Identification of locusts

The major difference between locusts and grasshoppers is that locusts have the ability to swarm. Grasshoppers do not. There are some 500 grasshopper species in Australia, some of which can develop large localised infestations without the risk of swarming.

It is therefore important that land managers can identify the four locust species and one grasshopper considered economically important pests in Queensland.

Life cycle

All locusts and grasshoppers have the same three-stage life cycle (egg ==› hopper (nymph) ==› adult) and require green vegetation (hence rainfall) for successful breeding.

Batches of eggs ('egg pods') are laid in the soil in holes up to 100 mm deep; holes are then filled with a froth plug. Some species lay in close proximity to each other, and these aggregations are known as 'egg beds'. Eggs need warmth and moisture to incubate in the soil. Under ideal conditions eggs hatch in 2–3 weeks, but may remain viable in the soil for up to 12 months.

The hatched locusts (nymphs or hoppers) are small, sexually immature, and flightless. They progress through a number of growth stages or 'instars' before 'fledging' into the adult form.

The number of instars varies between species (from 5–9), as does the time taken to reach maturity. Some species form dense aggregations of hoppers, known as 'bands', which can march across country in densities up to 5000 locusts/m^2.

Adults of all locust species are winged. New adults (fledglings) are sexually immature, and may remain in this state for as little as 14 days or for many months. Adults can form swarms covering several square kilometres which, under suitable climatic conditions, can migrate long distances to invade previously uninfested areas. For the Australian plague locust, migrations in excess of 500 km in a night are not unusual, and are associated with weather fronts (see Figure 1).

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Day flight differs from migration, with locusts relocating over short-distances. As a rule, swarms flying during the day are displaced downwind and will build up along treelines and creeks.

Migration is a survival strategy. Locust outbreak areas generally have unreliable rainfall. When locusts breed on rain, subsequent rain in the same area (needed for survival of the next generation) is not guaranteed. So locusts move (migrate) on weather fronts that are associated with rainfall events. This strategy ensures at least some insects will find green vegetation and successfully reproduce. However, when rain is widespread, the majority of locusts breed successfully, and population increase is very rapid. If this occurs for three or four generations, a plague can develop.

Economic impact/damage

A high density swarm (›50 insects per m^2) of Australian plague locusts covering 2 km^2 will contain around a billion insects, which can eat 20 t of vegetation a day. Locusts at both the hopper and adult stage can cause extensive crop and pasture damage. In Queensland, all crops can potentially be attacked, but summer crops are most at risk.

The ability of locusts to invade previously uninfested areas and lay eggs within days, combined with the mobility of flying swarms, makes swarm control particularly difficult for individual landholders.

Locust control is usually best carried out at the hopper stage.

Economically important species

The four locust species of economic importance in Queensland are the Australian plague locust, the spur-throated locust, the migratory locust, and the yellow-winged locust. The wingless grasshopper is occasionally a pest along the southern border of the state. The giant grasshopper (*Valanga irregularis*) is often encountered as a pest of urban and farm gardens but is not of economic importance.

Australian plague locust

Chortoicetes terminifera (Walker)

This is the most economically important Australian locust because of the extent and frequency of outbreaks. Successful breeding occurs after good rains in the Channel Country of western Queensland. Locusts then migrate on prevailing weather systems, invading adjacent agricultural areas (including southern Queensland).

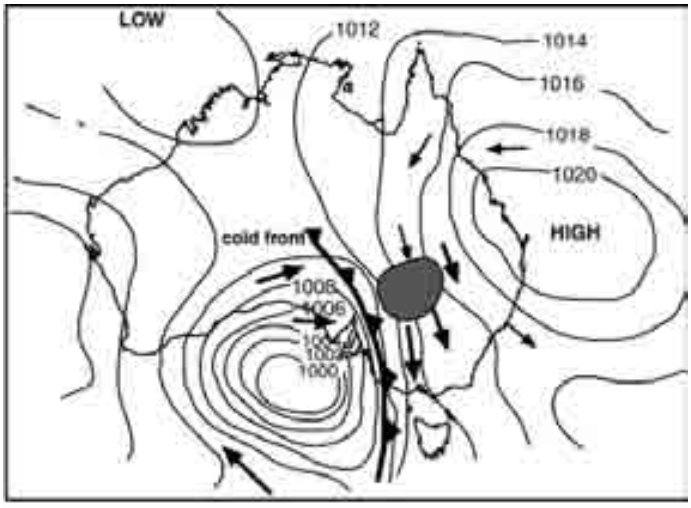

Figure 1. Hot northerly winds ahead of a depression (often associated with a cold front) may induce mass takeoff at dusk and long-distance migration downwind during the evening. Cold conditions in the wake of the depression stop further migration and prevent any movement. Night flights can result in the sudden relocation of a plague

Up to four generations occur each year, with eggs able to survive extended dry periods via quiescence (arrested growth), and then continue to develop following rain. The population overwinters as eggs in the ground via a compulsory resting stage (diapause) that ensures eggs laid in autumn do not hatch till spring. Nymphs develop through five instars, and can form dense bands of up to 5000 locusts/m^2. Bands 1 km long and dense enough to be seen from aircraft flying at 800 m are not unusual. Swarms of flying adults can occur from spring to autumn.

At normal summer temperatures (28–33 °C), the minimum life cycle is: egg (11 days) ==› hopper (35 days) ==› laying adult (12 days).

Description

Australian plague locust adults grow 25–44 mm long. General body colour is grey, brown or occasionally green—often with a pale stripe down the middle of the back. The hind wing has a conspicuous black spot at the tip, and the hind legs have red shanks.

Adults make short flights just above the grass, often landing side on to the observer. This flight is also typical of several grasshopper species, including the eastern plague locust. This insect looks very similar to *C. terminifera*, but its hind wings are pale yellow with a dark band and it lacks the red shanks on the hind legs.

Spur-throated locust

Austracris guttulosa (Walker)

This locust has a one-year life cycle, and no ability to survive extended dry spells. Normally this limits populations outside of monsoonal climates, so that plagues are infrequent compared to the Australian plague locust. However, migrations can occur into cropping areas, particularly the Central Highlands, where outbreaks can develop if summer rain falls.

This large locust can form dense swarms that feed on all summer crops. Hoppers also cause significant crop damage, particularly in seedling sorghum. Eggs are not laid in egg beds, but scattered throughout an area. Hatchings do not form bands, making control of large dispersed hopper populations difficult.

At normal summer temperatures (28–33 °C), the minimum life cycle is: egg (18 days) ==› hopper (65 days) ==› laying adult (220 days).

Nymphs hatch from November to February. Adults overwinter as roosting swarms, remaining immature until spring. Adults lay following rains in October/November.

Description

Both the nymphs and adults of this locust have a conspicuous spur between the front legs. Hoppers are green on hatching, and soon develop a black stripe down the middle of their back. Their colour may change to light brown as they mature.

Adults are 50–80 mm long with slim pale brown bodies and longitudinal white stripes. They have a strong darting flight that ends with the locust plunging into the grass. Hind wings are colourless or with a slight blue tinge. The hind legs bear two rows of dark-tipped white spines.

Migratory locust

Locusta migratoria (Linnaeus)

This insect is normally confined to the Central Highlands of Queensland, though low numbers are common as far south as northern New South Wales.

Nymphs and adults can be found all year, but damaging populations are restricted to the warmer months. Migratory locusts can have four generations per year, but eggs lack the ability to survive extended dry periods. At high population densities hopper bands and adult swarms can form.

At normal summer temperatures (28–33 °C), the minimum life cycle is: egg (11 days) ==› hopper (30 days) ==› laying adult (14 days).

Description

This large (45–60 mm) heavily built locust is green or brown in the solitary form, but straw-coloured when gregarious (swarming). Hind wings have no markings, but may be faintly greenish yellow. The mandibles (jaws) are dark purple to black. Hopper bands can be a striking black and tan colour. Adult flight is strong and steady, with the slight green wing tinge visible.

Yellow-winged locust

Gastrimargus musicus (Fabricius)

This locust occurs in all mainland states. Populations are highest from spring to autumn, and have previously caused crop damage from areas in Cape York to the Lockyer Valley in Queensland. At high population densities, hopper bands and adult swarms can form; eggs are laid in dense egg beds.

Map 1.
Normal distribution of the Australian plague locust

Map 2.
Normal distribution of the spur-throated locust

Map 3.
Normal distribution of migratory locusts

Map 4.
Normal distribution of yellow-winged locust

Map 5.
Normal distribution of wingless grasshopper

At normal summer temperatures (28–33 °C), the minimum life cycle is: egg (11 days) ==› hopper (40 days) ==› laying adult (12 days); life cycle is similar to *Chortoicetes terminifera*.

Description

Similar in shape though smaller than migratory locusts, adults are 36–50 mm long. In flight they make a distinctive clicking noise, and are easily identified by their bright yellow wings edged with a black band. Colour and body shape varies considerably with population density—green or brown with black markings and arched thorax when solitary, straw coloured with saddle-shaped thorax when gregarious.

Wingless grasshopper

Phaulacridium vittatum (Sjötedt)

The wingless grasshopper has one generation per year. The species overwinters in the egg stage, with a compulsory resting stage (diapause) ensuring eggs do not hatch until after winter. Nymphs are found in late spring to autumn, while adults are found mainly in summer and autumn.

At normal summer temperatures (28–33 °C), the minimum life cycle is: egg (210 days) ==› hopper (40 days) ==› laying adult (10 days).

Outbreaks are restricted to the moister coastal and elevated tableland areas of southern Queensland. Because two-thirds of the adult population are flightless, outbreaks are of local origin and usually of limited extent.

Description

This small, dark grasshopper grows 12–19 mm long. The wings of most adults are small papery, scale-like appendages. These differ from the wing buds of hoppers of other species which are thick and fleshy.

Steps for identification

1. Time and place – Check maps 1 to 5. While individuals are sometimes found outside the distribution areas shown, it will be unusual to find large concentrations.
2. Gregarious behaviour – Swarms of flying adults are likely to be either Australian plague locusts, spur-throated locusts, migratory locusts, or yellow-winged locusts. Spur-throated locusts in high densities generally roost in trees. Hopper bands will be either Australian plague, migratory, or yellow-winged locusts, or small plague grasshoppers. Spur-throated locusts do not form bands.
3. Observe adult flight behaviour – See previous species notes describing flight.
4. Size – Adult size is a good guide, but remember that males are only two-thirds the size of females. Look at the rear end—females have a four-pronged ovipositor for drilling and egg-laying; the male's rear end is either rounded or drawn out to a point. Nymph size is not a good guide since it varies with growth stage (instar).
5. Catch a specimen – Compare with above species notes and colour photos provided.

Adult female of the Australian plague locusts

Migratory locust, adult

Yellow-winged locust, adult

Spur-throated locust, adult

Spur-throated locust, viewed from below, showing the spur between the first pair of legs

Wingless grasshopper, adult

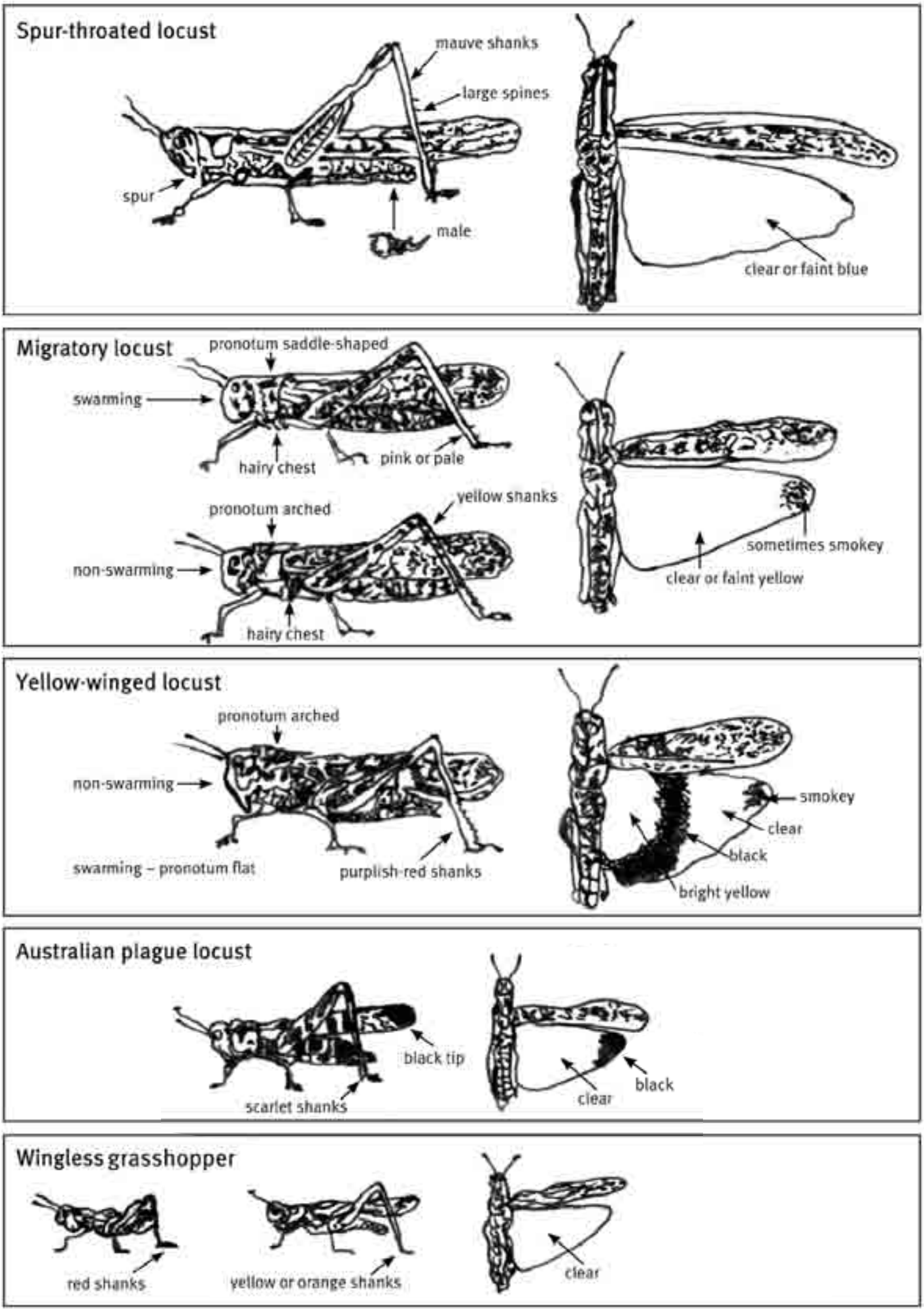

FIGURE 2 – IDENTIFICATION KEY

Each illustration approximates to the actual size of a female of each species. The males are all generally slightly smaller. The identifying features are the same for both sexes. The patterning on the head, body and forewings vary considerably in each species and are poor identification characteristics.

Describing population density

By adopting standard descriptions for locust densities landholders can accurately describe the extent of their locust infestation. This information is important when coordinating control operations. The terms given in Table 1 are those used by the Australian Plague Locust Commission.

Table 1. Number of insects per m²

Adults		Nymphs	
Concentration	0.5–3	Present	1–5
Low density swarm	4–10	Numerous	6–30
Medium density swarm	11–50	Sub-band	31–80
High density swarm	›50	Band	›80

Responsibility for control

Locust control in Queensland is primarily the responsibility of the landholder.

Provision has been made within the Act for the establishment of locust committees by local authorities, with the powers to enforce control by landholders and carry out control work as deemed necessary. The Department of Primary Industries and Fisheries will coordinate locust control operations throughout the state.

The Australian Plague Locust Commission, an organisation with joint state and Commonwealth funding, will only implement control measures where the commission considers locusts present an interstate threat.

Recommendations for locust control can be found in Biosecurity Queensland's pest fact sheet *Control of locusts* (available for download on www.biosecurity.qld.gov.au).

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland (call 13 25 23 or visit our website at www.biosecurity.qld.gov.au).

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