Microcoryphia (Bristletails)

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(Bristletails)

Class Insecta

Order Microcoryphia

Number of families 2

Evolution and systematics

Members of the order Microcoryphia, or Archaeognatha, are superficially similar to common silverfish (order Thysanura). Both have life cycles without metamorphosis and never develop wings. Microcoryphia are true insects, but they diverged from the main developmental path leading to other insect orders very early in evolutionary time. The order is structurally primitive, retaining many features believed to have been possessed by the ancestral insect. The earliest known fossil is from the Lower Devonian period (/earth-and-environment/geology-and-oceanography/geology-and-oceanography/devonian-period). There are two modern families, Machilidae and Meinertellidae, containing approximately 450 species.

Physical characteristics

Microcoryphia range in size (excluding appendages) from 0.3–0.8 in (7–20 mm). Microcoryphia are cylindrical, with enlarged dorsal thoracic plates, making them appear teardrop shaped or humpbacked. The body is covered with scales. The name Microcoryphia means "small head." The head bears a pair of long, threadlike antennae, along with a pair of enlarged maxillary palps that resemble a fourth pair of legs. The eyes are large, meeting on top of the head, and can apparently detect movement and form images. The 10-segmented abdomen bears three long, antennalike tail appendages, and ventrally, segments two through nine possess pairs of styli, which support the abdomen and enable it to glide smoothly across the substrate. Pairs of eversible sacs are frequently found on abdominal segments one through seven.

Common silverfish, in contrast, have flattened bodies and smaller, widely separated eyes. Microcoryphia have mandibles with only one point of articulation, similar in structure to those of noninsect hexapod groups such as the springtails (order Collembola). All other true insects, including silverfish, have mandibles with two points of articulation.

Distribution

Microcoryphia are known from all continents except Antarctica, and are distributed from sea level (/earth-and-environment/geology-and-oceanography/geology-and-oceanography/sea-level) to 15,750 ft (4,800 m) in the Himalayas.

Habitat

Most Microcoryphia live near the ground, on the surface of the soil, in leaf litter, and on or under rocks. Species inhabiting tropical rainforests are often partially or entirely arboreal.

Behavior

Activity in a large number of species is crepuscular or nocturnal. Many species are known to aggregate, and these aggregations may consist of members of multiple species and genera from the same family, but not from different families. Individuals seem to follow certain paths and routes. Chemical signals may be important in trail forming and aggregating behavior.

Microcoryphia jump by bending and suddenly releasing the tip of the abdomen, striking it against the ground. These insects are also excellent climbers, using their abdominal styli to anchor themselves while they move like an inchworm up vertical surfaces.

Feeding ecology and diet

Microcoryphia are herbivores, feeding on algae, fungi, lichens, and leaf litter.

Reproductive biology

Elaborate tactile courtship behavior often occurs between pairs, involving special sensory structures. There are three common methods of sperm transfer. In the first, the carrier thread method, males spin a thread between the ground and the elevated tip of the abdomen. Sperm droplets are placed on the thread, which females collect with the ovipositor. In the second method, the male attaches a sperm packet to the ground. He then pushes his head and thorax below the female, "pick-a-back" style, and maneuvers her over the sperm packet, whereupon she takes it up with her ovipositor. In the third method, the male and female elevate the tips of their abdomens and bring them into contact, aligning themselves at a 45° angle. The male deposits a sperm droplet onto the ovipositor of the female.

Females lay eggs in protected places, usually cementing them to the substrate. Development generally progresses through six to eight instars. Adults continue to molt, an ancestral characteristic enabling regeneration of lost appendages. Individuals may live up to three years, and molt as many as 60 times.

Conservation status

No species of Microcoryphia is listed by the IUCN.

Significance to humans

No significance to humans has been noted for Microcoryphia.

Species accounts

List of Species

Neomachilellus scandens
Petrobius brevistylis
Trigoniophthalmus alternatus

No common name

Neomachilellus scandens

family

Meinertellidae

taxonomy

Neomachilellus scandens Wygodzinsky, 1978, vicinity of Manaus, Amazonas, Brazil.

other common names

None known.

physical characteristics

Length of body is 0.47 in (12 mm), tail is 0.51 in (13 mm), and antennae are 0.67 in (17 mm). Body pigment yellowish white, mostly obscured by a thick covering of darker scales. Diagnostic features of the species include large spots on the eyes and a single dark ring on the first antennal segment.

distribution

A circle with a radius of 62 mi (100 km), centered on Manaus, Amazonas, Brazil.

habitat

Inhabits both primary and secondary growth (/plants-and-animals/botany/botany-general/secondary-growth) dryland and inundation forests of the central Amazon. Believed to have originated in dryland areas, colonizing inundation forests via waterways in the remarkably water-resistant egg stage.

behavior

Almost entirely arboreal in dryland forests. In inundation forests, individuals inhabit the forest floor during the dry season (/earth-and-environment/ecology-and-environmentalism/environmental-studies/dry-season) and migrate to the canopy at the onset of rains. Has a very well-developed vertical jumping ability, an adaptation to life in trees.

feeding ecology and diet

Grazes in leaf litter, consuming fungi, algae, and decaying leaves.

reproductive biology

Copulates in the "pick-a-back" posture. The male attaches a sperm packet to the ground. He then pushes his head and thorax below the female and maneuvers her over the sperm packet, whereupon she takes it up with her ovipositor. Females deposit eggs in leaf litter. The generations are continual in dryland forests, but an annual life cycle has developed in inundation forests. Eggs remain submerged for prolonged periods, surviving five to six months of inundation in the wet season. A dry forest floor induces hatching, and the larvae develop rapidly, requiring only three months to reach maturity.

conservation status

Not threatened.

significance to humans

None known.

No common name

Petrobius brevistylis

family

Machilidae

taxonomy

Petrobius brevistylis Carpenter, 1913, Portraine, Dublin County, Ireland.

other common names

None known.

physical characteristics

Body length is 0.43 in (11 mm) excluding antennae and tail filaments, which are both about as long as the body. Body scaling silvery gray, contrastingly marked with irregular patches of dark scales. Antennae completely covered with dark scales.

distribution

Northern Europe. Introduced into northeastern North America (/places/oceans-continents-and-polar-regions/oceans-and-continents/north-america), perhaps on rocks used for ballast.

habitat

Cliffs and boulders along rocky seacoasts. Prefers sheer surfaces with few cracks and little loose sediment. Most abundant above the high tide line. In Europe, also inhabits building walls and masonry.

behavior

Individuals move about on the surface of cliffs and on rocks throughout the littoral zone. Rests in cracks in rock or under stones.

feeding ecology and diet

Grazes on algae, lichens, and mosses growing on rocks.

reproductive biology

Fertilization approaches an internal mode. The male and female elevate the tips of their abdomens and bring them into contact, aligning themselves at a 45° angle. The male deposits a sperm droplet onto the ovipositor of the female. Tactile contact is minimal. Some populations consist almost entirely of females and are apparently parthenogenetic. Groups of malleable eggs are laid in narrow crevices in rocks, and conform to the shape of the crevice containing them. Larval development requires three and a half months. Adults may live up to three years.

Grzimek's Animal Life Encyclopedia

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