreeC, D. maculatus outcompetes N. rufipes while at 32degreeC, both species co-exist. This observation p! os! sibly accounts for the low occurrence or absence of N. rufipes relative to D. maculatus in commercial dried fish in areas with temperatures of 20 to 30degreeC.

Dried Fish: Fish; Interspecific Competition; Moisture Content; Population Density; Population Growth; Temperature

Miller, D. R., Gibson K E, Raffa K F, Seybold S J, Teale S A, and Wood D L. 1997. Geographic variation in response of pine engraver, ips pini, and associated species to pheromone, lanierone. Journal of Chemical Ecology. 23:2013-2031.

Address: [A] Phero Tech Inc., 7572 Progress Way, Delta, Bc V4g 1e9 Canada. Country Canada

Lanierone strongly synergized the attraction of male and female Ips pini (Say) to ipsdienol in New York and Wisconsin. Synergy was only weakly significant in Montana and British Columbia and not significant in California. Catches of L. pini in ipsdienol-baited traps were increased 0% (i.e., nonsignificant) to 9942% by lanierone, with the highest increases in eastern North America. Lanierone had the least effect in California. The effects of lanierone on sex ratios of L. pini in trap catches varied significantly between regions. The addition of lanierone to ipsdienol-baited traps resulted in a general increase in male representation at nine of 12 sites. Ips integer (Eichhoff) was attracted to lanierone alone. Ipsdienol reduced the response of L. integer to lanierone. Enoclerus lecontei (Wolcott) (Cleridae) preferred traps baited with the combination of ipsdienol and lanierone. (R)-(-)-Ipsdienol was attractive to E. sphegeus (F.), Thanasimus undatulus (Say) (Cleridae), and T! em! nochila chlorodia (Mannerheim) (Trogositidae), while racemic ipsdienol was attractive to E. nigrifrons var. gerhardi Wolc. and Thanasimus dubius (F.). Lanierone had no effect on these species.

Aggregation Pheromone; Behavior; Female; Forest Pest; Geographic Variation; Kairomone; Lanierone; Male; Pest Management; Sex Ratio; Synergy

Lawson, S. A., Furuta K, and Katagiri K. 1997. Effect of natural enemy exclusion on mortality of ips typographus japonicus niijima (col., Scolytidae) in hokkaido, japan. Journal of Applied Entomology. 121:89-98.

Address: [A] Dep. Primary Industries Forestry, Queensland Forest Res. Inst., 80 Meiers Rd., Indooroopilly, Old 4068 Australia. Country Australia

The impact of natural enemies on the reproduction and survival of Ips typographus japonicus Niijima in Hokkaido was tested by sequentially caging off cohorts of a single beetle generation so as to investigate the effects of natural enemies at different developmental stages. A consistent increase in mortality of between 17-18% in the first 23 weeks of exposure to natural enemies was observed, after which mortality remained relatively constant. Natural enemies which were found to occur in logs exposed during this time were the predators Medetera sp., Thanasimus substriatus, and the adult parasitoid Tomicobia watanabei. Of these, only the first two were found to be significantly associated with beetle brood mortality. However, a confounding factor was the fact that beetle density also significantly increased in logs during the period when mortality was increasing. It was found that larval mine density, and hence intraspecific mortality, was the single most important factor co! rr! elated with beetle mortality during this period. It was thus concluded that increased intraspecific competition was responsible for most of the increase in mortality during the first 2-3 weeks exposure, with predators playing a more minor role. Parasitoids were observed to occur in logs late in the exposure period when mortality was relatively constant and so appeared to have little effect on beetle reproduction and survival. The results of this study were compared to results from similar previous exclusion experiments with bark beetles and the fact that beetle density-dependent effects as a mortality factor was not considered in many of these studies noted. It is therefore suggested that some of these previous studies may have overestimated the importance of natural enemies and associates as mortality factors and subsequently underestimated the importance of intraspecific competition. Suggestions are made to improve bark beetle exclusion methodology so as to remove the conf! ou! nding factor of beetle density from the analysis.

Biological Control; Biological Control Agent; Hokkaido; Mortality; Natural Enemy Exclusion; Pest; Pest Management

Hui, Y. and Bakke Alf. 1997. Development and reproduction of Thanasimus formicarius (l.) (Coleoptera: Cleridae) at three constant temperatures. Canadian Entomologist. 129:579-583.

Address: [A] Inst. Ecology Geobotany, Yunnan Univ., Kunming China. Country China

Thanasimus formicarius (L.), a main predator of bark beetles in Eurasia, was studied at constant temperatures of 15, 21, and 25 degree C. Morphological data and duration of development are indicated for the egg (2.4 by 0.8 mm; 28-7 days at temperatures from 15 to 25 degree C), three larval instars (9-14 days depending on instar and temperatures of 21 and 25 degree C), pupa (15 and 33.5 days over the range of temperatures), and adult. Information is also given on head capsule size, sex ratio, fecundity, and length of adult life.

Adult; Development; Eurasia; Fecundity; Instar; Longevity; Pupa; Reproduction; Sex Ratio; Temperature

Dippel, C., Heidger Christa, Nicolai Volker, and Simon Matthias. 1997. The influence of different predators on bark beetles in european forest ecosystems (Coleoptera: scolytidae). Entomologia Generalis 21:161-175.

Address: [A] Lehrstuhl Angew. Zool. Oekol. Tiere, Inst. Zool., Freie Univ. Berlin, Haderslebenerstr. 9, D-12163 Berlin Germany. Country Germany

Field and laboratory work was carried out to study the possible impact of 4 different species of bark beetle enemies. These are Scoloposcelis pulchella Zetterstedt 1838 (Heteroptera: Anthocoridae), Thanasimus formicarius Linnaeus 1758 (Coleoptera: Cleridae) Nemosoma elongatum Linnaeus 1761 (Coleoptera: Ostomidae) and Medetera dendrobaena Kowarz 1877 (Diptera: Dolichopodidae). These species are preying upon many bark beetles. The main prey species of N. elongatum and M. dendrobaena are Pityogenes chalcographus Linnaeus 175 8 (Coleoptera: Scolytidae) and Taphrorychus bicolor Herbst 1793 (Coleoptera: Scolytidae), S. pulchella mainly attacks P. chalcographus. On spruce the bark beetle Ips typographus Linnaeus 1758 (Coleoptera: Scolytidae) is one of the most important prey species of T. formicarius. The predator and the bark beetle species were reared in the laboratory to gain information about their biology. The Scolytidae were also reared to provide an adequate food supply fo! r ! the predators. In the laboratory, the egg production of the predator species and the prey consumption during their larval development were determined. Furthermore, the densities and the voltinism of the antagonists and of the bark beetles were investigated, Calculations to estimate the predator capacity of the 4 antagonistic species were performed. Based on this data the role of S. pulchella, T. formicarius, N. elongatum and N. dendrobaena in bark beetle regulation is discussed.

Egg Production; Forest Ecosystem; Population Density; Predation; Predator; Prey; Terrestrial Ecology

De Souza Ariana M and A. X. Linhares. 1997. Diptera and Coleoptera of potential forensic importance in southeastern brazil: relative abundance and seasonality. Medical & Veterinary Entomology. 11:8-12.

Address: Departamento De Parasitologia, Ib-Unicamp, Caixa Postal 6109, 13083-970 Campinas, Sp, Brazil. Country Brazil

To determine the species of Diptera and Coleoptera that visit and breed in carrion, four experiments, one for each season, were conducted from November 1992 to October 1993 in the vicinity of Campinas city, Southeastern Brazil. For each experiment two pigs weighing c. 10 kg were killed with a blow to the head with a blunt metallic object and immediately exposed, one in the shade and the other under sunlight. Adult insects and larvae leaving the carcass to pupate were collected daily. In addition, female blowflies were dissected in order to determine the stage of ovarian development. Five species of Calliphoridae: Chrysomya albiceps, C. megacephala, C. putoria, Phaenicia eximia and Hemilucilia segmentaria; three of Sarcophagidae: Pattonella intermutans, Liopygia ruficornis and Adiscochaeta ingens, and three of beetles: Dermestes maculatus, D. peruvianus (Dermestidae) and Necrobia rufipes (Cleridae), were considered of potential forensic importance, for they were able to bre! ed! in carrion exposed to natural environmental conditions. In addition, several fly species showed a definite seasonal pattern, with the Calliphoridae breeding more frequently during the warmer months of the year, and the Sarcophagidae preferring the cooler periods.

Adult; Forensic Entomology; Forensics; Larva; Seasonality

Brustel, H. 1997. Two new french localities for paratillus carus newman, 1840 (col. Cleridae). Entomologiste 53:159.

Address: Doumerc, F-31810 Clermont Le Fort, France. Country France

Aude; Biogeography; Climate; Dordogne; Gironde; Habitat; Minerve; Montcaret; Montoulieu; Soussac; Tarn

Bhuiyan, A. I and Saifullah A S. 1997. Biological note on necrobia rufipes (deg.) (Col.: Cleridae). Bangladesh Journal of Zoology. 25:121-124.

Address: Inst. Food Radiat. Biol., Atomic Energy Res. Establishment Gpo Box 3787, Dhaka, Bangladesh. Country Bangladesh

Some aspects of the biology of Necrobia rufipes were studied in the laboratory at 30 +- 0.5degreeC, 80 +- 5% r.h. and 8 hr of photoperiod. A mixture of dried fish and copra (9.1) with 20 +- 2% moisture content was used as food. The mean egg size was 91.73 X 18 21(m. The average lengths of larva, pupa and adult were 9.5 +- 0.7mm, 4.5 +- 0.3mm and 6.4 +- 0.4mm, respectively. The duration of egg, larval and pupal stages were 4.11 +- 0.42, 32.06 +- 5.21 and 9.92 +- 1.68 days, respectively. The average longevity of the adults was found to be 60.64 +- 3.9.46 days for females and 49.42 +- 18.2 days for males. In the absence of food, the adults showed cannibalistic behaviour. The mean fecundity recorded was 89.7 +- 17.8 eggs with a range of 0-350 eggs per female. The hatchability was 89.59 +- 7.27%. Egg laying continued until the death of the female.

Adult Longevity; Cannibalistic Behavior; Egg Laying

Berendes, K.-H. 1997. Studies on the sensitivity of Thanasimus formicarius l. To dimethoate formulated as rogor under laboratory conditions. BIOLOGISCHE BUNDESANSTALT FUER LAND- UND FORSTWIRTSCHAFT: Ed. Communications from the Federal Biological Institute for Agriculture and Forestry Berlin-Dahlem; Comparative studies on the sensitivity of non-target arthropods to plant protection products and feasibility of predicting risk based on exposure. Mitteilungen aus der Biologischen Bundesanstalt fuer Land- und Forstwirtschaft Berlin-Dahlem; Vergleichende Laboruntersuchungen zur Sensitivitaet von Nichtzielarthropoden gegenueber Pflanzenschutzmitteln und Moeglichkeiten der expositionsabhaengigen Risikoabschaetzung. 67-74.

Address: [A] Biol. Bundesanst. Land- Forstwirtsch., Inst. Pflanzenschutz Forst, Braunschweig Germany. Country Germany

Book Chapter

Wilson, I. M, Borden J H, Gries R, and Gries G. 1996. Green leaf volatiles as antiaggregants for the mountain pine beetle, dendroctonus ponderosae hopkins (Coleoptera: scolytidae). Journal of Chemical Ecology. 22:1861-1875.

Address: [A] Cent. Pest Management, Dep. Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia V5a 1s6 Canada. Country Canada

We tested the hypothesis that green leaf volatiles act as antiaggregants for the mountain pine beetle (MPB), Dendroctonus ponderosae Hopkins. In coupled gas chromatographic-electroantennographic detection (GC-EAD) analysis MPB antennae responded to 30 ng doses of all six-carbon green leaf alcohols tested (1-hexanol, (E)-2-hexen-1-ol, (Z)-2-hexen-1-ol, (E)-3-hexen-1-ol, and (Z)-3-hexen-1-ol), but not to the aldehydes, hexanal or (E)-2-hexenal, or to alcohol or aldehyde homologues with more or fewer than six carbon atoms. In field trapping experiments a blend of green leaf alcohols (1-hexanol, (Z)-2-hexen-1-ol, (E)-3-hexen-1-ol and (Z)-3-hexen-1-ol) effectively disrupted the response to attractive semiochemicals; a blend of the aldehydes hexanal and (E)-2-hexenal was inactive. The two best disruptants, (E)-2-hexen-1-ol and (Z)-3-hexen-1-ol, reduced catches of both sexes to levels not significantly different from catches in unbaited control traps. They also reduced the attack! o! n trees baited with attractive MBP pheromones to a level not significantly different from that on unbaited control trees. Neither of the clerid predators captured, Enoclerus sphegeus (F.) nor Thanasimus undatulus (Say), was repelled by green leaf volatiles. Our results suggest that green leaf alcohols are promising disruptants which may be used to supplement the antiaggregation pheromone, verbenone, in protecting single high-value trees as well as carefully selected stands with low-level populations of MPBs.

(E)-2-Hexen-1-Ol; (E)-2-Hexenal; (E)-3-Hexen-1-Ol; (Z)-2-Hexen-1-Ol; (Z)-3-Hexen-1-Ol; Aldehydes; Analytical Method; Antiaggregant; Antiaggregants; Coupled Gas Chromatographic-Electroantennographic Detection Analysis; Green Leaf Volatiles; Hexanal; Pesticides; 1-Hexanol

Veer, V., Negi B K, and Rao K M. 1996. Dermestid beetles and some other insect pests associated with stored silkworm cocoons in india, including a world list of dermestid species found attacking this commodity. Journal of Stored Products Research. 32:69-89.

Address: [A] Entomol. Div., Defense R and D Establishment, Gwalior-474 002 India. Country India

A key for the identification of adult and mature larvae of nine species of Dermestidae (Coleoptera) found associated with the Indian silkworm industry is given. The species included are Dermestes ater De Geer, Dermestes leechi Kalik, Dermestes maculatus De Geer, Dermestes undulatus Brahm, Attagenus birmanicus Arrow, Attagenus fasciatus (Thunberg), Orphinus fulvipes (Guerin-Meneville), Trogoderma halsteadi Vijay Veer and Rao, and Anthrenus flavipes (Le Conte). Notes on the biology and distribution are given for all species and detailed morphological descriptions of adult and mature larval stages are presented for D. ater, D. leechi, Att. birmanicus and O. fulvipes. D. ater and Att. fasciatus and T. halsteadi are serious pests of silkworm cocoons which are damaged by larvae boring into them to feed on pupae. Some information is given on damage to silk fabrics. Att. birmanicus and O. fulvipes are recorded for the first time as minor pests of the silkworm industry in India. A ! wo! rld list of 28 dermestid species recorded in association with the silk industry is appended. In addition, brief notes are included on three other beetles, Alphitobius laevigatus (F.), Tribolium castaneum (Herbst) (Tenebrionidae) and Necrobia rufipes (De Geer) (Cleridae), and an earwig, Marava arachidis (Yersin), which were also found associated with sericulture in India.

Identification Key; Pest Control; Stored Product Pest; Taxonomic Key

Solervicens, J. A. 1996. Taxonomic revision of the genus notocymatodera schenkling 1907 (Coleoptera: Cleridae). Acta Entomologica Chilena. 20:99-106.

Address: Instituto Entomologia, Univ. Metropolitana Ciencias De La Educacion, Casilla 147, Santiago, Chile. Country Chile

A revision of the genus Notocymatodera Schenkling, 1907 is made. Cymatodera modesta Spinola, 1849 (nec Spinola, 1844) correspond to a misidentification and is synonymized with Notocymatodera dimidiata (Germain, 1855). A redescription of N. dimidiata (Germain, 1855), type species of the genus, is made and its geographic distribution is determined. A new species, N. variabilis, is described.

Description; Geographic Distribution; Systematics

Schroeder, L. M. 1996. Interactions between the predators Thanasimus formicarius (col.: Cleridae) and rhizophagus depressus (col.: Rhizophagidae), and the bark beetle tomicus piniperda (col.: Scolytidae). Entomophaga. 41:63-75.

Address: Swedish Univ. Agricultural Sciences, Dep. Entomol., 750 07 Uppsala, Sweden. Country Sweden

The occurrences of Thanasimus formicarius (L.) (Cleridae), Rhizophagus depressus (F.) (Rhizophagidae), and Epuraea marseuli Reitter (Nitidulidae) in cut Scots pines, Pinus sylvestris L., attacked by Tomicus piniperda (L.) (Col.: Scolytidae) were recorded in the field, and interactions between the species were studied in caged pine bolts attacked by T. piniperda. T. formicarius eggs and R. depressus adults were abundant in the T. piniperda attacked trees, whereas only a few individuals of E. marseuli were found. T. formicarius and R. depressus, but not E. marseuli, reproduced in the caged bolts. T. piniperda offspring production per unit area of bark was reduced by 41 % when reared with R. depressus, by 81 % when reared with T. formicarius, and by 89% when all three species were reared together, compared with T. piniperda alone. The interaction between T. formicarius and R. depressus was mutually antagonistic. When both species were present in the same bolt the total number! o! f larvae was reduced by 49% for R. depressus and the number of large larvae (length gt 10 mm) was reduced by 35% for T. formicarius compared with their respective production values when each species was present alone with the bark beetle. There was a positive relationship between T. piniperda egg gallery density and the production of R. depressus larvae per m-2. Larvae of both R. depressus and T. formicarius developed into new adults during the first summer.

Biobusiness; Biological Control; Biological Control Agent; Host; Pest; Pest Management; Predator; Predator-Prey Interaction; Reproduction

Rossi, W. and Weir Alex. 1996. New species of laboulbeniales (fungi, ascomycetes) from sulawesi, indonesia. Canadian Journal of Botany. 74:77-83.

Address: [A] 32 Hartburn Lane, Stockton-on-Tees, Cleveland Ts18 3qh Uk. Country Uk

Four new species of Laboulbeniales occurring on beetles (Coleoptera) from Sulawesi (Celebes), Indonesia, are described and illustrated: Cucujomyces celebensis sp.nov. parasitic on Hyliota sp. (Cucujoidea, Cucujidae), Dimeromyces storkii sp.nov. parasitic on Eustra matanga Andrewes and Eustra plagiata Schm.-Goebel (Carabidae, Paussinae), Laboulbenia hammondii sp.nov. parasitic on Omadius spp. (Cleridae), and Rickia anthribidicola sp.nov. parasitic on Hypseus vestitus Jordan (Anthribidae, Anthribinae). All of the new species are compared with existing taxa. Of particular note is R. anthribidicola, which represents the first confirmed instance of parasitization by a laboulbenialean fungus on members of the hyperdiverse beetle family Anthribidae.

Beetle Infection; Description; Ecology; Geographic Distribution; Morphology; Nomenclature; Taxonomy

Ross, D. W., Gibson Kenneth E, Thier Ralph W, and Munson A Steve. 1996. Optimal dose of an antiaggregation pheromone (3-methylcyclohex-2-en-1-one) for protecting live douglas-fir from attack by dendroctonus pseudotsugae (Coleoptera: scolytidae). Journal of Economic Entomology. 89:1204-1207.

Address: [A] Northern Region, Coop. Forest. Pest Manage., Usda Forest Serv., P.o. Box 7669, Missoula, Mt 59807 Usa. Country Usa

The Douglas-fir beetle, Dendroctonus pseudotsugae Hopkins, antiaggregation pheromone, 3-methylcyclohex-2-en-1-one (MCH), was applied to stands of Douglas-fir, Pseudotsuga menziesii (Mirbel) Franco, at high risk for infestation to determine the lowest effective dose for protecting live trees. MCH was applied at rates of 50, 100, and 150 bubble capsules per hectare (20, 40, and 60 g/ha, respectively) in 1994, and 15, 30, and 50 bubble capsules per hectare (6, 12, and 20 g/ha, respectively) in 1995. Mean release rates throughout the beetle flight periods in 1994 and 1995 were 1.63 and 1.23 milligrams per capsule per day, respectively. For both years, catches of Douglas-fir beetles in pheromone-baited traps located at the plot centers were significantly lower on all MCH-treated plots compared with untreated plots, but there were no differences among the 3 doses of MCH. In contrast, MCH had no effect on the numbers of 3 predators (Thanasimus undatulus (Say), Enoclerus sphegeus ! F.! , and Temnochila chlorodia (Mannerheim)) collected in the traps during either year. In 1994, the percentage of Douglas-fir gtoreq 20 cm diameter at breast height (dbh) that were mass attacked was significantly lower on MCH-treated plots compared with the untreated control, and all 3 doses were equally effective. In 1995, there were no significant differences in the percentage of mass-attacked trees among the treatments. These results demonstrate that MCH applied at rates as low as 20 g/ha (50 bubble capsules per hectare) can reduce the probability that high-risk Douglas-fir will become infested.

Antiaggregation Pheromone; Host; Optimal Dose; Pest; Pest Control; Pest Management; Predator; 3-Methylcyclohex-2-En-1-One

Rifkind, J. 1996. New species of ant-like Enoclerus gahan from mexico (Coleoptera: Cleridae). Entomological Problems. 27:65-73.

Address: 11322 Cmarillo St., No. 304, North Hollywood, Ca 91602, Usa. Country Usa

Three new species of ant-like Mexican Enoclerus (Enoclerus) are described and figured: E. (E.) topes, E. (E.) bellamyi, and E. (E.) zacryptoceroides. Their probable involvement in ant mimicry complexes is discussed.

Description; Geographic Distribution; Mimicry; Systematics

Rifkind, J. 1996. A new genus and species of checkered beetle from honduras with additions to the honduran fauna (Coleoptera: Cleridae). Contributions in Science 461:1-10.

Address: Natural History Museum Los Angeles County, 900 Exposition Boulevard, Los Angelss, Ca 90007, Usa. Country Usa

Barrotillus kropotkini, a new genus and species of Honduran tilline, is described and illustrated; a key and a comparative table of characters are provided to facilitate discrimination of the new taxon from other members of its tribe in Honduras. New records for clerids in Honduras are presented.

Comparative Morphology; Description; Geographic Distribution; New Geographic Records; Systematics

Reeve, J. D., Simpson John A, and Fryar Jonny S. 1996. Extended development in Thanasimus dubius (f.) (Coleoptera: Cleridae), a predator of the southern pine beetle. Journal of Entomological Science. 31:123-131.

Address: South. Res. Stn., Usda for. Serv., Pineville, La 71360, Usa. Country Usa

Thanasimus dubius (F.) is an important predator of the southern pine beetle, Dendroctonus frontalis Zimmermann, a major pest of pine forests in the southern United States. We examined the development of T. dubius in the field using emergence traps, and by sampling the bark of trees previously attacked by D. frontalis. Over a 2-year period, several distinct episodes of T. dubius emergence occurred in trees enclosed by emergence traps, and bark sampling of other trees uncovered many T. dubius immatures almost 2 years after attack by D. frontalis. These results indicate that T. dubius development may be significantly longer and more variable under natural conditions than previously thought, and suggest that some individuals may undergo a diapause.

Biological Control; Diapause; Emergence; Immature; Pine Pest

Ratti, E. 1996. Catalogue of the Coleoptera of the lagoon of venice. Viii - trogossitidae, Cleridae, lymexylidae. Bollettino del Museo Civico di Storia Naturale di Venezia. 47:177-185.

Address: [A] Museo Civico Storia Naturale, S. Croce 1730, I-30125 Venezia Italy. Country Italy

A list of Trogossitidae, Cleridae, and Lymexylidae recorded from the lagoon, the seashore, the surrounding mainland, and the urban environments of Venice (including species intercepted in the harbour of Venice on both foreign logs and foodstuffs), is given. Old, doubtful records from literature, not confirmed by the present research, are prefixed by mchlt?mchgt.

Lagoon: Habitat; Seashore: Habitat; Urban Environment: Habitat; Catalog

Racca, F. F. and Peracchi Adriano Lucio. 1996. Contribution to the study of lasiodera gray e philyra laporte, gen. Rev. (Coleoptera, Cleridae). Revista Brasileira de Zoologia. 13:357-397.

Address: Inst. Biol., Univ. Fed. Rural Rio De Janeiro, 23851-970 Seropedica, Rj, Brazil. Country Brazil

This paper includes a revision of the species considered up to now in the genus Lasiodera Gray, 1832 with a detailed study of external morphology as well as males external genitalia which made to propose the separation into two genera, Lasiodera Gray, 1932 and Philyra Laporte, 1836, being the second one revalidated, which is now constituted by the following species: Philyra basalis (Racca Filho & Santos, 1988) comb. n., P. helopioides Laporte, 1836 comb. n.,P. jucunda (Schenkling, 1900) comb. n., P. quadrivittata (Peracchi, 1960) comb. n., P. stenochioides (Chevrolat, 1874) comb. n. and P. viridis (Pic, 1936) comb. n. The male genital structures, showing specific differences, are illustrated and discussed. Lasiodera malleri (Pic, 1933) is considered a synonym of L. ruficollis (Gorham, 1877). Lasiodera ornata (Klug, 1842) and L. voluptuosa (Thomson, 1860) had not their external genitalia examined because they are not represented in the collections studied. To identify the s! pe! cies of the genera, systematic keys are also presented.

Description; Genitalia; Reproductive System; Synonymy; Systematics

Menier, J. J. 1996. Preliminary description of bousquetoclerus arachnoides gen. N. Sp. N., A micropterous Cleridae from china (Coleoptera). Revue Francaise D'Entomologie 18:158.

Address: Lab. Entomol., Mnhn, 45 Rue Buffon, F-75005 Paris, France. Country France

A preliminary description of Bousquetoclerus arachnoides gen. n., sp. n., a micropterous Cleridae Clerinae from China (North Yunnan) is given.

Description; Geographic Distribution; Morphology; Systematics

Mawdsley, J. R. 1996. Key to species of omadius (Coleoptera: Cleridae) from manado, sulawesi, (indonesia) with new records and systematic notes. Entomological News. 107:329-331.

Address: Dep. Entomology, Comstock Hall, Cornell Univ., Ithaca, Ny 14853, Usa. Country Usa

A key is provided to the six species of Omadius recorded from Manado, Sulawesi (Indonesia): O. bivulneratus; O. fasciipes (NEW RECORD); O. indicus (NEW RECORD); O. prioceroides; O. mediofasciatus; and O. radulifer. Lectotypes are designated for Omadius bivulneratus and Omadius priocervides. Omadius femoralis and O. posticalis are placed in synonymy with O. mediofasciatus (NEW SYNONYMIES).

Biogeography; Synonymy; Systematics

Mawdsley, J. R. 1996. Key to palaearctic species of clerus fabricius (Coleoptera: Cleridae), with notes on mimicry. Entomologist's Gazette. 47:188-190.

Address: Dep. Entomol., Cornell Univ., Ithaca, Ny 14853, Usa. Country Usa

Distribution; Morphology; Systematics; Taxonomic Key

Lawson, S. A., Furuta K, and Katagiri K. 1996. The effect of host tree on the natural enemy complex of ips typographus japonicus niijima (col., Scolytidae) in hokkaido, japan. Journal of Applied Entomology. 120:77-86.

Address: [A] Inst. Biol. Sci., Univ. Tsukuba, Tsukuba, Ibaraki 305 Japan. Country Japan

The effect of host tree on the ecology of the insect natural enemy complex of Ips typographus was investigated. Tree species was found to influence parasitoid composition and abundance, with pteromalids being more abundant in Picea jezoensis than in P. abies. Within trees, bark texture had a significant influence on pteromalid density with higher densities occurring in smooth bark. Bark hardness was also shown to affect density of both pteromalid and braconid parasitoids. Pteromalid parasitoids were found to respond density dependently to host density. Predators showed no consistent response to host tree. Only the clerid predator Thanasimus substratum showed a density-dependent response to prey density. A predatory dolichopodid fly, Medetera sp., was shown to be a significant mortality factor for Ips typographus larvae. These results are compared to those of previous studies and their relevance to biological control commented upon.

Bark Hardness; Bark Texture; Biological Control; Economic Entomology; Environmental Sciences/Ecology; Hokkaido; Host; Larva; Mortality; Natural Enemy Complex; Parasitoid; Parasitoid Abundance; Parasitoid Composition; Parasitoid Density; Pest; Predator; Prey

Hornig, U. 1996. Trichodes species of upper lusatia (col., Cleridae). Entomologische Nachrichten und Berichte. 40:183-184.

Address: Lindenberger Str. 24, D-02736 Oppach/Ol, Germany. Country Germany

Biogeography; Habitat; Larva; Locality; Upper Lusatia

Hobson, K. R. and Raffa Kenneth F. 1996. Regional and seasonal shifts in bark beetle aggregation pheromones as an escape from predation. Bulletin of the Ecological Society of America. 77:198.
Address: Univ. Wisconsin, Madison, Wi 53706, Usa. Country Usa

Aggregation Pheromone; Ecology; Enantiomer; Endocrine System; Ipsdienol; Lanierone; Meeting Abstract; Predation Escape; Predator; Prey; Regional Shift; Seasonal Shift; Selection Pressure

Herard, F. and Mercadier G. 1996. Natural enemies of tomicus piniperda and ips acuminatus (col.; Scolytidae) on pinus sylvestris near orleans, france: temporal occurrence and relative abundance, and notes on eight predatory species. Entomophaga. 41:183-210.
Address: European Biol. Control Lab., U.s. Dep. Agric., Agric. Res. Serv., Parc Scientique Agropolis Ii, 34397 Montpellier Cedex 5, France. Country France
Ips acumiinatus (Gyllenhall) and Tomicus piniperda (L.) were the main scolytid beetles in Scots pine, Pinus sylvestric L., outbreak areas near Orleans, France during 1978-1979. Ips acuminatus attacked thin-bark logs while T. piniperda attacked thick-bark logs. More than 150 species of insects were associated with these scolytids. Forty-five species (31 predators and 14 parasitoids) were confirmed as natural enemies of bark beetles. Three predators were abundant: Thanasimus formicarius L. (Col.: Cleridae), Rhizophagus depressus (F.) (Col.: Rhizophagidae) and Medetera spp. (Kipt.: Dolichopodidae). The first two were especially frequent in galleries of T. piniperda, while Medetera spp. were more abundant in galleries of I. acuminatus. The main parasitoids were Rhopalicus tutela (Walker) and R. brevicornis Thomson (Hym.: Pteromalidae), Coeloides abdominalis Zetterstedt and C. melanostigma Strand, Dendrosoter middendorfi Ratzeburg and D. hartigii Ratzeburg, and Spathius rubidus! R! ossi (Hym.: Braconidae). These parasitoids are polyphagous. However, C. abdominalis was obtained from T. piniperda but not from I. acuminatus, while S. subidus and D. hartigii were obtained from I. acuminatus but not from T. piniperda. Temporal and relative abundance of natural enemies of T. piniperda and I. acuminatus were studied. The predators R. depressus and T. formicarius had complementary limiting effects on bark beetles as adults and larvae of R. depressus fed mainly on scolytid eggs, while T. formicarius adults attacked scolytid adults and the clerid larvae preyed upon scolytid larvae. The predatory pressure applied by T. formicarius and R. depressus to T. piniperda early during the spring was later complemented by a series of parasitoids and other predators. This sequential timing of the natural enemies of T. piniperda suggests that the interactions among the gild are more complementary than adverse. Differential timing of the natural enemies in logs infested by I.! a! cuminatus and some evidence of competition between the predators Medetera spp. and parasitoids suggested a less effective control of this scolytid. Number and duration of larval instars were determined, and measurements of predatory activity were made for Thanasimus formicarius, Rhizophagus depresus, Hypophloeus fraxini Kugelann (Col.: Tenebrionidae), Platysoma fronale Paykull (Col.: Histeridae), and Xylocoris cursitans (Fallen) (Het.: Anthocoridae). Predatory activity was evaluated for last instar larvae and adults of Scoloposcelis obscurella (Zetterstedt) (Het.: Anthocoridae), and for last instar larvae of Medetera sp. and Lonchaea collini Hackman (Dipt.: Lonchaeidae).
Biobusiness; Biological Control Agent; Host; Natural Enemy; Orleans; Parasitoid; Pest; Pest Control; Pest Management; Predator; Relative Abundance; Temporal Occurrence

Hansen, M., Mahler Viggo, Palm Eivind, and Pedersen Jan. 1996. 15th supplement to the list of danish Coleoptera. Entomologiske Meddelelser. 64:233-272.
Address: [A] Dalforet 16, 3 Th., Dk-2300 Kobenhavn S Denmark. Country Denmark
In 1995 ten species of Coleoptera have been recorded as new to Denmark, viz. Bembidion octomaculatum (Goeze), Acrotrichis henrici (Matth.), Gyrohypnus angustatus Steph. (nec auct.) Philonthus micantoides Benick & Lohse, Thanasimus femoralis (Zett.), Epuraea placida Makl., Pteryngium crenatum (Fabr.), Euglenes nitidifrons (Thoms.), Simo variegatus (Boh.) and Ips cembrae (Heer). Two species, Nevraphes talparum Lokay and Semanotus undatus (L.), are deleted from the Danish list. The number of known Danish species of Coleoptera is now 3682. Faunistic, biological or nomenclatorial notes are given on ca. 1000 Danish species.
Biogeography; Faunistics; Key; Nomenclature; Taxonomic Key

Cronin, J. T., Reeve John D, Turchin Peter, and Wilkens Richard. 1996. Movement and spatial pattern of a pine beetle-predator interaction. Bulletin of the Ecological Society of America. 77:96.
Address: [A] Bucknell University, Lewisburg, Pa 17837 Usa. Country Usa

Clerid; Ecology; Economic Entomology; Meeting Abstract; Movement; Pine Pest; Predator; Prey-Predator Interaction; Spatial Pattern

Solervicens, J. and Rodriguez Lorena. 1995. Synonyms in species of eurymetopum of the maculatum group (Coleoptera: Cleridae). Acta Entomologica Chilena. 19:109-112.

Address: [A] Instituto De Entomologia, Universidad Metropolitana De Ciencias De La Educacion, Casilla 147, Santiago Chile. Country Chile

The synonymy between Eurymetopum maculatum Blanchard, 1844 and Eurymetopum pallens Blanchard, 1844 is proposed based on the presence of the chromatic pattern of E. maculatum in the descendants of a female of E. pallens. The recognition of two chromatic patterns in E. maculatum allow to synonymize Eurymetopum semiprasinum (Chevrolat, 1876) and Eurymetopum multinotatum Pic, 1950, which have the same chromatic differences showed by E. maculatum and E. pallens, are very related to them, and are morphologically undistinguishable.

Chromatic Pattern; Taxonomy

Ross, D. W. and Daterman Gary E. 1995. Response of dendroctonus pseudotsugae (Coleoptera: scolytidae) and Thanasimus undatulus (Coleoptera: Cleridae) to traps with different semiochemicals. Journal of Economic Entomology. 88:106-111.

Address: [A] Dep. Forest Science, Oregon State Univ., Corvallis, or 97331-7501 Usa. Country Usa

The attractiveness of frontalin alone and in combinations with ethanol, MCOL (1-methylcyclohex-2-en-1-ol), and seudenol (3-methylcyclohex-2-en-1-ol) to the Douglas-fir beetle, Dendroctonus pseudotsugae Hopkins, and associated predators was determined in northeastern Oregon. All three alcohols significantly increased attractiveness of frontalin to the Douglas-fir beetle. Seudenol was most attractive followed by ethanol and MCOL, respectively Seudenol plus ethanol was the only combination of alcohols that significantly increased attractiveness of frontalin more than that of seudenol alone. There was no increase in attractiveness to the Douglas-fir beetle with addition of MCOL to a lure containing ethanol or seudenol, or both. Seudenol significantly increased the percentage of male Douglas-fir beetles trapped, but ethanol had the opposite effect. MCOL had no significant effect on the sex ratio of trapped Douglas-fir beetles. Thanasimus undatulus (Say) was the only predator ca! ug! ht in appreciable numbers. Seudenol significantly increased the number of T. undatulus caught in the traps compared with the other alcohols. These results suggest that the combination of frontalin, seudenol, and ethanol is the most effective lure tested for trapping the Douglas-fir beetle.

Lure; Pest Control; Trapping

Ross, D. W. and Daterman Gary E. 1995. Efficacy of an antiaggregation pheromone for reducing douglas-fir beetle, dendroctonus pseudotsugae hopkins (Coleoptera: scolytidae), infestation in high risk stands. Canadian Entomologist. 127:805-811.

Address: [A] Dep. Forest Science, Oregon State Univ., Corvallis, or 97331 Usa. Country Usa

The Douglas-fir beetle (Dendroctonus pseudotsugae) antiaggregation pheromone, 3-methylcyclohex-2-en-1-one (MCH), was applied to stands at high risk for infestation. The MCH was applied in a bubble capsule formulation to plots ranging from 2.1 to 2.6 ha in size at rates of 45-76 g/ha. Catches of Douglas-fir beetles in attractant-baited Lindgren funnel traps located at the plot centers were significantly lower on MCH-treated plots compared with untreated plots. In contrast, catches of the most abundant predator, Thanasimus undatulus (Say), were unaffected by the MCH treatment. The percentage of Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) trees gtoreq 20 cm dbh that were mass attacked was significantly lower on treated plots (0.2%) compared with untreated plots (8.5%). MCH alone was effective in reducing the probability of Douglas-fir beetle infestations occurring in high risk stands.

Behavior; Biological Control; 3-Methylcyclohex-2-En-1-One

Mawdsley, J. R. 1995. Key to the indian species of the genera orthrius gorham and xenorthrius gorham (Coleoptera: Cleridae: clerinae). Journal of the Bombay Natural History Society. 92:40-42.

Address: Dep. Entomol., Museum Comparative Zool., Harv. Univ., Cambridge, Ma 02138, Usa. Country Usa

Dichotomous keys are provided for the identification of the 17 species- of the genus Orthrius Gorham and the 5 species of the genus Xenorthrius Gorham known from India. Orthrius stevensi Corporaal is synonymised with Orthrius binotatus (Fisher), New synonymy.

Clerinae; Oriental Region; Synonymy; Systematics

Weslien, J. 1994. Interactions within and between species at different densities of the bark beetle ips-typographus and its predator Thanasimus-formicarius. Entomologia Experimentalis Et Applicata 71:133-143.*Interactions between the bark beetle Ips typographus and one of its predators, Thanasimus formicarius, were investigated in caged spruce logs containing both species in eight different density combinations. Productively (offspring per female) of Ips was adversely affected by high Ips gallery density as well as high Thanasimus density. Thanasimus productivity was enhanced by high Ips gallery density but negatively affected by high Thanasimus density. Ips productivity and Thanasimus developmental rate differed between tree individuals, probably owing to tree-related differences in phloem thickness. Relative predator-caused Ips mortality was ca 20% higher at high gallery density (ca 300 egg galeries per m(2)) than at low gallery density (ca 100 egg galleries per m(2)), indicating that mortality was density dependent. This difference was due to the fact that Thanasimus larval density was positively related to Ips gallery density. Mortality increased by ca 0.4% with each additional Thanasimus larva per m(2), independently of gallery density. Relative population levels of Ips and Thanasimus were monitored with pheromone traps in two regions differing in their Ips typographus outbreak history. Absolute catch as well as the Thanasimus/Ips catch ratio were ten times greater in the outbreak region than in the non-outbreak region. Coupled with the results in the caging experiment, this indicates that T. formicarius responds numerically to changes in I. typographus numbers per unit bark area as well as to Ips population changes at the regional level. The findings suggest that predation under bark may be a significant factor in supressing I. typographus outbreaks.*

Ips Typographus, Thanasimus Formicarius, Scolytidae, Cleridae, Predation, Competition, Density Dependence/Coleoptera

Schroeder, L. M. and J. Weslien. 1994. Reduced offspring production in bark beetle tomicus-piniperda in pine bolts baited with ethanol and alpha-pinene, which attract antagonistic insects. Journal of Chemical Ecology 20:1429-1444.*Bolts of Scots pine, Pinus sylvestris L., attacked by the bark beetle Tomicus piniperda (L.) were baited with ethanol and a-pinene to attract antagonistic insects and thereby enhance their detrimental effects on the production of bark beetle progeny. Unbaited and caged bolts were included in the experiments as controls. Attraction of beetles to the bolts and subsequent emergence were estimated using traps. Six phloem-feeding species (potential competitors of T. piniperda) and four predatory species were caught in significantly higher numbers at the baited bolts than at the unbaited ones. The number of offspring and the productivity of T piniperda were four to seven times higher in unbaited bolts than in baited bolts. Exclusion of other insects, by using cages, resulted in a nine-fold increase in the number of T. piniperda offspring per square meter and productivity (offspring per egg gallery) compared with unbaited, exposed bolts. Hylurgops palliatus (Gyll.) (Scolytidae) and Rhagium inquisitor (L.) (Cerambycidae) attacked both the baited and unbaited bolts, whereas Acanthocinus aedilis (L.) (Cerambycidae) and Pytho depressus (L.) (Pythidae) reproduced almost exclusively in the baited ones. Large numbers of larvae of Thanasimus (Cleridae) and Rhizophagus (Rhizophagidae) emerged from both the baited and unbaited bolts. Adults of Plegaderus vulneratus (Panzer) and Cylister linearis (Er.) (Histeridae) emerged almost exclusively from the baited bolts. The low progeny production of T piniperda in the baited bolts was attributed largely to the influence of adults of Rhizophagus and Epuraea (Nitidulidae), and larvae of Thanasimus and A. aedilis.*

Tomicus-Piniperda, Thanasimus-Formicarius, Rhizophagus-Depressus, Rhizophagus-Ferrugineus, Epuraea Spp, Acanthocinus-Aedilis/Ips-Typographus/Host Volatiles/Shoot Beetles/Natural Enemies/Lodgepole Pine/L Coleoptera/Scolytidae/Weevil

Schroeder, L. M. and J. Weslien. 1994. Interactions between the phloem-feeding species tomicus-piniperda (col, scolytidae) and acanthocinus-aedilis (col, cerambycidae), and the predator Thanasimus-formicarius (col, Cleridae) with special reference to brood production. Entomophaga 39:149-157.*Interactions between Tomicus piniperda (L.) (Col.: Scolytidae), Acanthocinus aedilis (L.) (Col.: Cerambycidae) and Thanasimus formicarius (L.) (Col.: Cleridae) were investigated in caged pine bolts. The treatments were T. piniperda alone, A. aedilis alone, T. piniperda together with A. aedilis, T. piniperda together with T. formicarius and all three species together.T. piniperda offspring production per m(2) was reduced by 92 % when reared with T. formicarius, by 78 % when reared with A. aedilis, and by 94 % when all three species were reared together, compared with T. piniperda reared alone. A. aedilis had a negative influence on the offspring production of T. formicarius and vice versa. When both species were present in the same bolt (together with T. piniperda) offspring production was reduced by 74 % for A; aedilis and by 42 % for T. formicarius compared with their respective production values when each species was present alone with the bark beetle. The new generation of T. formicarius emerged as larvae from June to August while most of the A. aedilis offspring emerged as adults from September to October, leaving only a few larvae in the bolts to hibernate. A. aedilis only reproduced in a small part of one of the bolts without bark beetles.*

Offspring Production, Competition, Predation/Ips/Coleoptera/Beetles/Impact

Ross, D. W. and G. E. Daterman. 1994. Reduction of douglas-fir beetle infestation of high-risk stands by antiaggregation and aggregation pheromones. Canadian Journal of Forest Research-Revue Canadienne De Recherche Forestiere 24:2184-2190.*A combination of antiaggregation and aggregation pheromones was tested for protecting stands of Douglas-fir (Pseudotsuga menziesii (Mirb.) France) at high risk for infestation by the Douglas-fir beetle (Dendroctonus pseudot-sugae Hopkins). The antiaggregation pheromone, 3-methylcyclohex-2-en-1-one (MCH), was applied in a bubble capsule formulation to the perimeter of 1-ha circular plots at a rate of 60 g/plot. Treated plots also had three or four clusters of four Lindgren funnel traps baited with frontalin, seudenol, 1-methylcyclohex-2-en-1-ol, and ethanol located outside of the plot but within 160 m of the boundary. Mean (+/-SE) accumulated catches in all traps per plot were 73 658 +/- 19 721 Douglas-fir beetles and 12 892 +/- 2 513 Thanasimus undatulus (Say), a predator of the Douglas-fir beetle. The mean percentage of Douglas-fir trees greater than or equal to 20 cm DBH that were mass attacked was reduced by 80% within the treated plots compared with the untreated plots. However, there was an eightfold increase in the percentage of trees mass attacked in the area outside the treated plots in the vicinity of the funnel traps. The net effect of the treatment was to concentrate mass-attacked trees within a limited area outside of the protected stand. Our results indicate that Douglas-fir beetle antiaggregation and aggregation pheromones can be used effectively to reduce the probability of infestation in small, high-value stands.*
Dendroctonus-Pseudotsugae Coleoptera/Hopkins Coleoptera/Scolytidae/1-Methylcyclohex-2-En-1-Ol/Population

Rifkind, J. 1994. New species of mexican Enoclerus gahan (Coleoptera, Cleridae). Coleopterists Bulletin 48:283-292.*Two new species of Mexican Enoclerus (Enoclerus) Gahan are described and illustrated: E. (E.) gabriellae from Oaxaca and Chiapas and E. (E.) madrensis from the Sierra Madre Occidental of Sinaloa. Likely interspecific relationships of the former are discussed. An argument is presented in favor of the simple species description as a valid taxonomic endeavor.*

Morrone, J. J., S. R. Junent, and J. V. Crisci. 1994. South-american beetles. Research & Exploration 10:104-115.*Analysis of the ranges of 67 Coleoptera species from the sub-Antarctic dominion of southern South America led to delimitation of 5 areas of endemism, namely Maule, Valdivian forest, Magellanic forest, Magellanic moorland, and Islas Malvinas (Falkland Islands). A cladistic biogeographic analysis of these areas was carried out, based on cladograms of the following 7 taxa: Creobius plus Cascellius (Carabidae); Eurymetopum modestum and maculatum species groups (Cleridae); Falklandius, Antarctobius, Germainiellus, and Anthonomus ornatus species group (Curculionidae). One general area cladogram was obtained applying the 3-area statements technique under both assumptions 0 and 1. According to this cladogram, the following sequence of area fragmentation could be hypothesized: (Maule (Valdivian forest (Islas Malvinas (Magellanic moorland, Magellanic forest)))).*
Biogeography/Diversity/Biodiversity/Coleoptera/Choice/Agony

Mawdsley, J. R. 1994. Systematic notes on neotropical checkered beetles of the genus Enoclerus gahan (Coleoptera, Cleridae). Studies on Neotropical Fauna and Environment 29:145-148.*One new species of the genus Enoclerus Gahan, E. alicei sp. n., is described from Mexico. Enoclerus laticinctus (White), resurrected specific epithet, is shown to be a senior rather than junior homonym of E. latecinctus (LeConte). Clerus lateluteus Pic is placed as a synonym of E. laticinctus (White). E. laticinctus is recorded for the first time from Colombia.*

Mawdsley, J. R. 1994. New records of checkered beetles (Coleoptera, Cleridae) from hainan-island, china, with a key to the known species. Proceedings of the Entomological Society of Washington 96:413-416.*The following 18 species of Cleridae (Coleoptera) are recorded from Hainan Island, China, for the first time: Orthocladiscus dimorphus (Lesne); Cylidroctonus chalybaeum (Westwood); Tilloidea notata (Klug); Callimerus amabilis Gorham; Callimerus chinensis Schenkling; Callimerus cyaneus (Thomson); Opilo mollis (Linnaeus); Orthrius striatopunctatus Schenkling; Orthrius sinensis Gorham; Orthrius binotatus (Fisher); Trichodes ircutensis (Laxmann); Tillicera cleroides Gorham; Thanasimus substriatus (Gebler); Omadius clytiformis Westwood; Omadius mediofasciatus Westwood; Omadius fasciipes Westwood; Dasyceroclerus ignavus (Westwood); Stigmatium mutillaecolor (White). The placement of two nomina nuda created by Hua is discussed. A key to the 18 species of Cleridae known from Hainan Island is provided.*
Coleoptera, Cleridae, Hainan-Island, China

Mawdsley, J. R. 1994. Mimicry in Cleridae (Coleoptera). Coleopterists Bulletin 48:115-125.*An annotated list of all known examples of mimicry involving members of the family Cleridae arranged according to the system proposed by Corporaal in the Coleopterorum Catalogus is provided. Trends in the evolution of mimicry within clerid genera, groups of genera, and subfamilies are discussed. In general, clerids most frequently mimic other species of Coleoptera (mimicked by species of 31 clerid genera), followed closely by aculeate Hymenoptera (mimicked by species of 24 clerid genera), while zygaenid moths and tachinid flies are mimicked by species of one and two genera of Cleridae, respectively. The coloration patterns employed in the latter two mimetic complexes are hypothesized to have evolved through exaptation of coloration patterns used in other mimetic interactions and in cryptic camouflage. The relation of mimicry in Cleridae to clerid biology and the use of characters evolved through mimetic interactions in reconstruction of phylogenies of groups within the family Cleridae are discussed.*

Levinson, H. and A. Levinson. 1994. Origin of grain storage and insect species consuming desiccated food. Anzeiger Fur Schadlingskunde Pflanzenschutz Umweltschutz 67:47-60.*The dwellers of ancient Egypt (km't*) have left in their tombs, paintings and papyri an immeasurable legacy of information concerning their religion, writing, language, agriculture, food storage and pest control. Several insect species (belonging to the families Anobiidae, Braconidae, Cleridae, Curculionidae, Cyclorrhapha, Dermestidae, Phycitidae, Ptinidae and Tenebrionidae) were found in the corpses (kha't) as well as the food offerings (pert er kheru) given to the deceased, which have been buried in predynastic (approximately 4500-2900 B. C.) and dynastic tombs (approximately 2900 B. C. -395 A. D.). These funerary insects witness the early occurrence of necrophagous and graminivorous pests infesting human and animal corpses as well as stored food offerings. Such infestations by harmful intruders may represent one of the first traceable links between insects and man in history. The understandable anxiety of the priests that tomb-defiling insects (apshait) may injure the mummified body of the dead, is expressed in chapter 36 of the Book of the Dead (XVIII. - XXII. Dynasty), used as a manual of instructions for the resurrected deceased (aakhu) in the underworld (duat).It is understood that the ancient Egyptians were not able to foresee that extensive employment of spacious stores stuffed with food supplies will attract 2 - 3 dozens of insect species and provide them with vast amounts of desiccated seeds, plant and animal tissues. The insects thus gained optimal conditions for their propagation and rapid build-up of dense pest populations. The country-wide use of large granaries and other food stores can be regarded as an early historical incidence interfering with the natural equilibrium among insects and man.The insect species breeding in desiccated cereals and other foodstuffs stored in ancient Egypt have probably originated from ancestors which prevailed in specific natural habitats (where they may be found also at present). The shift of those insect species from natural habitats to the storage environment was probably promoted by the ability of the former to live in storage buildings and utilize desiccated and partly nutrient-deficient foodstuffs - owing to their efficient water conservation, microbial supplementation of lacking nutrients, adaptation of their reproductive behaviour to reduced space and illumination as well as due to employment of a larval diapause in response to adverse conditions.*

Hayes, J. L., B. L. Strom, L. M. Roton, and L. L. Ingram. 1994. Repellent properties of the host compound 4-allylanisole to the southern pine-beetle. Journal of Chemical Ecology 20:1595-1615.*The phenylpropanoid 4-allylanisole is a compound produced by loblolly pines (Pinus taeda L.), an abundant species in southern pine forests and a preferred host of southern pine beetle (Dendroctonus frontalis Zimmermann). Repellency of individual beetles was demonstrated in laboratory behavioral assays of D. frontalis and other scolytids. Inhibition was demonstrated in natural populations of D. frontalis using baited traps. In both tests, response to the inhibitory pheromone verbenone was used for comparison. In the laboratory, a higher proportion of newly emerged and reemerged D. frontalis responded negatively to 4-allylanisole than to verbenone. However, fewer reemergent than newly emerged individuals responded to either compound. In all field trials, the response of D. frontalis to its attractant pheromone in funnel traps was significantly reduced by simultaneous release of 4-allylanisole. In most trials total reduction did not differ from verbenone; however, unlike verbenone, 4-allylanisole reduced male and female catches proportionally. Both compounds together did not significantly further reduce trap catch. The response of a major predator, Thanasimus dubius (F.), to the attractant pheromone of D. frontalis, did not differ with the simultaneous release of either verbenone or 4-allylanisole. The results of preliminary field applications are presented and discussed.*
Coleoptera, Scolytidae, Dendroctonus-Frontalis, Pinus, Host Compound, 4-Allylanisole, Repellent, Semiochemical, Verbenone, Inhibitor/Ips-Paraconfusus Coleoptera/Dendroctonus-Frontalis Coleoptera/Bark Beetles/Lodgepole Pine/Ponderosa Pine/Scolytidae Infestations/Behavioral Chemicals/Primary Attraction/Brevicomis/Pheromone

Hayes, J. L. and B. L. Strom. 1994. 4-allylanisole as an inhibitor of bark beetle (Coleoptera, scolytidae) aggregation. Journal of Economic Entomology 87:1586-1594.*To assess the extent of inhibitory activity of the host compound 4-allylanisole, we conducted field studies with three scolytid species. These species are geographically widespread and economically important. Trials were completed with Dendroctonus brevicomis LeConte (California), D. ponderosae Hopkins (Oregon), and Ips pini (Say) (Wisconsin) by using multiple-funnel traps with appropriate pheromone-based attractants. With the Dendroctonus species, the effects of 4-allylanisole were compared with verbenone, an aggregation inhibitor produced by beetles themselves. We also determined effects of the treatments on the most abundant coleopterous predators in each trial. Inhibition of bark beetle aggregation behavior by 4-allylanisole was demonstrated for D. ponderosae (Oregon) and I. pini (Wisconsin). In Oregon, 4-allylanisole reduced the catch of D. ponderosae at attractant-baited traps by 77%, whereas verbenone reduced the catch by 91% compared with attractant alone. Although both reductions were significant, the effect of verbenone was significantly greater than that of 4-allylanisole. In Wisconsin, addition of 4-allylanisole to attractant-baited traps resulted in a significant reduction (43%) in numbers of I. pini caught, compared with attractant alone. In the California trials, mean trap catches of D. brevicomis were reduced by both 4-allylanisole (35%) and verbenone (27%) compared with attractant alone, but neither reduction was significant. Sex ratios of target scolytids were not affected by inhibitory treatments in any trial. The predator Temnochila chlorodia (Mannerheim) (Coleoptera: Trogositidae) was not affected by 4-allylanisole in California; however, verbenone significantly reduced the number caught. Although captures were low, numbers of T. chlorodia caught by traps containing 4-allylanisole in Oregon were significantly higher than those containing verbenone or attractant alone (numbers in verbenone and attractant traps were not significantly different). Numbers of the predatory beetles counted in Wisconsin-Thanasimus dubius (F.) (Coleoptera: Cleridae), Platysoma parallelum Say (Coleoptera: Histeridae), and P. (Cylistix) cylindrica (Paykull) (Coleoptera: Histeridae)-were not affected by elution of 4-allylanisole with the attractant. Implications of these results for protection of individual trees and management of bark beetle populations are discussed.*
Scolytidae, 4-Allylanisole, Antiaggregation Behavior/Mountain Pine-Beetle/Ips-Paraconfusus Coleoptera/Dendroctonus-Brevicomis/British-Columbia/Lodgepole Pine/Pheromone/Verbenone/Semiochemicals/Attack/Field

Confalonieri, G., E. Marotta, F. Rama, P. Righi, G. Rosini, R. Serra, and F. Venturelli. 1994. Practical preparation of bicyclo[3.2.0]Hept-3-en-6-ones and it utilization in stereoselective total synthesis of grandisol and lineatin via a versatile intermediate. Tetrahedron 50:3235-3250.*New and efficient stereoselective total syntheses have been devised for racemic grandisol and lineatin, two important components of pheromonic blends. They are based on the utilisation of 1,4-dimethylbicyclo[3.2.0]hept-3-en-6-one as a pivotal intermediate. This compound, as well as other bicyclo[3.2.0]hept-3-en-6-ones, are now easily available by a practical bicyclization of the corresponding 3-hydroxy-6-alkenoic acids.*
Trypodendron-Lineatum/Aggregation Pheromone/Diastereoselective Synthesis/Thanasimus-Formicarius/Racemic Grandisol/Boll-Weevil/Coleoptera/Oxidation/(+)-Grandisol/Curculionidae

Werner, R. A. 1993. Response of the engraver beetle, lps-perturbatus, to semiochemicals in white spruce stands of interior alaska. Usda Forest Service Pacific Northwest Research Station Research Paper 1-9.*Field tests on the efficacy of various scolytid bark beetle pheromones to attract lps perturbatus (Eichhoff) were conducted from 1977 through 1992 in stands of white spruce (Picea glauca (Moench) Voss) in interior Alaska. Several pheromones attracted high numbers of I. perturbatus and species of the predator Thanasimus to baited funnel traps. Test results also indicated that attacks by I. perturbatus may be deterred by certain semiochemicals.*
Bark Beetles, Ips-Perturbatus, Semiochemicals, Pheromones, Aggregation Pheromones, Antiaggregation Pheromones, Insect Management, White Spruce, Picea-Glauca, Alaska (Interior)

Terada, M., S. Matsukawa, and K. Mikami. 1993. Enantiomerically pure compound synthesis by asymmetric glyoxylate ene reaction with vinylic sulfides and selenides catalyzed by a chiral titanium complex. Journal of the Chemical Society-Chemical Communications 327-328.*Asymmetric catalysis of the glyoxylate-ene reaction with vinylic sulfides and selenides by a binaphthol-derived titanium complex provides enantiomerically pure (e.p.) diastereoisomers (anti and Z) of beta-alkyl-alpha-hydroxy esters.*
Thanasimus-Dubius Cleridae/Prey-Predator Interaction/Alpha-Hydroxy Esters/Ips-Pini Scolytidae/Lewis-Acid/Grignard-Reagents/Practical Access/Bark Beetles/Ipsdienol/Rearrangement

Steinberg, S., M. Dicke, and L. E. M. Vet. 1993. Relative importance of infochemicals from 1st and 2nd trophic level in long-range host location by the larval parasitoid cotesia-glomerata. Journal of Chemical Ecology 19:47-59.*Recently parasitoids were hypothesized to encounter a reliability-detectability problem relating to chemical stimuli from the first and second trophic level, when searching for hosts. The relative role of infochemicals originating from the host, Pieris brassicae (second trophic level), and its food plant, cabbage (first trophic level), have been investigated with respect to long-range host location by the larval parasitoid Cotesia glomerata. Flight-chamber dual choice tests showed that uninfested cabbage plants are least attractive to female wasps. Host larvae and their feces were more attractive than clean plants but far less attractive than artificially damaged and herbivore-damaged plants. The plant-host complex, with host larvae actively feeding on the plant, was the most attractive odor source for the parasitoids. The data indicate that one of the solutions C glomerata uses to solve the reliability-detectability problem is to respond to infochemicals that are emitted from herbivore-damaged plants. Whether these infochemicals are herbivore-induced synomones that are produced by the plant remains to be demonstrated. Infochemicals emitted by the herbivore or its by-products am of little importance in the foraging behavior of C glomerata.*
Hymenoptera, Braconidae, Lepidoptera, Pieridae, Cruciferae, Tritrophic Interactions, Foraging Behavior, Host-Habitat Location, Herbivore-Induced Synomones, Flight Chamber, Infochemicals/Croceipes Cresson Hymenoptera/Predator-Prey Interactions/Zea Boddie Lepidoptera/Airborne Semiochemicals/Marginiventris Cresson/Heliothis-Virescens/Thanasimus-Dubius/Wind-Tunnel/Plant

Schlyter, F. and U. Lundgren. 1993. Distribution of a bark beetle and its predator within and outside old-growth forest reserves - no increase of hazard near reserves. Scandinavian Journal of Forest Research 8:246-256.*To test the hypothesis that reserves create a hazard because pest insects are more abundant in unmanaged forest reserves than in managed forests, pheromone trapping of Ips typographus was done within and outside two small old growth forest reserves (Tallet and Nyteboda) in southern Sweden. Initially, two 2 km perpendicular transects centered in the Tallet reserve did not show higher abundance of insects in the reserve in 1986 and 1987. A second hypothesis, that more predators existed in the diverse ecosystem in the reserves (giving fewer bark beetles) was tested. An important predator of bark beetles, Thanasimus formicarius, was monitored with kairomone traps inside and outside reserves, together with the prey in 1989. The catches of the prey (Ips) showed the same pattern as earlier, The predator was caught in small numbers, but in a pattern opposite to the predictions of the hypothesis of higher catches inside the reserves.*
Ips-Typographus, Coleoptera, Scolytidae, Thanasimus-Formicarius, Cleridae, Ipsdienol, Ipsenol, Dispersal, Dispersion, Pheromone, Kairomone, Reserve, Old Growth Forest, Forest Management, Pest Management/Ips-Typographus Populations/Different Attack Phases/Aggregation Pheromone/Traps/Components/Attraction/Range

Rifkind, J. 1993. A new species of cymatoderella-barr (Coleoptera, Cleridae) from mexico and central-america, with a key and distributional data for the genus. Coleopterists Bulletin 47:279-284.*Cymaloderella morula, new species, from Mexico and Central America is described and figured. The generic characterization is modified to allow inclusion of the new species. A key and distributional information are provided for all three species in the genus.*

Rifkind, J. 1993. A new species of cymatodera from oaxaca, mexico (Coleoptera, Cleridae). Coleopterists Bulletin 47:83-88.*Cymatodera barri from the state of Oaxaca, Mexico, is described and figured. Comparison is made with Cymatodera maculifera Barr (1948), a similar species known from Arizona and Mexico, which is figured here for the first time.*

Rifkind, J. 1993. 1st record of feeding-habits of aulicus-bicinctus linsley (Coleoptera, Cleridae) with a note on local abundance. Coleopterists Bulletin 47:75-76.

Peck, S. B. 1993. New beetle records from the galapagos-islands, ecuador (Coleoptera). Coleopterists Bulletin 47:151-157.*Records are given for beetles new to the fauna of the Galapagos Islands. Reported for the first time are the families Haliplidae (Haliplus sp.), Eucnemidae (Fornax sp.), Jacobsoniidae (Derolathrus sp.), Biphyllidae (Anobocoelus sp.), Bothrideridae (Sosylus sp.), Melandryidae (= Scraptiidae) (Naucles spp.) and Anthicidae (Anthicus pallidus, Omonadus floralis, Sapintus sp.). First records are given for genera in Hydrophilidae (Dactylosternum abdominale and D. sp., Omicrus sp., Aculomicrus sp., Cycrillum strigicolle), Lyctidae (Minthea rugicollis, Trogloxylon parallelopipedum), Bostrichidae (Dinoderus minutus), Cleridae (Tarsostenus univittatus), Nitidulidae (Carpophilus dimidiatus, Urophorus humeralis, Brachypeplus sp.), Cucujidae (Silvanus sp., Monanus coccinulus), Languriidae (Cryptophilus sp.), Corylophidae (Molamba sp., ? Corylophodes sp.), Coccinellidae (Pentilia sp.), Endomychidae (Coluocera maderae), Colydiidae (Synchita sp.), Mycetophagidae (Typhaea stercorea) and Chrysomelidae (Myochrous sp.). New records in previously known genera are Piestus pygmaeus (Staphylinidae), Trogoderma sp. 2 (Dermestidae), Lyctus sp. (Lyctidae), Cryptolestes sp. (Cucujidae), and Hapalips sp. 2 (Languriidae). The Galapagos beetle fauna is now known to contain 59 families, 238 genera, and 411 species.*

Loyttyniemi, K. and R. Loyttyniemi. 1993. Cleridae (Coleoptera) from miombo woodland in zambia. Entomologica Fennica 4:223-224.

Weslien, J. and J. Regnander. 1992. The influence of natural enemies on brood production in ips-typographus (col, scolytidae) with special reference to egg-laying and predation by Thanasimus-formicarius (col, Cleridae). Entomophaga 37:333-342.*The predator Thanasimus formicarius (L.) (Coleoptera, Cleridae) and its prey Ips typographus (L.) (Coleoptera, Scolytidae) were studied in the laboratory and the field.In the laboratory, 11 T. formicarius laid 71-132 eggs (mean = 162) during 66-123 days. During this time they ate 66-132 I. typographus adults per pair (male + female). The number of eggs laid per female was not correlated with life span or the number of Ips eaten.In the field, predation by T. formicarius larvae and other natural enemies on I. typographus brood was studied in the last year of an outbreak. Caged and uncaged spruce bolts attacked by I. typographus were used, and pairs of T. formicarius were released in the cages. The treatments were : uncaged bolts, caged bolts without T. formicarius, caged bolts with 4 T. formicarius pairs, and caged bolts with 8 T. formicarius pairs. The productivity of I. typographus was highest in the caged bolts without T. formicarius (mean = 4.5 offspring/female) and lowest in the uncaged bolts (mean = 0.9 offspring/female). The density of I. typographus galleries was similar in the different treatments. Hence, the variation in productivity between treatments could not have been due to differences in the levels of intraspecific competition. There was no difference in bark beetle productivity or density of T. formicarius larvae between bolts with 4 pairs of T. formicarius and bolts with 8 pairs (mean = 2.5 offspring/female). This indicates that some kind of interference occurred between T. formicarius individuals (e.g. cannibalism) and that a maximum level of predation was reached. Predation by larvae of Medetera spp. (Diptera, Dolichopodidae), Thanasimus spp. and other beetles, and parasitism by wasps (Hymenoptera, Pteromalidae) probably caused the low productivity in the uncaged bolts.*
Scolytidae, Cleridae, Ips-Typographus, Thanasimus-Formicarius, Egg-Laying, Predation/Bark Beetle/Coleoptera/Emergence/Densities

Seybold, S. J., S. A. Teale, D. L. Wood, A. J. Zhang, F. X. Webster, K. Q. Lindahl, and I. Kubo. 1992. The role of lanierone in the chemical ecology of ips-pini (Coleoptera, scolytidae) in california. Journal of Chemical Ecology 18:2305-2329.*Five doses of lanierone (2-hydroxy-4,4,6-trimethyl-2,5-cyclohexadien-1-one) were tested with one dose of enantiomerically pure [99.4% (4R)-(-)] ipsdienol (2-methyl-6-methylene-2,7-octadien-4-ol) for activity as an aggregation pheromone of Ips pini (Say) in California. The response of I. pini to 1 mg/day ipsdienol + 20 mug/day lanierone was significantly greater than the response to ipsdienol alone, but the response pattern did not demonstrate a clear dose-response relationship. The response to the highest dose of lanierone (2 mg/day) was significantly lower than the response to ipsdienol alone. Ipsdienol attracted significantly more I. pini than a male-infested log. Lanierone did not alter the percentage of male I. pini responding to ipsdienol alone. Neither sex of I. pini or Dendroctonus brevicomis LeConte from California produced detectable amounts of lanierone, but myrcene-aerated male D. brevicomis produced 97.8%-(4S)-(+)-ipsdienol. The black-bellied clerid, Enoclerus lecontei (Wolcott) (Coleoptera: Cleridae) was attracted to lanierone when released with ipsdienol. Neither compound was attractive when released alone, proving synergism for the kairomone of this predator. Lanierone did not influence the response of the predators Temnochila chlorodia (Mannerheim) (Coleoptera: Trogositidae) and Enoclerus sphegeus (F.) (Coleoptera: Cleridae), which were attracted to all treatments containing ipsdienol. Tomicobia tibialis Ashmead (Hymenoptera: Pteromalidae) responded in significantly greater numbers to the male-infested log than it did to ipsdienol or ipsdienol + 20 mug/day lanierone.*
Coleoptera, Scolytidae, Cleridae, Trogositidae, Pteromalidae, Ips-Pini, Dendroctonus-Brevicomis, Enoclerus-Lecontei, Enoclerus-Sphegeus, Temnochila-Chlorodia, Tomicobia-Tibialis, Ipsdienol, Lanierone, Aggregation Pheromone, Kairomone/Bark Beetles/Say Coleoptera/North-America/New-York/Predators/Biosystematics/Attraction

Salom, S. M., R. F. Billings, W. W. Upton, M. J. Dalusky, D. M. Grosman, T. L. Payne, C. W. Berisford, and T. N. Shaver. 1992. Effect of verbenone enantiomers and racemic endo-brevicomin on response of dendroctonus-frontalis (Coleoptera, scolytidae) to attractant-baited traps. Canadian Journal of Forest Research-Revue Canadienne De Recherche Forestiere 22:925-931.*Different enantiomeric ratios and elution rates of the inhibitor pheromones verbenone and racemic endo-brevicomin were evaluated for their effects on the numerical response of the southern pine beetle, Dendroctonus frontalis Zimm., to attractant-baited traps. Enantiomeric ratios and elution rates of verbenone were important factors in inhibiting response of male D. frontalis. Deterrence was most effective for enantiomeric ratios of verbenone containing 34 and 50% of the (+) enantiomer. Using a 34% (+):66% (-) mixture of verbenone, the number of male D. frontalis captured in attractant-baited traps declined as elution rates increased from 4.2 to 12.5 mg/h. None of the enantiomeric ratios or elution rates of verbenone tested consistently influenced female response. endo-Brevicomin added to attractant-baited traps reduced catches of male D. frontalis, but did not significantly reduce catches further when added to traps also emitting verbenone. Female catches were not reduced significantly by the presence of endo-brevicomin. Numerical responses of the predatory beetle Thanasimus dubius Fab. are generally unaffected by the presence of verbenone alone or in combination with endo-brevicomin.*
Southern Pine-Beetle/Pheromone

Salem, M. M. and A. M. Alsuhaibani. 1992. A preliminary survey of the dung beetles in riyadh area, saudi-arabia. Arab Gulf Journal of Scientific Research 10:159-165.*A preliminary survey of beetles inhabiting six different kinds of animal dung (cow, horse, sheep, camel, mixed dung, and dry manure) was carried out during 1989 - 1990. Thirty five species of beetles belonging to the following families were recorded: Anthicidae, Aphodiidae, Carabidae, Cleridae, Dermestidae, Histeridae, Hydrophylidae, Scarabaeidae, Staphyliindae, and Tenebrionidae. Of these, eight species were recorded for the first time in Saudi Arabia.*

Safranyik, L., T. L. Shore, D. A. Linton, and B. S. Lindgren. 1992. The effect of verbenone on dispersal and attack of the mountain pine-beetle, dendroctonus-ponderosae hopk (col, scolytidae) in a lodgepole pine stand. Journal of Applied Entomology-Zeitschrift Fur Angewandte Entomologie 113:391-397.*The antiaggregation pheromone verbenone was tested at two release rates against unbaited controls for effects on mountain. pine beetle, Dendroctonus ponderosae Hopk., dispersal and attack in a lodgepole pine Pinus contorta var. latifolia Dougl. stand. Number of beetles trapped, number of attacked trees and number of attacks were measured. There were no significant differences between the two verbenone treatments in any of these variables. Means of all experimental variables were lower in the verbenone-treated plots than in the control plots but only the difference in the number of beetles trapped was statistically significant. Numbers of clerid beetles trapped appeared to be unaffected by the treatments.*
Alpha-Pinene/Coleoptera/Pheromones/Aggregation/Inhibition/Attraction/Field

Lawson, S. A. and F. D. Morgan. 1992. Rearing of 2 predators, Thanasimus-dubius and temnochila-virescens, for the biological-control of ips-grandicollis in australia. Entomologia Experimentalis Et Applicata 65:225-233.*Rearing methods for two coleopterous predators, Thanasimus dubius and Temnochila virescens, imported into Australia for the biological control of Ips grandicollis, were developed. Bionomic data obtained from laboratory rearings between 1982-1987 showed that T. dubius eggs took about 7 days to hatch and that duration of the larval stage was about 42 days. Observations showed that T. dubius had a prolonged prepupal stage (xBAR = 56.4 days, range 14-274 days), which was probably non-diapausal in nature. Mean adult longevity was 50 days (range 1-358 days). Temnochila virescens eggs took almost 9 days to hatch, and a lengthy larval stage (xBAR = 155.4 days, range 73-333 days) was observed. Mean duration of the pupal stage was 14 days (range 7-28 days). A long preoviposition period (xBAR = 141 days, range 47-206 days) was observed, and adults were very long-lived (xBAR = 232.7 days, range 14-667 days). Capacity for increase (r(c)) calculated from rearing data suggested that numbers of T. dubius could be increased faster than T. virescens. Mortality between 1982-1987 averaged about 70% for both species. However, mortality of T. dubius in 1987 increased significantly, suggesting that inbreeding or other methodological factors could be responsible. A mass-rearing method using Ips-infested pine billets was developed as a cheaper alternative to laboratory rearing, and was shown to be effective in producing large numbers of insects for release.*
Predators, Rearing Methods, Biological Control, Ips-Grandicollis, Thanasimus-Dubius, Temnochila-Virescens/Roptrocerus-Xylophagorum Hym/Scolytidae/Torymidae

Kolibac, J. 1992. Species of the genera Thanasimus-latreille and korynetes-herbst in central-europe (Coleoptera, Cleridae). Acta Entomologica Bohemoslovaca 89:309-314.*Thanasimus pectoralis (Fuss, 1863) is found to be synonymous with Thanasimus femoralis (Zetterstedt, 1828). Korynetes ruficornis Sturm, 1837 is recorded as a new beetle species for Czechoslovakia. It was mistaken for Korynetes caeruleus (Degeer, 1775). Keys to central-European species of Thanasimus Latreille, 1806 and Korynetes Herbst, 1792 are given.*
Taxonomy, New Synonymy, Central Europe, Thanasimus-Latreille, Korynetes-Herbst, Key

Russell, L. M. and M. B. Stoetzel. 1991. Inquilines in egg nests of periodical cicadas (homoptera, cicadidae). Proceedings of the Entomological Society of Washington 93:480-488.*Egg nests of brood X of 17-year periodical cicadas (Magicicada spp.) of 1987 were occupied by four orders of Insecta. Species of Pseudococcidae and Eriococcidae (Homoptera) developed from eggs to adults, larvae of two species of Cleridae and one species of Coccinellidae (Coleoptera) were found, larvae of Torymidae and immature and adult Scelionidae (Hymenoptera) were present, and two species of Gryllidae (Orthoptera) deposited eggs in the cicada egg nests. Specimens were identified to family, genus or species. Mealybugs entered nests where unhatched cicada eggs and dead cicada nymphs were present; all other species occupied nests containing only cicada egg shells. Previously none of these insects were known to deposit eggs or to molt in periodical cicada egg nests.*
Cicada Egg Nests, Coccoids, Beetles, Wasps, Crickets

Miller, D. R., J. H. Borden, G. G. S. King, and K. N. Slessor. 1991. Ipsenol - an aggregation pheromone for ips-latidens (leconte) (Coleoptera, scolytidae). Journal of Chemical Ecology 17:1517-1527.*Ipsenol was identified from the frass of male, but not female, Ips latidens from British Columbia, feeding in phloem tissue of lodgepole pine, Pinus contorta var. latifolia. The responses of I. latidens to sources of ipsenol and cis-verbenol were determined with multiple-funnel traps in stands of lodgepole pine in British Columbia. Ipsenol attracted both male and female I. latidens, verifying that it is a pheromone for this species. Male I. latidens showed a slight preference for (S)-(-)-ipsenol. cis-Verbenol was not produced by beetles of either sex and, in contrast to an earlier report, both enantiomers inhibited attraction to ipsenol-baited traps. The predators, Enoclerus sphegeus and Thanasimus undatulus (Cleridae), were attracted to traps baited with cis-verbenol and ipsenol.*
Pheromone, Ipsenol, Cis-Verbenol, Chirality, Ips-Latidens, Coleoptera, Scolytidae, Predator, Kairomone, Enoclerus-Sphegeus, Thanasimus-Undatulus, Cleridae/Dendroctonus-Ponderosae Hopkins/Beetles Coleoptera/Bark Beetles/Pine Beetles/Semiochemicals/Colonization/Inhibition/Field

Herms, D. A., R. A. Haack, and B. D. Ayres. 1991. Variation in semiochemical-mediated prey-predator interaction - ips-pini (scolytidae) and Thanasimus-dubius (Cleridae). Journal of Chemical Ecology 17:515-524.*The bark beetle Ips pini (Say) displays variation in its response to and production of enatiomeric blends of its pheromone ipsdienol. One of the principal predators of Ips pini is Thanasimus dubius (F.), which uses ipsdienol as a kairomone for prey location. During 1988 and 1989, in Wisconsin and Michigan, the response of both species to a range of enantiomeric blends of ipsdienol was investigated. Blends tested had the following ratios of the (S)-(+) to (R)-(-) enantiomers: 3%:97%, 25%:75%, 50%:50%, 75%:25%, and 97%:3%. Either 75% (+):25% (-) or 50% (+):50% (-) ipsdienol captured the most Ips pini in both years at both sites. The 25% (+):75% (-) blend also caught more Ips pini than the control during both years at both sites. All blends tested were attractive to Thanasimus dubius in both years at both locations. Blend preferences of both species were variable and labile at both sites. Response patterns of both species in Wisconsin were different from those in Michigan each year. Furthermore, response patterns of both species to the ipsdienol blends changed from 1988 to 1989 at both locations. A genetic component to this variation would permit predator-prey coevolution, as well as the development of resistance by Ips pini to management strategies based on mass-trapping with single blends.*
Ips-Pini, Thanasimus-Dubius, Coleoptera, Scolytidae, Cleridae/Bark Beetle Pheromone/Coleoptera-Scolytidae/Coevolution/Ipsdienol

Avtzis, N. 1991. Side captures in bark beetle-pheromone traps in n greece. Anzeiger Fur Schadlingskunde Pflanzenschutz Umweltschutz 64:13-14.*13 Rochling Pheromone traps were used in a pine forest in Thessaloniki, N. Greece. The synthetic pheromones Pheroprax, Linoprax, CME 1986 519.66 and CME 1988 619.02 were placed in the traps. As side captures 24 species of insects were caught by the traps.Total 867 individual predators were captured in the 13 traps. In average 33 specimens of Thanasimus formicarius (L.) (Cleridae) and 30 specimens of Aulonium ruficorne (01.) (Colydiidae) were caught per trap.*

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Mizell, R. F., J. L. Frazier, and T. E. Nebeker. 1984. Response of the clerid predator Thanasimus-dubius (f) to bark beetle pheromones and tree volatiles in a wind-tunnel. Journal of Chemical Ecology 10:177-187.

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