

Index

NB: numbers in italics refer to photos and illustrations

A

Ackery, Philip (1984), 54

Acraea leucographa
(Nymphalidae), 86

Acraeinae (subfamily), 78, 79,
87, 95

*Actinote antea*s (Nymphalidae), 99

Actinote ozomene (Nymphalidae), 78

Adelpha melanthe
(Nymphalidae), 33

adult butterfly, 21–22, 36–38

alternative food sources of,
192–196

crispis in, 155, 166–168

eclosure of, 150–152

food of, 190–198

mating behavior in, 215–221

predators of, 156–166

reproduction, 152–155

survival of, 152–155

aestivation, 109–110

Africa, 87

African mocker swallowtail. *See*
Papilio dardanus
(Papilionidae)

African wanderer. *See* *Danaus*
chrysippus (Nymphalidae)

Agathiphaga, 50

aggregation, 199–204

Aglais urticae (Nymphalidae),
208

Agraulis vanillae (Nymphalidae),
129, 130, 141, 147, 153, 163,
175, 215, 261

Aiello, Annette, 57

alcon blue. *See* *Maculinea alcon*
(Lycaenidae)

alfalfa butterfly. *See* *Colias*
eurytheme (Pieridae)

alternative food sources, 192–196

amateur lepidopterist, 290

Amathusinae (subfamily), 79

Amauris albimaculata
(Nymphalidae), 293

Amauris niavius (Nymphalidae),
293

American coppers. *See* *Lycaena*
phleas (Lycaenidae)

American painted ladies. *See*
Vanessa virginiensis
(Nymphalidae)

American snout. *See* *Libythea*
bachmanii (Nymphalidae)

Anaea andria (Nymphalidae),
215, 215, 218, 219, 220

Anartia amathea (Nymphalidae),
73

Anartia jatrophae (Nymphalidae),
149

Anctoxypha numitor
(Hesperiidae), 296

androgeus swallowtail. *See*
Papilio androgeus
(Papilionidae)

Anetia briarea (Nymphalidae),
204

anglewings. *See* *Polygonia* sp.
(Nymphalidae)

Anolis sp. (Squamata;
Iguanidae), 129, 130–132,
164

ant larvae, 75, 118

Antarctica, 87

antennae, 34, 36, 38, 151–152,
227, 229

Anteos maerula (Pieridae), 67

Anteos sp. (Pieridae), 216

Anthocharis cardamines (Pieridae),
132, 142

Anthocharis midea (Pieridae), 33,
108

anti-aphrodisiac, 241–242

ants, 75, 118, 120, 137, 138–139,
139, 152, 270, 271

Apatura irus (Nymphalidae), 219

Aphantopus hyperantus
(Nymphalidae), 282

aphrodite fritillary. *See* *Speyeria*
aphrodite (Nymphalidae)

aphytophagy, 73, 118

Apocynaceae, 81, 175

apollos. *See* Parnassiinae
subfamily; *Parnassius apollo*
(Papilionidae)

Aporia crataegi (Pieridae), 140,
190, 200, 230

aposematicism, 134–135, 155; *See*
also warning coloration

apricot sulphur. *See* *Phoebis*
argente

Araschnia levana (Nymphalidae),
18, 247

Arawacus sito (Lycaenidae;
Riodininae), 168, 169

Archaeolopsis, 50–51

Archontias eurytele (Pieridae), 99

Archontias tereas (Pieridae), 99

arctic grayling. *See* *Hipparchia*
autonoe (Nymphalidae)

arctics. *See* *Oenis* sp.
(Nymphalidae)

Argiope aurantia (Araneidae), 154

Argynnini/Argynninae (tribe/
subfamily), 77, 87, 129

Argynnis paphia (Nymphalidae),
15, 230

Arhopala pseudocentaurus
(Lycaenidae), 137

Aristolochiaceae, 64, 65, 277

Ascia monuste (Pieridae), 31, 127,
206, 206

Asclepiadaceae, 81, 158, 175,
178, 192, 282, 286, 300

Asia, 87

aster (Asteraceae), 79; *See also*
Compositae

Asterocampa clyton
(Nymphalidae), 129, 151,
161

Asterocampa leilia
(Nymphalidae), 224, 234–
235, 235

Asterocampa sp. (Nymphalidae),
220

Attilides balesus (Lycaenidae), 301

Australian skippers, 87
see also Trapezitinae
(subfamily)

automimicry, 182

awl king. *See* *Choaspes benjaminii*
(Hesperiidae; Coeliadinae)

B

Bacillus thuringiensis. *See* *Bt*
(*Bacillus thuringiensis*)

Baltimore. *See* *Euphydryas*
phaeton (Nymphalidae)

banded hairstreak. *See* *Satyrium*
calanus (Lycaenidae)

banded peacock. *See* *Anartia*
amathea (Nymphalidae)

Baronia brevicornis (Papilionidae),
51, 64

Baroniinae (subfamily), 64

Basking. *See* thermoregulation

batch layers, 118

Bates, Henry W., 179, 290

Batesian mimicry, 179–180

Battus philenor (Papilionidae),
135, 182, 183, 184–188, 185,
186

Battus polydamus (Papilionidae),
174

Battus sp. (Papilionidae), 175

bay checkerspot. *See* *Euphydryas*
editha bayensis
(Nymphalidae)

beaks. *See* *Libythea bachmanii*

A WORLD FOR BUTTERFLIES

- (Nymphalidae)
 Berger's clouded yellow. *See* *Colias australis* (Pieridae)
 Binomial Nomenclature, 52–54
 biogeography, 82–84
 bird of paradise plant. *See* *Heliconia*
 birds, 178–179
 black swallowtail. *See* *Papilio polyxenes* (Papilionidae)
 black-veined white. *See* *Aporia crataegri* (Pieridae)
 Blue Mountain/John Crow Mountain National Park, 275
 blues. *See* Lycaenidae (family)
 body-basking, 210–211
 body fluid. *See* haemolymph
 body form and structure, 29–38
 body temperature, 206–215
Boloria titania (Nymphalidae), 199
 bordered patch. *See* *Chlosyne lacinia* (Nymphalidae)
 Bowers, Deane, 173
 Brassolinae subfamily, 76, 79
Brephidium exilis (Lycaenidae), 70
 Brewer, Jo, 41–42
 bronze copper. *See* *Lycaena hyllus* (Lycaenidae)
 Brower, Lincoln, 178
 brushfooted butterflies. *See* Nymphalidae (family)
Bt (*Bacillus thuringiensis*), 251–253, 257
Bt corn, 258, 288
 buckeye. *See* *Junonia coenia* (Nymphalidae)
Buddleia sp., 300
 butterflies
 classification of, 51–56
 geographic distribution of, 84–85, 89
 observation of, 291–294
 origin of, 50–51
 as predators of plants, 106–107
 rearing of, 294–297
 range of, 105, 275–277, 278–280
 study of, 291–294; *See also* lepidopterology
The Butterflies of Costa Rica, 138–139
 Butterfly Conservation, 262
 butterfly
 farming of, 275–277
 gardening for, 297–301
 butterfly-moths, 40, 56, 59–60
 cabbage. *See* Cruciferae
 cabbage white. *See* *Pieris rapae* (Pieridae)
Calephelis virginiensis (Lycaenidae), 69
Caligo atreus (Nymphalidae), 76, 170
Caligo sp. (Nymphalidae), 169–170
Calycopis cecrops (Lycaenidae), 68
 Camberwell beauty. *See* *Nymphalis antiopa* (Nymphalidae)
 Camouflage. *See* crypsis
 Canadian tiger swallowtail. *See* *Papilio canadensis* (Papilionidae)
 cannibalism, 124
 Capparidaceae, 67
 Caribbean yellow angles sulfur. *See* *Anteos maerula* (Pieridae)
 Carnivory, 71, 118
 carrots. *See* Rutaceae
Carterocephalus palaemon (Hesperiidae; Heteroptera), 63
 Caryophyllaceae, 190
 case studies
 butterfly farming, 275–277
 extirpation of Karner blue, 266–271
 extirpation of large blue, 271–273
 global warming and butterfly range, 277–280
 Homerus swallowtail, 273–275
 monarch migration, 280–289
Castnia licus (Castniidae), 57
 Castniidae/Castnioidea (family/superfamily), 40, 56, 57–59, 87, 89
 caterpillar, 21, 23, 26, 28, 31, 31–33, 49, 116, 123–140
Catopsilia florella (Pieridae), 111
Celastrina ladon (Lycaenidae), 212
Celastrina sp. (Lycaenidae), 145
 centaur oak blue. *See* *Arhopala pseudocentaurus* (Lycaenidae)
Ceratinia diona (Nymphalidae), 181
Ceratinia fenestella (Nymphalidae), 181
Ceratinia tutia (Nymphalidae), 33
Cercyonis pegala (Nymphalidae), 296
Charaxes eupale (Nymphalidae), 74
Charaxes jasius (Nymphalidae), 193
 Charaxinae (subfamily), 74
 checked white. *See* *Pontia protodice* (Pieridae)
 checkerspot butterflies. *See* *Euphydryas* sp. (Nymphalidae)
 chemical signals, 152
 children, teaching of, 302
Chlorostymon simaethis (Lycaenidae), 171
Chlosyne lacinia (Nymphalidae), 136
Chaospes benjamini (Hesperiidae; Coeliadinae), 61
 chrysalis, 21, 27, 33, 34–36, 40, 49, 117, 141–149, 141, 142, 143
 CITES. *See* Convention on International Trade in Endangered Species (CITES)
Cithaerias menander (Nymphalidae), 215
 classification, 51–56
 clipper. *See* *Parthenos sylvia* (Nymphalidae)
Clossiana selene (Nymphalidae), 296
 clouded yellow. *See* *Colias erate* (Pieridae)
 cloudless sulphur. *See* *Phoebis sennae* (Pieridae)
 Coeliadinae (subfamily), 61
Coenonympha arcania (Nymphalidae), 283
Coenonympha inornata (Nymphalidae), 192, 209, 296
 Coleoptera, 48
 Coliadiinae (subfamily), 67–68
Colias australis (Pieridae), 230
Colias cesonia (Pieridae), 216
Colias christina (Pieridae), 294
Colias erate (Pieridae), 234
Colias eurytheme (Pieridae), 31, 46, 257
Colias philodice (Pieridae), 296
Colias sp. (Pieridae), 233
Colobura dirce (Nymphalidae), 169
 colonies, 204–206
 color, 130–135, 151–152; *See also* warning coloration
 Committee for the Protection of British Lepidoptera, 262
 common blue. *See* *Polyommatus icarus* (Lycaenidae)
 common names, 54
 common ringlet. *See* *Aphantopus hyperantus* (Nymphalidae)
 commonness, 103–106
 Compositae, 68, 187, 192, 192, 232, 234, 299, 299, 301
 Compton's tortoiseshell. *See* *Nymphalis vaualbum* (Nymphalidae)
 confusion displays, 202, 203–204
 conservation, 45–47, 93, 102, 115, 262–265, 288–289
 and alien species, 249
 and habitat loss, 252, 253–256
 and protective measures in, 262–265
 continental drift, 85, 86–88
 continuous dispersers, 112
 Convention on International Trade in Endangered Species (CITES), 258, 263, 273
 coppers. *See* Lycaenidae (family)
 copulation, 238–243; *See also* courtship, reproduction
 coral hairstreaks. *See* *Harknlenus titus* (Lycaenidae)
 corn, *Bt*, 257–258
 cosmopolitan butterfly. *See* *Vanessa cardui* (Nymphalidae)
 Cossioidea, 59
 coupling mechanism, 50
 courtship, 222, 223, 225–235
 pheromones and, 225, 228
 rejection posture and, 229, 230
 species-specific behaviors, 228–230
 success in, 225, 238
 cracker. *See* *Hamadryas amphycloa* (Nymphalidae)
 Crassulaceae, 65
 crepuscular, 40
 Cruciferae, 67, 102
 crypsis, 145–147, 155, 166–168, 169–173
Cupido minimus (Lycaenidae), 258
D
Damora sagana (Nymphalidae), 28/29
 Danainae (subfamily), 80, 80–81
Danaus chrysippus aegyptius (Nymphalidae), 293
Danaus chrysippus dorippus (Nymphalidae), 293
Danaus chrysippus

INDEX

- (Nymphalidae), 180, 251
Danaus eresimus (Nymphalidae), 182
Danaus gilippus (Nymphalidae), 31, 175, 179, 182, 199, 230–233, 232, 233, 255, 301
Danaus plexippus (Nymphalidae), 81, 107, 112, 175–176, 177, 178, 178, 179, 198, 204, 204, 205, 237, 258, 261, 280–289, 285, 286, 288, 291, 299
Dentaria diphylla (Cruciferae), 102
DeVries, Phil, 138
Diaethria cembra (Nymphalidae), 40
diana fritillary. See *Speyeria diana* (Nymphalidae)
diapause, 23, 109–113
Dichorragia nesimachus (Nymphalidae), 192
Dicotyledons, 60–61
Diptera, 48
Dismorphia amphiona (Pieridae), 99
Dismorphia eunoe (Pieridae), 99
Dismorphia praxinoe (Pieridae), 181
Dismorphia theucharila (Pieridae), 99
Dismorphiinae (subfamily), 68, 99, 181
dispersal, 107, 109–113
diurnal living, 39–40, 50
diversity, 54–56
 and conservation, 47
 and continental drift, 86–88
 and island biogeography theory, 89–93
 and rainforest refugia, 93–99
 study of, 42, 96–97
 of wing pattern, 21, 36
 by zoogeographic regions, 89
dogbane. See *Apocynaceae*
Dorcas copper. See *Lycaena dorcas* (Lycaenidae)
dormancy, 109–110
Douglas, Matt, 123, 150
Dynastor darius (Nymphalidae), 31
Dysschemia jansonius (Arctiidae; Pericopinae), 99
E
eastern tailed blue. See *Everes comyntas* (Lycaenidae)
ectothermic, 206
egg(s), 21–26, 29–30, 30, 49, 116, 117–123, 119, 143
 red-egg syndrome in, 123, 132
Ehrlich, Paul, 174
emetic response, 178–179
empress leilia. See *Asterocampa leilia* (Nymphalidae)
endangered-species legislation, 263–265
endangerment
 causes of, 250–253
 natural threats, 250–251
Enodia anthedon (Nymphalidae), 222, 223
environmental mortality
 sources, 147
Epargyreus clarus (Hesperiidae), 131, 299
Erebia pronoe (Nymphalidae), 194
Eresia coela (Nymphalidae), 99
Eresia mechanitis (Nymphalidae), 99
Eresia philyra (Nymphalidae), 181
Eriocranioidea, 50
Euchloe olympia (Pieridae), 66, 122, 123, 296
Euides isabella (Nymphalidae), 166
Euides zorcaon (Nymphalidae), 181
Eumaeus atala (Lycaenidae), 16, 31
Euphaedra neophron (Nymphalidae), 197
Euphorbiaceae, 219
Euphydryas editha bayensis (Nymphalidae), 105, 244–247, 280, 285
Euphydryas gilletti (Nymphalidae), 119
Euphydryas maturna (Nymphalidae), 194
Euphydryas phaeton (Nymphalidae), 137
Euphydryas sp. (Nymphalidae), 112, 138
Euptoieta claudia (Nymphalidae), 120, 128, 128
Euptoieta hegesia (Nymphalidae), 22, 23, 23–28, 26, 27, 30, 53, 121, 124, 132, 133, 138, 152, 167, 176, 298
Eurema lisa (Pieridae), 222, 233
Eurema mexicana (Pieridae), 216
Eurema nicippe (Pieridae), 15
Eurema sp. (Pieridae), 230
European comma. See *Polygona c-album* (Nymphalidae)
European map butterfly. See *Araschnia levana* (Nymphalidae)
European skipper. See *Thymelicus lineola* (Hesperiidae)
European wood white. See *Leptidea sinapsis* (Pieridae)
Eurytides euryleon (Papilionidae), 99
Eurytides marcellus (Papilionidae), 33, 64, 261, 264
Euschemon rafflesia (Hesperiidae), 50
Euthalia dirtea (Nymphalidae), 31
Everes comyntas (Lycaenidae), 297
Eversman's parnassian. See *Parnassius eversmanni* (Papilionidae)
exoskeleton, 33
eyepots, 169–172, 170, 172
eyes, 36, 151–152
F
Fabaceae, 68
falcate orangetip. See *Anthocharis midea* (Pieridae)
Feniseca tarquinius (Lycaenidae), 71, 118, 118
Fish and Wildlife Conservation Act, 264
five-bar swallowtail. See *Graphium antiphates* (Papilionidae)
Fixsenia favonius (Lycaenidae), 217
Flacourtiaceae, 79
flash and conceal, 167–168
flight
 during courtship, 227–228, 230–233
 forward, 212
 fuel for, 116, 192
 temperature for, 207–208
 time available for, 189–190
floaters, 224
food, 124, 125–128, 190–198
 alternative sources, 192–196, 193–195, 197, 198, 203, 245
 flowers, 190–192
fossils, 50–51
foxtglove, 176
frass, 129
frosted elfin. See *Incisalia irus* (Lycaenidae)
fruit fly, 195
G
Galbula ruficauda (Galbulidae), 163
gatekeeper. See *Pyronia tithonus* (Nymphalidae)
 geographic distribution of butterflies, 84–85
giant skippers. See Megathyminae (subfamily)
giant swallowtail. See *Papilio cressphontes* (Papilionidae)
Gilbert, Larry, 204, 242
Gillette checkerspot. See *Euphydryas gilletti* (Nymphalidae)
glaciation, 88, 94
Glanville fritillary. See *Melitaea cinxia* (Nymphalidae)
glassywing skipper. See *Pompeius verna* (Hesperiidae)
Glaucopsyche alexis (Lycaenidae), 280
Glaucopsyche lygdamus (Lycaenidae), 296
Glaucopsyche xerces (Lycaenidae), 257, 262
global warming, 277–280
goatweed butterfly. See *Anaea andria* (Nymphalidae)
gold-banded forester. See *Euphaedra neophron* (Nymphalidae)
Gondwanaland, 85, 87
Graphium antiphates (Papilionidae), 201
gray hairstreak. See *Strymon melinus* (Lycaenidae)
grayling. See *Hipparchia semele* (Nymphalidae)
great purple hairstreak. See *Atlides balesus* (Lycaenidae)
great southern white. See *Ascia monuste* (Pieridae)
green-underside blue. See *Glaucopsyche alexis* (Lycaenidae)
gregariousness, 125, 135–138, 136, 140
Greta diaphana (Nymphalidae), 245
gulf fritillary. See *Agraulis vanillae* (Nymphalidae)
gypsy moth. See *Lymantria dispar* (Lycaenidae)
H
habitat
 fragmentation of, 93, 105, 274
 loss of, 253–256
 management of, 271–272
 preference for, 82, 105, 113–115
 restoration of, 268, 297–301
hackberries. See *Ulmaceae*

A WORLD FOR BUTTERFLIES

- haemolymph, 28, 37
 hairstreaks. *See* Lycaenidae (family)
Hamadryas amphycloe (Nymphalidae), 165
Hamadryas sp. (Nymphalidae), 166
Handbook for Butterfly Watchers, 291
Harkenclenus titus (Lycaenidae), 300
 harvester. *See* *Feniseca tarquinius* (Lycaenidae)
 haustellum. *See* proboscis
 Hedyliidae/Hedyloidea (family/superfamily), 40, 56, 59–60
Heliconia, 49
 Heliconiinae (subfamily), 79–80, 95, 176, 182–183
Heliconius charithonia (Nymphalidae), 32, 33, 34, 35, 148, 149, 173, 173, 205, 261
Heliconius erato (Nymphalidae), 95, 96, 98, 225, 242
Heliconius ethilla (Nymphalidae), 244–247
Heliconius hecalasia (Nymphalidae), 240
Heliconius hecale (Nymphalidae), 99
Heliconius hewitsoni (Nymphalidae), 99, 127
Heliconius ismenius (Nymphalidae), 99
Heliconius melpomene (Nymphalidae), 95, 97, 98, 209, 240, 245
Heliconius numata (Nymphalidae), 77
Heliconius pachtinus (Nymphalidae), 99
Heliconius sp. (Nymphalidae), 206, 238
Heliconius telchinia (Nymphalidae), 181
Hemiargus isola (Lycaenidae), 270
 Hemiptera, 48
 Heppner, John B., 54
Hernandia sp. (Hernandiaceae), 273
Hesperia sp. (Hesperiidae), 145
 Hesperidae/Hesperioidea (family/superfamily), 21, 38, 56, 60–62, 62, 128
 Hesperinae (subfamily), 60–62
 Heterocera, 21
 Heteropterinae (subfamily), 61, 62
 hibernation, 109–110
Hipparchia autonoe (Nymphalidae), 213
Hipparchia semele (Nymphalidae), 145, 156, 229
Historis odius (Nymphalidae), 221
 holometabolous, 21–22
 Homerus swallowtail. *See* *Papilio homerus* (Papilionidae)
 human intervention in butterfly lives, 256–261
 human population growth, 256
Hylephila phyleus (Hesperiidae), 59
 Hymenoptera. *See* ants, paper wasps
Hypoleria cassotis (Nymphalidae), 79
Hypolimnas misippus (Nymphalidae), 180
Hypothyris euclea (Nymphalidae), 99
I
Idea leucone (Nymphalidae), 80
 Imago/imagine. *See* adult butterfly
 immobility, 145
Incisalia irus (Lycaenidae), 114, 267
 Indian leaf butterfly. *See* *Kallima inachus* (Nymphalidae)
 information sharing, 206
 inornate ringlet. *See* *Coenonympha inornata* (Nymphalidae)
Insect Conservation Biology, 45–47
 Instar, 27, 35
 intermediate skippers. *See* Heteropterinae (subfamily)
 International Code of Zoological Nomenclature, 53
 International Unions for the Conservation of Nature and Natural Resources (IUCN), 262, 273
 isabella heliconian. *See* *Euides isabella* (Nymphalidae)
 island biogeography theory, 89–93
Issoria lathonia (Nymphalidae), 229
 Ithomiinae (subfamily), 79, 79, 80, 227
J
 Jacamar. *See* *Galbula ruficauda* (Galbulidae)
Jalmenus evagorus (Lycaenidae), 145
 Jamaican clearwing. *See* *Greta diaphana* (Nymphalidae)
 Jamaican pygmy fritillary. *See* *Phyciodes (Antillea) proctea* (Nymphalidae)
 Japanese constable. *See* *Dichorragia nesimachus* (Nymphalidae)
 Japanese skipper. *See* *Parnara guttata* (Hesperiidae)
 Japanese swallowtail. *See* *Sericinus montela* (Papilionidae)
Juditha molpe (Lycaenidae), 139
Junonia coenia (Nymphalidae), 176, 177, 228, 295
K
Kallima inachus (Nymphalidae), 166
Karanasa regeli (Nymphalidae), 82
 Karner blue. *See* Lycaeides melissa samuelis (Lycaenidae)
L
 Labiatae, 192
 large blue. *See* *Maculinea arion* (Lycaenidae)
 larva/larvae, 26–27, 135–137; *see also* caterpillar
 larvae, gregarious, 135–137
 larval stages, 27; *see also* instar
 Lauraceae, 64, 185
 Laurasia, 85, 87
 laurel. *See* Lauraceae
 legumes. *See* Fabaceae; Leguminosae
 Leguminosae, 192, 266
 Lepidoptera, 20–22, 48, 50
 lepidopterology, 13, 21, 41–44
Leptidea sinapsis (Pieridae), 67
Leptotes perkinsae (Lycaenidae), 90
 lesser spotted fritillary. *See* *Melitaea trivia* (Nymphalidae)
Libellula sp. (Odonata; Libellulidae), 161
Libythea bachmanii (Nymphalidae), 81, 108, 234
Libytheana bachmanii (Nymphalidae), 107, 233–234
 Libytheidae/Libytheinae (family/subfamily), 63, 81
 life cycle, 22–29
 life-history studies, 294–297
 Limenitini (tribe), 78
Limenitis archippus (Nymphalidae), 145, 177, 178, 179
Limenitis arthemis arthemis (Nymphalidae), 188, 188
Limenitis arthemis astyanax (Nymphalidae), 31, 186, 188
Limenitis populi (Nymphalidae), 194
 Linnaeus, Carolus, 52
 Linnean system of binomial nomenclature, 52–54
 little blue. *See* *Cupido minimus* (Lycaenidae)
 little yellow. *See* *Eurema lisa* (Pieridae)
The Lives of Butterflies, 123
 Loganiaceae, 300
 long dash skipper. *See* *Polites mystic* (Hesperiidae)
Lathyrus sp. (Leguminosae), 67
 lupine, 266, 267
Lycaeides melissa samuelis (Lycaenidae), 106, 263, 264, 266–271, 297
Lycaena dorcas (Lycaenidae), 102
Lycaena hyllus (Lycaenidae), 70
Lycaena phleas (Lycaenidae), 300
 Lycaenidae/Lycaeninae (family/subfamily), 62, 63, 68–75, 137, 142, 145, 212, 220, 238
Lycorea atergatis (Nymphalidae; Danainae), 181
Lycorea cleobaea (Nymphalidae), 228
Lymantria dispar (Lycaenidae), 250, 252
M
 Macoun's arctic. *See* *Oeneis macounii* (Nymphalidae)
Macrosoma heliconiaria (Castniidae), 58
Macrosoma sp., 59
Maculinea alcon (Lycaenidae), 239
Maculinea arion (Lycaenidae), 118, 269, 271, 271–273
 Magnoliaceae, 64
 magnolias. *See* Magnoliaceae
Malacosoma sp. (Lasiocampidae), 253
 male-male interactions, 235–238
 Malvaceae, 302
Maniola jurtina (Nymphalidae), 293
 Marden, James, 215
 mates
 patrolling for, 217–218, 219,

INDEX

- 227
 perching for, 215, 218, 220-221, 227
- mating behavior
 mate-carrying, 238-239
 mate-location, 217-221
 mate-discrimination, 221
 of pupae, 148, 225, 238, 240, 242
 signal-chain response, 225
 and sperm precedence, 241-243
- meadow brown. *See Maniola jurtina* (Nymphalidae)
- Mechanitis doryssus* (Nymphalidae), 181
- Mechanitis* sp. (Nymphalidae), 145, 145-147
- meconium, 28, 147, 152, 176
- Megathyminae (subfamily), 61-62
- Megathymus streckeri* (Hesperiidae; Megathyminae), 62
- Megisto cymela* (Nymphalidae), 296
- Melanargia russiae* (Nymphalidae), 73
- Melinaea ethra* (Nymphalidae), 99
- Melinaea imitata* (Nymphalidae), 181
- Melitaea cinxia* (Nymphalidae), 101
- Melitaea trivialis* (Nymphalidae), 211
- Melitaeni (tribe), 78
- metalmarks. *See Calephelis virginianensis* (Lycaenidae); Lycaenidae (family)
- metamorphosis, 20, 21, 26, 35, 110, 142
- metapopulation, 101, 103
- Mexican fritillary. *See Euptoieta hegesia hoffmanni* (Nymphalidae); *Euptoieta hegesia* (Nymphalidae)
- migration, 109-113, 280-289
 estimating size of, 107
- Milbert's tortoiseshells. *See Nymphalis milberti* (Nymphalidae)
- Miletinae subfamily, 73
- milkweed. *See Asclepiadaceae*
- milkweed butterflies. *See Danainae* (subfamily)
- Mimeresia libentina* (Lycaenidae), 71
- mimic skippers. *See Coeliadinae* (family)
- mimicry, 95-96, 289
 automimicry, 182
 Batesian, 179-180, 180
 geographic-limited, 184, 188
 monarch-vice-roy system, 281-282
 Müllerian, 182
 pipevine swallowtail system, 178-188
 sex-limited, 184, 186, 187
 mineral salts, 196, 199-204, 200-202
- misdirection, 169-173
- Miss Perkins' blue. *See Leptotes perkinsae* (Lycaenidae)
- Misumena vatia* (Araneae; Thomisidae), 156
- Mitoura grynea* (Lycaenidae), 31, 33
- mobility, 147-148
- molt, 27, 33, 142
- monarch butterfly. *See Danaus plexippus* (Nymphalidae)
- monarch-vice-roy mimicry system, 181-182
- Monroe, Eugene, 93
- Morphinae (subfamily), 78-79
- Morpho cypris* (Nymphalidae), 220
- Morpho peleides* (Nymphalidae), 75, 163
- Morpho* sp. (Nymphalidae), 220
- mortality rates, 155, 275
- moths, 21, 38-40, 48, 49-50
- mourning cloak. *See Nymphalis antiopa* (Nymphalidae)
- Müllerian mimicry, 182
- mustard white. *See Pieris napi* (Pieridae)
- mustards. *See Cruciferae*
- Mylothria malenka* (Pieridae; Pierinae), 181
- myrmecophily, 138; *see also* ants
- Myrmica* sp. (Hymenoptera; Formicidae), 118, 271; *see also* ants
- N**
- Nabokov, Vladimir, 20
- Napeogenes peredia* (Nymphalidae; Ithomiinae), 99
- natural threats of endangerment, 250-251
- neotropical mosaic. *See Colobura dirce* (Nymphalidae)
- nettles. *See Urticaceae*
- nitrogen, 196; *see also* mineral salts
- nomenclature, 36, 51-56
- binomial, 52-54
 common names, 54
 Linnean system, 52-54
- North America, 87
- Nymphalidae (family), 62, 63, 75-81, 169, 212, 238
- Nymphalinae/Nymphalini (subfamily/tribe), 73, 77, 78, 95
- Nymphalis antiopa* (Nymphalidae), 54, 110, 207, 208, 211, 261
- Nymphalis milberti* (Nymphalidae), 110
- Nymphalis vaualbum* (Nymphalidae), 110, 195
- O**
- observation of butterflies, 291-294
- Odocoileus virginianus* (Cervidae; Mammalia), 268
- Oecophylla* sp. (Hymenoptera; Formicinae), 137; *see also* ants
- Oeneis macounii* (Nymphalidae), 108
- Oeneis uhleri* (Nymphalidae), 108, 109
- Oenis* sp. (Nymphalidae), 108
- old world swallowtail. *See Papilio machaon* (Papilionidae)
- Oleria paula* (Nymphalidae), 99
- olympia marblewing. *See Euchloe olympia* (Pieridae)
- oocytes, 244
- Opsiphanes tamarindi* (Nymphalidae), 31, 33, 49
- orange sulfur. *See Colias eurytheme* (Pieridae)
- orange tip. *See Anthocharis cardamines* (Pieridae)
- origin of butterflies, 50-51
- orion. *See Historis odius* (Nymphalidae)
- Ornithoptera* sp. (Papilionidae), 275
- Ornithoptera victoria* (Papilionidae), 277, 278, 279
- Orthoptera, 48
- osmeteria/osmeterium, 134-135, 135
- outbreak populations, 107
- overcollection/overexploitation, 106, 258-261, 264-265
- oviposition, 23, 116, 120, 122, 123, 127, 174, 189, 244-247, 245, 247
- ova/ovum. *See* egg
- owl butterflies. *See Brassolinae* subfamily
- P**
- painted lady. *See Vanessa cardui* (Nymphalidae)
- Pangea, 85, 86-87
- Papaveraceae, 65
- paper wasps. *See Polistes* sp. (Hymenoptera)
- Papilio androgeus* (Papilionidae), 200
- Papilio canadensis* (Papilionidae), 170, 250, 264, 296
- Papilio cressphontes* (Papilionidae), 133, 223, 261
- Papilio dardanus* (Papilionidae), 293
- Papilio glaucus* (Papilionidae), 172, 184-185, 185, 186, 251
- Papilio homerus* (Papilionidae), 272, 273, 273-275, 274
- Papilio machaon* (Papilionidae), 121
- Papilio polyxenes* (Papilionidae), 31, 143, 144, 162, 183, 185, 215-216, 216, 264
- Papilio troilus* (Papilionidae), 23, 24, 31, 134, 134-135, 135, 185
- Papilio xuthus* (Papilionidae), 125
- Papilionidae/Papilionoidea (family/superfamily), 51, 56, 62-81, 63-65, 142, 145, 238
- Papilioninae (subfamily), 63-64
- parasitoids, 128-129, 128, 131, 144
- Parides arcas* (Papilionidae; Papilioninae), 99
- Parnesan, Camille, 280
- Parnara guttata* (Hesperiidae), 158
- parnassians. *See* Papilionidae (family)
- Parnassiinae (subfamily), 64-65
- Parnassius actius* (Papilionidae), 17
- Parnassius apollo* (Papilionidae), 106, 120, 256, 258
- Parnassius eversmanni* (Papilionidae), 65, 242
- Parnassius* sp. (Papilionidae), 242
- Parthenos sylvia* (Nymphalidae), 44
- Passiflora* sp. (Passifloraceae), 26, 79, 129, 139, 176
- passion vines. *See Passiflora* sp. (Passifloraceae)
- patrolling, 218
- pattern, 130-135, 173-174
- pearl crescentspots. *See Phyciodes*

A WORLD FOR BUTTERFLIES

- tharos* (Nymphalidae)
pearly eye. *See* *Enodia anthedon* (Nymphalidae)
pearly heath. *See* *Coenonympha arcania* (Nymphalidae)
pepper. *See* Capparidaceae
perching, 218
pheromones, 198, 199, 225, 227, 241–242
Phocides urania (Hesperiidae), 58
Phoebis argante (Pieridae), 200
Phoebis philea (Pieridae), 33
Phoebis sennae (Pieridae), 222, 302
Phoebis sp. (Pieridae), 216
Phyciodes (Antillea) proclea (Nymphalidae), 91
Phyciodes tharos (Nymphalidae), 201, 202, 296
phylogenetic systematics, 57
Phymata sp. (Hemiptera; Phymatidae), 158
Pieridae (family), 62, 65–68, 142, 145, 238
Pierinae (subfamily), 66–67
Pieris napi (Pieridae), 105, 296
Pieris rapae (Pieridae), 102, 103, 112, 158, 203, 257, 296
Pieris virginiensis (Pieridae), 102, 210
pipevine swallowtail. *See* *Battus philenor* (Papilionidae); *Battus* sp. (Papilionidae)
pipevine swallowtail mimicry system, 184–188
pipevines. *See* Aristolochiaceae
plain tiger. *See* *Danaus chrysippus* (Nymphalidae)
plants
 chemistry of, 174–176, 181–183, 184, 185
 as food, 48–49, 125–128
 as predators, 156, 156, 158
 sequestration from, 174–176
Poanes viator (Hesperiidae), 296
Polistes sp. (Hymenoptera), 129, 162
Polites mystic (Hesperiidae), 189
Polites peckius (Hesperiidae), 33
polydamas swallowtail. *See* *Battus polydamus* (Papilionidae); pipevine swallowtail
Polygonia c-album (Nymphalidae), 198
Polygonia comma (Nymphalidae), 31
Polygonia interrogationis (Nymphalidae), 45, 165, 220
Polygonia sp. (Nymphalidae), 134, 166
Polyommatae (subfamily), 69, 70
Polyommatus icarus (Lycaenidae), 236
Pompeius verna (Hesperiidae), 150
Pontia protodice (Pieridae), 108
poplar admiral. *See* *Limnitis populi* (Nymphalidae)
poppies. *See* Papaveraceae
population
 biology, 82–84, 100–115
 dynamics, 106–109
 human growth in, 256
 outbreaks, 107–108
 size, 105–108, 253–254
 structure, 101–103
postman. *See* *Heliconius melpomene* (Nymphalidae)
Potentilla fruticosa (Rosaceae), 102
Praepapilio sp. (Papilionidae), 51
predators
 avoidance of, 125, 130–139, 145–147, 155, 164, 170, 173
 of butterflies, 153–154, 156, 158, 160, 161, 162–163
 foraging strategies of, 128
 of eggs, 120, 121
 kinds of, 106–107, 128–129, 133, 155, 156–166, 178–179
 of larvae, 130, 138
 and population size, 106
 prepupal stadium, 27, 143
 proboscis, 36, 151, 151–152
 prolegs, 32, 49
Promachus binei (Diptera; Asilidae), 163
protection. *See* conservation
Protogynis cecrops (Nymphalidae; Nymphalinae), 181
provence hairstreak. *See* *Tomarus ballus* (Lycaenidae)
Pseudopontia paradoxa (Pieridae), 68
Pseudopontiinae (subfamily), 68
puddling, 199–204, 216–217
pupa/pupae. *See* chrysalis
pupal crypsis, 145–147
purple emperor. *See* *Apatura irus* (Nymphalidae)
Pyle, Robert M., 291
Pyrginae (subfamily), 50, 60–61, 62
Pyronia tithonus (Nymphalidae), 154
Pyrrhocalles jamiacensis (Hesperiidae), 88
Pyrrhogyra neaerea (Nymphalidae), 131
Pyrrhopyge araxes (Hesperiidae; Pyrrhopyginae), 60
Pyrrhopyginae (subfamily), 61
Q
Queen Alexandra's sulfur. *See* *Colias christina* (Pieridae)
queen butterflies. *See* *Danaus gilippus* (Nymphalidae)
queen of Spain fritillary. *See* *Issoria lathonia* (Nymphalidae)
Question Mark. *See* *Polygonia interrogationis* (Nymphalidae)
R
rainbow skipper. *See* *Phocides urania* (Hesperiidae)
rainforest refugia, 93–99, 94
Rana pipiens (Anura; Ranidae), 202
rare
 definitions of, 105
 in life history stages, 155
rarity, 103–106
Raven, Peter, 174
Reakirt's blue. *See* *Hemiargus isola* (Lycaenidae)
rearing, 294–297
red admirals. *See* *Vanessa atalanta* (Nymphalidae)
red-banded hairstreak. *See* *Calycopis cecrops* (Lycaenidae)
Red Data Books, 262
red-egg syndrome, 123, 132
red-spotted purple. *See* *Limnitis arthemis astyanax* (Nymphalidae)
reflectance-basking species, 210–211
refugia. *See* rainforest refugia
regal fritillary. *See* *Speyeria idalia* (Nymphalidae)
rejection posture, 229
release of living butterflies, 261
reproduction, 150, 152–155, 225, 238–242; *See also* courtship
reproductive system, 28
Rhabdodryas trite (Pieridae), 200
Rhopalocera, 56–57
Riodinidae (subfamily), 51, 68, 138
Ritland, David, 181
Rondonia Rain Forest Reserve, 97
roost
 fidelity, 206
 sites, 204–206, 204–205, 286
Rutaceae, 64
S
salt. *See* mineral salts
Samways, Michael, 45
Satyrinae (subfamily), 51, 73, 77, 78, 127, 238
Satyrium calanus (Lycaenidae), 300
Saxifragaceae, 65
Schaus' tawny skipper. *See* *Pyrrhocalles jamiacensis* (Hesperiidae)
Scoble, Malcolm, 54, 57
Scrophulariaceae, 176
Seasonality, 108–109
sensory capabilities, 151–152
Sericinus montela (Papilionidae), 13
Sesioidea, 59
Shapiro, Art, 121
shivering, 208–209. *See also* thermoregulation
shrubby cinquefoil. *See* *Potentilla fruticosa* (Rosaceae)
signal-response chain, 225
signature scent, 225
silk, 130, 138, 142
silver-spotted skipper. *See* *Epargyreus clarus* (Hesperiidae)
silver-washed fritillary. *See* *Argynnis paphia* (Nymphalidae)
size, 211–212
skimmer dragonfly. *See* *Libellula* sp. (Odonata; Libellulidae)
sleepy orange. *See* *Eurema nicippe* (Pieridae)
small postman. *See* *Heliconius erato* (Nymphalidae)
small sulfur. *See* *Eurema lisa* (Pieridae)
small tortoiseshell. *See* *Aglais urticae* (Nymphalidae)
small white. *See* *Pieris rapae* (Pieridae)
snout butterfly. *See* *Libytheana bachmanii* (Nymphalidae)
Solanaceae, 245
soldier. *See* *Danaus eresimus* (Nymphalidae)
Solenopsis invicta (Hymenoptera; Formicidae), 152
source/sink dynamics, 101
South America, 87
southern hairstreak. *See* *Fixsenia favonius* (Lycaenidae)
speciation, 88

INDEX

- spermatophore, 196–198, 239
Speryeria cybele (Nymphalidae), 129
Speyeria aphrodite (Nymphalidae), 203, 296
Speyeria atlantis (Nymphalidae), 296
Speyeria cybele (Nymphalidae), 296, 299
Speyeria diana (Nymphalidae), 185, 187
Speyeria idalia (Nymphalidae), 252
sphragis, 242, 243
spicebush swallowtail. *See Papilio troilus* (Papilionidae)
spider webs, 138
spiracles, 32, 34, 37
spring azure. *See Celastrina ladon* (Lycaenidae); *Celastrina* sp. (Lycaenidae)
St. Christopher's hairstreak. *See Chlorostymon simaethis* (Lycaenidae)
stonecrops. *See Crassulaceae*
straight-line sulphur. *See Rhabdodryas trite*
Strymon melinus (Lycaenidae), 172, 220
study of butterflies, 291–294
sugarcane-borer. *See Castnia licus* (Castniidae)
sulfurs. *See Pieridae* (family)
survival, 152–155
swallowtails. *See Papilionidae* (family); Papilioninae (subfamily)
Systema Naturae, 52
- T**
tawny emperor. *See Asterocampa clyton* (Nymphalidae)
taxonomy, 51–56
Tellervinae (subfamily), 80
Tenodera aridifolia (Orthoptera; Mantidae), 158
tent caterpillars. *See Malacosoma* sp. (Lasiocampidae)
territoriality, 217, 218–219, 221–225, 238
and courtship, 234–235
territory
floaters, 224
holders, 224
location of, 223–224
and male-male interactions, 235–238, 237
and mate-locating behavior, 217, 218–219
thermoregulation, 164, 206–215
basking, 207–211
and body size, 211–215, 213, 215
heat gain/loss, 211–213
shivering or thermogenesis, 209
thyme. *See Thymus* sp. (Labiatae)
Thymelicus lineola (Hesperiidae), 160, 202, 249, 296
Thymelicus sp. (Hesperiidae), 145
Thymus sp. (Labiatae), 118, 271
tiger mimic queen. *See Lycorea cleobaea* (Nymphalidae)
tiger swallowtail. *See Papilio glaucus* (Papilionidae)
titania fritillary. *See Boloria titania* (Nymphalidae)
Tithorea hippothous (Nymphalidae), 181
Tomarus ballus (Lycaenidae), 212
toothwort. *See Dentaria diphylla*
touch, 152
transgenic plants, 257
Trapezitinae (subfamily), 61, 62
tree nymph. *See Idea leucone* (Nymphalidae)
Trichoptera, 50
Troides sp. (Papilionidae), 275
Turnera ulmifolia (Turneraceae), 26, 160
- two-tailed pasha. *See Charaxes jasius* (Nymphalidae)
- U**
Uhler's arctic. *See Oeneis uhleri* (Nymphalidae)
Ulmaceae, 81, 129, 235
unnatural causes of endangerment, 251
Uranta leilus (Uraniidae), 39
Urbanus proteus (Hesperiidae), 31
urine, 204
Urticaceae, 79
- V**
Vanessa atalanta (Nymphalidae), 110, 254, 261
Vanessa cardui (Nymphalidae), 112, 147, 167, 168, 261
Vanessa virginiensis (Nymphalidae), 110, 128, 261, 301
variegated fritillary. *See Euptoieta claudia* (Nymphalidae)
veined white. *See Pieris napi* (Pieridae)
Verbenaceae, 22, 180, 192, 300
Vespa sp. (Hymenoptera), 129
viceroy. *See Limenitis archippus* (Nymphalidae)
- W**
warning coloration, 134–135, 155, 167–168, 173–174; *see also* color
water ringlet. *See Erebia pronoe* (Nymphalidae)
weather, 189
website:
www.aworldforbutterflies.com
West Virginia white. *See Pieris virginiana* (Pieridae)
Western pygmy blue. *See Brephidium exilis* (Lycaenidae)
White, Richard, 143
white admiral. *See Limenitis arthemis arthemis* (Nymphalidae)
white peacocks. *See Anartia jatropha* (Nymphalidae)
white-tailed deer. *See Odocoileus virginianus* (Cervidae; Mammalia)
whites. *See Pieridae* (family)
wing wave, 230
wing
color and pattern of, 20, 21, 36, 37, 39, 164
coupling mechanism, 39, 50
muscles, 208–209
position of, 39
scales on, 20, 21, 37, 48
size of, 37
veins of, 36, 37
wave, 230
World Conservation Union, 262
- X**
Xerces blue. *See Glaucopsyche xerces* (Lycaenidae)
Xerces Society, 262
Xochiqetzalpapalotl, 42
- Y**
yellow swallowtail. *See Papilio xuthus* (Papilionidae)
- Z**
Zaretis itys (Nymphalidae), 31
zebra longwing. *See Heliconius charithonia* (Nymphalidae)
zebra swallowtail. *See Eurytides marcellus* (Papilionidae)
Zelus longipes (Hemiptera; Reduviidae), 130
zoogeographic regions, 84, 84, 89
Zygaenoidea, 59