



Digital supplementary material to

STONE, J., LUKE, S.H., DRESCHER, J. & TURNER, E.C. 2025: The status and role of ants in oil palm landscapes: knowledge gaps and directions for future research. – Myrmecological News 35: 145-159.

The content of this digital supplementary material was subject to the same scientific editorial processing as the article it accompanies. However, the authors are responsible for copyediting and layout.

SUPPLEMENTARY MATERIAL

Figures S1, S2 & S3

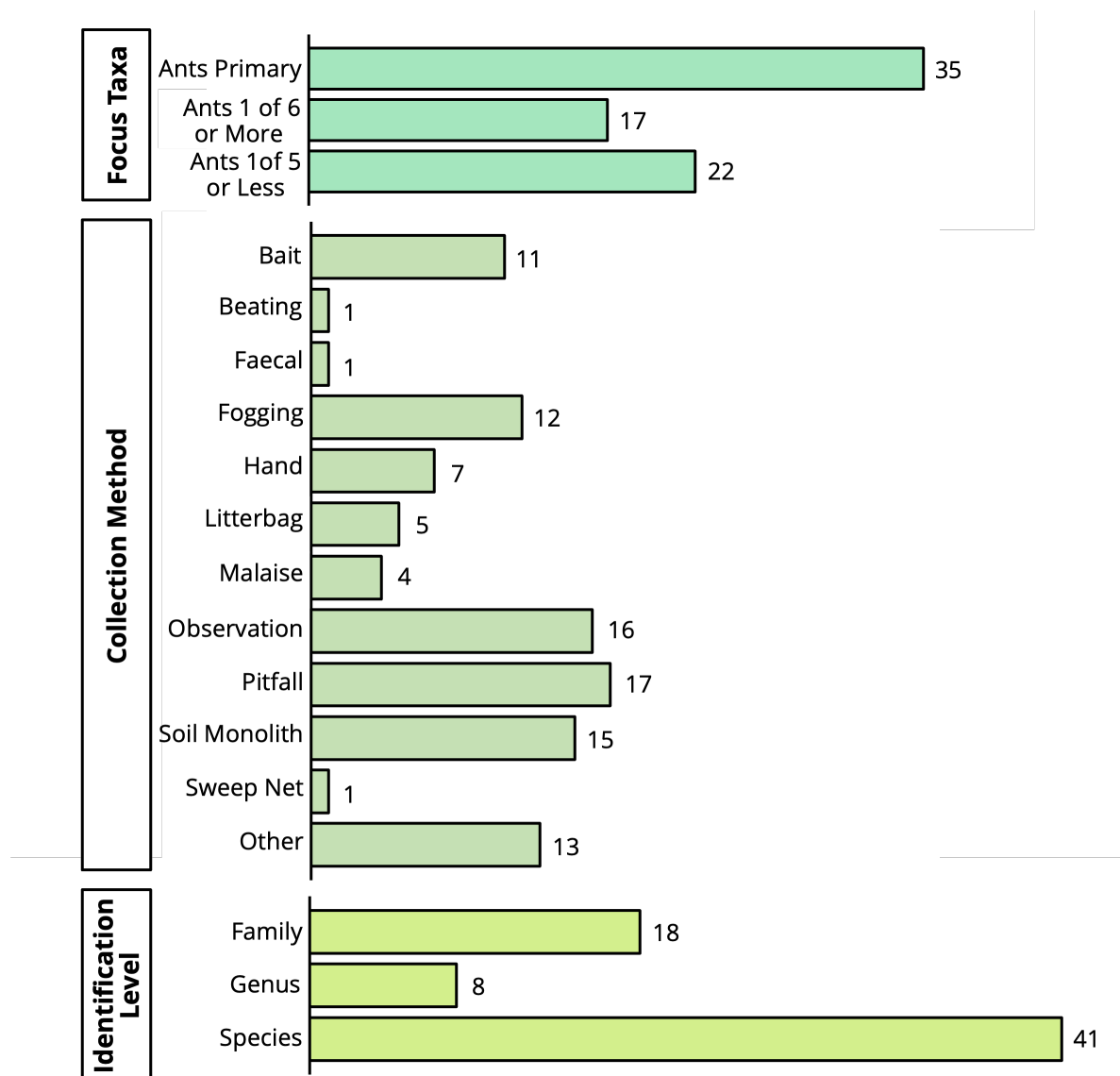


Fig. S1: Publication occurrences within three main categories and relevant sub-categories. “Focus Taxa” sub-categories are mutually exclusive with all 74 publications represented. “Collection Method” sub-categories are not mutually exclusive, but “Identification Level” sub-categories are mutually exclusive. Only the 67 publications for which ants were collected are represented. In the “Collection Method” sub-category “Other” represents an assortment of 13 studies that involve the displacement of varying organic material i.e., dead wood, termite mounds or palm fronds, as an ant sampling method.

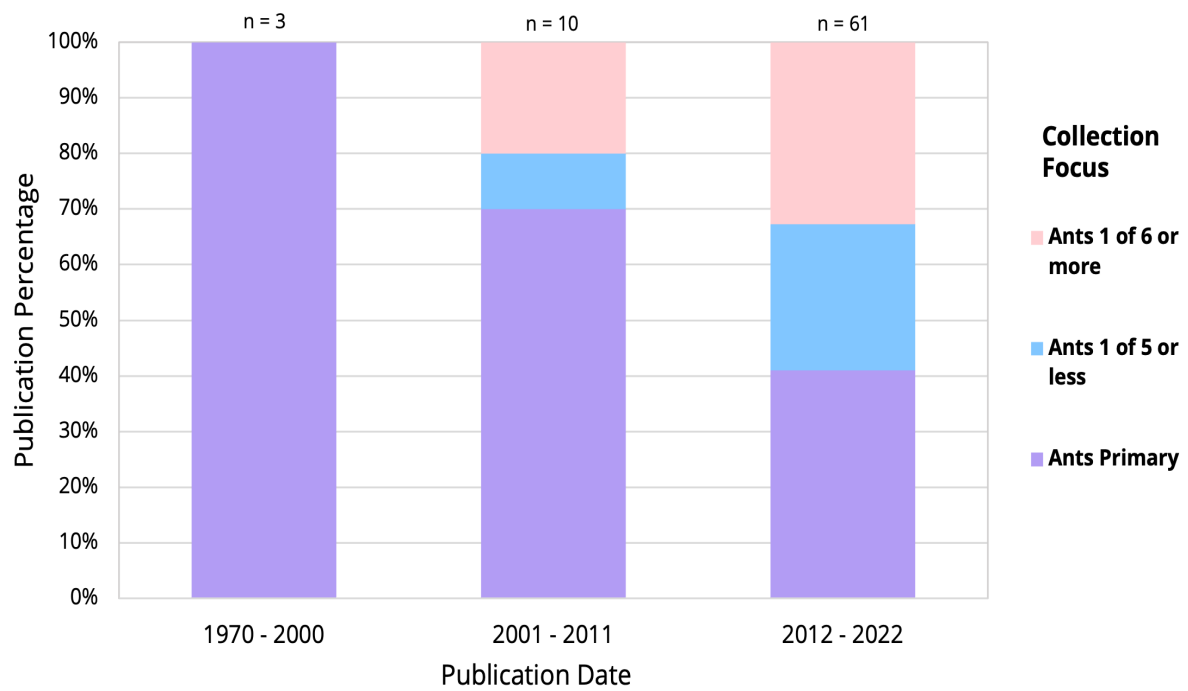


Fig. S2: Changes in the ant related collection focus over time since the first study was published. Publication count is displayed as a percentage for each time period. The first three decades have been combined due to low publication numbers.

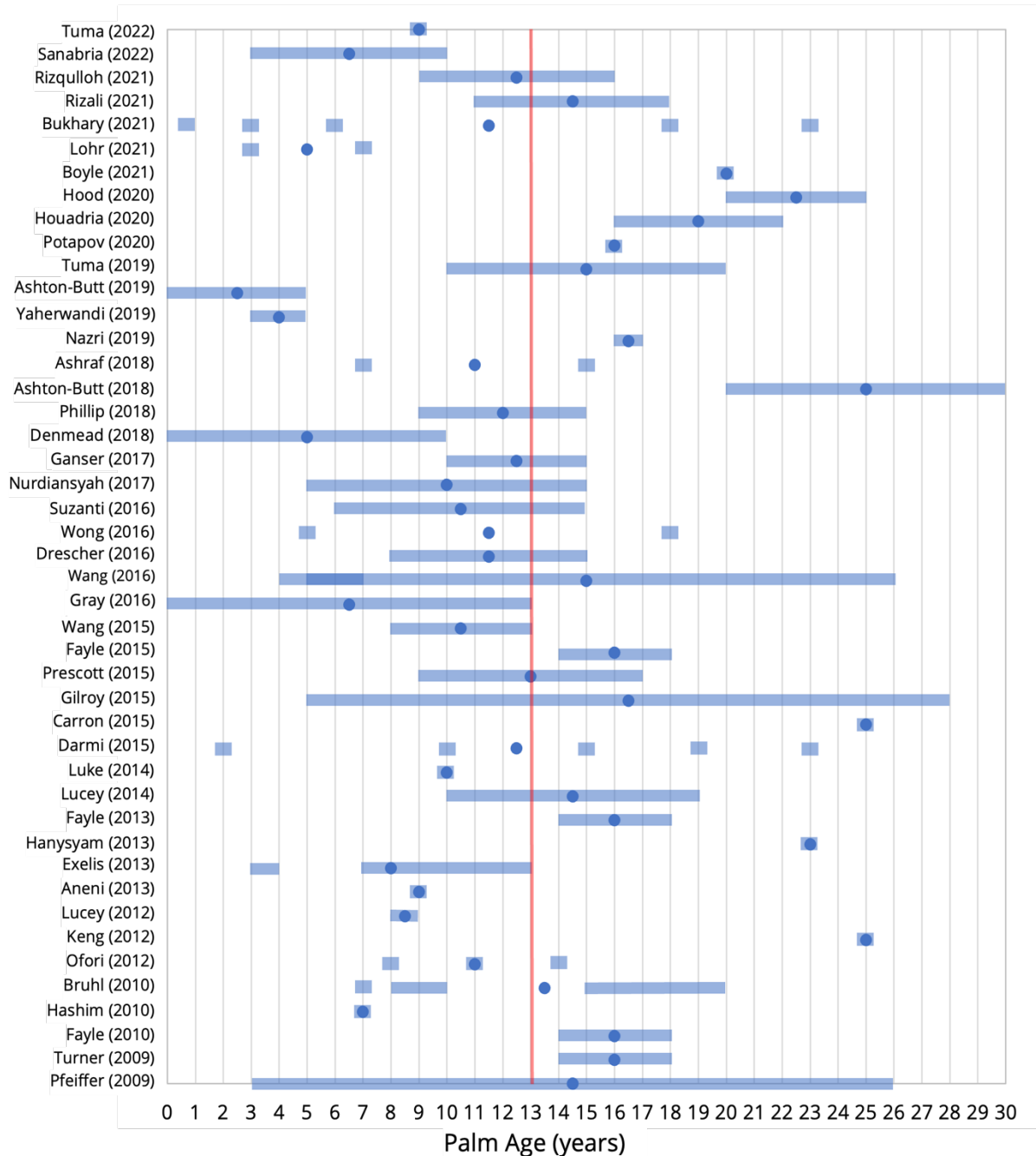


Fig. S3: Oil palm stand age for the 45 publications that recorded this. Each of the publications is identified on the y axis by first author and publication year. Blue bars represent age/age range of palms featured in each publication. Blue circles represent average oil palm age featured within each publication and red line represents average age of palms (13 years) across all 45 publications. 10 publications collected data from stands of two or more ages.

Tables S1, S2 & S3

Tab. S1: Details of the 74 publications included in the review, located through the initial Web of Science (WOS) search, snowballing, or the final consultation stage.

Lead Author	Year	Publication Title	Inclusion Stage
Advento, AD	2022	The first record of the parasitic myrmecophilous caterpillar <i>Liphyra brassolis</i> (Lepidoptera, Lycaenidae) inside Asian weaver ant (<i>Oecophylla smaragdina</i>) nests in oil palm plantations	WOS Search
Tuma, J	2022	The impacts of tropical mound-building social insects on soil properties vary between taxa and with anthropogenic habitat change	WOS Search
Pashkevich, MD	2022	Riparian buffers made of mature oil palms have inconsistent impacts on oil palm ecosystems	WOS Search
Sanabria, C	2022	Do morphological traits of ground-dwelling ants respond to land use changes in a neotropical landscape?	WOS Search
Johari, A	2022	Ant diversity inhabited oil palm plantations in a peatland in Sumatra, Indonesia	WOS Search
Kreider, JJ	2021	Rainforest conversion to monocultures favors generalist ants with large colonies	WOS Search
Narváez-Vásquez, A	2021	Ant (Hymenoptera: Formicidae) species diversity in secondary forest and three agricultural land uses of the Colombian Pacific Coast	Snowballing
Rizqulloh, MN	2021	Effects of rainforest transformation to monoculture cash crops on soil living ants (Formicidae) in Jambi Province, Sumatra, Indonesia	Consultation
Rizali, A	2021	Similarity of ant communities increases with isolation from natural habitat and abundance of invasive ants in oil palm plantations of Central Borneo	WOS Search
Bukhary, AKA	2021	Microhabitats Utilization by Solitary Parasitoids and Predatory Insects as Indicators of Oil Palm Agroecosystem's Capacity to Support Insect Species Diversity	WOS Search
Löhr, B	2021	Land use and terrestrial arthropods at the Colombian Pacific coast	WOS Search
Boyle, MJW	2021	Localised climate change defines ant communities in human-modified tropical landscapes	WOS Search
Hood, ASC	2020	Removing understory vegetation in oil palm agroforestry reduces ground-foraging ant abundance but not species richness	WOS Search
Houadria, MYI	2020	Reduced benefits of ant occupation for ant-trees in oil palm compared with heavily logged forest	WOS Search
Nazarreta, R	2020	Rainforest conversion to smallholder plantations of rubber or oil palm leads to species loss and community shifts in canopy ants (Hymenoptera: Formicidae)	WOS Search
Hood, ASC	2020	Termite mounds house a diversity of taxa in oil palm plantations irrespective of understory management	WOS Search
Potapov, A	2020	Aboveground soil supports high levels of biological activity in oil palm plantations	Consultation
Karawita, H	2019	Dietary composition and foraging habitats of the Indian Pangolin (<i>Manis crassicaudata</i>) in a tropical lowland forest-associated landscape in southwest Sri Lanka	WOS Search
Sholih, MB	2019	Effect of land-use types on shaping ant community structure and their provided ecosystem services	Consultation
Tuma, J	2019	Logging of rainforest and conversion to oil palm reduces bioturbator diversity but not levels of bioturbation	WOS Search
Ashton-Butt, A	2019	Replanting of first-cycle oil palm results in a second wave of biodiversity loss	Snowballing
Nanganoa, LT	2019	Impact of Different Land-Use Systems on Soil Physicochemical Properties and Macrofauna Abundance in the Humid Tropics of Cameroon	WOS Search

Yaherwandi	2019	The Influence of Forest Ecosystems to Ant Community on Smallholder Oil Palm Plantations at Dharmasraya Regency, West Sumatera Indonesia	WoS Search
Nazri, WZW	2019	Spatio-Temporal Pattern of Ants (Hymenoptera: Formicidae) in Endau Rompin Oil Palm Ecosystem, Pahang	Snowballing
Ashraf, M	2018	Alley-cropping system can boost arthropod biodiversity and ecosystem functions in oil palm plantations	WoS Search
Ashton-Butt, A	2018	Understory Vegetation in Oil Palm Plantations Benefits Soil Biodiversity and Decomposition Rates	WoS Search
Widiastuty	2018	Prey preference of <i>Myopopone castanea</i> (hymenoptera: formicidae) toward larvae <i>Oryctes rhinoceros</i> Linn (coleoptera: scarabidae)	Snowballing
Philip, AJ	2018	Selectively Logging Old Growth Rain Forest Twice Changes Canopy Ant Species Composition, While Conversion to Oil Palm Changes Composition and Reduces Species Richness and Diversity	Consultation
Denmead, LH*	2017	The role of ants, birds and bats for ecosystem functions and yield in oil palm plantations	WoS Search
Ganser, D	2017	Local and landscape drivers of arthropod diversity and decomposition processes in oil palm leaf axils	WoS Search
Dassou, AG	2017	Vegetation structure of plantain-based agrosystems determines numerical dominance in community of ground- dwelling ants	Consultation
Nurdiansyah, F	2017	Biological control in Indonesian oil palm potentially enhanced by landscape context	WoS Search
Andres Sendoya, CA	2016	Natural enemies of <i>Stenoma cecropia</i> (Lepidoptera: Elachistidae) in oil palm, in the southwest of Colombia	WoS Search
Sanabria, C	2016	Influence of regions, land uses and soil properties on termite and ant communities in agricultural landscapes of the Colombian Llanos	WoS Search
Suzanti, F	2016	Contribution of epiphytes on the canopy insect population in oil palm plantations in North Sumatera	Snowballing
Wong, MK	2016	Comparison of soil macro-invertebrate communities in Malaysian oil palm plantations with secondary forest from the viewpoint of litter decomposition	Snowballing
Drescher, J	2016	Ecological and socio-economic functions across tropical land use systems after rainforest conversion	Consultation
Wang, WY*	2016	Ground-foraging ant communities vary with oil palm age	WoS Search
Gray, CL	2016	Are riparian forest reserves sources of invertebrate biodiversity spillover and associated ecosystem functions in oil palm landscapes?	WoS Search
Wang, WY	2015	The effects of forest conversion to oil palm on ground-foraging ant communities depend on beta diversity and sampling grain	WoS Search
Fayle, TM	2015	An ant-plant by-product mutualism is robust to selective logging of rain forest and conversion to oil palm plantation	WoS Search
Prescott, GW	2015	Retaining biodiversity in intensive farmland: epiphyte removal in oil palm plantations does not affect yield	WoS Search
Gilroy, JJ	2015	Minimizing the biodiversity impact of Neotropical oil palm development	WoS Search
Rubiana, R	2015	Agricultural land use alters species composition but not species richness of ant communities	WoS Search
Carron, MP	2015	Temporal variability in soil quality after organic residue application in mature oil palm plantations	WoS Search
Carron, MP	2015	Spatial heterogeneity of soil quality around mature oil palms receiving mineral fertilization	WoS Search
Darmi	2015	Communities of Ants (Hymenoptera: Formicidae) In Peatland Planted with Oil Palm Stands of Different Age Strata	Consultation
Gray, CL	2015	Riparian reserves within oil palm plantations conserve logged forest leaf litter ant communities and maintain associated scavenging rates	WoS Search
Edwards, DP	2014	Selective-logging and oil palm: multitaxon impacts, biodiversity indicators, and trade-offs for conservation planning	WoS Search

Sanabria, C	2014	Ants as indicators of soil-based ecosystem services in agroecosystems of the Colombian Llanos	WoS Search
Konopik, O	2014	From rainforest to oil palm plantations: Shifts in predator population and prey communities, but resistant interactions	WoS Search
Luke, SH*	2014	Functional structure of ant and termite assemblages in old growth forest, logged forest and oil palm plantation in Malaysian Borneo	WoS Search
Lucey, JM	2014	Tropical forest fragments contribute to species richness in adjacent oil palm plantations	WoS Search
Fayle, TM*	2013	Ant mosaics occur in SE Asian oil palm plantation but not rain forest and are influenced by the presence of nest-sites and non-native species	WoS Search
Hanysyam, MNM	2013	Entomofaunal Diversity of Insects in FELDA Gunung Besout 6, Sungkai, Perak	WoS Search
Exelis, MP	2013	Studies on the predatory activities of <i>Oecophylla smaragdina</i> (Hymenoptera: Formicidae) on <i>Pteroma pendula</i> (Lepidoptera: Psychidae) in oil palm plantations in Teluk Intan, Perak (Malaysia)	WoS Search
Aneni, TI	2013	Influence of weather factors on seasonal population dynamics of <i>Coelaenomenodera elaedis</i> (Coleoptera – Chrysomelidae) and its natural enemies in Nifor, Nigeria	WoS Search
Lucey, JM	2012	Spillover of Insects from Rain Forest into Adjacent Oil Palm Plantations	WoS Search
Keng, WM	2012	Logistic Regression to Predict Termite Occurrences with Environmental Variables in Primary Forest and Oil Palm Ecosystem: The Case Study in Sabah, Malaysia	WoS Search
Khairiyah, SMH	2012	Entomofaunal Diversity of Hymenoptera in FELDA Besout 6 Oil Palm Plantation	Snowballing
Ofori, S	2012	Preliminary Study into the Occurrence and Diversity of Arboreal Ants in Three Differently Aged Oil Palm Fields at Kusi	Consultation
Chin, HC	2010	Insect Succession Associated with a Hanging Pig Carcass Placed in an Oil Palm Plantation in Malaysia	WoS Search
Bruhl, CA*	2010	Fuelling the biodiversity crisis: species loss of ground-dwelling forest ants in oil palm plantations in Sabah, Malaysia (Borneo)	WoS Search
Hashim, NR	2010	Ant diversity in a Peninsular Malaysian mangrove forest and oil palm plantation	WoS Search
Fayle, TM*	2010	Oil palm expansion into rain forest greatly reduces ant biodiversity in canopy, epiphytes and leaf-litter	WoS Search
Kenne, M	2009	Nesting and foraging habits in the arboreal ant <i>Atopomyrmex mocquersyi</i> ANDRE, 1889 (Hymenoptera: Formicidae: Myrmicinae)	WoS Search
Turner, EC	2009	The impact of forest conversion to oil palm on arthropod abundance and biomass in Sabah, Malaysia	Snowballing
Chin, HC	2008	Ants (Hymenoptera: Formicidae) associated with pig carcasses in Malaysia	WoS Search
Pfeiffer, M*	2008	Exploring arboreal ant community composition and co-occurrence patterns in plantations of oil palm <i>Elaeis guineensis</i> in Borneo and Peninsular Malaysia	WoS Search
Chin, HC	2007	A preliminary study of insect succession on a pig carcass in a palm oil plantation in Malaysia	WoS Search
Bruhl, CA	2003	Size does matter – Effects of tropical rainforest fragmentation on the leaf litter ant community in Sabah, Malaysia	Snowballing
Dejean, A	1997	Ant mosaic in oil palm plantations of the southwest province of Cameroon: Impact on leaf miner beetle (Coleoptera: Chrysomelidae)	WoS Search
Taylor, B	1977	The ant mosaic on cocoa and other tree crops in Western Nigeria	Snowballing
Room, PM	1975	Diversity and Organization of the Ground Foraging Ant Faunas of Forest, Grassland and Tree Crops in Papua New Guinea	Snowballing

* Benchmark paper used to formulate search criteria

Tab. S2: Details of the 33 publications that were found in the initial Web of Science (WOS) search, but subsequently excluded at one of the three initial screening stages.

Lead Author	Year	Publication Title	Exclusion Stage
Wilker, I	2023	Land-use change in the Amazon decreases ant diversity but increases ant-mediated predation	(Full Text)
Lum, JY	2023	Anthropogenic Influence on the Distribution of the Longlegged Ant (Hymenoptera: Formicidae)	(Abstract)
Exelis, MP	2023	Foraging Behaviour and Population Dynamics of Asian Weaver Ants: Assessing Its Potential as Biological Control Agent of the Invasive Bagworms <i>Metisa plana</i> (Lepidoptera: Psychidae) in Oil Palm Plantations	(Abstract)
Advento, AD	2022	Which Protein Source is Best for Mass-Rearing of Asian Weaver Ants?	(Abstract)
Hood, ASC	2022	A whole-ecosystem method for experimentally suppressing ants on a small scale	(Title)
Lee, CY	2022	Biology, Ecology, and Management of the Invasive Longlegged Ant, <i>Anoplolepis gracilipes</i>	(Abstract)
Dean, WRJ	2021	A review of the conservation status of birds in the Guineo-Congolian forest of Africa	(Title)
Hanafiah, KM	2021	Impact of Malaysian palm oil on sustainable development goals: co-benefits and trade-offs across mitigation strategies	(Abstract)
Ratnadass, A	2021	Crop protection practices and viral zoonotic risks within a One Health framework	(Abstract)
Araujo, VCR	2019	Distribution and attack of pineapple mealybug to macauba palm <i>Acrocomia aculeata</i>	(Abstract)
Ocampo-Ariza, C	2019	Extinction thresholds and negative responses of Afrotropical ant-following birds to forest cover loss in oil palm and agroforestry landscapes	(Abstract)
Di Mattia, C	2019	Antioxidant Activities in vitro of Water and Liposoluble Extracts Obtained by Different Species of Edible Insects and Invertebrates	(Title)
Woodham, CR	2019	Effects of Replanting and Retention of Mature Oil Palm Riparian Buffers on Ecosystem Functioning in Oil Palm Plantations	(Full Text)
Sanders, AJP	2019	Unrelenting games: Multiple negotiations and landscape transformations in the tropical peatlands of Central Kalimantan, Indonesia	(Abstract)
Chellaiah, D	2018	Riparian buffers mitigate impacts of oil palm plantations on aquatic macroinvertebrate community structure in tropical streams of Borneo	(Abstract)
Kimber, A	2018	Strong but taxon-specific responses of termites and wood-nesting ants to forest regeneration in Borneo	(Full Text)
Bourguignon, T	2017	Ant and termite communities in isolated and continuous forest fragments in Singapore	(Abstract)
Luiza-Andrade, A	2017	Influence of oil palm monoculture on the taxonomic and functional composition of aquatic insect communities in eastern Brazilian Amazonia	(Abstract)
Neoh, KB	2017	The effect of remnant forest on insect successional response in tropical fire-impacted peatland: A bi-taxa comparison	(Full Text)
Hosoishi, S	2017	A comparison of ground-dwelling and arboreal ant assemblages (Hymenoptera: Formicidae) in lowland forests of Cambodia	(Abstract)
Lu, ZX	2016	Can reforested and plantation habitats effectively conserve SW China's ant biodiversity?	(Full Text)
Powell, LL	2015	Ecology and conservation of avian insectivores of the rainforest understory: A pantropical perspective	(Title)
Ewers, RM	2015	Logging cuts the functional importance of invertebrates in tropical rainforest	(Abstract)
Tawatao, N	2014	Biodiversity of leaf-litter ants in fragmented tropical rainforests of Borneo: the value of publicly and privately managed forest fragments	(Abstract)
Hosoishi, S	2013	Ant diversity in rubber plantations (<i>Hevea brasiliensis</i>) of Cambodia	(Title)
Senior, MJM	2013	Trait-dependent declines of species following conversion of rain forest to oil palm plantations	(Abstract)

Edwards, DP	2012	Reduced-impact logging and biodiversity conservation: a case study from Borneo	(Abstract)
Woodcock, P	2011	The conservation value of South East Asia's highly degraded forests: evidence from leaf-litter ants	(Abstract)
Tawatao, N	2011	Impacts of forest fragmentation on the genetic diversity and population structure of <i>Pachycondyla obscurans</i> in Sabah, Malaysian Borneo	(Abstract)
Fayle, TM	2011	A positive relationship between ant biodiversity (Hymenoptera: Formicidae) and rate of scavenger-mediated nutrient redistribution along a disturbance gradient in a south-east Asian rain forest	(Full Text)
Fitzherbert, EB	2008	How will oil palm expansion affect biodiversity?	(Abstract)
Hassall, M	2006	Biodiversity and abundance of terrestrial isopods along a gradient of disturbance in Sabah, East Malaysia	(Title)
Bickel, TO	2006	Influence of habitat fragmentation on the genetic variability in leaf litter ant populations in tropical rainforests of Sabah, Borneo	(Abstract)

Tab S3: List of the 93 genera (sorted by subfamily) recorded in the 74 publications*, with the geographic region(s) and number of publications in which they were reported. All genera have been updated to fit current accepted taxonomic nomenclature.

Subfamily	Genera	Geographic Region	No. of Publications (by region) Total
Amblyoponinae	<i>Myopopone</i>	Asia	1
	<i>Prionopelta</i>	Asia	4
	<i>Stigmatomma</i>	Asia	1
Dolichoderinae	<i>Chronoxenus</i>	Asia	4
	<i>Dolichoderus</i>	Asia, South America	(11, 1) 12
	<i>Iridomyrmex</i>	Asia, Oceania	(6, 1) 7
	<i>Linepithema</i>	South America	1
	<i>Loweriella</i>	Asia	4
	<i>Ochetellus</i>	Asia	5
	<i>Philidris</i>	Asia	2
	<i>Tapinoma</i>	Asia, Oceania, South America	(16, 1, 1) 18
	<i>Technomyrmex</i>	Asia, Oceania	(15, 1) 16
	<i>Acanthostichus</i>	South America	2
Dorylinae	<i>Aenictus</i>	Asia, Oceania	(5, 1) 6
	<i>Cerapachys</i>	Asia	2
	<i>Dorylus</i>	Asia	5
	<i>Eciton</i>	South America	1
	<i>Labidus</i>	South America	4
	<i>Ectatomma</i>	South America	4
Ectatomminae	<i>Gnamptogenys</i>	Asia**, South America	(7, 1) 8
	<i>Acropyga</i>	Asia, South America	1
Formicinae	<i>Anoplolepis</i>	Asia, Oceania	(22, 1) 23
	<i>Brachymyrmex</i>	South America	3
	<i>Camponotus</i>	Africa, Asia, South America	(1, 20, 2) 23
	<i>Colobopsis</i>	Asia	3
	<i>Dinomyrmex</i>	Asia	1
	<i>Euprenolepis</i>	Asia	7
	<i>Lepisiota</i>	Africa	1
	<i>Nylanderia</i>	Asia, South America	(14, 2) 16
	<i>Oecophylla</i>	Africa, Asia	(1, 18) 19
	<i>Overbeckia</i>	Asia	2
	<i>Paraparatrechina</i>	Asia	8
	<i>Paratrechina</i>	Africa, Asia, Oceania, South America	(1, 14, 1, 3) 19
	<i>Plagiolepis</i>	Asia	13
	<i>Polyrhachis</i>	Africa, Asia, Oceania	(1, 11, 1) 13
	<i>Prenolepis</i>	Asia	4
	<i>Pseudolasius</i>	Asia	3
Leptanillinae	<i>Leptanilla</i>	Asia	1
Myrmecinae	<i>Acromyrmex</i>	South America	1
	<i>Aphaenogaster</i>	Asia	4
	<i>Atopomyrmex</i>	Africa	1
	<i>Atta</i>	South America	1
	<i>Calyptomyrmex</i>	Asia	5
	<i>Cardiocondyla</i>	Asia, Oceania	(17, 1) 18
	<i>Carebara</i>	Asia, Oceania	(17, 1) 18
	<i>Cataulacus</i>	Asia	3
	<i>Crematogaster</i>	Africa, Asia, South America	(1, 20, 1) 22
	<i>Cyphomyrmex</i>	South America	1
	<i>Dacotinops</i>	Asia	1
	<i>Eurhopalothrix</i>	Asia	1

	<i>Lasiomyrma</i>	Asia	2
	<i>Lophomyrmex</i>	Asia	13
	<i>Lordomyrma</i>	Asia	3
	<i>Mayriella</i>	Asia	2
	<i>Meranoplus</i>	Asia	6
	<i>Monomorium</i>	Asia, South America	(21, 1) 22
	<i>Myrmecina</i>	Asia	11
	<i>Myrmicaria</i>	Asia	3
	<i>Octostruma</i>	South America	1
	<i>Paratopula</i>	Asia	1
	<i>Pheidole</i>	Africa, Asia, South America	(1, 25, 3) 29
	<i>Pristomyrmex</i>	Asia	9
	<i>Proatta</i>	Asia	7
	<i>Recurvidris</i>	Asia	5
	<i>Rotastruma</i>	Asia	3
	<i>Solenopsis</i>	Asia, South America	(12, 3) 15
	<i>Strumigenys</i>	Asia, South America	(13, 1) 14
	<i>Sylophopsis</i>	Asia	1
	<i>Tetheamyрма</i>	Asia	1
	<i>Tetramorium</i>	Asia, Oceania	(25, 1) 26
	<i>Vollenhovia</i>	Asia	10
	<i>Wasmannia</i>	South America	3
Ponerinae	<i>Anochetus</i>	Asia, Oceania	(8, 1) 9
	<i>Brachyponera</i>	Asia, Oceania	(2, 1) 3
	<i>Centromyrmex</i>	South America	3
	<i>Cryptopone</i>	Asia	6
	<i>Diacamma</i>	Asia	10
	<i>Euponera</i>	Asia	1
	<i>Hypoponera</i>	Asia, South America	(14, 3) 17
	<i>Leptogenys</i>	Asia, South America	(16, 1) 17
	<i>Mesoponera</i>	Asia	2
	<i>Myopias</i>	Asia	2
	<i>Neoponera</i>	South America	1
	<i>Odontomachus</i>	Africa, Asia, Oceania, South America	(1, 13, 1, 3) 17
	<i>Odontoponera</i>	Asia	19
	<i>Pachycondyla</i>	Asia**, South America	(12, 3) 15
	<i>Platythyrea</i>	Asia, South America	(7, 1) 8
	<i>Ponera</i>	Asia	12
	<i>Rasopone</i>	South America	1
Proceratiinae	<i>Discothyrea</i>	Asia	1
	<i>Proceratium</i>	Asia	2
Pseudomyrmecinae	<i>Pseudomyrmex</i>	South America	2
	<i>Tetraponera</i>	Asia	6

* Genera which were listed in Ofori et al., 2012 have been excluded from this table (as well as from any related data presented within the review) due to taxonomic identifications which appear to be incorrect, given recorded distributions of species.

** Recent revisions mean that the genera listed is no longer considered to reside within this continent, however, as specific species were not listed in original publications, it is not possible to update taxonomic classification and therefore are listed as reported.