

SCREWWORM

1. BIOLOGY, DISTRIBUTION AND IDENTIFICATION

An international threat to human and animal health

The Problem

Screwworms are serious pests of warm-blooded vertebrates (mammals and birds) including humans and their livestock. Screwworms infest wounds of these animals which may die unless the wound is treated.



Adult screwworm flies and larvae at a wound.

Two species of screwworm flies are of importance - the New World screwworm fly, *Cochliomyia hominivorax* (Coquerel) and the Old World screwworm fly, *Chrysomya bezziana* (Villeneuve). Screwworms are the larvae of true flies belonging to the family Calliphoridae.

Both species are included in the list of diseases or pests notifiable to the World Organisation for Animal Health (OIE).

There are other flies associated with wounds, however, only screwworm larvae feed on healthy living tissues, whereas larvae of other fly species generally feed on dead tissues and fluids found in the wound. The term 'myiasis' is used to refer to the infestation of wounds by fly larvae.

The name 'screwworm' comes from the appearance of the larva or maggot which has a series of rings of backwardly protruding spines, around the tapered body of the larva, giving a screw-like appearance.

Wounds

Screwworm flies are attracted to and will lay their eggs on all types of wounds, ranging from tick bites or scratches to much larger wounds such as those caused during dehorning or castration of cattle and shearing of sheep. The navel of new-born mammals is also a favoured site.

Wounds produce odours that attract gravid adult female screwworm flies which lay their eggs. The wounds increase in size through the activity of increasing numbers of larvae.



Screwworms infest a wide range of warm-blooded vertebrates.

Clockwise from top left: Goat, cow, sheep, dog, human, camel, horse and pig.

Copulation



- Adults mate within a couple of days after emerging from the soil.
- Males:
 - sexually mature within 24 hours.
 - may mate five to six times.
- Females:
 - sexually mature within 2 or 3 days.
 - generally mate only once.

Adult



- After emerging from puparium, adult burrows to soil surface, where wings extend fully. Adult then flies away.
- Up to 10 mm long.
- Various colours from metallic blue to bluish purple or blue-green.
- Eyes reddish in colour.
- Live for about 2 weeks.
- Harmless apart from their ability to lay eggs on the wounds of animals.

Oviposition



- Each female capable of laying several egg masses during her lifetime.
- Egg masses laid on or near an open wound of a living animal.
- 100 to 300 eggs per egg mass.

Eggs



- Laid in a pattern like roof-tiles.
- White, cigar-shaped, approximately 1 mm long.
- Hatch 10 - 12 hours later.

Life Cycle

The New World and Old World screwworm flies are similar in appearance and biology. The length of the lifecycle depends on temperatures, with the adult and pupal stages lasting longer when temperatures are cooler.

Pupa



- Mature third instar larvae exit wound and drop to ground, usually at shaded places, where animals rest during the day.
- Larvae burrow 2 - 3 cm below soil surface.
- Larva develops into a pupa inside the darkening larval skin ('puparium').
- Puparia are brownish in colour approximately 10 mm long.
- Pupal period depends on temperature, from 7 days in warm conditions to 65 days in winter.

Myiasis



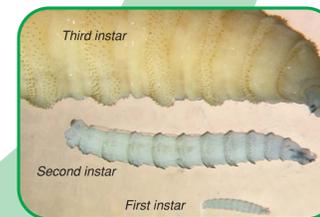
- Larvae form dense aggregations.
- Larvae feed with their heads buried downwards in the wound.
- Only posterior larval ends exposed to the surface.
- Spiracles on the posterior end used to obtain oxygen from the air.
- 'Myiasis' is a term used to refer to the presence of fly larvae in a wound.

Larval Feeding



- Head of mature third instar larva with dark mouth hooks.
- Mouth hooks used to tear at the host tissues during feeding.

Larvae



After hatching from the egg, three stages or instars of larvae (also known as maggots).

- First instar larvae are white, small (up to 3 mm long); crawl into the wound and start feeding on living tissues; duration: 1 day.
- Second instar larvae are white to cream in colour, (up to 7 mm long); continue eating on living flesh; duration: 1 day.
- Third instar larvae are white to cream in colour, when mature change to pinkish colouration, (up to 17 mm long); further enlarge the wound; duration: 3 - 5 days.

Distribution

New World Screwworm Fly



Reported Eradicated

Old World Screwworm Fly



Reported

Screwworm flies are reported in tropical and subtropical areas as indicated on the maps above. Their distribution is naturally restricted by geographical barriers such as oceans and high mountain ranges as well as by the climate. Screwworm flies thrive under warm moist conditions and do not tolerate prolonged very dry hot or permanently cold weather.

Screwworm adults can fly long distances and in warm weather may spread outside their overwintering limits. For example, the New World screwworm fly used to regularly enter central North America each year in summer from overwintering sites in Texas, Mexico and Florida before it was eradicated from these areas. Human activities such as the movement of infested livestock can also lead to the long distance spread of screwworm flies.

Larval Identification

The identification of screwworm adults and larvae is the job of a specialist. Some key larval features are given here as a guide for people who have collected larvae from wounds. For official identification, however, larvae should be sent to a specialist.

Characteristic differences between third instar larvae of New World and Old World screwworm include the number of lobes of the anterior spiracles and, following dissection of larvae and removal of opaque fat tissues, the extent of pigmentation on the tracheae from the posterior spiracles.

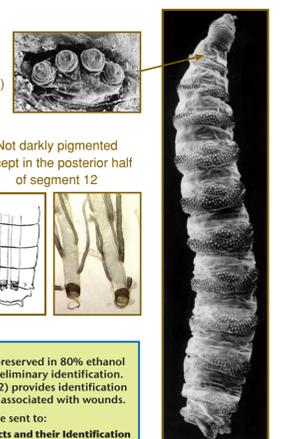
New World Screwworm



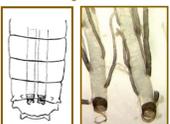
Darkly pigmented to segment 9 or 10



Old World Screwworm



Not darkly pigmented except in the posterior half of segment 12



Anterior spiracle
6 to 12 lobes (usually 7 to 9) 3 to 7 lobes (usually 4 to 6)

Tracheal trunks

Samples of adults and larvae collected from wounds should be preserved in 80% ethanol and sent to the nearest government veterinary laboratory for preliminary identification. Live samples must not be shipped for diagnosis. Spradbery (2002) provides identification keys to immature and adult stages of screwworm and other flies associated with wounds.

For confirmation of identification, samples can be sent to:
FAO Reference Centre for Myiasis-Causing and Disease Vector Insects and their Identification
Department of Entomology, Natural History Museum
Cromwell Road, London SW7 5BD, UK
Tel: +44-(0)20-7942-3726
Fax: +44-(0)20-7942-5229