T11.16 LAND AND FRESHWATER INVERTEBRATES

The most diverse and numerous group of animals, the invertebrates, form a biological community more complex in species numbers and relationships than any other terrestrial community. Invertebrate animals are located nearly everywhere and consequently serve very important functions in the ecosystems which they inhabit. Invertebrates are responsible for the pollinating of many flowering plants, the leading consumers of vegetation, initiators of successional trends, the leading consumers of other invertebrates, recyclers of dead organic material, regulators of element cycles, turners of the soil, and food for higher animals. However, they are generally least fully studied, mainly due to the large number of species involved as well as their small size and obscure habitats, particularly those that inhabit the soil or bottom sediments of lakes and ponds.

In general, their roles can often be demonstrated without species identification. However, species and often life-stage identification, is necessary in cases such as parasitic infection, defoliation of trees, or where detailed environmental studies are required. Many insect species have complex life cycles, with distinct larval forms occupying a completely different habitat from that occupied by the adults. In order to make the correct associations between larva and adult, it is often necessary to observe the animals in all stages of their life cycle.

The invertebrates are generally categorized as insects, other arthropods and other invertebrates. Land and freshwater invertebrates share many characteristics and some species are associated with both terrestrial and aquatic habitats.

Representatives of most land and freshwater invertebrate groups are known to occur throughout the province; however, a comprehensive list of species is not available at present. Much of the information on the biology of invertebrates found in Nova Scotia has been drawn from scientific studies conducted elsewhere. *(Enlargements or reductions in the figures are approximate).*

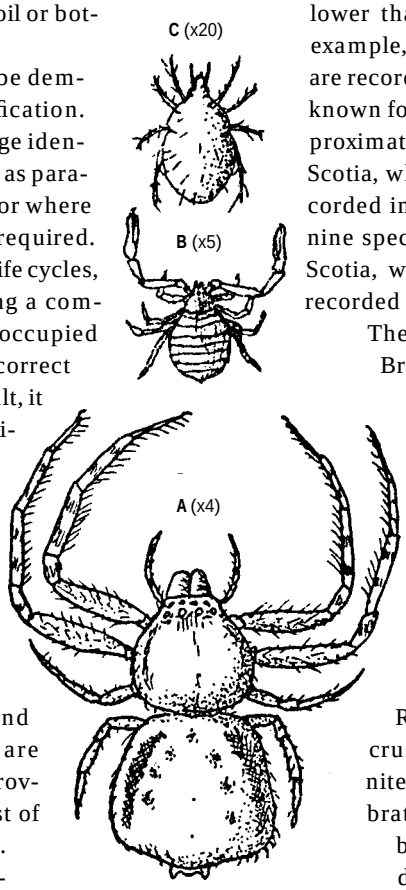

Figure T11.16.1: Examples of arachnids. The Crab or Flower Spider **A** feeds on insects. The Pseudoscorpion **B** often feeds on mites **C**, which may be decomposers or carnivores.

DIVERSITY

A general review of the collections of the Nova Scotia Museum and some published lists suggests that there are more than 15 000 species of land and freshwater invertebrates in Nova Scotia.

The insects have the most species, followed by the arachnids (spiders, mites and allies)[2] (see Table T11.16.1). Very little is known about the phyla, Protozoa through Nematoda. The low numbers generally reflect a lack of systematic study.

Nova Scotia's location and the narrowness of the Chignecto Isthmus have been, and are, a barrier to the easy natural spread of plants and animals into the province. The number of species in the province is lower than in other areas in Canada. For example, only seventeen species of rotifers are recorded, although some 362 species are known for Canada as a whole. There are approximately 13 000 species of insects in Nova Scotia, whereas there are 25 000 species recorded in Ontario. Similarly, there are only nine species of freshwater mussels in Nova Scotia, whereas there are forty-six species recorded from eastern Canada.

The insects, mites and spiders of Cape Breton Highlands National Park (Region 100) have been studied by the staff of the Biosystematics Research Centre in Ottawa.[1] The numbers recorded may reflect the probable numbers of species across the province.

DISTRIBUTION OF NATIVE SPECIES

Records of molluscs, freshwater crustaceans and insects indicate definite distribution patterns of invertebrates in Nova Scotia. There appears to be a close relationship between the distribution of species and the distribution of various elements of the flora. Food plants and climate, as well as other habitat factors, are important for all species, including many flying insects which, although

Group	Approximate Number of Species
Protozoa	?
Porifera (sponges)	10
Cnidaria	2
Platyhelminthes - *Turbellaria* (flat worms)	3
Platyhelminthes - Cestoda (tape worms)	2
Platyhelminthes - Trematoda (flukes)	?
Rotifera	17
Nematomorpha (hair and ribbon worms)	1
Nematoda (round worms)	?
Mollusca - Gastropoda (snails, slugs)	80
Mollusca - Bivalvia (clams, mussels)	18
Oligochaeta (earthworms, etc.)	15
Hirudinea (leeches)	19
Diplopoda (millipedes)	10
Chilopoda (centipedes)	10
Insecta - Lepidoptera (moths, butterflies)	2,000
Insecta - Diptera (flies)	2,500
Insecta - Coleoptera (beetles)	2,500
Insecta - Hymenoptera (bees, wasps, ants)	2,500
Insecta - Hemiptera (bugs)	1,500
Insecta - other orders	2,000
Arachnids (spiders, ticks, mites)	2,500
Crustacea (water fleas, sowbugs, etc.)	more than 60

Table T11.16.1: Approximate numbers of invertebrate species recorded or estimated for land and freshwater habitats in Nova Scotia.

capable of wide distribution, are limited by the requirements of their aquatic larval stages.

Many species are common and ubiquitous, such as the freshwater amphipod *Hyalella azteca*, the land snail *Zonitoides arboreus* and the Libellulid Dragonfly *Libellula quadrimaculata*. Other species, however, show limited distributions which reflect their mode of colonization. The freshwater isopod crustacean *Caecidotea communis* has its main population in southwestern Nova Scotia, with pockets in the Sydney River in Cape Breton.

The polygyrid land snails *Mesodon sayanus* and *Stenotrema fraternum*, found in Cumberland County (Unit 523), are examples of colonization across the Chignecto Isthmus land bridge.[3]

The original post-glacial (late Pleistocene) fauna that occupied Nova Scotia was gradually displaced by the fauna of adjacent areas. There are no large Arctic–Alpine habitats left in Nova Scotia; however, there are species of butterflies and freshwater crustacea[4] with arctic affinities that can still be found in bog and barren habitats along the Atlantic Coast (Region 800) and in the Cape Breton highlands (Region 200).

Some species are limited by the range of habitat or availability of host species. The southern pine/hemlock forest and oak forests each has its own

distinct Lepidoptera species. Many of these Acadian forest species do not extend into the spruce and fir forests, which have a characteristic boreal fauna of their own.[5]

Some species of dragonfly and damselfly oviposit in plant tissue. In some instances, they employ dead plant material, such as floating or standing dead wood in other living plants, usually floating emergents such as *Potamageton* or edge-growing species such as *Myrica gale*. The presence of suitable plants for ovipositing may, in part, dictate the distribution of some species of damselfly. The species of insects that inhabit the upper levels of salt marshes and other seashore habitats are fairly distinct and are often found on both sides of the Atlantic.

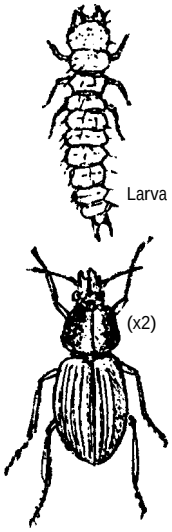

Figure T11.16.2: Carabid Beetle. There are more than 200 species of carabid or ground beetle recorded in Nova Scotia. Many were introduced in ship's ballast.

INTRODUCED SPECIES

Many species were introduced in ships' ballast, by the importation of plants for agriculture and horticulture, and transshipment of goods since at least the seventeenth century (see Figure T11.16.2). These species arrived as land was cleared for agriculture and development, activities which caused the destruction of native habitats and their associated soils, and the decline of native species. The province's history of human colonial settlement and its geographic isolation has resulted in the highest ratio of introduced invertebrate species to native species in Canada. For example, there are nine species of slug recorded from Nova Scotia, six of which are definitely introduced. Some of the slugs are very aggressive and colonize native habitats directly or through the course of succession, while others have remained close to the point of introduction. The native slug species of the family Philomicidae are now restricted to native forest habitats. More than twenty per cent of all terrestrial mollusc species of Nova Scotia are introduced[3]. (see Figure T11.16.4).

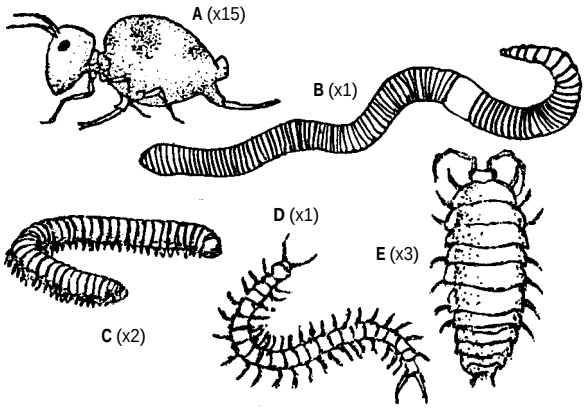

Figure T11.16.3: A: Springtail; **B**: Earthworm; **C**: Millipede; **D**: Centipede; Sowbug. These invertebrates inhabit the soil surface, acting as decomposers in the leaf litter.

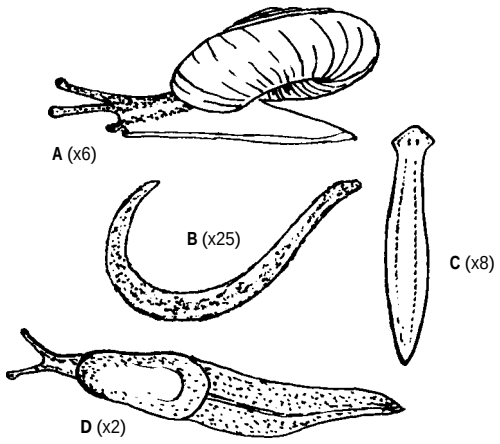

Figure T11.16.4: A: Snail; **B**: Nematode; **C**: Flatworm; **D**: Slug. Soil meso- and microfauna and flora are essential components of the detritus food web and important in the maintenance of good soil conditions (see T9.3). They convert organic material into forms available for plant use and regulate the rate of element cycles, and ultimately ecosystem productivity.

Earthworms, ground beetles, click beetles, sow or cellar bugs, centipedes, and millipedes are introduced species commonly found in gardens (see Figure T11.16.3). Familiar urban invertebrates include cockroaches, bedbugs, carpet beetles, flour beetles, clothes moths, flour moths, earwigs, fleas, lice, houseflies and booklice.

Species are often introduced without the accompanying diseases, parasites and predators which keep the populations in check. They can multiply rapidly and gain the reputation of being pests. In Nova Scotia species such as the Winter Moth, Birch Casebearer, aphids, scale insects and sawflies are notorious for damage to trees and shrubs.[6]

INSECTS AND PLANTS

Insects interact with plants in many ways. They play an important role in the pollination of flowers, not only in orchards but also in other agricultural areas and, especially, in the wild (see Figure T11.16.4).

Spruce Budworm (*Choristoneura fumiferana*) caterpillars feed upon the young shoots of fir and spruce trees, causing severe growth retardation and possibly death. The occurrence of high-level populations is cyclic and in a natural system would be controlled by predators, parasites and diseases. The natural forty-year cycle of the Spruce Budworm is disrupted by forest-management practices, which maintain artificially high populations of insects poised for reinfestation, perpetuating the infestation stage of the cycle.

Other moth larvae, such as the White-marked Tussuck (*Orgyia leucostigma*) and Forest Tent Cater-

pillar (*Malacosoma disstria*), periodically defoliate hardwoods in certain areas of the province. Many trees are killed by successive infestations; however, the effects on forest habitats are short lived.

Dutch Elm disease is a fungal parasite which is transmitted by the native Elm Bark Beetle (*Hylurgopinus rufipes*). The larvae develop under the bark of dead branches, and the adult feeds on the bark of young shoots. The beetle carries the spores from one tree to another. The disease has been spreading for many years and has killed most of the native elms in some parts of rural Nova Scotia (see T10.2).

The Beech Scale (*Cryptococus fagisuga*) is an introduced insect responsible for the spread of beech bark disease (see T10.1). Galls, such as oak apples, mossy rose galls, willow pine galls, and a great variety of often colourful growths on leaves and stems of plants, are caused by insects. The galls form in response to a chemical released by the developing larvae of gall flies (Cecidomyidae) or gall wasps (Cynipidae). The larvae feed throughout the summer and overwinter in the galls, emerging as adults the following spring.

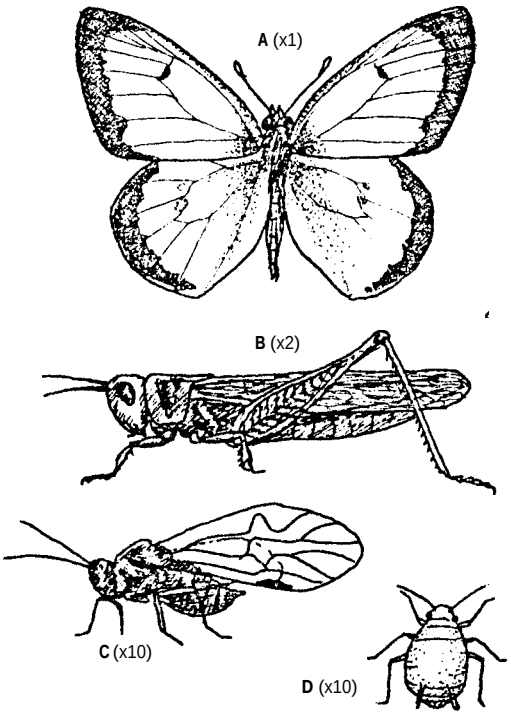

Figure T11.16.5: **A**: Butterfly; **B**: Grasshopper; **C**: Adult Winged Aduly Aphid; **D**: nymph. The niche of herbivore in land and freshwater ecosystems is largely occupied by insects, particularly the grasshoppers, leaf hoppers, leaf bugs, aphids, leaf beetles, sawflies, and larval stages of butterflies and moths. Many species are specific to certain plants, and this characteristic may cause concern when these plants are agricultural crops or commercial forest trees.

The fifteen species of Lumbricid earthworms, familiar to many people as "night crawlers", are all introductions. They live mainly in cultivated land but have also invaded second-growth forest and other habitats.

The Cinnabar Moth *Tyria jacobaeae* was introduced at Northwest Margaree in the early 1960s and in 1963 at Durham, Pictou County.[7] The gregarious, black-and-yellow-banded caterpillars completely destroy their food plants, Ragwort, and are considered to be a positive biological-control agent. The handsome, black-and-red moths are now abundant in Cape Breton and northern mainland Nova Scotia, wherever Ragwort, a plant poisonous to cattle, is most common.

SOIL INVERTEBRATES

Many important aspects of terrestrial ecology and zoogeography relate to soil fauna. Soil fauna includes burrowing mammals and amphibians. The majority of species, however, are minute invertebrates. The main groups include protozoans, flatworms, nematodes, rotifers, lumbricid and enchytraeid worms (oligochaetes), snails and slugs (molluscs), tardigrades, crustaceans, arachnids, insects and other arthropod groups. Some soil invertebrates have close affinities with aquatic invertebrates, such as worms and crustaceans, and as a result are restricted to water film in soil pores. Lack of water in the soil because of drought or disturbance can be detrimental to these organisms. Other soil fauna are confined to the air spaces.

Many of these invertebrates are very small and constitute the soil meiofauna. The great diversity of these species inhibits easy identification. The Nematoda, which inhabit the water film, include some 2000 species on a world-wide basis; a sample of one cubic decimetre (about sixty cubic inches) of forest soil could contain as many as 30 000 individuals.

Forest soil generally contains a greater number and diversity of soil fauna than agricultural soil. For example, the species of mites in an area of pasture soil may be less than half of the number and diversity found in an area of equal proportion in coniferous-forest soil.

Further studies of soil fauna could reveal important details of changes in soil character during forest succession. The invertebrates of old-forest soils and caves could also provide insight into the origin of the Nova Scotia fauna.

FRESHWATER INVERTEBRATES

Many species are considered to be freshwater invertebrates although they inhabit fresh water only during certain stages of their development (e.g. mayfly nymphs). Some terrestrial invertebrates also inhabit fresh water during their larval stage (see Figure T11.16.6). Although the adults of some insects, such as waterbugs and water beetles, may be aquatic, only the larval stage of most species inhabits fresh water. This larval development is usually the longest phase of the insect's life cycle. The adult flying stage is usually much shorter and is primarily for mating and dispersal. The larvae of caddisflies (Trichoptera), blackflies and Chironimids (Diptera), as well as mayfly nymphs (Ephemeroptera), stoneflies (Plecoptera), dragonflies and damselflies (Odonata) are the most common groups of insects found in most freshwater habitats. All of these represent a very important food source for many other invertebrates, fish, amphibians, reptiles and birds.

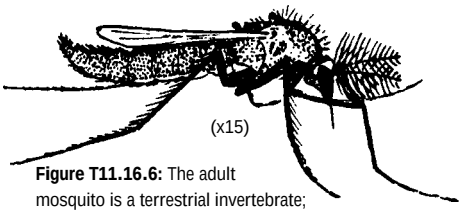

Figure T11.16.6: The adult mosquito is a terrestrial invertebrate; however, the larval stages occur in fresh water.

A number of recent studies have been carried out to determine the species distribution of benthic invertebrates in Nova Scotia streams.[4,8,9] This research has identified thirty-seven species of mayflies, approximately thirty species of stoneflies and about 100 species of caddisflies in the Medway River and the Gold River. These were then divided into distinct groups, based on geographic distribution and tolerance to acidic stream conditions. Mayfly populations were determined to be most affected by acidity, while stoneflies were the least influenced.[10] In addition, a comprehensive species list of dragonflies and damselflies found in Nova Scotia is at present being compiled with a total of 101 species identified in collections to date.[11]

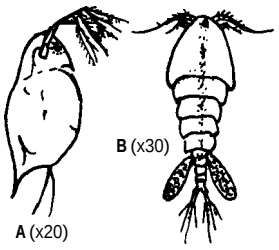

Figure T11.16.7: Both the *Daphnia* **A** and the *Cyclops* **B** are active swimmers in open water and often become food for other invertebrates.

Nova Scotia has a great number of lakes, ponds, rivers, streams, marshes and bogs which provide varied habitats for freshwater animals. Water-quality factors, such as pH, are influenced by the geology and soil conditions, as well as atmospheric input, and directly affect the abundance and diversity of species present in any aquatic habitats. Peterson determined that, although certain areas of Nova Scotia have probably been historically acidic due to high concentrations of organic acids, pH currently limits the distributions of many indigenous invertebrate species.[10] These species may also be vulnerable to the more recent influences of "acid rain". Many aquatic species, particularly molluscs with calcareous shells, are not found in waters with high acidity levels. Populations of acid-tolerant organisms, including many insect species, tend to be relatively low, due to the dystrophic waters characterized by low pH (Region 400). In waters with a comparatively high pH, the size and diversity of invertebrate populations are usually much greater (Region 500).

The conspicuous invertebrate fauna is largely composed of insects; however, many other species including crustaceans, arachnids, gastropod and bivalve molluscs, leeches, oligochaete worms, flatworms, coelenterates and sponges are also present in most freshwater habitats. Microscopic communities inhabit open water in lakes and rivers, as well as the bottom mud. These organisms, known as primary consumers, form a link between the primary producers (i.e., plants) and the secondary consumers, such as fish, and they are essential to the survival of the ecosystem (see Figure T11.16.7).

Open -water Invertebrates

The majority of planktonic animals (zooplankton) are herbivores that feed mostly on the microscopic algae (phytoplankton) (see T10.9). The dominant species are two groups of crustaceans: the cladocerans and the copepods. These small animals are significant since they provide a vital food source for numerous other animals, including many species of fish. Rotifers are also microscopic creatures which are usually found attached to vegetation near the shore. Some of the larger open-water species can be seen with the naked eye (see Figure T11.16.8).

Cladocerans (water fleas) are the best known of all the planktonic herbivores. All species extract food, usually algae, from the water by rapidly beating the tiny hairs or setae attached to their legs. These animals can often produce offspring without males being present. The eggs are laid in a pouch on the back of the female and develop into copies of the adult before being released. The most widespread species observed in Nova Scotia include *Bosmia longirostris,*

Holopedium gibberum and *Daphnia catawba.*

Copepods are comprised of three groups: the calanoids, which are usually herbivorous; the cyclopoids, which are mainly carnivorous; and harpacticoids, which live in the margins of freshwater habitats, often in damp moss and wet leaves. Some cyclopoids have become external parasites, a condition which may have derived from holding on to small fish in order to feed off the surface of their body. Other copepod species, such as *Diaptomus* and *Cyclops,* are host for the first larval stage of the Fish Tapeworm *Dibothriocephalus latus.*

The eggs of copepods hatch into larvae known as nauplii. Copepods are less adaptable than cladocerans to environmental changes, and therefore are usually less abundant. The most prevalent species found in the province include *Diaptomus minutus, Mesocyclops edax* and *Tropocyclops prasinus.*

Rotifers are tiny animals that possess a crown of cilia around their mouths for locomotion as well as feeding purposes. Like cladocerans, rotifers can reproduce asexually. Populations can fluctuate greatly according to the food supply, sometimes going from levels of tens to hundreds per litre in less than a week. Some of the frequently observed rotifers in Nova Scotia waters include *Keratella taurocephala, Keratella cochlearis* and *Kellicotia longispina.*

The community of plant and animals which is attached to or moves about on submerged surfaces is often described by the German word Aufwuchs. They may be found clinging to stems or leaves of rooted plants or other surfaces projecting above the bottom.

Edge-vegetation Invertebrates

Freshwater invertebrates are most abundant in the vegetation at the edges of ponds, lakes and slow-moving streams (see H3.5, H3.6). In addition to supplying a food source for many herbivores, plants in the hydrosere provide a link between the bottom and the surface which is essential for many air-breathing molluscs and emergent insects (e.g., dragonflies). A large number of the animals that occupy this habitat feed on a layer of living material that accumulates on leaves and stems. The submerged surfaces of plants are often heavily colonized by invertebrates, with the total surface area usually much greater than the area of the lake bottom.

Leeches are generally found in most freshwater habitats and may either be predatory or parasitic on many small animals. Nineteen species have been recorded for the province.[13] Among the most common is the medicinal leech *Macrobdella decora,* which frequently attaches itself to swimmers.

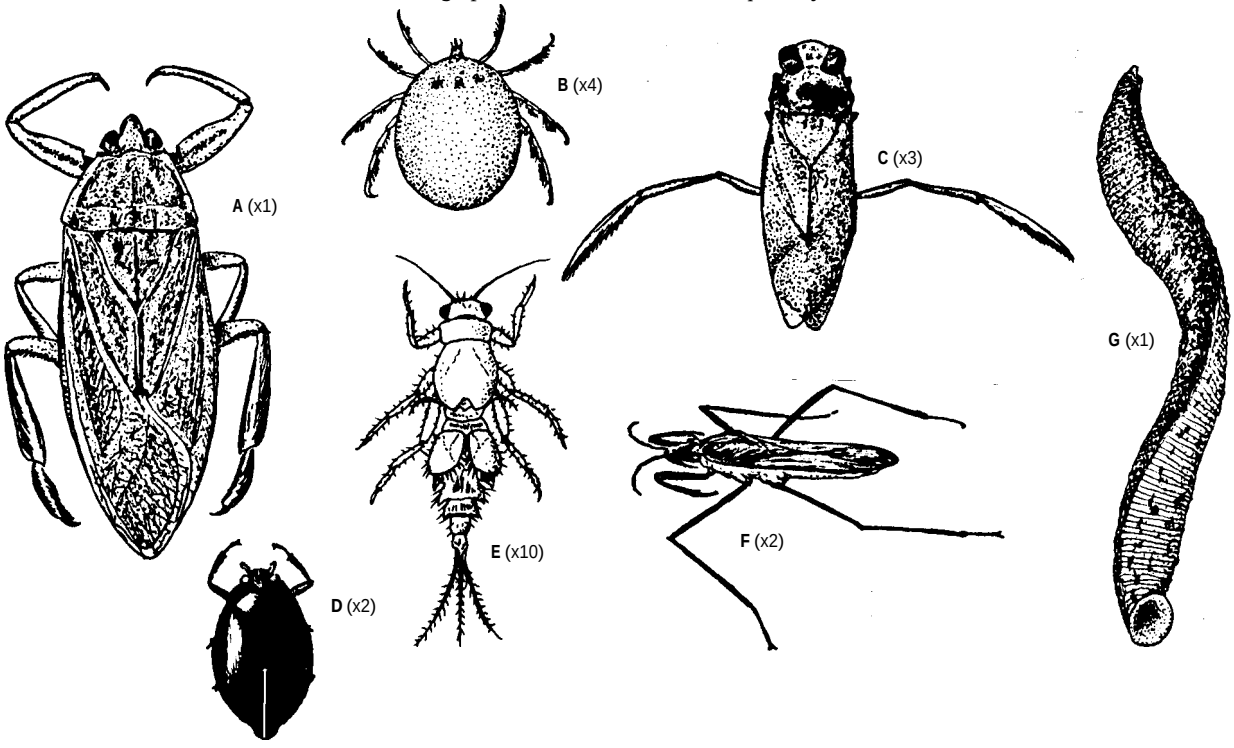

Figure T11.16.8: Examples of open-water and edgewater vegetation invertebrates. **A**: Giant Waterbug; **B**: Water Mite; **C**: Backswimmer; **D**: Whirligig; **E**: Mayfly nymph; **F**: Water Slider; **G**: Leech. Edge vegetation creates a calm-water environment offering protection to a variety of invertebrates. Some, like the Backswimmer and the Giant Waterbug, swim freely among the vegetation; others, like the Mayfly nymph, are associated with the surface vegetation.

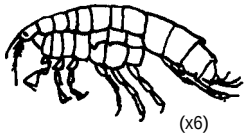

Figure T11.16.9: Benthic organisms are important because they consume decaying organic material and provide a primary food source for larger bottom-dwelling animals, mainly insect larvae and crustaceans such as the amphipod *Hyalella*.

Benthic Invertebrates

Microscopic benthic animals, sometimes called meiofauna, inhabit the bottom sediments of most lakes and slow-moving streams (see H3.3 and H3.4) and include many species of crustaceans, rotifers, nematodes and protozoans.

One of the most common group of molluscs are pond snails (gastropods), which scrape periphyton (attached microflova) with their tongues for food. The relative abundance of snails is often an indicator of 'hard- or-soft-water'. Snail shells are composed of calcium carbonate. Snails are usually more plentiful in hard water, which contains high levels of dissolved minerals. Eleven freshwater-snail species have been recorded for the province, of which the Ramshorn Snail *Menetus dilalatus,* is considered rare.[12] Freshwater mussels are important filter feeders and are usually the largest members of the lake ecosystem to feed directly on microscopic algae. Ten species of mussels are known to exist in Nova Scotia.[13] One rare species, the Yellow-lamp Mussel *Lampsilis cariosa*, has been found only in the Sydney River area within Nova Scotia. Mussels are of great biological interest, as their larvae are parasitic on freshwater-fish species.[14] Smaller bivalves known as pea clams *Pisidium sp*. are also frequently found, sometimes in large numbers. Pea clams have been found in acidic lakes (with pH of 4.6.)[4] (see Figure T11.16.10).

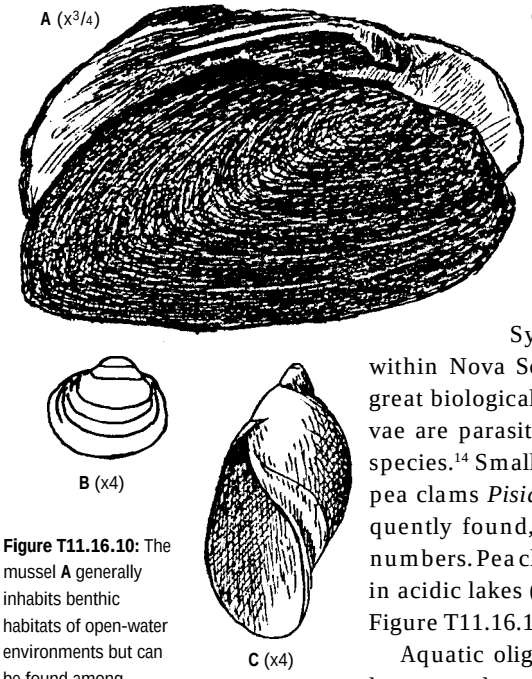

Figure T11.16.10: The mussel **A** generally inhabits benthic habitats of open-water environments but can be found among plants. The pea clam **B** is generally found among plants but may also be found in open-water situations. The Tadpole Snail **C** is found in a variety of freshwater habitats.

Aquatic oligochaete worms have been poorly studied in Nova Scotia but may play a significant role in the ecology of freshwater habitats. One of them, *Tubifex*, is an indicator of organic pollution and poor oxygenation conditions. This worm has red haemoglobin in its blood which helps trap oxygen[15]. (see Figure T11.16.11).

Adaptations

In harsh environmental conditions, such as exposure to waves in lakes or fast-flowing currents in streams, the number of invertebrates is substantially reduced. Certain animals which do inhabit these areas have adapted for their survival. Blackfly larvae and caddisfly larvae have special adaptations which enable them to become attached to rocks in fast water (see Figure T11.16.12). Other insects live under and behind rocks in fast water or burrow in gravel.

Other species, such as snails, have adapted to living in temporary ponds which may dry up completely during the summer. Reproduction and development must be completed before the habitat becomes too dry. Depending on the species, the adults, eggs or larvae will then estivate (i.e., exist in a dormant state during the summer) in the bottom sediment until conditions improve.

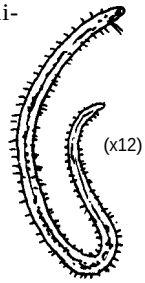

Figure T11.16.11: Aquatic oligochaetes are sometimes referred to as aquatic earthworms. They have the same fundamental structure as the common terrestial earthworm.

RARE SPECIES

Knowlege of the distribution of invertebrate species is incomplete, making it difficult to distinguish and justify rarity. In a provincial context, the preservation of representative habitats should adequately protect the soil and freshwater invertebrates, including those species not yet discovered and identified. Particular attention should be paid to the fauna of soil in old, mature forests, which is the main habitat for the undisturbed native fauna.

Two species of freshwater mollusc native to eastern North America are considered rare (a disjunct population) in a Canadian context. These are the Ramshorn Snail (*Menetus dilatatus*) from Atlantic coast waters and the Yellow-lamp Mussel *Lampsilis cariosa*, which occurs in the Sydney River and in New Brunswick.

Most of our rare native species are found in Cape Breton. For example, the Bog Horsefly (*Haematopota rara*) recently discovered on the Big Barren near Middle River, Cape Breton Island (District 210), was

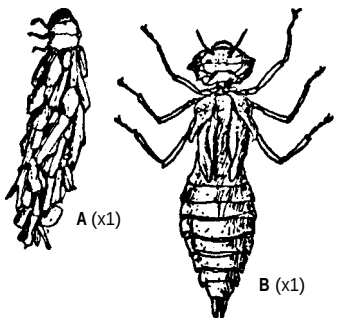

Figure T11.16.12: Caddisfly **A** and dragonfly **B** nymphs. Macromid dragonfly nymphs may have extremely long legs for gripping in high currents or compressed bodies to counteract the effects of strong currents.

previously known from only sixteen specimens collected in New Jersey, Pennsylvania and Ohio. *Syngrapha surena*, a moth, is also common on the Big Barren, though rarely encountered elsewhere. This moth, rare in collections, is also found in northern Ontario, Quebec, Labrador and Newfoundland. *Oeneis jutta*, an arctic butterfly, is found among Black Spruce trees at the margins of bogs near Mount Uniacke. Two other butterflies, rare in collections, are found in southern Nova Scotia: *Incisalia lanoraiensis* at Gold River and Bridgewater, in Lunenburg County, and *Erora laeta* in Armdale, Halifax County, and at Digby.[16]

Special Features

1. There are no known endemic invertebrate species on mainland Nova Scotia. There are endemic subspecies, however, the best known being the Short-tailed Swallowtail Butterfly (*Papilio brevicauda bretonensis*), which occurs only in northern Cape Breton Island and in Newfoundland, though its food plant, Scotch Lovage, is found on coasts around the province.

2. There is an increasing amount of evidence to suggest that Sable Island was a glacial refugium for many species of invertebrates which failed to return to, or survive on, the mainland. So far, two species of moths, *Agrotis arenarius* and an undescribed *Papaipema sp*., and a beetle, *Pyrrhalta sablensis*, have been discovered. Several subspecies and unusual forms of moths have been collected, though only one, *Orgyia leucostigma sablensis*, has been named.[17]

3. The Common Green Darner *Anax junius* is a migratory dragonfly species which flies from the New England states (and possibly New Brunswick) to Nova Scotia every year. There is also evidence of nymphs emerging in the province, and hence the possibility that the species also overwinters in the nymphal stage. The species has been recorded from Cape Breton and Sable islands but not from Newfoundland; Nova Scotia may be at the northern limit of its range.

4. There are two species of dragonfly and one of damselfly which appear to have disjunct or highly limited distributions within the province. *Libellula incesta* is recorded from Kejimkujik National Park and South Milford in the Atlantic interior, and from River Hebert in Hants County (Region 400).[18] *Libellula luctuosa* is recorded only from Mount Uniacke. *Calopteryx amata* is only known from certain rivers in Cumberland and Hants counties.[11]

5. The American Dog Tick, an unwelcome immigrant from the eastern United States, arrived in southwestern Nova Scotia during the 1930s and '40s. At present, the main population is confined west of Highway 12 between Chester Basin and Kentville, with isolated outbreaks occurring as far east as Glace Bay, wherever gravid females have dropped off their hosts, principally dogs, into suitable terrain. All stages in the life history are ectoparasites, feeding on the blood of a series of hosts, mainly mice, to which they become attached for short periods of time.

Associated Topics

T4.3 Post-glacial Colonization by Animals, T8.2 Freshwater Environments, T9.1 Soil-Forming Factors, T9.3 Biological Environment, T11.18 Rare and Endangered Animals, T12.11 Animals and Resources

Associated Habitats

H2.5 Tidal Marsh, H3 Fresh Water, H4 Freshwater Wetland, H5 Terrestrial Unforested, H6 Forests

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