

Presentation title:

What is an associate? Predators, parasitoids, competitors, symbionts, and hangers-on in the southern pine beetle community

Authors:

Caroline Kanaskie, Richard Hofstetter, Kier Klepzig, Fred Stephen, Jeff Garnas

References – directly cited in EntSoc EB 2025 presentation:

Southern pine beetle is an outbreak species of economic and ecological importance (Pye et al. 2011; Tchakerian and Coulson 2011). Several resources compile key information about southern pine beetle community ecology (Goyer et al. 1980; Coulson and Klepzig 2011). However, these resources are not comprehensive. We decided to undertake a systematic review of southern pine beetle associates, following the Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) framework (Page et al. 2021 Mar 29).

See the following pages for all references included in our systematic review.

Appendix 1-1. References included in our systematic review.

Citation	Item title
(Aanen et al. 2009)	Biological pest control in beetle agriculture
(Alexander et al. 1980)	Association of <i>Heterobasidion annosum</i> and the southern pine-beetle on loblolly-pine
(Alexander et al. 1981)	Effects of <i>Heterobasidion annosum</i> on radial growth in southern pine beetle-infested loblolly-pine
(Arango-Velez et al. 2018)	Anatomical and chemical responses of eastern white pine (<i>Pinus strobus</i> L.) to blue-stain (<i>Ophiostoma minus</i>) inoculation
(Ashmead 1894)	Descriptions of new parasitic Hymenoptera
(Ayres et al. 2000)	Nitrogen budgets of phloem-feeding bark beetles with and without symbiotic fungi
(Ayres et al. 2011)	Southern pine beetle ecology: Populations within stands
(Barras 1970)	Antagonism between <i>Dendroctonus frontalis</i> and the fungus <i>Ceratocystis minor</i>
(Barras and Hodges 1969)	Carbohydrates of inner bark of <i>Pinus taeda</i> as affected by <i>Dendroctonus frontalis</i> and associated microorganisms
(Barras and Perry 1972)	Fungal symbionts in the prothoracic mycangium of <i>Dendroctonus frontalis</i> (Coleopt.: Scolytidae)
(Barron 1971)	A revision of the Trogossitidae of America north of Mexico (Coleoptera: Cleroidea)
(Berisford 1974)	Parasite abundance in <i>Ips</i> spp infestations as influenced by southern pine beetle
(Berisford 1980)	Natural enemies and associated organisms
(Berisford 2011)	Parasitoids of the southern pine beetle
(Biel et al. 1977)	Dimorphism in <i>Ceratocystis minor</i> var- <i>barrasii</i>
(Billings 1985)	Southern pine bark beetles and associated insects
(Billings 2011)	Aerial detection, ground evaluation, and monitoring of the southern pine beetle: State perspectives
(Billings and Cameron 1984)	Kairomonal responses of Coleoptera, <i>Monochamus titillator</i> (Cerambycidae), <i>Thanasimus dubius</i> (Cleridae), and <i>Temnochila virescens</i> (Trogositidae), to behavioral chemicals of southern pine bark beetles (Coleoptera: Scolytidae)
(Birch et al. 1980)	Influence of chemically mediated behavior on host tree colonization by four cohabiting species of bark beetles
(Birt 2011a)	Population dynamics of southern pine beetle in forest landscapes
(Birt 2011b)	Regional population dynamics
(Blodgett et al. 2010)	Common biosynthetic origins for polycyclic tetramate macrolactams from phylogenetically diverse bacteria
(Book et al. 2014)	Cellulolytic <i>Streptomyces</i> strains associated with herbivorous insects share a phylogenetically linked capacity to degrade lignocellulose
(Böving and Champlain 1920)	Larvae of North American beetles of the family Cleridae
(Bramble and Holst 1935)	Microorganisms infecting pines attacked by <i>Dendroctonus frontalis</i>
(Bramble and Holst 1940)	Fungi associated with <i>Dendroctonus frontalis</i> in killing shortleaf pines and their effect on conduction
(Brand and Barras 1977)	The major volatile constituents of a basidiomycete associated with southern pine beetle
(Brand et al. 1977)	Bark-beetle pheromones: Enhancement of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae) aggregation pheromone by yeast metabolites in laboratory bioassays
(Bridges 1983)	Mycangial fungi of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae) and their relationship to beetle population trends
(Bridges 1987)	Effects of terpenoid compounds on growth of symbiotic fungi associated with the southern pine-beetle
(Bridges and Moser 1983)	Role of two phoretic mites in transmission of bluestain fungus, <i>Ceratocystis minor</i>
(Bridges and Moser 1986)	Relationship of phoretic mites (Acari, Tarsonemidae) to the bluestaining fungus, <i>Ceratocystis minor</i> , in trees infested by southern pine-beetle (Coleoptera, Scolytidae)
(Bridges and Perry 1985)	Effects of mycangial fungi on gallery construction and distribution of bluestain in southern pine beetle-infested pine bolts
(Bridges and Perry 1987)	<i>Ceratocystiopsis ranaculosus</i> sp. nov. associated with the southern pine-beetle
(Bridges et al. 1984)	A quantitative study of the yeasts and bacteria associated with laboratory-reared <i>Dendroctonus frontalis</i> Zimm. (Coleopt., Scolytidae)
(Bridges et al. 1985)	Southern pine beetle (Coleoptera: Scolytidae) infestations without the bluestain fungus, <i>Ceratocystis minor</i>
(Bushing 1965)	A synoptic list of the parasites of Scolytidae (Coleoptera) in North America north of Mexico
(Caird 1935)	Physiology of pines infested with bark beetles
(Camors and Payne 1972)	Response of <i>Heydenia unica</i> (Hymenoptera: Pteromalidae) to <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae) pheromones and a host-tree terpene
(Camors and Payne 1973)	Sequence of arrival of entomophagous insects to trees infested with the southern pine beetle
(Carta et al. 2009)	Culture and morphology of a new <i>Parasitorhabditis</i> (Rhabditida) from <i>Dendroctonus frontalis</i> demonstrated with alternative methods for low temperature-SEM

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Carta et al. 2010)	Description of <i>Parasitorhabditis frontalis</i> n. sp. (Nemata: Rhabditida) from <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera: Scolytidae)
(Chamberlin 1939)	The bark and timber beetles of North America north of Mexico
(Ciesla 1966)	Southern pine beetle attacks red pine in North Carolina
(Clarke and Hartshorn 2021)	Contrasting competitor and predator responses to a short-lived southern pine beetle outbreak: A case study
(Clarke and Menard 2006)	Predation of an ambrosia beetle (Coleoptera: Platypodidae) by a checkered beetle (Coleoptera: Cleridae) congregating on pines containing brood adult southern pine beetles (Coleoptera: Curculionidae)
(Clarke et al. 2016)	Forest management and southern pine beetle outbreaks: A historical perspective
(Cook and Hain 1985)	Qualitative examination of the hypersensitive response of loblolly pine, <i>Pinus taeda</i> L., inoculated with two fungal associates of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera, Scolytidae)
(Cook and Hain 1986)	Defensive mechanisms of loblolly and shortleaf pine against attack by southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann, and its fungal associate, <i>Ceratocystis minor</i> (Hedgecock) Hunt
(Cook and Hain 1987)	Four parameters of the wound response of loblolly and shortleaf pines to inoculation with the blue-staining fungus associated with the southern pine beetle
(Cook and Hain 1988)	Wound response of loblolly and shortleaf pine attacked or reattacked by <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera, Scolytidae) or its fungal associate, <i>Ceratocystis minor</i> (Hedgecock) Hunt
(Cook et al. 1986)	Seasonality of the hypersensitive response by loblolly and shortleaf pine to inoculation with a fungal associate of the southern pine beetle (Coleoptera, Scolytidae)
(Coppedge et al. 1995)	Variation in female southern pine beetle size and lipid content in relation to fungal associates
(Costa and Reeve 2011a)	Upwind flight response of the bark beetle predator <i>Thanasimus dubius</i> towards olfactory and visual cues in a wind tunnel
(Costa and Reeve 2011b)	Olfactory experience modifies semiochemical responses in a bark beetle predator
(Costa and Reeve 2012)	the effect of larval predators <i>Thanasimus dubius</i> (Coleoptera: Cleridae), produced by an improved system of rearing, against the southern pine beetle <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae)
(Coster 1969)	Observations on <i>Platypus flavicornis</i> (Coleoptera: Platypodidae) in southern pine beetle infestation
(Coster and Ragenovich 1976)	Effects of six insecticides on emergence of some parasites and predators from southern pine beetle infested trees
(Coulson et al. 1973a)	Variables associated with use of frontalure and cacodylic acid in suppression of southern pine beetle. 1. Factors influencing manipulation to prescribed trap trees
(Coulson et al. 1973b)	Variables associated with use of frontalure and cacodylic acid in suppression of southern pine beetle. 2. Brood reduction in trees treated with cacodylic acid
(Coulson et al. 1976)	Interspecific competition between <i>Monochamus titillator</i> and <i>Dendroctonus frontalis</i>
(Coulson et al. 1980)	Impact of foraging by <i>Monochamus titillator</i> [Col: Cerambycidae] on within-tree populations of <i>Dendroctonus frontalis</i> [Col: Scolytidae]
(Coulson et al. 1999)	Forest landscapes: Their effect on the interaction of the southern pine beetle and red-cockaded woodpecker
(Craighead 1950)	Insect enemies of eastern forests
(Craighead and St. George 1940)	Field observations on the dying of pines infected by the blue-stain fungus, <i>Ceratostomella pini</i> Munch
(Cronin et al. 2000)	The pattern and range of movement of a checkered beetle predator relative to its bark beetle prey
(Davis 2015)	The ecology of yeasts in the bark beetle holobiont: A century of research revisited
(DeAngelis et al. 1986)	Phenolic metabolites of <i>Ceratocystis minor</i> from laboratory cultures and their effects on transpiration in loblolly pine seedlings
(Delalibera et al. 2005)	Contrasts in cellulolytic activities of gut microorganisms between the wood borer, <i>Saperda vestita</i> (Coleoptera: Cerambycidae), and the bark beetles, <i>Ips pini</i> and <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae)
(Dix and Franklin 1974)	Interspecific and intraspecific encounters of southern pine beetle parasites under field conditions
(Dix and Franklin 1977)	Diel activity of <i>Thanasimus dubius</i> , a southern pine beetle predator
(Dix and Franklin 1978)	Field biology of three hymenopterous parasitoids of southern pine beetle
(Dix and Franklin 1981)	Observations on the behavior of the southern pine beetle parasite <i>Roptrocercus eccoptogastri</i> Ratz. (Hymenoptera, Torymidae)

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Dix and Franklin 1983)	Behavior of four braconid parasites and one pteromalid parasite of the southern pine beetle
(Dixon and Osgood 1961)	Southern pine beetle: A review of present knowledge

(W. N. Dixon and Payne 1979)	Aggregation of <i>Thanasimus dubius</i> on trees under mass-attack by the southern pine beetle
(Wayne N Dixon and Payne 1979)	Sequence of arrival and spatial distribution of entomophagous and associate insects on southern pine beetle-infested trees
(Dixon and Payne 1980)	Attraction of entomophagous and associate insects of the southern pine beetle to beetle-produced and host tree-produced volatiles (Coleoptera, Scolytidae)
(Dodds and Stephen 2000)	Partial age-specific life tables for <i>Monochamus titillator</i> in <i>Dendroctonus frontalis</i> infested loblolly pines
(Dodds and Stephen 2002)	Arrival and species complex of Cerambycidae on pines attacked by southern pine beetle
(Dodds et al. 2002)	Oviposition biology of <i>Acanthocinus nodosus</i> (Coleoptera: Cerambycidae) in <i>Pinus taeda</i>
(Dominguez-Sanchez et al. 2008)	Respuesta kairomonal de coleopteros asociados a <i>Dendroctonus frontalis</i> y dos especies de Ips (Coleoptera: Curculionidae) en bosques de Chiapas, Mexico
(Drumtra and Stephen 1999)	Incidence of wildflower visitation by hymenopterous parasitoids of southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann
(Dunn and Lorio 1992)	Effects of bark girdling on carbohydrate supply and resistance of loblolly pine to southern pine beetle (<i>Dendroctonus frontalis</i> Zimm.) attack
(Evans et al. 2011)	Temperature alters the relative abundance and population growth rates of species within the <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae) community
(Fiske 1908)	Notes on insect enemies of wood boring Coleoptera
(Flamm et al. 1987)	Host colonization by cohabiting <i>Dendroctonus frontalis</i> , <i>Ips avulsus</i> , and <i>I. calligraphus</i> (Coleoptera, Scolytidae)
(Flamm et al. 1989)	maintenance of a phloem-inhabiting guild
(Flamm et al. 1993)	Colonization of disturbed trees by the southern pine bark beetle guild (Coleoptera: Scolytidae)
(Franklin 1969)	Hymenopterous parasites of the southern pine beetle in Georgia
(Franklin 1970)	Observations on the blue stain-southern pine beetle relationship.
(Franklin and Green 1965)	Observations on clerid predation of the southern pine beetle
(Frazier et al. 1981)	Predatory behavior of the clerid beetle <i>Thanasimus dubius</i> (Coleoptera, Cleridae) on the southern pine beetle (Coleoptera, Scolytidae)
(Friedenberg et al. 2007)	Differential impacts of the southern pine beetle, <i>Dendroctonus frontalis</i> , on <i>Pinus palustris</i> and <i>Pinus taeda</i>
(Fronk 1947)	Virginia Agricultural Experiment Station Technical Bulletin 108: The southern pine beetle—Its life history
(Gargiullo and Berisford 1981)	Effects of host density and bark thickness on the densities of parasites of the southern pine beetle (Coleoptera, Scolytidae)
(Gaylord et al. 2006)	Seasonality and lure preference of bark beetles (Curculionidae: Scolytinae) and associates in a northern Arizona ponderosa pine forest
(Goldhammer et al. 1989)	Average radial growth rate and chlamydospore production of <i>Ceratocystis minor</i> , <i>Ceratocystis minor</i> var. <i>barrasii</i> , and SJB 122 in culture
(Goyer and Finger 1980)	Relative abundance and seasonal distribution of the major hymenopterous parasites of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera, Scolytidae), on loblolly pine
(Goyer and Smith 1981)	The feeding potential of <i>Corticeus glaber</i> and <i>Corticeus parallelus</i> (Coleoptera, Tenebrionidae), facultative predators of the southern pine beetle, <i>Dendroctonus frontalis</i> (Coleoptera, Scolytidae)
(Goyer et al. 1980)	How to identify common insect associates of the southern pine beetle
(Goyer et al. 1985)	Distinguishing immatures of insect associates of southern pine bark beetles. Agriculture Handbook 641.
(Hain et al. 2011)	Natural history of the southern pine beetle
(Happ et al. 1976)	Bark beetle fungal symbiosis. II. Fine-structure of a basidiomycetous ectosymbiont of southern pine beetle
(Harrington and Zambino 1990)	<i>Ceratocystiopsis ranaculosus</i> , not <i>Ceratocystis minor</i> var <i>barrasii</i> , is the mycangial fungus of the southern pine beetle
(Harrington et al. 2021)	Corticoid basidiomycetes associated with bark beetles, including seven new <i>Entomocorticium</i> species from North America and <i>cylindrobasidium ipidophilum</i> , comb. nov
(Hayes et al. 1994)	Repellent properties of the host compound 4-allylanisole to the southern pine-beetle
(Hetrick 1940)	Some factors in natural control of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimm.
(Hetrick 1949)	Some overlooked relationships of southern pine beetle
(Hodges and Pickard 1971)	Lightning in the ecology of the southern pine beetle, <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Hodges et al. 1968)	Amino acids in inner bark of loblolly pine as affected by southern pine beetle and associated microorganisms
(Hofstetter 2011)	Mutualists and phoronts of the southern pine beetle
(Hofstetter et al. 2005)	Effects of tree phytochemistry on the interactions among endophloeic fungi associated with the southern pine beetle

(Richard W. Hofstetter et al. 2006)	Antagonisms, mutualisms and commensalisms affect outbreak dynamics of the southern pine beetle
(Richard W Hofstetter et al. 2006)	Seasonal dynamics of mites and fungi and their interaction with southern pine beetle
(Hofstetter et al. 2007)	Temperature-dependent effects on mutualistic, antagonistic, and commensalistic interactions among insects, fungi and mites
(Hofstetter et al. 2008)	Synergistic effects of α -pinene and exo-brevicomine on pine bark beetles and associated insects in Arizona
(Hofstetter et al. 2012)	Attraction to monoterpenes and beetle-produced compounds by syntopic <i>Ips</i> and <i>Dendroctonus</i> bark beetles and their predators
(Holst 1936)	<i>Zygosaccharomyces pini</i> , a new species of yeast associated with bark beetles in pines
(Hopkins 1892)	Notes on a destructive forest tree scolytid
(Hopkins 1893)	Catalogue of West Virginia Scolytidae and their enemies: With list of trees and shrubs attacked
(Hopkins 1899)	Report on investigations to determine the cause of unhealthy conditions of spruce and pine from 1880-1893. Bulletin 56
(Hopkins 1909)	Practical information on the scolytid beetles of North American forests I. Barkbeetles of the genus <i>Dendroctonus</i>
(Hulcr et al. 2011)	Presence and diversity of <i>Streptomyces</i> in <i>Dendroctonus</i> and sympatric bark beetle galleries across North America
(Hulcr et al. 2012)	Mycangia of ambrosia beetles host communities of bacteria
(Jones and Stephen 1994)	Effect of temperature on development of hymenopterous parasitoids of <i>Dendroctonus frontalis</i> (Coleoptera, Scolytidae)
(Kanaskie et al. 2024)	Southern pine beetle (Coleoptera: Curculionidae) and its associated insect community: Similarities and key differences between northeastern and southeastern pine forests
(Kinn 1979)	Three methods of sampling mites phoretic on bark beetles: A comparison
(Kinn 1980)	Mutualism between <i>Dendrolaelaps neodisetus</i> and <i>Dendroctonus frontalis</i>
(Kinn 1982)	Seasonal distribution of three common mite associates of the southern pine beetle (Coleoptera, Scolytidae) in central Louisiana
(Kinn 1984)	Life cycle of <i>Dendrolaelaps neodisetus</i> (Mesostigmata, Digamasellidae), a nematophagous mite associated with pine bark beetles (Coleoptera, Scolytidae)
(Kinn 1986)	Incidence of the pinewood nematode in a southern pine beetle infestation in central Louisiana
(Kinn and Stephen 1981)	The incidence of endoparasitism of <i>Dendroctonus frontalis</i> Zimm. (Coleoptera, Scolytidae) by <i>Contortylenchus brevicorni</i> (Massey) Ruhm (Nematoda, Sphaerulariidae)
(Kinn and Witcosky 1978)	Variation in southern pine beetle attack height associated with phoretic uropodid mites
(Klepzig 1998)	Competition between a biological control fungus, <i>Ophiostoma piliferum</i> , and symbionts of the southern pine beetle
(Klepzig 2005)	Melanin and the ecology of southern pine beetle associated fungi
(Klepzig and Hofstetter 2011)	From attack to emergence: Interactions between southern pine beetle, mites, microbes, and trees
(Klepzig and Wilkens 1997)	Competitive interactions among symbiotic fungi of the southern pine beetle
(Klepzig et al. 2001)	Symbiosis and competition: Complex interactions among beetles, fungi and mites
(Klepzig et al. 2004)	Effects of available water on growth and competition of southern pine beetle associated fungi
(Klepzig et al. 2005)	effects of mass inoculation on induced oleoresin response in intensively managed loblolly pine
(Knebel et al. 2008)	Resin flow responses to fertilization, wounding and fungal inoculation in loblolly pine (<i>Pinus taeda</i>) in North Carolina
(Knell and Allen 1978)	Morphology and ultrastructure of <i>Unikaryon minutum</i> sp. n. (Microsporidia: Protozoa), a parasite of southern pine beetle, <i>Dendroctonus frontalis</i>
(Knull 1934)	The southern pine beetle in Pennsylvania (<i>Dendroctonus frontalis</i> Zimm.)
(Kroll and Fleet 1979)	Impact of woodpecker predation on over-wintering within-tree populations of the southern pine beetle (<i>Dendroctonus frontalis</i>)
(Kroll et al. 1980)	Woodpeckers and the southern pine beetle. Agriculture Handbook no. 564.
(Kudon and Berisford 1980)	Influence of brood hosts on host preferences of bark beetle parasites
(Kudon and Berisford 1981a)	Identification of host origin of parasites of bark beetles (Coleoptera, Scolytidae) by fatty-acid composition

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Kudon and Berisford 1981b)	An olfactometer for bark beetle parasites
(Linit and Stephen 1983)	Parasite and predator component of within-tree southern pine-beetle (Coleoptera, Scolytidae) mortality
(Lombardero et al. 2000)	Biology, demography and community interactions of <i>Tarsonemus</i> (Acarina: Tarsonemidae) mites phoretic on <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(Lombardero et al. 2003)	Strong indirect interactions of <i>Tarsonemus</i> mites (Acarina: Tarsonemidae) and <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(MacAndrews 1926)	The biology of the southern pine beetle
(MacGuidwin et al. 1980)	Redescription and life-history of <i>Contortylenchus brevicorni</i> , a parasite of the southern pine beetle <i>Dendroctonus frontalis</i>
(Macías-Sámano et al. 2014)	Response of bark beetles and their predators to semiochemicals in southeast Mexico
(Martinson et al. 2013)	Alternate attractors in the population dynamics of a tree-killing bark beetle
(Massey 1957)	Four new species of <i>Aphelenchulus</i> (Nematoda) parasitic in bark beetles in the United States
(Massey 1958)	Four new species of <i>Parasitylenchus</i> (Nematoda) from scolytid beetles
(Massey 1974)	Biology and taxonomy of nematode parasites and associates of bark beetles in the United States. Agriculture Handbook no. 446
(Mathews and Stephen 1997)	Effect of artificial diet on longevity of adult parasitoids of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(Mathews and Stephen 1999)	Effects of an artificial diet and varied environmental conditions on longevity of <i>Coeloides pissodis</i> (Hymenoptera: Braconidae), a parasitoid of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(McCravy et al. 2000)	Evaluation of multiple-funnel and slot traps for collection of southern pine bark beetles and predators
(Miller et al. 1995)	Effect of sodium N-methylthiocarbamate with dimethyl-sulfoxide on southern pine beetle (Col., Scolytidae) development: Results of initial field tests
(Mizell and Nebeker 1981)	Within-tree distribution of the pupae of <i>Thanasimus dubius</i> (Coleoptera: Cleridae), a predator of the southern pine beetle (Coleoptera: Scolytidae)
(Mizell et al. 1984)	Response of the clerid predator <i>Thanasimus dubius</i> (F.) to bark beetle pheromones and tree volatiles in a wind tunnel
(Moore 1970)	Isolating entomogenous fungi and bacteria, and tests of fungal isolates against the southern pine beetle.
(Moore 1971)	Mortality factors caused by pathogenic bacteria and fungi of the southern pine beetle in North Carolina
(Moore 1972)	Southern pine beetle mortality in North Carolina caused by parasites and predators
(Moser 1975)	Mite predators of southern pine beetle
(John C. Moser 1976)	Phoretic carrying capacity of flying southern pine beetles (Coleoptera: Scolytidae)
(John C Moser 1976)	Surveying mites (Acarina) phoretic on the southern pine beetle (Coleoptera: Scolytidae) with sticky traps
(Moser and Bridges 1986)	<i>Tarsonemus</i> (Acarina: Tarsonemidae) mites phoretic on the southern pine beetle (Coleoptera: Scolytidae): Attachment sites and numbers of bluestain (Ascomycetes, Ophiostomataceae) ascospores carried
(Moser and Macías-Sámano 2000)	Tarsonemid mite associates of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae): Implications for the historical biogeography of <i>D. frontalis</i>
(Moser and Roton 1971)	Mites associated with southern pine bark beetles in Allen Parish, Louisiana
(Moser et al. 1974)	Mites associated with <i>Dendroctonus frontalis</i> Zimmermann (Scolytidae - Coleoptera) in Central America and Mexico
(Moser et al. 1995)	Ascospore dispersal of <i>Ceratocystiopsis ranaculosus</i> , a mycangial fungus of the southern pine beetle
(Moser et al. 2005)	The Mexican pine beetle, <i>Dendroctonus mexicanus</i> : First record in the United States and co-occurrence with the southern pine beetle – <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae or Curculionidae: Scolytinae)
(Moser et al. 1971)	Relative abundance of southern pine beetle <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera: Scolytidae) associates in east Texas
(Muesebeck 1935)	Synonymical notes on <i>Ecphylus</i> Foerster, with descriptions of one new species (Hym., Braconidae)
(Muesebeck 1938)	The genus <i>Dendrosoter</i> Wesmael in the United States (Hymenoptera: Braconidae)
(Munro et al. 2020)	Electrophysiological and behavioral responses of <i>Dendroctonus frontalis</i> and <i>D. terebrans</i> (Coleoptera: Curculionidae) to resin odors of host pines (<i>Pinus</i> spp.)
(Munro et al. 2021)	Through space and time: Predicting numbers of an eruptive pine tree pest and its predator under changing climate conditions
(Nebeker 2011)	Southern pine bark beetle guild

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
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(Nebeker and Purser 1980)	Relationship of temperature and prey type to developmental time of the bark beetle predator <i>Thanasimus dubius</i> (Coleoptera: Cleridae)
(Nelson and Beal 1929)	Experiments with bluestain fungi in southern pines
(Niño-Domínguez et al. 2015)	Pheromone-mediated mate location and discrimination by two syntopic sibling species of <i>Dendroctonus</i> bark beetles in Chiapas, Mexico
(Niño-Domínguez et al. 2018)	Discrimination of odors associated with conspecific and heterospecific frass by sibling species <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae: Scolytinae) and <i>Dendroctonus mesoamericanus</i> (Coleoptera: Curculionidae: Scolytinae)
(Oh et al. 2009)	Mycangimycin, a polyene peroxide from a mutualist <i>Streptomyces</i> sp.
(Otrosina et al. 1997)	Blue-stain fungi associated with roots of southern pine trees attacked by the southern pine beetle, <i>Dendroctonus frontalis</i>
(Overgaard 1968)	Insects associated with southern pine beetle in Texas, Louisiana, and Mississippi
(Paine and Stephen 1987a)	Fungi associated with the southern pine beetle: Avoidance of induced defense response in loblolly pine
(Paine and Stephen 1987b)	Response of loblolly pine to different inoculum doses of <i>Ceratocystis minor</i> , a blue-stain fungus associated with <i>Dendroctonus frontalis</i>
(Paine and Stephen 1987c)	Influence of tree stress and site quality on the induced defense system of loblolly pine
(Paine and Stephen 1987d)	The relationship of tree height and crown class to the induced plant defenses of loblolly pine
(Paine and Stephen 1988)	Induced defenses of loblolly pine, <i>Pinus taeda</i> : Potential impact on <i>Dendroctonus frontalis</i> within-tree mortality
(Paine et al. 1981)	Niche breadth and resource partitioning by four sympatric species of bark beetles (Coleoptera: Scolytidae)
(Paine et al. 1988)	Phenology of an induced response in loblolly pine following inoculation of fungi associated with the southern pine beetle
(Paine et al. 1993)	Within-tree and among-tree variation of the induced response of loblolly pine to a fungus associated with <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera: Scolytidae) and sterile wounding
(Payne and Richerson 1985)	Pheromone-mediated competitive replacement between two bark beetle populations: Influence on infestation suppression
(Payne et al. 1984)	Insect predator-prey coevolution via enantiomeric specificity in a kairomone-pheromone system
(Pettersson et al. 2000)	Odor perception in the bark beetle parasitoid <i>Roptrocercus xylophagorum</i> exposed to host associated volatiles
(Pureswaran et al. 2016)	Western pine beetle populations in Arizona and California differ in the composition of their aggregation pheromones
(Reeve 1997)	Predation and bark beetle dynamics
(Reeve 2000)	Complex emergence patterns in a bark beetle predator
(Reeve 2011)	Predators of the southern pine beetle
(Reeve et al. 1980)	Spatial distribution of flying southern pine-beetle (Coleoptera: Scolytidae) and the predator <i>Thanasimus dubius</i> (Coleoptera: Cleridae)
(Reeve et al. 1996)	Extended development in <i>Thanasimus dubius</i> (F.) (Coleoptera: Cleridae), a predator of the southern pine beetle
(Reeve et al. 1998)	Scramble competition in the southern pine beetle, <i>Dendroctonus frontalis</i>
(Reeve et al. 2009)	Geographic variation in prey preference in bark beetle predators
(Richerson and Payne 1979)	Effects of bark beetle inhibitors on landing and attack behavior of the southern pine beetle and beetle associates
(Richerson et al. 1980)	Disruption of southern pine beetle infestations with frontalure
(Ross et al. 1992)	Growth of southern pine beetle associated fungi in relation to the induced wound response in loblolly pine
(Roton 1978)	Mites phoretic on southern pine beetle: When and where they attach
(Rumbold 1931)	Two blue-staining fungi associated with bark beetle infestation of pines
(Sáenz-Romero et al. 2023)	Abundance of <i>Dendroctonus frontalis</i> and <i>D. mexicanus</i> (Coleoptera: Scolytinae) along altitudinal transects in Mexico: Implications of climatic change for forest conservation
(Salom et al. 1991)	Electroantennogram responses of the southern pine beetle parasitoid <i>Dinotiscus dendroctoni</i> (Ashmead) (Hymenoptera: Pteromalidae) to potential semiochemicals
(Salom, Billings, et al. 1992)	Effect of verbenone enantiomers and racemic <i>endo</i> -brevicomin on response of <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae) to attractant-baited traps
(Salom, Ascoli-Christensen, et al. 1992)	Electroantennogram responses of the southern pine beetle parasitoid <i>Coeloides pissodis</i> (Ashmead) (Hym.: Braconidae) to potential semiochemicals
(Salom et al. 1995)	Effect of an inhibitor-based suppression tactic on abundance and distribution of the southern pine beetle (Coleoptera: Scolytidae) and its natural enemies

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Sánchez-Martínez and Wagner 2002)	Bark beetle community structure under four ponderosa pine forest stand conditions in northern Arizona

(Schaefer et al. 2004)	Red-cockaded woodpecker nestling provisioning and reproduction in two different pine habitats
(Schmitt and Goyer 1983)	Consumption rates and predatory habits of <i>Scoloposcelis mississippiensis</i> and <i>Lyctocoris elongatus</i> (Hemiptera: Anthrenidae) on pine bark beetles
(Schoeller et al. 2012)	Molecular evidence of facultative intraguild predation by <i>Monochamus titillator</i> larvae (Coleoptera: Cerambycidae) on members of the southern pine beetle guild
(Scott et al. 2008)	Bacterial protection of beetle—fungus mutualism
(Shepherd and Sullivan 2017)	Spatial displacement of a lure component can reduce catches of two nontarget species during spring monitoring of southern pine beetle
(Sikorowski et al. 1979)	The impact of diseases on southern pine beetle in Mississippi. Technical Bulletin no. 99
(Smith and Goyer 1980)	Relative abundance and seasonal occurrence of <i>Corticeus glaber</i> and <i>Corticeus parallelus</i> (Coleoptera: Tenebrionidae), associates of the southern pine beetle, <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(Smith and Goyer 1982)	The life-cycle of <i>Corticeus glaber</i> (Coleoptera: Tenebrionidae), a facultative predator of the southern pine beetle, <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(St. George and Beal 1929)	The southern pine beetle: A serious enemy of pines in the south
(Staebein et al. 2015)	Enantiospecific responses of southern pine beetle (<i>Dendroctonus frontalis</i>) and its clerid predator, <i>Thanasimus dubius</i> , to α -pinene
(Stein and Coster 1977)	Distribution of some predators and parasites of southern pine beetle in two species of pine
(Stephen 2011b)	Southern pine beetle population dynamics in trees
(Stephen 2011a)	Southern pine beetle competitors
(Stephen and Berisford 2011)	Biological control of southern pine beetle
(Stephen and Browne 2000)	Application of Eliminate parasitoid food to boles and crowns of pines (Pinaceae) infested with <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(Stephen and Kinn 1980)	Spatial distribution of mite associates of within-tree populations of <i>Dendroctonus frontalis</i> Zimm. (Coleoptera: Scolytidae)
(Stephen and Paine 1985)	Seasonal patterns of host tree resistance to fungal associates of the southern pine beetle
(Stephen and Taha 1976)	Optimization of sampling effort for within-tree populations of southern pine beetle and its natural enemies
(Stephen et al. 1997)	Augmentation of <i>Dendroctonus frontalis</i> parasitoid effectiveness by artificial diet
(Strom et al. 1999)	Visual and semiochemical disruption of host finding in the southern pine beetle
(Sullivan 2005)	Electrophysiological and behavioral responses of <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae) to volatiles isolated from conspecifics
(Sullivan 2011)	Southern pine beetle behavior and semiochemistry
(Sullivan et al. 1997)	Field response of southern pine beetle parasitoids to some natural attractants
(Sullivan et al. 2003)	Interspecific variation in host-finding cues of parasitoids of the southern pine beetle (Coleoptera: Scolytidae)
(Sullivan et al. 2016)	Intra-annual variation in responses by flying southern pine beetles (Coleoptera: Curculionidae: Scolytinae) to pheromone component <i>endo</i> -brevicomin
(Sullivan et al. 2021)	Alternative formulations of trap lures for operational detection, population monitoring, and outbreak forecasting of southern pine beetle in the United States
(Sullivan et al. 2022)	4-allylanisole as a lure adjuvant for <i>Dendroctonus frontalis</i> (Coleoptera: Curculionidae: Scolytinae) and two associated beetles
(Sullivan et al. 2024)	Potential for a minor pine bark beetle pest, <i>Dendroctonus terebrans</i> (Coleoptera: Curculionidae: Scolytinae), to mediate host location by a major pine killer, <i>Dendroctonus frontalis</i>
(Svihra et al. 1980)	Interspecific olfactory communications in southern pine beetles
(Taylor et al. 1992)	A phloem sandwich allowing attack and colonization by bark beetles (Coleoptera: Scolytidae) and associates
(Tchakerian and Coulson 2011)	Ecological impacts of southern pine beetle
(Thatcher 1960)	Bark beetles affecting southern pines: A review of current knowledge.
(Thatcher and Pickard 1964)	Seasonal variations in activity of the southern pine beetle in east Texas
(Thatcher and Pickard 1966)	The clerid beetle <i>Thanasimus dubius</i> as a predator of southern pine beetle
(Tisdale et al. 2003)	The role of oleoresin flow in the induced response of loblolly pine to a southern pine beetle associated fungus
(Turchin et al. 1999)	Dynamical role of predators in population cycles of a forest insect: An experimental test
(Turnbow and Franklin 1979)	<i>Hyalomyodes triangulifera</i> (Diptera: Tachinidae), parasite of the southern pine beetle predator <i>Thanasimus dubius</i> (Coleoptera: Cleridae)
(Turnbow and Franklin 1982)	Behavior and development of an overwintering population of the southern pine beetle predator, <i>Thanasimus dubius</i> (Fab.)

Appendix 1-1, continued. References included in our systematic review.

Citation	Item title
(Turnbow et al. 1978)	Prey consumption and longevity of adult <i>Thanasimus dubius</i>
(Valiev et al. 2009)	Analysis of cellulase and polyphenol oxidase production by southern pine beetle associated fungi
(VanLaerhoven and Stephen 2002)	Height distribution of adult parasitoids of the southern pine beetle complex

(Sherah L. VanLaerhoven and Stephen 2003)	Rain influences trap catch of adult parasitoids of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann
(Sherah L. VanLaerhoven and Stephen 2003)	Host species influences body size and egg load of the bark beetle parasitoid <i>Roptrocercus xylophagorum</i> (Hymenoptera: Pteromalidae)
(VanLaerhoven et al. 2002)	Baseline egg load of southern pine beetle parasitoid complex
(VanLaerhoven et al. 2005)	Adult parasitoids of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann (Coleoptera: Scolytidae), feed on artificial diet on pine boles, pine canopy foliage and understory hardwood foliage
(Vasanthakumar et al. 2006)	Characterization of gut-associated bacteria in larvae and adults of the southern pine beetle, <i>Dendroctonus frontalis</i> Zimmermann
(Vazquez-Ortiz et al. 2022)	Metabarcoding of mycetangia from the <i>Dendroctonus frontalis</i> species complex (Curculionidae: Scolytinae) reveals diverse and functionally redundant fungal assemblages
(Veysey et al. 2003)	Relative suitability of Virginia pine and loblolly pine as host species for <i>Dendroctonus frontalis</i> (Coleoptera: Scolytidae)
(Vité and Williamson 1970)	<i>Thanasimus dubius</i> : Prey perception
(Vité et al. 1964)	Field observations on response to attractants of bark beetles infesting southern pines
(Wallin et al. 2008)	Forest management treatments, tree resistance, and bark beetle resource utilization in ponderosa pine forests of northern Arizona
(Weed et al. 2016)	Spatio-temporal dynamics of a tree-killing beetle and its predator
(Williams et al. 2009)	Relative and seasonal abundance of three bark beetle predators (Coleoptera: Trogossitidae: Cleridae) across an elevation gradient in ponderosa pine forests of north central Arizona
(Williamson 1971)	Olfactory discernment of prey by <i>Medetera bistriata</i> (Diptera: Dolichopodidae)
(Younan and Hain 1984)	Sequence of arrival of insects associated with severed pines during a collapsing southern pine beetle epidemic