



Leatherjackets continue to undermine turf

Dr Terry Mabbett casts his expert eye over the leatherjacket

By definition and description professional turf is a well nourished and nurtured sward but the crisply low-cut grass shoots and leaves offer slim pickings for insect pests, because the green above-ground pristine biomass is clearly limited in scope.

But underground is an extensive dense and highly efficient fibrous root system, established over many years and active virtually year round, collecting and pumping water and nutrients for stem and leaf growth to replace the clippings sliced off by regular mowing. Chafer grubs and leatherjackets are the two important insect pests of professional turf in the United Kingdom (UK), and both predictably target turf grass roots.

Root zones of perennial grass species like fescues and bents, the key component species of UK professional turf, are ideal territory for invertebrate animals. And

logically better host plants than cereals which are essentially annual 'grasses' grown for a single season in the farmer's three to four year crop rotation on the same piece of land.

Lots of invertebrate animals feed on grass roots and thatch while only causing little if any damage to the turf, but a select few can rise to economic pest levels and threaten sports turf as a commercial playable surface. Invertebrate animal pests do not possess backbones but these two insects in particular – chafer grubs and leatherjackets – have the capacity to 'break the back' of fine professional turf with it the spirit of greenkeepers.

The larval stages (grubs) directly damage grass plants through their voracious feeding on the roots and indirectly, and usually more seriously, by attracting wild predator animals to feed on the larvae and causing penetrating collateral damage in the process. These may

be wild mammals like foxes and badgers or wild birds (especially corvids including rooks and crows), all seeking out the larvae (grubs) as food and tearing up the turf in the process.

Leatherjacket life history

Crane flies (*Tipula* sp) the Dipterous (double-winged) insects popularly known as 'Daddy Long-legs' are among the most short-lived and delicate of insects, but this doesn't stop their robust, long-lived and 'hungry' leatherjacket larval stage from becoming a serious insect pest of turf. Mass appearance of adult crane flies during the perceptibly cooling and shortening days of late August and September marks the beginning of a year-long life cycle with rapid appearance of large, long-lived, robust and damaging larvae and the complete antithesis of adult crane flies.



about the author

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Adult crane flies emerge from pupae in dew-covered turf on early autumn mornings and almost immediately lay eggs in turf. With hard winter conditions just several months away and no time to lose larvae hatch within 14 days and promptly start to feed on the grass roots. They feed at a low level through winter then step up a gear in spring, gorging on new root growth sustained through winter by autumn application of fertiliser. More fierce feeding resumes in the warmer conditions of spring on growth kick-started by spring fertiliser especially the phosphate components.

Leatherjackets continue to increase in size and voracity, cutting through turf grass roots and stem bases with sharp biting mouth parts through spring and into summer. Now approaching maturity and ready for pupation, they are 'greasy' looking, earth-coloured grubs, legless and several cm long with a tough and leathery cuticle (outer covering) and a correspondingly appropriate common name.

Leatherjackets feed on and damage grass roots through autumn and winter, but first tell tale signs of damage do not appear until spring when feeding accelerates and cumulative effects become apparent. In spite of the now warm moist conditions growth by damaged plants is sluggish and yellow patches of stressed and dying turf start to appear. Problems become painfully obvious during hot dry spells when already damaged grass is put under even more stress, dies and turns brown.

Affected turf is easy to lift having lost its firm anchorage due to extensive leatherjacket damage to the root system. Rapid weed growth in spring will take advantage of the weakened and thinner turf, and unusually large numbers of birds including corvids (crows, rooks, magpies and jays) and starlings may start to take an unhealthy interest, pecking down into the turf to secure the grubs.

Early symptoms of leatherjacket feeding and damage can be mistakenly taken for poor water relations, nutritional imbalance or even disease, but when large numbers of particular birds at key times of the year take up residence on turf this is a pretty accurate indicator of turf pests like leatherjackets and the signal for greenkeepers the signal to act quickly.

Lifting segments of the damaged turf reveals the leatherjackets but there are easier ways to locate and identify them. Soak part of the affected area with water and cover overnight with black polythene or old carpet which encourages the leatherjackets to the surface by the next morning.

Detailed examination reveals legless, segmented grubs with black retractile heads; a pair of horny jaws with two dark coloured spiracles (breathing holes), surrounded by six cone-shaped projections, on the last body segment. Leatherjacket damage is most severe on poorly drained soils and made worse by wet autumns. Any management practice that improves drainage is beneficial.

Population dynamics

Leatherjacket populations vary from year to year, with prevailing conditions at key points of the life cycle affecting numbers and resulting damage levels in turf during the following months and into the next calendar year. Climate and weather clearly impact on adult emergence, movement and egg lay in September, autumn feeding of newly hatched larvae and their ability to survive the winter and resume feeding in spring.

The same leatherjackets are important insect pests of agricultural grassland and cereal crops with the farming community keeping a watchful eye on populations from year to year. This information can prove useful to greenkeepers by giving a strong indication of what they are likely to expect. For instance in spite of the very cold winter of 2009/2010, calculated in many parts of the country as the coldest for around 30 years, SAC (Scottish Agricultural College) is predicting high numbers and significant damage from leatherjackets. And this in the coldest part of the UK.

According to SAC Ecologist Dr. Davy McCracken two-thirds of all the fields sampled harboured populations greater than 0.6 million grubs per hectare (ha), while over half were well above that at 1 mil-

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Dr. Davy McCracken

lion/ha. “It means the damage and loss of yield could be serious when hungry grubs start feeding as soils warm up, said McCracken.

“Unfortunately, the severe winter weather this year will not have had any impact on reducing grub numbers,” he says.

“Leatherjackets are very resilient to cold and frost and all they do under such conditions is reduce their feeding until the soil warms up again.”

And this in spite of their shallow position in the soil where they eat the roots of grasses, cereals and other plants. SAC's annual surveys shows leatherjacket densities fluctuate from year to year, but there has been a consistently higher trend over the last 13 years linked, it is believed, to



climate change and wetter, milder autumns.

Management and control

On balance chafer grubs are generally regarded as the bigger pest problem for professional turf but that is probably because were traditionally the more difficult to control. Greenkeepers have 'always' been able to rely on the 'old' stalwart insecticide chlorpyrifos that could have been tailor-made to deal with leatherjackets.

By acting in three different ways - contact, fumigant and ingestion action - chlorpyrifos is the ideal all-round insecticide for use against most soil-borne pests as seen from its continued use after many decades worldwide in agriculture and horticulture as well as turf and amenity.

What's more chlorpyrifos resists leaching which allows it to stay in the uppermost layer of the soil to kill shallow-seated leatherjackets feeding on turf grass roots just below the soil surface.

But even the control of leatherjackets, one of the oldest, most recognised and persistently damag-

ing insect pests in the UK, cannot escape increasingly important environmental and biodiversity considerations and implications.

Leatherjacket grubs are clearly important food sources for a variety of birds but the adult crane flies or daddy long-legs are equally important food sources for bats.

When the National Trust says it was a bad year for crane flies they mean adult emergence in September was low with correspondingly reduced food available for bats.

When an agricultural or amenity survey says it will be a bad year for leatherjackets they imply widespread and heavy damage to turf, pasture grass and cereals.

That said SAC and other agricultural monitoring bodies are very mindful of the biodiversity implications of leatherjacket control with chemical pesticides.

SAC has conducted an annual survey each winter since the mid-1970s and says their latest 2009/2010 results show once again the value of such long-term surveillance and the data generated.

In addition to the risk posed to grassland leatherjackets are an

important food resource for farmland birds.

Greenkeepers should use the behaviour of birds on turf to their advantage. If species like rooks, crows and starlings are showing an unhealthy interest in the turf then it is a sure sign of ample food just beneath the soil, probably in the form of leatherjackets requiring immediate control.

Biopesticides based on nematodes which infect leatherjackets with a lethal bacterium are available. Like all natural enemies and biocontrol products they are density dependent.

This means the number and effect of the entomopathogenic nematodes will rise in response to increases in the leatherjacket (host) population, only to fall away again as leatherjacket numbers decline. They do not act as quickly as dedicated chemical insecticides and require more exacting soil conditions (temperature and moisture) for optimum activity. That said, the rate at which chemical pesticides are disappearing from the marketplace in the face of broad-front EU legislation means that biopesticides almost certainly have their 'best days' yet to come.



This article comes to you courtesy of the BIGGA Learning and Development Fund.

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