

Literature Cited

- Aanen DK, Eggleton P, Lefèvre CR, Frøslev TG, Rosendahl S, Boomsma JJ (2002) The evolution of fungus-growing termites and their mutualistic fungal symbionts. *Proc Natl Acad Sci U S A* 99:14887–14892
- Ackerman JD (1989) Geographic and seasonal variation in fragrance choices and preferences of male euglossine bees. *Biotropica* 21:340–347
- Addicott JF (1996) Cheaters in yucca/moth mutualism. *Nature* 380:114–115
- Addicott JF, Bao T (1999) Limiting the costs of mutualism: multiple modes of interaction between yuccas and yucca moths. *Proc R Soc Lond B* 266:197–202
- Airy Shaw HK (1978) Notes on Malesian and other Asiatic Euphorbiaceae. *Kew Bull* 33:25–77
- Als TD, Vila R, Kandul NP, Nash DR, Yen S-H, Hsu Y-F, Mignault AA, Boomsma JJ, Pierce NE (2004) The evolution of alternative parasitic life histories in large blue butterflies. *Nature* 432:386–390
- Althoff DM, Groman JD, Segraves KA, Pellmyr O (2001) Phylogeographic structure of the bogus yucca moth *Prodoxus quinquepunctellus*: comparisons with coexisting pollinator moths. *Mol Phylogenet Evol* 21:117–127
- Althoff DM, Segraves KA, Pellmyr O (2005) Community context of an obligate mutualism: pollinator and florivore effects on *Yucca filamentosa*. *Ecology* 86:905–913
- Althoff DM, Segraves KA, Smith CI, Leebens-Mack J, Pellmyr O (2012) Geographic isolation trumps coevolution as a driver of yucca and yucca moth diversification. *Mol Phylogenet Evol* 62:898–906
- Althoff DM, Xiao W, Sumoski S, Segraves KA (2013) Florivore impacts on plant reproductive success and pollinator mortality in an obligate pollination mutualism. *Oecologia* 173:1345–1354
- Angiosperm Phylogeny Group (2003) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Bot J Linn Soc* 141:300–436
- Angiosperm Phylogeny Group (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Bot J Linn Soc* 161:105–121
- Antal JS, Prasad M (1996) Some more leaf-impressions from the Himalayan foot-hills of Darjeeling District, West Bengal, India. *Palaeobotanist* 43:1–9
- Askew RR (1980) The diversity of insect communities in leaf-mines and plant galls. *J Anim Ecol* 49:817–829
- Axelrod R, Hamilton WD (1981) The evolution of cooperation. *Science* 211:1390–1396
- Ayasse M, Schiestl FP, Paulus HF, Ibarra F, Francke W (2003) Pollinator attraction in a sexually deceptive orchid by means of unconventional chemicals. *Proc R Soc Lond B* 270:517–522

- Bailey R, Schönrogge K, Cook JM, Melika G, Csóka G, Thuróczy C, Stone GN (2009) Host niches and defensive extended phenotypes structure parasitoid wasp communities. *PLoS Biol* 7: e1000179
- Baldwin BG, Wagner WL (2010) Hawaiian angiosperm radiations of North American origin. *Ann Bot* 105:849–879
- Bao T, Addicott JF (1998) Cheating in mutualism: defection of *Yucca baccata* against its yucca moths. *Ecol Lett* 1:155–159
- Barriault I, Barabé D, Cloutier L, Gibernau M (2010) Pollination ecology and reproductive success in Jack-in-the-pulpit (*Arisaema triphyllum*) in Québec (Canada). *Plant Biol* 12:161–171
- Bashford R (2002) The insect fauna inhabiting *Uromycladium* (Uredinales) rust galls on silver wattle (*Acacia dealbata*) in Tasmania. *Aust Entomol* 29:81–95
- Bawa KS (1990) Plant–pollinator interactions in tropical rain forests. *Annu Rev Ecol Syst* 21:399–422
- Beardsley PM, Yen A, Olmstead RG (2003) AFLP phylogeny of *Mimulus* section *Erythranthe* and the evolution of hummingbird pollination. *Evolution* 57:1397–1410
- Beattie AJ, Hughes L (2002) Ant–plant interactions. In: Herrera CM, Pellmyr O (eds) Plant–animal interactions: an evolutionary approach. Blackwell Science, Oxford, pp 211–235
- Beattie AJ, Turnbull CL, Knox RB, Williams EG (1984) Ant inhibition of pollen function: a possible reason why ant pollination is rare. *Am J Bot* 71:421–426
- Bennett GM, O’Grady PM (2013) Historical biogeography and ecological opportunity in the adaptive radiation of native Hawaiian leafhoppers (Cicadellidae: *Nesophrosyne*). *J Biogeogr* 40:1512–1523
- Bentley BL (1977) Extrafloral nectaries and protection by pugnacious bodyguards. *Annu Rev Ecol Syst* 8:407–427
- Beraldi-Campesi H (2013) Early life on land and the first terrestrial ecosystems. *Ecol Process* 2:1
- Bidartondo MI (2005) The evolutionary ecology of myco-heterotrophy. *New Phytol* 167:335–352
- Bidartondo MI, Bruns TD (2001) Extreme specificity in epiparasitic Monotropoideae (Ericaceae): widespread phylogenetic and geographical structure. *Mol Ecol* 10:2285–2295
- Bidartondo MI, Read DJ, Trappe JM, Merckx V, Ligrone R, Duckett JG (2011) The dawn of symbiosis between plants and fungi. *Biol Lett* 7:574–577
- Blanco MA, Barboza G (2005) Pseudocopulatory pollination in *Lepanthes* (Orchidaceae: Pleurothallidinae) by fungus gnats. *Ann Bot* 95:763–772
- Bland KP (1980) Nigerian Gracillariidae. *J Lepidop Soc* 34:25–35
- Bogler DJ, Neff JL, Simpson BB (1995) Multiple origins of the yucca–yucca moth association. *Proc Natl Acad Sci U S A* 92:6864–6867
- Brantjes N (1976a) Riddles around pollination of *Melandrium album* (Mill) Garcke (Caryophyllaceae) during oviposition by *Hadena bicruris* Hufn (Noctuidae Lepidoptera), 1. *Proc K Ned Akad Wet C* 79:1–12
- Brantjes N (1976b) Riddles around pollination of *Melandrium album* (Mill) Garcke (Caryophyllaceae) during oviposition by *Hadena bicruris* Hufn (Noctuidae Lepidoptera), 2. *Proc K Ned Akad Wet C* 79:127–141
- Braun AF (1909) Notes on Chamber’s species of Tineina. *Entomol News* 20:428–434
- Bray JR, Curtis JT (1957) An ordination of the upland forest communities of southern Wisconsin. *Ecol Monogr* 27:325–349
- Brian WM, Trautwein MD, Winkler IS, Barr NB, Kim JW, Lambkin C, Bertone MA, Cassel BK, Bayless KM, Heimberg AM, Wheeler BM, Peterson KJ, Pape T, Sinclair BJ, Skevington JH, Blagoderov V, Caravas J, Kutty SN, Schmidt-Ott U, Kampmeier GE, Thompson FC, Grimaldi DA, Beckenbach AT, Courtney GW, Friedrich M, Meier R, Yeates DK (2011) Episodic radiations in the fly tree of life. *Proc Natl Acad Sci* 108:5690–5695
- Brito R, Gonçalves GL, Vargas HA, Moreira GR (2013) A new Brazilian *Passiflora* leafminer: *Spinivalva gaucha*, gen. n., sp. n. (Lepidoptera, Gracillariidae, Gracillariinae), the first gracillariid without a sap-feeding instar. *Zookeys* 17:1–26

- Brooke M de L, Jones PJ (1995) The diet of the Henderson fruit dove *Ptilinopus insularis*. I. Field observations of fruit choice. *Biol J Linn Soc* 56:149–165
- Brouat C, Garcia N, Andary C, McKey D (2001) Plant lock and key: pairwise coevolution of an exclusion filter in an ant–plant mutualism. *Proc R Soc Lond B* 268:2131–2141
- Brower AVZ (1994) Rapid morphological radiation and convergence among races of the butterfly *Heliconius erato* inferred from patterns of mitochondrial DNA evolution. *Proc Natl Acad Sci U S A* 91:6491–6495
- Brown JM, Pellmyr O, Thompson JN, Harrison RG (1994) Mitochondrial DNA phylogeny of the Prodoxidae (Lepidoptera: Incurvarioidea) indicates a rapid ecological diversification of the yucca moths. *Ann Entomol Soc Am* 87:795–802
- Bshary R, Grutter AS (2006) Image scoring and cooperation in a cleaner fish mutualism. *Nature* 441:975–978
- Buchmann SL (1987) The ecology of oil flowers and their bees. *Annu Rev Ecol Syst* 18:343–369
- Bull JJ, Rice WR (1991) Distinguishing mechanisms for the evolution of co-operation. *J Theor Biol* 149:63–74
- Burkill IH, Crosby CS (1901) The flora of Vavau, one of the Tonga islands. *J Linn Soc Lond Bot* 35:20–65
- Busck A (1934) Microlepidoptera of Cuba. *Entomol Am* 13:151–217
- Butaud J-F (2009) Les Gambier, un archipel à la végétation naturelle relictuelle et à la flore patrimoniale menacée. *Bull Soc Étud Océan* 315–316:99–140
- Butaud J-F, Jacq F (2009) Atolls soulevés des Tuamotu: guide floristique. Direction de l'Environnement, Government of French Polynesia, Papeete. <http://www.environnement.pf/spip.php?article125>. Accessed 28 June 2015
- Butaud J-F, Gérard J, Guibal D (2008) Guide des arbres de Polynésie française: bois et utilisations. Éditions Au vent des îles. Pirae, French Polynesia
- Byers KJ, Bradshaw HD Jr, Riffell JA (2014) Three floral volatiles contribute to differential pollinator attraction in monkeyflowers (*Mimulus*). *J Exp Biol* 217:614–623
- Cantley JT, Swenson NG, Markey A, Keeley SC (2014) Biogeographic insights on Pacific *Coprosma* (Rubiaceae) indicate two colonizations to the Hawaiian Islands. *Bot J Linn Soc* 174:412–424
- Carlquist S (1974) Island biology. Columbia University Press, New York
- Carroll SP, Bord C (1992) Host race radiation in the oapberry bug: natural history with the history. *Evolution* 46:1052–1069
- Casquet J, Bourgeois YXC, Cruaud C, Gavory F, Gillespie RG, Thébaud C (2015) Community assembly on remote islands: a comparison of Hawaiian and Mascarene spiders. *J Biogeogr* 42:39–50
- Chakrabarty T, Balakrishnan NP (2009) Transfer of Indian species of *Glochidion*, *Breynia*, and *Sauropus* to *Phyllanthus* (Phyllanthaceae): new combinations and new names. *J Econ Taxon Bot* 33:712–716
- Chakrabarty T, Gangopadhyay M (1995) The genus *Glochidion* (Euphorbiaceae) in the Indian subcontinent. *J Econ Taxon Bot* 19:173–234
- Chakrabarty T, Gangopadhyay M (1996) The genus *Breynia* (Euphorbiaceae) in the Indian subcontinent. *J Econ Taxon Bot* 20:501–512
- Chantaranothai P (2005) Taxonomic notes on the genus *Phyllanthus* L. (Euphorbiaceae) in Thailand. *Thai For Bull* 33:16–20
- Chen C, Song Q, Proffitt M, Bessière JM, Li Z, Hossaert-McKey M (2009) Private channel: a single unusual compound assures specific pollinator attraction in *Ficus semicordata*. *Funct Ecol* 23:941–950
- Chiba S (2004) Ecological and morphological patterns in communities of land snails of the genus *Mandarina* from the Bonin Islands. *J Evol Biol* 17:131–143
- Cibois A, Beadell JS, Graves GR, Pasquet E, Slikas B, Sonsthagen SA, Thibault J-C, Fleischer RC (2011) Charting the course of reed-warblers across the Pacific islands. *J Biogeogr* 38:1963–1975

- Clark JR, Wagner WL, Roalson EH (2009) Patterns of diversification and ancestral range reconstruction in the southeast Asian-Pacific angiosperm lineage *Cyrtandra* (Gesneriaceae). *Mol Phylogenet Evol* 53:982–994
- Clarke JFG (1971) The Lepidoptera of Rapa Island. *Smithson Contr Zool* 56:1–282
- Clarke JFG (1986) Pyralidae and microlepidoptera of the Marquesas Archipelago. *Smithson Contr Zool* 416:1–485
- Clarke D, Whitney H, Gregory G, Robert D (2013) Detection and learning of floral electric fields by bumblebees. *Science* 340:66–69
- Clayton DH, Bush SE, Goates BM, Johnson KP (2003) Host defense reinforces host–parasite cospeciation. *Proc Natl Acad Sci U S A* 100:15694–15699
- Clouard V, Bonneville A (2005) Ages of seamounts, islands, and plateaus on the Pacific plate. In: Foulger GR, Natland JH, Presnall DC, Anderson DL (eds) *Plates, plumes, and paradigms*, vol 388. Geological Society of America Special Paper, Boulder, pp 71–90
- Colley H (2009) Fiji, geology. In: Gillespie RG, Clague DA (eds) *Encyclopedia of islands*. University of California Press, Berkeley, pp 305–309
- Compton SG (1990) A collapse of host specificity in some African fig wasps. *S Afr J Sci* 86:39–40
- Compton SG, Holton KC, Rashbrook VK, van Noort S, Vincent SL, Ware AB (1991) Studies of *Ceratosolen galili*, a non-pollinating agaonid fig wasp. *Biotropica* 23:188–194
- Condit IJ (1947) *The fig*. Chronica Botanica Co., Waltham
- Conow C, Fielder D, Ovadia Y, Libeskind-Hadas R (2010) Jane: a new tool for the cophylogeny reconstruction problem. *Algorithm Mol Biol* 5:16
- Cook JM, Rasplus JY (2003) Mutualists with attitude: coevolving fig wasps and figs. *Trends Ecol Evol* 18:241–248
- Cornille A, Underhill JG, Cruaud A, Hossaert-McKey M, Johnson SD, Tolley KA, Kjellberg F, van Noort S, Proffit M (2012) Floral volatiles, pollinator sharing and diversification in the fig–wasp mutualism: insights from *Ficus natalensis*, and its two wasp pollinators (South Africa). *Proc R Soc B* 279:1731–1739
- Coyne JA, Orr HA (2004) *Speciation*. Sinauer Associates, Sunderland
- Crabb BA, Pellmyr O (2006) Impact of the third trophic level in an obligate mutualism: do yucca plants benefit from parasitoids of yucca moths? *Int J Plant Sci* 167:119–124
- Cronk Q, Ojeda I (2008) Bird-pollinated flowers in an evolutionary and molecular context. *J Exp Bot* 59:715–727
- Csotonyi and Addicott (2001)
- Culley TM, Weller SG, Sakai AK (2002) The evolution of wind pollination in angiosperms. *Trends Ecol Evol* 17:361–369
- Cunningham DD (1888) On the phenomena of fertilization in *Ficus roxburghii* Wall. *Ann R Bot Gard Calcutta* 1:11–51
- Currie CR, Wong B, Stuart AE, Schultz TR, Rehner SA, Mueller UG, Sung GH, Spatafora JW, Straus NA (2003) Ancient tripartite coevolution in the attine ant–microbe symbiosis. *Science* 299:386–388
- Dafni A, Kevan PG, Husband BC (2005) *Practical pollination biology*. Enviroquest, Cambridge
- Darwin C (1859) *On the origin of species by means of natural selection*. John Murray, London
- Davidson DW, McKey D (1993) The evolutionary ecology of symbiotic ant–plant relationships. *J Hymenopt Res* 2:13–83
- Davis DR (1967) A revision of the moths of the subfamily Prodoxinae (Lepidoptera: Incurvariidae). *US Nat Mus Bull* 255:1–170
- Davis CC, Webb CO, Wurdack KJ, Jaramillo CA, Donoghue MJ (2005) Explosive radiation of Malpighiales supports a mid-cretaceous origin of modern tropical rain forests. *Am Nat* 165: E36–E65
- Davis CC, Latvis M, Nickrent DL, Wurdack KJ, Baum DA (2007) Floral gigantism in Rafflesiaceae. *Science* 315:1812
- De Prins J, De Prins W (2005) *World catalogue of insects, volume 6: Gracillariidae (Lepidoptera)*. Apollo Books, Svendborg

- De Prins J, De Prins W (2016) Global taxonomic database of Gracillariidae (Lepidoptera). Available at: <http://www.gracillariidae.net>
- Després L, Ibanez S, Hemborg ÅM, Godelle B (2007) Geographic and within population variation in the globeflower–globeflower fly interaction: the costs and benefits of rearing pollinators' larvae. *Oecologia* 151:240–250
- Diakonoff A (1955) Microlepidoptera of New Guinea. Results of the third Archbold Expedition (American-Netherlands Indian Expedition 1938–1939). Part V. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde* 50:1–210
- Diamond J (2002) Evolution, consequences and future of plant and animal domestication. *Nature* 418:700–707
- Dobson HEM (2006) Relationship between floral fragrance composition and type of pollinator. In: Pichersky E, Dudareva N (eds) *Biology of floral scent*. CRC Press, Boca Raton, pp 147–198
- Dötterl S, Füssel U, Jürgens A, Aas G (2005) 1, 4-Dimethoxybenzene, a floral scent compound in willows that attracts an oligolectic bee. *J Chem Ecol* 31:2993–2998
- Dötterl S, Burkhardt D, Weißbecker B, Jürgens A, Schütz S, Mosandl A (2006) Linalool and lilac aldehyde/alcohol in flower scents: electrophysiological detection of lilac aldehyde stereoisomers by a moth. *J Chromatogr A* 1113:231–238
- Drake DR, Motley TJ, Whistler WA, Imada CT (1996) Rain forest vegetation of 'Eua Island, Kingdom of Tonga. *N Z J Bot* 34:65–77
- Dunn DW, Segar ST, Ridley J, Chan R, Crozier RH, Yu DW, Cook JM (2008) A role for parasites in stabilising the fig–pollinator mutualism. *PLoS Biol* 6:e59
- Dupont YL, Hansen DM, Valido A, Olesen JM (2004) Impact of introduced honey bees on native pollination interactions of the endemic *Echium wildpretii* (Boraginaceae) on Tenerife, Canary Islands. *Biol Conserv* 118:301–311
- Economio EP, Sarnat EM (2012) Revisiting the ants of Melanesia and the taxon cycle: historical and human-mediated invasions of a tropical archipelago. *Am Nat* 180:E1–E16
- Edwards DP, Hassall M, Sutherland WJ, Yu DW (2006) Assembling a mutualism: Ant symbionts locate their host plants by detecting volatile compounds. *Insect Soc* 53:172–176
- Ehrlich PR, Raven PH (1964) Butterflies and plants: a study in coevolution. *Evolution* 18:586–608
- Engelmann G (1872) The flower of *Yucca* and its fertilization. *Bull Torrey Bot Club* 3:33
- Espíndola A, Carstens BC, Alvarez N (2014) Comparative phylogeography of mutualists and the effect of the host on the genetic structure of its partners. *Biol J Linn Soc* 113:1021–1035
- Etienne M, Michea G, Díaz E (1982) Flora, vegetacion y potencial pastoral de Isla de Pascua. *Boletín Técnico* 47:1–29. Facultad de Ciencias Agrarias, Veterinarias y Forestales, Universidad de Chile, Santiago
- Farrell BD (1998) 'Inordinate fondness' explained: why are there so many beetles? *Science* 281:555–559
- Farrell BD (2001) Evolutionary assembly of the milkweed fauna: cytochrome oxidase I and the age of *Tetraopes* beetles. *Mol Phylogenet Evol* 18:467–478
- Federle W, Maschwitz U, Fiala B, Riederer M, Hölldobler B (1997) Slippery ant-plants and skillful climbers: selection and protection of specific ant partners by epicuticular wax blooms in *Macaranga* (Euphorbiaceae). *Oecologia* 112:217–224
- Fenster C, Armbruster W, Wilson P, Dudash M, Thomson J (2004) Pollination syndromes and floral specialization. *Annu Rev Ecol Syst* 35:375–403
- Field KJ, Pressel S, Duckett JG, Rimington WR, Bidartondo MI (2015) Symbiotic options for the conquest of land. *Trends Ecol Evol* 30:477–486
- Fleming TH, Holland JN (1998) The evolution of obligate pollination mutualisms: senita cactus and senita moth. *Oecologia* 114:368–375
- Fleming TH, Tuttle MD, Horner MA (1996) Pollination biology and the relative importance of nocturnal and diurnal pollinators in three species of Sonoran Desert columnar cacti. *Southwest Nat* 41:257–269
- Fleming TH, Sahley CT, Holland JN, Nason JD, Hamrick JL (2001) Sonoran Desert columnar cacti and the evolution of generalized pollination systems. *Ecol Monogr* 71:511–530

- Fleming TH, Geiselman C, John Kress W (2009) The evolution of bat pollination: a phylogenetic perspective. *Ann Bot* 104:1017–1043
- Flenley JR, King ASM, Teller IT, Prentice ME, Jackson J, Chew C (1991) The Late Quaternary vegetational and climatic history of Easter Island. *J Quat Sci* 6:85–115
- Fletcher TB (1921) Life-histories of Indian Insects. Microlepidoptera. VI. Gracillariidae [sic]. *Mem Dept Agr ic India Entomol Ser* 6:1–217
- Fletcher TB (1933) Life histories of Indian Microlepidoptera (Second Series). Cosmopterygidae to Neopseustidae. Scientific monograph, vol 4. Imperial Council of Agricultural Research, New Delhi, pp 1–85
- Fletcher QE, Boutin S, Lane JE, LaMontagne JM, McAdam AG, Krebs CJ, Humphries MM (2010) The functional response of a hoarding seed predator to mast seeding. *Ecology* 91:2673–2683
- Florence J (1997a) Flore de la Polynésie française, vol 1. Éditions de l'ORSTOM, Paris
- Florence J (1997b) New species of *Alyxia* Banks ex R. Brown (Apocynaceae) and *Glochidion* J. R. & J. G. Forster (Euphorbiaceae) from the Pitcairn Islands (South East Pacific). *Novon* 7:27–31
- Florence J, Lorence DH (1997) Introduction to the flora and vegetation of the Marquesas Islands. *Allertonia* 7:226–237
- Florence J, Waldren S, Chepstow-Lusty AJ (1995) The flora of the Pitcairn Islands: a review. *Biol J Linn Soc* 56:79–119
- Fordyce JA (2010) Host shifts and evolutionary radiations of butterflies. *Proc R Soc B* 277:3735–3743
- Fosberg FR, Falanruw MVC, Sachet M-H (1975) Vascular flora of the Northern Marianas Islands. *Smithson Contrib Bot* 22:1–45
- Franke S, Ibarra F, Schulz C, Twele R, Poldy J, Barrow R, Peakall R, Schiestl FP, Francke W (2009) The discovery of 2, 5-dialkylcyclohexan-1, 3-diones as a new class of natural products. *Proc Natl Acad Sci U S A* 106:8877–8882
- Friberg M, Schwind C, Roark LC, Raguso RA, Thompson JN (2014) Floral scent contributes to interaction specificity in coevolving plants and their insect pollinators. *J Chem Ecol* 40:955–965
- Galil J, Eisikowitch D (1969) Further studies on the pollination ecology of *Ficus sycomorus* L. (Hymenoptera, Chalcidoidea, Agaonidae). *Tijdschr Entomol* 112:1–13
- Gaskett AC (2011) Orchid pollination by sexual deception: pollinator perspectives. *Biol Rev Camb Philos Soc* 86:33–75
- Gaunt MW, Miles MA (2002) An insect molecular clock dates the origin of the insects and accords with palaeontological and biogeographical landmarks. *Mol Biol Evol* 19:748–761
- Gemici Y (1993) A new species of *Flueggea* (Euphorbiaceae) from Anatolia. *Edinb J Bot* 50:75–77
- Gilbert MG, Thulin M (2008) A new species of *Phyllanthus* (Euphorbiaceae) from Somalia. *Nord J Bot* 13:171–173
- Gillespie RG (2004) Community assembly through adaptive radiation in Hawaiian spiders. *Science* 303:356–359
- Godsoe W, Yoder JB, Smith CI, Pellmyr O (2008) Coevolution and divergence in the Joshua tree/yucca moth mutualism. *Am Nat* 171:816–823
- Godsoe W, Strand E, Smith CI, Yoder JB, Esque TC, Pellmyr O (2009) Divergence in an obligate mutualism is not explained by divergent climatic requirements. *New Phytol* 183:589–599
- Gómez JM, Zamora R (2006) Ecological factors that promote the evolution of generalization in pollination systems. In: Waser N, Ollerton J (eds) *Plant–pollinator interactions: from generalization to specialization*. University of Chicago Press, Chicago, pp 145–166
- Goodman KR, Welter SC, Roderick GK (2012) Genetic divergence is decoupled from ecological diversification in the Hawaiian *Nesosydné* planthoppers. *Evolution* 66:2798–2814
- Goor A (1965) The history of the fig in the Holy Land from ancient times to the present. *Econ Bot* 19:124–135
- Goto R, Okamoto T, Kierns ET, Kawakita A, Kato M (2010) Selective flower abortion maintains moth cooperation in a newly discovered pollination mutualism. *Ecol Lett* 13:321–329

- Govaerts R, Frodin RG, Radcliffe-Smith A (2000) World checklist and bibliography of Euphorbiaceae. Royal Botanic Gardens, Kew
- Graham LK, Wilcox LW (2000) The origin of alternation of generations in land plants: a focus on matrotrophy and hexose transport. *Philos Trans R Soc Lond B* 355:757–767
- Grandcolas P, Murienne J, Robillard T, Desutter-Grandcolas L, Jourdan H, Guilbert E, Deharveng L (2008) New Caledonia: a very old Darwinian island? *Philos Trans R Soc B* 363:3309–3317
- Grangier J, Dejean A, Malé PJG, Solano PJ, Orivel J (2009) Mechanisms driving the specificity of a myrmecophyte–ant association. *Biol J Linn Soc* 97:90–97
- Grant PR, Grant BR (2008) How and why species multiply: the adaptive radiation of Darwin’s finches. Princeton University Press, Princeton
- Gressitt JL (1956) Some distribution patterns of Pacific island faunas. *Syst Zool* 5:11–32
- Grisson-Pigé L, Bassière J, Hossaert-McKey M (2002) Specific attraction of fig-pollinating wasps: role of volatile compounds released by tropical figs. *J Chem Ecol* 28:283–295
- Grisson-Pigé L, Hossaert-McKey M, Greeff JM, Bassière J (2003) Fig volatile compounds—a first comparative study. *Phytochemistry* 61:61–71
- Grodzinski U, Clayton NS (2010) Problems faced by food-caching corvids and the evolution of cognitive solutions. *Philos Trans R Soc Lond B* 365:977–987
- Gruas-Cavagnetto CE, Köhler E (1992) Pollens fossils d’Euphorbiacées de l’Eocène français. *Grana* 31:291–304
- Guimarães PR, Rico-Gray V, Oliveira PS, Izzo TJ, dos Reis SF, Thompson JN (2007) Interaction intimacy affects structure and coevolutionary dynamics in mutualistic networks. *Curr Biol* 17:1797–1803
- Haine ER, Martin J, Cook JM (2006) Deep mtDNA divergences indicate cryptic species in a fig-pollinating wasp. *BMC Evol Biol* 6:83
- Hansen DM, Olesen JM, Jones CG (2002) Trees, birds and bees in Mauritius: exploitative competition between introduced honey bees and endemic nectarivorous birds? *J Biogeog* 29:721–734
- Hardoim PR, van Overbeek LS, Berg G, Pirttilä AM, Compant S, Campisano A, Döring M, Sessitsch A (2015) The hidden world within plants: ecological and evolutionary considerations for defining functioning of microbial endophytes. *Microbiol Mol Biol Rev* 79:293–320
- Hartmann S, Nason JD, Bhattacharya D (2002) Phylogenetic origins of *Lophocereus* (Cactaceae) and the senita cactus–senita moth pollination mutualism. *Am J Bot* 89:1085–1092
- Hata H, Kato M (2006) A novel obligate cultivation mutualism between damselfish and *Polysiphonia* algae. *Biol Lett* 2:593–596
- Hata H, Watanabe K, Kato M (2010) Geographic variation in the damselfish–red alga cultivation mutualism in the Indo-West Pacific. *BMC Evol Biol* 10:185
- Hayden WJ (1987) The identity of the genus *Neowawraea*. *Brittonia* 39:268–277
- Heil M, McKey D (2003) Protective ant–plant interactions as model systems in ecological and evolutionary research. *Annu Rev Ecol Syst* 34:425–453
- Heil M, Rattke J, Boland W (2005) Postsecretory hydrolysis of nectar sucrose and specialization in ant/plant mutualism. *Science* 308:560–563
- Heinrich B (1979) Bumblebee economics. Harvard University Press, Cambridge
- Hembry DH, Balukjian B (2016) Molecular phylogeography of the Society Islands (Tahiti; South Pacific) reveals departures from hotspot archipelago models. *J Biogeogr* 43:1372–1387
- Hembry DH (2013) Herbarium specimens reveal putative insect extinction on the deforested island of Mangareva (Gambier Archipelago, French Polynesia). *Pac Sci* 67:553–560
- Hembry DH, Okamoto T, Gillespie RG (2012) Repeated colonization of remote islands by specialized mutualists. *Biol Lett* 8:258–261
- Hembry DH, Kawakita A, Gurr NE, Schmaedick MA, Baldwin BG, Gillespie RG (2013a) Non-congruent colonizations and diversification in a coevolving pollination mutualism on oceanic islands. *Proc R Soc B* 280:20130361
- Hembry DH, Okamoto T, McCormack G, Gillespie RG (2013b) Phytophagous insect community assembly through niche conservatism on oceanic islands. *J Biogeogr* 40:225–235

- Hendrix SD (1980) An evolutionary and ecological perspective of the insect fauna of ferns. *Am Nat* 115:171–196
- Heraty JM, Burks RA, Cruaud A, Gibson GAP, Liljeblad J, Munro J, Rasplus J-Y, Delvare G, Janšta P, Gumovsky A, Huber J, Woolley JB, Krogmann L, Heydon S, Polaszek A, Schmidt S, Darling DC, Gates MW, Mottern J, Murray E, Dal Molin A, Triapitsyn S, Baur H, Pinto JD, van Noort S, George J, Yoder M (2013) A phylogenetic analysis of the megadiverse Chalcidoidea (Hymenoptera). *Cladistics* 29:466–542
- Herre EA (1989) Coevolution of reproductive characteristics in 12 species of New World figs and their pollinator wasps. *Experientia* 45:367–347
- Herre EA, Machado CA, Bermingham E, Nason JD, Windsor DM, McCafferty S, Van Houten W, Bachmann K (1996) Molecular phylogenies of figs and their pollinator wasps. *J Biogeogr* 23:521–530
- Herre EA, Knowlton N, Mueller UG, Rehner SA (1999) The evolution of mutualisms: exploring the paths between conflict and cooperation. *Trends Ecol Evol* 14:49–53
- Herre EA, Jandér KC, Machado CA (2008) Evolutionary ecology of figs and their associates: recent progress and outstanding puzzles. *Annu Rev Ecol Syst* 39:439–458
- Hibbett DS, Gilbert LB, Donoghue MJ (2000) Evolutionary instability of ectomycorrhizal symbioses in basidiomycetes. *Nature* 407:506–508
- Hoffmann P (2008) Revision of *Heterosavia*, stat. nov., with notes on *Gonatogyne* and *Savia* (Phyllanthaceae). *Brittonia* 60:136–166
- Hoffmann P, McPherson G (2003) Transfer of Madagascan *Glochidion* to *Phyllanthus* (Euphorbiaceae s.l. or Phyllanthaceae). *Novon* 13:307–310
- Hoffmann P, Kathriarachchi H, Wurdack KJ (2006) A phylogenetic classification of Phyllanthaceae (Malpighiales; Euphorbiaceae sensu lato). *Kew Bull* 61:37–53
- Holland JN (2000) Ecological and evolutionary conditions for fruit abortion to regulate pollinating seed-eaters and increase plant reproduction. *Theor Pop Biol* 61:251–263
- Holland BS, Cowie RH (2009) Land snail models in island biogeography: a tale of two snails. *Am Malacol Bull* 27:59–68
- Holland JN, Fleming TH (1999) Mutualistic interactions between *Upiga virescens* (Pyrilidae), a pollinating seed-consumer, and *Lophocereus schottii* (Cactaceae). *Ecology* 80:2074–2084
- Holland JN, Fleming TH (2002) Co-pollinators and specialization in the pollinating seed-consumer mutualism between senita cacti and senita moths. *Oecologia* 133:534–540
- Hölldobler B, Wilson EO (1990) The ants. Harvard University Press, Cambridge
- Hollis S, Brummitt RK (1992) World geographic scheme for recording plant distributions. Hunt Institute for Botanical Documentation, Pittsburgh
- Holm-Nielsen LB (1979) Comments on the distribution and evolution of the genus *Phyllanthus*. In: Larsen K, Holm-Nielsen LB (eds) *Tropical Botany*. Academic Press, London, pp 277–290
- Hosokawa T (1935) Materials of the botanical research towards flora of Micronesia III. *T Nat Hist Soc Formosa* 25:17–39
- Hosokawa T, Kikuchi Y, Nikoh N, Shimada M, Fukatsu T (2006) Strict host–symbiont cospeciation and reductive genome evolution in insect gut bacteria. *PLoS Biol* 4:1841–1851
- Hossaert-McKey M, Gibernau M, Frey JE (1994) Chemosensory attraction of fig wasps to substances produced by receptive figs. *Entomol Exp Appl* 70:185–191
- Howe HF, Smallwood J (1982) Ecology of seed dispersal. *Annu Rev Ecol Syst* 13:201–228
- Hu BB, Wang SX, Zhang J, Li HH (2011) Taxonomy and biology of two seed-parasitic gracillariid moths (Lepidoptera, Gracillariidae), with description of one new species. *ZooKeys* 83:43–56
- Humphreys CP, Franks PJ, Rees M, Bidartondo MI, Leake JR, Beerling DJ (2010) Mutualistic mycorrhiza-like symbiosis in the most ancient group of land plants. *Nat Commun* 1:103
- Huth CJ, Pellmyr O (1999) *Yucca* moth oviposition and pollination behavior is affected by past flower visitors: evidence for a host-marking pheromone. *Oecologia* 119:593–599
- Huth CJ, Pellmyr O (2000) Pollen-mediated selective abortion in yuccas and its consequences for the plant–pollinator mutualism. *Ecology* 81:1100–1107

- Ibanez S, Gallet C, Dommanget F, Després L (2009) Plant chemical defense: a partner control mechanism stabilising plant–seed-eating pollinator mutualisms. *BMC Evol Biol* 9:261
- Imada Y, Kato M (2016a) Bryophyte-feeding of *Litoleptis* (Diptera: Rhagionidae) with descriptions of new species from Japan. *Zootaxa* 4097:41–58
- Imada Y, Kato M (2016b) Bryophyte-feeders in a basal brachyceran lineage (Diptera: Rhagionidae: Spaniinae): adult oviposition behavior and changes in the larval mouthpart morphology accompanied with the diet shifts. *PLoS ONE* 11:e0165808
- Imada Y, Kawakita A, Kato M (2011) Allopatric distribution and diversification without niche shift in a bryophyte-feeding basal moth lineage (Lepidoptera: Micropterigidae). *Proc R Soc B* 176:3026–3033
- Itioka T (2005) Diversity of anti-herbivore defenses in *Macaranga*. In: Roubik DW, Sakai S, Karim AAH (eds) *Pollination ecology and the rain forest: Sarawak studies*. Springer, New York
- Itioka T, Nomura N, Inui Y, Itino T, Inoue T (2000) Difference in intensity of ant defense among three species of *Macaranga* myrmecophyte in a Southeast Asian dipterocarp forest. *Biotropica* 32:318–326
- Jaeger N, Després L (1998) Obligate mutualism between *Trollius europaeus* and its seed-parasite pollinators *Chiasocheta* flies in the Alps. *C R Acad Sci III* 321:789–796
- James TY, Kauff F, Schoch C, Matheny PB, Hofstetter V, Cox C, Celio G, The AFTOL Working Group (2006) Reconstructing the early evolution of the fungi using a six gene phylogeny. *Nature* 443:818–822
- Jandér KC, Herre EA (2010) Host sanctions and pollinator cheating in the fig tree–fig wasp mutualism. *Proc R Soc B* 277:1481–1488
- Jandér KC, Herre EA, Simms EL (2012) Precision of host sanctions in the fig tree–fig wasp mutualism: consequences for uncooperative symbionts. *Ecol Lett* 15:1362–1369
- Janzen DH (1971) Euglossine bees as long-distance pollinators of tropical plants. *Science* 171:203–205
- Janzen DH (1979) How to be a fig. *Annu Rev Ecol Syst* 10:13–51
- Jersáková J, Johnson SD, Kindlmann P (2006) Mechanisms and evolution of deceptive pollination in orchids. *Biol Rev* 81:219–235
- Jobb G (2011) TREEFINDER version of March 2011. Munich, Germany. Distributed by the author at <http://www.treefinder.de/>
- Jousselin E, Hossaert-McKey M, Herre EA, Kjellberg F (2003) Why do fig wasps actively pollinate monoecious figs? *Oecologia* 134:381–387
- Jousselin E, van Noort S, Rasplus JY, Greeff JM (2006) Patterns of diversification of Afrotropical Otiteselline fig wasps: phylogenetic study reveals a double radiation across host figs and conservatism of host association. *J Evol Biol* 19:253–266
- Jousselin E, van Noort S, Berry V, Rasplus JY, Rønsted N, Erasmus JC, Greeff JM (2008) One fig to bind them all: host conservatism in a fig wasp community unravelled by cospeciation analyses among pollinating and nonpollinating fig wasps. *Evolution* 62:1777–1797
- Jürgens A, Wee SÅ, Shuttleworth A, Johnson SD (2013) Chemical mimicry of insect oviposition sites: a global analysis of convergence in angiosperms. *Ecol Lett* 16:1157–1167
- Kahn JG, Nickelsen C, Stevenson J, Porch N, Dotte-Sarout E, Christensen CC, May L, Athens JS, Kirch PV (2015) Mid- to late Holocene landscape change and anthropogenic transformations on Mo‘orea, Society Islands: a multi-proxy approach. *The Holocene* 25:333–347
- Kandul NP, Lukhtanov VA, Dantchenko AV, Coleman JW, Sekercioglu CH, Haig D, Pierce NE (2004) Phylogeny of *Agrodiaetus* Hüber 1822 (Lepidoptera: Lycaenidae) inferred from mtDNA sequences of COI and COII and nuclear sequences of EF1- α : karyotype diversification and species radiation. *Syst Biol* 53:278–298
- Kathriarachchi H, Hoffmann P, Samuel R, Wurdack KJ, Chase MW (2005) Molecular phylogenetics of Phyllanthaceae inferred from five genes (plastid *atpB*, *matK*, 3′*ndhF*, *rbcL*, and nuclear *PHYC*). *Mol Phylogenet Evol* 36:112–134

- Kathriarachchi H, Samuel R, Hoffmann P, Mlinarec J, Wurdack KJ, Ralimanana H, Stuessy TF, Chase MW (2006) Phylogenetics of the tribe Phyllanthaeae (Phyllanthaceae; Euphorbiaceae sensu lato) based on nrITS and plastid *matK* DNA sequence data. *Am J Bot* 93:637–655
- Kato M (1988) Bumblebee visits to *Impatiens* spp.: Pattern and efficiency. *Oecologia* 76:364–370
- Kato M (1996a) Plant–pollinator interactions in the understory of a lowland mixed dipterocarp forest in Sarawak. *Am J Bot* 83:732–743
- Kato M (1996b) Effects of parasitoid community structure upon the population dynamics of the honeysuckle leafminer, *Chromatomyia suikazurae* (Diptera: Agromyzidae). *Res Popul Ecol* 38:27–40
- Kato M (2002) First records of herbivory on Lycopodiaceae (Lycopsidales) by a dipteran (Pallopteridae) leaf/stem miner. *Can Entomol* 134:699–702
- Kato M, Inoue T (1994) Origin of insect pollination. *Nature* 368:195
- Kato M, Kawakita A (2004) Plant–pollinator interactions in New Caledonia influenced by introduced honey bees. *Am J Bot* 91:1814–1827
- Kato M, Nagamasu H (1995) Dioecy in the endemic genus *Dendrocacalia* (Compositae) on the Bonin (Ogasawara) Islands. *J Plant Res* 108:443–450
- Kato M, Shibata A, Yasui T, Nagamasu H (1999) Impact of introduced honeybees, *Apis mellifera*, upon native bee communities in the Bonin (Ogasawara) Islands. *Res Popul Ecol* 41:217–228
- Kato M, Takimura A, Kawakita A (2003) An obligate pollination mutualism and reciprocal diversification in the tree genus *Glochidion* (Euphorbiaceae). *Proc Natl Acad Sci U S A* 100:5264–5267
- Kato M, Kosaka Y, Kawakita A, Okuyama Y, Kobayashi C, Phimminith T, Thongphan D (2008) Plant–pollinator interactions in tropical monsoon forests in Southeast Asia. *Am J Bot* 95:1375–1394
- Kawahara AY, Sohn J-C, De Prins J, Cho S (2010) Five species of Gracillariidae (Lepidoptera) new to Korea. *Entomol Res* 40:131–135
- Kawahara AY, Plotkin D, Ohshima I, Lopez-Vaamonde C, Houlihan P, Breinholt JW, Kawakita A, Xiao L, Regier JC, Davis DR, Kumata T, Sohn J-C, De Prins J, Mitter C (2017) A molecular phylogeny and revised higher-level classification for the leaf-mining moth family Gracillariidae and its implications for larval host use evolution. *Syst Entomol* 42:60–81
- Kawakita A (2010) Evolution of obligate pollination mutualism in the tribe Phyllanthaeae (Phyllanthaceae). *Plant Spec Biol* 25:3–19
- Kawakita A (2012) Zettai sōfun-kyōsei wa ika ni umi o watatta ka – Komikansō-ka/Hanahosogazoku kyōsei no tōsho seibutsuchiri (How did obligate pollination mutualisms cross the ocean? Island biogeography of the Phyllanthaceae–*Epicephala* pollination mutualism). *Jpn J Ecol* 62:317–327. [In Japanese]
- Kawakita A, Kato M (2004a) Obligate pollination mutualism in *Breynia* (Phyllanthaceae): further documentation of pollination mutualism involving *Epicephala* moths (Gracillariidae). *Am J Bot* 91:1319–1325
- Kawakita A, Kato M (2004b) Evolution of obligate pollination mutualism in New Caledonian *Phyllanthus* (Euphorbiaceae). *Am J Bot* 91:410–415
- Kawakita A, Kato M (2006) Assessment of the diversity and species specificity of the mutualistic association between *Epicephala* moths and *Glochidion* trees. *Mol Ecol* 15:3567–3581
- Kawakita A, Kato M (2009) Repeated independent evolution of obligate pollination mutualism in the Phyllanthaeae–*Epicephala* association. *Proc R Soc B* 276:417–426
- Kawakita A, Kato M (2016) Revision of the Japanese species of *Epicephala* Meyrick with descriptions of seven new species (Lepidoptera, Gracillariidae). *ZooKeys* 568:87–118
- Kawakita A, Takimura A, Terachi T, Sota T, Kato M (2004) Cospeciation analysis of an obligate pollination mutualism: Have *Glochidion* trees (Euphorbiaceae) and pollinating *Epicephala* moths (Gracillariidae) diversified in parallel? *Evolution* 58:2201–2214
- Kawakita A, Okamoto T, Goto R, Kato M (2010) Mutualism favours higher host specificity than does antagonism in plant–herbivore interaction. *Proc R Soc B* 277:2765–2774

- Kawakita A, Mochizuki K, Kato M (2015) Reversal of mutualism in a leafhopper–leafhopper moth association: the possible driving role of a third-party partner. *Biol J Linn Soc* 116:507–518
- Kennett D, Anderson A, Prebble M, Conte E, Southon J (2006) Prehistoric human impacts on Rapa, French Polynesia. *Antiquity* 80:340–354
- Kephart S, Reynolds RJ, Rutter MT, Fenster CB, Dudash MR (2006) Pollination and seed predation by moths on *Silene* and allied Caryophyllaceae: evaluating a model system to study the evolution of mutualisms. *New Phytol* 169:667–680
- Kerdelhue C, Le Clainche I, Rasplus JY (1999) Molecular phylogeny of the *Ceratosolen* species pollinating *Ficus* of the subgenus *Sycomorus* sensu stricto: biogeographical history and origins of the species-specificity breakdown cases. *Mol Phylogenet Evol* 3:401–414
- Kiers ET, Denison RF (2008) Sanctions, cooperation, and the stability of plant–rhizosphere mutualisms. *Annu Rev Ecol Evol Syst* 39:215–236
- Kiers ET, Rousseau RA, West SA, Denison RF (2003) Host sanctions and the legume–rhizobium mutualism. *Nature* 425:78–81
- Kiers ET, Duhamel M, Beesetty Y, Mensah JA, Franken O, Verbruggen E, Fellbaum CR, Kowalchuk GA, Hart MM, Bago A, Palmer TM, West SA, Vandenkoornhuysse P, Jansa J, Bucking H (2011) Reciprocal rewards stabilize cooperation in the mycorrhizal symbiosis. *Science* 333:880–882
- Kiester AR, Lande R, Schemske DW (1984) Models of coevolution and speciation in plants and their pollinators. *Am Nat* 124:220–243
- Kirch PV (2004) Environmental and ethnographic background. In: Conte E, Kirch PV (eds) *Archaeological investigations in the Mangareva Islands (Gambier Archipelago), French Polynesia*, vol 62. Archeological Research Facility, University of California, pp 16–32
- Kjellberg F, Jusselin E, Bronstein JL, Patel A, Yokoyama J, Rasplus JY (2001) Pollination mode in fig wasps: the predictive power of correlated traits. *Proc R Soc London, Ser B* 268:1113–1121
- Knudsen JT, Olesen JM (1993) Buzz-pollination and patterns in sexual traits in North European Pyrolaceae. *Am J Bot* 80:900–913
- Knudsen JT, Tollsten L (2004) Trends in floral scent chemistry in pollination syndromes: floral scent composition in moth-pollinated taxa. *Bot J Linn Soc* 113:263–284
- Knudsen JT, Eriksson R, Gershenzon J, Ståhl B (2006) Diversity and distribution of floral scent. *Bot Rev* 72:1–120
- Kolle M, Lethbridge A, Kreysing M, Baumberg JJ, Aizenberg J, Vukusic P (2013) Bio-inspired band-gap tunable elastic optical multilayer fibers. *Adv Mater* 25:2239–2245
- Koponen A (1990) Entomophily in the Splachnaceae. *Bot J Linn Soc* 104:115–127
- Kristensen NP (1984) Studies on the morphology and systematics of primitive Lepidoptera (Insecta). *Steenstrupia* 10:141–191
- Kumata T (1966) Descriptions of twenty new species of the genus *Caloptilia* Hübner from Japan including the Ryukyu Islands (Lepidoptera: Gracillariidae). *Insecta Matsumurana* 29:1–21
- Kumata T (1982) A taxonomic revision of the *Gracillaria* group occurring in Japan (Lepidoptera: Gracillariidae). *Insecta Matsumurana* 26:1–186
- Kumata T (1998) Japanese species of the subfamily Oecophyllembiinae Real et Balachowsky. (Lepidoptera: Gracillariidae), with descriptions of a new genus and eight new species. *Insecta Matsumurana* 54:77–131
- Kumata T, Kuroko H, Ermolaev VP (1988a) Japanese species of the *Acrocercops*-group (Lepidoptera: Gracillariidae). Part II. *Insecta Matsumurana* 40:1–133
- Kumata T, Kuroko H, Ermolaev VP (1988b) Japanese species of the *Acrocercops*-group (Lepidoptera: Gracillariidae). Part I. *Insecta Matsumurana* 38:1–111
- Kuznetsov VI (1979) A review of the genera of Gracillariidae (Lepidoptera) of the Palaearctic fauna. *Entomol Obozr* 58:835–856
- Labandeira CC (2010) The pollination of mid Mesozoic seed plants and the early history of long-proboscid insects. *Ann Mo Bot Gard* 97:469–513

- Labouche AM, Bernasconi G (2013) Cost limitation through constrained oviposition site in a plant–pollinator/seed predator mutualism. *Funct Ecol* 27:509–521
- Lack DL (1947) Darwin's finches. Cambridge University Press, Cambridge
- Larson G, Piperno D, Allaby RG, Purugganan MD, Andersson L, Arroyo-Kalin M, Barton L, Climer VC, Denham T, Dobney K, Doust AN, Gepts P, Gilbert MTP, Gremillion K, Lucas L, Lukens L, Marshall FB, Olsen KM, Pires JC, Richerson PJ, Rubio de Casas R, Sanjur OI, Thomas MG, West-Eberhard MJ, Fuller D (2014) Current perspectives and the future of domestication studies. *Proc Natl Acad Sci U S A* 111:6139–6146
- Lavin M, Herendeen PS, Wojciechowski MF (2005) Evolutionary rates analysis of Leguminosae implicates a rapid diversification of lineages during the Tertiary. *Syst Biol* 54:575–594
- Lebrun J-P, Stork AL (2006) Tropical African flowering plants: ecology and distribution, vol 2: Euphorbiaceae–Dichapetalaceae. Conservatoire Botanique de Genève, Geneva
- Legendre P, Desdevises Y, Bazin E (2002) A statistical test for host–parasite coevolution. *Syst Biol* 51:217–234
- Lengyela S, Govec AD, Latimerd AM, Majerc JD, Dunna RR (2010) Convergent evolution of seed dispersal by ants, and phylogeny and biogeography in flowering plants: a global survey. *Perspect Plant Ecol Evol Syst* 12:43–55
- Lenz LW (2007) Reassessment of *Yucca brevifolia* and recognition of *Y. jaegeriana* as a distinct species. *Aliso* 24:97–104
- Lerner HR, Meyer M, James HF, Hofreiter M, Fleischer RC (2011) Multilocus resolution of phylogeny and timescale in the extant adaptive radiation of Hawaiian honeycreepers. *Curr Biol* 21:1838–1844
- Li H, Yang X (2015) Three new species of *Epicephala* Meyrick (Lepidoptera, Gracillariidae) associated with *Phyllanthus microcarpus* (Benth.) (Phyllanthaceae). *ZooKeys* 484:71–81
- Li H, Zhang Z (2016) Five species of the genus *Epicephala* Meyrick, 1880 (Lepidoptera: Gracillariidae) from China. *Zootaxa* 4084:391–405
- Li B, Qiu H, Ma J, Zhu H, Gilbert MG, Esser H-J, Dressler S, Hoffmann P, Gillespie LJ, Vorontsova M, McPherson GD (2008) Euphorbiaceae. In: Wu ZY, Raven PH, Hong DY (eds) *Flora of China*, vol 11 (Oxalidaceae through Aceraceae). Science Press/Missouri Botanical Garden Press, Beijing/St. Louis
- Li H, Wang Z, Hu B (2015) Four new species of *Epicephala* Meyrick, 1880 (Lepidoptera, Gracillariidae) associated with two species of *Glochidion* (Phyllanthaceae) from Hainan Island in China. *ZooKeys* 508:53–67
- Lloyd DG, Webb C (1977) Secondary sex characters in plants. *Bot Rev* 43:177–216
- Lopez-Vaamonde C, Rasplus JY, Weiblen GD, Cook JM (2001) Molecular phylogenies of fig wasps: partial cocladogenesis of pollinators and parasites. *Mol Phylogenet Evol* 21:55–71
- Lopez-Vaamonde C, Dixon DJ, Cook JM, Rasplus JY (2002) Revision of the Australian species of *Pleistodontes* (Hymenoptera: Agaonidae) fig-pollinating wasps and their host–plant associations. *Zool J Linnean Soc* 136:637–683
- Lopez-Vaamonde C, Wikström N, Labandeira C, Godfray H CJ, Goodman SJ, Cook JM (2006) Fossil-calibrated molecular phylogenies reveal that leaf-mining moths radiated millions of years after their host plants. *J Evol Biol* 19:1314–1326
- Luo Z, Zhang D, Renner SS (2008) Why two kinds of stamens in buzz-pollinated flowers? Experimental support for Darwin's division-of-labour hypothesis. *Funct Ecol* 22:794–800
- Luo S-X, Esser HJ, Zhang D, Renner SS (2011a) Nuclear ITS sequences help disentangle *Phyllanthus reticulatus* (Phyllanthaceae), an Asian species not occurring in Africa, but introduced to Jamaica. *Syst Bot* 36:99–104
- Luo S, Li Y, Chen S, Zhang D, Renner SS (2011b) Gelechiidae moths are capable of chemically dissolving the pollen of their host plants: first documented sporopollenin breakdown by an animal. *PLoS ONE* 6:e19219
- Lutzoni F, Pagel M, Reeb V (2001) Major fungal lineages are derived from lichen symbiotic ancestors. *Nature* 411:937–940

- MacArthur RH, Wilson EO (1967) *The theory of island biogeography*. Princeton University Press, Princeton
- Macbride JF (1951) *Flora of Peru: Euphorbiaceae, spurge family*. Field Museum of Natural History, Chicago
- Machado CA, Jusselin E, Kjellberg F, Compton SG, Herre EA (2001) Phylogenetic relationships, historical biogeography and character evolution of fig-pollinating wasps. *Proc R Soc B* 268:685–694
- Machado CA, Robbins N, Gilbert MTP, Herre EA (2005) Critical review of host specificity and its coevolutionary implications in the fig/fig-wasp mutualism. *Proc Natl Acad Sci U S A* 102:6558–6565
- Mann D, Edwards J, Chase J, Beck W, Reanier R, Mass M, Finney B, Loret J (2008) Drought, vegetation change, and human history on Rapa Nui (Isla de Pascua, Easter Island). *Quat Res* 69:16–28
- Martin-Ordas G, Haun D, Colmenares F, Call J (2010) Keeping track of time: evidence for episodic memory in great apes. *Anim Cogn* 13:331–340
- Marussich WA, Machado CA (2007) Host-specificity and coevolution among pollinating and nonpollinating New World fig wasps. *Mol Ecol* 16:1925–1946
- Maury RC, Legendre C, Chauvel C, Guille G, Blais S, Guillou H, Rossi P (2014) An atypical hotspot chain. In: Meyer J-Y, Claridge E (eds) *Terrestrial biodiversity of the Austral Islands, French Polynesia*. Muséum national d'histoire naturelle, Paris, pp 21–37
- McClatchey W, Thaman R, Vodonaivalu S (2000) A preliminary checklist of the flora of Rotuma with Rotuman names. *Pac Sci* 54:345–363
- McCormack G (2007) *Cook Islands biodiversity database*. Cook Islands Natural Heritage Trust, Rarotonga. <http://cookislands.bishopmuseum.org> (Version 2007.2). Accessed 29 June 2015
- McKain MR, McNeal JR, Kellar PR, Eguiarte LE, Pires JC, Leebens-Mack J (2016) Timing of rapid diversification and convergent origins of active pollination within Agavoideae (Asparagaceae). *Am J Bot* 103:1717–1729
- McNutt M, Menard HW (1978) Lithospheric flexure and uplifted atolls. *J Geophys Res* 83:1206–1212
- Meier-Kolthoff JP, Auch AF, Huson DH, Göker M (2007) COPYPAT: copylogenetic analysis tool. *Bioinformatics* 23:898–900
- Meyer J-Y (2004) Threat of invasive alien plants to native flora and forest vegetation of Eastern Polynesia. *Pac Sci* 58:357–375
- Meyer J-Y (2007a) Rapport de mission dans l'île de Mai'ao (Société) du 24 au 29 mai 2007: inventaire préliminaire de la flore et des différents types de végétation et observations sur la faune terrestre. Délégation à la Recherche, Government of French Polynesia, Papeete http://www.li-an.fr/jyves/Meyer_2007_Rapport_mission_Maiao.pdf. Accessed 29 June 2015
- Meyer J-Y (2007b) Rapport de mission sur l'île d'Uvea (Wallis & Futuna) du 6 au 17 novembre 2007: inventaire préliminaire de la flore vasculaire secondaire. Délégation à la Recherche, Government of French Polynesia, Papeete http://www.li-an.fr/jyves/Meyer_2007_Rapport_Plantes_Introduites_Wallis.pdf. Accessed 29 June 2015
- Meyer J-Y (2010) Montane cloud forests on remote islands of Oceania: the example of French Polynesia (south Pacific Ocean). In: Bruijnzeel LA, Scatena FN, Hamilton LS (eds) *Tropical montane cloud forests: science for conservation and management*. Cambridge University Press, Cambridge, pp 121–129
- Meyer J-Y (2013) Rapport de mission sur l'atoll de Maria (archipel des Australes) du 05 au 07 mai 2013: inventaire floristique, observations ornithologiques et recommandations de gestion et de conservation. Délégation à la Recherche, Government of French Polynesia, Papeete. http://www.li-an.fr/jyves/Meyer_2013_Rapport_Mission_Atoll_Maria.pdf. Accessed 29 June 2015
- Meyer J-Y, Fourdrigniez M, Taputuarai R (2009) Evaluation de la biodiversité terrestre de l'île de Me'eti'a (archipel de la Société). *Contribution à la Biodiversité de Polynésie française 18. Sites Naturels d'Intérêt Ecologique VII*. Délégation à la Recherche, Government of French Polynesia, Papeete. <http://www.jymeyer.com/article-22996318.html>. Accessed 29 June 2015

- Meyer J-Y, Chevillotte H, Motley TJ (2014) Vascular flora, general traits, and main threats. In: Meyer J-Y, Claridge E (eds) *Terrestrial biodiversity of the Austral Islands, French Polynesia*. Muséum national d'histoire naturelle, Paris, pp 117–131
- Meyrick E (1881) Descriptions of Australian micro-Lepidoptera. III Tineina Proc Linnean Soc NSW 5(132–182):204–271
- Meyrick E (1908a) Descriptions of Indian Micro-Lepidoptera. VIII. J Bombay Nat Hist Soc 18:806–832
- Meyrick E (1908b) Descriptions of African Micro-Lepidoptera. Proc Zool Soc London 47:716–756
- Meyrick E (1910) Notes and descriptions of Indian Micro-Lepidoptera. Rec Indian Mus 5:217–232
- Meyrick E (1918) Exotic Microlepidoptera. Exotic Microlepidoptera (Marlborough) 2:161–192
- Meyrick E (1922) Exotic Microlepidoptera. Exotic Microlepidoptera (Marlborough) 2:545–576
- Meyrick E (1927) Micro-Lepidoptera. Insects of Samoa 3:65–116. British Museum of Natural History, London
- Meyrick E (1928) The micro-lepidoptera of the “St. George” expedition. T Ent Soc London 76:489–521
- Meyrick E (1930) Exotic microlepidoptera. Exotic Microlepidoptera (Marlborough) 3:577–608
- Meyrick E (1931) Exotic microlepidoptera. Exotic Microlepidoptera (Marlborough) 4:161–192
- Meyrick E (1935) Exotic microlepidoptera. Exotic Microlepidoptera (Marlborough) 4:577–608
- Meyrick E (1936) Exotic microlepidoptera. Exotic Microlepidoptera (Marlborough) 5:1–64
- Michaloud G, Carriere S, Kobbi M (1996) Exceptions to the one:one relationship between African fig trees and their fig wasp pollinators: possible evolutionary scenarios. J Biogeogr 23:513–520
- Michener CD (2007) *The bees of the world*. Johns Hopkins Univ Press, Baltimore
- Mikheyev AS, Mueller UG, Abbot P (2006) Cryptic sex and many-to-one coevolution in the fungus-growing ant symbiosis. Proc Natl Acad Sci U S A 103:10702–10706
- Mitter C, Farrell B, Wiegmann B (1988) The phylogenetic study of adaptive zones: has phytophagy promoted insect diversification? Am Nat 132:107–128
- Moe AM, Weiblen GD (2012) Pollinator-mediated reproductive isolation among dioecious fig species (*Ficus*, Moraceae). Evolution 66:3710–3721
- Molbo D, Machado CA, Sevenster JG, Keller L, Herre EA (2003) Cryptic species of fig-pollinating wasps: implications for the evolution of the fig–wasp mutualism, sex allocation, and precision of adaptation. Proc Natl Acad Sci U S A 100:5867–5872
- Momose K, Yumoto T, Nagamitsu T, Kato M, Nagamasu M, Sakai S, Harrison RD, Itioka T, Inoue T (1998) Pollination biology in a lowland dipterocarp forest in Sarawak, Malaysia. I. Characteristics of the plant–pollinator community in a lowland dipterocarp forest. Am J Bot 85:1477–1501
- Moran NA, Telang A (1998) The evolution of bacteriocyte-associated endosymbionts in insects. Bioscience 48:295–304
- Morat P (1993) Our knowledge of the flora of New Caledonia: endemism and diversity in relation to vegetation types and substrates. Biodivers Lett 1:72–81
- Morat P, Veillon J-M (1985) Contribution à la connaissance de la végétation et de la flore de Wallis & Futuna. Bull. Mus. Natn. Hist. Nat., Paris, 4^e sér., 7, section B. Adansonia 3:259–329
- Morishita M (1959) Measuring of the dispersion and analysis of the distribution patterns. Mem Fac Sci Kyushu Univ Series E 2:215–235
- Mueller UG, Rehner SA, Schultz TR (1998) The evolution of agriculture in ants. Science 281:2034–2038
- Mueller UG, Gerado NM, Aanen DK, Six DL, Schultz TR (2005) The evolution of agriculture in insects. Annu Rev Ecol Syst 36:563–595
- Nguyen NT (2007) *Taxonomy of Euphorbiaceae in Vietnam*. Vietnam National University Publishers, Hanoi
- Nylander JAA (2004) MrModeltest v2. Program distributed by the author. Evolutionary Biology Centre, Uppsala University, Sweden

- O'Connor TK, Humphrey PT, Lapoint RL, Whiteman NK, O'Grady PM (2014) Microbial interactions in the ecology and evolution of Hawaiian Drosophilidae. *Front Microbiol* 5:1–8
- Oelschlägel B, Nuss M, Tschirnhaus M, Pätzold C, Neinhuis C, Dötterl S, Wanke S (2014) The betrayed thief—the extraordinary strategy of *Aristolochia rotunda* to deceive its pollinators. *New Phytol* 206:342–351
- Ohshima I (2008) Host race formation in the leaf-mining moth *Acrocercops transecta* (Lepidoptera: Gracillariidae). *Biol J Linn Soc* 93:135–145
- Okamoto T, Kawakita A, Kato M (2007) Interspecific variation of floral scent composition in *Glochidion* and its association with host-specific pollinating seed parasite (*Epicephala*). *J Chem Ecol* 33:1065–1081
- Okamoto T, Kawakita A, Kato M (2008) Floral adaptations to nocturnal moth pollination in *Diplomorpha* (Thymelaeaceae). *Plant Species Biol* 23:192–201
- Okamoto T, Kawakita A, Goto R, Svensson GP, Kato M (2013) Active pollination favours sexual dimorphism in floral scent. *Proc R Soc B* 280:20132280
- Okamoto T, Okuyama Y, Goto R, Tokoro M, Kato M (2015) Parallel chemical switches underlying pollinator isolation in Asian *Mitella*. *J Evol Biol* 28:590–600
- Okuyama Y, Kato M, Murakami M (2004) Pollination by fungus gnats in four species of the genus *Mitella* (Saxifragaceae). *Bot J Linn Soc* 144:449–460
- Oliver TH, Leather SR, Cook JM (2009) Tolerance traits and the stability of mutualism. *Oikos* 118:346–352
- Ollerton J, Winfree R, Tarrant S (2011) How many flowering plants are pollinated by animals? *Oikos* 120:321–326
- Ort BS, Bantay RM, Pantoja NA, O'Grady PM (2012) Fungal diversity associated with Hawaiian *Drosophila* host plants. *PLoS ONE* 7:e40550
- Patel A, Hossaert-McKey M (2000) Components of reproductive success in two dioecious fig species, *Ficus exasperata* and *Ficus hispida*. *Ecology* 81:2850–2866
- Patt JM, Rhoades DF, Corkill JA (1988) Analysis of the floral fragrance of *Platanthera stricta*. *Phytochemistry* 27:91–95
- Peakall R, Whitehead MR (2014) Floral odour chemistry defines species boundaries and underpins strong reproductive isolation in sexually deceptive orchids. *Ann Bot* 113:341–355
- Pellissier L, Litsios G, Fiedler K, Pottier J, Dubuis A, Pradervand JN, Salamin N, Guisan A (2012) Loss of interactions with ants under cold climate in a regional myrmecophilous butterfly fauna. *J Biogeogr* 39:1782–1790
- Pellmyr O (1989) The cost of mutualism: interactions between *Trollius europaeus* and its pollinating parasites. *Oecologia* 78:53–59
- Pellmyr O (1992) The phylogeny of a mutualism: evolution and coadaptation between *Trollius* and its seed-parasitic pollinators. *Biol J Linn Soc* 47:337–365
- Pellmyr O (1997) Pollinating seed eaters: why is active pollination so rare? *Ecology* 78:1655–1660
- Pellmyr O (1999) A systematic revision of the yucca moths in the *Tegeticula yuccasella* complex north of Mexico. *Syst Entomol* 24:243–271
- Pellmyr O (2002) Pollination by animals. In: Herrera CM, Pellmyr O (eds) *Plant–animal interactions*. Blackwell Publishing, Oxford, pp 157–184
- Pellmyr O (2003) Yuccas, yucca moths, and coevolution: a review. *Ann Mo Bot Gard* 90:35–55
- Pellmyr O (2012) Pollen load in an active pollinator, the yucca moth *Tegeticula yuccasella* (Prodoxidae). *J Lepid Soc* 66:50–51
- Pellmyr O, Augenstein EJ (1997) Pollination biology of *Hesperaloe parviflora* (Agavaceae). *Southwest Nat* 42:182–187
- Pellmyr O, Huth CJ (1994) Evolutionary stability of mutualism between yuccas and yucca moths. *Nature* 372:257–260
- Pellmyr O, Krenn HW (2002) Origin of a complex key innovation in an obligate insect–plant mutualism. *Proc Natl Acad Sci U S A* 99:5498–5502
- Pellmyr O, Leebens-Mack J (1999) Forty million years of mutualism: evidence for Eocene origin of the yucca–yucca moth association. *Proc Natl Acad Sci U S A* 96:9178–9183

- Pellmyr O, Seraves KA (2003) Pollinator divergence within an obligate mutualism: two yucca moth species (Lepidoptera; Prodoxidae: *Tegeticula*) on the Joshua tree (*Yucca brevifolia*; Agavaceae). *Ann Entomol Soc Am* 96:716–722
- Pellmyr O, Thompson JN (1992) Multiple occurrences of mutualism in the yucca moth lineage. *Proc Natl Acad Sci U S A* 89:2927–2929
- Pellmyr O, Thompson JN, Brown JM, Harrison RG (1996a) Evolution of pollination and mutualism in the yucca moth lineage. *Am Nat* 148:827–847
- Pellmyr O, Leebens-Mack J, Huth CJ (1996b) Non-mutualistic yucca moths and their evolutionary consequences. *Nature* 380:155–156
- Pellmyr O, Balcázar-Lara M, Althoff DM, Segraves KA, Leebens-Mack J (2006) Phylogeny and life history evolution of *Prodoxus* yucca moths (Lepidoptera: Prodoxidae). *Syst Entomol* 31:1–20
- Pellmyr O, Segraves KA, Althoff DM, Balcázar-Lara M, Leebens-Mack J (2007) The phylogeny of yuccas. *Mol Phylogenet Evol* 43:493–501
- Peng YQ, Duan ZB, Yang DR, Rasplus JY (2008) Co-occurrence of two *Eupristina* species on *Ficus altissima* in Xishuangbanna, SW China. *Symbiosis* 45:9–14
- Pettersson MW (1991a) Flower herbivory and seed predation in *Silene vulgaris* (Caryophyllaceae). Effects of pollination and phenology. *Holarct Ecol* 14:45–50
- Pettersson MW (1991b) Pollination by a guild of fluctuating moth populations: option for unspecialization in *Silene vulgaris*. *J Ecol* 79:591–604
- Poulsen M, Boomsma JJ (2005) Mutualistic fungi control crop diversity in fungus-growing ants. *Science* 307:741–744
- Powell JA (1992) Interrelationships of yuccas and yucca moths. *Trends Ecol Evol* 7:10–15
- Prasad M (1994) Siwalik (Middle Miocene) leaf impressions from the foothills of the Himalayas, India. *Tertiary Res* 15:53–90
- Prebble M (2014) The paleobotanical record of Rapa: implications for the phylogeography. In: Meyer J-Y, Claridge E (eds) *Terrestrial biodiversity of the Austral Islands, French Polynesia*. Muséum national d'histoire naturelle, Paris, pp 149–169
- Prebble M, Wilmshurst JM (2009) Detecting the initial impact of humans and introduced species on island environments in Remote Oceania using palaeoecology. *Biol Invasions* 11:1529–1556
- Price P (1980) *Evolutionary biology of parasites*. Princeton University Press, Princeton
- Proctor M, Yeo P, Lack A (1996) *The natural history of pollination*. Timber Press, Portland
- Proffitt M, Schatz B, Bessière JM, Chen C, Soler C, Hossaert-McKey M (2008) Signalling receptivity: comparison of the emission of volatile compounds by figs of *Ficus hispida* before, during and after the phase of receptivity to pollinators. *Symbiosis* 45:15–24
- Proffitt M, Chen C, Soler C, Bessière JM, Schatz B, Hossaert-McKey M (2009) Can chemical signals, responsible for mutualistic partner encounter, promote the specific exploitation of nursery pollination mutualisms?—the case of figs and fig wasps. *Entomol Exp Appl* 131:46–57
- Pruesapan K, Telford IRH, Bruhl JJ, Draisma SGA, van Welzen PC (2008) Delimitation of *Sauropus* (Phyllanthaceae) based on plastid *matK* and nuclear ribosomal ITS DNA sequence data. *Ann Bot* 102:1007–1018
- Pruesapan K, Telford IRH, Bruhl JJ, van Welzen PC (2012) Phylogeny and proposed circumscription of '*Breynia*', '*Sauropus*' and '*Synostemon*' (Phyllanthaceae), based on chloroplast and nuclear DNA sequences. *Aust Syst Bot* 25:313–330
- Quek SP, Davies SJ, Itino T, Pierce NE (2004) Codiversification in an ant–plant mutualism: stem texture and the evolution of host use in *Crematogaster* (Formicidae: Myrmicinae) inhabitants of *Macaranga* (Euphorbiaceae). *Evolution* 58:554–570
- Quek SP, Davies SJ, Ashton PS, Itino T, Pierce NE (2007) The geography of diversification in mutualistic ants: a gene's-eye view into the Neogene history of Sundaland rain forests. *Mol Ecol* 16:2045–2062
- Radcliffe-Smith A (1996) Notes on African Euphorbiaceae XXX: *Phyllanthus* (V) & c. *Kew Bull* 51:301–331
- Radcliffe-Smith A (2001) *Genera Euphorbiacearum*. Royal Botanic Gardens, Kew

- Raguso RA, Willis MA (2005) Synergy between visual and olfactory cues in nectar feeding by wild hawkmoths, *Manduca sexta*. *Anim Behav* 69:407–418
- Raguso RA, Henzel C, Buchmann SL, Nabhan GP (2003) Trumpet flowers of the Sonoran Desert: floral biology of *Peniocereus* cacti and sacred *Datura*. *Int J Plant Sci* 164:877–892
- Ralimanana H, Hoffmann P (2011) Taxonomic revision of *Phyllanthus* (Phyllanthaceae) in Madagascar and the Comoro Islands I: synopsis and subgenera *Isocladus*, *Betsileani*, *Kirganelia* and *Tenellanthus*. *Kew Bull* 66:331–335
- Ralimanana H, Hoffmann P (2014) Taxonomic revision of *Phyllanthus* L. (Phyllanthaceae) in Madagascar and the Comoro Islands II: subgenera *Anisonemoides* (Jean F. Brunel) Ralim. & Petra Hoffm., stat. nov. and *Menarda* (Müll. Arg.) Ralim. & Petra Hoffm., stat. nov. *Adansonia* 36:265–301
- Ralimanana H, Hoffmann P, Rajeriarison C (2013) Taxonomic revision of *Phyllanthus* (Phyllanthaceae) in Madagascar and the Comoro Islands III: subgenera *Swartziani*, *Afroswartziani* and *Emblica*. *Kew Bull* 68:535–558
- Ramírez W (1969) Fig wasps: mechanisms of pollen transfer. *Science* 163:580–581
- Ramirez WB (1974) Coevolution of *Ficus* and Agaonidae. *Ann Mo Bot Gard* 61:770–780
- Redecker D, Kodner R, Graham LE (2000) Glomalean fungi from the Ordovician. *Science* 289:1920–1921
- Regier JC, Shultz JW, Zwick A, Hussey A, Ball B, Wetzer R, Martin JW, Cunningham CW (2010) Arthropod relationships revealed by phylogenomic analysis of nuclear protein-coding sequences. *Nature* 463:1079–1083
- Ren R, Labandeira CC, Santiago-Blay JA, Rasnitsyn A, Shih CK, Bashkuev A, Amelia M, Logan V, Hotton CL, Dilcher D (2009) A probable pollination mode before angiosperms: Eurasian, long-proboscid scorpionflies. *Science* 326:840–847
- Richter KS, Weis AE (1995) Differential abortion in yucca. *Nature* 376:557–558
- Riley CV (1872) The fertilization of the yucca plant by *Pronuba yuccasella*. *Can Entomol* 4:182
- Riley CV (1873) On a new genus in the lepidopterous family Tineidae, with remarks on the fertilization of yucca. *Trans Acad Sci St Louis* 3:55–64
- Riley CV (1880) The true and bogus yucca moth, with remarks on the pollination of *Yucca*. *Am Entomol* 3:141–145
- Riley CV (1881) Further notes on the pollination of *Yucca* and on *Pronuba* and *Prodoxus*. *Proc Am Assoc Adv Sci* 29:617–639
- Riley CV (1892) The yucca moth and yucca pollination. *Annu Rep MO Bot Gard* 3:99–158
- Robinson GS, Tuck KR, Shaffer M (1994) A field guide to the smaller moths of South-East Asia. Malaysian Nature Society, Kuala Lumpur, pp 1–309
- Robinson GS, Ackery PR, Kitching J, Beccaloni GW, Hernández LM (2001) Hostplants of the moth and butterfly caterpillars of the Oriental Region. The Natural History Museum, London, pp 1–744
- Rodda P (1994) Geology of Fiji. In: Stevenson AJ, Herzer RH, Balance PF (eds) Geology and submarine resources of the Tonga-Lau-Fiji region. SOPAC Technical Bulletin 8:131–151. South Pacific Applied Geoscience Commission (SOPAC) Secretariat, Suva, Fiji
- Roderick GK (1997) Herbivorous insects and the Hawaiian silversword alliance: coevolution or cospeciation? *Pac Sci* 51:440–449
- Romero GQ, Benson WW (2005) Biotic interactions of mites, plants and leaf domatia. *Curr Opin Plant Biol* 8:436–440
- Ronquist F, Huelsenbeck JP (2003) MrBayes 3: Bayesian phylogenetic inference under mixed models. *Bioinformatics* 19:1572–1574
- Rønsted N, Weiblen GD, Cook JM, Salamin N, Machado CA, Savolainen V (2005) 60 million years of co-divergence in the fig–wasp symbiosis. *Proc R Soc B* 272:2593–2599
- Roubik DW (1992) Ecology and natural history of tropical bees. Cambridge University Press, Cambridge
- Sachs JL, Simms EL (2006) Pathways to mutualism breakdown. *Trends Ecol Evol* 21:585–592

- Sachs JL, Mueller UG, Wilcox TP, Bull JJ (2004) The evolution of cooperation. *Q Rev Biol* 79:135–160
- Sakagami SF, Maeta Y (1989) Compatibility and incompatibility of solitary life with eusociality in two normally solitary bees *Ceratina japonica* and *Ceratina okinawana* (Hymenoptera: Apoidea) with notes on the incipient phase of eusociality. *Jpn J Ent* 57:417–439
- Sakai S (2002) A review of brood-site pollination mutualism: plants providing breeding sites for their pollinators. *J Plant Res* 115:161–168
- Sakai S, Kato M, Nagamasu H (2000) *Artocarpus* (Moraceae)–gall midge pollination mutualism mediated by a male-flower parasitic fungus. *Am J Bot* 87:440–445
- Sakai S, Harrison RD, Momose K, Kuraji K, Nagamasu H, Yasunari T, Chong L, Nakashizuka T (2006) Irregular droughts trigger mass flowering in aseasonal tropical forests in Asia. *Am J Bot* 93:1134–1139
- Sanderson MJ, Donoghue MJ (1996) Reconstructing shifts in diversification rates on phylogenetic trees. *Trends Ecol Evol* 11:15–20
- Sawamura M, Kawakita A, Kato M (2009) Fern–spore-feeder interaction in temperate forests in Japan: sporing phenology and spore-feeding insect community. *Am J Bot* 96:594–604
- Schiestl F, Peakall R (2005) Two orchids attract different pollinators with the same floral odour compound: ecological and evolutionary implications. *Funct Ecol* 19:674–680
- Schiestl FP, Ayasse M, Paulus HF, Löfstedt C, Hansson BS, Ibarra F, Francke W (1999) Orchid pollination by sexual swindle. *Nature* 399:421
- Schluter D (2000) The ecology of adaptive radiation. Oxford University Press, New York
- Schmid M (1991) *Phyllanthus*. In: Morat P, Mackee HS (eds) Flore de la Nouvelle-Calédonie et Dépendances, vol 17. Muséum national d'histoire naturelle, Paris, pp 31–320
- Segraves KA (2003) Understanding stability in mutualisms: can extrinsic factors balance the yucca–yucca moth interaction? *Ecology* 84:2943–2951
- Segraves KA (2008) Florivores limit cost of mutualism in the yucca–yucca moth association. *Ecology* 89:3215–3221
- Shapiro JM, Addicott JF (2003) Regulation of moth–yucca mutualisms: mortality of eggs in oviposition-induced ‘damage zones’. *Ecol Lett* 6:440–447
- Shuttleworth A, Johnson SD (2009) The importance of scent and nectar filters in a specialized wasp–pollination system. *Funct Ecol* 23:931–940
- Simon L, Bousquet J, Levesque C, Lalonde M (1993) Origin and diversification of endomycorrhizal fungi and coincidence with vascular land plants. *Nature* 363:67–69
- Simon R, Holderied MW, Koch CU, von Helversen O (2011) Floral acoustics: conspicuous echoes of a dish-shaped leaf attract bat pollinators. *Science* 333:631–633
- Singer RB (2002) The pollination biology of *Sauroglossum elatum* Lindl. (Orchidaceae: Spiranthinae): moth-pollination and protandry in neotropical Spiranthinae. *Bot J Linn Soc* 138:9–16
- Smith AC (1981) Flora Vitiensis nova (A new flora of Fiji), vol 2. National Tropical Botanical Garden, Lawai
- Smith CI, Pellmyr O, Althoff DM, Balcazar-Lara M, Leebens-Mack JH, Segraves KA (2008a) Pattern and timing of diversification in *Yucca* (Agavaceae): specialized pollination does not escalate rates of diversification. *Proc R Soc B* 275:249–258
- Smith CI, Godsoe WKW, Tank S, Yoder JB, Pellmyr O (2008b) Distinguishing coevolution from covariance in an obligate pollination mutualism: asynchronous divergence in Joshua tree and its pollinators. *Evolution* 62:2676–2687
- Smith CI, Yoder JB, Godsoe W, Pellmyr O (2009) Host specificity and reproductive success of yucca moths (*Tegeticula* spp., Lepidoptera: Prodoxidae) mirror patterns of gene flow between host plant varieties of Joshua tree (*Yucca brevifolia*: Agavaceae). *Mol Ecol* 18:5218–5229
- Soler C, Proffitt M, Chen C, Hossaert-McKey M (2010) Private channels in plant–pollinator mutualisms. *Plant Signal Behav* 5:893–895
- Soler CC, Proffitt M, Bessiere JM, Hossaert-McKey M, Schatz B (2012) Evidence for intersexual chemical mimicry in a dioecious plant. *Ecol Lett* 15:978–985

- Song Q, Yang D, Zhang G, Yang C (2001) Volatiles from *Ficus hispida* and their attractiveness to fig wasps. *J Chem Ecol* 27:1929–1942
- Song B, Chen G, Stöcklin J, Peng DL, Niu Y, Li ZM, Sun H (2014) A new pollinating seed-consuming mutualism between *Rheumobile* and a fly fungus gnat, *Bradysia* sp., involving pollinator attraction by a specific floral compound. *New Phytol* 203:1109–1018
- Song B, Stöcklin J, Gao Y-Q, Peng D-L, Song M-S, Sun H (2016) Oviposition by mutualistic seed-consuming pollinators reduces fruit abortion in a recently discovered pollination mutualism. *Sci Rep* 6:29886
- Sorensen AE (1986) Seed dispersal by adhesion. *Annu Rev Ecol Syst* 17:443–463
- Sota T, Hayashi M (2007) Comparative historical biogeography of *Plateumaris* leaf beetles (Coleoptera: Chrysomelidae) in Japan: interplay between fossil and molecular data. *J Biogeogr* 34:977–993
- St. John H (1977) The flora of Niuaotupapu Island, Tonga. *Phytologia* 36:374–390
- St. John H, Smith AC (1971) The vascular plants of the Horne and Wallis Islands. *Pac Sci* 25:313–348
- Stainton HT (1856) Descriptions of three species of Indian Micro-Lepidoptera. *Trans Entomol Soc Lond NS* 3:301–304
- Stainton HT (1859) Descriptions of twenty-five species of Indian Micro-Lepidoptera. *Trans Entomol Soc Lond NS* 5:111–126
- Steadman DW (2006) Extinction and biogeography of tropical Pacific birds. Chicago University Press, Chicago
- Steinebrunner F, Twele R, Francke W, Leuchtman A, Schiestl FP (2008) Role of odour compounds in the attraction of gamete vectors in endophytic *Epichloë* fungi. *New Phytol* 178:401–411
- Stensmyr MC, Urru I, Collu I, Celander M, Hansson BS, Angioy AM (2002) Rotting smell of dead-horse arum florets. *Nature* 420:625–626
- Stoddart DR (1992) Biogeography of the tropical Pacific. *Pac Sci* 46:276–293
- Stone BC (1970) The flora of Guam: a manual for the identification of the vascular plants of the island. *Micronesica* 6:1–659
- Stone GN, Schonrogge K (2003) The adaptive significance of insect gall morphology. *Trends Ecol Evol* 18:512–522
- Stout JC, Goulson D, Allen JA (1998) Repellent scent-marking of flowers by a guild of foraging bumblebees (*Bombus* spp.) *Behav Ecol Sociobiol* 43:317–326
- Strauss SY, Zangerl AR (2002) Plant–insect interactions in terrestrial ecosystems. In: Herrera CM, Pellmyr O (eds) *Plant–animal interactions*. Blackwell Publishing, Oxford, pp 77–106
- Su Z-H, Iino H, Nakamura K, Serrato A, Oyama K (2008) Breakdown of the one-to-one rule in Mexican fig–wasp associations inferred by molecular phylogenetic analysis. *Symbiosis* 45:73–82
- Suchan T, Beauverd M, Trim N, Alvarez N (2015) Asymmetrical nature of the *Trollius–Chiastocheta* interaction: insights into the evolution of nursery pollination systems. *Ecol Evol* 5:4766–4777
- Suetsugu K, Kawakita A, Kato M (2015) Avian seed dispersal in a mycoheterotrophic orchid *Cyrtosia septentrionalis*. *Nat Plants* 1:15052
- Sugisima K, Kumata T, Tominaga S (2005) Discovery of *Acrocercops tricuneatella* (Gracillariidae, Gracillariinae) from Ryukyu, southern Japan, and its appropriate generic placement. *Trans Lepid Soc Jap* 56:257–265
- Sugiura S, Yamazaki K (2005) Moth pollination of *Metaplexis japonica* (Apocynaceae): pollinaria transfer on the tip of the proboscis. *J Plant Res* 118:257–262
- Sun G, Ji Q, Dilcher DL, Zheng S, Nixon KC, Wang X (2002) Archaeofractaceae, a new basal angiosperm family. *Science* 296:899–904
- Sun X-J, Xiao J-H, Cook JM, Feng G, Huang D-W (2011) Comparisons of host mitochondrial, nuclear and endosymbiont bacterial genes reveal cryptic fig wasp species and the effects of *Wolbachia* on host mtDNA evolution and diversity. *BMC Evol Biol* 11:86

- Svensson GP, Okamoto T, Kawakita A, Goto R, Kato M (2010) Chemical ecology of obligate pollination mutualisms: testing the 'private channel' hypothesis in the *Breynia-Epicephala* association. *New Phytol* 186:995–1004
- Sykes WR (1970) Contributions to the flora of Niue. *Bull N Z Dept Scient Ind Res* 200:1–321
- Sykes WR, Campbell EO (1977) Kermadec Islands flora: an annotated check list. *Bull N Z Dep Scient Ind Res* 219:1–216
- Sykes WR, West CJ (1996) New records and other information on the vascular flora of the Kermadec Islands. *New Zeal J Bot* 34:447–462
- Takeuchi W (1999) New plants from Crater Mt., Papua New Guinea, and an annotated checklist of the species. *Sida* 18:941–986
- Takeuchi W (2003) Two new species from the Bomberai Peninsula of Indonesian Papua, New Guinea. *Harv Pap Bot* 7:131–136
- Telford IRH, Naaykens J (2015) *Synostemon hamersleyensis* (Phyllanthaceae), a new species endemic to the Pilbara, Western Australia. *Nuytsia* 25:31–37
- Terry I, Walter GH, Moore C, Roemer R, Hull C (2007) Odor-mediated push-pull pollination in cycads. *Science* 318:70
- The Plant List (2013) Version 1.1. Available at: <http://www.theplantlist.org/>
- Thien LB, Bernhardt P, Gibbs GW, Pellmyr O, Bergström G, Groth I, McPherson G (1985) The pollination of *Zygogynum* (Winteraceae) by a moth, *Sabatinka* (Micropterigidae): an ancient association? *Science* 227:540–543
- Thien LB, Sage TL, Jaffré T, Bernhardt P, Pontieri V, Weston PH, Malloch D, Azuma H, Graham SW, McPherson MA, Rai HS, Sage RF, Dupre J-L (2003) The population structure and floral biology of *Amborella trichopoda* (Amborellaceae). *Ann Mo Bot Gard* 90:466–490
- Thin NN (2007) Taxonomy of Euphorbiaceae in Vietnam. Vietnam National University Publishers, Hanoi
- Thompson JN (1994) The coevolutionary process. The University of Chicago Press, Chicago
- Thompson JN (2005) The geographic mosaic of coevolution. The University of Chicago Press, Chicago
- Thompson JN, Cunningham BM (2002) Geographic structure and dynamics of coevolutionary selection. *Nature* 417:735–738
- Thompson JN, Pellmyr O (1992) Mutualism with pollinating seed parasites amid co-pollinators: constraints on specialization. *Ecology* 73:1780–1791
- Thompson JN, Laine A-L, Thompson JF (2010) Retention of mutualism in a geographic diverging interaction. *Ecol Lett* 13:1368–1377
- Thompson JN, Schwind C, Guimarães PR, Friberg M (2013) Divergence through multitrait evolution in coevolving interactions. *Proc Natl Acad Sci U S A* 110:11487–11492
- Thulin M (2003) *Phyllanthus xyloorrhizus* (Phyllanthaceae), a new species from Somalia. *Nord J Bot* 23:385–387
- Tollsten L, Bergström LG (1993) Fragrance chemotypes of *Platanthera* (Orchidaceae)—the result of adaptation to pollinating moths? *Nord J Bot* 13:607–613
- Trueblood DD, Gallagher ED, Gould DM (1994) Three stages of seasonal succession on the Savin Hill Cove mudflat, Boston Harbor. *Limnol Oceanogr* 39:1440–1454
- Tsai HF, Liu JS, Staben C, Christensen MJ, Latch GC, Siegel MR, Schardl CL (1994) Evolutionary diversification of fungal endophytes of tall fescue grass by hybridization with *Epichloë* species. *Proc Natl Acad Sci U S A* 91:2542–2546
- Turner AJ (1894) Descriptions of Micro-Lepidoptera from Moreton Bay. *Trans Proc R Soc S Aust* 18:120–138
- Turner AJ (1896) Descriptions of Micro-Lepidoptera from Queensland. *Trans Proc R Soc S Aust* 20:1–34
- Turner AJ (1900) New Micro-Lepidoptera, mostly from Queensland. *Trans Proc R Soc S Aust* 24:6–23
- Turner AJ (1913) Studies in Australian Microlepidoptera. *Proc Linnean Soc NSW* 38:174–228

- Turner AJ (1940) A revision of the Australian Gracilariidae [sic] (Lepidoptera). *Trans Proc R Soc S Aust* 64:50–69
- Turner AJ (1947) Contributions to our knowledge of Australian Microlepidoptera. *Proc R Soc Queensl* 57:65–74
- Ueda S, Quek SP, Itioka T, Inamori K, Sato Y, Murase K, Itino T (2008) An ancient tripartite symbiosis of plants, ants and scale insects. *Proc R Soc B* 275:2319–2326
- Uhe G (1974) The composition of the plant communities inhabiting the recent volcanic ejecta of Niuafo'ou, Tonga. *Trop Ecol* 15:126–139
- van Noort S, Compton SG (1996) Convergent evolution of agaonine and sycoecine (Agaonidae, Chalcidoidea) head shape in response to the constraints of host fig morphology. *J Biogeogr* 23:415–424
- van Oudtshoorn KVR, van Rooyen MW (2013) Dispersal biology of desert plants. Springer, Berlin
- van Welzen PC (2003) Revision of the Malesian and Thai species of *Sauropus* (Euphorbiaceae: Phyllanthoideae). *Blumea* 48:319–391
- van Welzen PC, Chayamarit K (2015) Flora of Thailand: Euphorbiaceae. Naturalis Biodiversity Center, Leiden; Forest Herbarium, National Park, Wildlife and Plant Conservation Department, Bangkok. www.nationaalherbariumnl/thaieuph. Accessed 20 May 2015
- van Welzen PC, Pruesapan K, Telford IRH, Esser H-J, Bruhl JJ (2014) Phylogenetic reconstruction prompts taxonomic changes in *Sauropus*, *Synostemon* and *Breynia* (Phyllanthaceae tribe Phyllanthae). *Blumea* 59:77–94
- Vander Wall SB (2010) How plants manipulate the scatter-hoarding behaviour of seed-dispersing animals. *Philos Trans R Soc Lond B* 365:989–997
- Vargas HA, Landry B (2005) A new genus and species of Gracilariidae (Lepidoptera) feeding on flowers of *Acacia macracantha* Willd. (Mimosaceae) in Chile. *Acta Entomol Chil* 29:47–57
- Vári L (1961) South African Lepidoptera. volume 1: Lithocolletidae. Transvaal Museum, Pretoria
- Visser AA, Ros VID, de Beer ZW, Debets AJM, Hartog E, Kuyper TW, Laessøe T, Slippers B, Aanen DK (2009) Levels of specificity of *Xylaria* species associated with fungus-growing termites: a phylogenetic approach. *Mol Ecol* 18:553–567
- von Helversen D, von Helversen O (1999) Acoustic guide in bat-pollinated flower. *Nature* 398:759–760
- Wagner WL, Lorence DH (2011) A nomenclator of Pacific oceanic island *Phyllanthus* (Phyllanthaceae), including *Glochidion*. *PhytoKeys* 4:67–94
- Wagner WL, Herbst DR, Sohmer SH (1990) Manual of the flowering plants of Hawai'i, vol 1. Bishop Museum Press/University of Hawaii Press, Honolulu
- Wagner WL, Herbst DR, Tornabene MW, Weitzman A, Lorence DH (2012) Flora of Micronesia. Smithsonian Institution/National Tropical Botanical Garden, Washington/Lāwa'i. <http://botany.si.edu/pacificislandbiodiversity/micronesia/index.htm>. Accessed 19 May 2015
- Waldren S, Florence J, Chepstow-Lusty AJ (1995) A comparison of the vegetation communities from the islands of the Pitcairn Group. *Biol J Linn Soc* 56:121–144
- Wang RW, Dunn DW, Sun BF (2014) Discriminative host sanctions in a fig–wasp mutualism. *Ecol* 95(5):1384–1393
- Wang G, Cannon CH, Chen J (2016) Pollinator sharing and gene flow among closely related sympatric dioecious fig taxa. *Proc R Soc B* 283:20152963
- Waser NM (2006) Specialization and generalization in plant–pollinator interactions: a historical perspective. In: Waser NM, Ollerton J (eds) Plant–pollinator interactions: from specialization to generalization. The University of Chicago Press, Chicago, pp 3–17
- Webster GL (1956) A monographic study of the West Indian species of *Phyllanthus*. *J Arnold Arbor* 37:91–122, 217–268, 340–359
- Webster GL (1957) A monographic study of the West Indian species of *Phyllanthus*. *J Arnold Arbor* 38:51–80, 170–198, 295–373
- Webster GL (1958) A monographic study of the West Indian species of *Phyllanthus*. *J Arnold Arbor* 39(49–100):111–212

- Webster GL (1970) A revision of *Phyllanthus* (Euphorbiaceae) in the continental United States. *Brittonia* 22:44–76
- Webster GL (1984) A revision of *Flueggea* (Euphorbiaceae). *Allertonia* 3:259–312
- Webster GL (1986) A revision of *Phyllanthus* (Euphorbiaceae) in Eastern Melanesia. *Pac Sci* 40:88–105
- Webster GL (1994) Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Ann Mo Bot Gard* 81:33–144
- Webster GL (2002) Three new sections and a new subgenus of *Phyllanthus*. *Novon* 12:290–298
- Webster GL (2003) A synopsis of *Phyllanthus* section *Nothoclema* (Euphorbiaceae). *Lundellia* 6:19–36
- Webster GL (2007) Taxonomic and nomenclatural changes in American Euphorbiaceae sensu lato. *Contrib Univ Mich Herb* 25:235–239
- Webster GL, Carpenter KJ (2002) Pollen morphology and phylogenetic relationships in neotropical *Phyllanthus* (Euphorbiaceae). *Bot J Linn Soc* 138:325–338
- Webster GL, Carpenter KJ (2008) Pollen morphology and systematics of palaeotropical *Phyllanthus* and related genera of Phyllanthinae (Euphorbiaceae). *Bot J Linn Soc* 157:591–608
- Webster GL, Miller KI (1963) The genus *Reverchonia* (Euphorbiaceae). *Rhodora* 65:193–207
- Weiblen GD (2000) Phylogenetic relationships of functionally dioecious *Ficus* (Moraceae) based on ribosomal DNA sequences and morphology. *Am J Bot* 87:1342–1357
- Weiblen GD (2001) Phylogenetic relationships of fig wasps pollinating functionally dioecious *Ficus* based on mitochondrial DNA sequences and morphology. *Syst Biol* 50:243–267
- Weiblen GD (2002) How to be a fig wasp. *Annu Rev Entomol* 47:299–330
- Weiblen GD (2004) Correlated evolution in fig pollination. *Syst Biol* 53:128–139
- Weiblen GD, Bush GL (2002) Speciation in fig pollinators and parasites. *Mol Ecol* 11:1573–1578
- Weisler MI (1995) Henderson Island prehistory: colonization and extinction on a remote Polynesian island. *Biol J Linn Soc* 56:377–404
- Weng J-K, Chapple C (2010) The origin and evolution of lignin biosynthesis. *New Phytol* 187:273–285
- Westerbergh A (2004) An interaction between a specialized seed predator moth and its dioecious host plant shifting from parasitism to mutualism. *Oikos* 105:564–574
- Weston PH, Crisp MD (1996) Trans-Pacific biogeographic patterns in the Proteaceae. In: Keast A, Miller SE (eds) The origin and evolution of Pacific island biotas, New Guinea to Eastern Polynesia: patterns and processes. SPB Academic Publishing bv, Amsterdam, pp 215–232
- Whistler WA (2002) The Samoan rainforest: a guide to the vegetation of the Samoan archipelago. *Isle Botanica*, Honolulu
- Whistler WA (2004) Rainforest trees of Samoa: a guide to the common lowland and foothill forest trees of the Samoan archipelago. *Isle Botanica*, Honolulu
- Wiebes JT (1979) Co-evolution of figs and their insect pollinators. *Annu Rev Ecol Syst* 10:1–12
- Willson MF, Ågren J (1989) Differential floral rewards and pollination by deceit in unisexual flowers. *Oikos* 55:23–29
- Wilson RD, Addicott JF (1998) Regulation of mutualism between yuccas and yucca moths: is oviposition behavior responsive to selective abscission of flowers? *Oikos* 81:109–118
- Wink M (1997) Compartmentation of secondary metabolites and xenobiotics in plant vacuoles. *Adv Bot Res* 25:141–169
- Wise KAJ (1962) *Parectopa leucocyma* (Meyrick) (Lepidoptera: Gracillariidae) rediscovered as a leaf-miner of kauri (*Agathis australis* Salisb.) *Trans R Soc NZ Zool* 1:373–375
- Yokoyama J (2003) Cospeciation of figs and fig-wasps: a case study of endemic species pairs in the Ogasawara Islands. *Popul Ecol* 45:249–256
- Yumoto T, Itino T, Nagamasu H (1997) Pollination of hemiparasites (Loranthaceae) by spider hunters (Nectariniidae) in the canopy of a Bornean tropical rainforest. *Selbyana* 18:51–60
- Zeng L, Zhang Q, Sun R, Kong H, Zhang N, Ma H (2014) Resolution of deep angiosperm phylogeny using conserved nuclear genes and estimates of early divergence times. *Nat Commun* 5:4956

- Zhang J, Wang SX, Li HH, Hu BB, Yang XF, Wang ZB (2012a) Diffuse coevolution between two *Epicephala* species (Gracillariidae) and two *Breynia* species (Phyllanthaceae). PLoS ONE 7: e41657
- Zhang J, Hu B, Wang S, Li H (2012b) Six new species of *Epicephala* Meyrick, 1880 (Lepidoptera: Gracillariidae) associated with Phyllanthaceae plants. Zootaxa 3275:43–54
- Zhao J-B, Peng Y-Q, Quinell RJ, Compton SG, Yang D-R (2014) A switch from mutualist to exploiter is reflected in smaller egg loads and increased larval mortalities in a ‘cheater’ fig wasp. Acta Oecol 57:51–57

Index

A

- Abies*, 23
- Abortion, 128
- Acrocercopinae, 120
- Acrocercops maranthaceae*, 119
- Acrocercops transecta*, 119
- Actephila*-type pollen, 146
- Active pollination, 174, 181
- Active pollination behavior, 127, 174
- Active pollinator, 261
- Aculeata, 36
- Acyclic terpene alcohol, 177
- Adaptive radiation, 100, 224
- Adelidae, 47
- Adenoglochidion*, 103
- Adonivermith, 265
- Africa, 87, 90, 92, 99, 100
- Africanized honeybees, 45
- Afroswartziani*, 98, 99
- Agaonidae, 36, 58, 251
- Agaoninae, 251
- Agathiphaga*, 23
- Agathiphagids, 45
- Agathis*, 23, 45
- Agathis australis*, 119
- Agavaceae, 34, 47, 57, 58, 182, 256
- Agromyzid, 19
- Agromyzidae, 19, 49
- Aleurites fordii*, 100
- Algal farms, 57
- Allopatric speciation, 197
- Alocasia*, 51
- Amami Island, 161
- Amami-Oshima Island, 65, 183
- Amazonian rainforest, 137
- Ambophily, 28
- Amborella*, 28
- Amborellaceae, 28, 100
- Amegilla*, 43, 45
- American Samoa, 222, 232
- Anaa, 224, 236, 239
- Anacardiaceae, 44, 55
- Ancestral character state, 145
- Androecium, 111
- Anemochory, 27
- Angiosperms, 22–24
- Anisonema*, 95, 174
- Anisonemoides*, 105
- Ant, 35, 107, 140
- Antagonism, 150
- Ant ferns, 37
- Antheridium, 9, 11
- Anthers, 89
- Anthocerotophyta, 9
- Anthomyiid, 19
- Anthomyiidae, 49, 258
- Anthophorini, 43
- Antidesma*, 175
- Antidesma japonicum*, 178
- Antipodals, 23
- Antipodanthus*, 98
- Ants, 37, 100
- Ant tree, 37
- Apalopteron*, 54
- Apetalous, 63
- Apidae, 43
- Apis dorsata*, 44
- Apis laboriosa*, 44
- Apocrita, 35
- Apocryptophagus*, 204

- Apocynaceae, 46, 54
 Apoidea, 35, 37, 42
Aporosella, 107
Aprostocetus, 215
 Aquatic, 88, 105
 Araceae, 34, 51
 Araucaliaceae, 23
 Araucariaceae, 45
 Arbuscular, 14
 Arbuscular mycorrhiza, 13
 Arbuscule, 13
Archaeofructus liaoningensis, 24
 Archegonia, 20
 Archegonium, 7, 11
 Archipelago, 221
 Archostemata, 23
 Arecaceae, 55
Arisaema, 34
Aristolochia, 51
 Aristolochiaceae, 51
 Aromatic compound, 175, 177
 Arthropoda, 17
Artocarpus, 51, 55
 Ascomycetes, 7, 17
 Ascomycota, 15
 Asia, 87, 92
 Asparagaceae, 182
 Asymmetrical obligate pollination
 mutualism, 259
 Ātiu, 239
 Atoll, 222
 Australasian tropics, 111
 Australia, 71, 85, 87, 92, 100, 121, 140
 Australian, 98, 109
 Austral Islands, 224, 227, 233
 Austrobaileyales, 28
 Autochory, 27
Averrhoa, 55
 Aves, 52
- B**
- Baccate fruits, 92, 95
Balansia, 17
 Balloon vine, 113
Barringtonia, 56
 Bartonian, 146
 Basaltic, 224, 239
 Basidiomycetes, 7, 23
 Basidiomycota, 15
 Bats, 35, 56, 257
 Beeches, 15
 Bee flies, 50
 Bees, 35, 42, 100, 105, 140, 258
 Beetles, 35, 140, 263
 Behavior, 65
 Benefit, 263
 Bennetiales, 21
 Benzaldehyde, 177, 178
Berchemia, 165
Berchemiella, 165
 Berries, 90
Betsileani, 105
 Betulaceae, 15, 55
Betula fruticosa, 73
Bidens cernua, 73
 Big Island, 224
 Bignoniaceae, 37, 57
 Bioassay, 172, 173
 Biogeography, 222
 Biosynthetic pathway, 175
 Birches, 15
 Bird dispersal, 90
 Birds, 34, 35, 52, 246
Bischofia-type pollen, 146
 Blephariceridae, 48
 Bogus yucca moth, 256
 Bombacaceae, 54
 Bombini, 43
 Bombyliidae, 35, 50
 Bombyliid flies, 257
 Bora Bora, 227, 235
Borboryctis, 119
 Borneo, 44
Bracon, 215
 Braconid wasp, 73, 76, 98, 113, 193, 208, 215
 Braconidae, 36
Bradysia, 259, 265
 Brazil, 87, 92, 137
Breynia, 64, 83, 108, 109, 111, 173, 174, 242
Breynia disticha, 73, 111, 242
Breynia oblongifolia, 73
Breynia retusa, 111, 140, 145
Breynia vitis-idaea, 71, 111, 173, 263, 264, 267
 Bromeliaceae, 54, 57
 Brood site, 251
 Brood-site pollination, 51
 Bryophytes, 14, 27, 119
 Bulbuls, 53
 Bumblebees, 43, 44, 257
 Buprestid, 23
 Burmanniaceae, 16
 Butterflies, 35, 47, 140
 Buzz pollination, 43

C

- Cacao, 125
 Caching, 55
 Cactaceae, 34, 57, 257
Caesalpinia, 43
Calamites, 11
 Calcareous, 239
 Calcareous forest, 101
 Calliphoridae, 35, 50
Caloptilia, 119, 155, 163
Calybites phasianipennella, 119
Camellia, 54, 113
 Camelliaceae, 54
 Campanulaceae, 46, 57
 Canary Islands, 45
 Canopy, 114
 Capsules, 90
 Carboniferous, 21
Cardiospermum, 113
 Carene, 178
 Caribbean, 87, 90–92
 Caribbean Islands, 105
 Caroline Islands, 229
 Carpenter bees, 43
 Carposinidae, 47, 155, 163
 Caryophyllaceae, 46, 258
 β -Caryophyllene, 178
 Cataphylls, 85
 Caudiciform, 113
Cauliflora, 105
 Cauliflorous, 55
 Cauliflory, 89
 Cauline, 105, 107, 111
 Caytoniales, 21
 Cecidomyiid, 51
 Cecidomyiidae, 49
 Cellulose, 9
 Centroplacaceae, 81
Ceramanthus, 94, 95
 Cerambycid, 23
 Cerambycidae, 35
Ceratina, 43
 Ceratophyllales, 28
Ceratosolen, 204
Ceratosolen galili, 256
Ceratosolen gravelyi, 173
 C-glycosyl-flavone, 265
 Chalchidoidea, 35
 Charales, 7
 Charophyte, 7
 Cheater, 154, 256
 Cheating, 265
 Chemical mimicry, 169, 177
Chiastocheta, 258, 265
Chileoptilia, 119, 120
Chiloglottis, 172
 Chimpanzee, 57
 China, 108, 121, 211
 Chiropterophilous, 57
 Chloranthaceae, 28
 Chloropidae, 49
Chorisandra, 107
 Chrysomelid, 19
 Chrysomelidae, 35
 Chuuk, 230
Cicca, 107
 Ciliated proboscis, 70
 Clavicipitaceae, 17
 Cloud forest, 239
 Clusiaceae, 55
 2-C-methyl-D-erythritol 4-phosphate/
 1-deoxy-D-xylulose 5-phosphate
 pathway (MEP/DOXP pathway), 175
 Cocoon, 133
 Coevolution, 198, 205, 268
 Coevolutionary escalation, 115
 Coexistence, 205
Coleochaete, 9
 Coleophorid, 23
 Coleophoridae, 47
 Coleoptera, 35
 Coleopteran, 96
 Colletidae, 43
 Colombia, 137
 Colonization, 244, 246
 Comoro Islands, 100
Conami, 105
 Conifers, 21
 Connate, 64, 103, 105
Conocephalum, 45
Conopobathra, 119, 120
Conopomorpha, 92, 119, 120, 125
Conopomorpha flueggella, 92, 121, 125,
 137, 167
 Continent, 221
 Convergence, 105
 Cook-Austral Islands, 229
 Cook Islands, 222, 224, 227, 233
 Cooks, 241
 Copollinator, 79, 139, 257, 258, 261
 Coral reef, 222
 Corvid, 55
 Cosmopterigidae, 47
 Cospeciation, 197, 203, 267
 Cossidae, 47
 Cost, 263

- Cost of mutualism, 263
 Crane flies, 99
 Cretaceous, 24, 35, 36, 52, 54
 Cryptic stigma, 65
Cryptoblades, 163
Cryptogynum, 109
 Cuba, 87, 89, 105, 133
 Cucurbitaceae, 34
 Cultivation mutualism, 57
 Cupedidid, 23
Cuphodes, 165
 Curculionid, 23
 Curculionidae, 35
C. wisteriae, 165
 Cycadophyta, 21
 Cycads, 21
 Cyindrotomidae, 19
 Cynipoidea, 35
Cyrtandra, 239
Cyrtosia, 53
 Cytochrome oxidase subunit I gene (COI), 70,
 77, 147, 163, 211
- D**
- Dalechampia*, 34
 Damsel fish, 57
Datura, 170
 Deceptive pollination, 169
 Deer browsing, 114
 Defense, 218, 264
 Dehiscent, 73
Deltophora, 95
Dendrocycter, 119
 Deuterophlebiidae, 48
 Devonian, 17
Dicranopteris, 232
 Diet, 119
 Dikarya, 14, 15
 Dioecious, 89
 Dioecy, 43
 Diopsidae, 49
Diospyros, 43
Diphtheroptila, 155, 163, 205
 Diptera, 35, 48
 Dipteran insect, 258
 Dipterans, 35, 96
 Dipterothyraceae, 15, 44
 Dipterothyrus, 15, 37
 Disk, 99
 Dispersal, 244, 247
 Distribution, 87
 Divergence time, 146
 Diversification, 71, 198
 Domatia, 37
 Domestication, 57
 Double fertilization, 24
 Drosophilid, 51
 Drosophilidae, 35, 49, 50
 Drupes, 90, 107, 108
 Dry sclerophyllous forest, 101
Durio, 55
- E**
- Early Eocene, 146
 Earth's mantle, 224
 Easter Island, 239
 Ebenaceae, 43, 165
 (*E*)- β -ocimene, 177, 178
 Ectomycorrhiza, 15
 Ectomycorrhizal, 23
 Ecuador, 87, 92, 137
 Egg, 65, 73, 182, 183, 211
 Egg mortality, 79
 Elachistidae, 47
 Elaiosomes, 37
 Electrophysiological analyses, 173
 Elemene, 178
 Elevations, 239
 (*E*)-linalool oxide furanoid, 178
Emblica, 107
 Enantiomer, 175
 Endemic, 100, 228
 Endocarp, 98
 Endophytes, 16, 17
 Entognatha, 17
Ephedra, 22
 Ephemeroptera, 17
 Ephydriidae, 49
Epicephala, 61, 119–121, 144, 155, 170,
 211, 242
Epicephala acrocarpa, 242
Epicephala anthophilia, 65, 159, 183
Epicephala bipollenella, 67, 159
Epicephala colymbetella, 121, 242
Epicephala corruptrix, 130, 159, 161
Epicephala frugicola, 121
Epicephala laceolatella, 161
Epicephala lanceolatella, 159, 205
Epicephala mirivalvata, 127
Epicephala obovatella, 67, 130, 159, 161
Epicephala parasitica, 108
Epicephala perplexa, 159, 161, 205
Epicephala relictella, 137
Epicephala spinula, 242

- Epicephala vitisidaea*, 72, 127, 267
Epichloe, 17
 Epithet, 227
 Epizoochory, 27
 Ericaceae, 43, 46, 119
Eriococcus, 97
 Eriocranidae, 47
 Eruption, 224
 Eudicots, 28
 Eugenol, 177
Euglossa, 43
 Euglossine bees, 34, 43
 Euglossini, 43
 Eulophid, 215
 Euphorbiaceae, 34, 37, 81
Eupristima, 256
Eupristina, 265
Eupristina altissima, 265
 Eusociality, 37, 43
 Evolutionary stability, 181
 Explosive dehiscence, 90
 Extrafloral nectar, 37
- F**
- Fabaceae, 37, 43, 44, 56, 57, 165
 Fagaceae, 15, 55
Fagraea, 56
 Fakarava, 224
 Fatu Hiva, 242
 Federated States of Micronesia, 222, 229
 Female reproductive success, 261
 Fern, 119
Ficus, 36, 58, 173, 177, 241, 251
Ficus altissima, 256, 265
Ficus boninshimae, 268
Ficus carica, 251
Ficus nishimurae, 268
Ficus rubiginosa, 263
Ficus semicordata, 173
Ficus sycomorus, 256
 Fig, 64, 155, 167, 198, 204, 251
 Fig–Fig Wasp mutualism, 251–256
 Fig wasps, 36, 58, 64, 155, 167, 173, 177, 198,
 204, 207, 251, 263
 Fiji, 71, 111, 222, 224, 230, 241
 Fijian archipelago, 229
 Filaments, 89
 Finch, 54
 Firs, 15
 Fleshy fruits, 64, 90
 Flies, 100, 105, 113, 140, 258
 Flight migration, 65
 Flora, 100
 Floral odor, 204, 266
 Floral scent, 170, 192
 Florivore, 182
 Flower abscission, 183
 Flowering period, 170
Flueggea, 92, 175
Flueggea elliptica, 92, 137
Flueggea gracilis, 89, 92
Flueggea jullienii, 92
Flueggea neowawraea, 92, 242
Flueggea suffruticosa, 92, 121, 178
Flueggea virosa, 92, 137, 242
 Forest edge, 114
 Formicidae, 37
 Fossil, 146
 French Guiana, 137
 French Polynesia, 222
 Fringillidae, 53, 54
 Fruit-bats, 57
 Fruit set, 184
 Fruits, 24, 67, 73, 90
 Fungivorous, 15
 Fungus gnats, 34, 50, 140, 259
 Fused style, 114
- G**
- Gabon, 90
 Gall, 129, 130, 159, 208, 211, 215, 256
 Galling, 119, 218
 Gall midge, 98
 Gambier Islands, 236
Garcinia, 55
 Gas chromatography with
 electroantennographic detection
 (GC-EAD), 173
 Gas chromatography-mass spectrometry
 (GC-MS), 170, 173
 Geitonogamy, 43
 Gelechid, 23
 Gelechiidae, 47
 Gelechiidae, 95
 Genitalia, 121
 Genitalic morphology, 70
 Gentianaceae, 56
 Geoflorous, 111
 Geometridae, 46, 258
 Geranyl acetone, 178
 Geranyl nitrile, 177
 Gesneriaceae, 54, 57, 239
 Giant honeybees, 44, 45
 Gibbon, 55

- Gibbovalva tricuneatella*, 119
 Ginkgo, 21
 Ginkgophyta, 21
 Globeflower, 140
 Globeflower fly, 140
 Globeflower–globeflower fly mutualism, 258
Glochidion, 61, 63, 83, 104, 114, 155, 170, 174, 222, 224, 228, 266, 267
Glochidion acuminatum, 65, 159, 161, 177, 183, 205, 206
Glochidion arborescens, 114
Glochidion brothersonii, 241
Glochidion calciphilum, 231
Glochidion christophersenii, 232
Glochidion cleistanthoides, 229
Glochidion comitum, 237
Glochidion concolor, 231
Glochidion cordatum, 231
Glochidion cuspidatum, 232
Glochidion emarginatum, 240
Glochidion–Epicephala mutualism, 198
Glochidion euryoides, 231
Glochidion ferdinandii, 121
Glochidion grantii, 239
Glochidion hivaoaense, 238
Glochidion hosokawae, 229
Glochidion huahineense, 239
Glochidion inusitatum, 231
Glochidion kanehirae, 229
Glochidion lanceolatum, 159, 161, 171, 173, 175, 177, 205
Glochidion littorale, 114, 228, 229
Glochidion longfeldiae, 235
Glochidion macrosepalum, 229
Glochidion manono, 240
Glochidion marchionicum, 227, 238
Glochidion marianum, 230
Glochidion moorei, 240
Glochidion myrtifolium, 227, 235, 240
Glochidion nadeaudii, 240
Glochidion obovatum, 65, 114, 130, 155, 159, 161, 171, 175, 177, 205, 218
Glochidion orohenense, 239
Glochidion palauense, 229
Glochidion papenooense, 240
Glochidion philippicum, 206
Glochidion pitcairnense, 237
Glochidion podocarpum, 231
Glochidion ponapense, 229
Glochidion puberulum, 229
Glochidion pungens, 203
Glochidion raivavense, 234
Glochidion ramiflorum, 227, 231–233
Glochidion rapaense, 235
Glochidion rubrum, 130, 159, 161, 171, 175, 177
Glochidion senyavinianum, 229
Glochidion sericeum, 203
Glochidion societatis, 234, 235
Glochidion societatis, 239
Glochidion sumatranum, 203
Glochidion taitense, 234, 240
Glochidion temehaniense, 227, 240
Glochidion toovianum, 227, 238
Glochidion tuamotuense, 236
Glochidion websteri, 229
Glochidion wilderi, 231, 236, 237
Glochidion zeylanicum, 65, 155, 159, 161, 175
 Glomerales, 23
 Glomeromycota, 13, 14
 Glossata, 46, 47
 Glossopteridales, 21
 Gnetales, 22
 Gnetophyta, 21
 Gnetophytes, 21
Gnetum, 119
Gnetum gnemon, 21
Gomphidium, 64, 74, 89, 100, 105
 Gondwana, 87, 100
 Gracillariid, 23
 Gracillariidae, 47, 61, 64, 117
 Gracillariinae, 120
 Grande Terre, 100
Greya, 139
Greya enchrysa, 257
Greya politella, 257
 Grossulariaceae, 257
 Growth form, 240
 Guam, 224, 230
 Guiana Highlands, 137
 Guinea, 140
 Guyana, 137
 Gymnosperms, 23, 24, 27, 119
 Gynophore, 264
- H**
 Habitat, 87, 100, 239
Hadena, 139, 258
Hadena bicruris, 258, 264
 Halictidae, 43
 Halictid bee, 257
 Hawaii, 54, 92, 222, 224
 Hawaiian archipelagos, 224
 Hawaiian Islands, 239, 242
 Hawk moths, 47, 178

H. cylindrica, 257
 Heliconiaceae, 54
 Heliozeidae, 47
 Heliozelidae, 119
 Hemlocks, 15
 Henderson, 224, 237
 Henderson fruit dove, 246
 Hepaticae, 9
 Herb, 105
 Herbaceous, 88, 121, 129, 140, 150
 Herbarium, 133
 Herbivory, 19
Hesperoe, 256
Hesperoyucca, 256
Hesperoyucca whipplei, 150
 Heterobathmiids, 45
Heterosavia, 89, 90
Heuchera, 257
 Hexapoda, 17
Hibiscus tiliaceus, 241
 High island, 222, 224
 Hiva Oa, 239
 Homonymy, 227
 Honey bees, 43, 44, 108
 Honeycreepers, 54
 Honeyeaters, 53, 54
 Hornets, 37, 43
 Hornwort, 9
 Host defense, 153
 Host sanction, 207, 263
 Host-shift, 203, 205, 247
 Host-specificity, 70, 153, 170, 206, 266
 Host switch, 203, 269
 Hotspot, 224
 Hoverflies, 50, 98
 Huahine, 227, 236, 239, 240
 Hummingbirds, 53, 54, 256
 Humulene, 178
 Hunting wasps, 35
 Hurricane, 107
 Hybridization, 166, 266
 Hybrids, 166, 267
 Hydrochory, 27
Hylaesus, 43
 Hymenoptera, 35
 hypermetamorphosis, 117
 Hyphae, 14

I

Iberian Peninsula, 87, 92
 Ichneumonoidea, 35
 Imbricate, 98, 103, 105

Incurvariidae, 47
 Independent Samoa, 232
 India, 95
 Indian gooseberry, 108
 Indochina, 92, 97
 Indole, 177
 Innovation, 259
 Insecta, 17
 Ishigaki Island, 173
 Island, 100, 222
 Island biology, 246
Isocladus, 94

J

Jamaica, 133
 Japan, 65, 95, 98, 111, 155, 183
 Jays, 55
 Juglandaceae, 55, 119
 Jurassic, 49, 52

K

Kermadec Islands, 239
 Key innovation, 150
Kirganelia, 95, 175
 Kosrae, 238
 Kradibiinae, 251

L

Lacerate, 97
 Lamiaceae, 47, 54
 Lanceolate, 101
Lansium, 55
 Laos, 71, 100
 Larches, 15
 Larva, 67, 73, 215
 Larvae, 133, 183, 211
 Larval competition, 192
Lasioglossum, 43
 Late Eocene, 146
 Leafflower, 84
 Leaf gall, 155
 Leaf impression, 146
 Leaf miners, 23, 45, 64, 155
 Leaf-mining, 117
 Leaf roll, 119, 155
Lecanopteris, 37
 Lecythidaceae, 56
 Leeward Society Islands, 239
Lepidodendron, 11
 Lepidoptera, 35, 45, 117

- Lepidopterans, 23
Leucaena leucocephala, 100
 Life cycle, 67
 Lignin, 9
 Lilac compound, 178
 Liliaceae, 46
 Limestone, 88, 105, 241
 Limonene, 178
 Linalool, 170, 177
Lingelsheimia, 90
 Lithocolletinae, 120
Lithophragma, 139, 257
Lithophragma–*Greya* mutualism, 257
 Lithospheric flexure, 224
 Liverworts, 9, 14, 45
 Locules, 90, 114, 130
 Longan, 125
 Long-distance dispersal, 221
 Loranthaceae, 54
Loranthus, 54
 Lychee, 125
 Lycophyta, 9
- M**
 Macaque, 55
Macaranga, 37
Macraea, 94
 Macrophytes, 16
 Madagascan, 104
 Madagascar, 87, 90, 91, 95, 99, 100, 104, 105, 121, 140
 Magnoliid, 28
 Makatea, 224, 233, 236, 239, 241
 Makatea island, 224
 Malaysia, 71, 114
 Male reproductive success, 261
 Malpighiaceae, 34
 Malpighiales, 81, 147
 Malvaceae, 37, 57, 125
 Mammals, 35, 54
Manduca sexta, 170
 Mangaia, 224, 239
 Mangareva, 236
Mangifera, 55
 Mangrove, 229
 Maquis, 101
 Maranthaceae, 119
Margaritaria, 91
Margaritaria discoidea, 91
Margaritaria indica, 91
Margaritaria nobilis, 92
 Mariana Islands, 222, 224, 230
 Marianas, 241
Marmara, 119
Marmara smilacisella, 119
 Marmarinae, 120
 Marotiri, 235
 Marquesas, 224, 240, 242
 Marquesas Islands, 121, 238, 242
 Marshall Islands, 224
 Masarinae, 37
 Mass flower, 56
 Mast seeding, 56
 Mating, 172
 Maupiti, 235, 239, 240
 Mauritius, 45
 Maxillary tentacle, 256
 Mecopterans, 35
 Megachilidae, 43, 45
 Megagametophytes, 20, 23
 Megaspores, 20
 Megasporophyll, 21, 23
 Mehetia, 224
Melastoma, 43
 Melastomataceae, 43
 Meliaceae, 55
 Meliphagidae, 53
 Meliphagiidae, 54
 Meliponinae, 43
 Melittidae, 43
 Melittophilous, 43
 Melittophily, 45
 Mesozoic, 23
 Methional, 178
 4-Methylanisole, 173
 Methyl anthranilate, 177
 Methyl benzoate, 178
 2-Methyl butyric acid methyl ester, 259
 6-Methyl-5-hepten-2-one, 177
 Methyl salicylate, 178
 Mexico, 107
 Microgametophytes, 20, 21, 23
Microglochidion, 137
 Micronesia, 222
 Micropterigid, 35
 Micropterigidae, 19, 45
 Microspores, 20
 Microsporophyll, 21
 Middle Eocene, 146
 Middle Miocene, 147
Mimulus, 54
 Miocene, 222
 Mirid, 11
Mitella, 50
 Molecular clock, 147

- Monocots, 28, 120
 Monoecious, 89, 174
 Monoterpene, 170, 177
 Montane, 239
 Moorea, 236, 240
 Moraceae, 34, 36, 51, 55, 58, 251
 Moss, 9
 Moths, 34, 35, 45, 169, 258
 Mt. Marojeji, 105
 Mucoromycotina, 14
Mucuna, 56, 57
Musa, 55, 56
 Musaceae, 54–56
 Musci, 9
 Mutualism, 150, 153, 207
 - benefit, 181
 - cheater, 181
 - cost, 181
 - dissolution, 207, 208
 - reversal, 207, 208, 217
- Myanmar, 71
 Mycetophagidae, 50
 Mycetophilidae, 34
 Mycoheterotrophic, 16, 53
 Mycophagous, 15
 Mycorrhizal, 13, 17
 Mycorrhizal fungi, 16
 Mycorrhizal mutualism, 5–6
Myoporum, 54
 Myrmecochory, 40
 Myrmecophytic, 37
 Myrsinaceae, 119
Myrsine, 239
 Myrtaceae, 15
 Myrtles, 15
- N**
- Nauru, 241
 Nectar, 24, 65, 72, 89, 98, 107, 140, 257, 258
 Nectaries, 98, 105, 108
 Nectariniidae, 53
 Nectary, 28
 Neotropical, 105
 Neotropics, 53, 57, 121, 133
Neotyphodium, 17
Nephelium, 55
 Nepticulidae, 47, 119
 Nerolidol, 178
 New Caledonia, 23, 28, 45, 64, 71, 74, 87, 89, 95, 100, 111, 121, 140, 268
 New Guinea, 100
 New World, 85, 100, 105, 121
- Niau, 224, 236, 239
 Nigeria, 121
 Nitidulidae, 35
 Nitrogen-bearing compound, 177
 Niuafu'ou, 224
 Niue, 222, 233
 Noctuidae, 46, 258
 Nocturnal, 169
 Nonphyllanthoid branching, 94, 107
 Nonpollinating fig wasp, 256
 North America, 140, 182
 Northern Mariana Islands, 238
Nothoclema, 105, 107, 134
 Nothofagaceae, 45
Nothofagus, 45
 Nuclei, 23
 Nuku Hiva, 240, 242
 Nyctaginaceae, 237
 Nymphaeace, 28
 Nymphomyiidae, 48
- O**
- Oaks, 15
 Obligate pollination mutualism, 64, 140, 181, 251
 Obovate, 99
 Oceanic islands, 206, 221
 β -Ocimene, 170
 Odor, 95
 Oecophoridae, 47
 Oecophyllembiinae, 120
 Ogasawara, 45, 54
 Ogasawara Islands, 268
 Oil-collecting bees, 34, 43
 Old World, 85, 121
 Old World tropics, 133
 Olfactometer, 172, 173
 Olfactory cue, 169
 Olfactory signal, 204
 Oligolectic, 43
 Onagraceae, 46
 Oncothecaceae, 100
Ophrys, 172
 Opostegidae, 47
 Orangutan, 55
 Orchidaceae, 16, 34, 46
 Orchid bees, 43
 Orchids, 35
 Ordovician, 7, 14
 Origin, 145
 Origin of mutualism, 145
 Ornithochory, 53

- Ornithophilous, 53, 54
 Ornithophily, 54
 Ornitodera, 52
 Ornixolinae, 120, 133, 165, 205
 Ovary, 24, 90
 Oviposition, 65, 174, 211, 215
 Oviposition scar, 182, 186
 Ovipositor, 65, 70, 98, 113, 125, 127, 182, 183,
 215, 263
 Ovules, 22, 23, 67, 90
 Oxalidaceae, 55
- P**
- Pachycereus schottii*, 257
 Pacific, 87, 228
 Pacific Basin, 222
 Pacific Islands, 100
 Pacific Ocean, 100, 221
 Pacific Plate, 224
 Pakistan, 111
 Palau, 222, 224, 229, 241
 Paleogene, 54
 Paleotropical, 95
 Paleozoic, 12
 Pallopterid, 19
 Pandaceae, 81
Pandanus, 241
 Paracryphiaceae, 100
 Parafit, 201
Parasitaxus usta, 23
 Parasite, 207, 211
 Parasitic lifestyle, 153, 154
 Parasitica, 35
 Parasitism, 207
 Parasitoid, 36, 119, 132, 182, 214, 263
Parategeticula, 167, 256, 269
Parectopa, 119
Parectopa leucocyma, 119
 Paromichinae, 120
 Partner choice, 207
Passiflora, 119
 Passifloraceae, 37
 Peltate, 101
 Peraceae, 81
Peragrarchis syncolleta, 163
Perizoma, 139, 258
 Permian, 22
 Peroidae, 19
 Peru, 107
 Petals, 89
 Phanerozoic, 7
 Phellinaceae, 100
 Phenology, 89
 Phenylacetaldehyde, 177, 178
 Phenylacetoneitrile, 177
 2-Phenylacetoneitril, 173
 2-Phenylethyl alcohol, 173
 Philippines, 111
 Phorid, 51
 Phrymaceae, 54
 Phyllanthaceae, 34, 61, 82
 Phyllantheae, 83–87, 140, 144, 221
Phyllanthodendron, 112, 175
 Phyllanthoid branching, 84, 98
Phyllanthus, 64, 74, 83–85, 174, 175, 224,
 265, 268
Phyllanthus abnormis, 100
Phyllanthus acidus, 89, 107
Phyllanthus aeneus, 74, 77, 103
Phyllanthus amarus, 88, 100, 242
Phyllanthus amicorum, 241
Phyllanthus angustifolius, 133
Phyllanthus aoraiensis, 242
Phyllanthus arbuscula, 107
Phyllanthus bourgeoisii, 74, 77, 88, 100, 101
Phyllanthus brothersonii, 240
Phyllanthus calciphilus, 231
Phyllanthus chamaecerasus, 77
Phyllanthus chamaecrystoides, 133
Phyllanthus christophersenii, 232
Phyllanthus chrysanthus, 95
Phyllanthus cleistanthoides, 229
Phyllanthus cochinchinensis, 95
Phyllanthus comitus, 237
Phyllanthus concolor, 231, 233, 234, 240
Phyllanthus cordatus, 231
Phyllanthus cuscutiflorus, 130
Phyllanthus cuspidatus, 232, 242
Phyllanthus debilis, 99, 242
Phyllanthus distichus, 92, 242
Phyllanthus dracunculoides, 101
Phyllanthus emarginatus, 240
Phyllanthus emblica, 108
Phyllanthus euryoides, 231
Phyllanthus flexuosus, 89, 95, 140, 178
Phyllanthus florencei, 234, 235, 239, 240
Phyllanthus fluitans, 88, 107
Phyllanthus grantii, 239, 240
Phyllanthus grayanus, 240
Phyllanthus guillauminii, 77
Phyllanthus heterodoxus, 241
Phyllanthus hivaoaense, 238, 239
Phyllanthus hosokawae, 229
Phyllanthus huahineense, 239, 240
Phyllanthus humbertii, 105, 130

- Phyllanthus inusitatus*, 231
Phyllanthus kanehirae, 229, 230
Phyllanthus koniamboensis, 77
Phyllanthus lepidocarpus, 107, 140
Phyllanthus littorale, 228
Phyllanthus littoralis, 229
Phyllanthus liukuensis, 97, 140
Phyllanthus lokohensis, 99
Phyllanthus longfieldiae, 235
Phyllanthus loranthoides, 101
Phyllanthus macrosepalus, 229
Phyllanthus madagascariensis, 99
Phyllanthus maderaspatensis, 94
Phyllanthus mangenotii, 77
Phyllanthus manono, 240
Phyllanthus marchionicus, 227, 238, 240
Phyllanthus mariannensis, 230
Phyllanthus marianus, 241
Phyllanthus marojejiensis, 105
Phyllanthus microcarpus, 88, 95, 208, 216
Phyllanthus mirabilis, 88, 113
Phyllanthus myrtifolius, 95
Phyllanthus myrtilloides, 133
Phyllanthus nadeaudii, 240
Phyllanthus niruri, 107, 242
Phyllanthus nutans, 133
Phyllanthus oligospermus, 96, 140
Phyllanthus orohenense, 239, 240
Phyllanthus otobedii, 229
Phyllanthus pacificus, 242
Phyllanthus palauensis, 241
Phyllanthus pancherianus, 77
Phyllanthus papenooense, 240
Phyllanthus peltatus, 101
Phyllanthus pergracilis, 241
Phyllanthus pilifer, 77
Phyllanthus pinaiensis, 241
Phyllanthus pitcairnense, 237
Phyllanthus podocarpus, 231
Phyllanthus ponapense, 229
Phyllanthus raiateaensis, 240
Phyllanthus raivavense, 234
Phyllanthus rapaense, 235, 239
Phyllanthus reticulatus, 95, 178, 208, 216, 269
Phyllanthus reticulatus species complex, 129, 208, 210
Phyllanthus rheophyticus, 88, 95
Phyllanthus roseus, 113, 140, 178
Phyllanthus rupiinsularis, 241
Phyllanthus saffordii, 241
Phyllanthus samoanus, 227, 231, 232, 242
Phyllanthus seemannii, 240
Phyllanthus senyavinianus, 229, 230
Phyllanthus smithianus, 241
Phyllanthus societatis, 241
Phyllanthus st-johnii, 227, 235, 240
Phyllanthus taitensis, 234, 238, 240
Phyllanthus temehaniensis, 227, 240
Phyllanthus tenellus, 88, 100
Phyllanthus tennellus, 242
Phyllanthus tiebaghiensis, 77
Phyllanthus tuamotuensis, 236, 239, 240
Phyllanthus-type pollen, 146
Phyllanthus urinaria, 88, 242
Phyllanthus ussuriensis, 95
Phyllanthus virgatus, 95, 242
Phyllanthus vulcani, 77
Phyllanthus warnockii, 89, 100
Phyllanthus websteri, 229
Phyllanthus wilderi, 231, 236, 237, 239
Phyllanthus wilkesianus, 241
Phylloclade, 105
Phyllocnistinae, 120
Phyllocnistis, 117
Phylogenetic analysis, 201, 214, 215, 244
Phylogenies, 202
Phylogeny, 85, 216
Picnonotidae, 53
Picrodendraceae, 81
Pinaceae, 15, 23
Pines, 15
Pinophyta, 21
Pisonia grandis, 237
Pistils, 23, 89
Pitcairn, 237
Pitcairn Islands, 87, 222, 224, 237
Plagiocladus, 90
Plagiocladus diandrus, 90
Platyterium, 37
Platy podid, 23
Poaceae, 57
Podocarpaceae, 23
Podocarpus, 119
Pohnpei, 229, 242
Polar nuclei, 23
Pollen, 20, 23
Pollen collection, 174, 211
Pollen-limited, 184
Pollen pocket, 251
Pollen-to-ovule ratio, 261
Pollen transfer efficiency, 261
Pollen tube, 21, 23
Pollinating behavior, 265
Pollination, 20, 65
Pollination by seed parasite, 139
Pollination droplets, 22

- Pollination mutualism, 4
 Pollination syndrome, 143
 Pollinator isolation, 267
 Pollinators, 22, 23, 35
 Polygonaceae, 119
 Polynesia, 222
 Polypodiopsida, 9
Polysiphonia, 57
Polysoma, 119, 120
 Pompilidae, 37
 Poplars, 15
 Precambrian, 13
 Prepupae, 183
 Primates, 55–57
 Primulaceae, 34, 239
 Private channel, 172
 Proboscis, 65, 128, 211
 Proctotrupeoidea, 35
 Prodoxidae, 47, 58, 154, 256, 257
Prodoxus, 166, 256
 Prostrate shrub, 240
 Protection mutualism, 5
 Prothallium, 11
 Pseudocopulation, 35
Psidium littorale, 100
 Psychidae, 47
Psychotria, 239
 Pteridophytes, 14, 27
 Pterygota, 17
Ptilinopus insularis, 246
 Pupae, 133
 Pupate, 67
 Putranjivaceae, 81
 Pyralidae, 19, 46, 67, 155, 163, 257
Pyrola, 43
- R**
- Radiation, 221
 Rafflesiaceae, 81
 Raiatea, 227, 236, 239, 240
 Rainforest, 101, 114
 Random flower abortion, 187
 Rangiroa, 224
 Ranunculaceae, 34
 Rapa, 227, 235, 239
 Ravens, 55
 Reciprocal diversification, 267
 Reciprocal obligate pollination mutualism, 259
 Reciprocal selection, 204
 Reconciliation analysis, 201
Redivia, 43
- Reinforced specificity, 166
 Remipedia, 17
 Reproductive isolation, 161, 267, 268
 Resource-limitation, 182–184
Reverchonina, 84
Reverchonina arenaria, 89, 100
 Reversal, 145
 Reward, 71
 Rhagionidae, 19, 49
 Rhamnaceae, 165
 Rheophytes, 74, 88, 101
Rheum nobile, 140, 259, 265
Rheum nobile–*Bradysia* mutualism, 259
 Rhizoids, 14
Richeriella, 84, 92
 Riparian, 240
 Riverbank, 101
 (R)-(–)-linalool, 171, 175, 177
 Roadside, 114
 Rodents, 56
 Rosaceae, 37, 257
 Rotuma, 227, 231
 Rubiaceae, 46, 54, 239
 Russia, 121
 Ryukyu Archipelago, 155
- S**
- Salacca*, 55
 Salicaceae, 15
 Samoa, 222, 224, 242
 Samoan, 224
 Samoan archipelago, 232
 Sand dune, 100
 Sap feeder, 117
 Sap feeding, 117
 Sapindaceae, 55, 113, 125
Sapindus, 238
 Sapotaceae, 54
 Sarcotesta, 73, 90, 111
Sauropus, 83, 108, 110
Sauropus androgynus, 111
Sauropus discocalyx, 111
Sauropus heteroblastus, 88
Sauropus macranthus, 85
Sauropus quadrangularis, 140
Sauropus racemosus, 111
 Savai'i, 224
Savia, 83, 90
 Sawflies, 23, 35
 Saxifragaceae, 34, 47, 50, 257
 Scandent, 88

- Scarabaeidae, 35
 Scatter hoarding, 55
 Sciadopityaceae, 23
Sciadopitys, 23
 Sciarid, 35
 Sciaridae, 49, 259
 Scolytid, 23
 Scrophulariaceae, 34, 43, 54
 Scrubland, 240
 Seasonally dry tropical forest, 108
 Seed destruction, 67
 Seed dispersal, 37, 108
 Seed-dispersal mutualism, 5
 Seed-feeding, 119, 163
 Seed production, 187
 Seeds, 67, 73, 90
 Selective abortion, 185, 263
 Selective flower abortion, 182
 Self-compatible, 107, 143
 Semiovorous, 55
 Senita cactus, 139, 257
 Senita cactus–senita moth mutualism, 257
 Senita moth, 139, 257
 Sensilla, 127, 128, 214
 Serpentine, 88, 100, 105
 Sesquiterpene, 170
 Sesquiterpenoid, 178
 Settling moth, 178
 Sex pheromone, 172
 Sexual deception, 35
 Sexual dimorphism, 174, 175
 Shikimic acid pathway, 175
 Shrub, 114
Sigillaria, 11
Silene, 139, 258
Silene–Hadena/Perizoma mutualism, 258
Silene latifolia, 258, 264
 Silurian, 9
 Siricid, 23
 (S)-(+)-linalool, 176–178
 Smilacaceae, 119
 Snail, 246
 Snow Bush, 111
 Soapberry bug, 113
 Society, 224
 Society Islands, 224, 227, 229, 235, 240, 241
 Solanaceae, 43, 46, 57, 170
Solanum, 43
 Solitary bee, 257
 South Africa, 43, 92, 121
 South America, 87, 107
 Southeast Asia, 85, 92, 95, 108, 112, 140
 Spaniinae, 49
 Specialization, 153, 205, 261
 Speciation, 197
 Species richness, 267
 Species specificity, 77
 Species-specificity breakdown, 206, 269
 Spermatophyta, 9
 Sphecid, 35, 42
 Sphecidae, 42
 Sphenophyta, 9
 Sphingidae, 46
 Spider, 246
 Spiderhunters, 53, 54
Spinivalva, 119
 Splachnaceae, 9
 Sporangia, 11
 Sporophyll, 22
 Sporophytes, 20, 21
 Sporopollenin, 7, 20, 95
 Springtails, 17
Spulerina, 119
 Squirrels, 55
 Sri Lanka, 95
 Stamens, 23, 28, 64, 89, 103, 105
 Staphylidae, 35
 Starling, 246
 Stathmopodid, 11, 19
Stegastes nigricans, 67
 Stigma, 23, 65
 Stingless bees, 43, 45
Stomphastis, 119, 120
Stomphastis chalybacma, 121
 Strasburgeriaceae, 100
 Styler pit, 65
 Styles, 23, 65, 71, 89, 95, 104, 105, 111, 143, 205
 Subduction zone, 224
 Subshrub, 105
 Succulent, 88
 Sulfur compound, 178
 Sunbirds, 53, 54
 Suriname, 137
Swartziani, 98, 100
 Swollen fruit, 98, 113
Sycomorus, 204
 Syconia, 177, 251
 Syconium, 263
 Symphyta, 35
 Synapomorphy, 127
 Syndrome, 104
 Synergids, 23

Synonym, 227
Synostemon, 84, 109
 Syrphidae, 35, 50

T

Tahaa, 227, 236, 239
 Tahiti, 236, 239, 240, 242
 Tahuata, 239
 Taiwan, 96, 155, 159, 208
 Tanzania, 90
 Taravai, 236
 Taveuni, 231
 Taxonomy, 121
Taxu, 22
Tegeticula, 167, 256, 269
Tegeticula antithetica, 268
Tegeticula corruptrix, 256
Tegeticula intermedia, 256
Tegeticula synthetica, 268
Tegeticula yuccasella, 182
Tenellanthus, 98, 100
 Tepals, 23, 89, 95, 97, 99, 103, 105, 111
 Tephritidae, 49
 Tepui, 137
 Terpenoid, 175
 Terrestrialization, 7, 17
 Tetramerous, 97
 Tetrapusiinae, 251
 Thailand, 113
 4-Thiapentanal, 178
 Third parties, 182, 193
 Third-party partner, 208, 263
 Thorn, 114
 Thymelaeaceae, 46
 Tineid, 11
 Tineidae, 47
 Tingidae, 19
 Tischeridae, 47
 Tissue feeder, 117
 Tonga, 100, 222, 224, 227, 233, 241
 Tortricid, 23
 Tortricidae, 47, 67, 155, 163
 Torymidae, 36
 Tracheophytes, 9, 12
Trans- α -farnesene, 178
 Trapping, 43
 Tree, 114
 Treelet, 114
 Triassic, 35, 54
 Trichoptera, 45
Tritopterna, 163
 Triuridaceae, 16

Trochillidae, 53
Trollius, 265
Trollius europaeus, 258
 Tuamotu Islands, 224
 Tuamotus, 236
 Turkey, 87, 92
 Typhaceae, 119

U

Ulithi Atoll, 241
 Ultramarine Lorikeet, 246
 Unisexual flower, 174
 United States, 100
Upiga virescens, 257
 Uplift, 224
Urinaria, 107

V

Vaccinium, 43
 Vanua Levu, 230
 Vegetative form, 87, 100
 Venezuela, 87, 137
 Vespid, 43
 Vespidae, 37
 Vicariance, 197, 203
Vini ultramarina, 246
 Visual cue, 169
 Viti Levu, 230
 Volatile, 170
 Volcano, 222, 224
 Voles, 55

W

Wallis and Futuna, 222, 227, 232
 Weed, 100
 Weevil, 113
 Wetland, 240
 White-eyes, 53, 54
 Winteraceae, 35
 Wushe, 159

X

Xyelid, 23
 Xyelidae, 35
Xylocopa, 45
 Xylocopinae, 43
Xylophylla, 89, 105, 133
 Xylopopini, 43
Xylosma, 238

Y

Yucca, 47, 58, 64, 182, 198, 256, 263, 269
Yucca baccata, 265
Yucca brevifolia, 268
Yucca filamentosa, 182, 263
Yucca jaegeriana, 268
Yucca moth, 58, 64, 154, 166, 182, 198, 207,
256, 263
Yucca–*yucca* moth mutualism, 256

Z

Zaire, 90
Zingiberaceae, 54
Zoochory, 27
Zoophilous, 22, 63
Zoophily, 27
Zosteropidae, 53, 54
Zygogynum, 35