

Grzimek's Animal Life Encyclopedia

Second Edition



Volume 1 Lower Metazoans and Lesser Deuterostomes

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In association with the American Zoo and Aquarium Association



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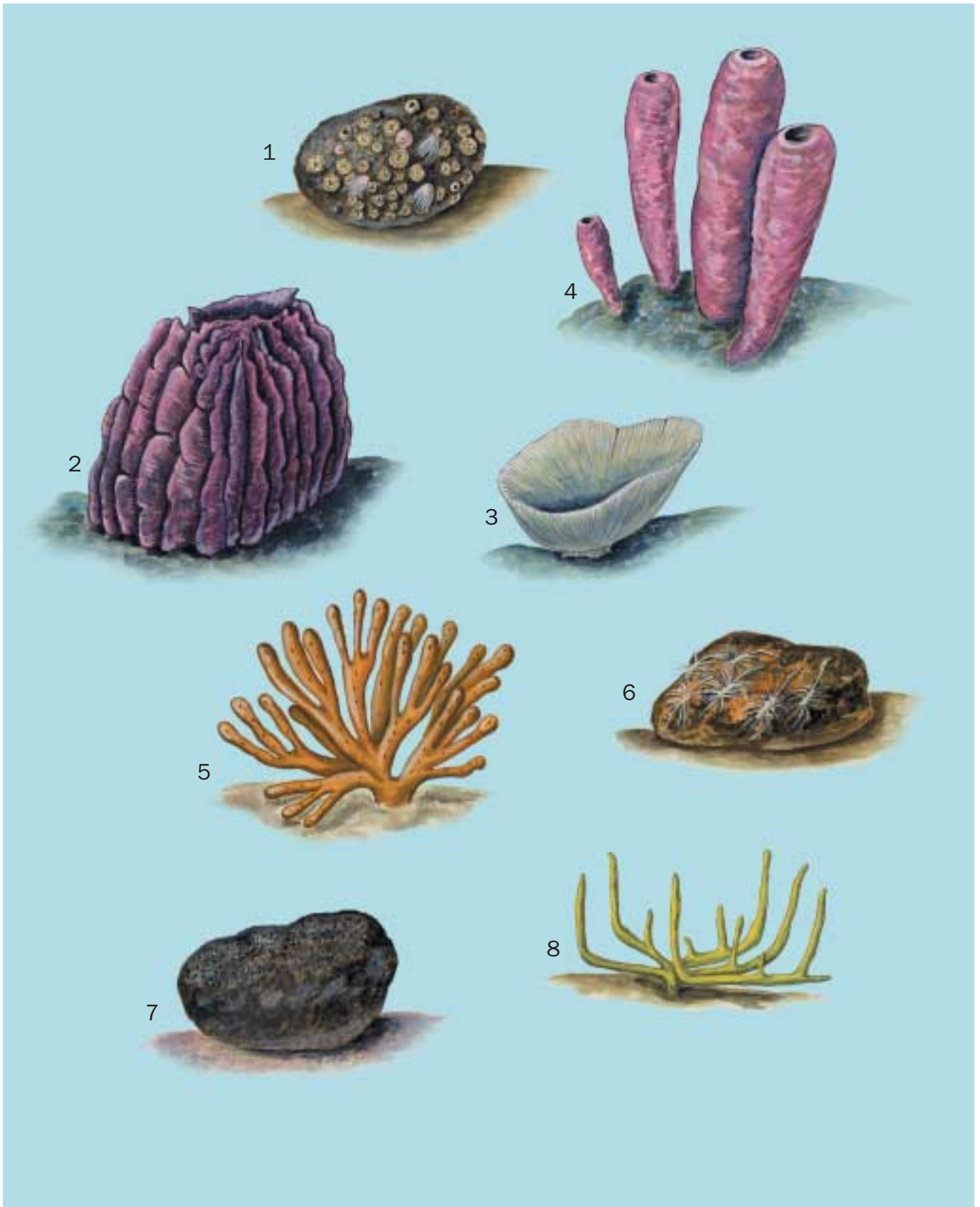
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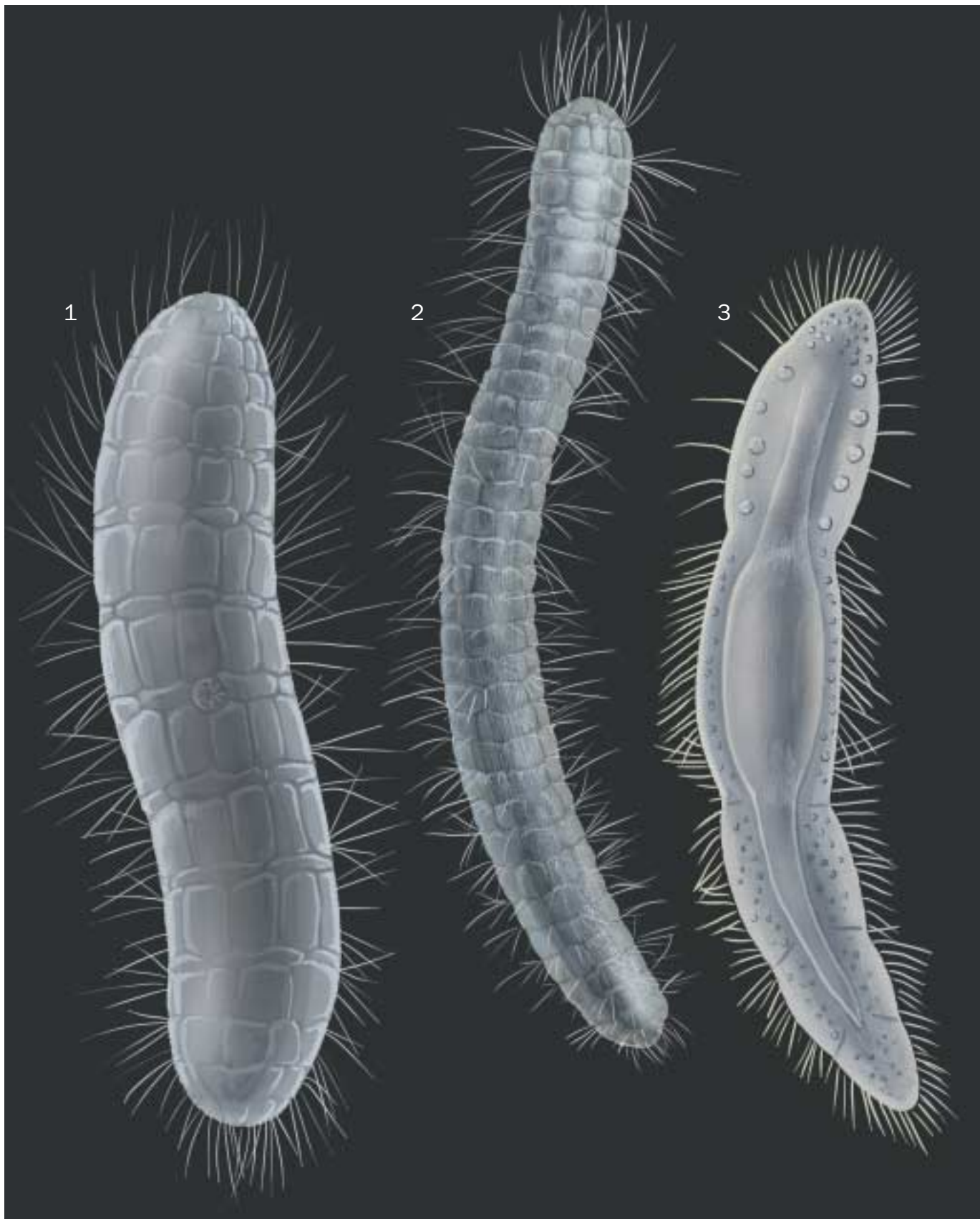
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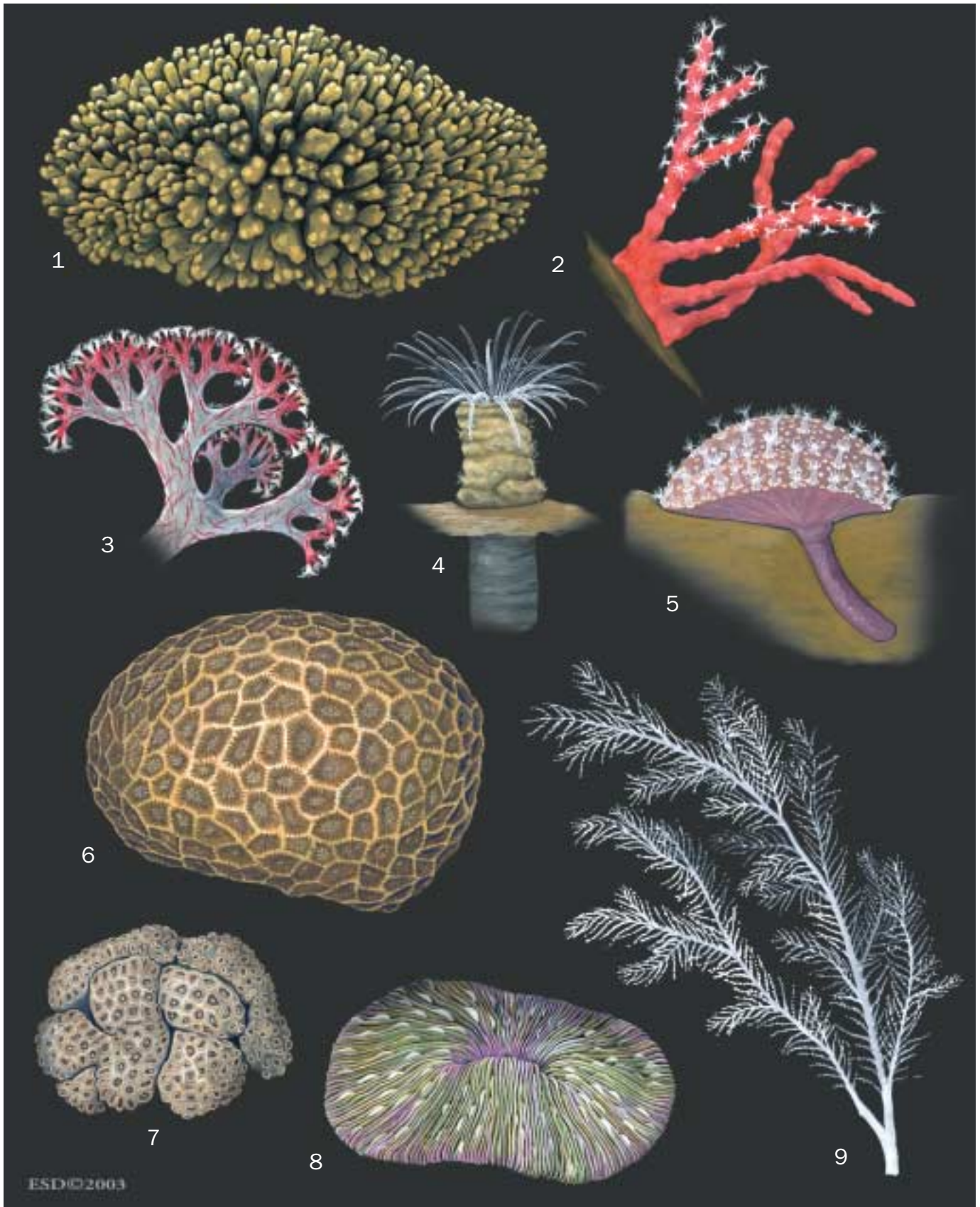
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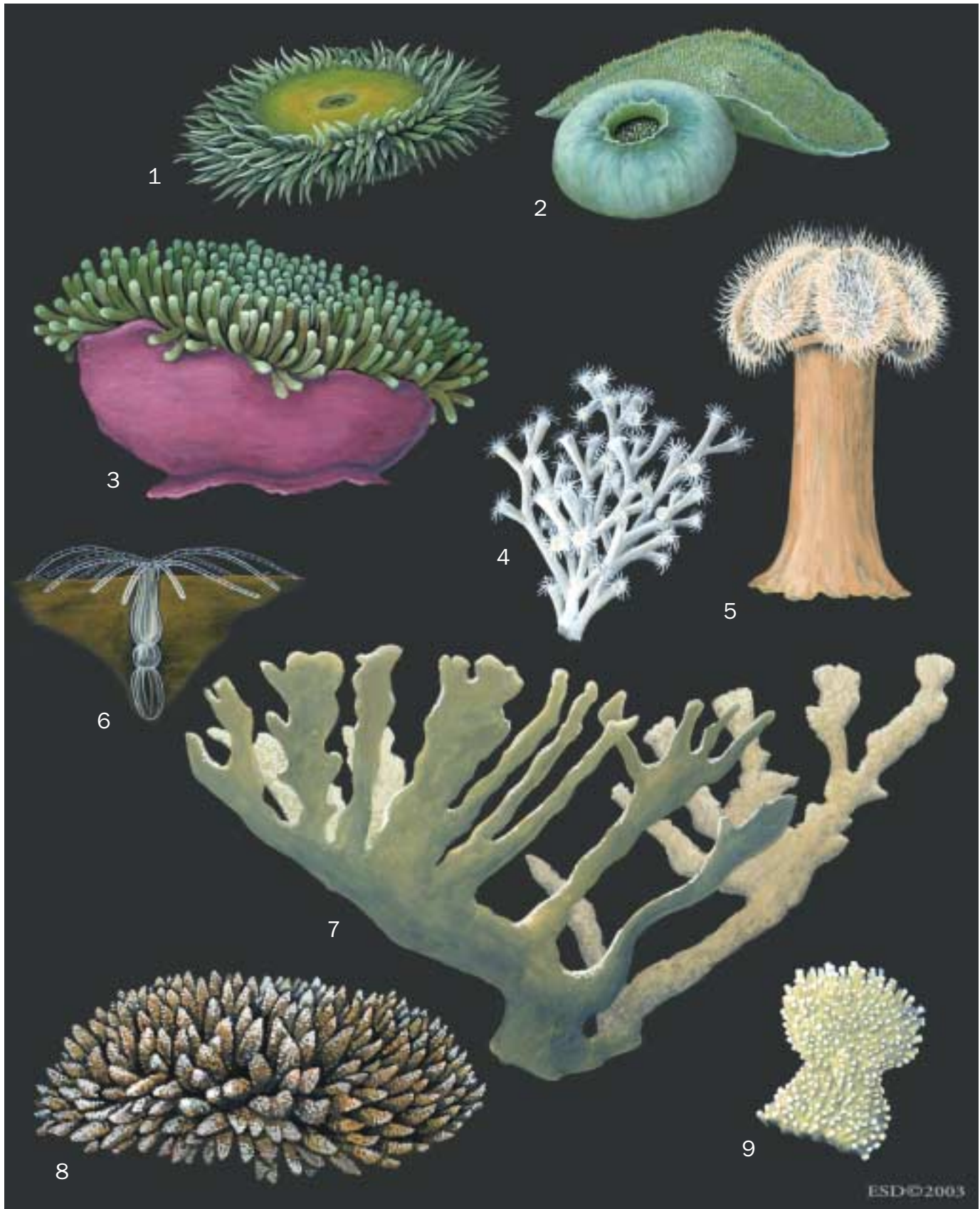
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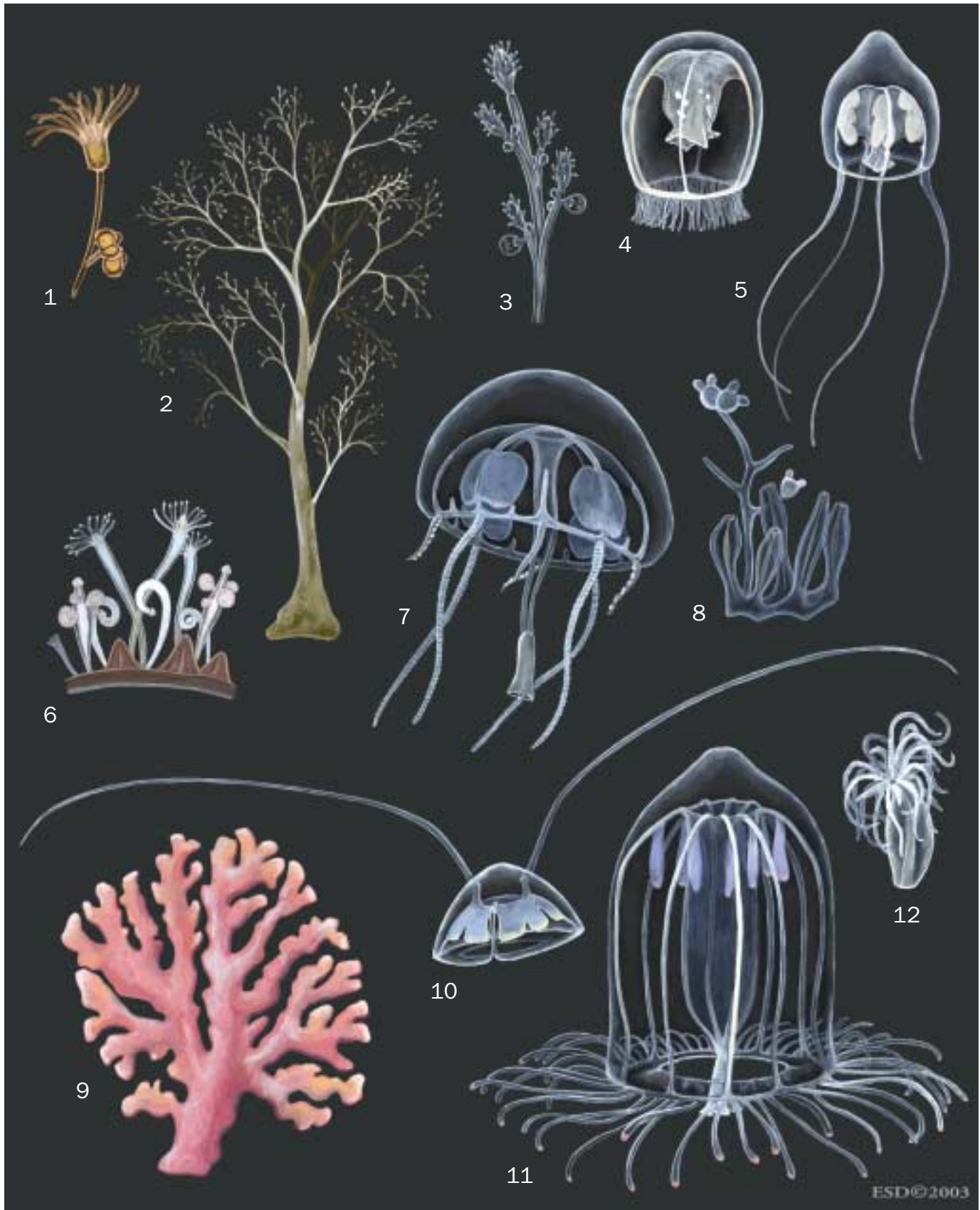
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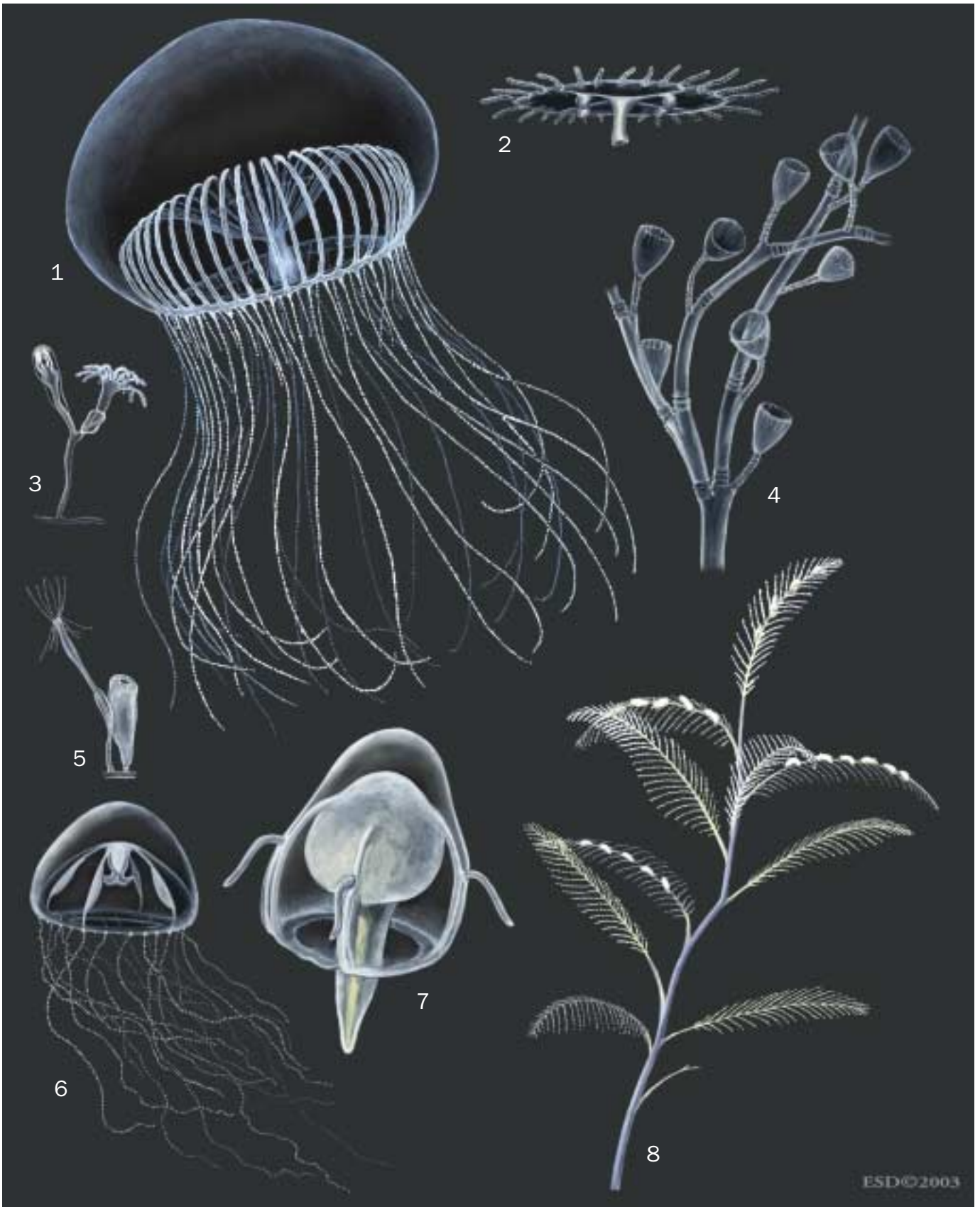
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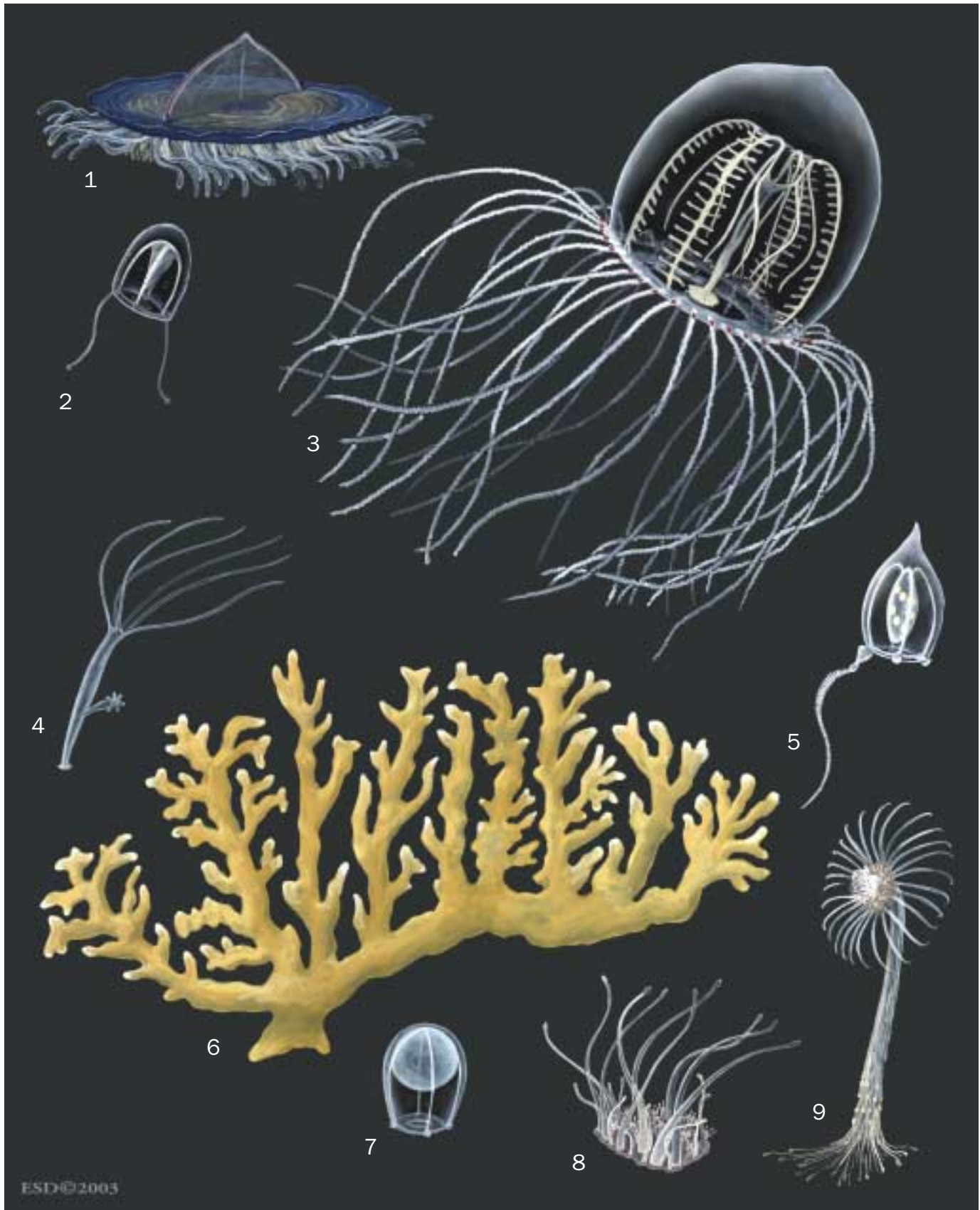
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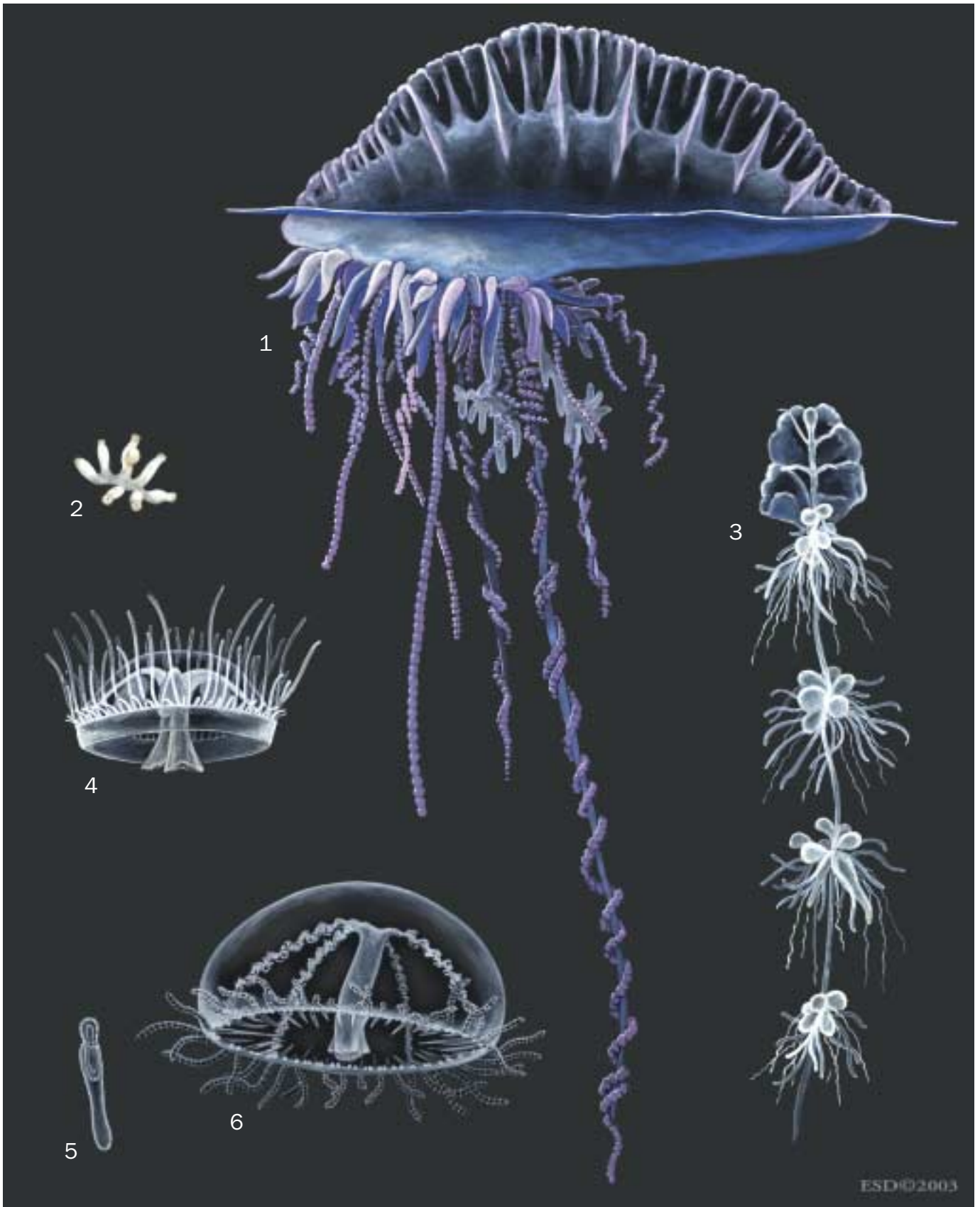
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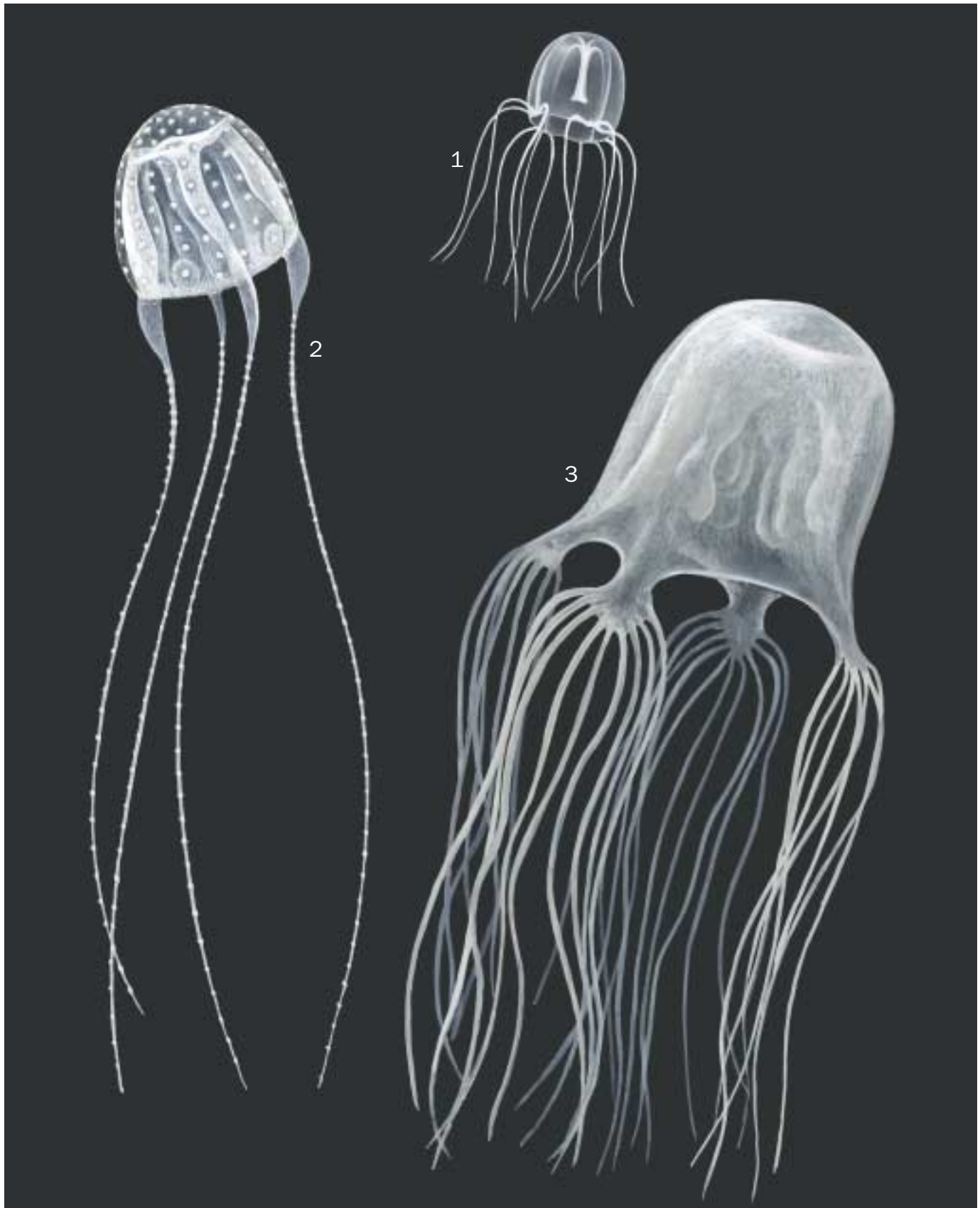
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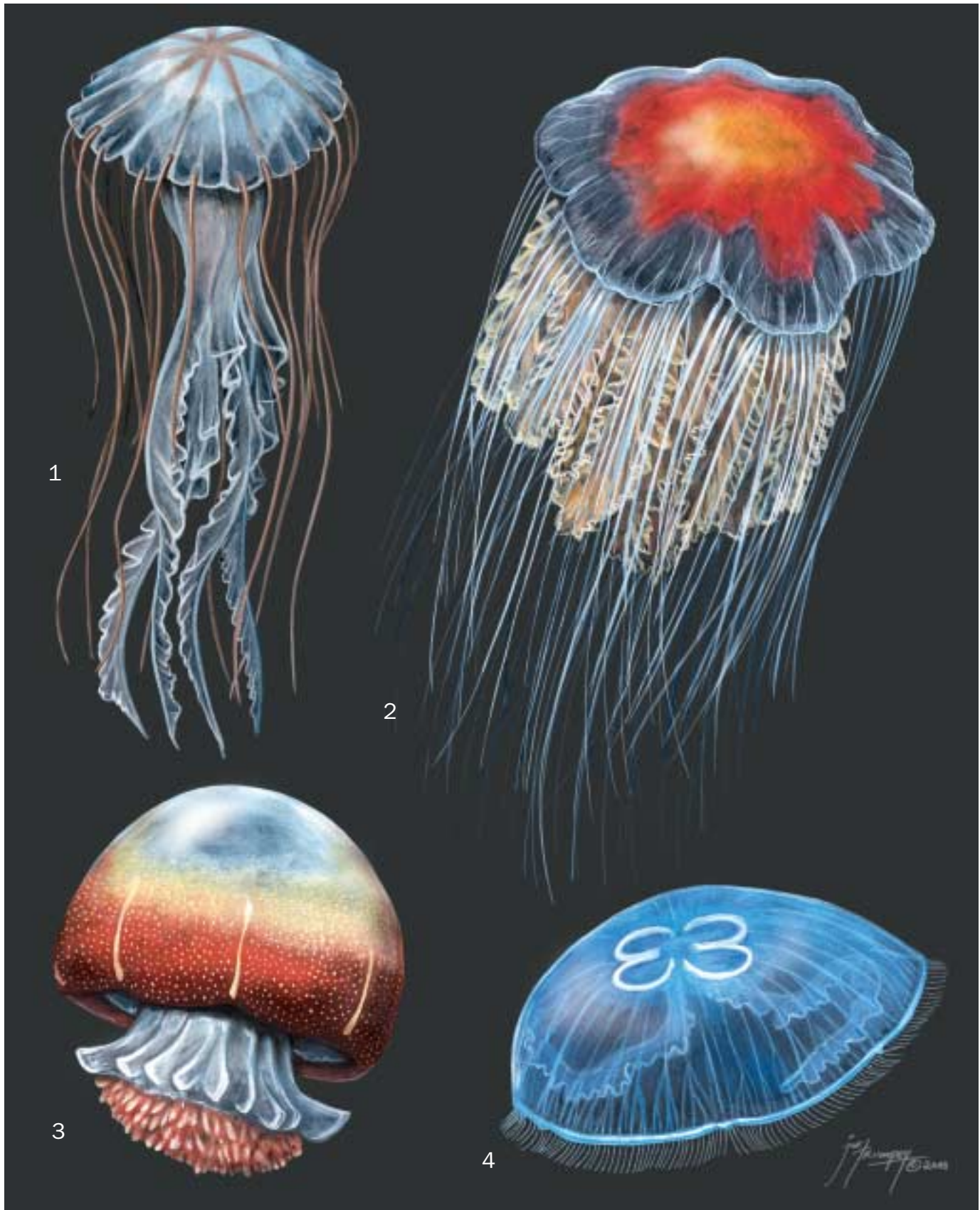
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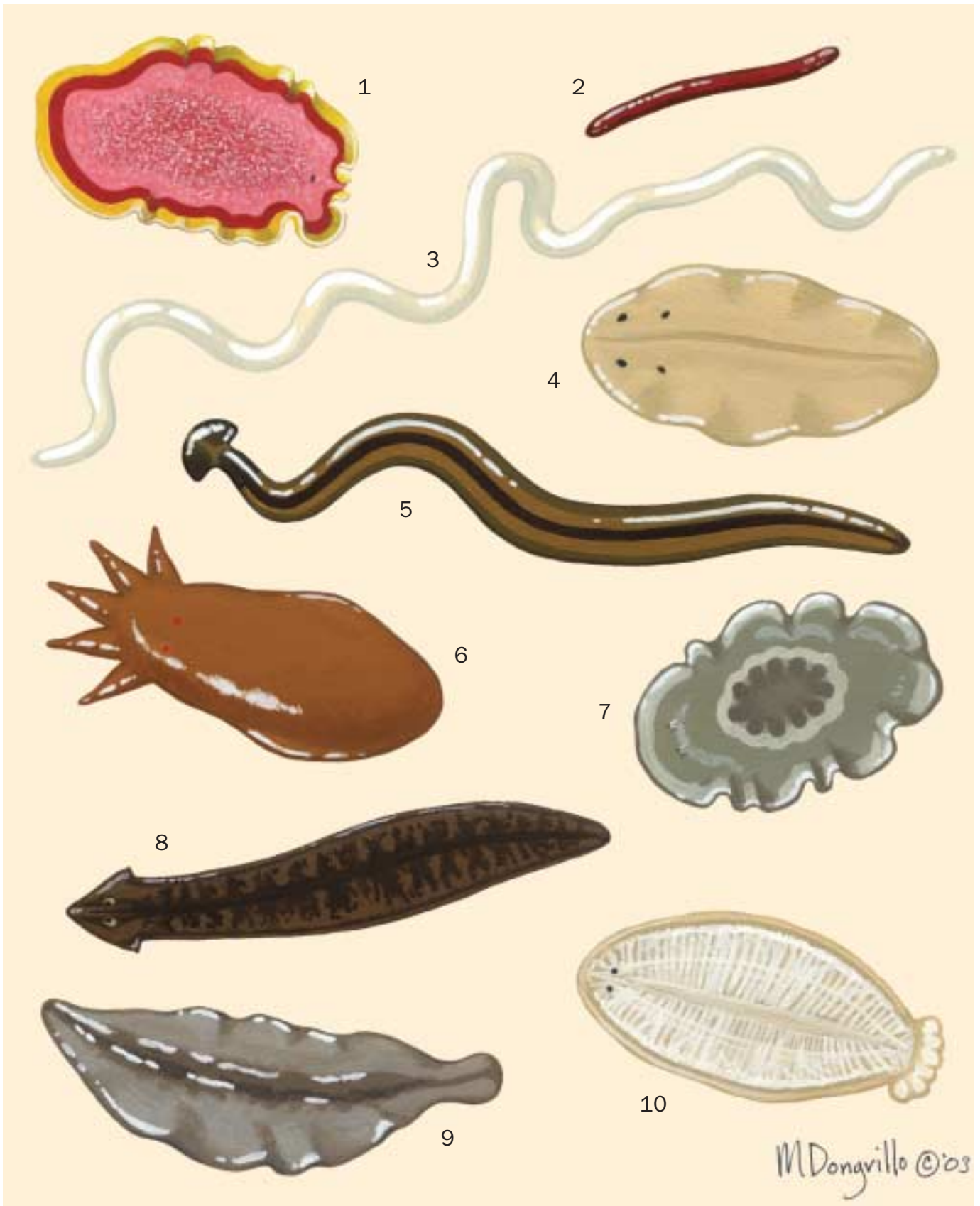
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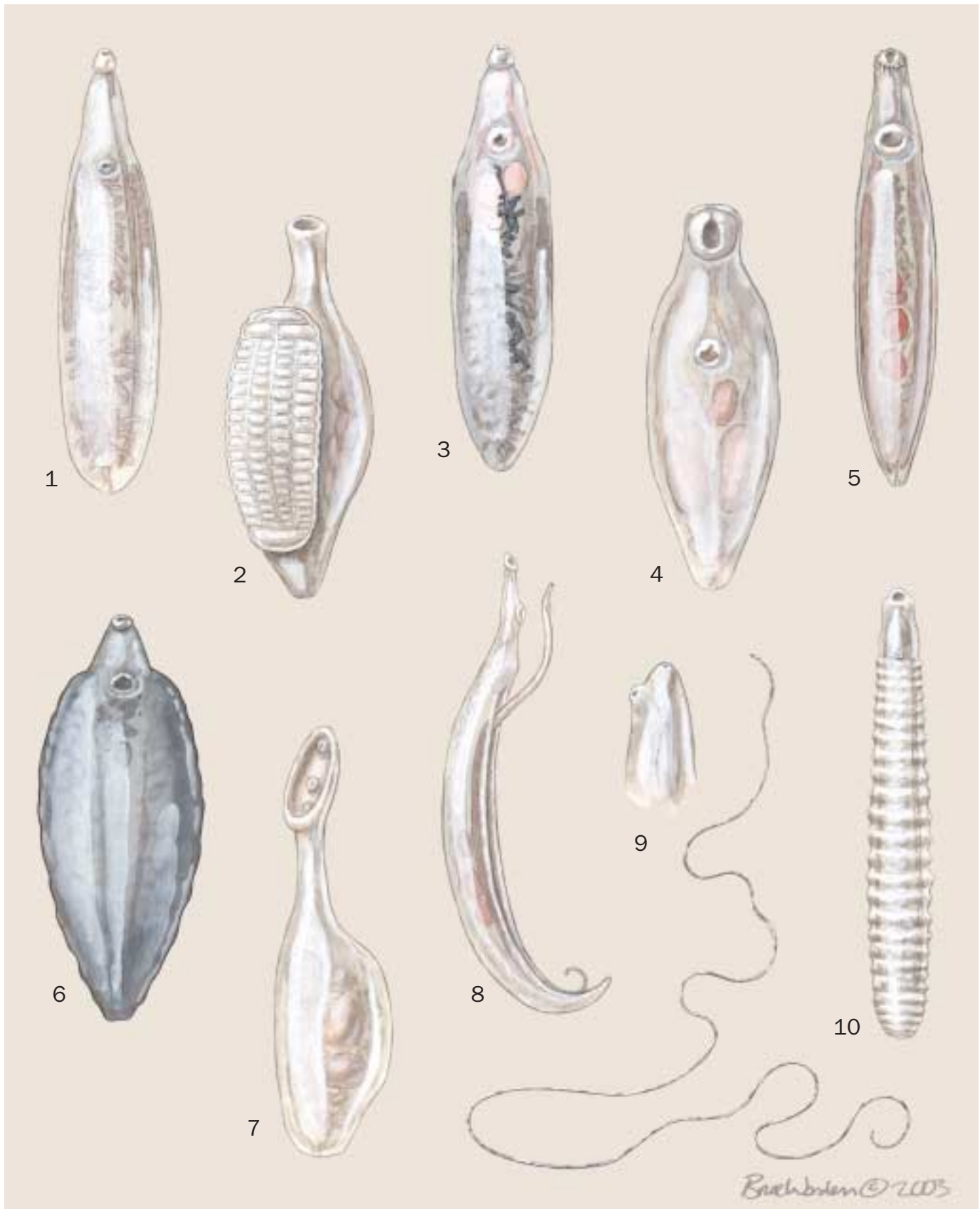
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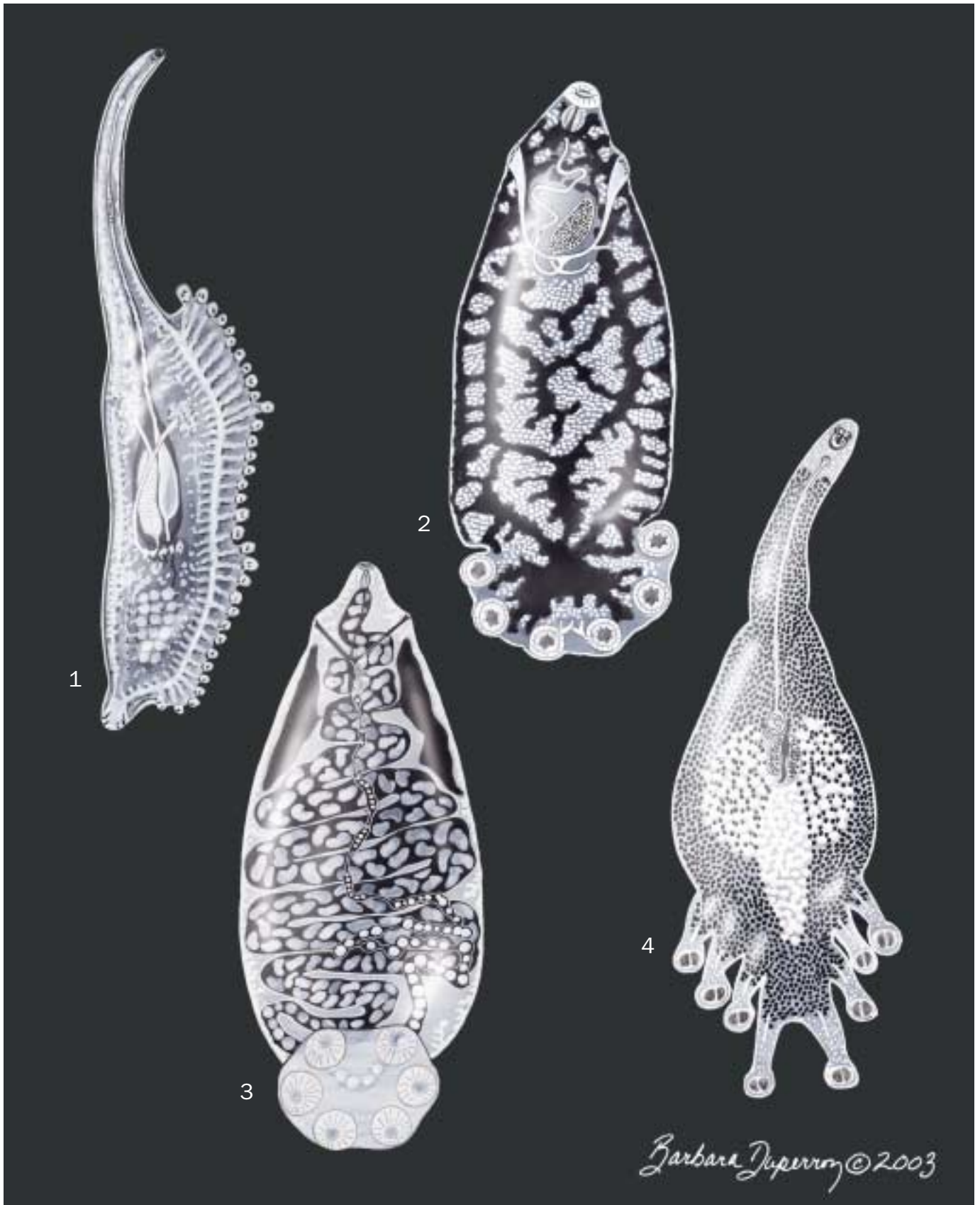
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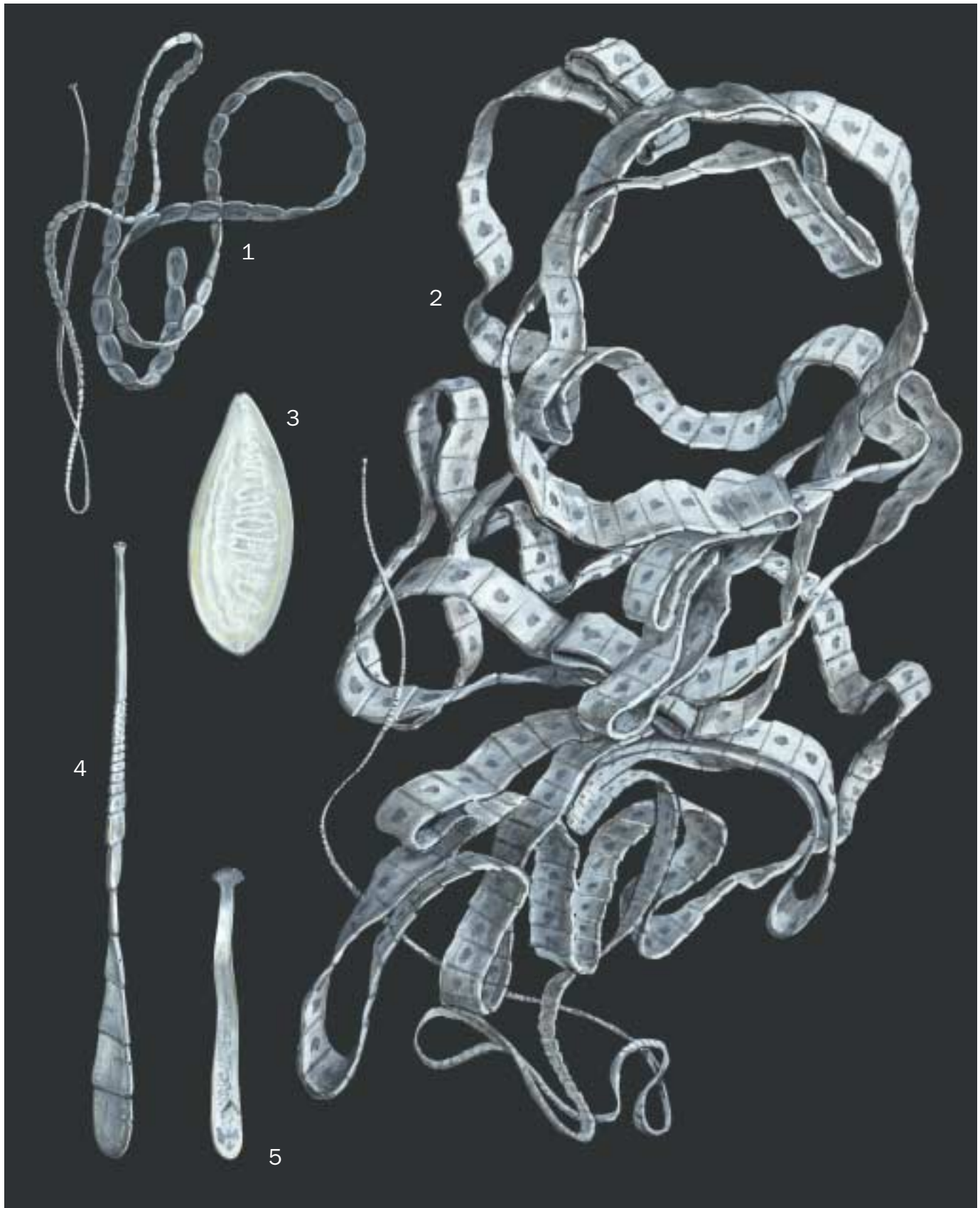
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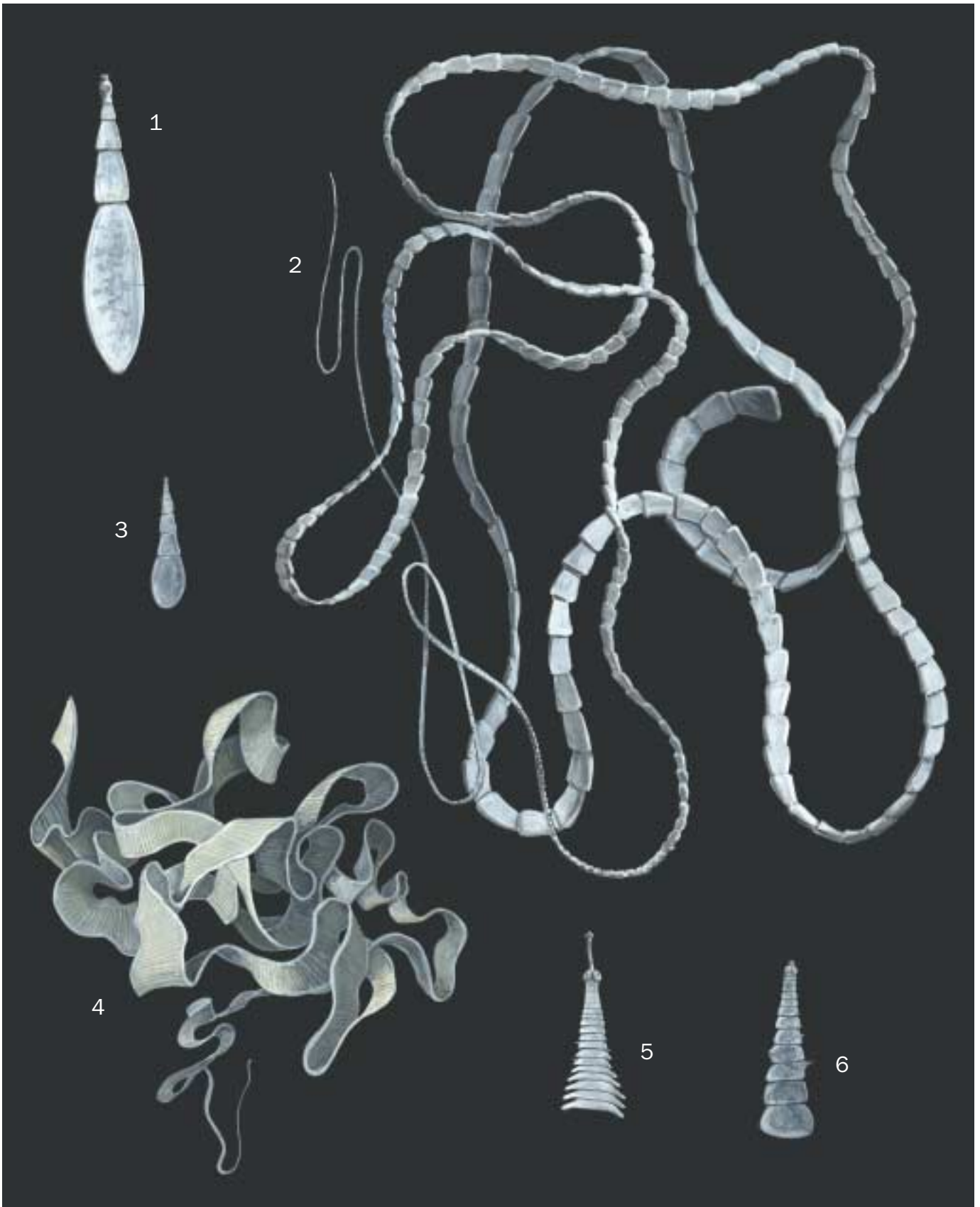
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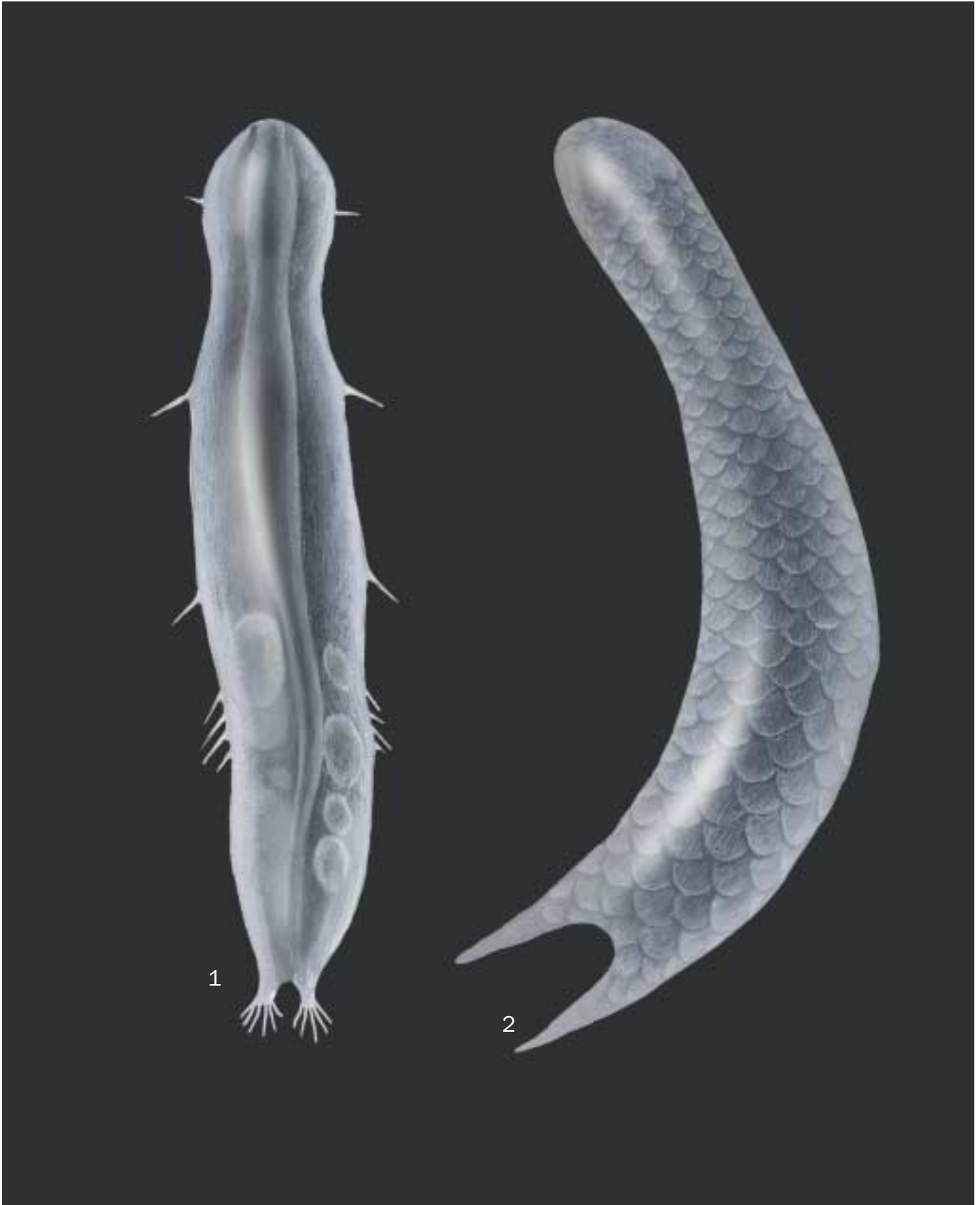
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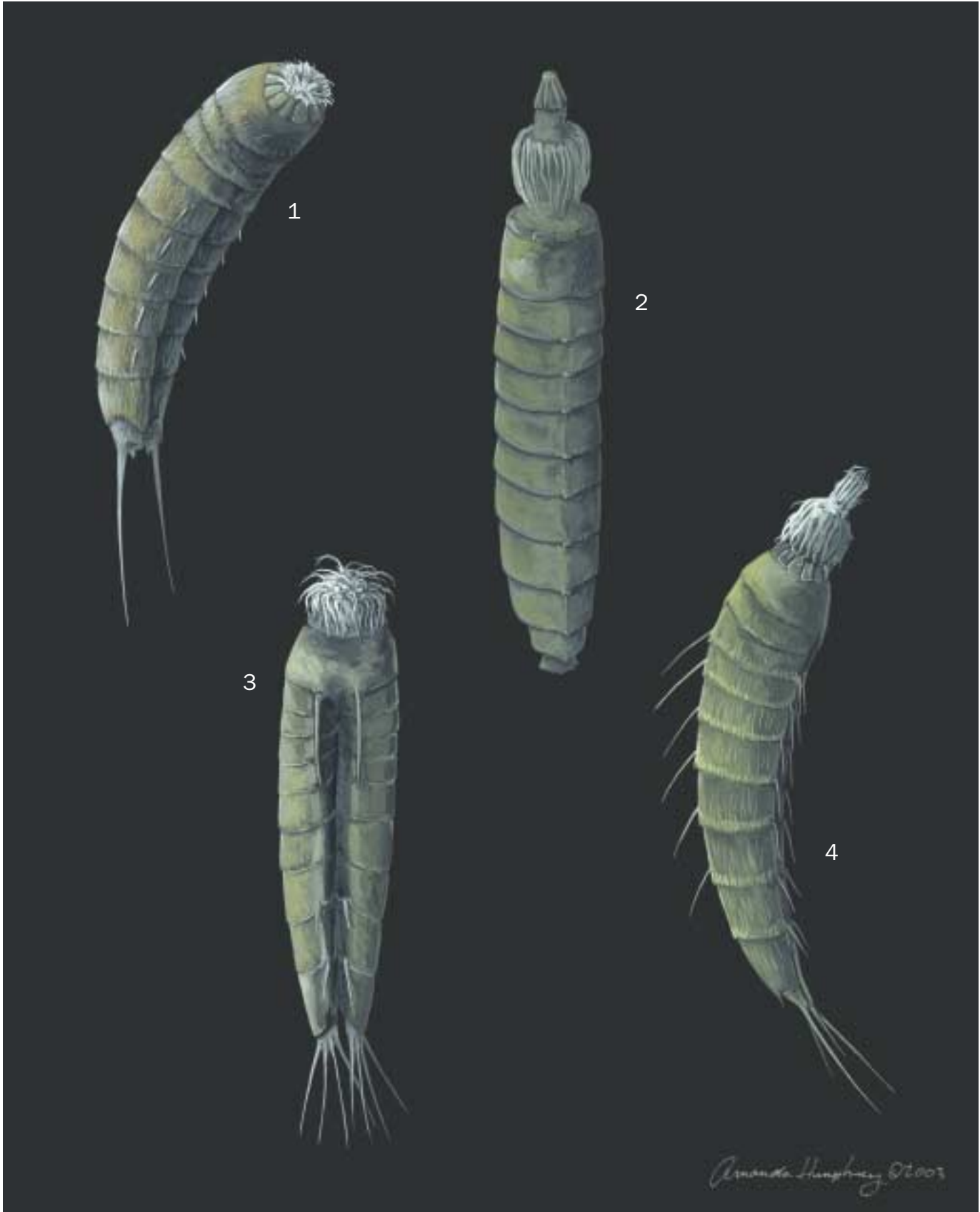
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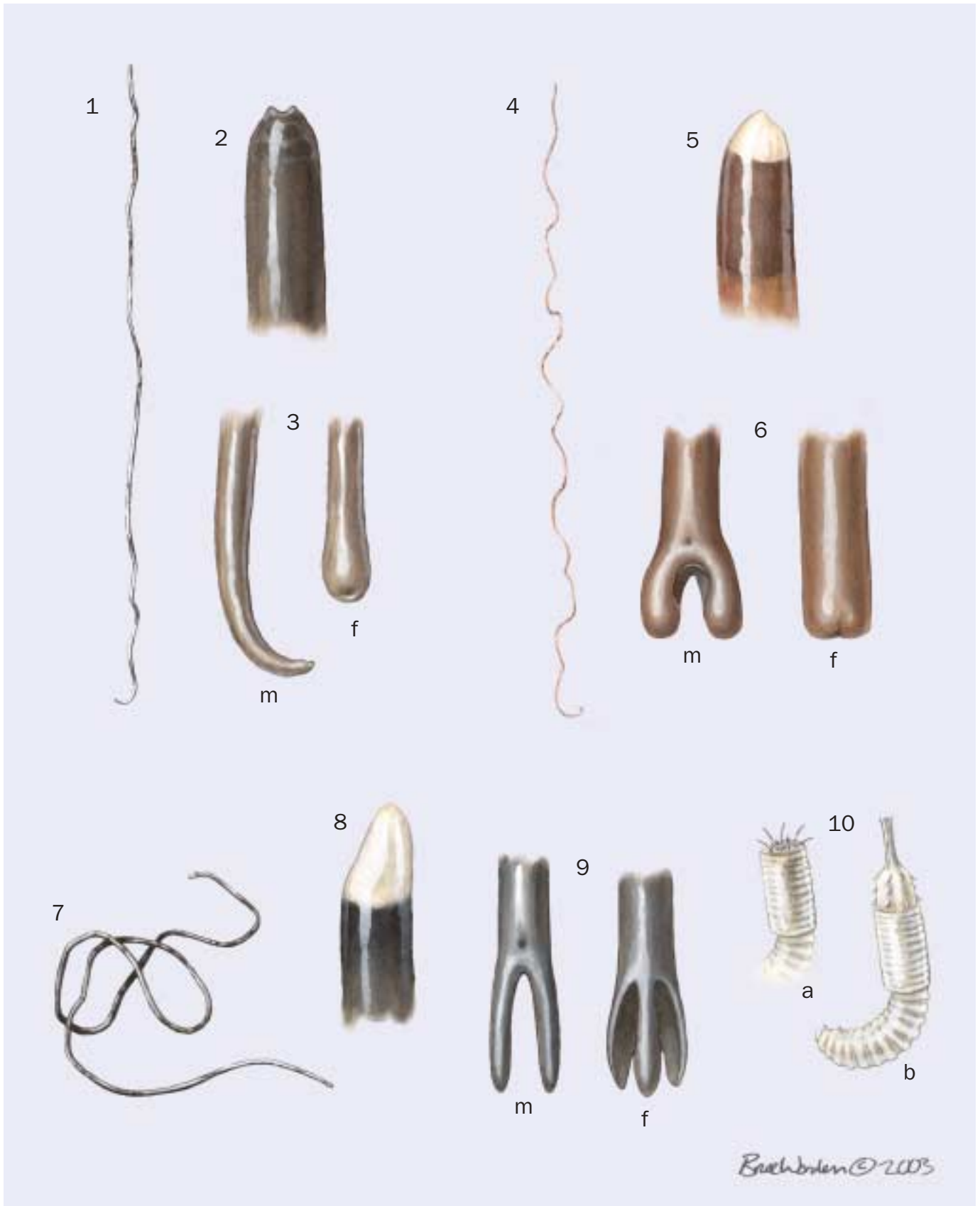
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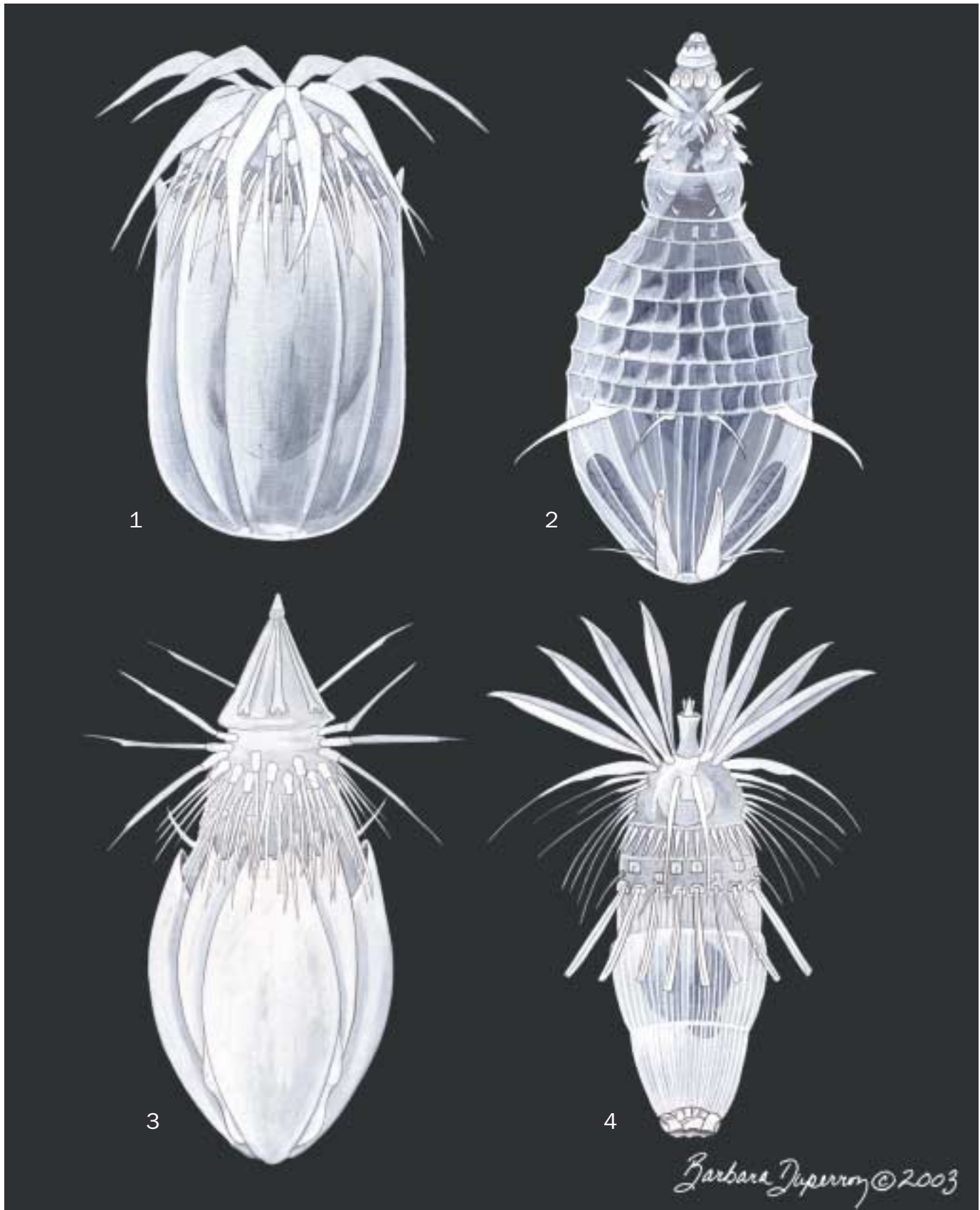
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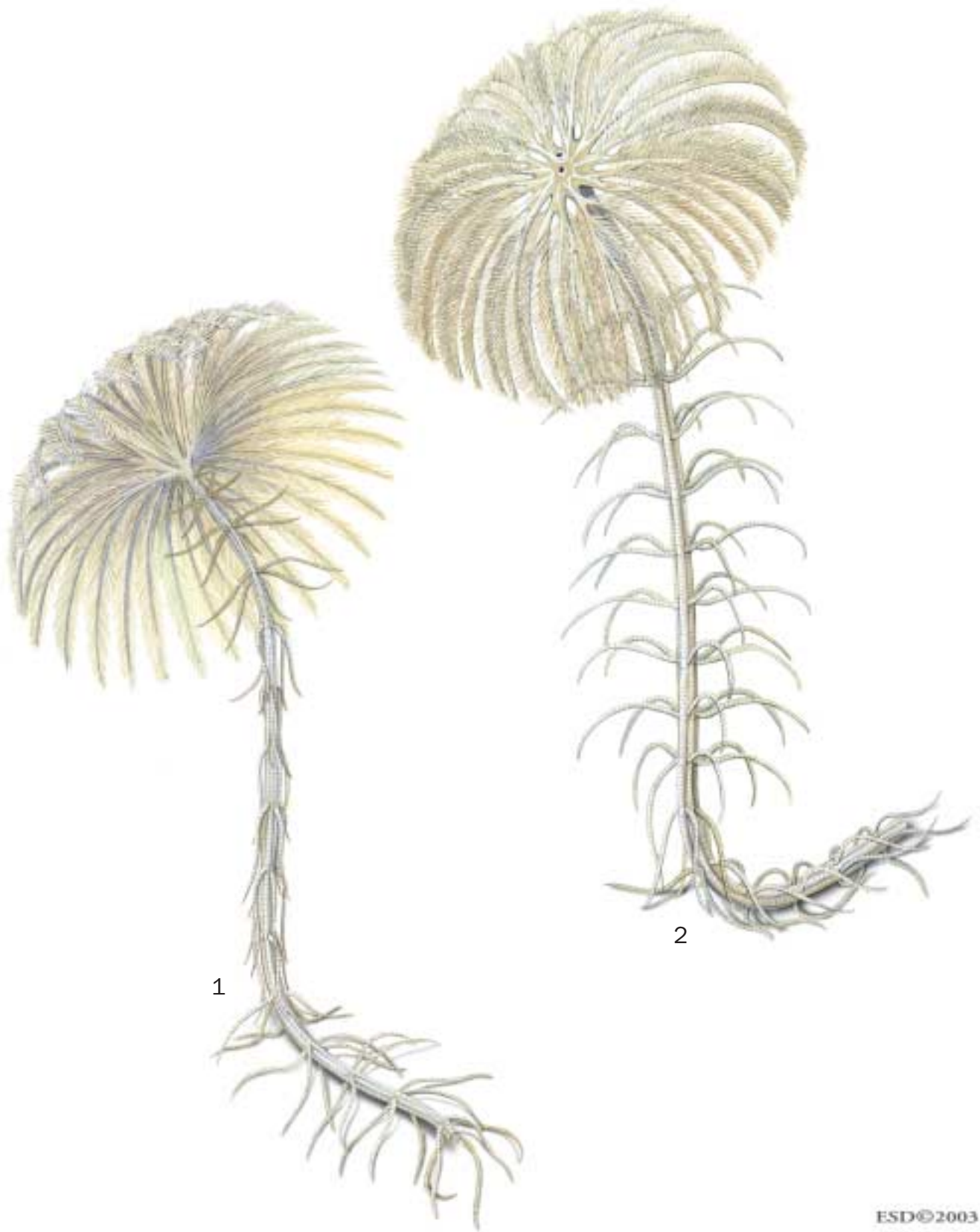


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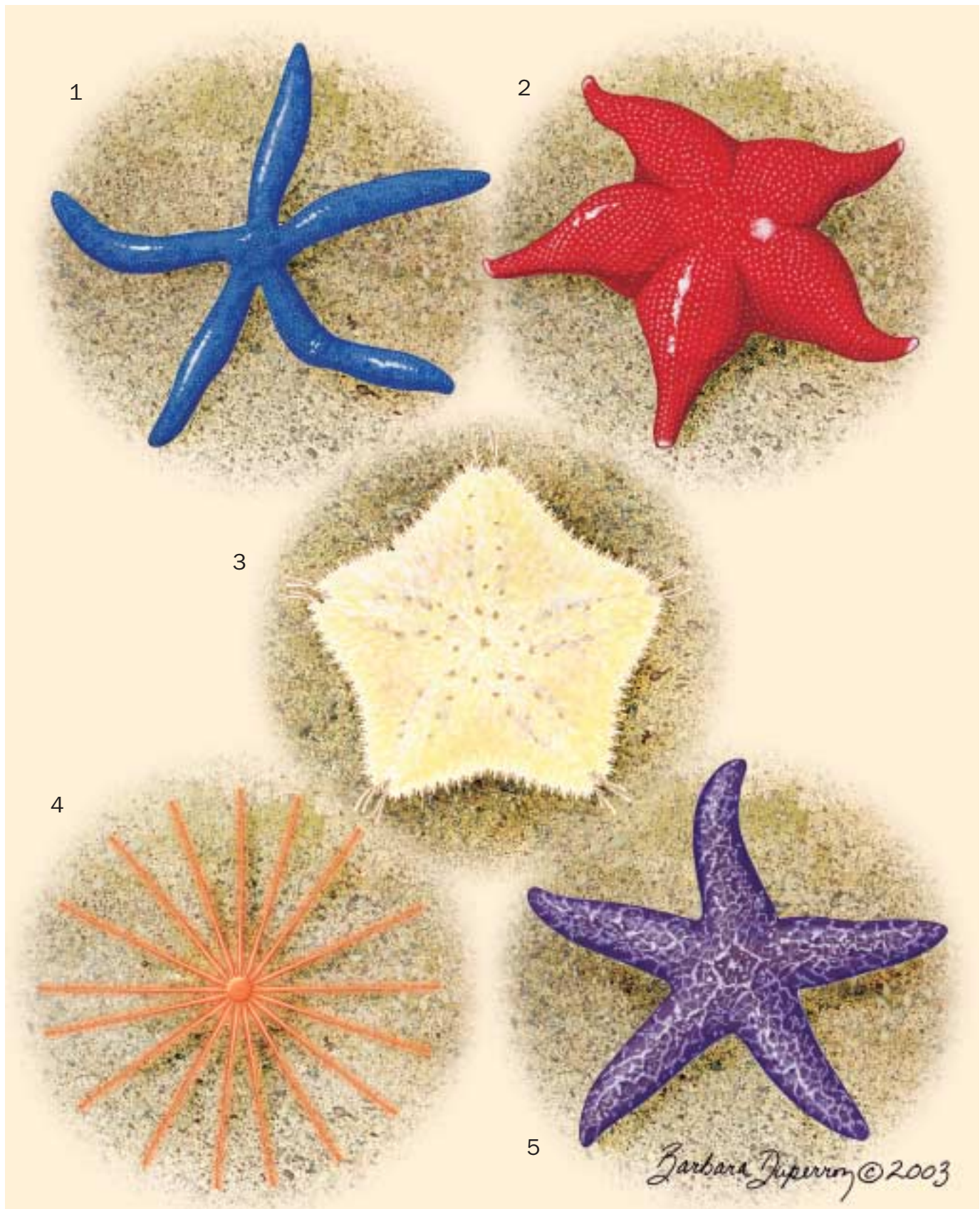


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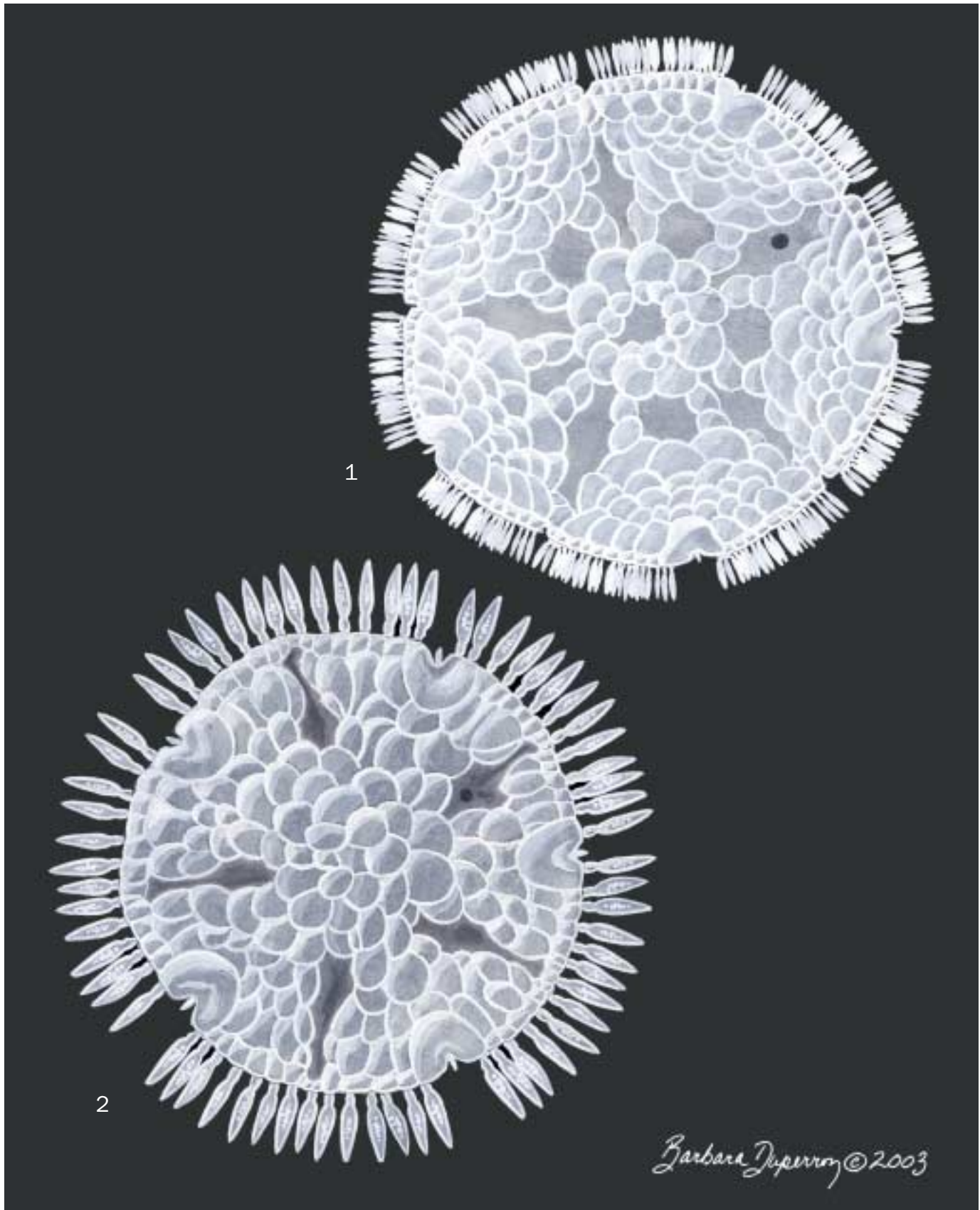
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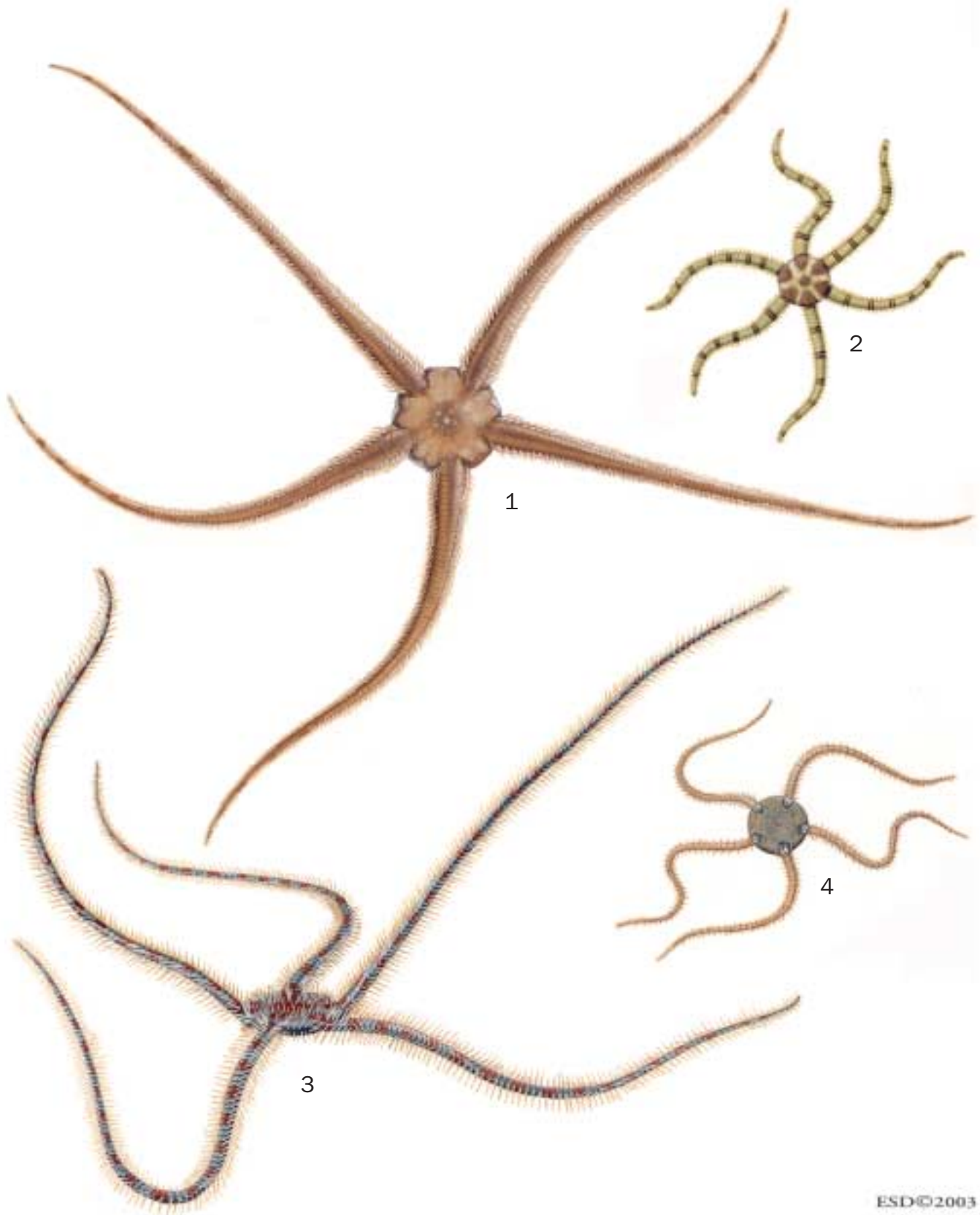


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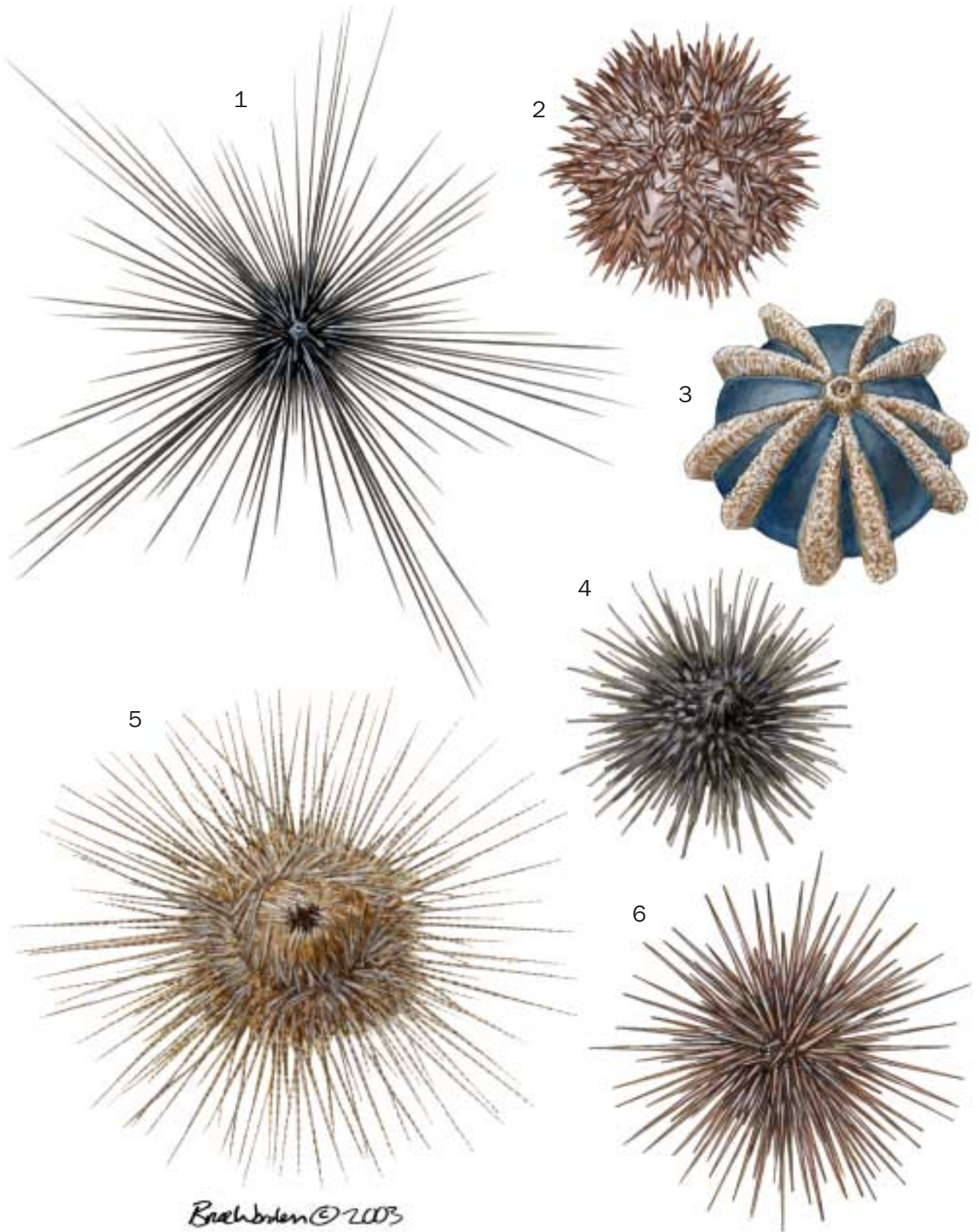
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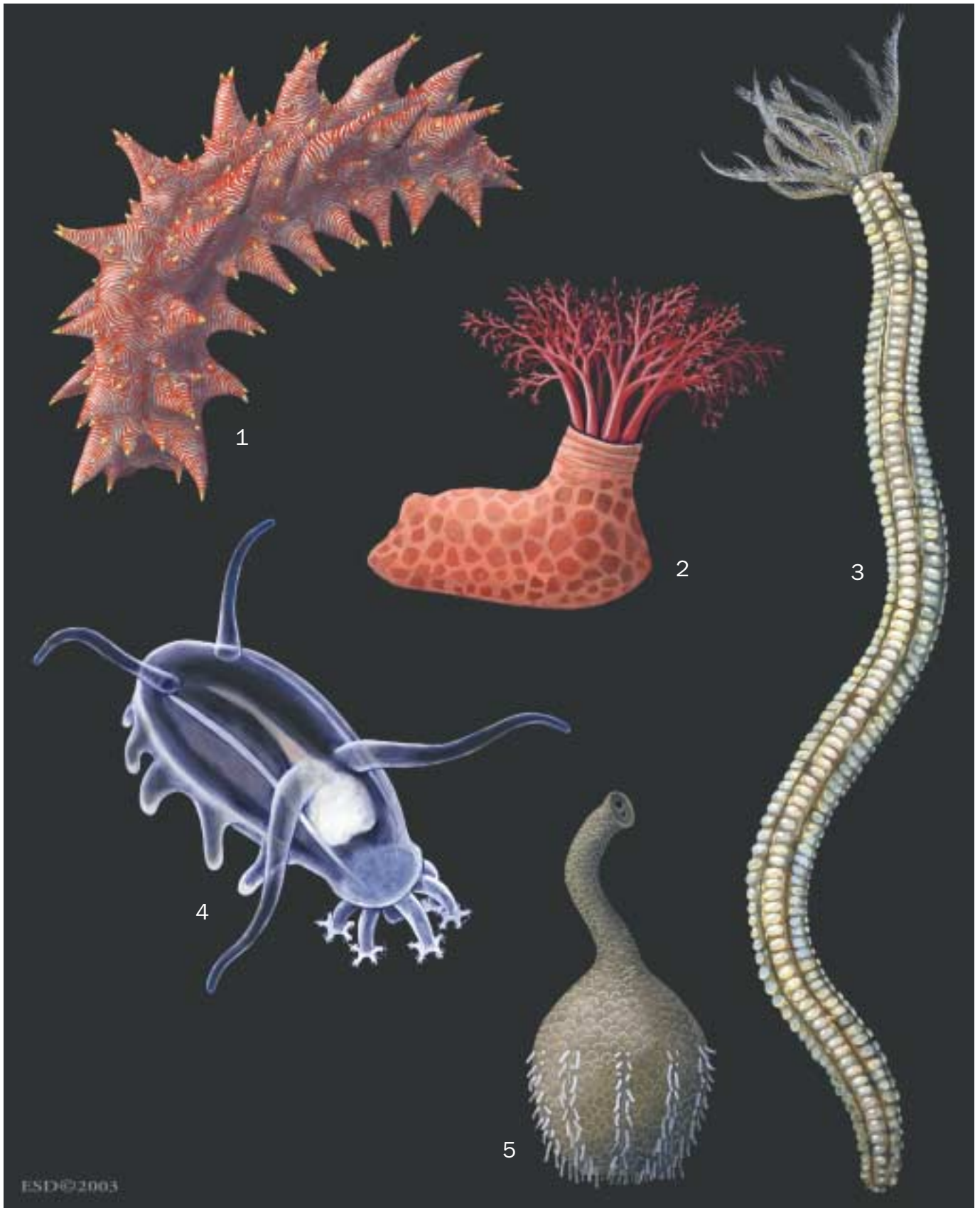
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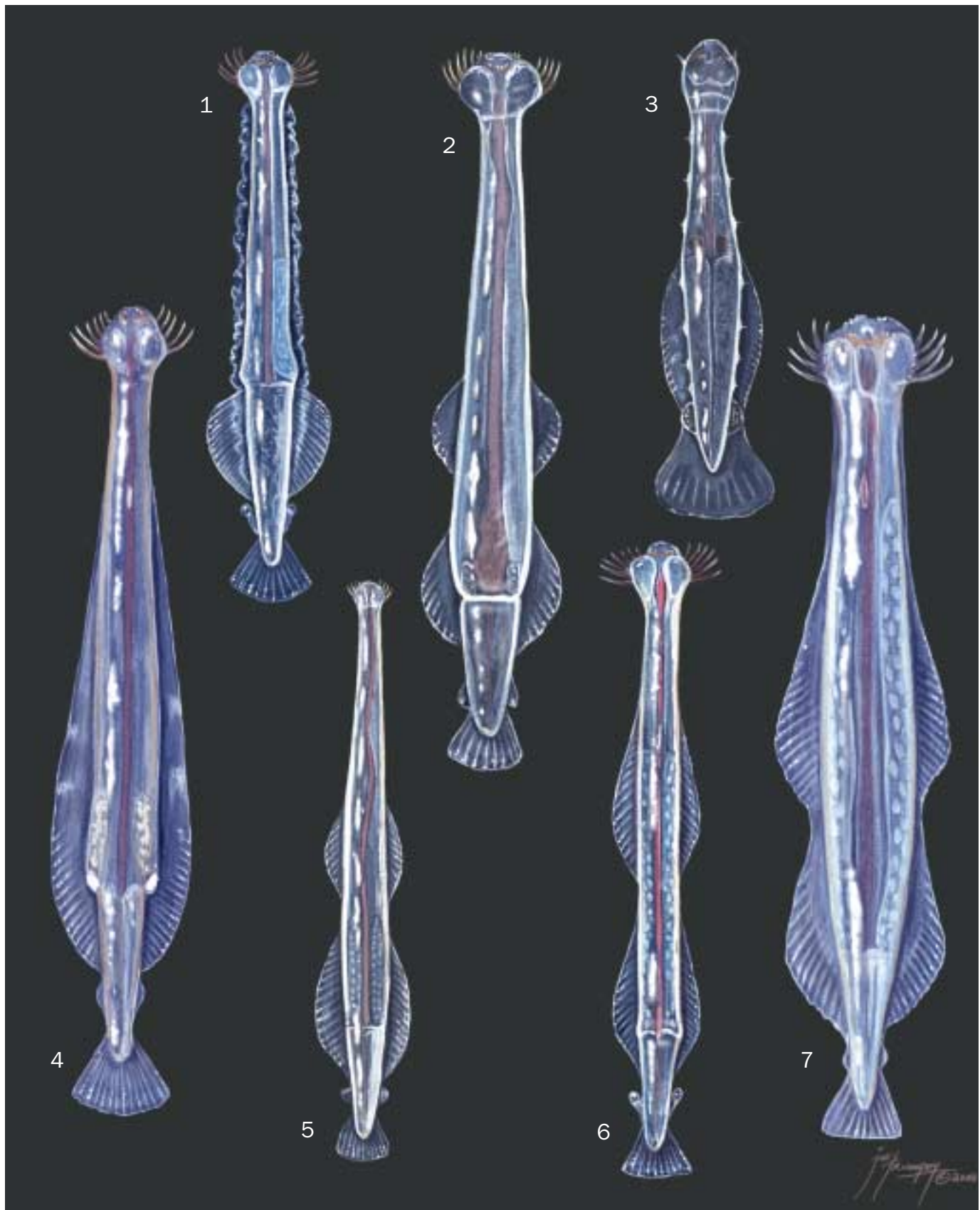
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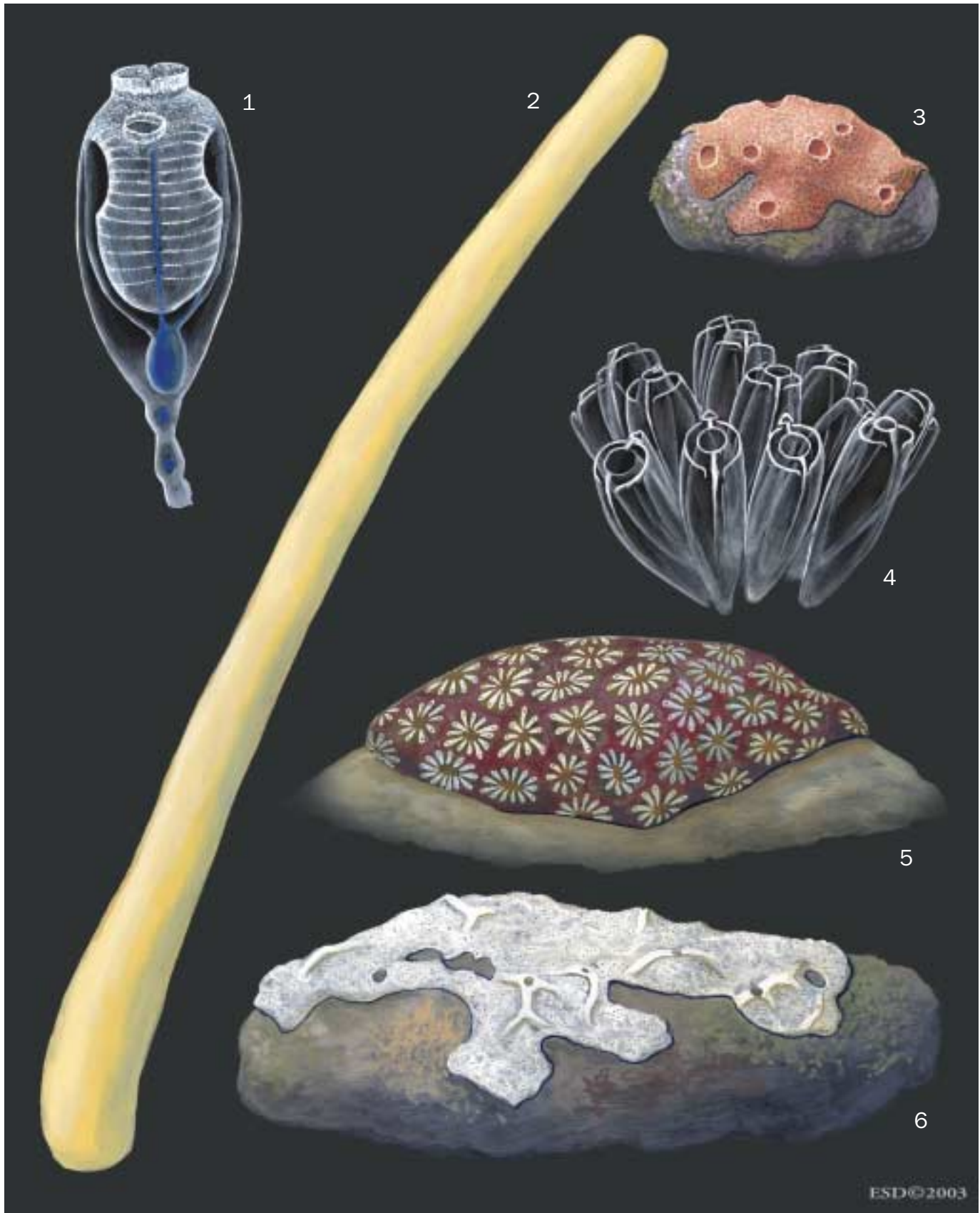
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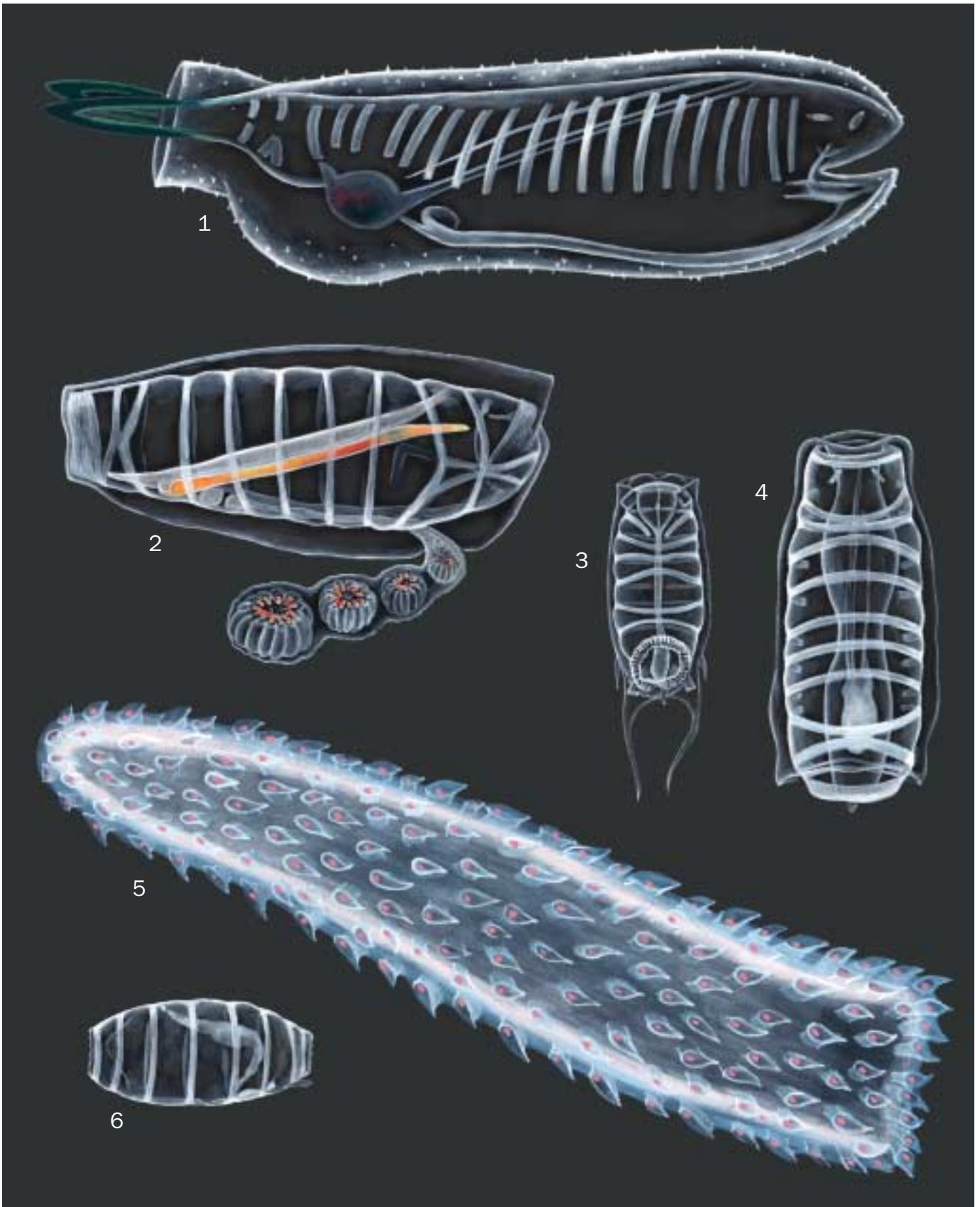
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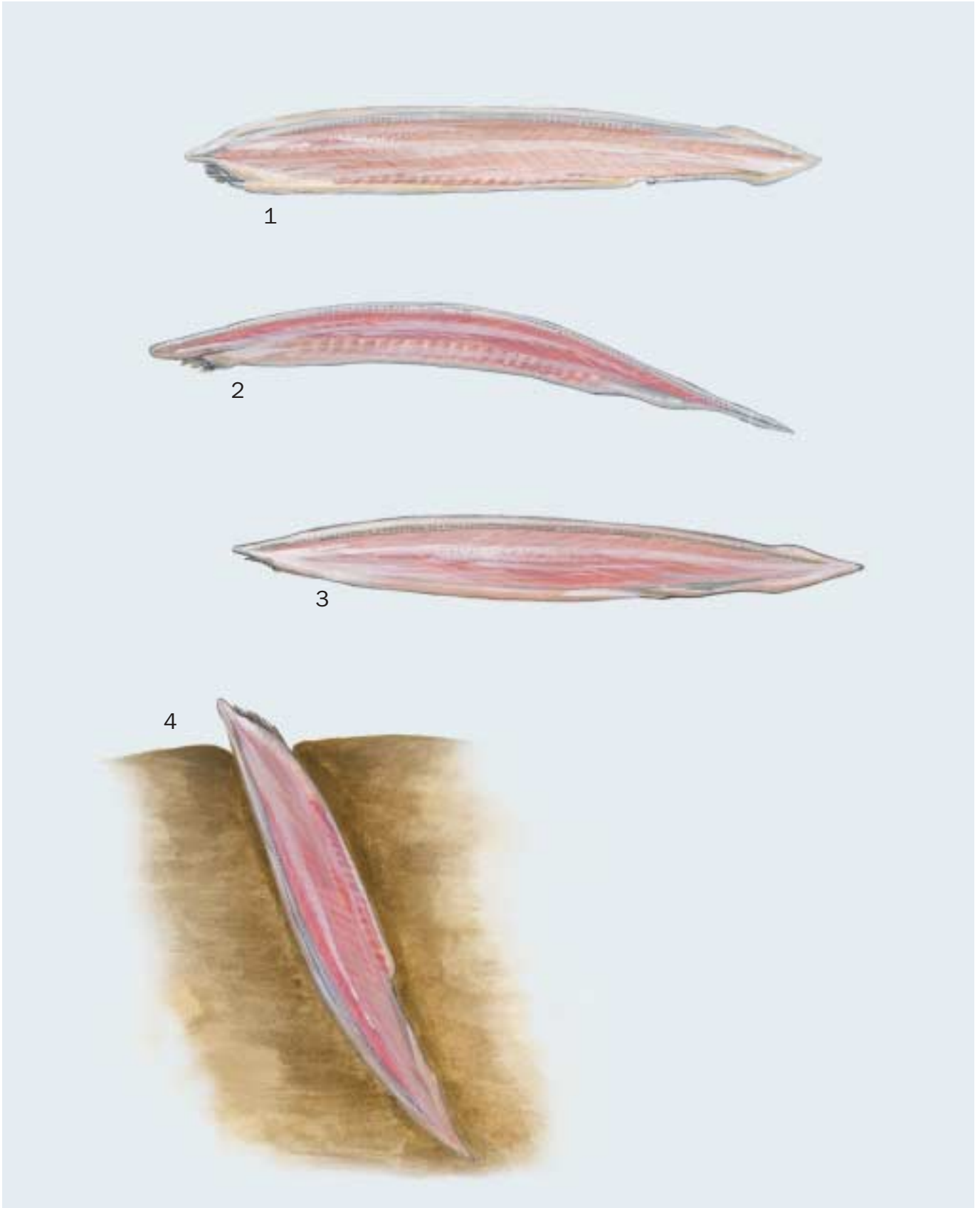


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Second Edition



**Volume 2
Protostomes**

**Sean F. Craig, Advisory Editor
Dennis A. Thoney, Advisory Editor
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Joseph E. Trumpey, Chief Scientific Illustrator



Michael Hutchins, Series Editor

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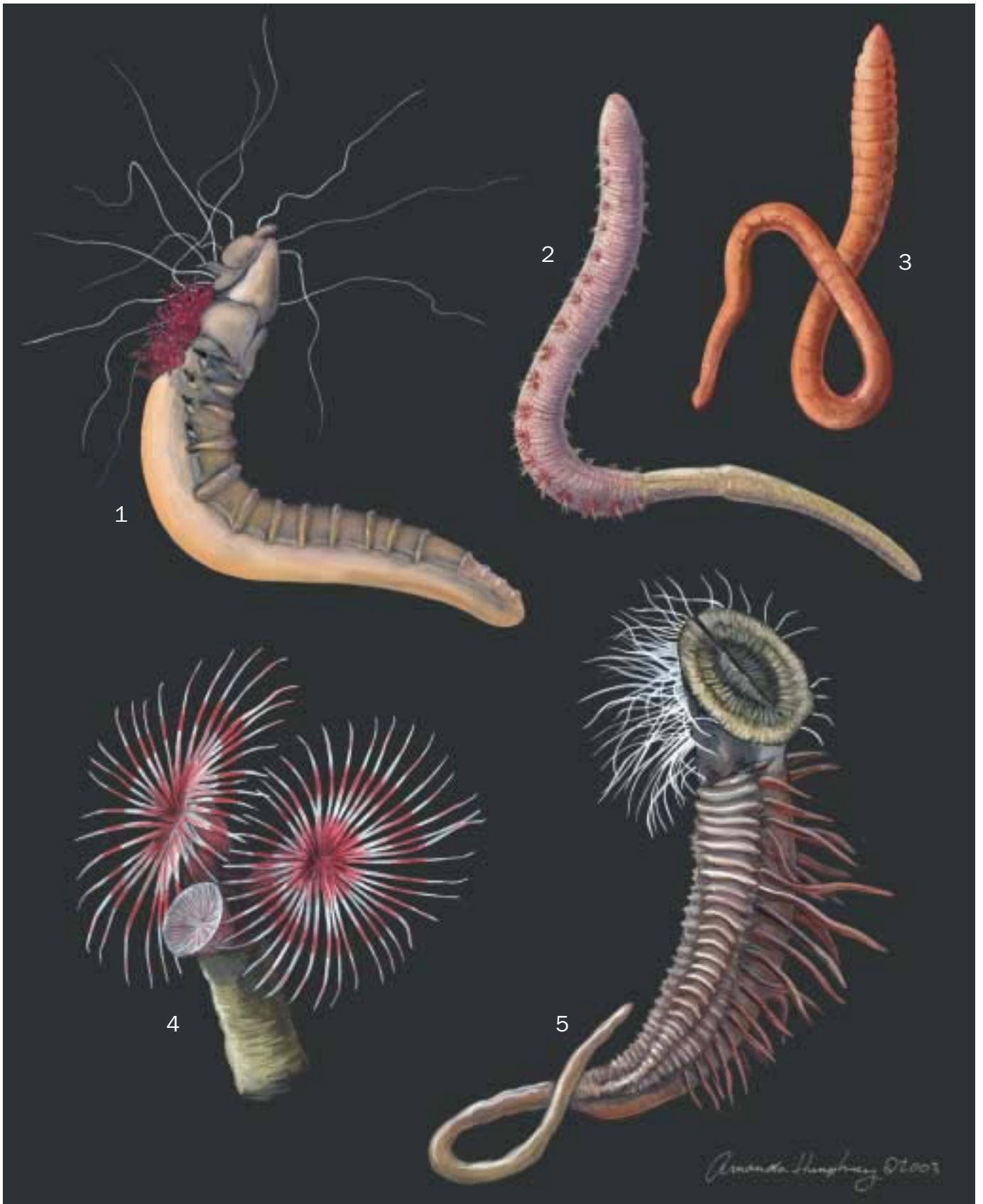


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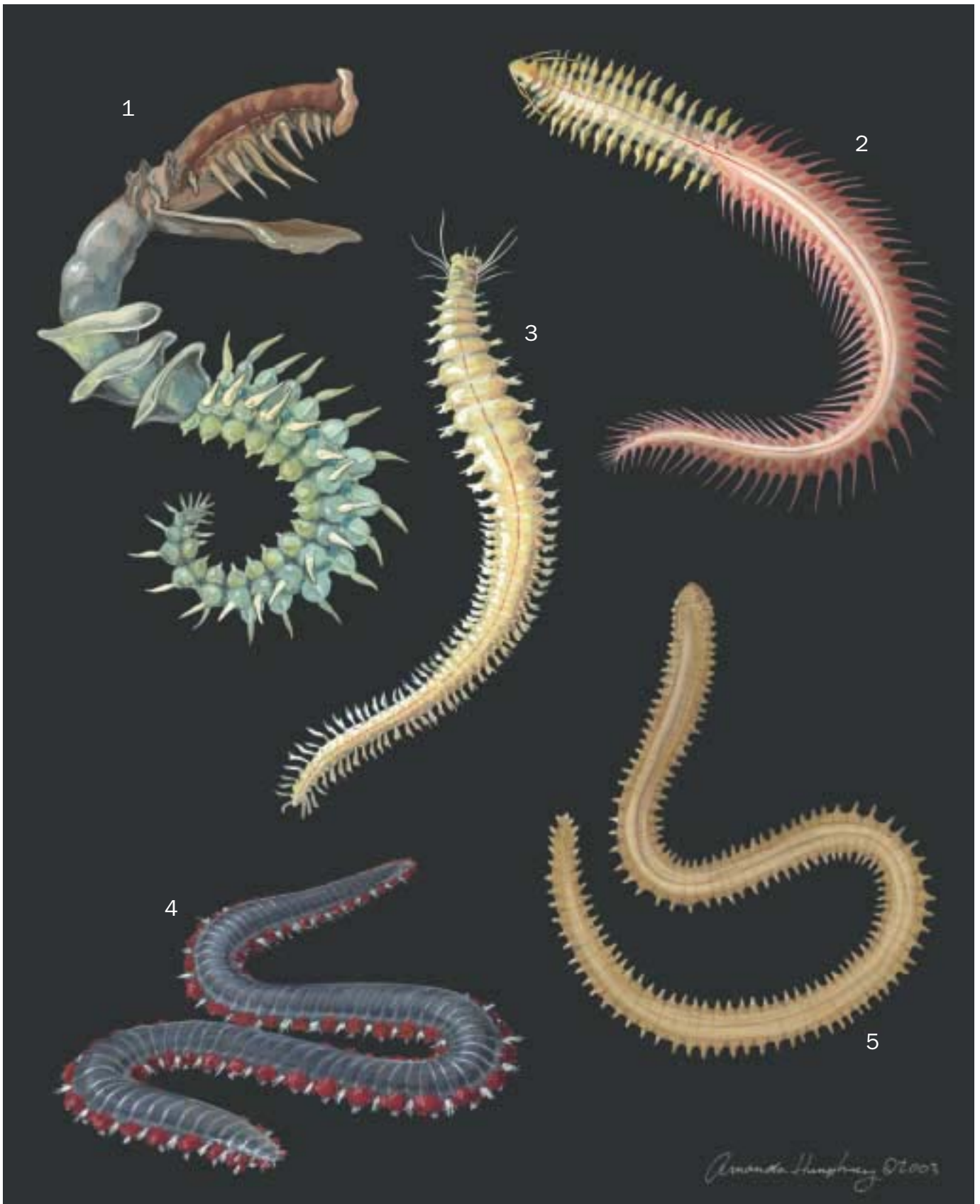
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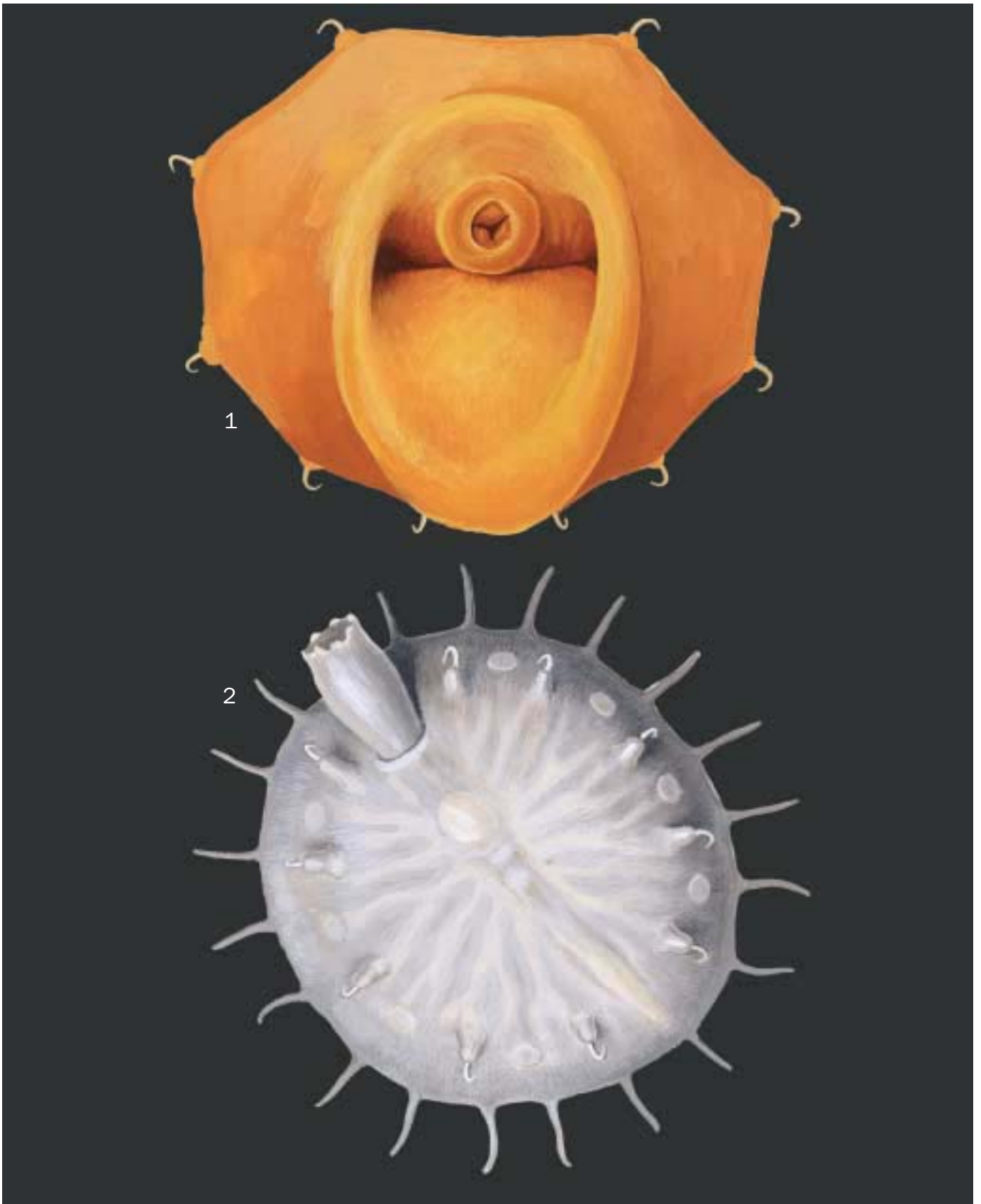
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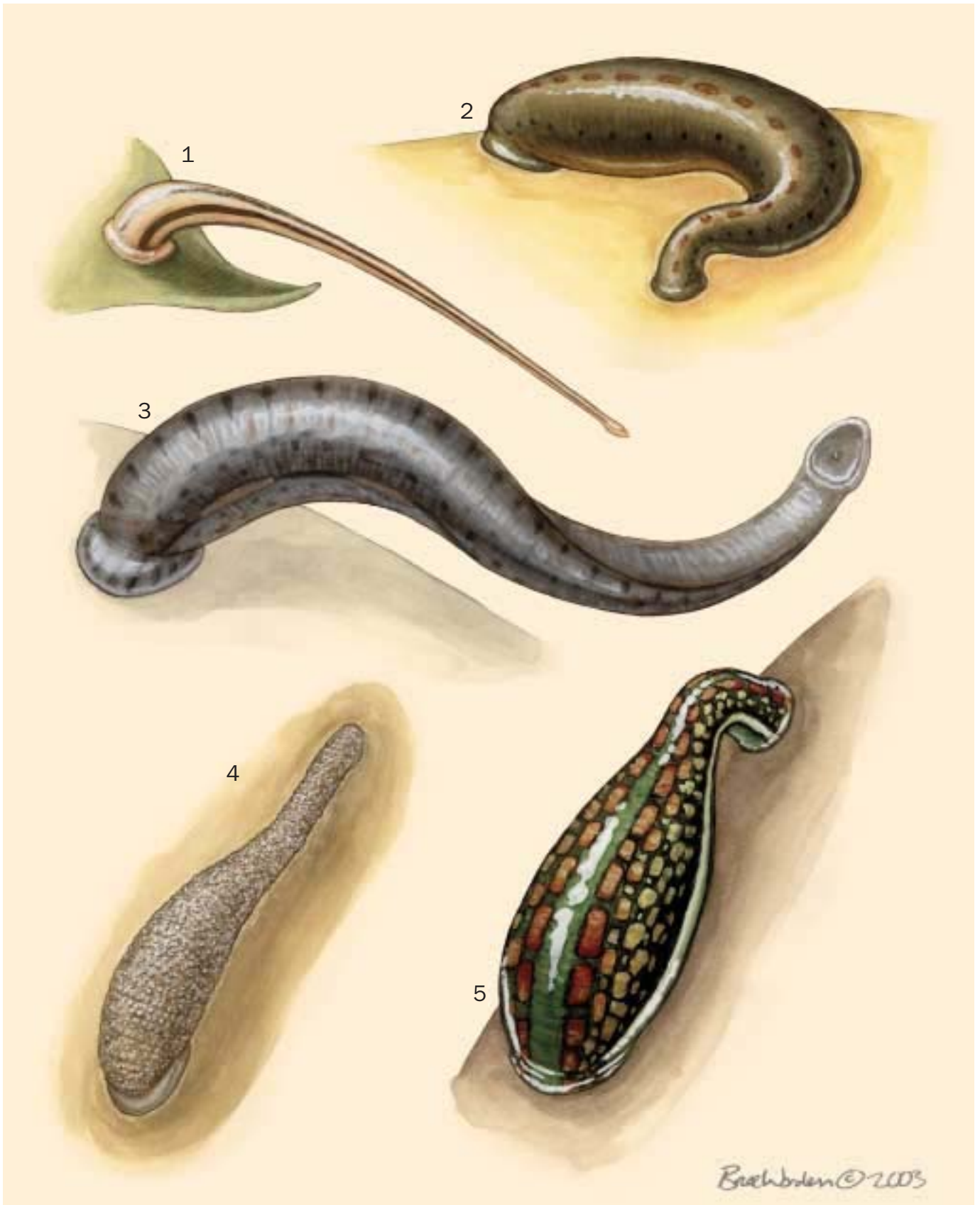
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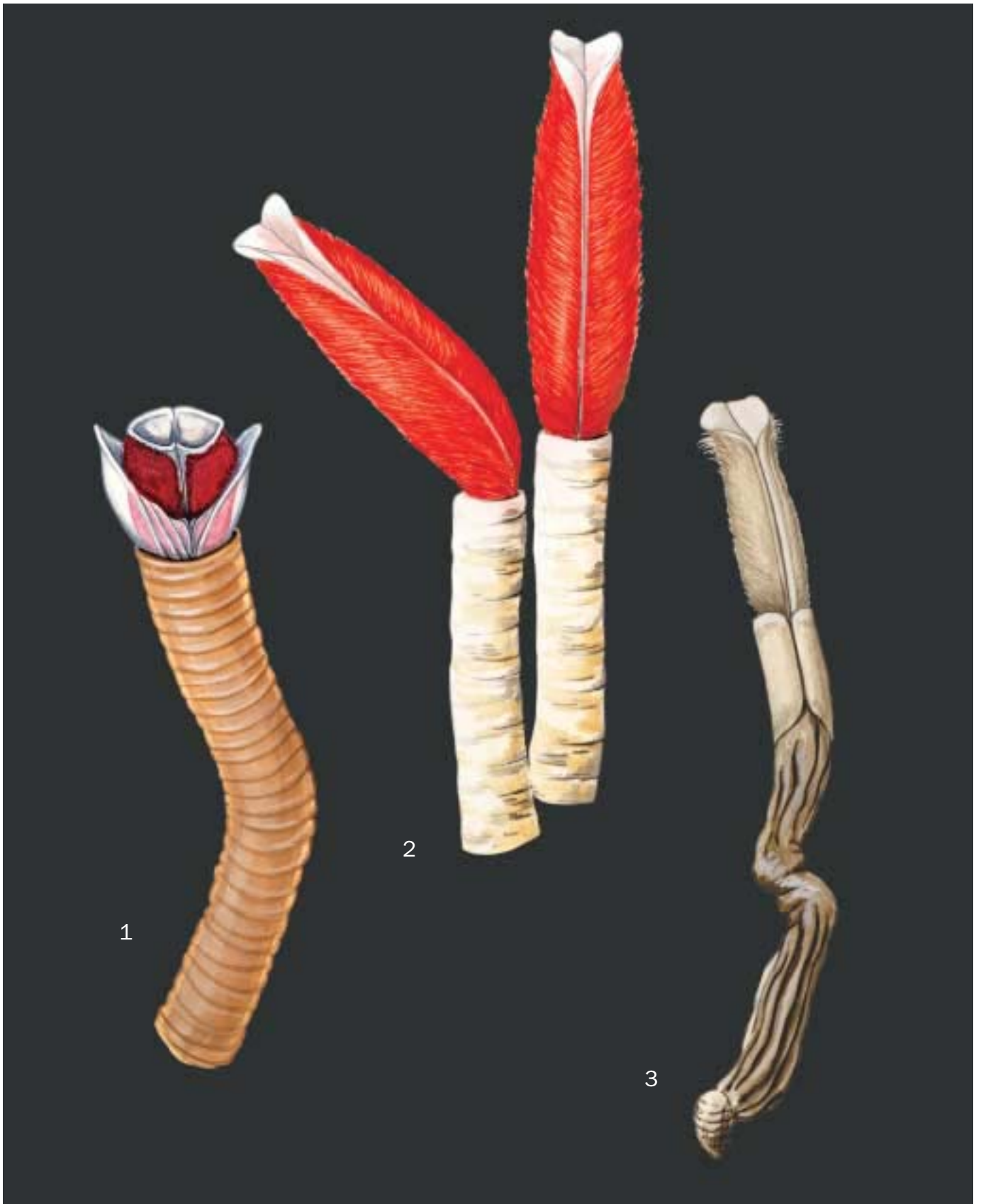
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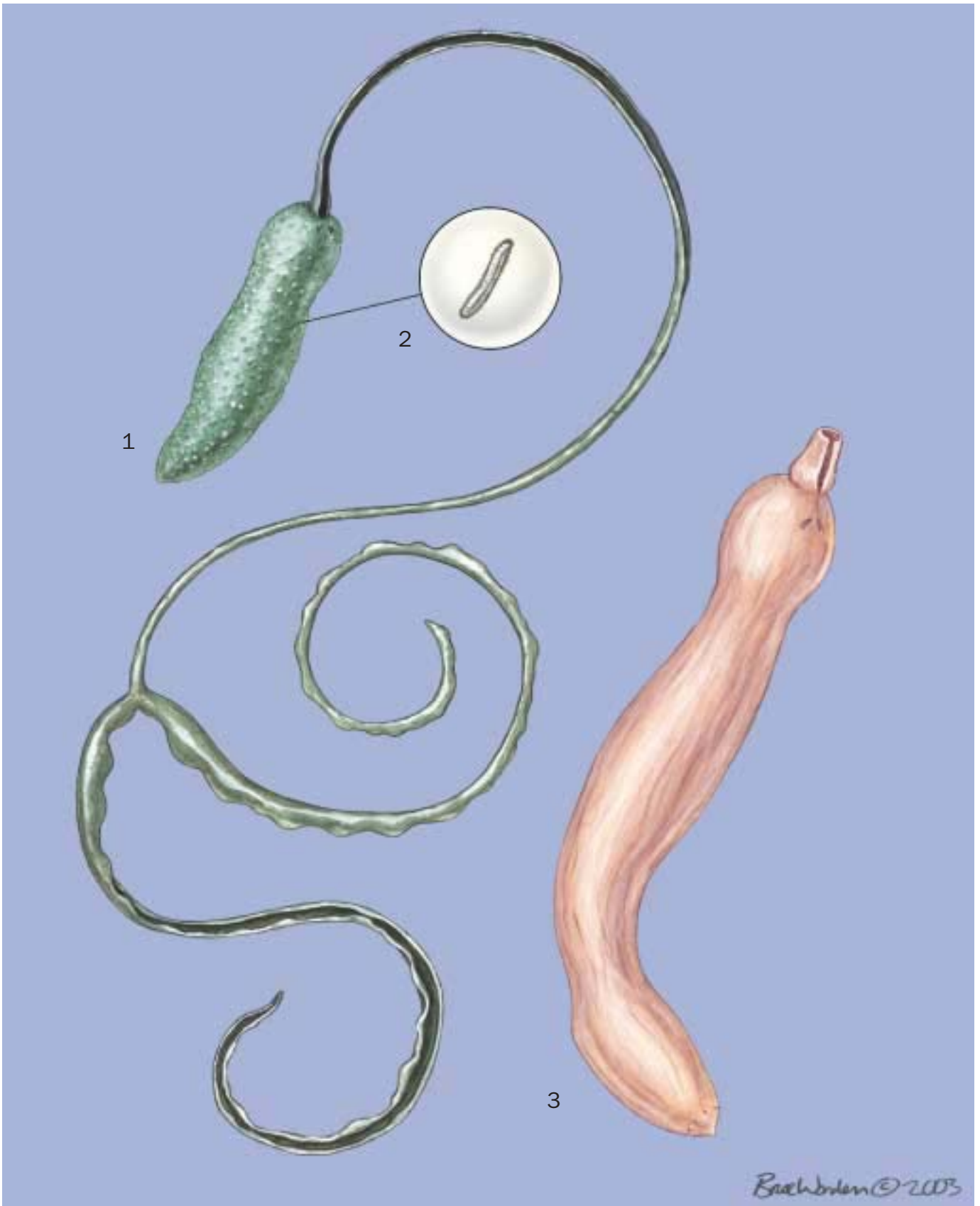
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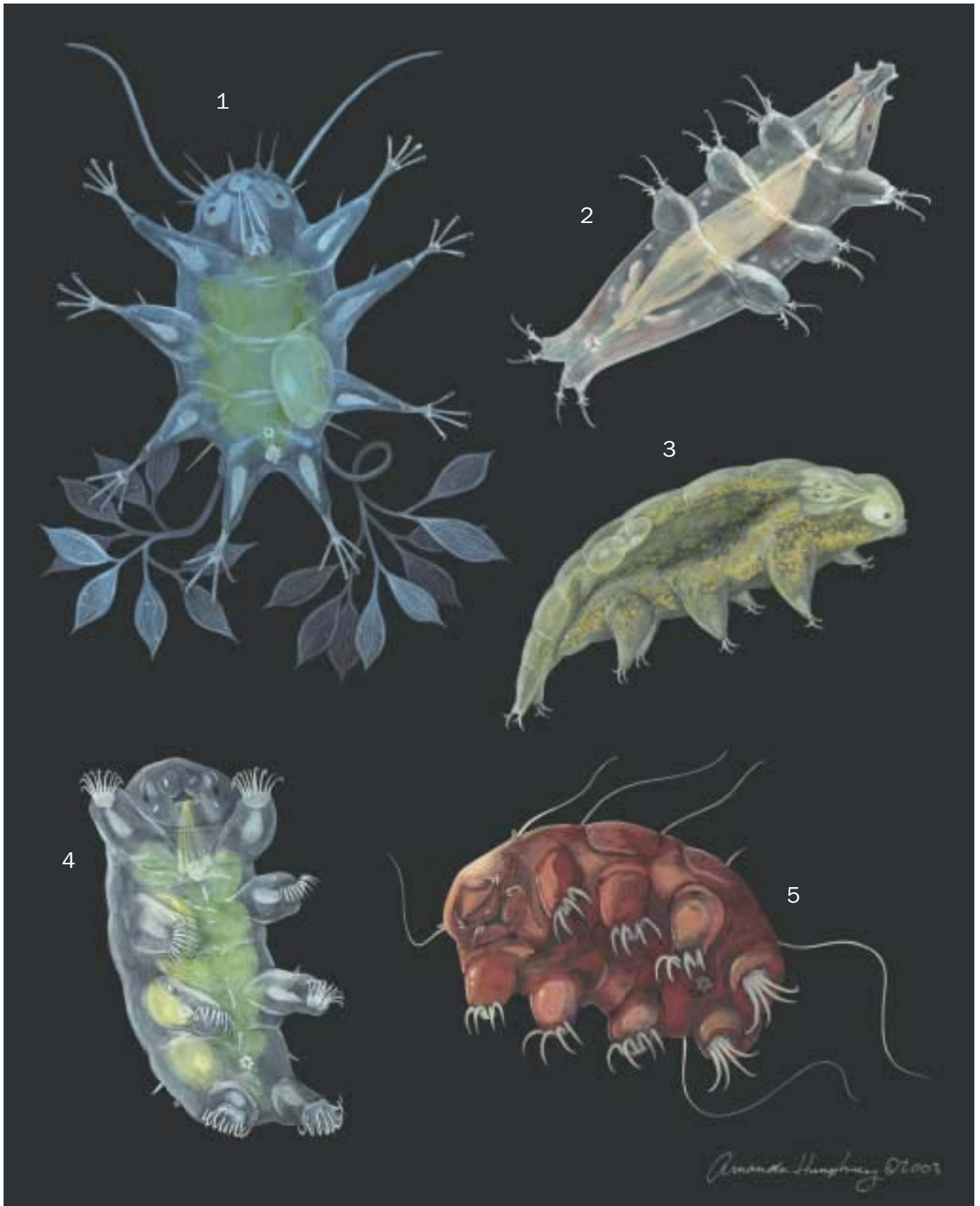
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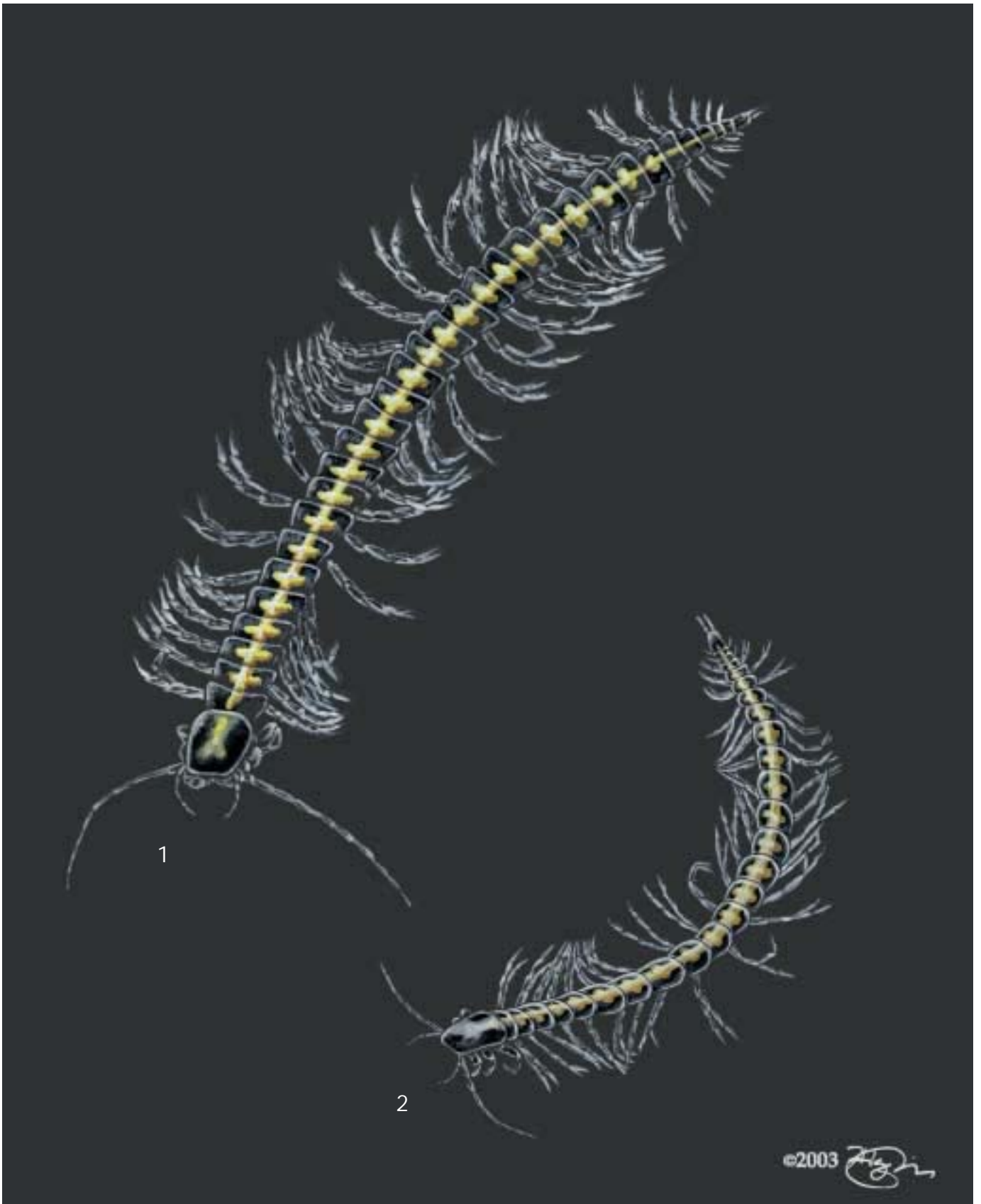
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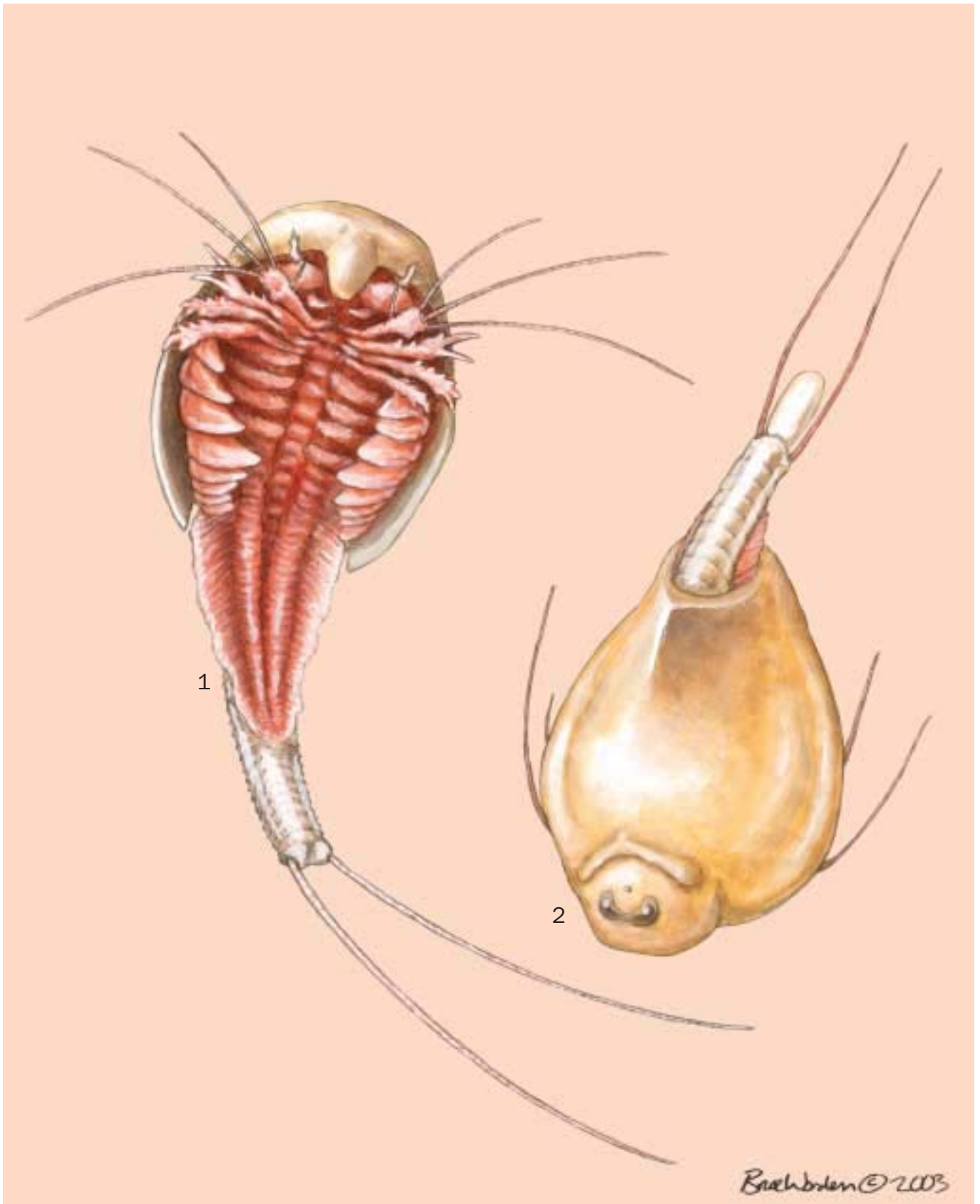
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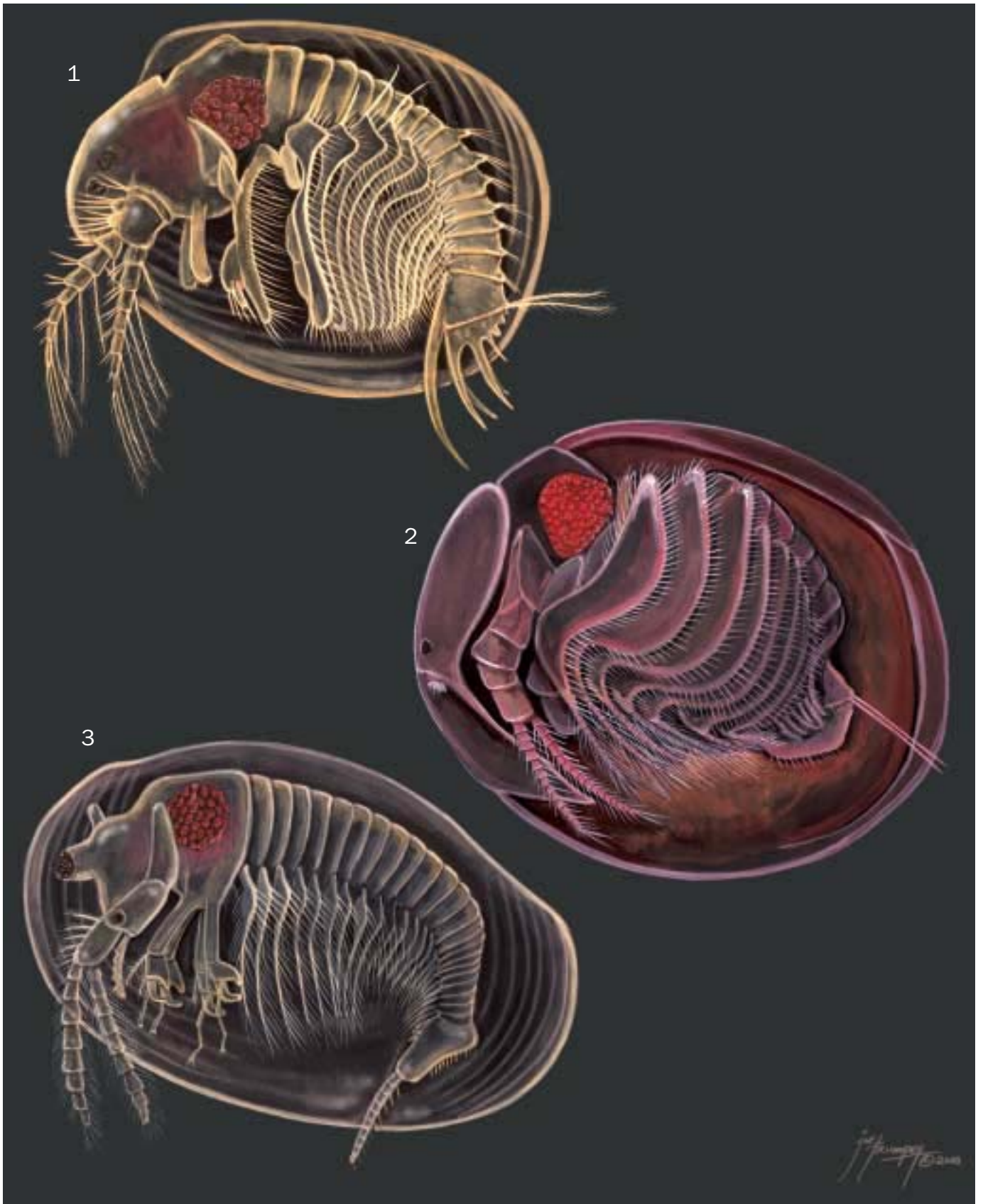
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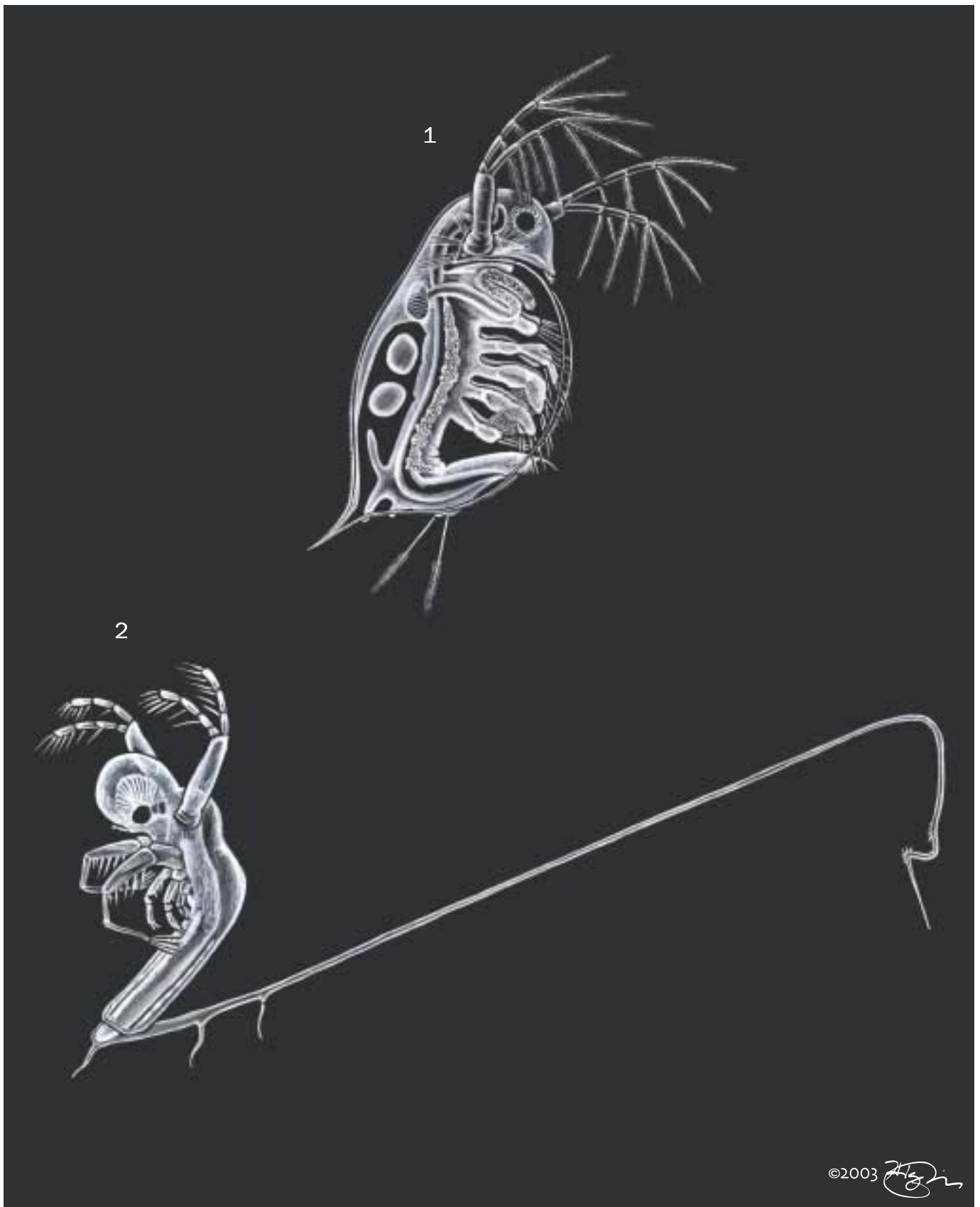
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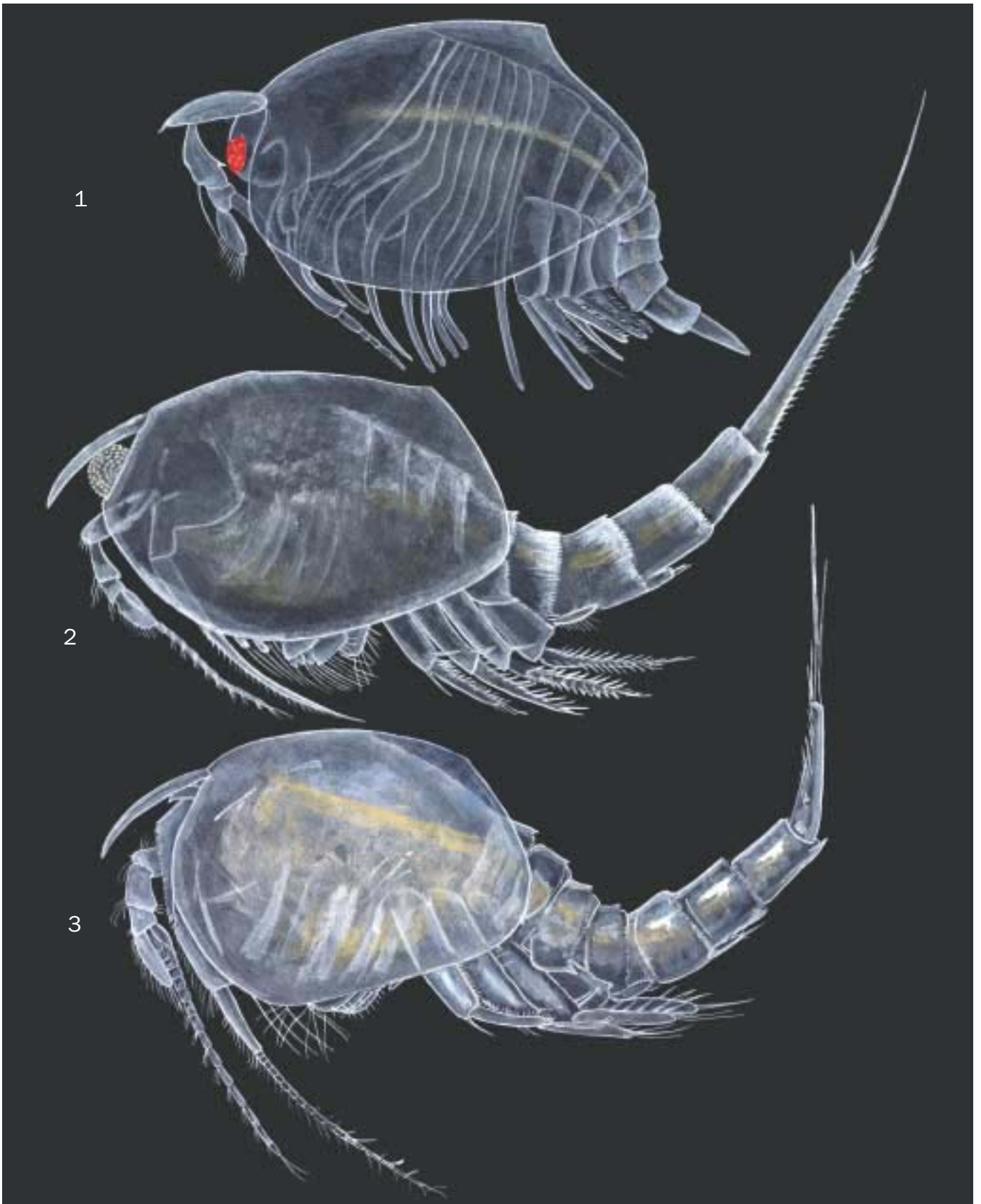
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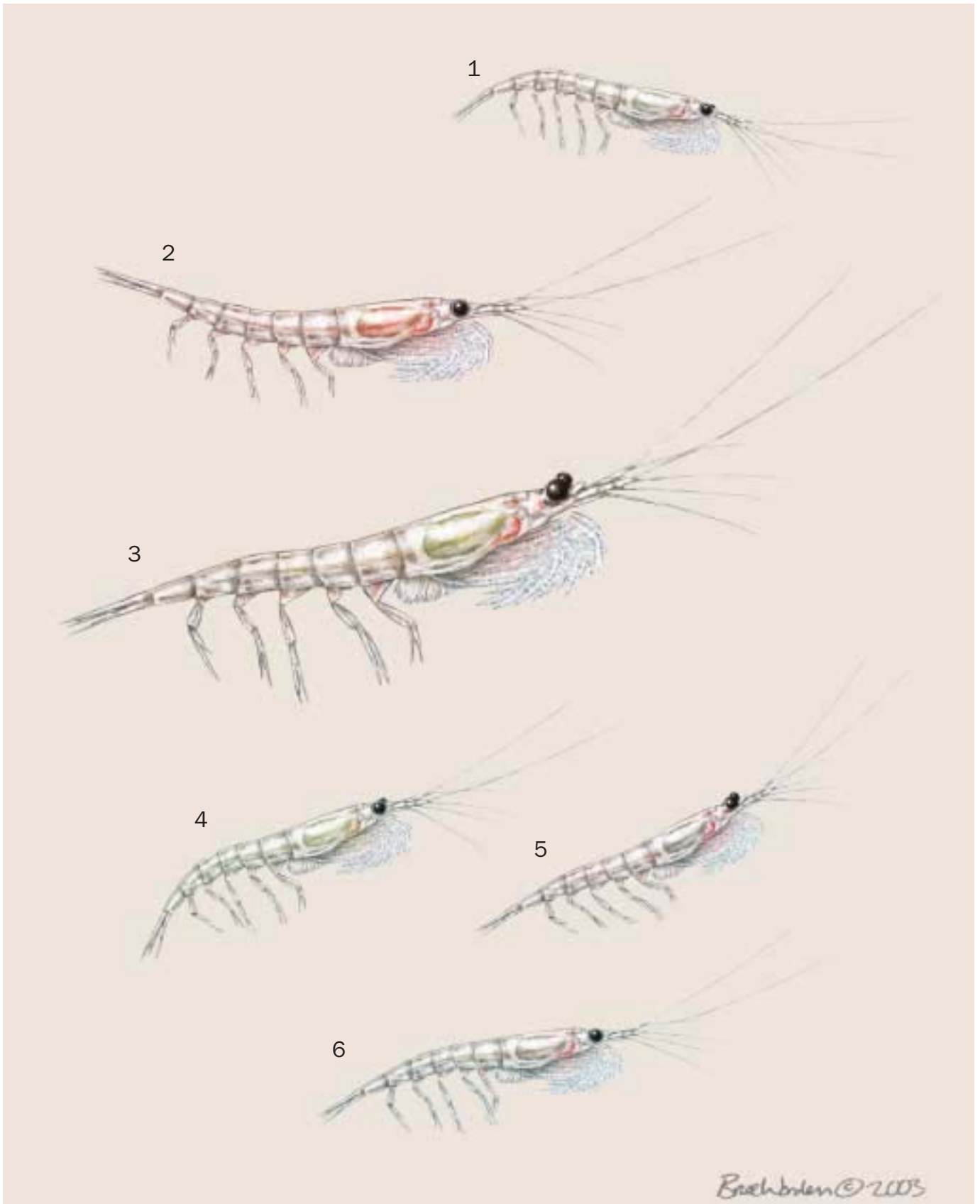
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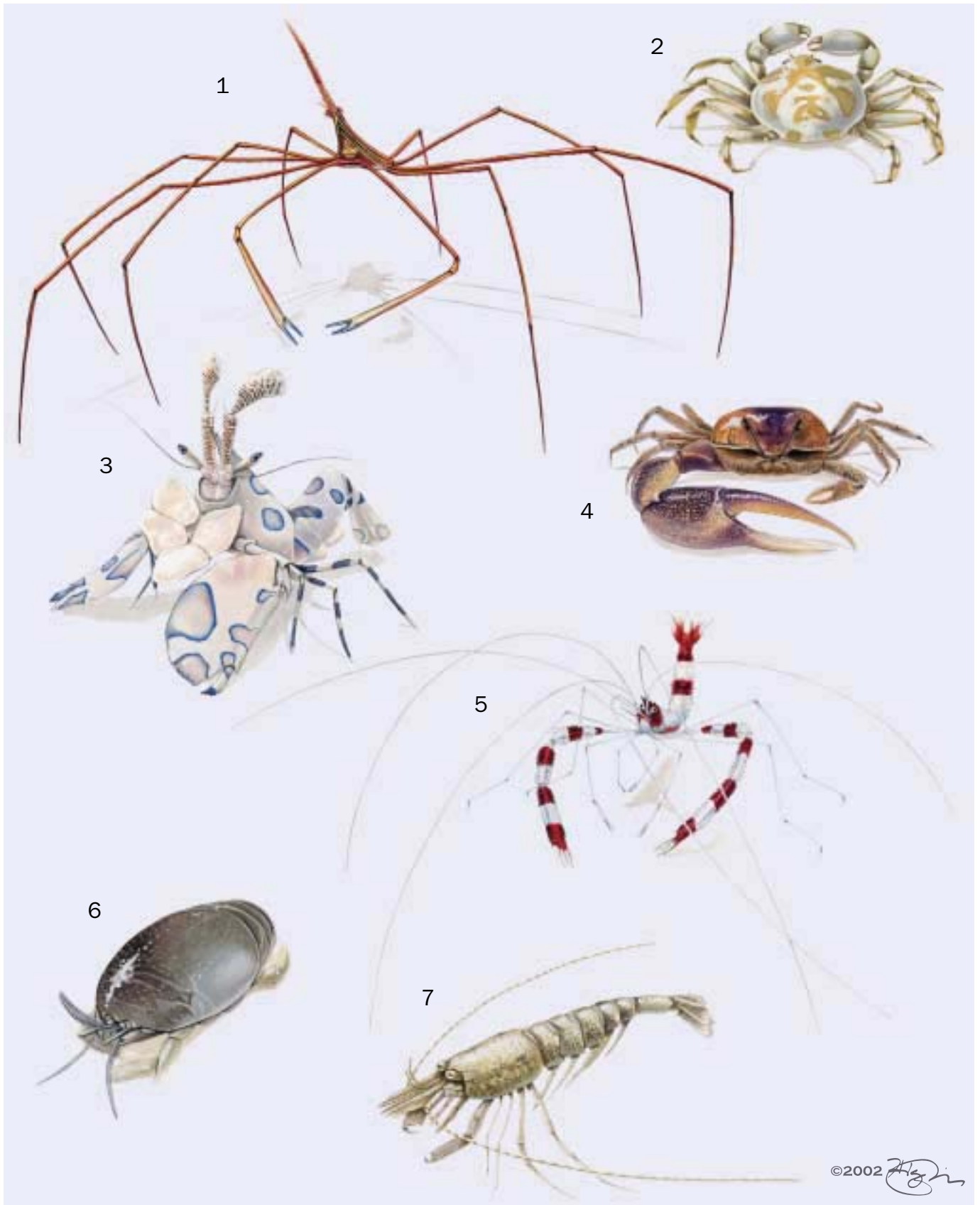
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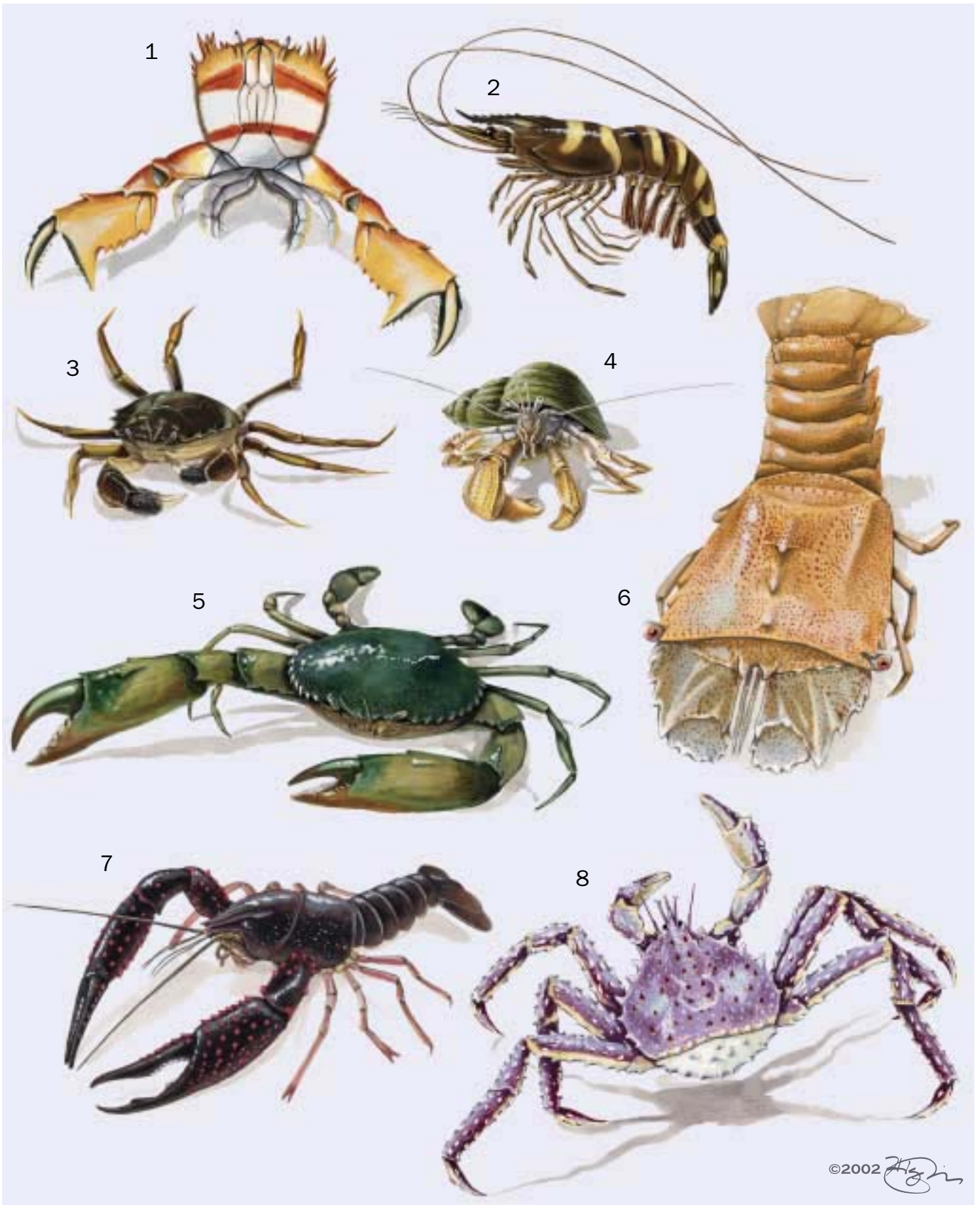
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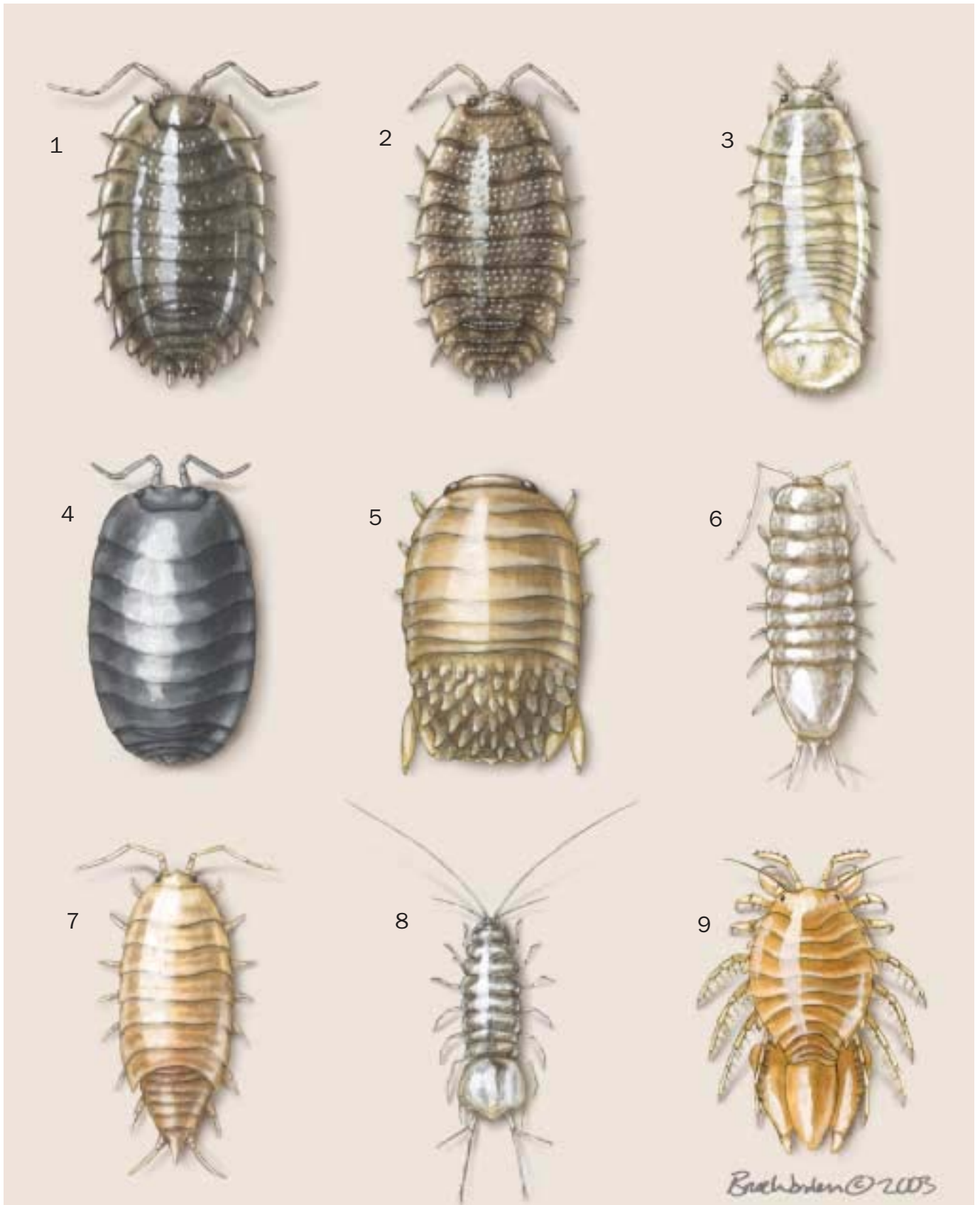
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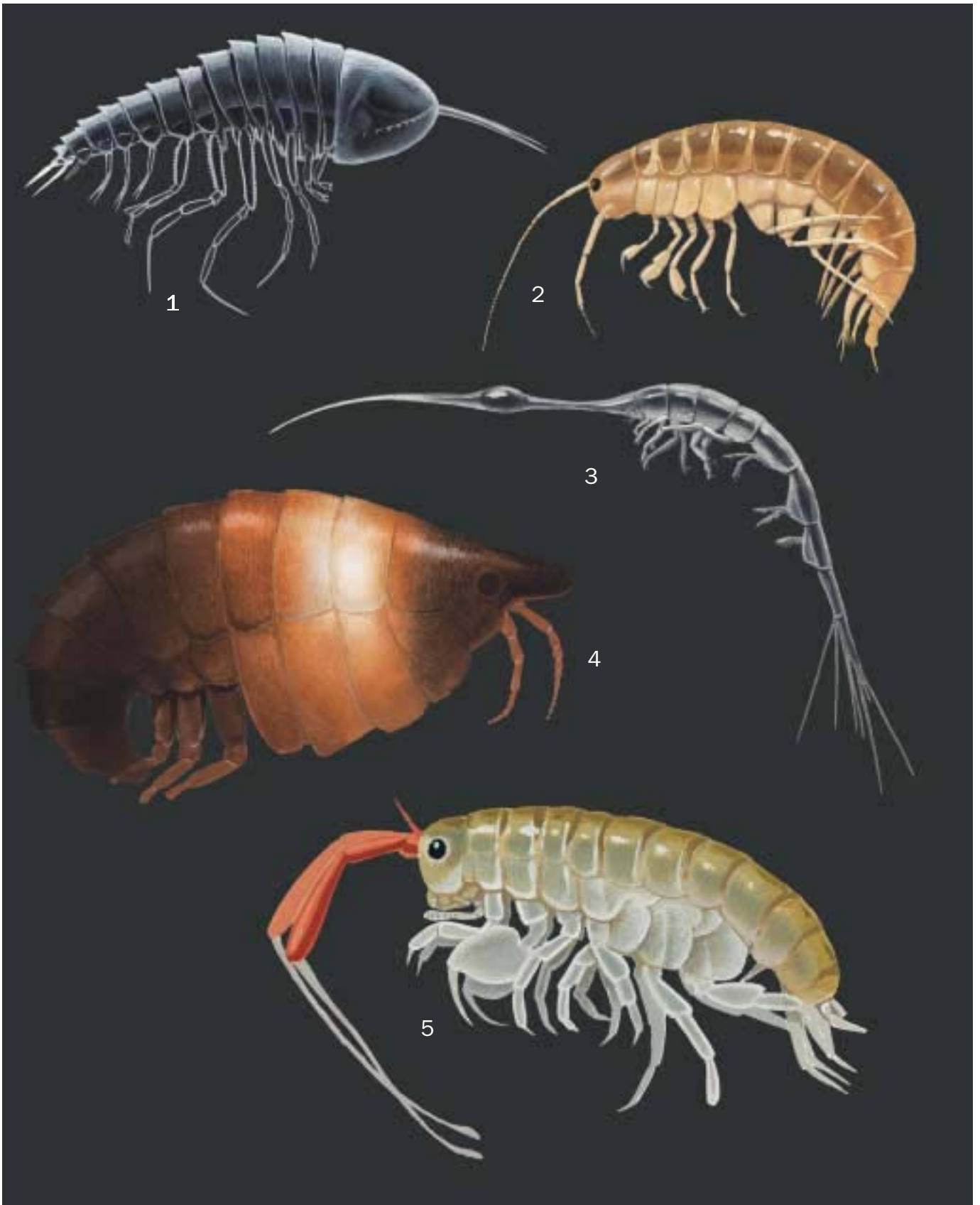
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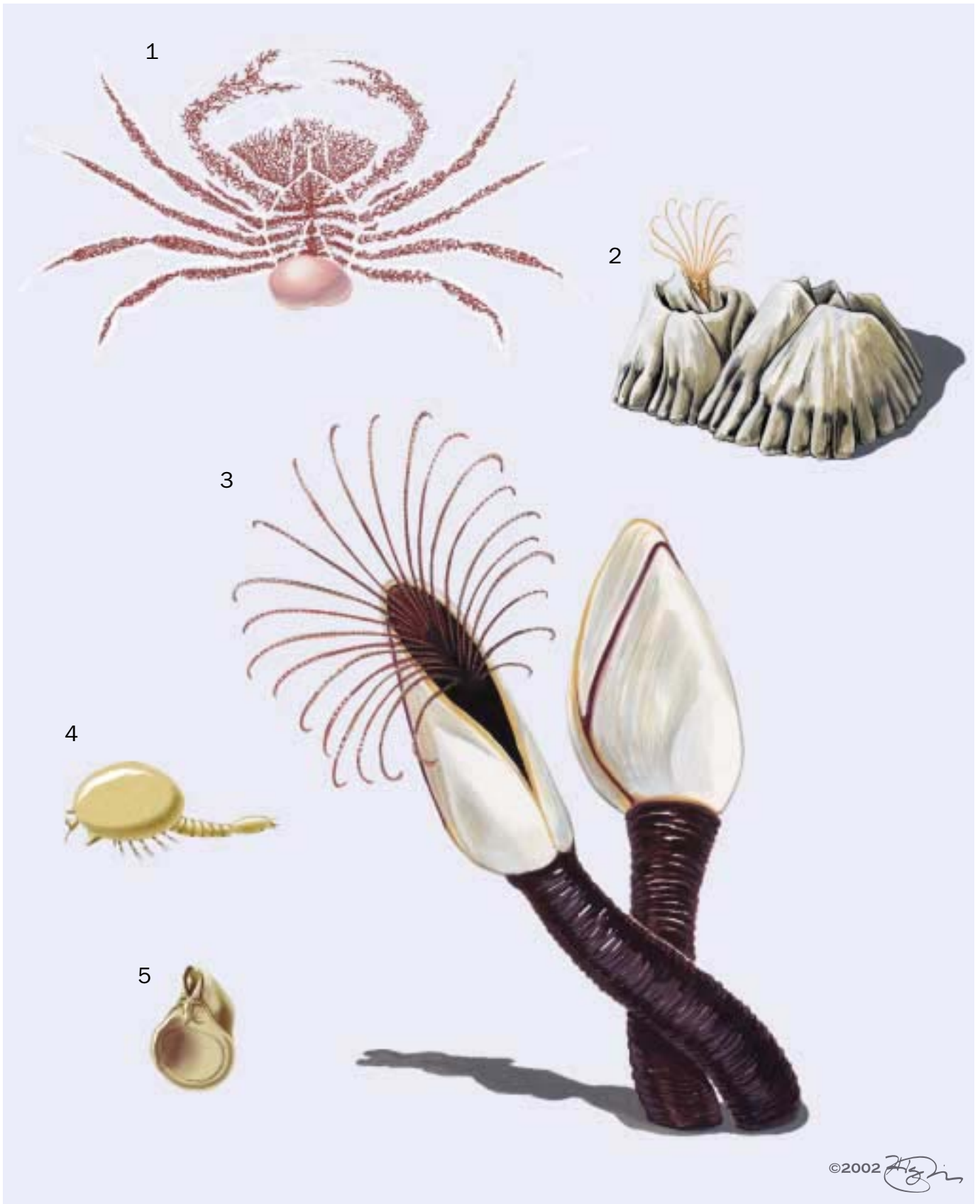
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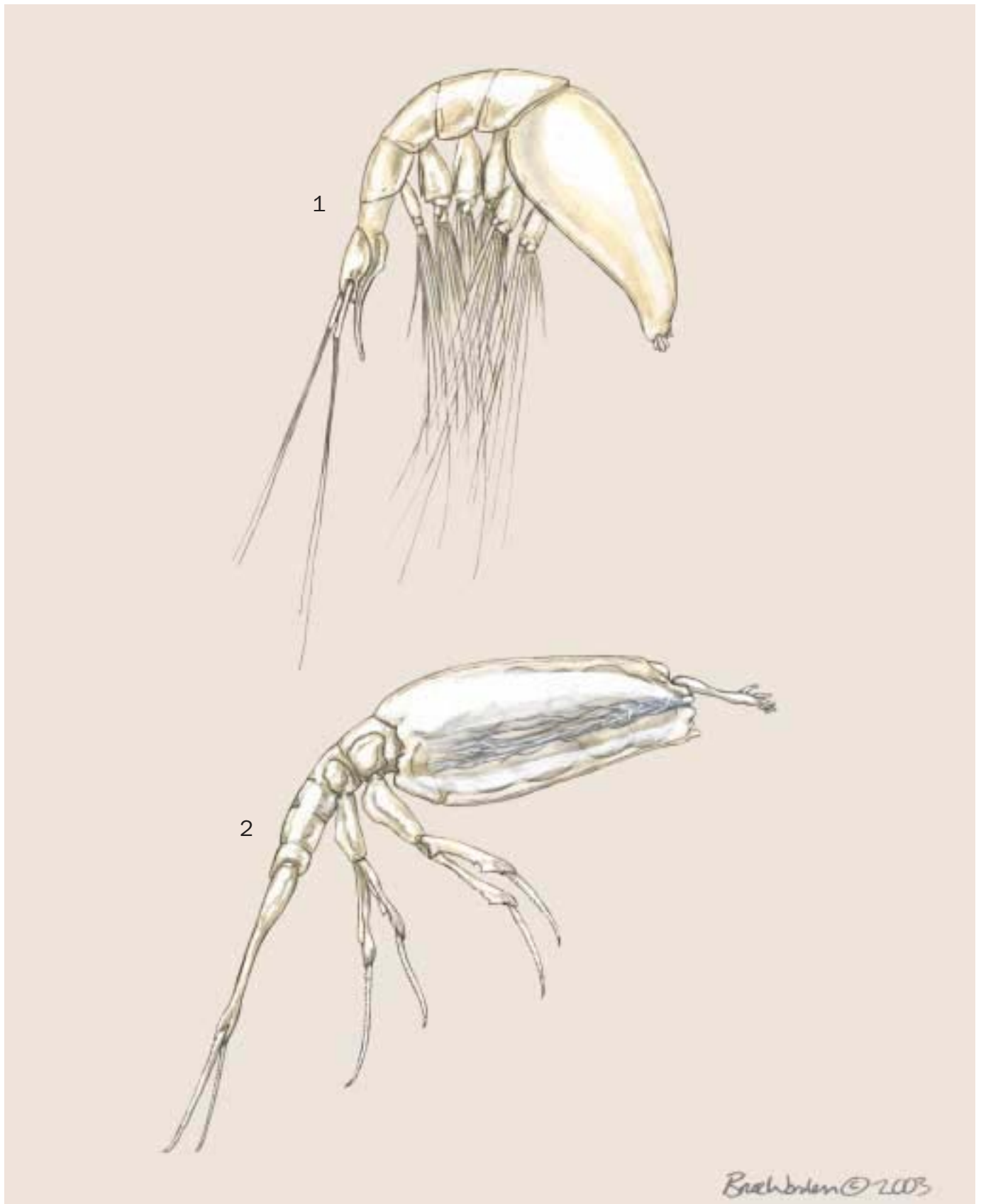


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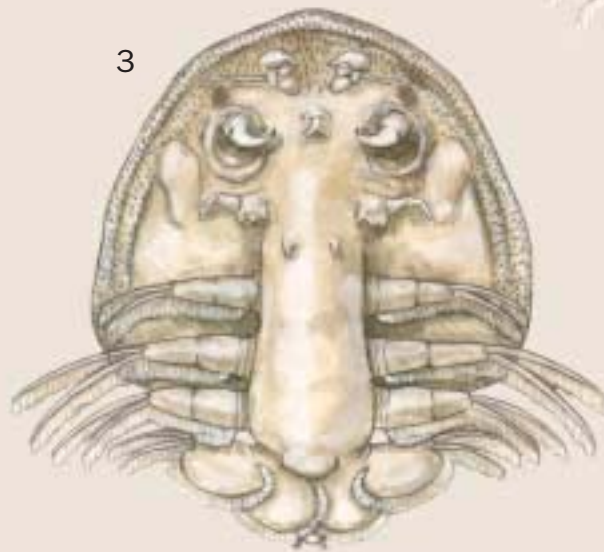
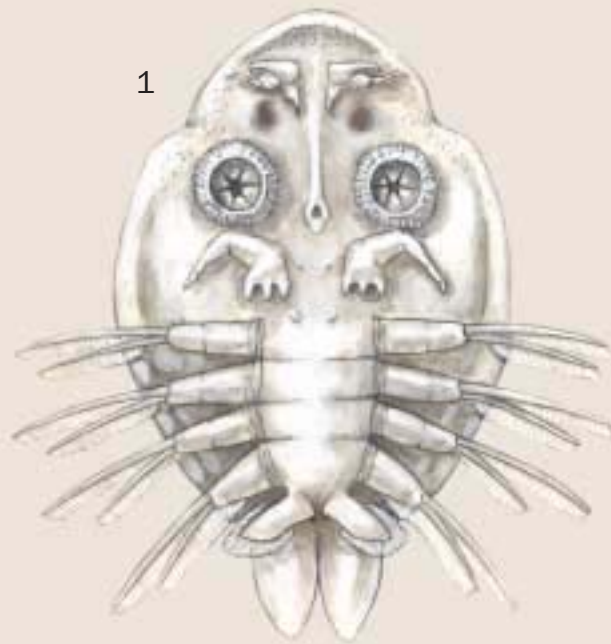


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1. Root-like barnacle (*Sacculina carcini*); 2. Rock barnacle (*Semibalanus balanoides*); 3. Common goose barnacle (*Lepas anatifera*); 4. *Ascothorax ophiactenesis*; 5. *Trypetesa lampas*. (Illustration by Jonathan Higgins)

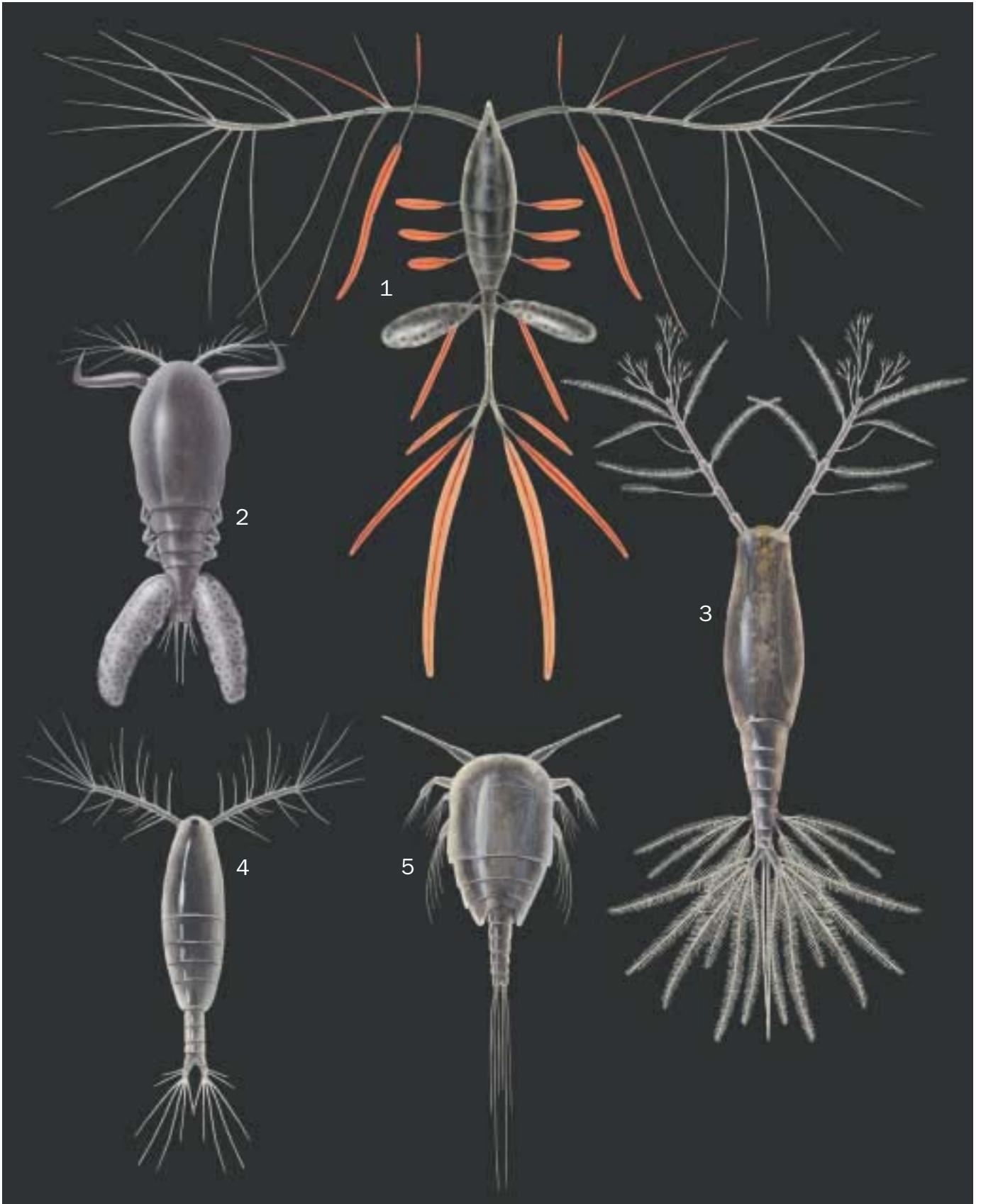


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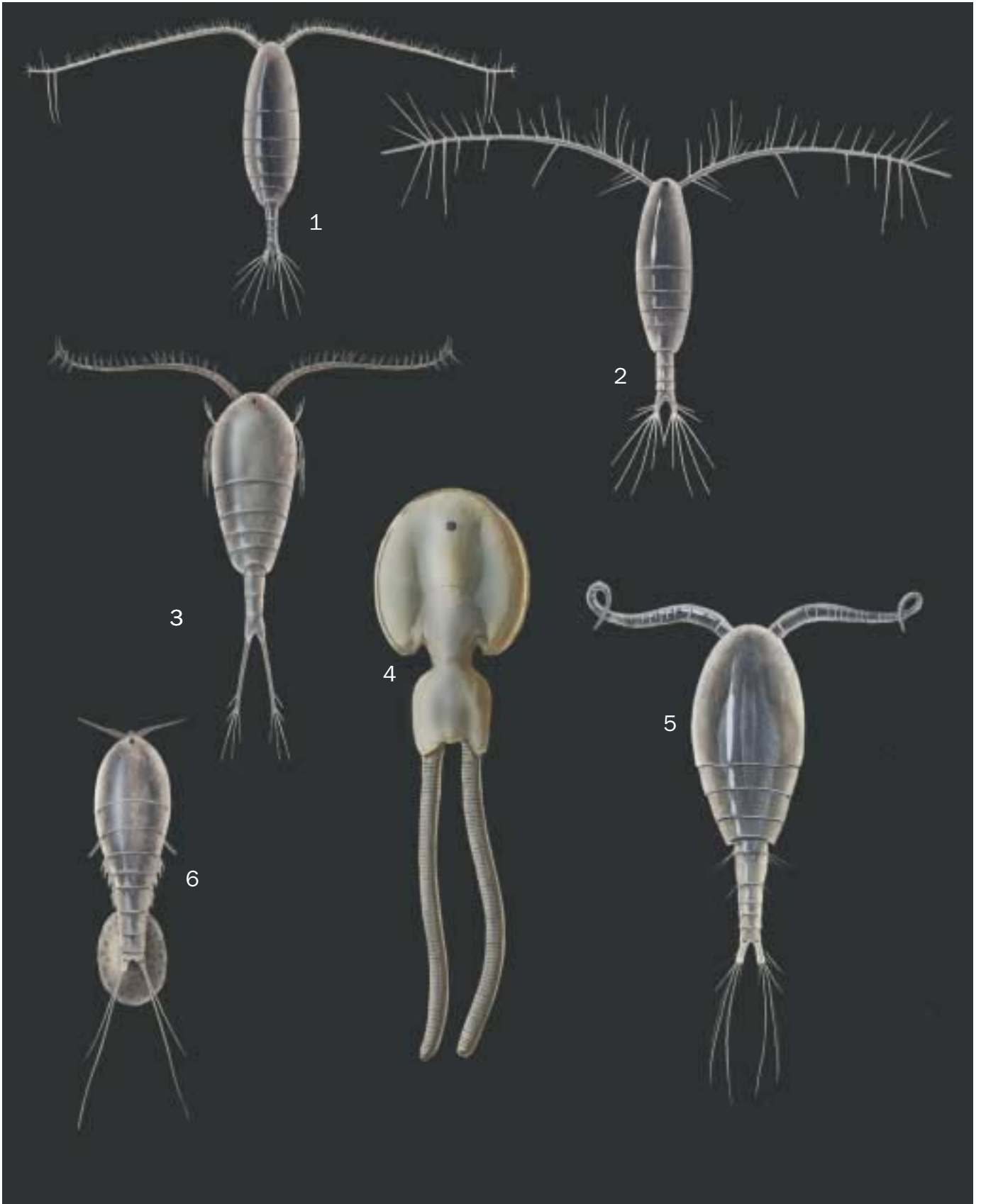


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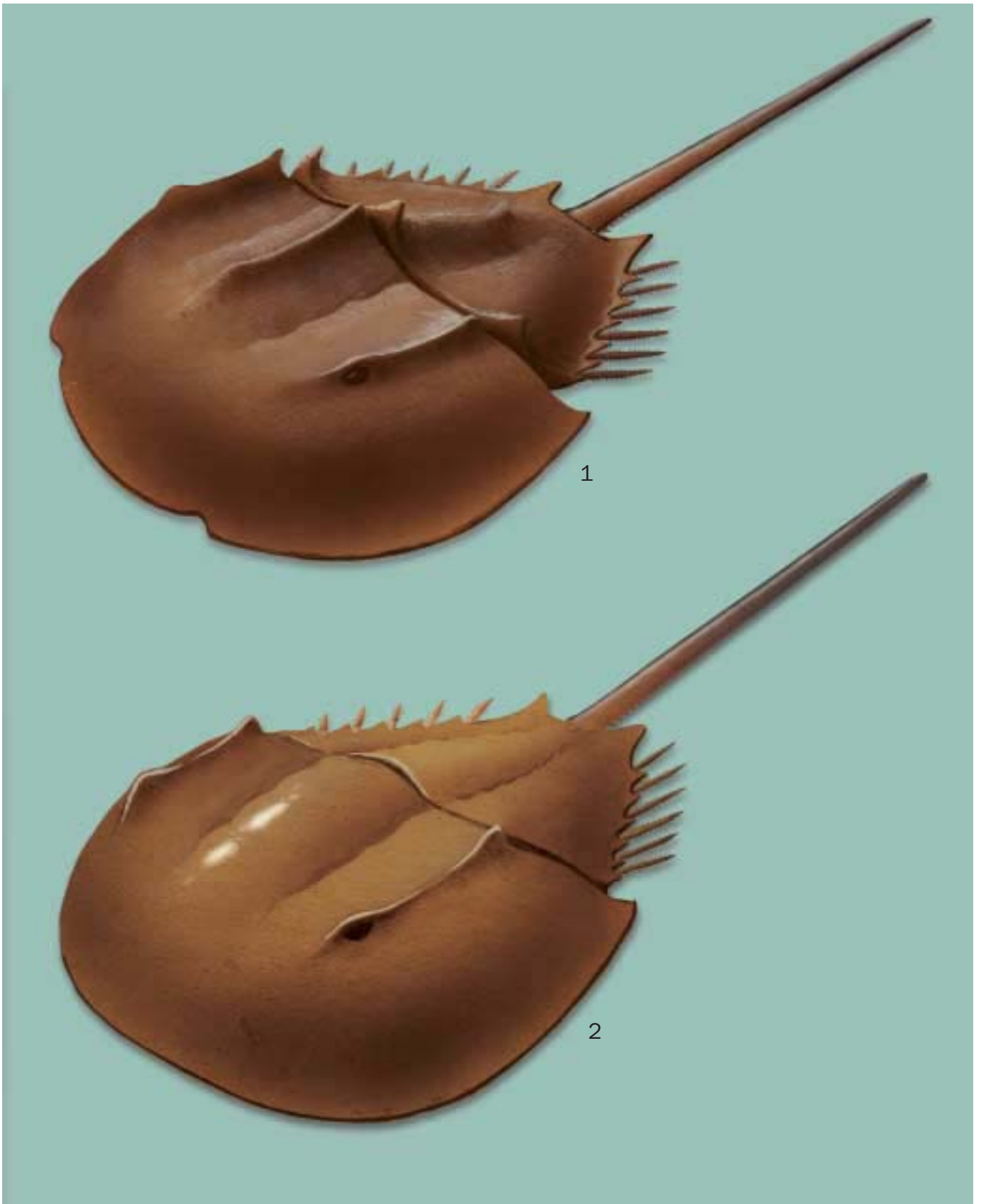


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1. Japanese horseshoe crab (*Tachypleus tridentatus*); 2. American horseshoe crab (*Limulus polyphemus*). (Illustration by John Megahan)



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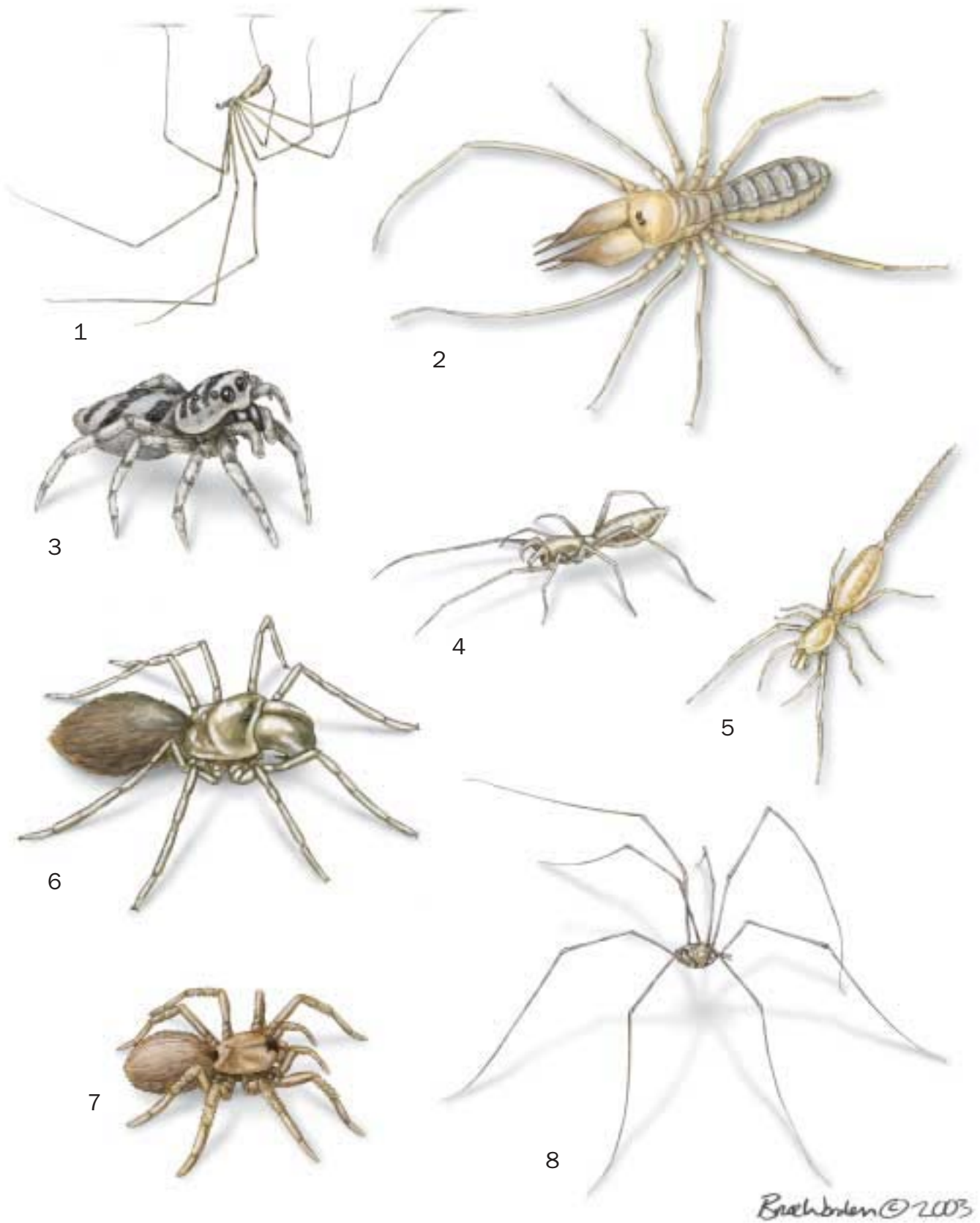
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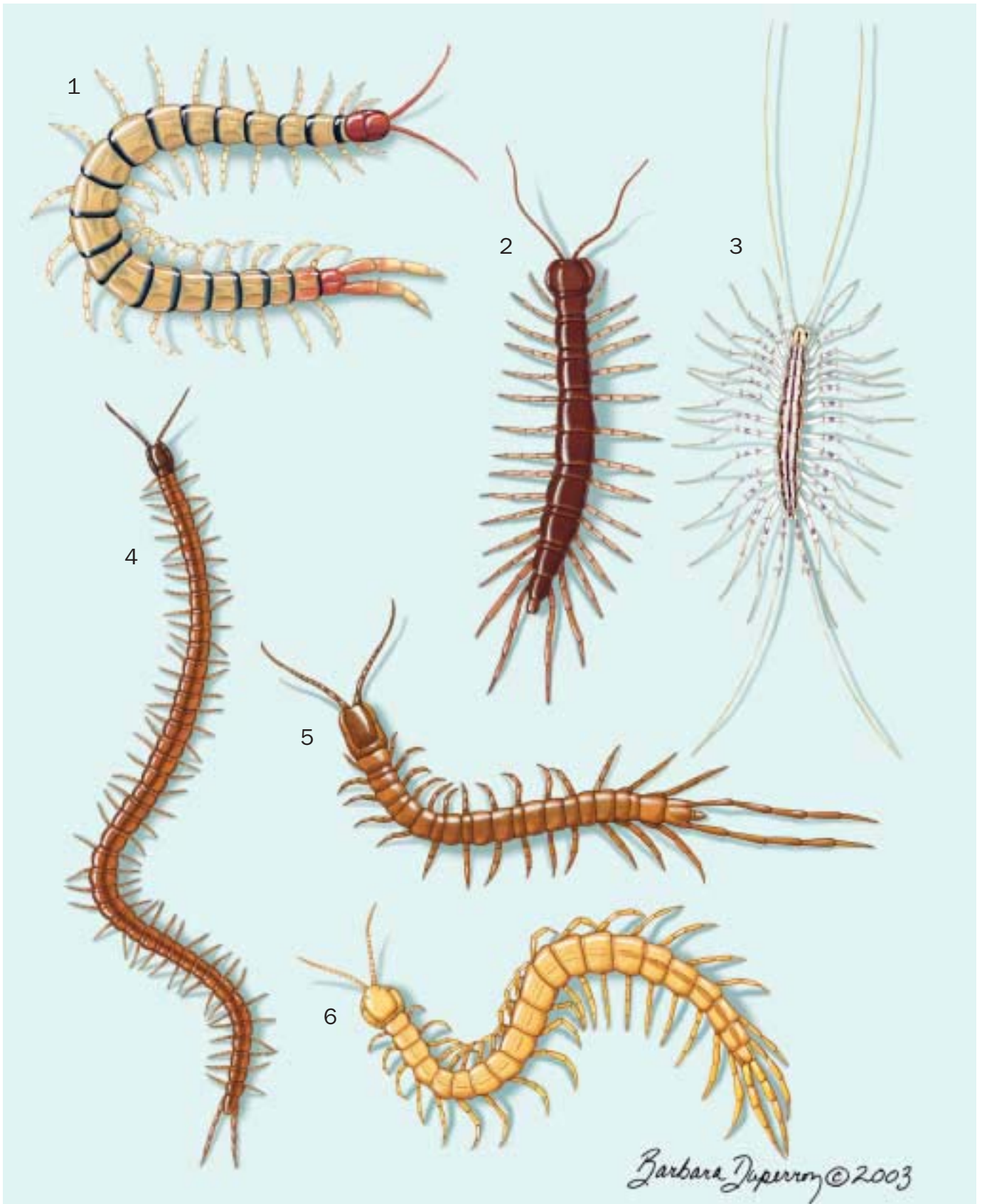
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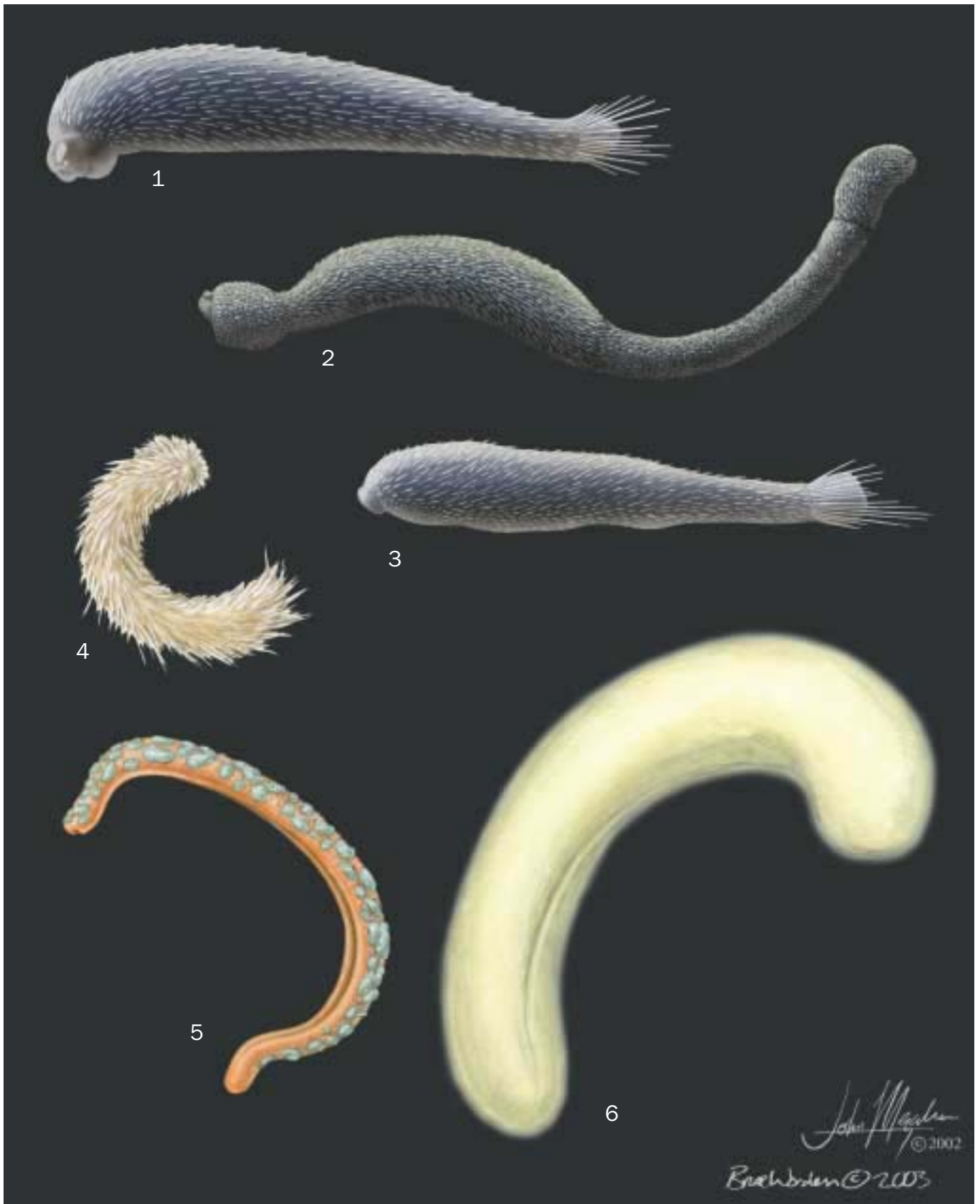
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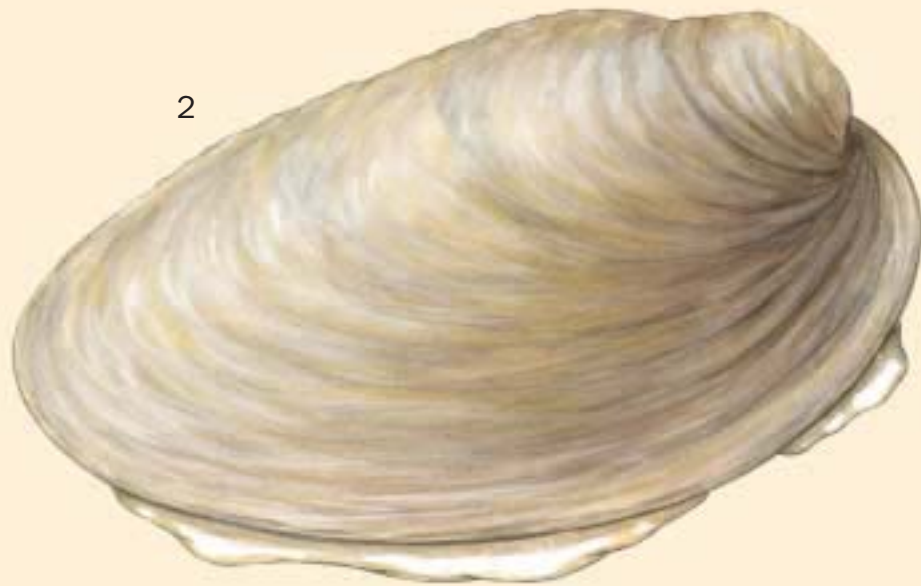
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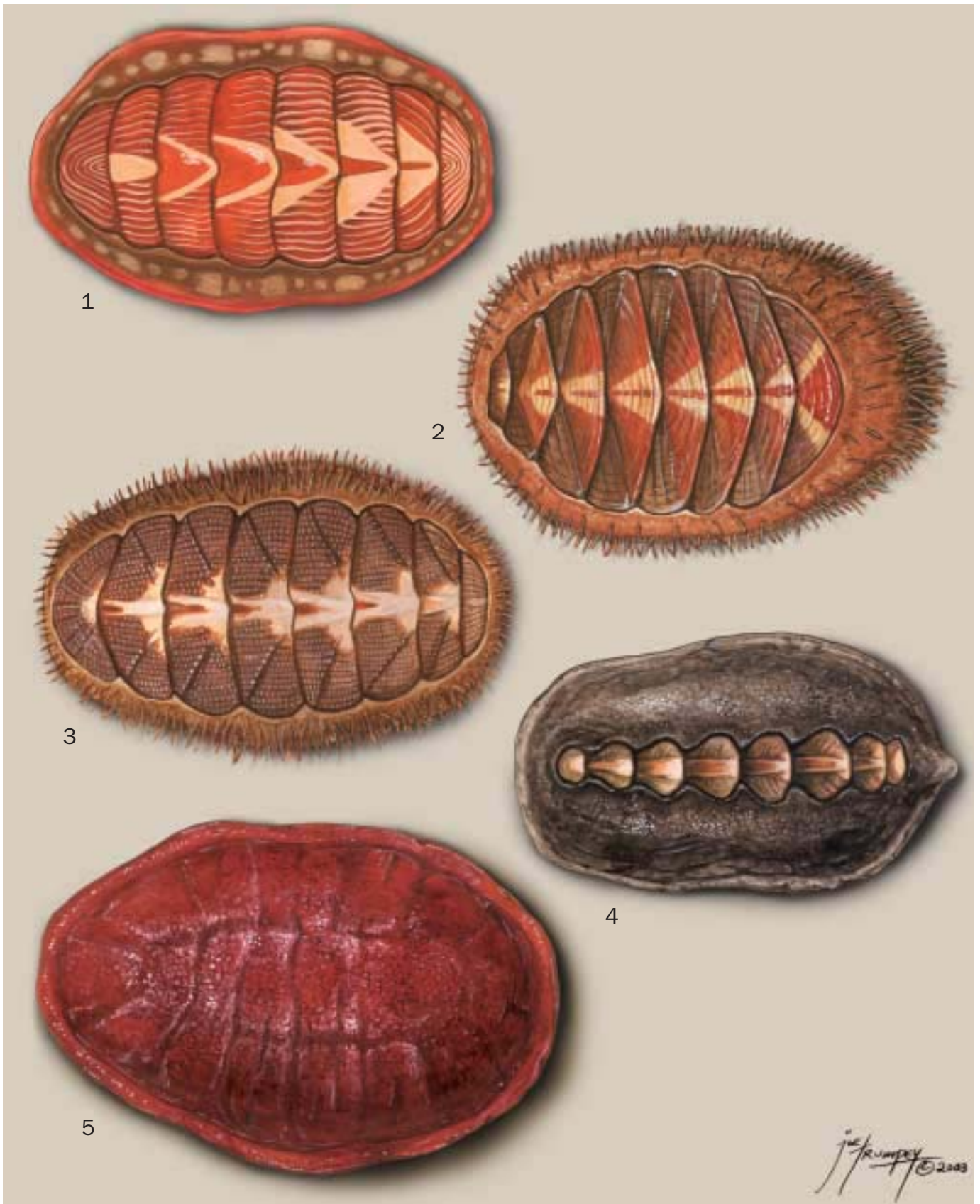


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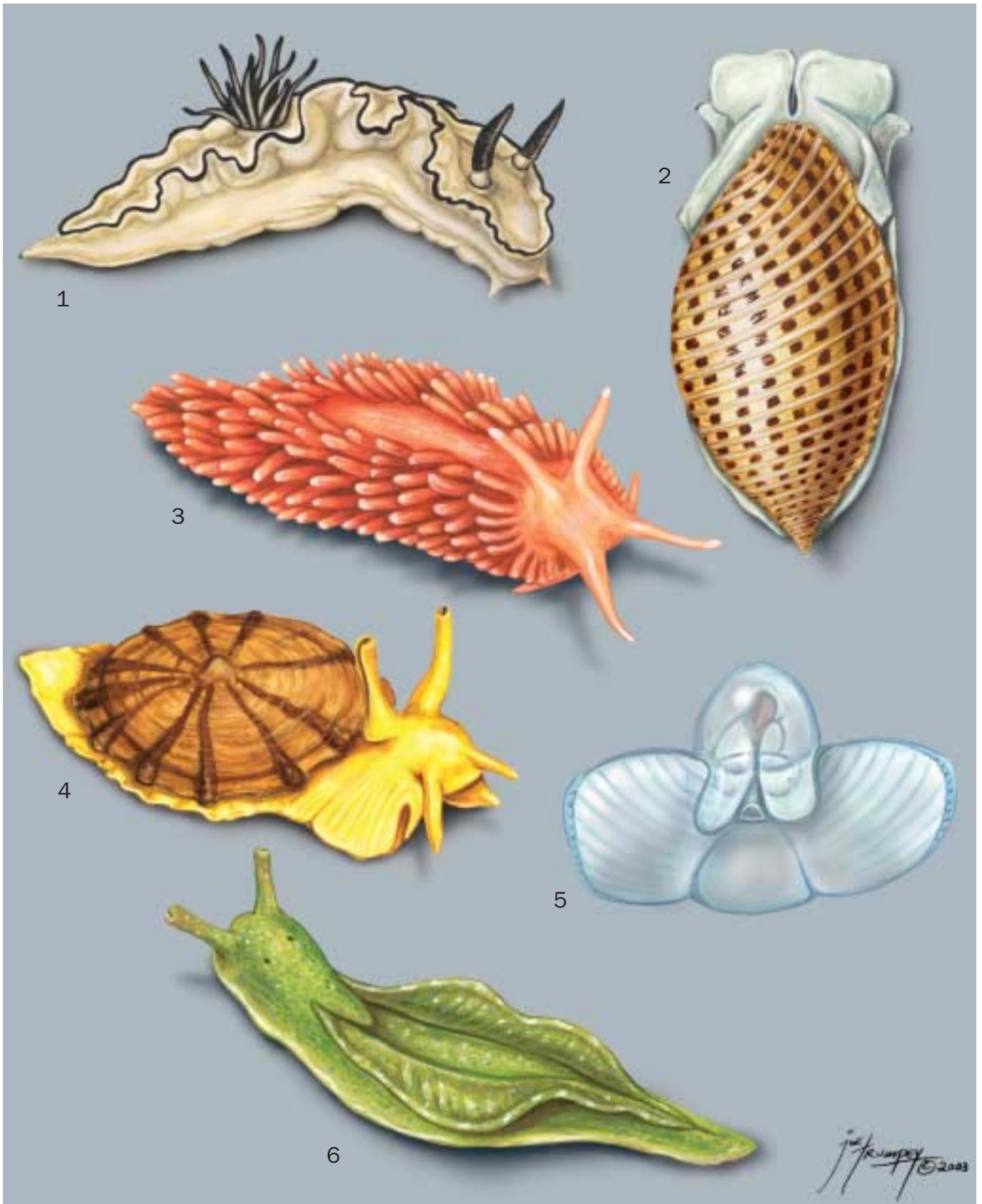


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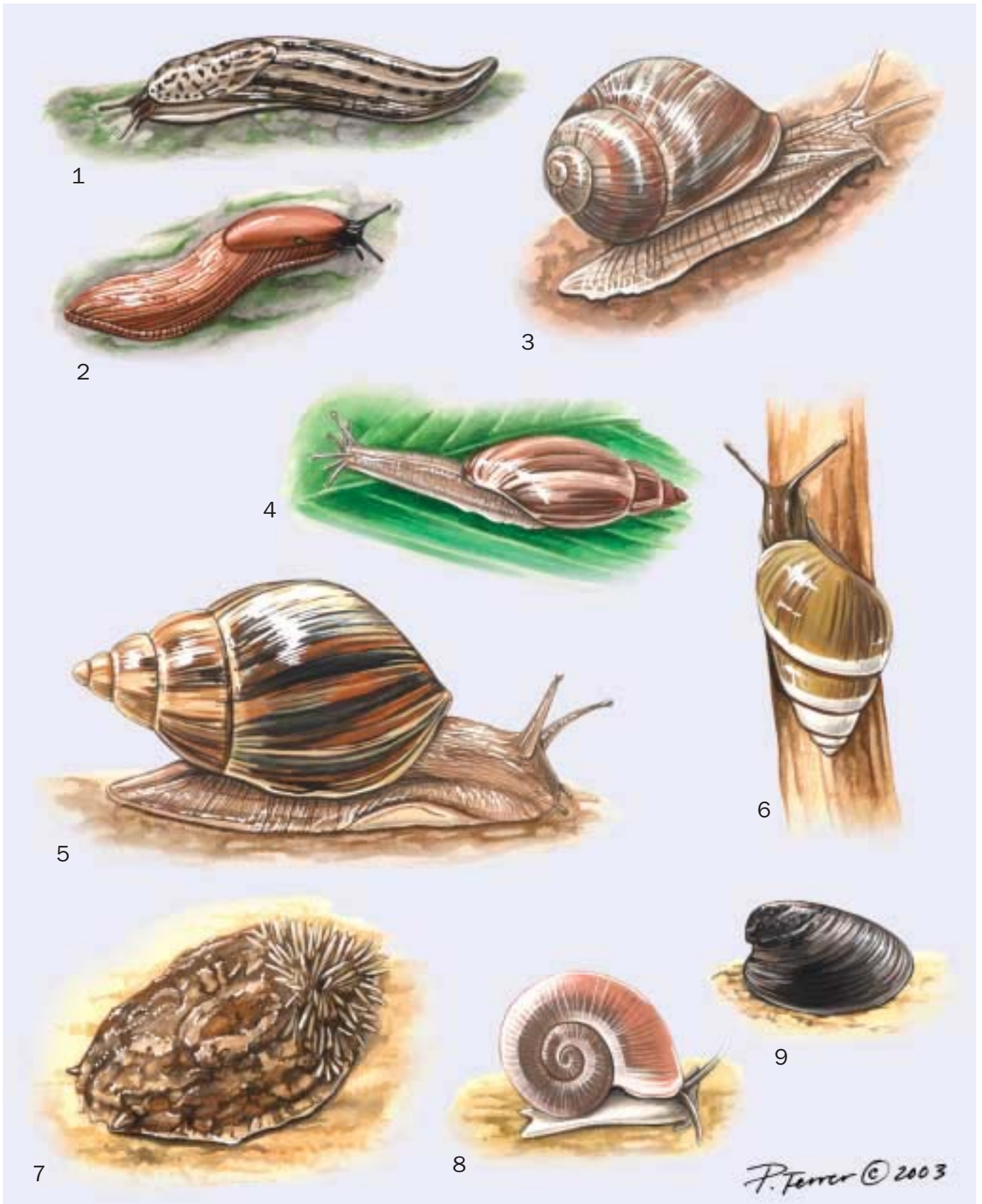
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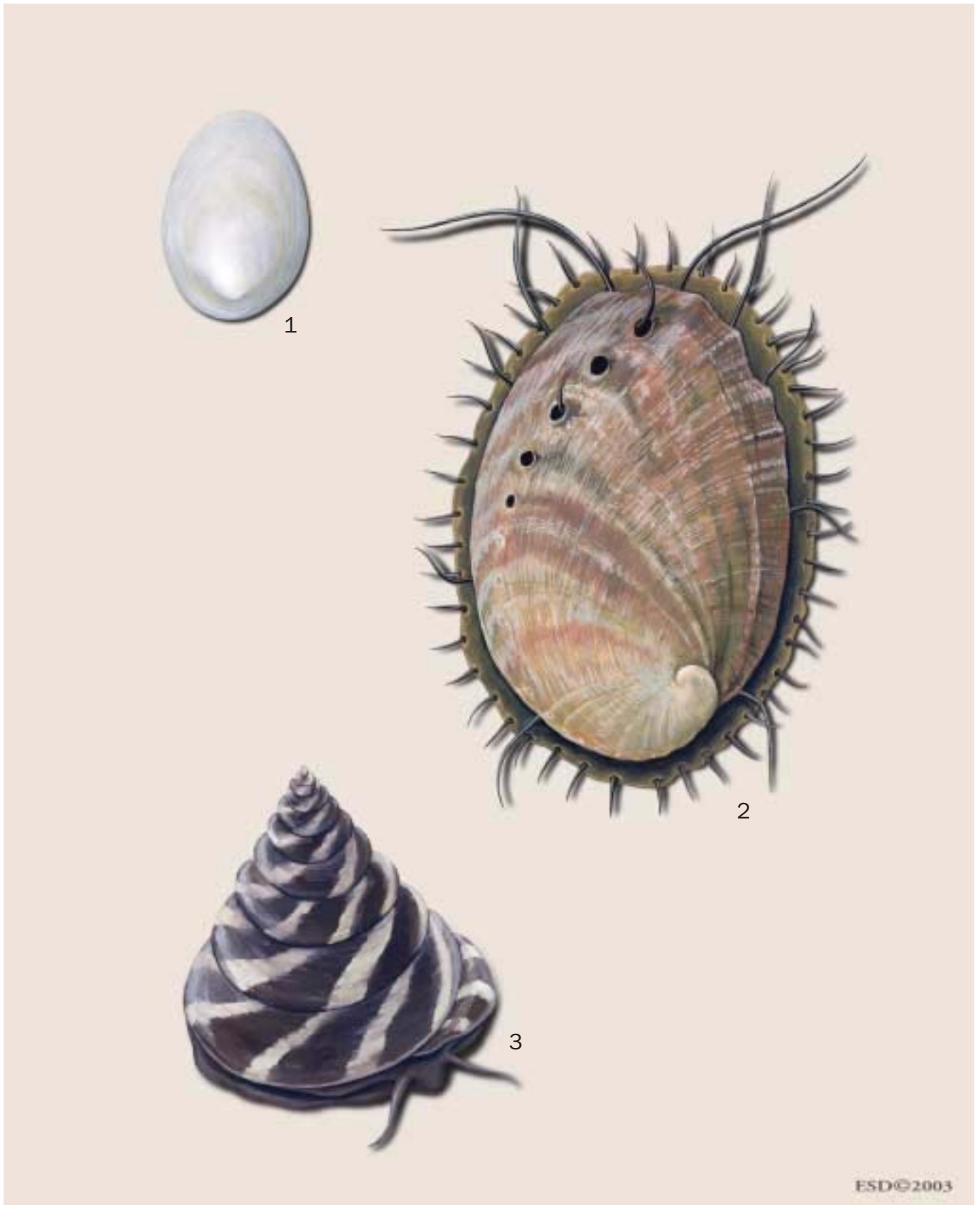
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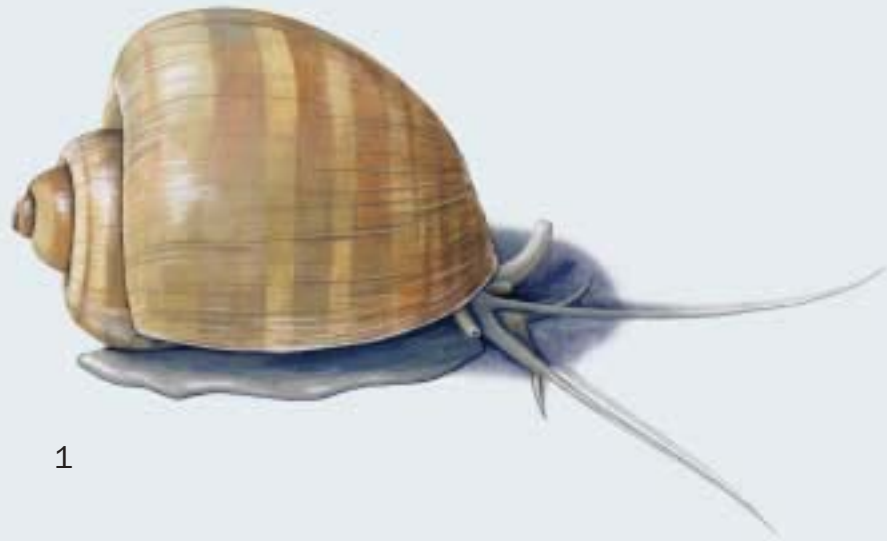
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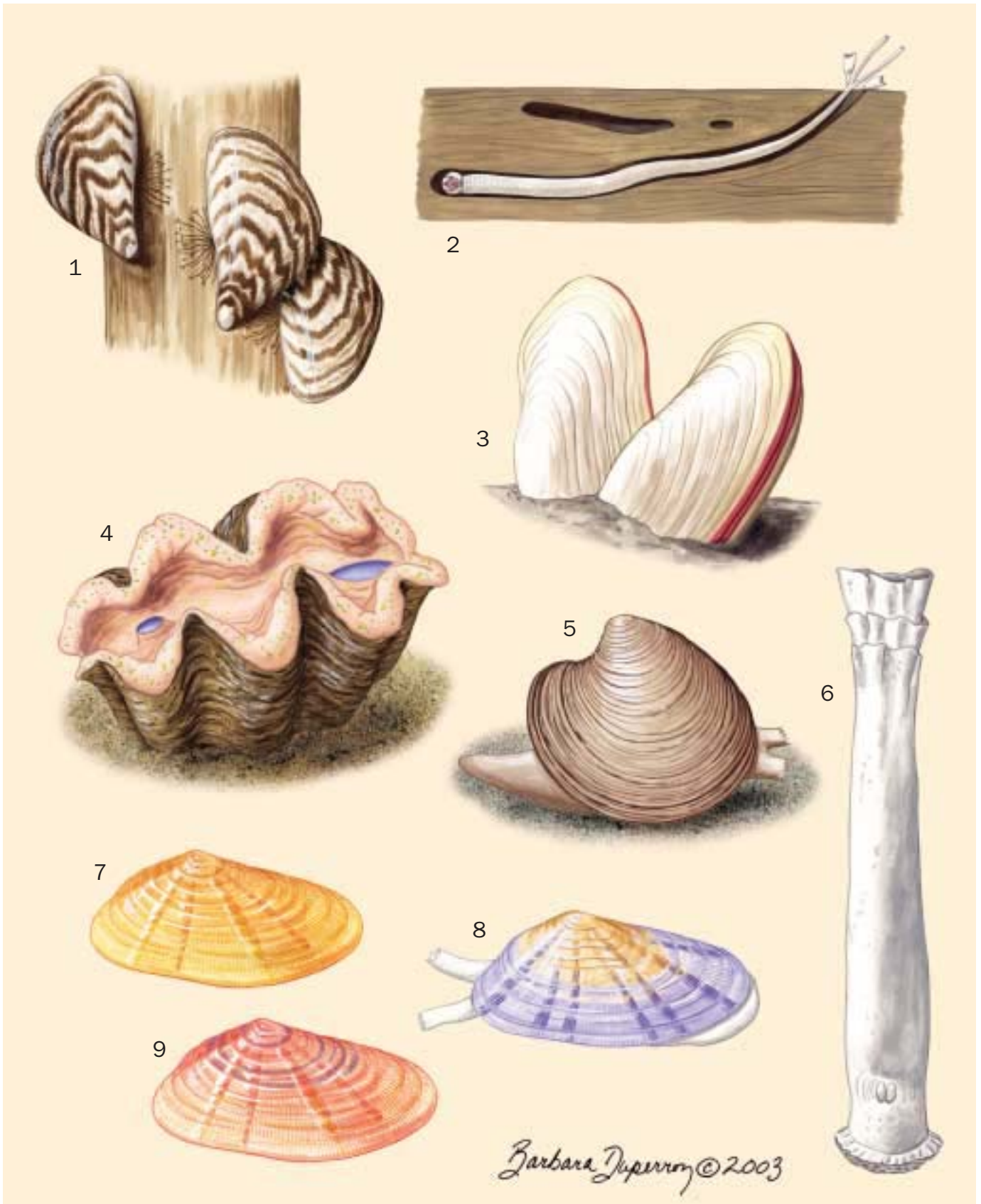
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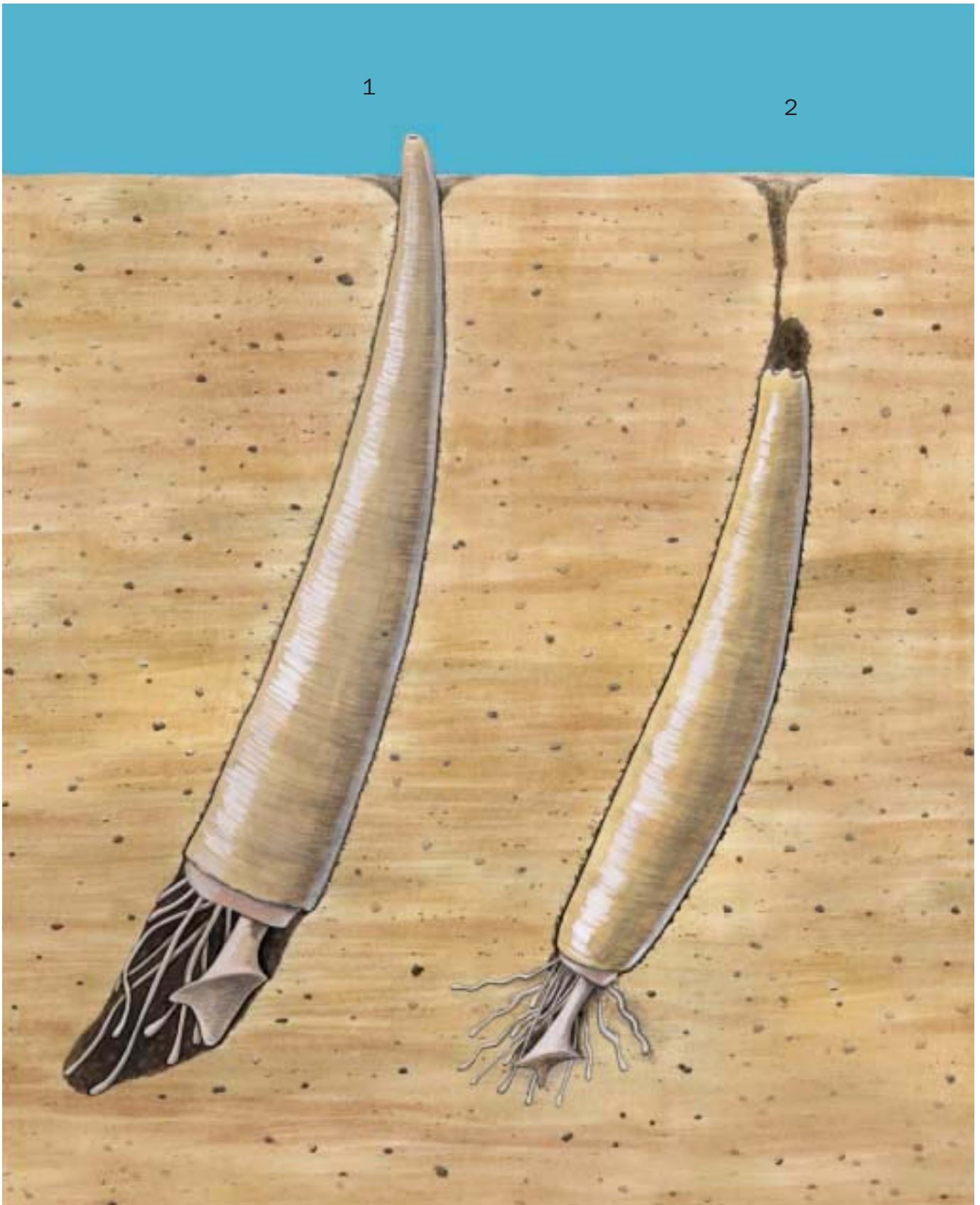
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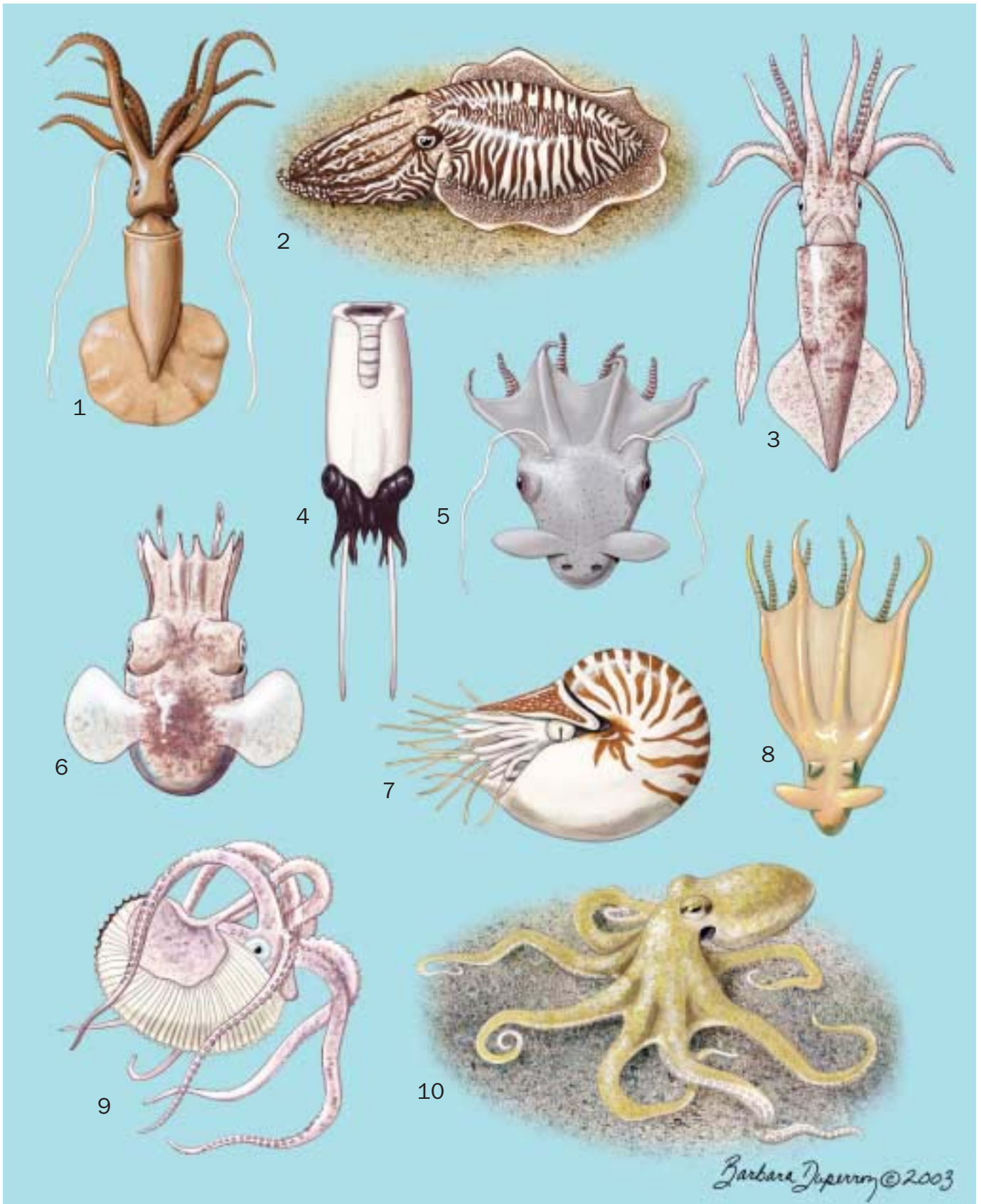
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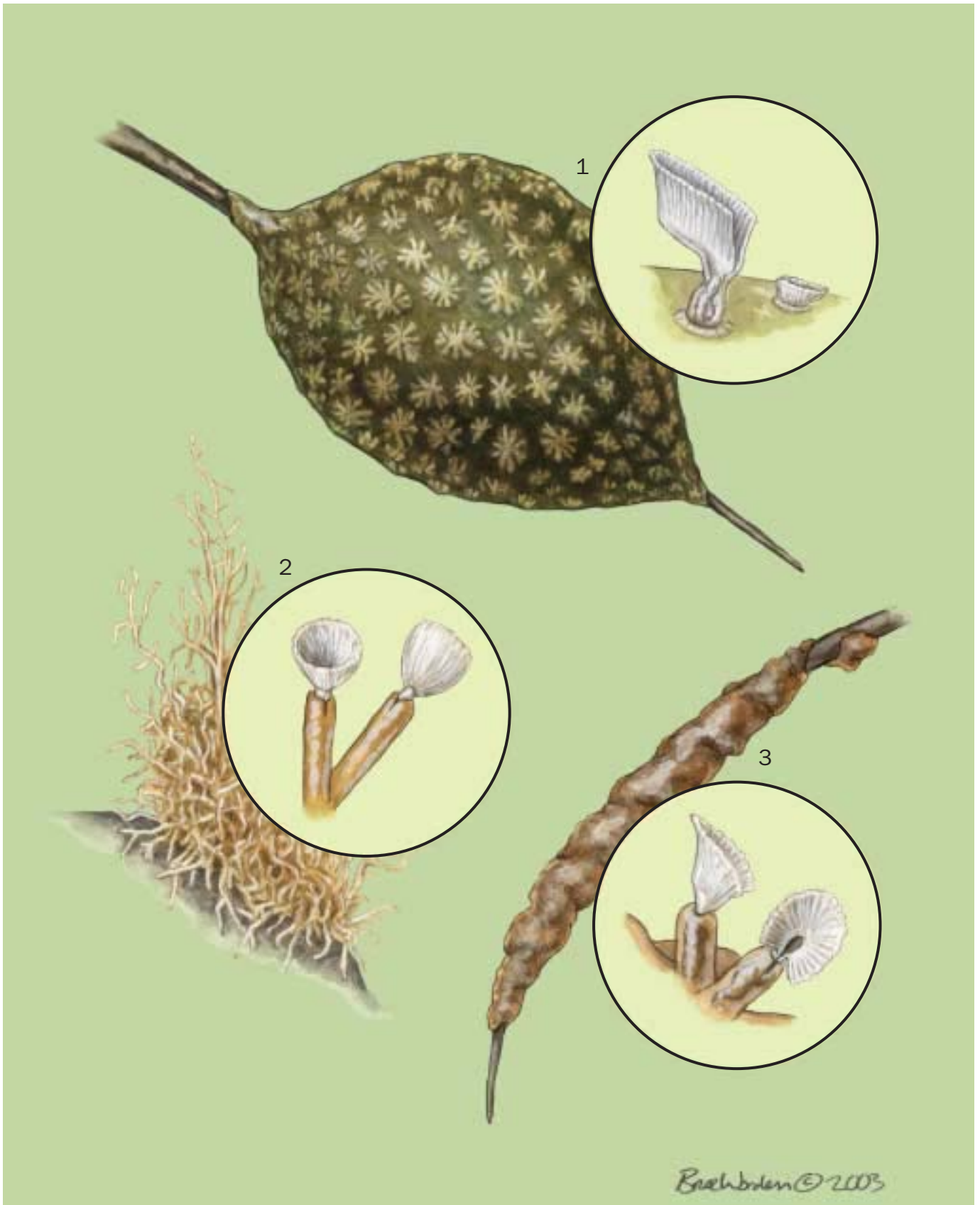
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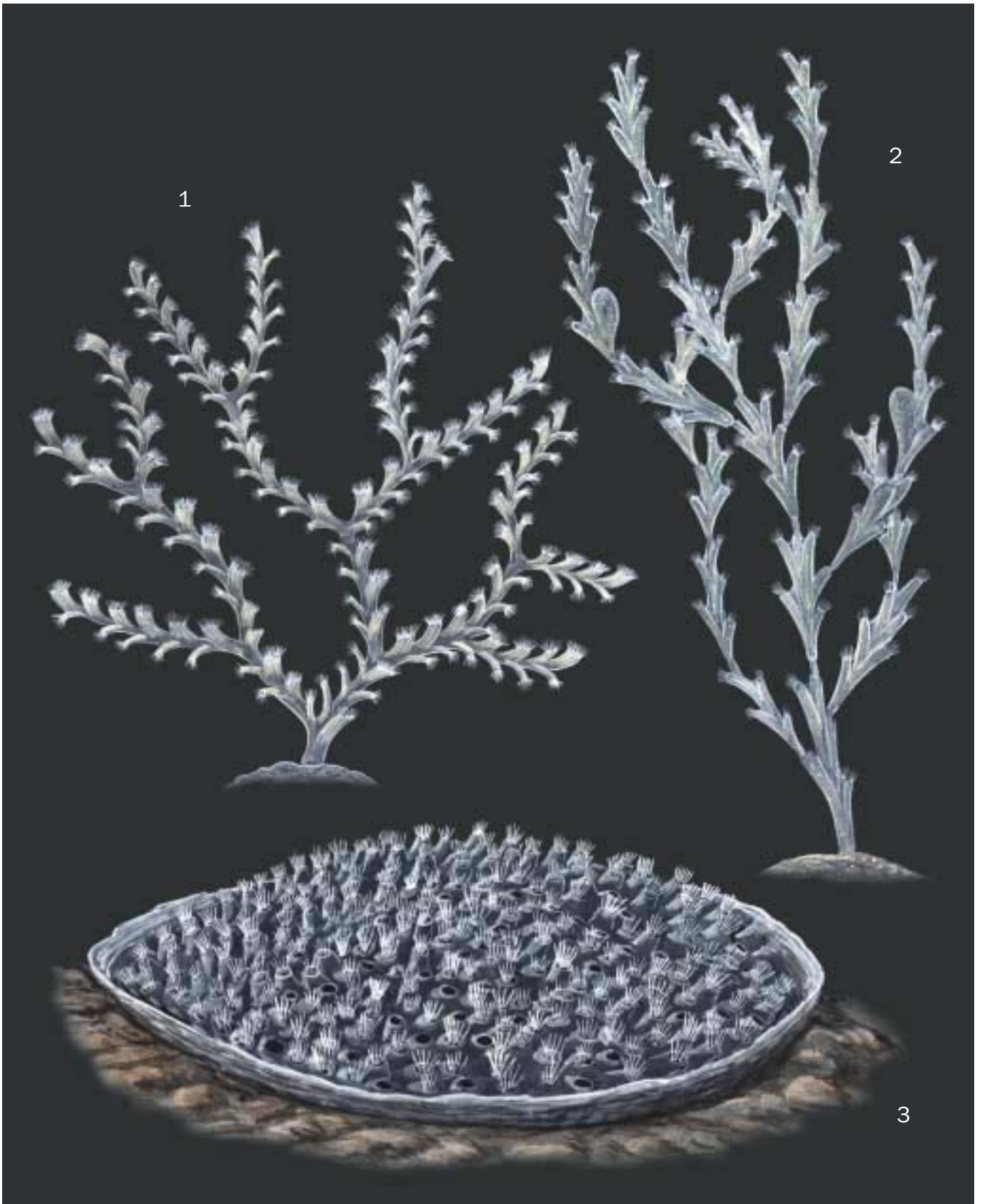
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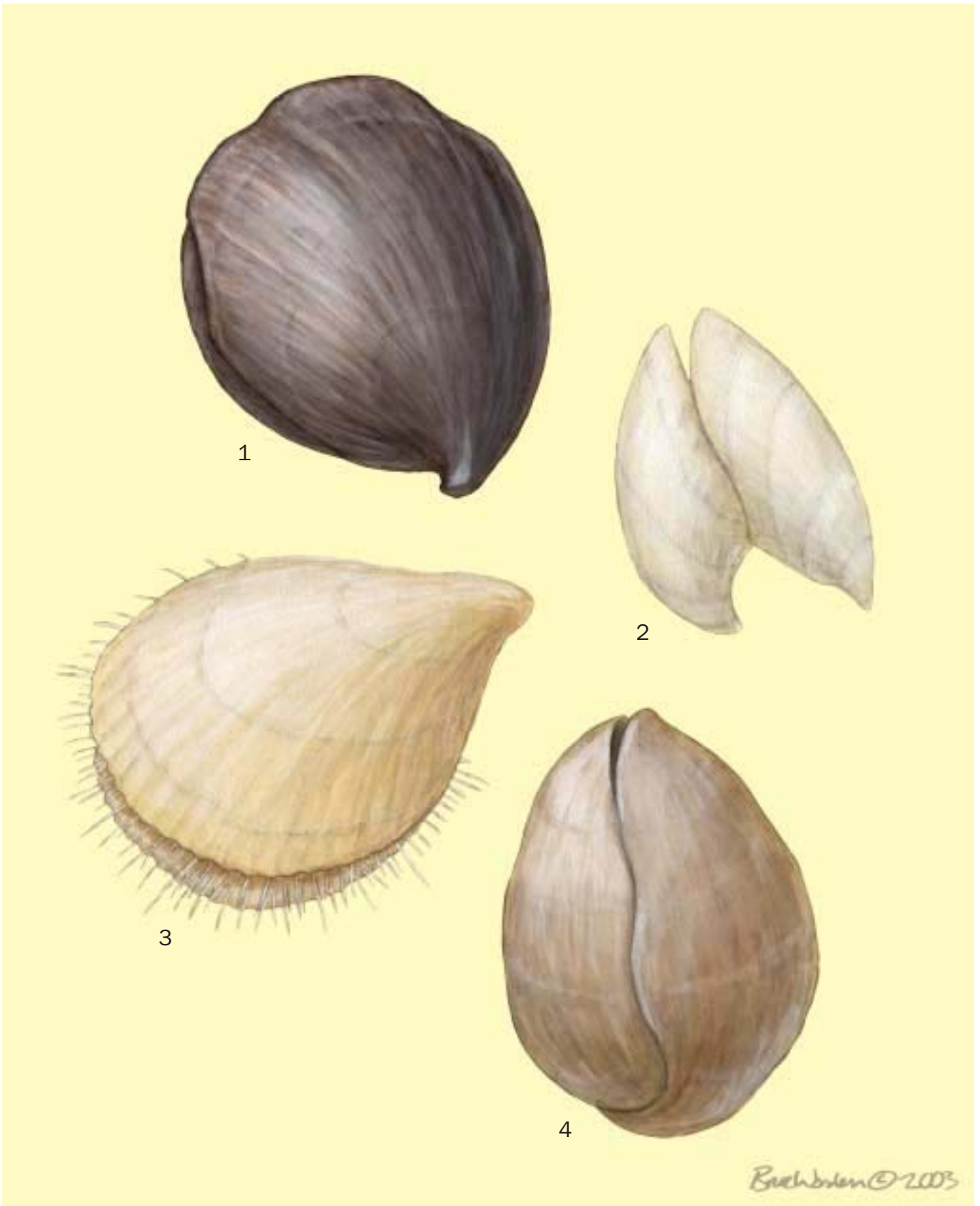
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Grzimek's Animal Life Encyclopedia

Second Edition



**Volume 3
Insects**

**Arthur V. Evans, Advisory Editor
Rosser W. Garrison, Advisory Editor
Neil Schlager, Editor**

Joseph E. Trumpey, Chief Scientific Illustrator



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In association with the American Zoo and Aquarium Association



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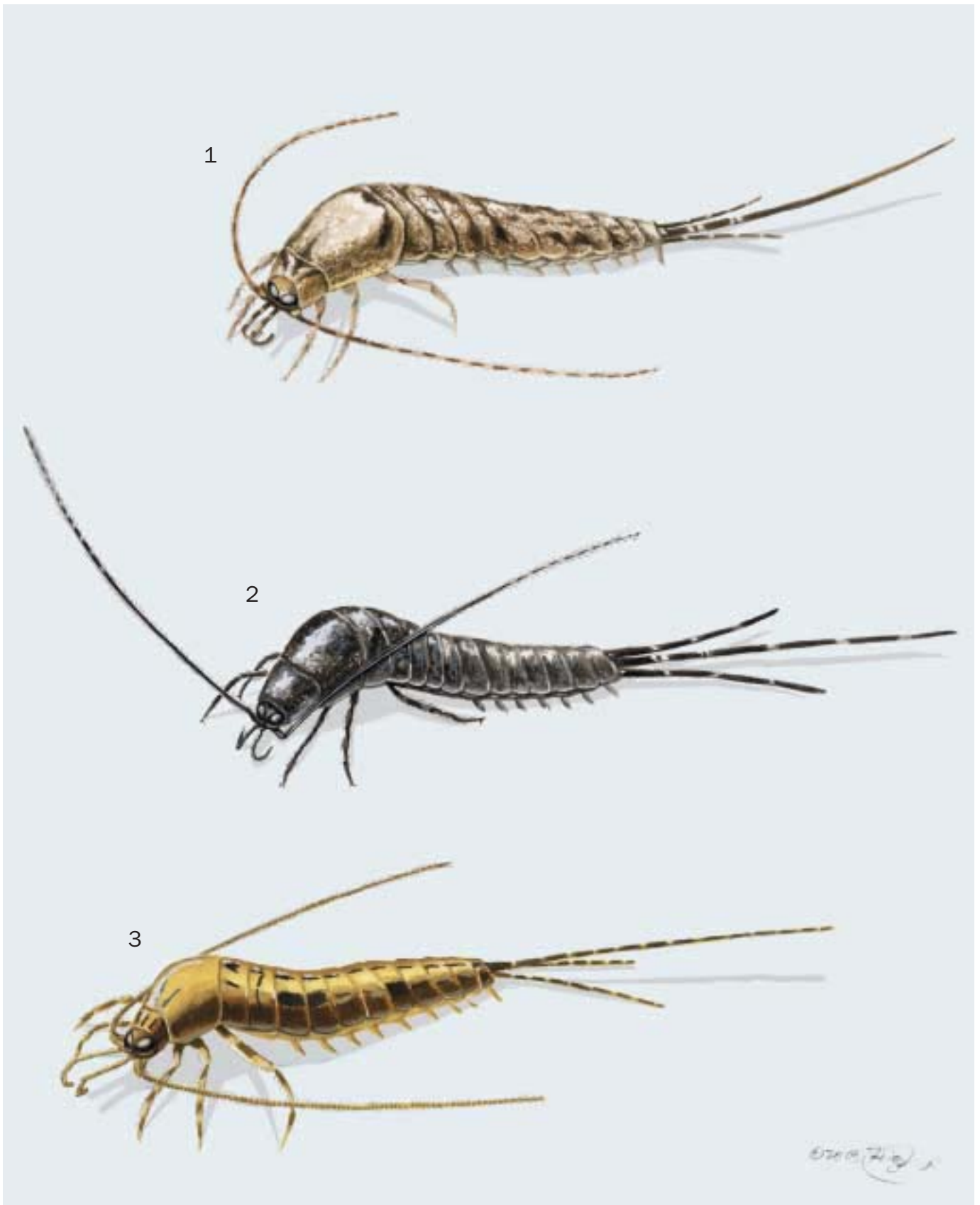
1. *Sinentomon yoroii*; 2. *Berberentulus huisunensis*; 3. *Neocondeellum japonicum*; 4. *Eosentomon palustre*. (Illustration by John Megahan)



1. Lucerne flea (*Sminthurus viridis*); 2. Varied springtail (*Isotoma viridis*); 3. Water springtail (*Podura aquatica*). (Illustration by Amanda Humphrey)



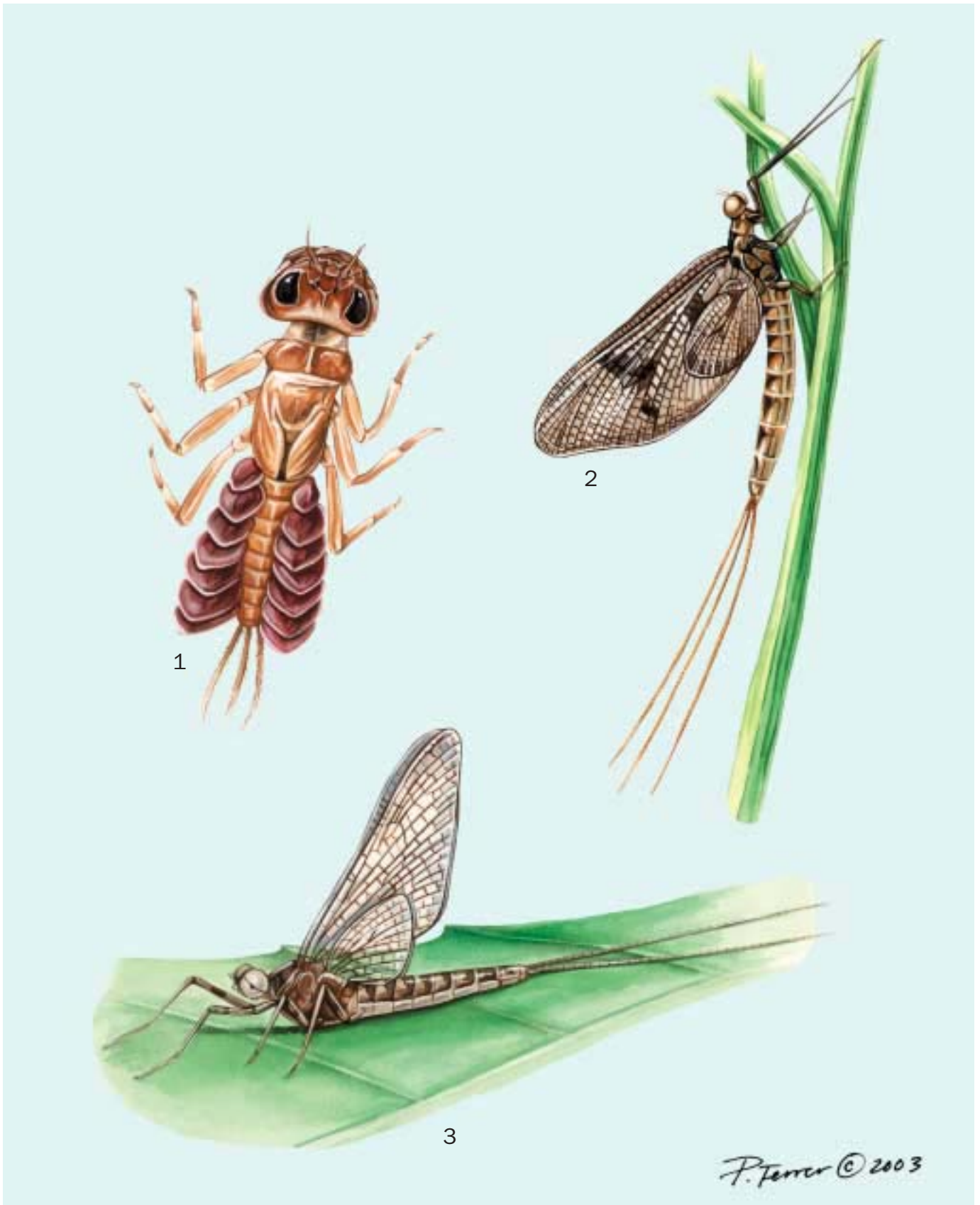
1. *Holjapyx diversiunguis*; 2. *Campodea fragilis*; 3. *Heterojapyx gallardi*. (Illustration by John Megahan)



1. *Trigoniophthalmus alternatus*; 2. *Neomachilellus scandens*; 3. *Petrobius brevistylis*. (Illustration by Jonathan Higgins)



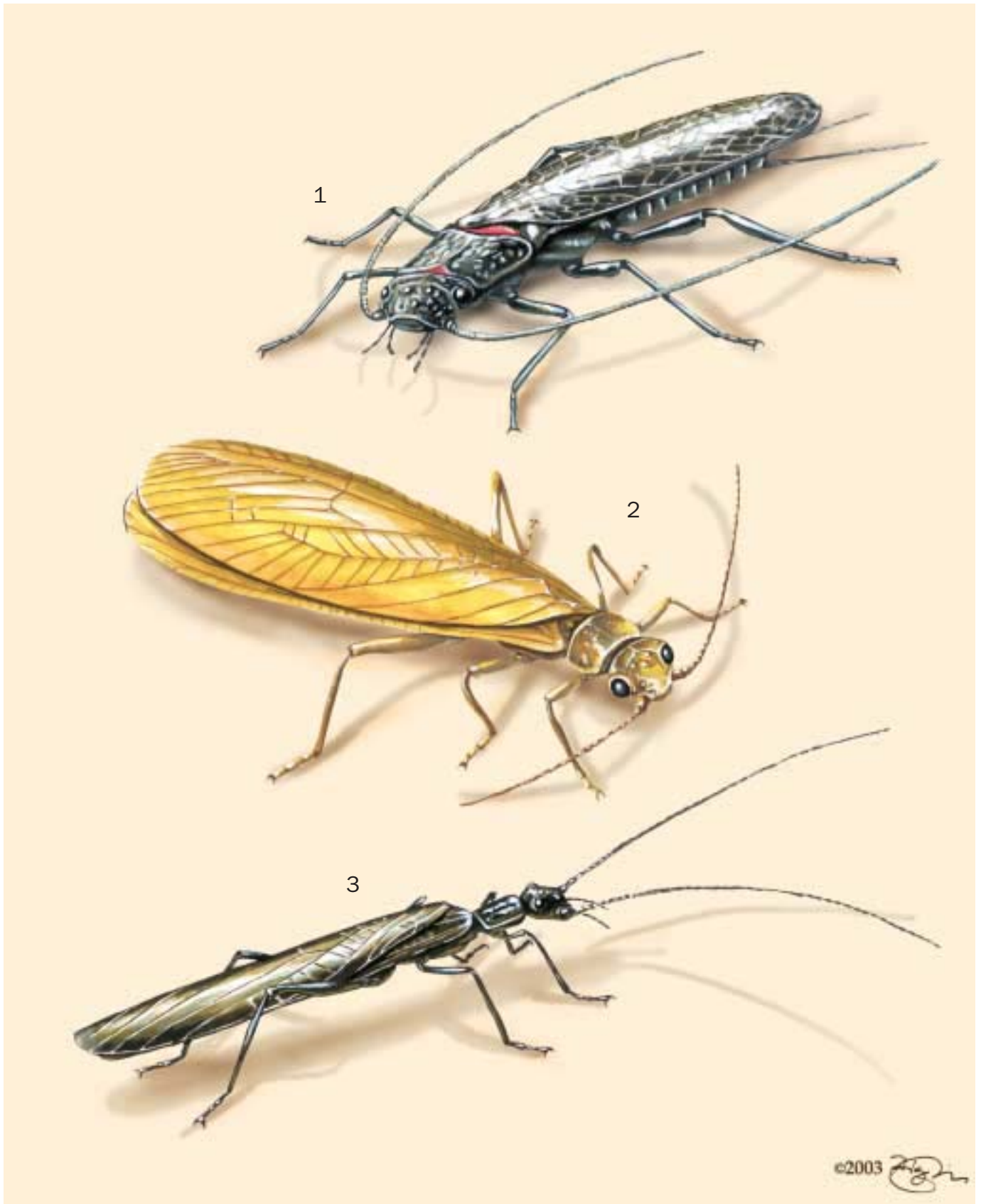
1. Relic silverfish (*Tricholepidion gertschi*); 2. Silverfish (*Lepisma saccharina*); 3. *Cubacubana spelaea*. (Illustration by Jonathan Higgins)



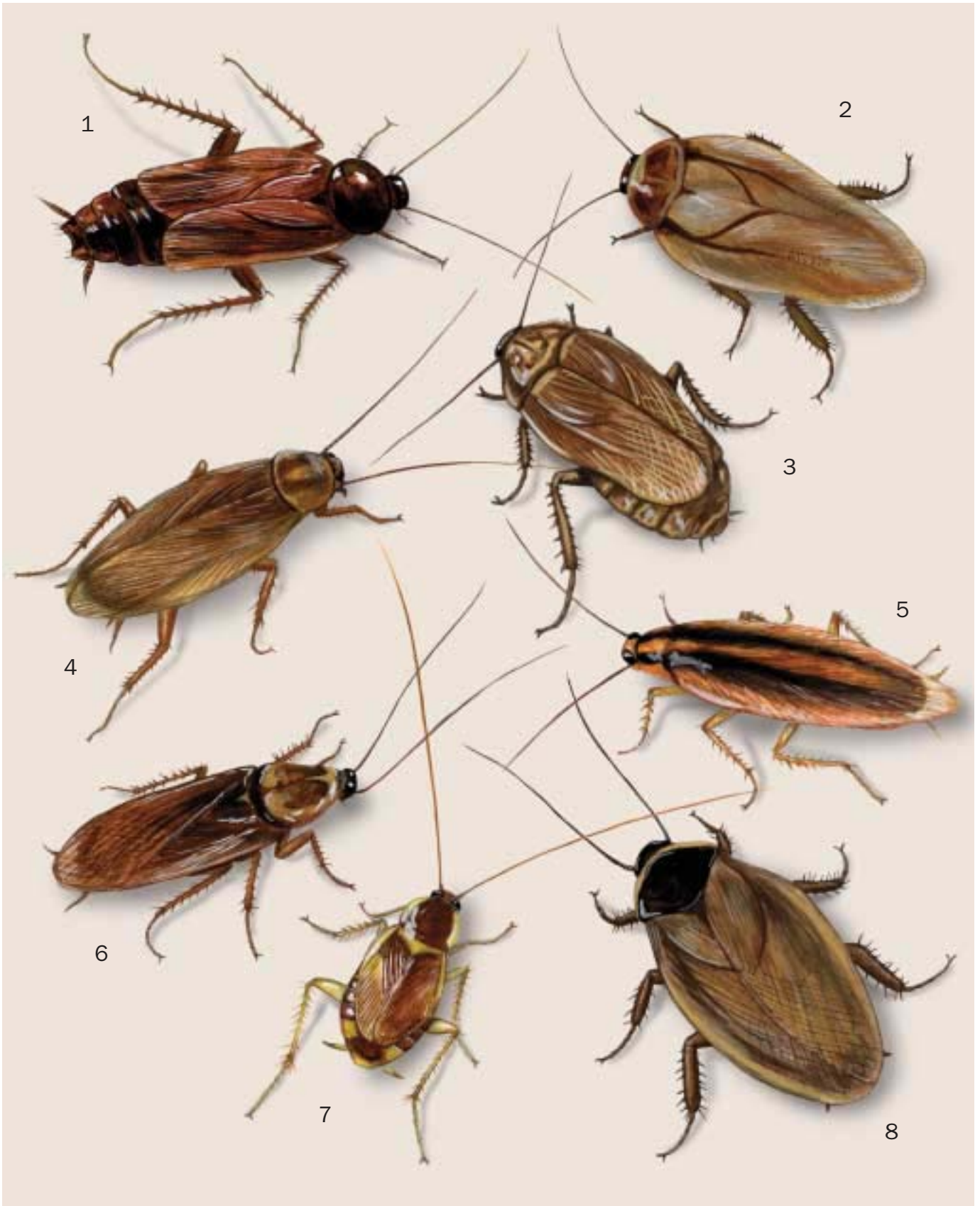
1. *Chilopterus eatoni* nymph stage; 2. *Ephemera vulgata*; 3. *Stenonema vicarium*. (Illustration by Patricia Ferrer)



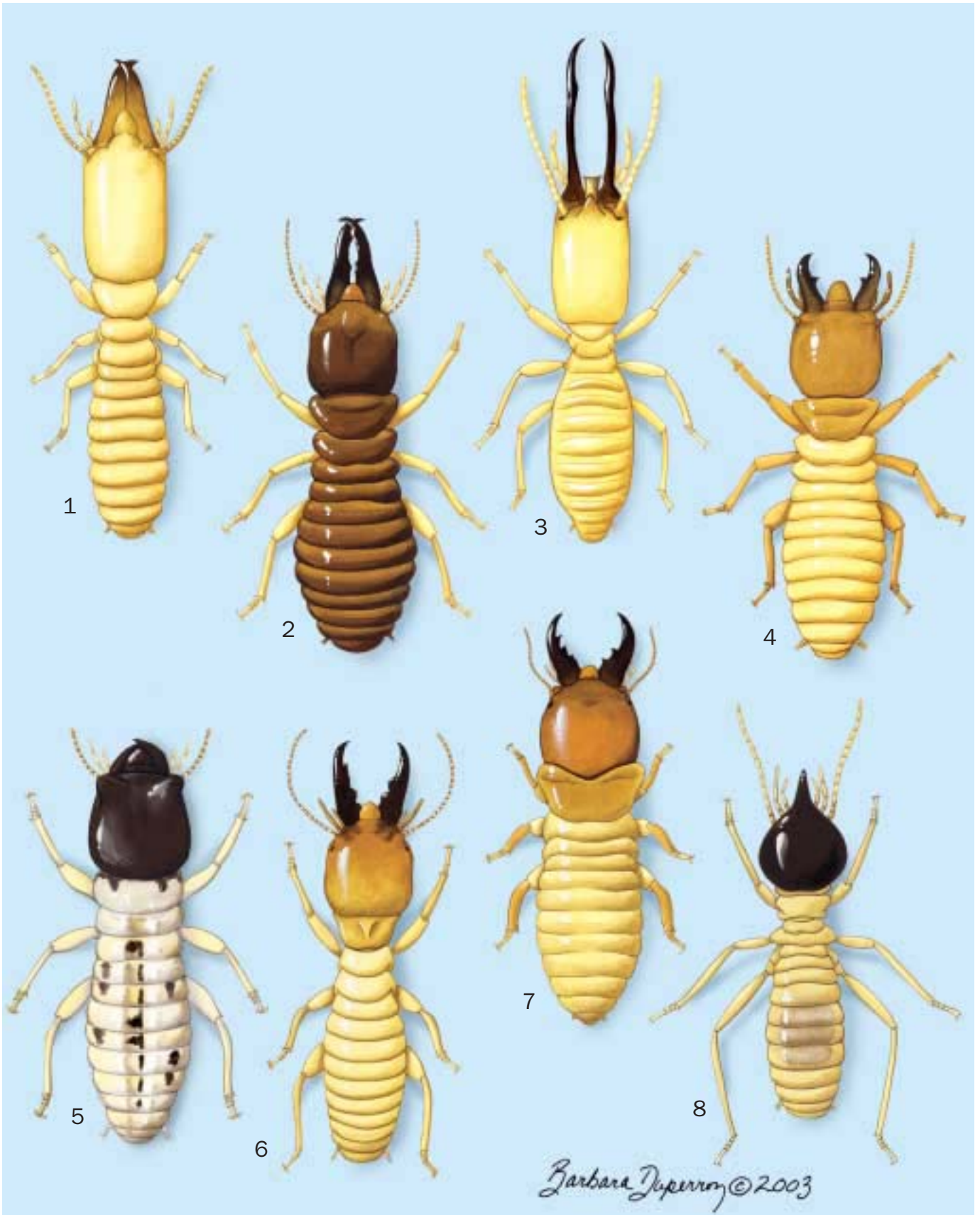
1. Living fossil (*Epiophlebia laidlawi*); 2. Forest giant (*Megaloprepus caerulatus*); 3. Wandering glider (*Pantala flavescens*). (Illustration by Jacqueline Mahannah)



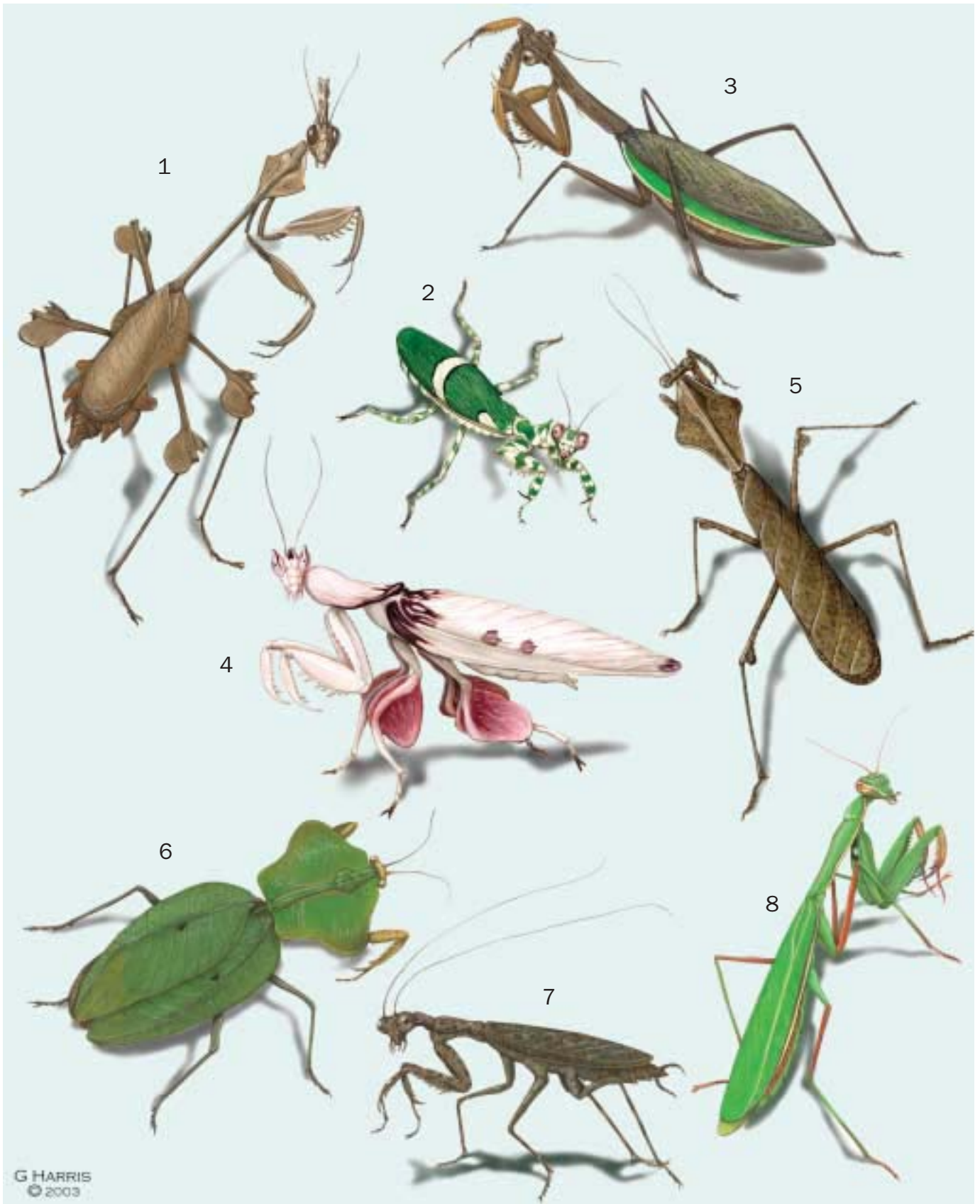
1. Giant salmonfly (*Pteronarcys californica*); 2. Golden stone (*Hesperoperla pacifica*); 3. Common needleyfly (*Zealectra claasseni*). (Illustration by Jonathan Higgins)



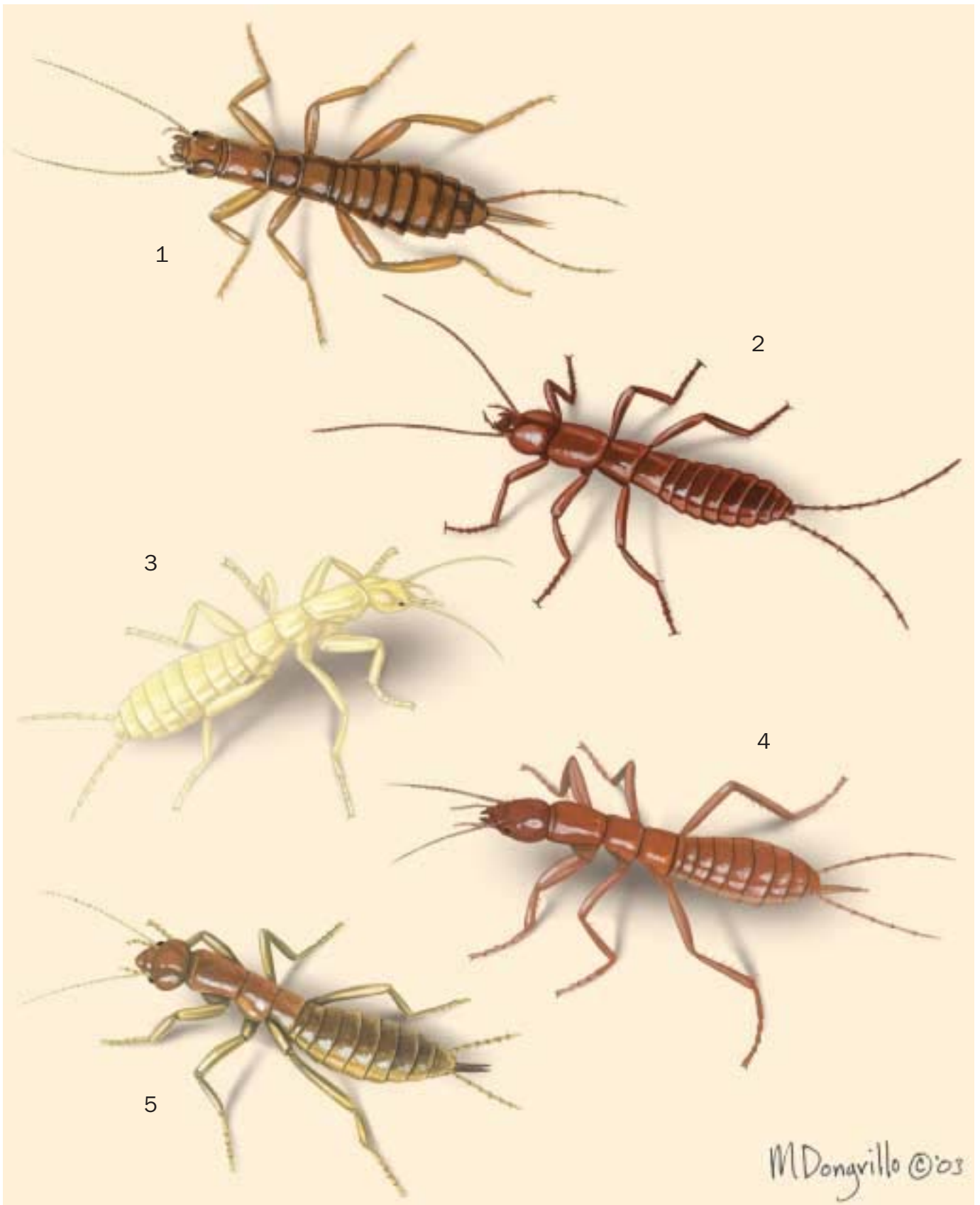
1. Oriental cockroach (*Blatta orientalis*); 2. Madeira cockroach (*Rhyparobia maderae*); 3. Cinereous cockroach (*Nauphoeta cinerea*); 4. German cockroach (*Blattella germanica*); 5. Asian cockroach (*Blattella asahinai*); 6. American cockroach (*Periplaneta americana*); 7. Brownbanded cockroach (*Supella longipalpa*); 8. Suriname cockroach (*Blatta surinamensis*). (Illustration by Amanda Smith)



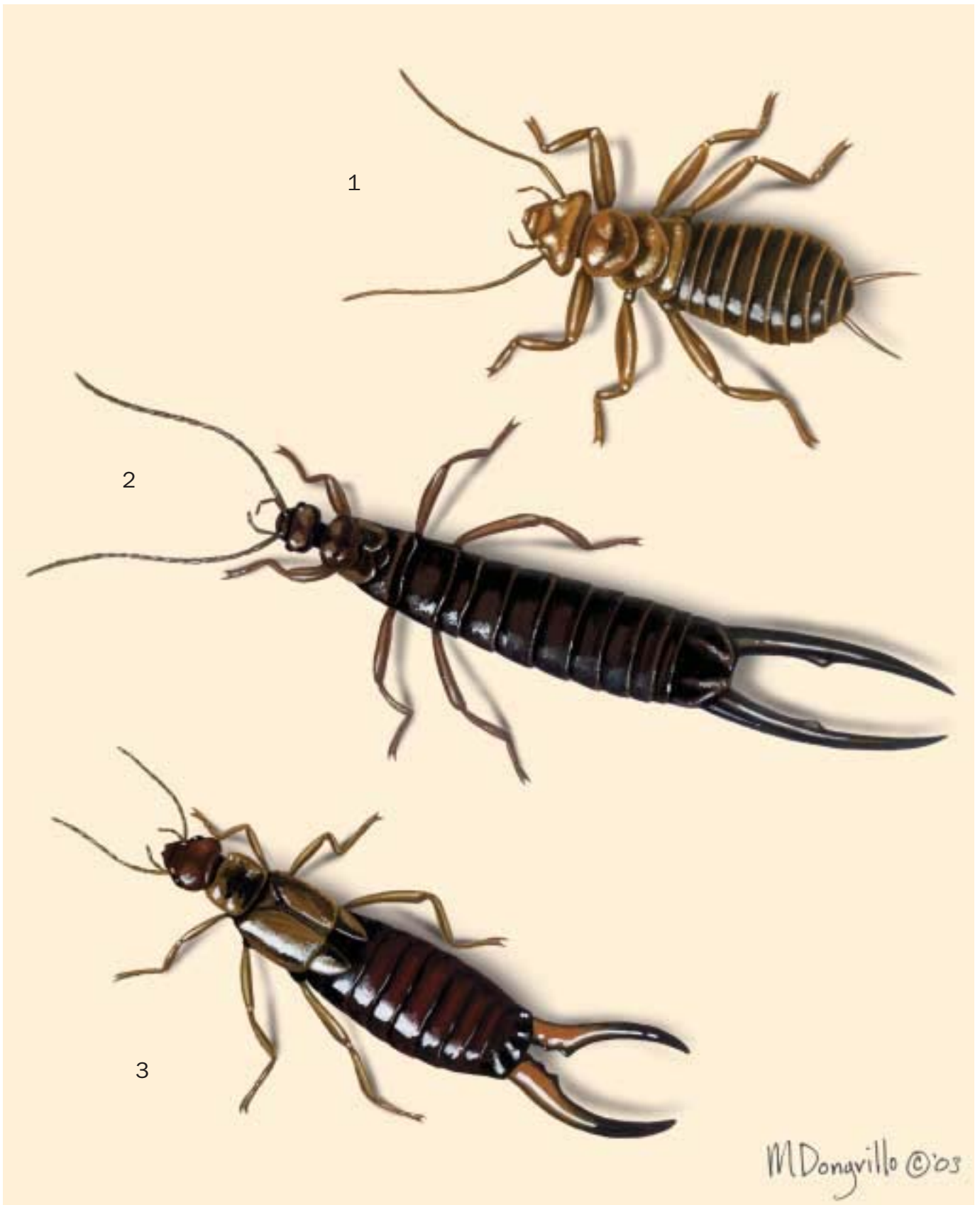
1. Eastern subterranean termite (*Reticulitermes flavipes*); 2. Black macrotermes (*Macrotermes carbonarius*); 3. Linnaeus's snapping termite (*Termites fatalis*); 4. Giant Australian termite (*Mastotermes darwiniensis*); 5. West Indian powderpost drywood termite (*Cryptotermes brevis*); 6. Wide-headed rottenwood termite (*Zootermopsis laticeps*); 7. Giant Sonoran drywood termite (*Pterotermes occidentis*); 8. Black-headed nasute termite (*Nasutitermes nigriceps*). (Illustration by Barbara Duperron)



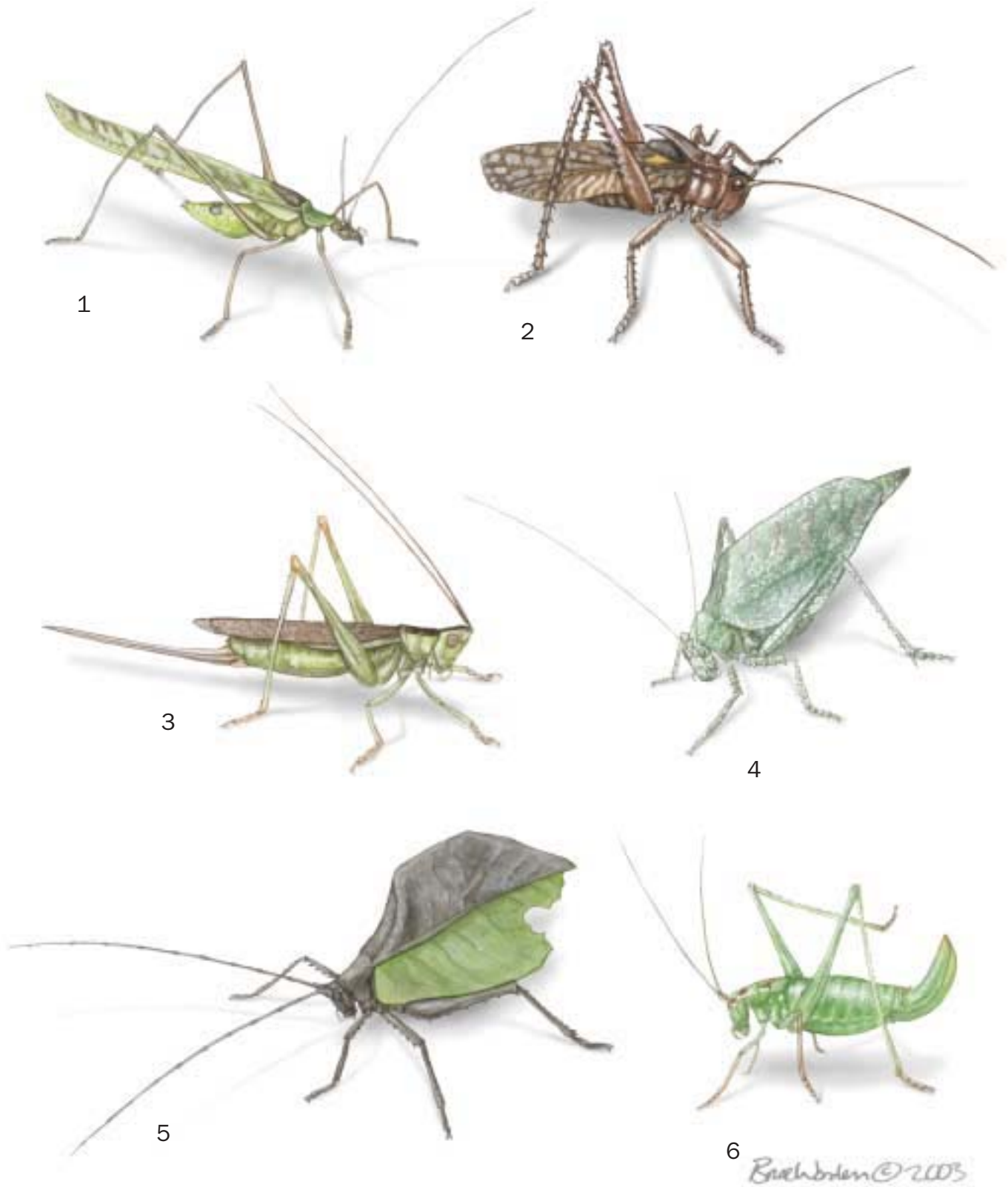
1. Wandering violin mantid (*Gongylus gongyloides*); 2. Boxer mantid (*Theopropus elegans*); 3. Chinese mantid (*Tenodera aridifolia sinensis*); 4. Orchid mantid (*Hymenopus coronatus*); 5. Dead-leaf mantid (*Deroplatys lobata*); 6. *Choeradodis rhomboidea*; 7. *Liturgusa charpentieri*; 8. European mantid (*Mantis religiosa*). (Illustration by Gillian Harris)



1. Pravdin's rock-crawler (*Grylloblattella pravdini*); 2. Biryong rock-crawler (*Namkungia biryongensis*); 3. Japanese rock-crawler (*Galloisiana nipponensis*); 4. Djakonov's rock-crawler (*Grylloblattina djakonovi*); 5. Northern rock-crawler (*Grylloblatta campodeiformis*). (Illustration by Marguette Dongvillo)



1. *Arixenia esau*; 2. St. Helena earwig (*Labidura herculeana*); 3. European earwig (*Forficula auricularia*). (Illustration by Marguette Dongvillo)



1. Balsam beast (*Anthophiloptera dryas*); 2. Hispaniola hooded katydid (*Polyancistrus serrulatus*); 3. Long-winged conehead (*Conocephalus discolor*); 4. Speckled rossophyllum (*Rossophyllum maculosum*); 5. Dead leaf mimetica (*Mimetica mortuifolia*); 6. Speckled bush-cricket (*Leptophyes punctatissima*). (Illustration by Bruce Worden)



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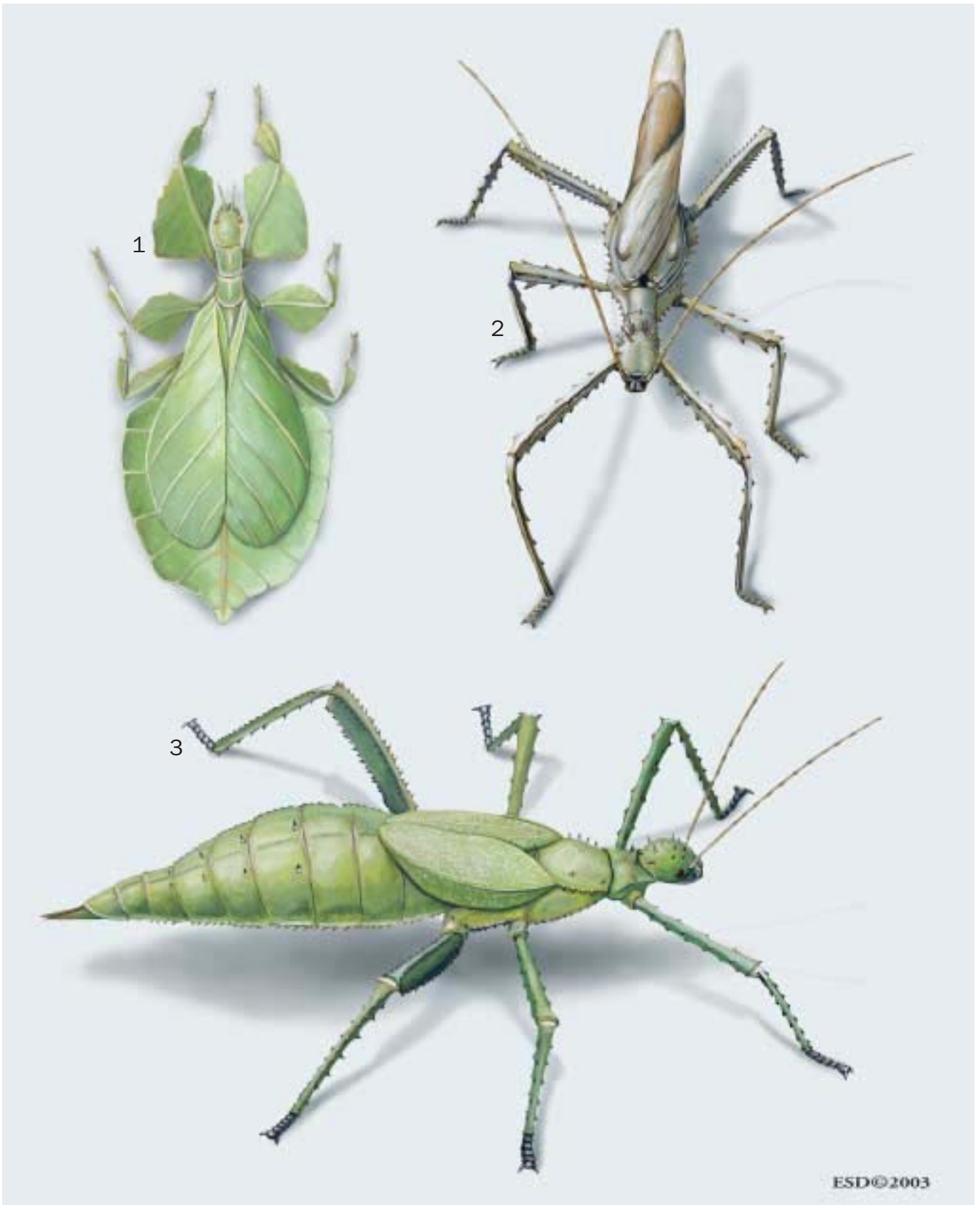
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1. Variegated grasshopper (*Zonocerus variegatus*); 2. Greenhouse camel cricket (*Tachycines asynamorus*); 3. Beetle cricket (*Rhabdotogryllus caraboides*); 4. Field grasshopper (*Chorthippus brunneus*); 5. Suriname clicking cricket (*Eneoptera surinamensis*). (Illustration by Bruce Worden)



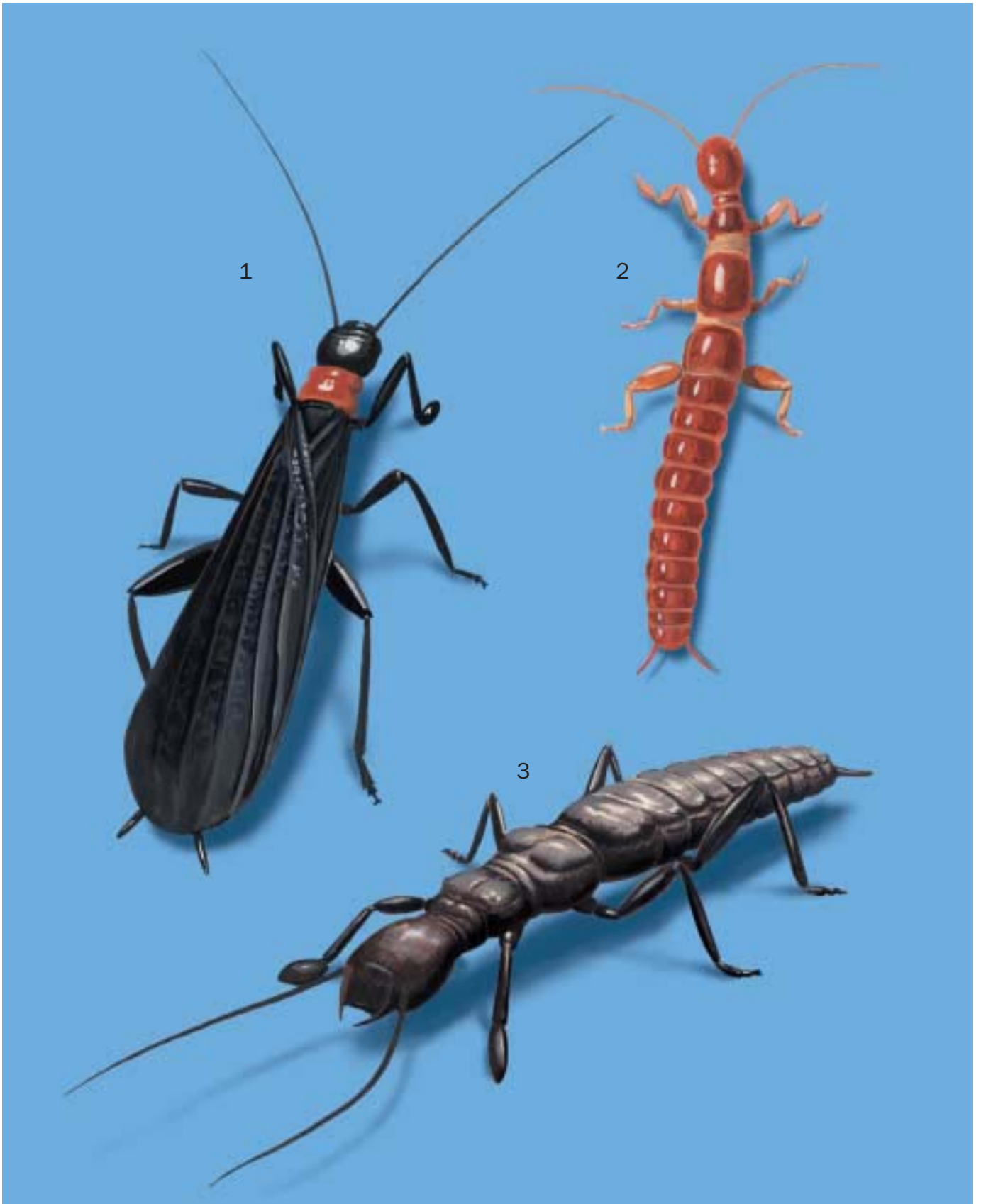
1. Female Darwin stick insect (*Eurychema osiris*); 2. Female Macleay's spectre (*Extatosoma tiaratum*). (Illustration by Emily Damstra)



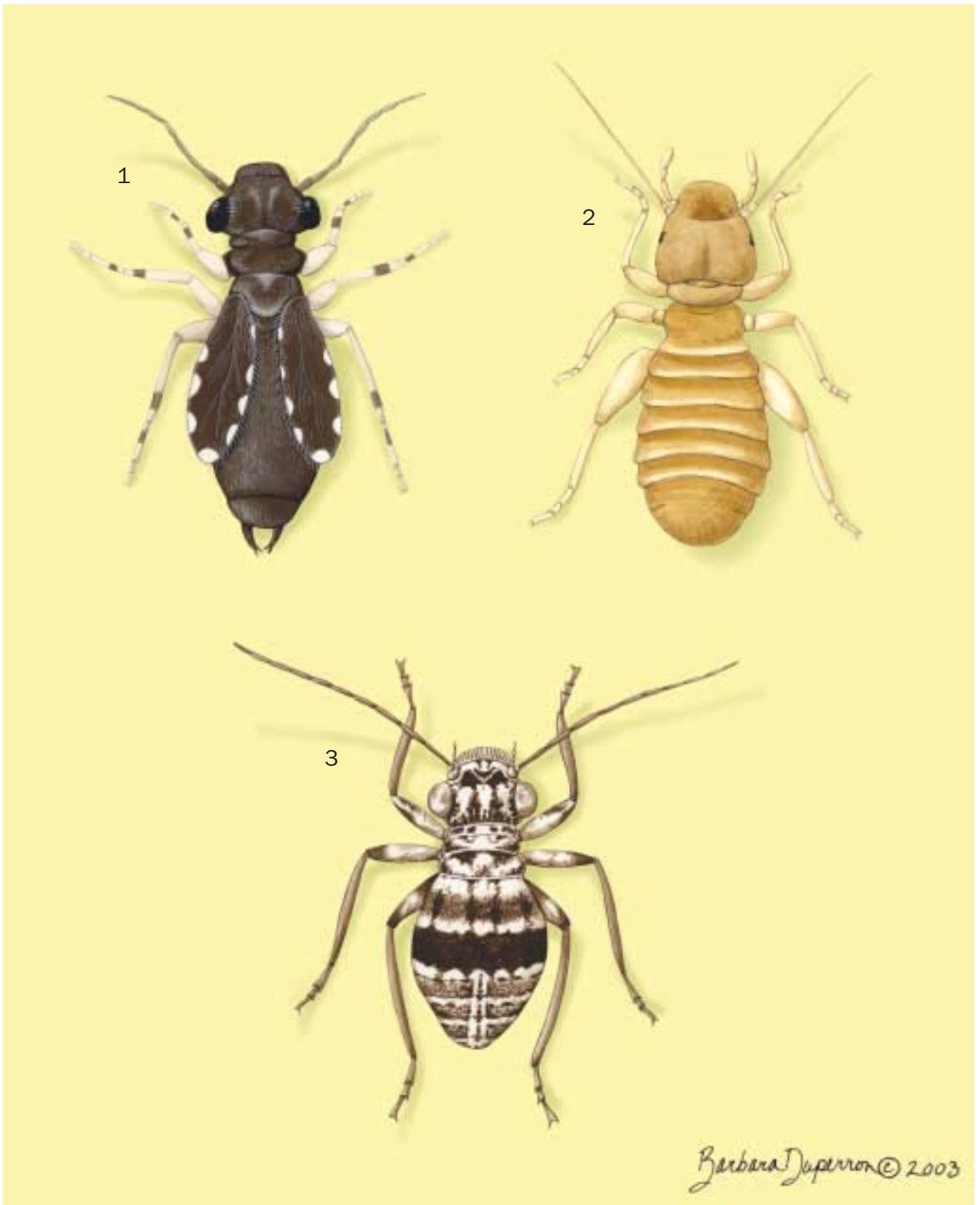
1. Javan leaf insect (*Phyllium* [*Pulchriphyllum*] *bioculatum*); 2. Male jungle nymph (*Heteropteryx dilatata*); 3. Female jungle nymph (*H. dilatata*). (Illustration by Emily Damstra)



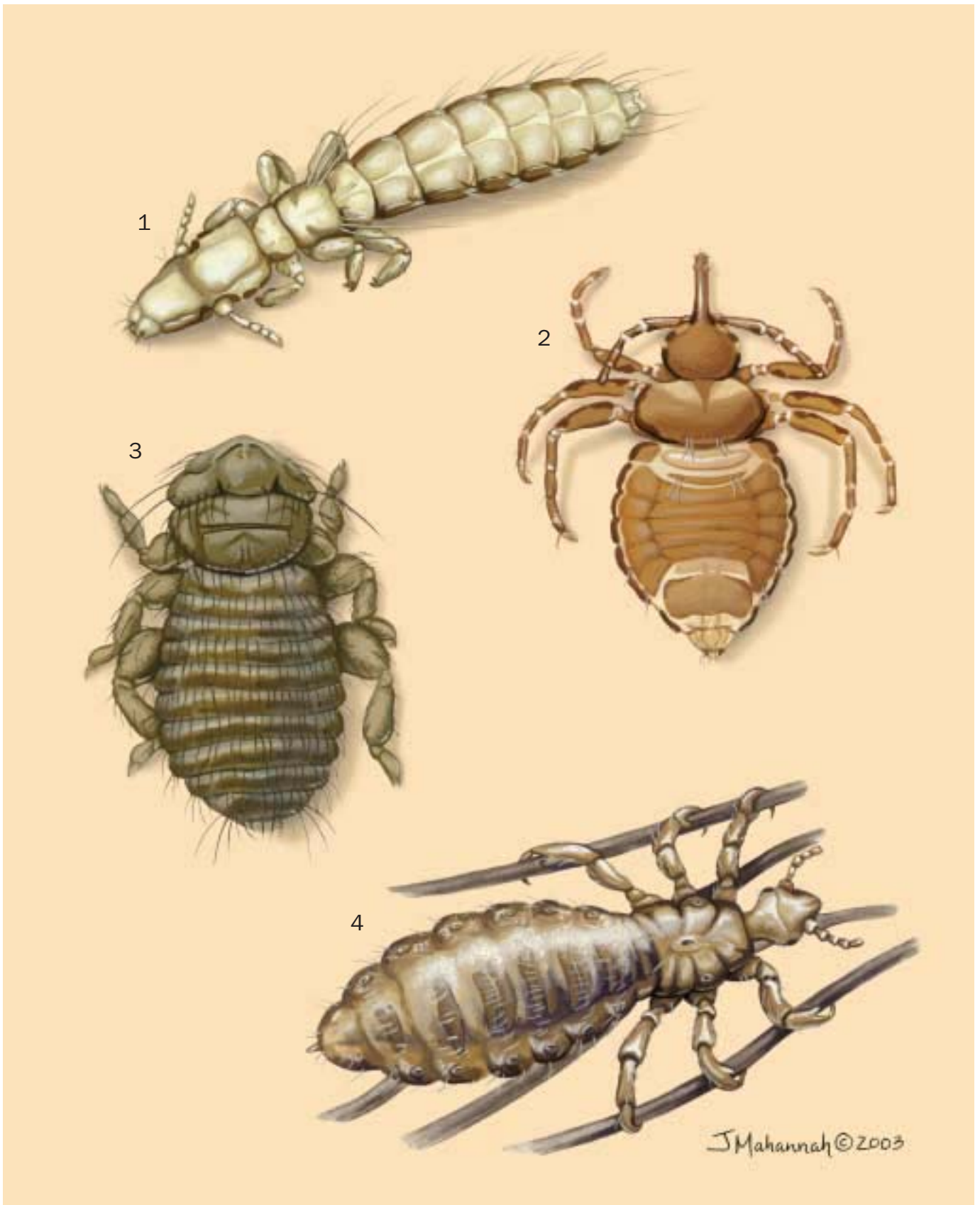
1. Female Indian stick insect (*Carausius morosus*); 2. Female Thunberg's stick insect (*Macynia labiata*); 3. Female coconut stick insect (*Graefea crouanii*); 4. Female Mediterranean stick insect (*Bacillus rossius*); 5. Female common American walking stick (*Diaphecomera femorata*). (Illustration by Emily Damstra)



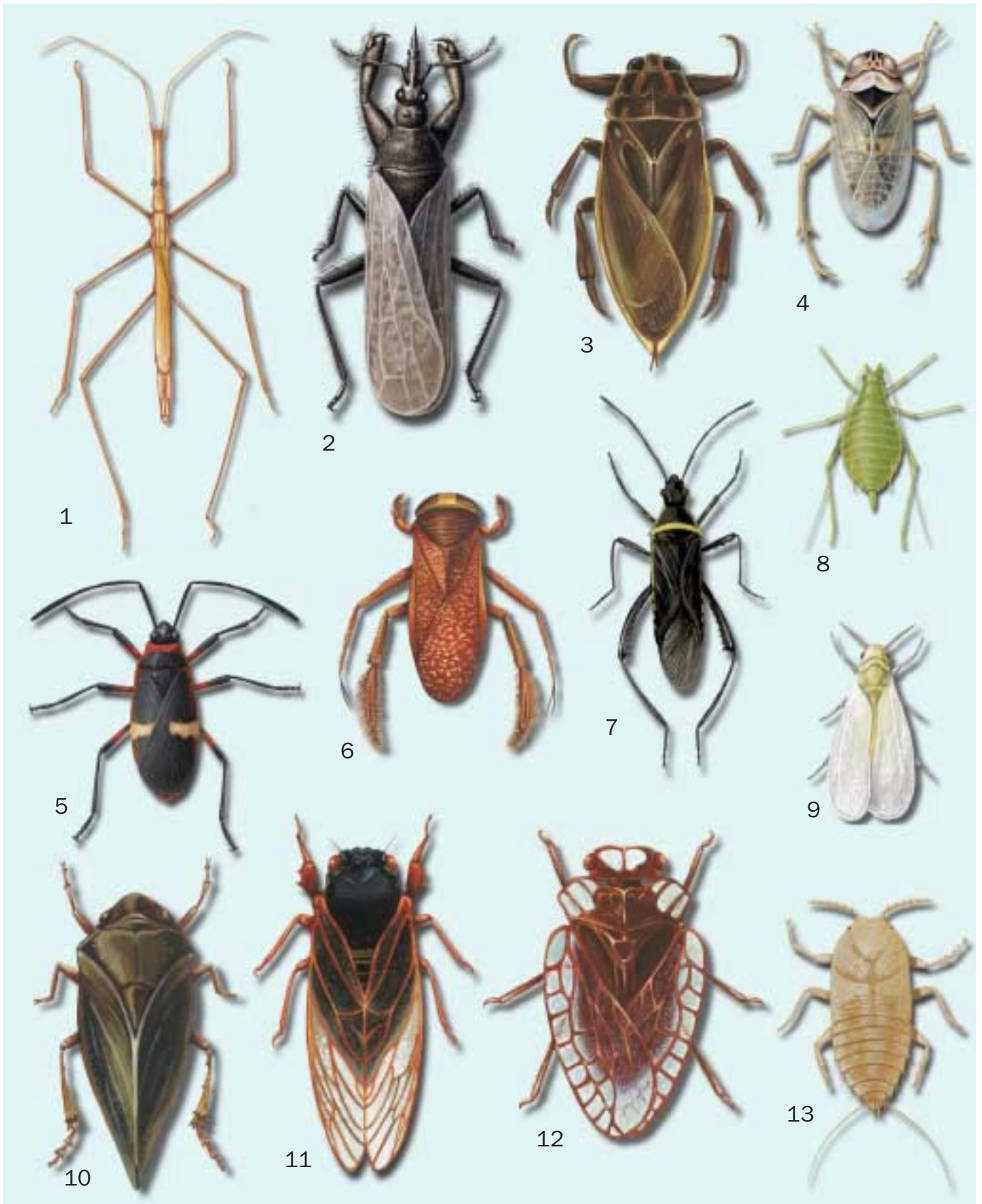
1. Adult male *Antipaluria urichi*; 2. Adult female Saunders embiid (*Oligotoma saundersii*); 3. Adult female *Australembia rileyi*. (Illustration by John Megahan)



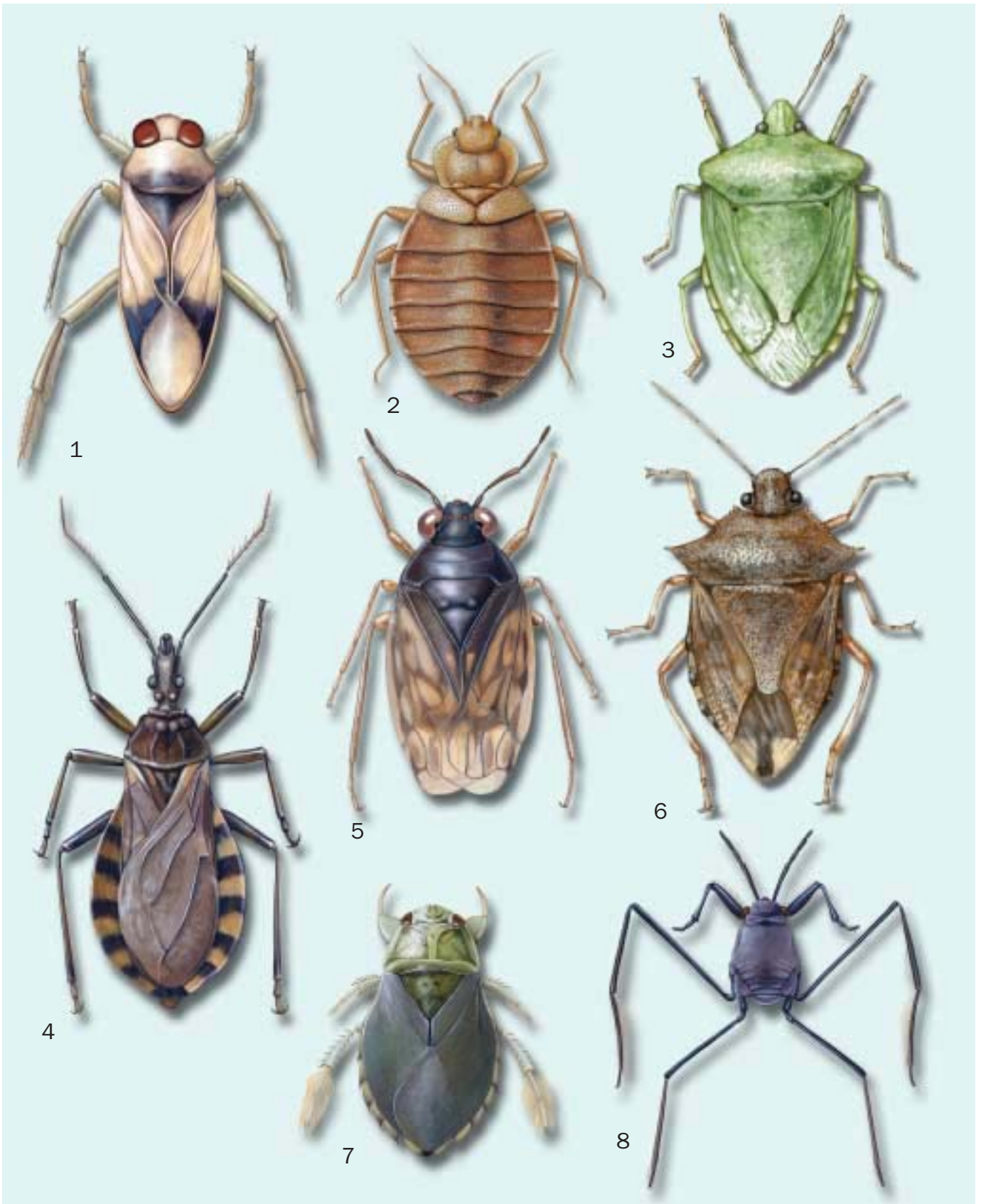
1. *Psoquilla marginepunctata*; 2. *Liposcelis bostrychophila*; 3. *Mesopsocus unipunctatus*. (Illustration by Barbara Duperron)



1. Slender pigeon louse (*Columbicola columbae*); 2. Elephant louse (*Haematomyzus elephantis*); 3. Wandering seabird louse (*Ancistronea vagelli*); 4. Human head/body louse (*Pediculus humanus*). (Illustration by Jacqueline Mahannah)



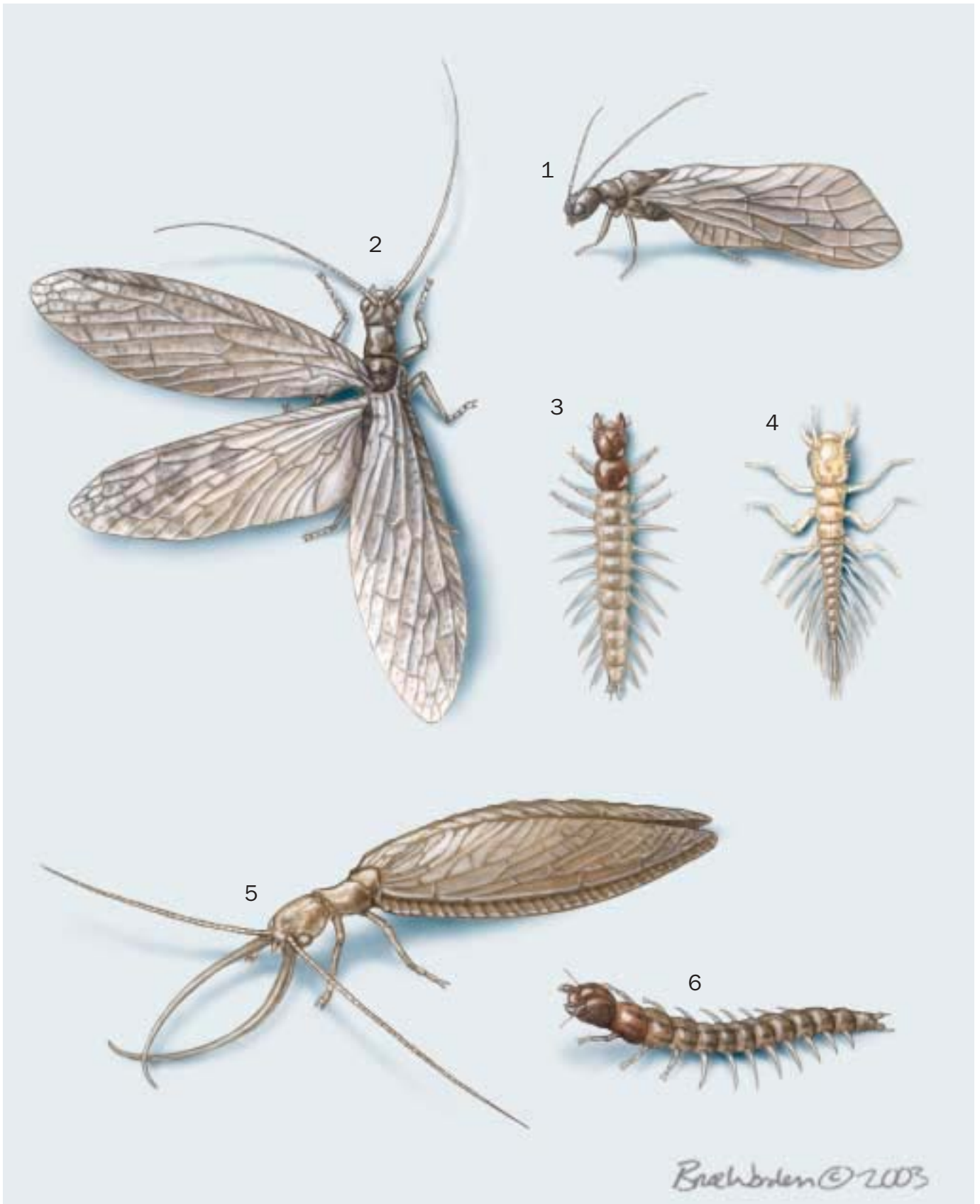
1. Water measurer (*Hydrometra argentina*) 2. Unique-headed bug (*Gamostolus subantarcticus*); 3. Giant water bug (*Lethocerus maximus*); 4. Delphacid treehopper (*Delphacodes kuscheli*); 5. Staining bug (*Dysdercus albofasciatus*); 6. Water boatman (*Sigara platensis*); 7. Tomato bug (*Phthia picta*); 8. Pea aphid (*Acyrthosiphon pisum*); 9. Greenhouse whitefly (*Trialeurodes vaporariorum*); 10. Spittle bug (*Cephus siccifolius*); 11. Seventeen-year cicada (*Magicicada septendecim*); 12. Moss bug (*Peloridium hammoniorum*); 13. Rhodesgrass mealybug (*Antonina graminis*). (Illustration by Katie Nealis)



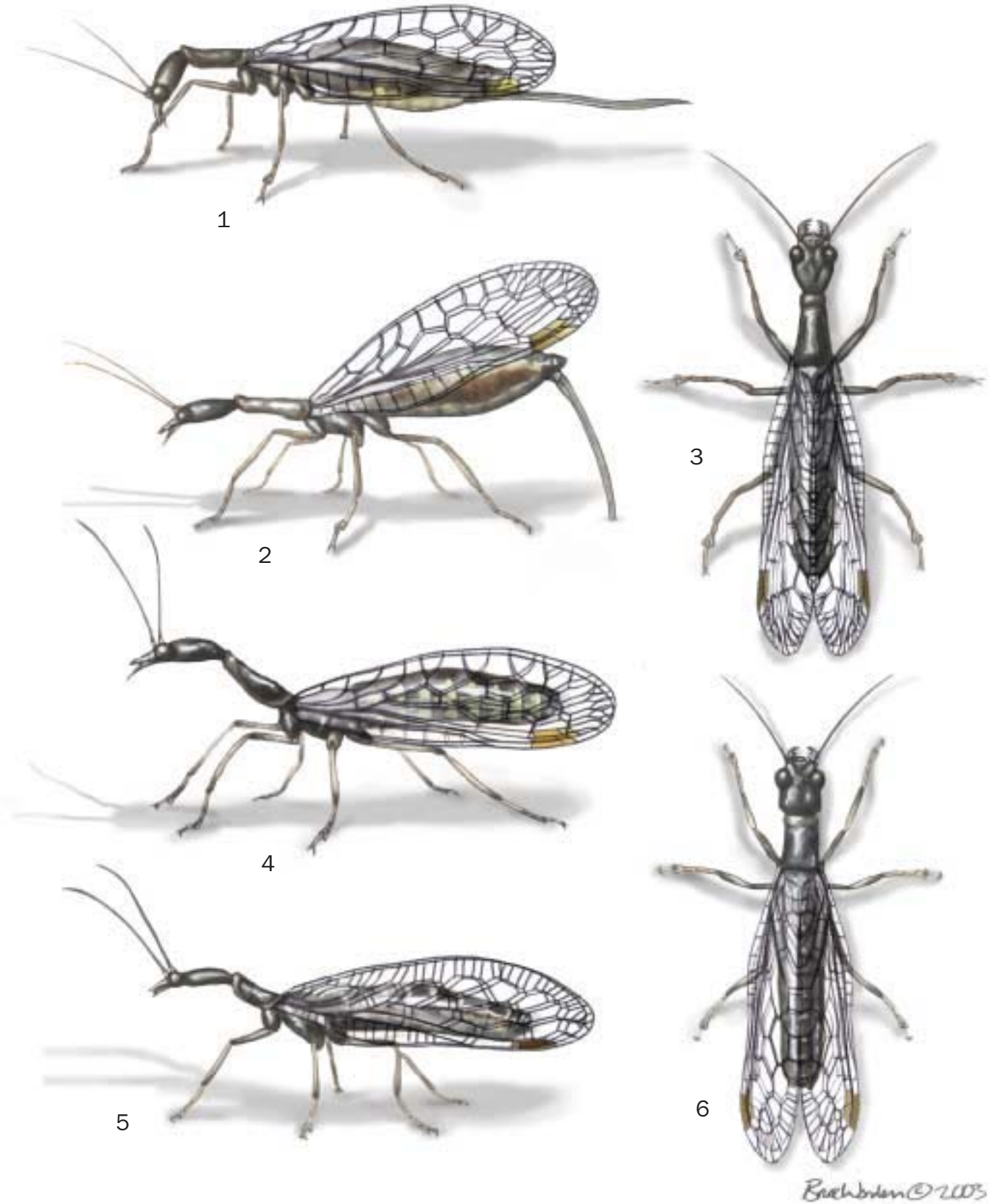
1. Backswimmer (*Notonecta sellata*); 2. Bed bug (*Cimex lectularius*); 3. Southern green stink bug (*Nezara viridula*); 4. Kissing bug (*Triatoma infestans*); 5. Shore bug (*Saldula coxalis*); 6. Spiny soldier bug (*Podisus maculiventris*); 7. Creeping water bug (*Ilyocoris cimicoides*); 8. Sea skater (*Halobates micans*). (Illustration by Emily Damstra)



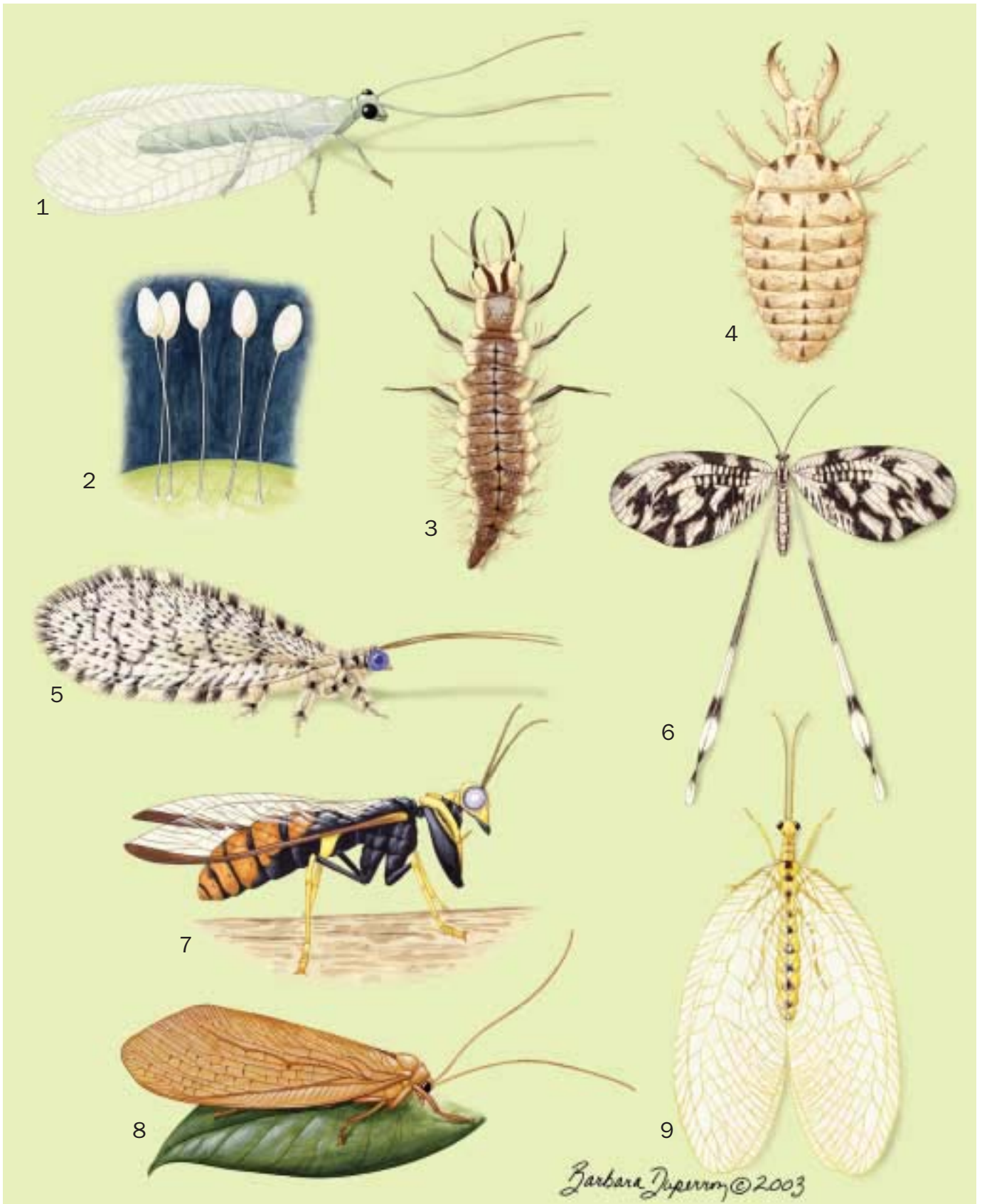
1. Crowned thrips (*Ecacanthothrips tibialis*); 2. Western flower thrips (*Frankliniella occidentalis*). (Illustration by John Megahan)



1. Alderfly (*Sialis lutaria*) adult; 2. Dobsonfly (*Archichauliodes diversus*) adult; 3. Black creeper (*A. diversus* larva); 4. *S. lutaria* larva; 5. Eastern dobsonfly (*Corydalus cornutus* adult); 6. *C. cornutus* larva. (Illustration by Bruce Worden)



1. Female Schremmer's snakefly (*Alena [Aztekoraphidia] schremmeri*); 2. Female yellow-footed snakefly (*Dichrostigma flavipes*); 3. Female common European snakefly (*Phaeostigma [Phaeostigma] notata*); 4. Male wart-headed Uzbekian snakefly (*Mongoloraphidia [Usbekoraphidia] josifovi*); 5. Male Schummel's inocelliid snakefly (*Inocellia crassicornis*); 6. Male Brauer's inocelliid snakefly (*Parainocellia braueri*). (Illustration by Bruce Worden)



1. Green lacewing (*Mallada albobfascialis*) adult; 2. Green lacewing (*M. albobfascialis*) eggs; 3. Green lacewing (*M. albobfascialis*) larva; 4. Antlion (*Myrmeleon formicarius*) larva; 5. Beaded lacewing (*Spermophorella maculatissima*); 6. Spoonwing lacewing (*Nemoptera sinuata*); 7. Mantis lacewing (*Euclimacia torquata*); 8. Moth lacewing (*Megalithone tillyardi*); 9. Norfolius (*Norfolius howensis*). (Illustration by Barbara Duperron)



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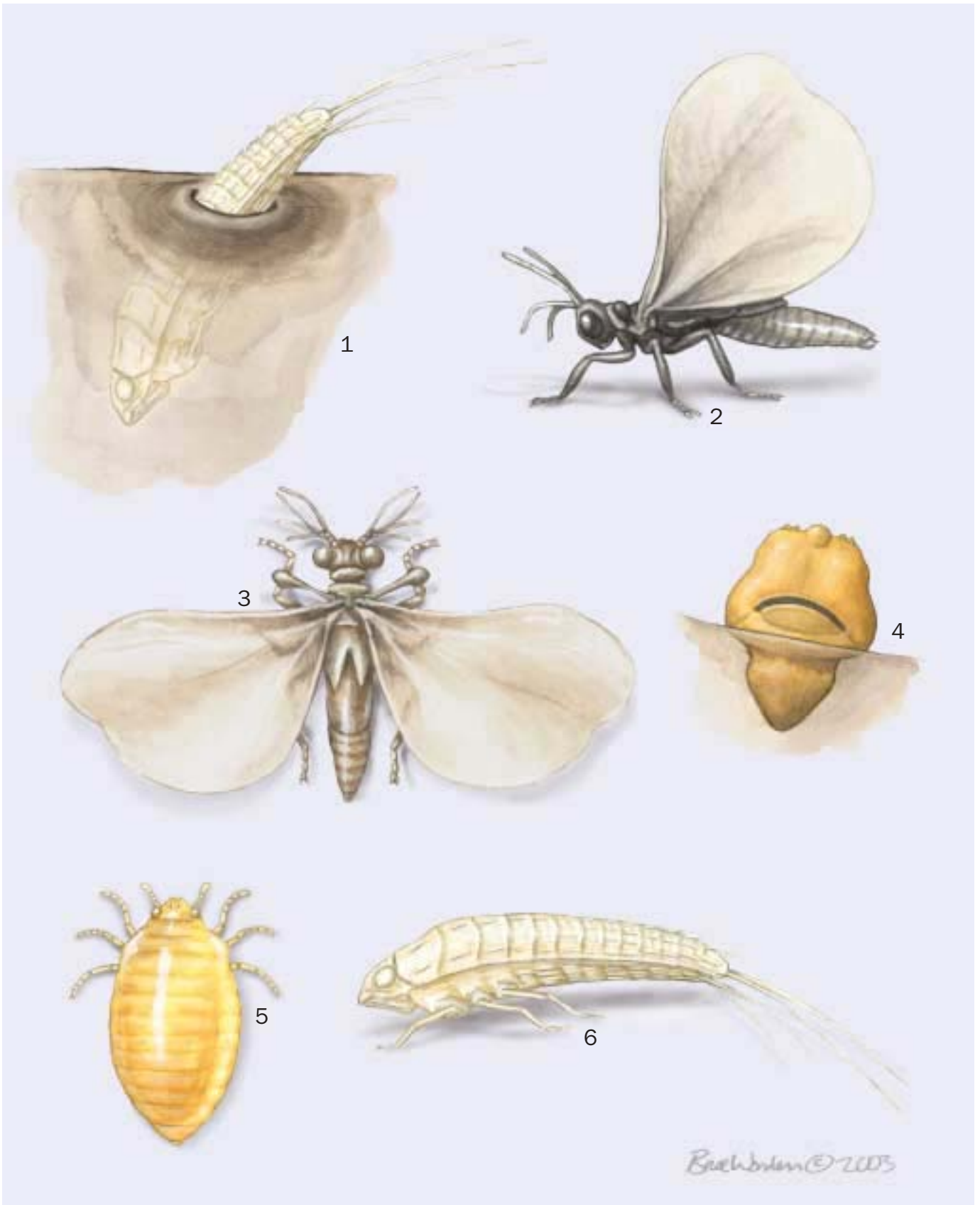
1. Sacred scarab (*Scarabaeus sacer*); 2. Whirligig beetle (*Dineutus discolor*); 3. Cupedid beetle (*Priacma serrata*); 4. Great water beetle (*Dytiscus marginalis*); 5. Pink glowworm (*Microphotus angustus*); 6. Spanish fly (*Lytta vesicatoria*). (Illustration by Joseph E. Trumpey)



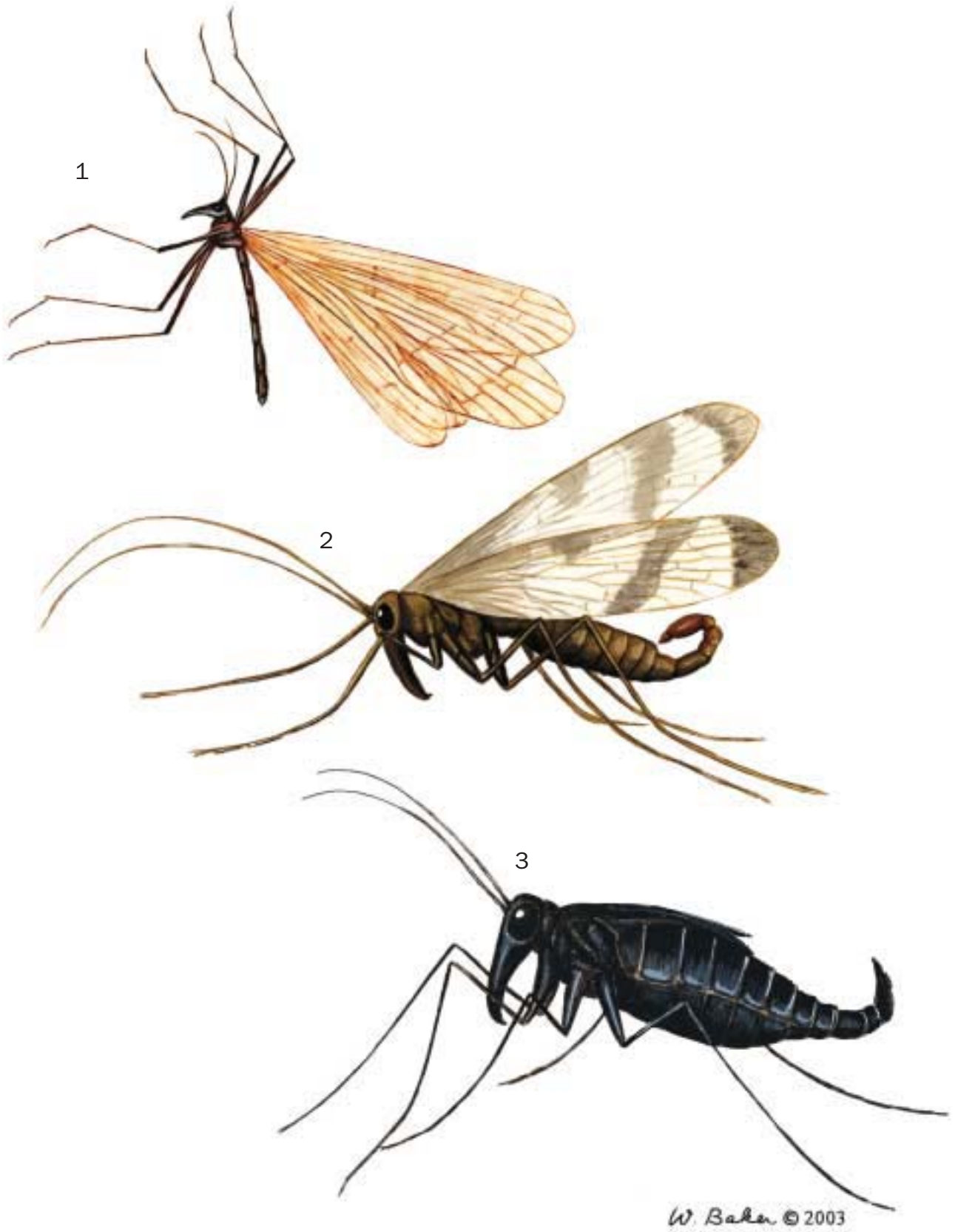
1. American burying beetle (*Nicrophorus americanus*); 2. Eyed click beetle (*Alaus oculatus*); 3. Lion beetle (*Ulochaetes leoninus*); 4. Non-jeweled ma'kech (*Zopherus chilensis*); 5. Jeweled ma'kech (*Z. chilensis*); 6. Devil's coach-horse (*Ocyopus olens*); 7. Giraffe-necked weevil (*Trachelophorus giraffa*). (Illustration by Joseph E. Trumpey)



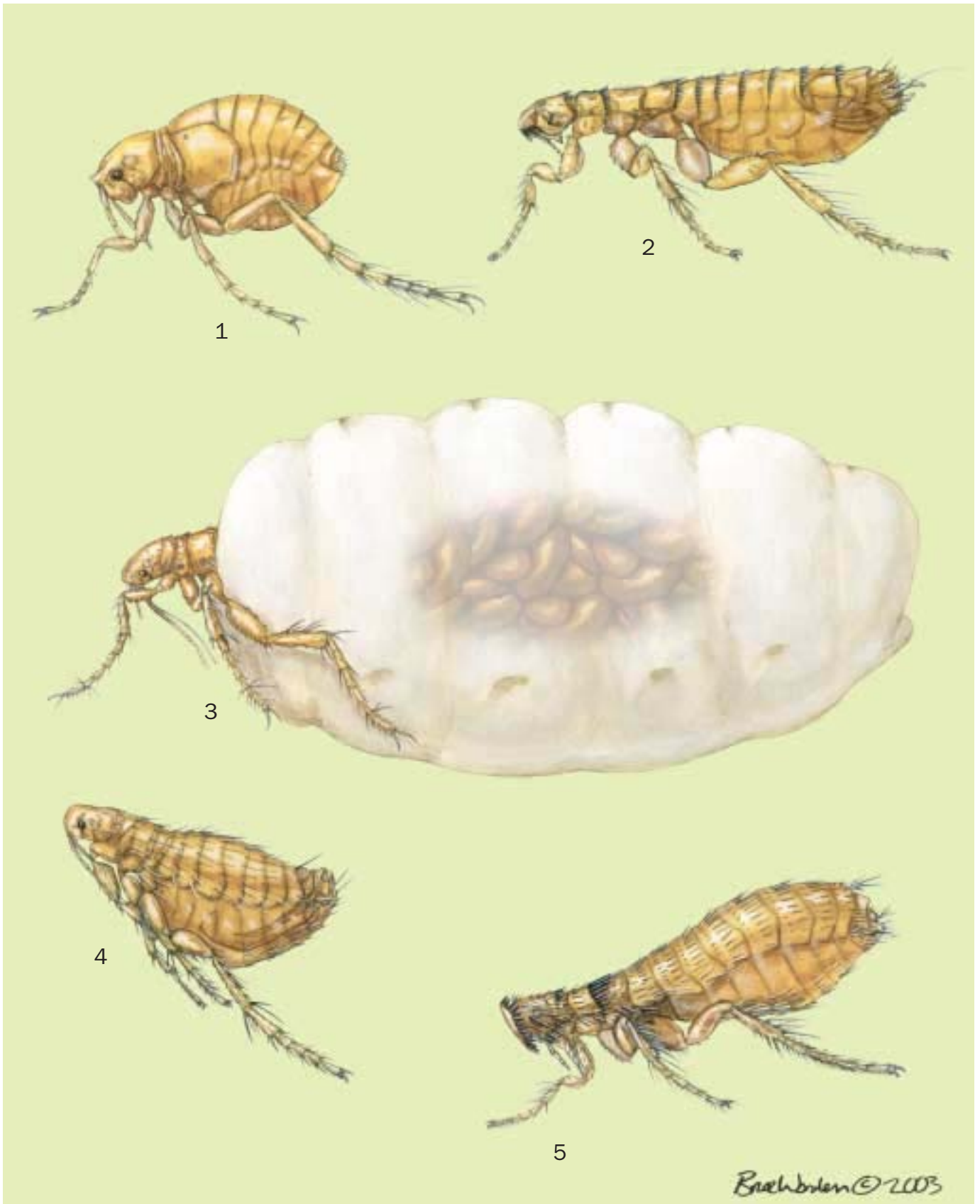
1. Titanic longhorn beetle (*Titanus gigantea*); 2. Giant metallic ceiba borer (*Euchroma gigantea*); 3. Female European stag beetle (*Lucanus cervus*); 4. Male European stag beetle (*L. cervus*); 5. Female Hercules beetle (*Dynastes hercules*) 6. Male Hercules beetle (*D. hercules*). (Illustration by Joseph E. Trumpey)



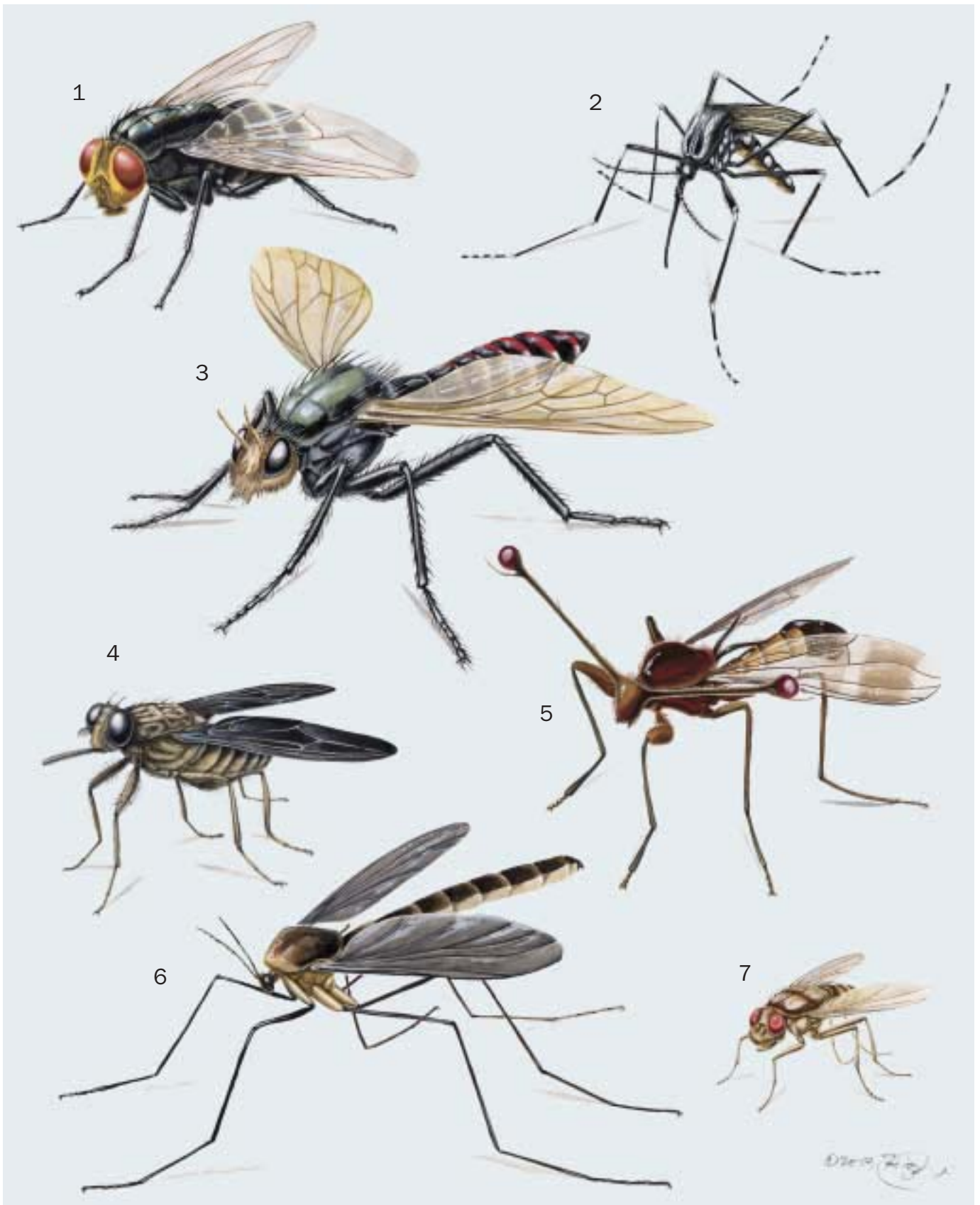
1. *Stichotrema dallatorreanum* adult; 2. *S. dallatorreanum* larva; 3. *Halictophagus naulti* adult; 4. *H. naulti* larva; 5. *Eoxenos laboulbenei* adult; 6. *E. laboulbenei* larva. (Illustration by Bruce Worden)



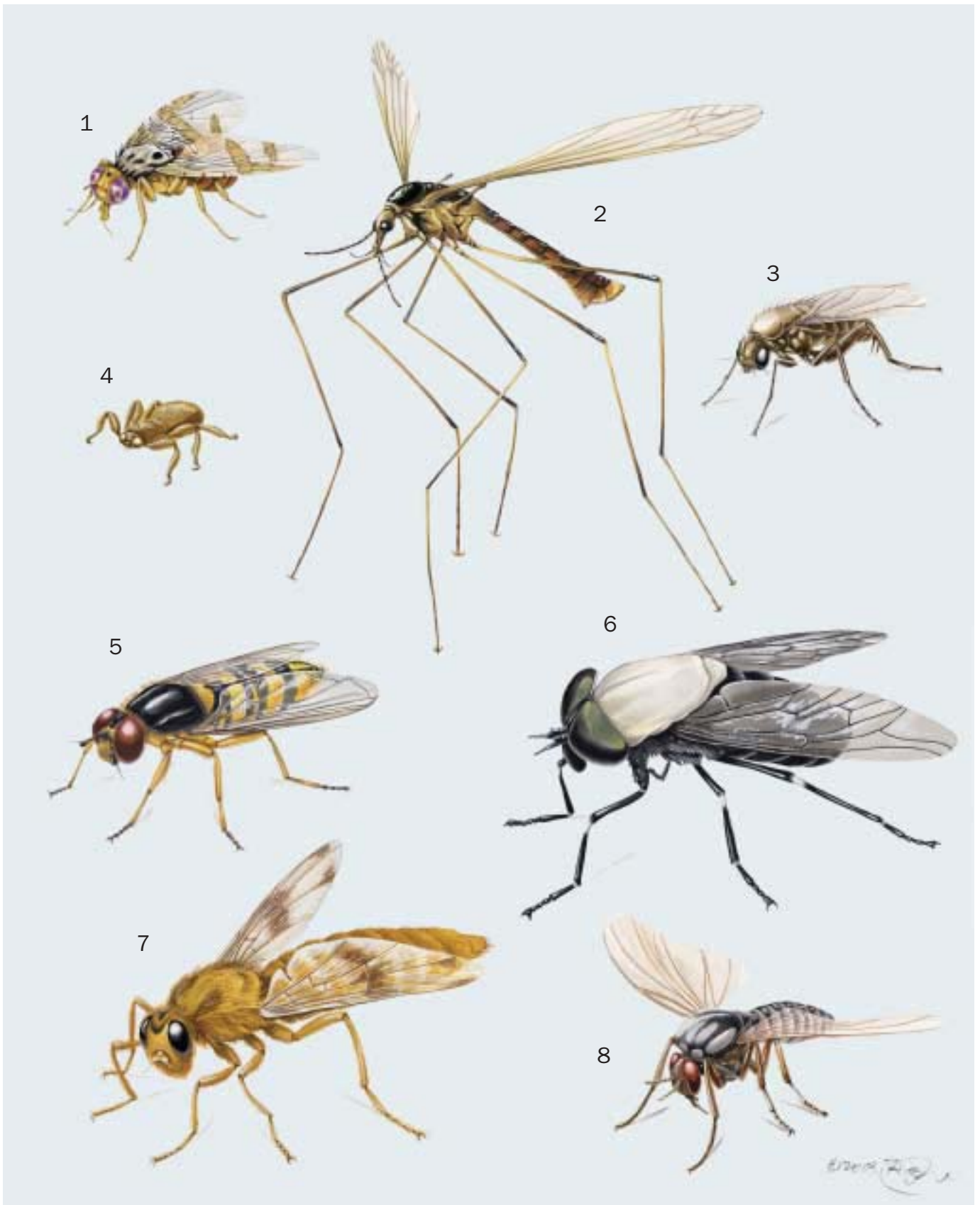
1. Black-tipped hangingfly (*Hylobittacus apicalis*); 2. *Panorpa nuptialis*; 3. Snow scorpionfly (*Boreus brumalis*). (Illustration by Wendy Baker)



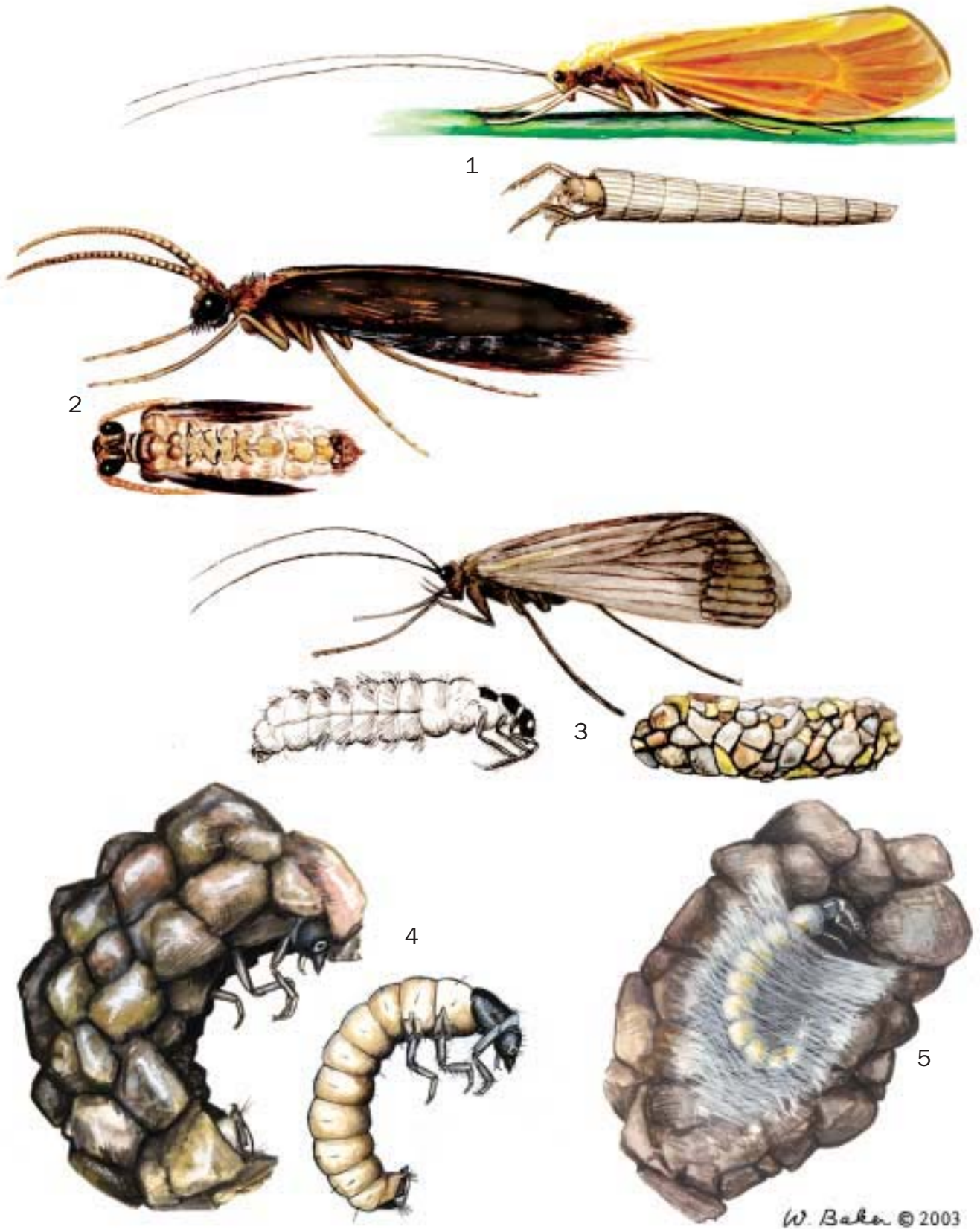
1. Chigoe (*Tunga penetrans*); 2. Bat flea (*Ischnopsyllus octactenus*); 3. Sheep and goat flea (*Dorcadia ioffi*); 4. Oriental rat flea (*Xenopsylla cheopis*); 5. Helmet flea (*Stephanocircus dasyuri*). (Illustration by Bruce Worden)



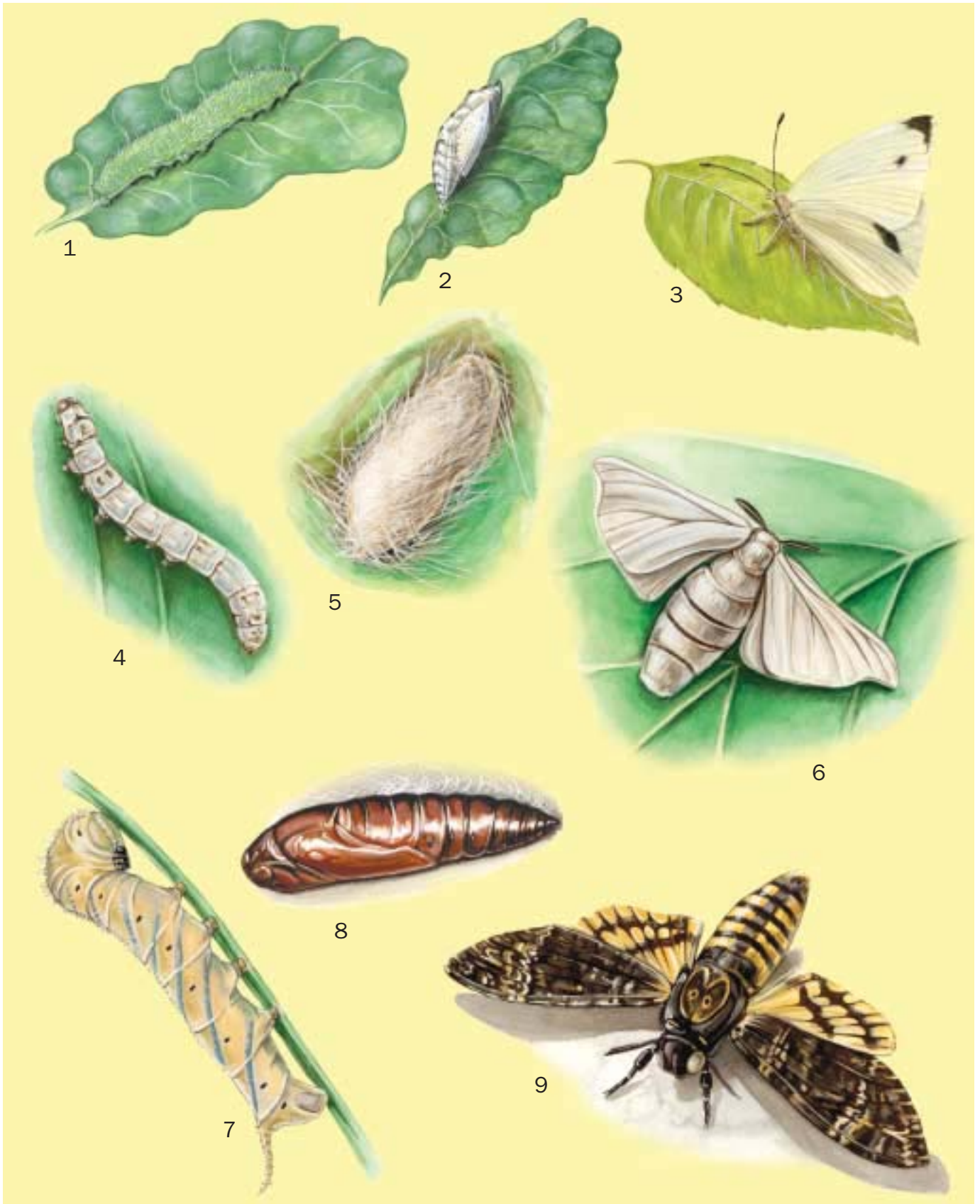
1. New World primary screwworm (*Cochliomyia hominivorax*); 2. Yellow fever mosquito (*Aedes aegypti*); 3. *Dasygogon diadema*; 4. Tsetse fly (*Glossina palpalis*); 5. *Cyrtodiopsis dalmanni*; 6. New Zealand glowworm (*Arachnocampa luminosa*); 7. Petroleum fly (*Helaemyia petrolei*). (Illustration by Jonathan Higgins)



1. Mediterranean fruit fly (*Ceratitis capitata*); 2. European marsh crane fly (*Tipula paludosa*); 3. Fire ant decapitating fly (*Pseudacteon curvatus*); 4. Spider bat fly (*Basilia falcozi*); 5. Chevroned hover fly (*Allograpta obliqua*); 6. Big black horse fly (*Tabanus punctifer*); 7. Horse bot fly (*Gasterophilus intestinalis*); 8. Dawson River black fly (*Austrosimulium pestilens*). (Illustration by Jonathan Higgins)



1. *Triaenodes bicolor* adult and larva in larval case; 2. *Abtrichia antennata* adult and dorsal views of larva; 3. October caddisfly (*Dicosmoecus gilvipes*) adult and larva; 4. *Glossosoma nigrior* larva; 5. *Stenopsyche siamensis* larva. (Illustration by Wendy Baker)

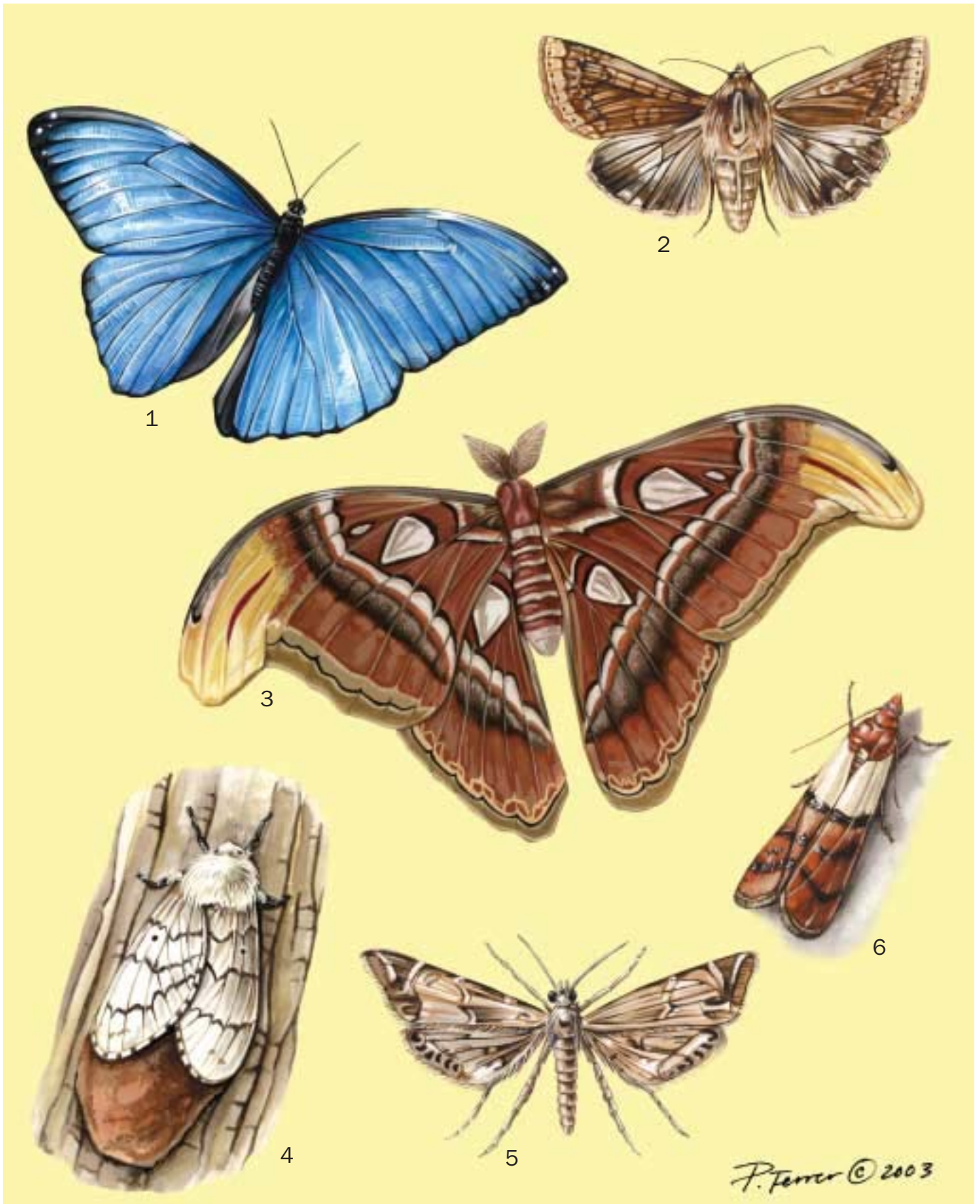


1. European cabbage white (*Pieris rapae*) larva; 2. *Pieris rapae* pupa; 3. *Pieris rapae* adult; 4. Silkworm (*Bombyx mori*) larva; 5. *Bombyx mori* pupa; 6. *Bombyx mori* adult; 7. Death's head hawk moth (*Acherontia atropos*) larva; 8. *Acherontia atropos* pupa. (Illustration by Patricia Ferrer)



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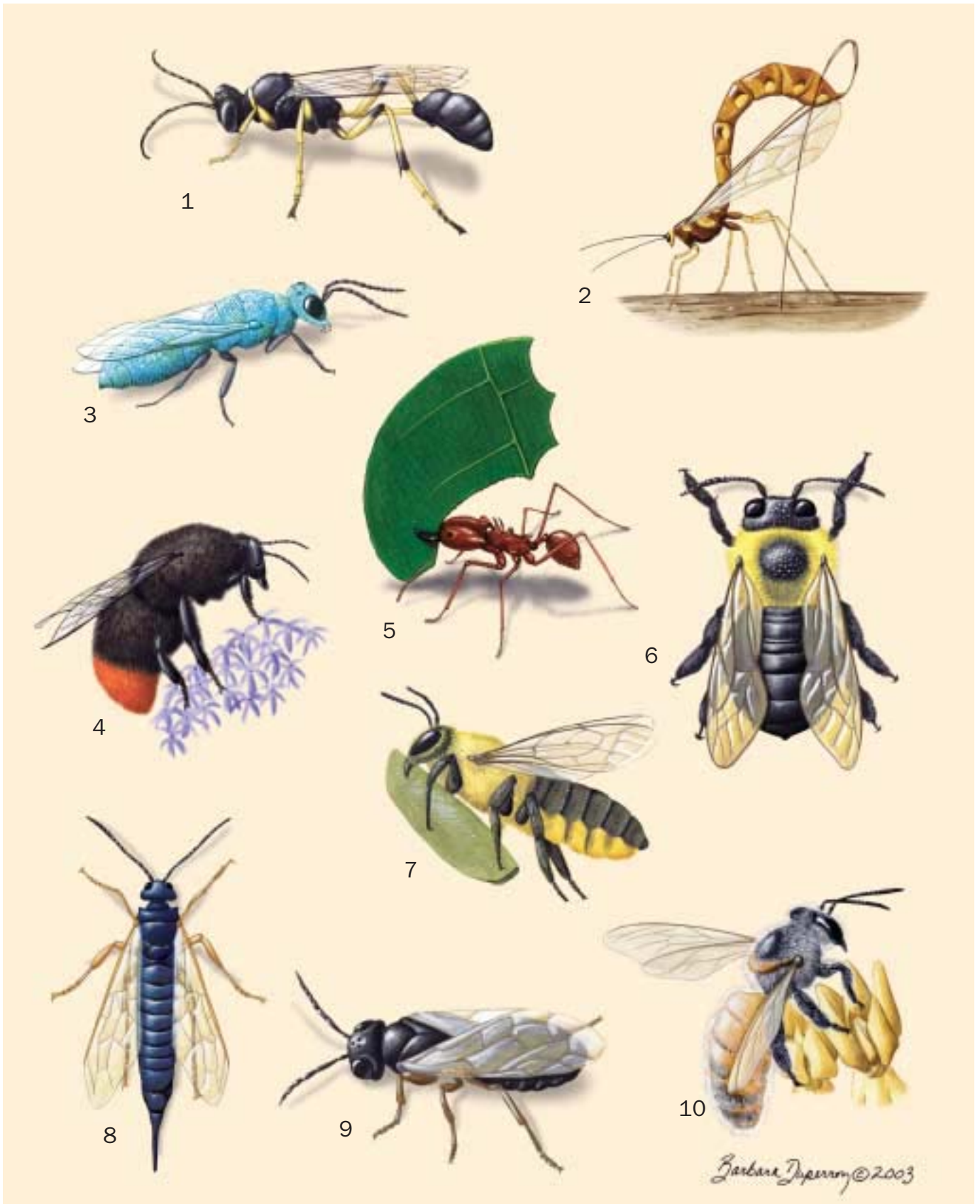
1. Yucca moth (*Tegeticula yuccasella*); 2. Large blue (*Maculinea arion*); 3. Female Queen Alexandra's birdwing (*Ornithoptera alexandrae*); 4. *Micropterix calthella*; 5. Citrus leaf miner (*Phyllocnistis citrella*); 6. Webbing clothes moth (*Tineola bisselliella*) 7. Bagworm (*Thyridopteryx ephemeraeformis*). (Illustration by Michelle Meneghini)



1. Blue morpho (*Morpho menelaus*); 2. Corn earworm (*Helicoverpa zea*); 3. Atlas moth (*Attacus atlas*); 4. Gypsy moth (*Lymantria dispar*); 5. *Paratyraconte confusalis*; 6. Indian mealmoth (*Plodia interpunctella*). (Illustration by Patricia Ferrer)



1. Yellow jacket (*Vespula germanica*); 2. Potter wasp (*Eumenes fraternus*); 3. Tarantula hawk (*Pepsis grossa*); 4. *Ibalia leucospoides*; 5. Golden paper wasp (*Polistes fuscatus*); 6. *Apoanagyrus lopezi*; 7. *Trissolcus basalidis*; 8. Digger wasp (*Scolia dubia*); 9. *Pelecinus polyturator*; 10. Velvet ant (*Mutilla europaea*). (Illustration by Barbara Duperron)



1. Mud dauber wasp (*Sceliphron caementarium*); 2. Cuckoo wasp (*Chrysis coeruleans*); 3. *Megarhyssa nortoni*; 4. Large red-tailed bumble bee (*Bombus lapidarius*); 5. Leaf cutter ant (*Atta sexdens*); 6. Large carpenter bee (*Xylocopa virginica*); 7. Alfalfa leaf cutter bee (*Megachile rotundata*); 8. European wood wasp (*Sirex noctilio*); 9. Pear and cherry slug (*Caliroa cerasi*); 10. Honey bee (*Apis mellifera*). (Illustration by Barbara Duperron)