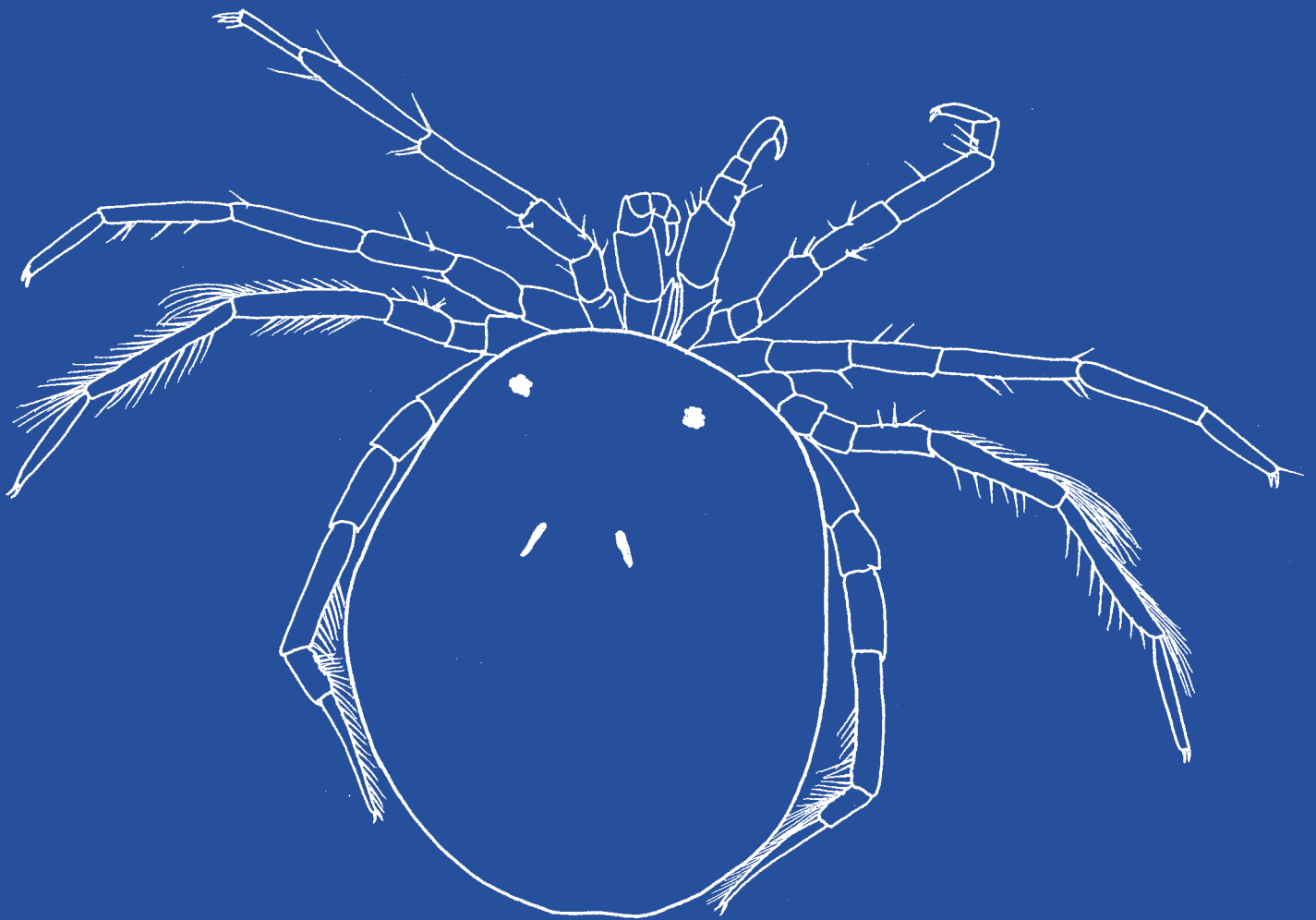


Mites, spiders, crustaceans and insects



8 Phylum Arthropoda—arthropods including water mites, water spiders, crustaceans, insects

Background

Phylum Arthropoda includes between 10 and 20 classes, depending on the classification adopted. There is much debate about the appropriate classification. Over 750,000 species of arthropods have been described worldwide, with more to be discovered and described. They are found in terrestrial, marine, estuarine and freshwater environments and in climates from the hottest to the coldest. They are probably the most successful and diverse phylum of all animals.

Some of the better known groups are Insecta (insects), Collembola (springtails), Crustacea (e.g. crabs, shrimps and crayfish), Arachnida (spiders, scorpions, ticks and mites), Chilopoda (centipedes), Diplopoda (millipedes) and the extinct Trilobita (trilobites). The first four of these groups include species that inhabit inland waters and these are discussed in further detail in their individual sections below.

Arthropods are believed to have evolved from annelids, or it may be that Arthropoda and Annelida evolved from a common ancestor. Fossil arthropods first appeared in sediments from the Precambrian era, about 590 million years ago.

Size

In such a diverse group of animals, size varies considerably. Freshwater arthropods range from less than 1 mm long to more than 300 mm long, in the case of large freshwater crayfish.

Features

Adult arthropods have segmented bodies with jointed appendages—legs, antennae, and mouthparts. Many have a thickened skin or cuticle that forms a rigid external skeleton, or 'exoskeleton', made of a chemical substance called 'chitin'. It provides protection for the soft tissue underneath as well as an attachment point for muscles, and reduces the amount of water that can evaporate from the body. Larvae of arthropods may lack some of these characteristics.

Diet and feeding

Arthropods are a diverse group and feed in many different ways. They may be herbivores, detritivores, scavengers, carnivores or active predators; some are filter feeders.

Locomotion

Many arthropods are good swimmers and can move swiftly through the water. Others walk on the water surface or climb and cling to plants in the water, and some crawl along the bottom of the water body. Many aquatic insects have adult life stages that are able to fly.

Gas exchange (breathing)

Respiratory systems range from diffusion of oxygen through the surface of the body to complicated gill structures supplied with blood vessels that help to transport oxygen around the entire body.

Phylum Arthropoda—arthropods including water mites, water spiders, crustaceans, insects

Life cycle and reproduction

Some arthropods have life cycles that are entirely aquatic; others (some insects) have larval stages and pupae that are aquatic, but adult stages that are terrestrial or, at best, semi-aquatic. Reproduction can occur through parthenogenesis or by sexual means that result in the production of eggs. Arthropods can take as little as two weeks to as much as several years to complete their life cycles.

Habitat

Arthropods can be found in every habitat, from fast-flowing to still or stagnant waters, from fresh waters to hypersaline lakes, from temporary to permanent water, and from pristine water bodies to extremely nutrient-enriched and degraded water bodies. Some like to burrow in sand and silt, others require stable substrates to which to cling, and still others skate across the surface of the water, only rarely submerging. In South Australia, the distribution of some arthropods may be limited to certain areas, either because the species are rare or because they prefer a particular altitude, water temperature or specialised habitat. Other species are very common and can be found throughout the State.

Critter facts

Trilobites were common ocean-living arthropods during the Palaeozoic era, first appearing about 540 million years ago and becoming extinct about 250 million years ago. Over 3900 species of trilobites have been described from fossils. Adults ranged in size from 0.5 mm to almost a metre in length.

Identification

As adults, arthropods have segmented bodies and jointed appendages. They vary greatly in appearance and often are difficult to identify as juveniles. Some juveniles have segmented bodies and jointed legs, but some Diptera or true flies, for example, have larvae that are maggot-like in appearance and do not have jointed appendages or distinguishable body segments.

Classification and sensitivity

A single sensitivity ranking is not given for arthropods as they are a very large group and range in sensitivity from very tolerant to very intolerant of a range of pollutants.

Phylum Arthropoda

Class Arachnida

Class Crustacea

Class Collembola

Class Insecta

References

Hawking & Smith 1997, p 40; Williams 1980, p 118; Gooderham & Tsyrlin 2002, pp 59-212.

9

Class Arachnida—water mites and water spiders

Background

The main types of arachnids are spiders, scorpions, mites and ticks. There are over 70,000 species worldwide. The orders Acariformes and Parasitiformes (mites and ticks) and the order Araneae (spiders) all have aquatic members, but aquatic mites are far more numerous and diverse than the water spiders. At least 30 families of aquatic mites are found in Australia, most of which occur in South Australia. Only one type of spider is aquatic, and this belongs to the family Pisauridae (fishing spiders). Fossil records for mites date back to the Devonian period, about 400 million years ago, but spiders appear much later, in the Carboniferous period, about 300 million years ago.

Class Arachnida also includes scorpions, but although aquatic scorpions have been found in the fossil record, in the Silurian period about 420 million years ago, all are extinct today. What we now refer to as 'water scorpions' are, in fact, insects in the bug family Nepidae.

Size

Aquatic arachnids range in size from tiny mites less than 1 mm long to water spiders that can grow up to 50 mm long.

Features

Arachnids have two main body segments: the 'prosoma' or 'cephalothorax', which is the arachnid equivalent of the insect head and thorax fused together; and the abdomen. Mites have only a single body segment as the prosoma and abdomen are fused together. Arachnids lack antennae and as adults have eight legs and two pairs of feeding appendages, the 'chelicerae' and 'pedipalps'.

Diet and feeding

Arachnids feed on the juices of their prey. They grasp their prey with pedipalps that are situated near the mouth, insert their mouthparts into the prey and suck out the body fluids.

Locomotion

Some arachnids, particularly larval mites, are parasitic and travel around with their hosts. Others are able to crawl or creep using specialised legs. Some water mites are very good swimmers and use the long hairs on their legs to propel themselves through the water.

Gas exchange (breathing)

Water mites take oxygen from the water by diffusion. They have a 'tracheal system' that transports the oxygen throughout the body through a system of tubes. Water spiders (fishing spiders) use fine hairs on their abdomens to trap a bubble of air that provides a source of oxygen when they dive under the surface of the water.

Class Arachnida—water mites and water spiders

Life cycle and reproduction

Sexual reproduction occurs in both water mites and water spiders, but the life cycles of water mites and water spiders are quite different. Both water mites and water spiders lay eggs. The female mites attach their eggs to submerged water plants or inside molluscs and sponges. On hatching, the young often parasitise insect larvae. In contrast, female fishing spiders carry their eggs around with them, using their jaws. The eggs are kept in a sac until the young are ready to hatch and, for the first few juvenile stages, the spiders remain on land sheltered in vegetation. The young of both mites and spiders (spiderlings) resemble the adults, although juvenile mites have only six legs instead of eight.

Habitat

Water mites are found in almost every aquatic habitat, but are more common in still waters than they are in running water. Mites can often be found among aquatic vegetation. They tend to be absent from extremely polluted or saline waters. Water spiders, in contrast, prefer the shorelines of ponds, lakes, marshes, streams and rivers.

Critter facts

One species of terrestrial mite, commonly called a ‘chigger’, can cause severe dermatitis. An intense itching is caused by the secretions that it leaves as it bites. This species is also of medical importance as it acts as a vector for human pathogens, such as the Asian scrub typhus.

The largest species of aquatic scorpions, now extinct, grew to 86 cm.

Identification: The key starting on page 21 of *The Waterbug Book* should help you tell mites and spiders from other animals. Aquatic mites vary in shape and colour, but all are quite small. They have eight legs and most have spherical bodies. Large mites that are brightly coloured may be seen with the naked eye. Many others, due to their small size, may go unnoticed without the aid of a microscope, although they are far more common than water spiders.

Water spiders are light in colour, usually brown, and they have long legs. They have eight eyes arranged in two rows of four. The arrangement of the eyes is the easiest way to recognise a water spider.

Classification and sensitivity

Sensitivity not rated

Phylum: Arthropoda

Class Arachnida

Order Acariformes

Order Parasitiformes

Order Araneae

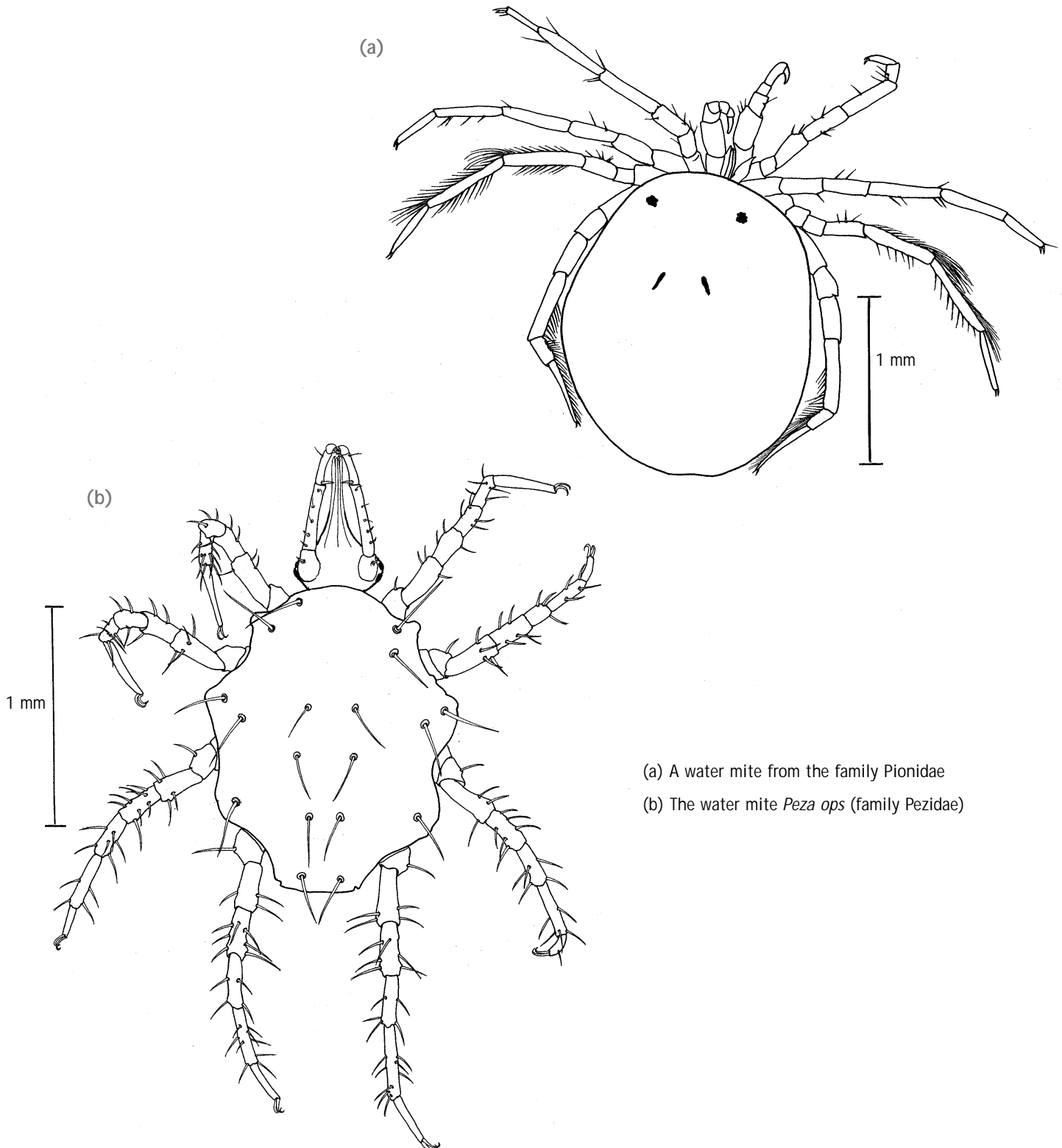
References

Hawking & Smith 1997, pp 40-46; Williams 1980, p 118; Gooderham & Tsyrlin 2002, pp 59-62.

9.1 Orders Acariformes and Parasitiformes-water mites

Background

There are over 45,000 named species of mites and ticks worldwide, including terrestrial, marine and freshwater forms. Some authors suggest that the order Acariformes, which consists of many types of mites and ticks, should be split into seven separate orders. At least 22 families of aquatic Acariformes are found in Australia. For South Australia, at least 33 species of mites are known, but that number is increasing as more species are recognised. Fossil records date back to the Early Devonian period, nearly 400 million years ago.



(a) A water mite from the family Pionidae

(b) The water mite *Peza ops* (family Pezidae)

Class Arachnida—water mites and water spiders

Size

Larger aquatic mites grow to 2.5 mm long, but many species are smaller.

Features

The prosoma and abdomen are fused to form the body of a water mite, which is called the 'idiosoma'. Many of these mites are brightly coloured—sometimes red, blue or green. Some are soft bodied while others have heavily sclerotised, or hardened, bodies. They are often round in shape, but some are elongate or flattened. Adults have four pairs of legs, which are often fringed with swimming hairs. They also have one pair each of chelicerae and pedipalps, which they use for feeding.

Diet and feeding

Some aquatic mites eat detritus, but as adults most are predatory. They feed on crustaceans and larvae of aquatic insects. Mites grasp their prey with a pair of palps near the mouth. Their piercing mouthparts puncture the prey and the juices are sucked out. Most larval mites parasitise other invertebrates.

Locomotion

Some mites are strong swimmers, having long hairs on their legs that help them move swiftly through the water. Other mites crawl along the bottom of the water body and have legs modified for this purpose.

Gas exchange (breathing)

Water mites get oxygen from the water by diffusion. They have tracheae that are used to transport oxygen throughout the body.

Life cycle and reproduction

Typically, the life cycle of an aquatic mite has four stages. During mating, the male mite grasps a female and, using his third pair of legs, passes a packet of sperm from his penis to the genital pore of the female. Eggs are laid either singly or in a group and are usually attached to submerged plants. On hatching from the egg, most larvae parasitise other freshwater organisms. Larval mites have only six legs and are usually teardrop-shaped. The mature larva moults into a stage called a 'deutonymph', which looks like the adult, but lacks fully developed reproductive organs. The deutonymph eventually becomes an adult.

Habitat

Water mites are found in almost every aquatic habitat except extremely polluted or saline waters. In South Australia, they can be found in ponds, lakes, slow-flowing streams and rivers, but they are not as common in fast-flowing waters. Some mites are ectocommusal and may be found in the gill chambers of crustaceans.

Critter facts

Many mites parasitise larval or pupal insects that have terrestrial adult life stages, staying inside the insect as it pupates to the adult, and then travelling to other water bodies with the unsuspecting winged insect. This enables mites to colonise new water bodies.

Identification

Mites are small animals with eight legs and are usually rotund. They can be mistaken for spiders, but are smaller and do not have distinct body segments. Spiders by contrast have two-segmented bodies. Water mites vary in colour from white, yellow, grey and blue, to red and sometimes green. They can have either soft or hardened bodies, and generally are difficult to identify to family or genus levels.

Classification and sensitivity

Note that 'Acarina' is not a formal taxonomic group but refers to aquatic mites from a number of taxonomic groups within the Order Acariformes.

Phylum Arthropoda

Class Arachnida

Order Acariformes-'Acarina' (6)

Order Acariformes-all other members (NR)

Order Parasitiformes (NR)

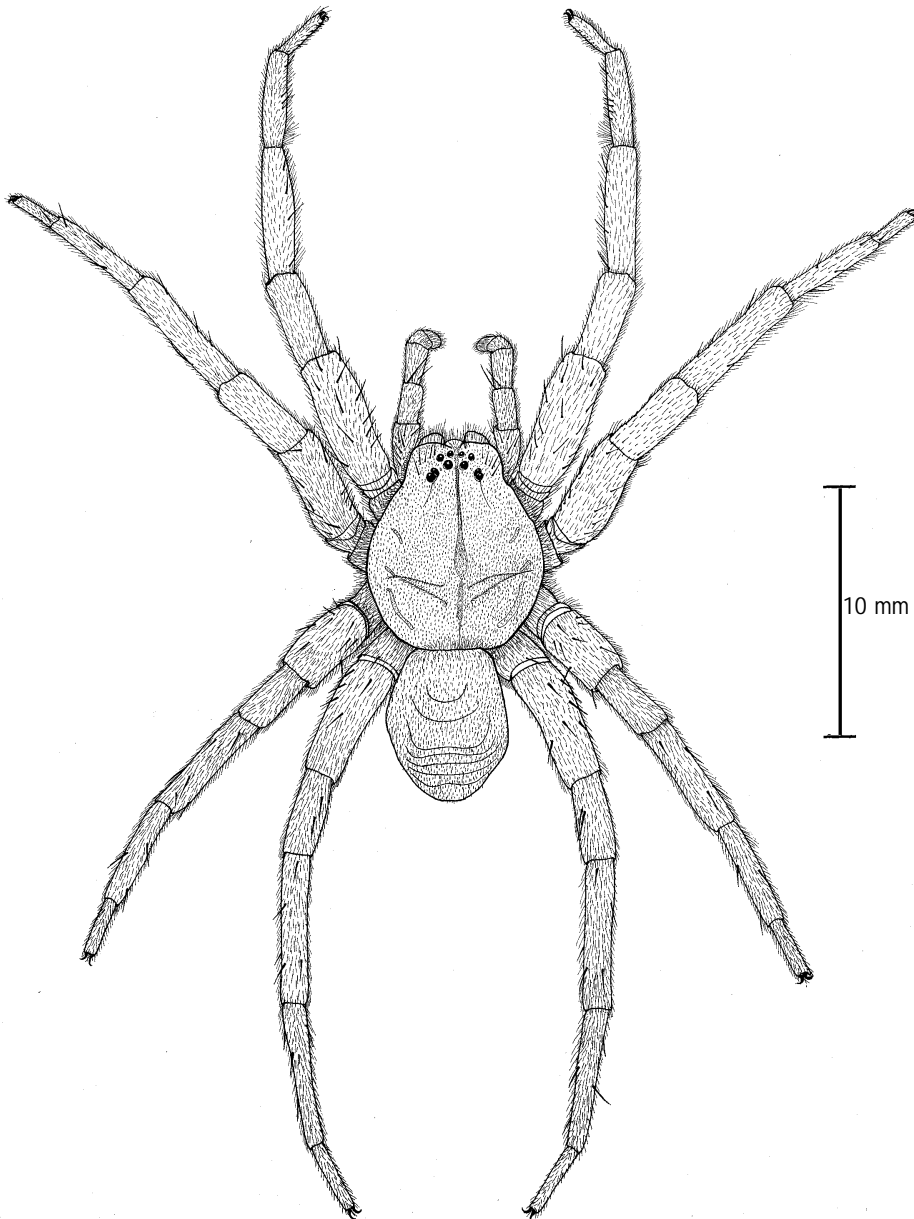
References

Hawking & Smith 1997, pp 40-46; Williams 1980, p 118; Gooderham & Tsyrlin 2002, pp 59-60.

9.2 Order Araneae-water spiders or fishing spiders

Background

There are some 35,000 species of Araneae worldwide, most of which are terrestrial. Many species of non-aquatic spiders can be found around water. However, the family Pisauridae, commonly called fishing spiders, depend upon water as a habitat. Worldwide, there are about 100 species of fishing spiders. They can be found throughout Australia, including South Australia. Fossil records of spiders date back to the Carboniferous period, about 300 million years ago.



The fishing spider *Dolomedes* sp. (family Pisauridae)

Size

Adult fishing spiders can grow up to 50 mm long, including legs. The body is about the size of a 50-cent piece. Females are slightly larger than males.

Features

All spiders have eight legs and a body of two segments, with the head and thorax combined as a single segment and abdomen as the second segment. They have no antennae and have two pairs of feeding appendages, the chelicerae and pedipalps. Fishing spiders are usually brownish in colour. They resemble wolf spiders (family Lycosidae) but have longer legs. Some wolf spiders are often found in the same habitat, on the edge of water bodies.

Diet and feeding

Fishing spiders catch semi-aquatic insects that frequent the surface of the water. They are also able to dive for food beneath the surface of the water where they can hunt aquatic insects, fish and tadpoles. They have excellent vision and can detect the slightest movement in both bright and dim light. After they have captured their prey, they feed, sitting on the bank of the water body or on a rock.

Locomotion

Aquatic spiders usually run on the surface film of a water body. The surface tension prevents them from falling into the water. When threatened or hunting for food, they are able to dive under the water, completely submerging themselves.

Gas exchange (breathing)

Fishing spiders have fine hairs on the abdomen that they use to trap air bubbles. The air bubble provides them with an oxygen supply while they are under the water. Oxygen can diffuse from the water into the bubble and carbon dioxide dissipates into the water. This system allows the spider to remain under water for more than 30 minutes.

Life cycle and reproduction

Fishing spiders produce round white eggs that the female carries in a sac in her jaws. She carries the egg sac for approximately three weeks and, just before the eggs hatch, builds a nursery web around the eggs. This web is attached to vegetation and provides a safe haven for the spiderlings during the first few stages of their lives. The spiderlings go through a series of moults. They leave the web after one or two moults and must hunt food and survive on their own. An adult female will produce two to three egg sacs in her lifetime.

Habitat

Fishing spiders live at the shorelines of ponds, lakes, marshes, streams and rivers. They are frequently found in aquatic vegetation in still waters, not often in fast flowing waters. Fishing spiders live in water bodies throughout South Australia but are not commonly seen.

Class Arachnida—water mites and water spiders

Critter facts

Most spiders construct webs to capture their prey. Fishing spiders are one of the few spiders that capture their prey without using a web. They only build a web to protect their eggs.

Fishing spiders do not usually bite humans and generally the spider will retreat when a human is present. They may bite when defending young or an egg sac, but the poison produced by this spider causes only localised pain in humans.

Identification

Fishing spiders are light in colour, usually brownish. They have eight eyes, arranged in two rows of four, and long legs. They are difficult to distinguish from terrestrial spiders but the arrangement of the eyes may be helpful. Another spider family, the Tetragnathidae, often build their webs near creeks. These spiders have long thin legs like daddy-long-legs and have longer bodies than fishing spiders.

Classification and sensitivity

Phylum Arthropoda

Class Arachnida

Order Araneae (NR)

Family Pisauridae (NR)

References

Williams 1980, p 121; Gooderham & Tsyrlin 2002, pp 60-62.