STUDIES ON INSECTS ASSOCIATED WITH GORSE, *ULEX EUROPAEUS* L.

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Ulex europaeus L. is a West-European shrub, now introduced into many parts of the world. It is a noxious weed in New Zealand, where attempts at its biological control started as early as 1927 (Davies, 1928). These attempts resulted in the introduction and establishment of the seed-feeding weevil *Apion ulicis* Forst. In spite of high population densities the weevil was not capable of controlling gorse in New Zealand. In 1961 the European Station of the Commonwealth Institute of Biological Control was asked to resume search for potential enemies of *U. europaeus*. Since a former inventory of insects associated with *U. europaeus* had been made in England (Chater, 1931), this present survey for gorse insects was restricted to France (1962-1965).

Gorse is common in western France reaching highest densities in areas bordering the Atlantic. Being sensitive to frost it prefers a warm and humid climate. In areas showing winter temperatures below freezing point its growth and reproductive capacity are markedly reduced. The plant tends to avoid calcareous soils. The numbers of insect species found on gorse were highest in those regions of western France where gorse is most abundant (Brittany). In central France, i.e., at the eastern border of its natural distribution area, gorse is attacked by relatively few insect species. Available information suggests that in France climate (frost), soil conditions and agricultural management limit and control the occurrence of gorse, whilst phytophagous organisms locally reduce the competitive capacity of the plant.

About 90 phytophagous arthropod species attack gorse in Europe. About 40% of these are polyphagous, about 30% attack a broad range of genera of Leguminosae and about 20% are restricted to *Ulex* and closely related genera. The following species appear to be closely associated with *Ulex*:

"*Tetranychus telarius* L." (Acarina, Tetranychidae) - The taxonomic status of this mite is not as yet clear, it may be a biotype of *T. telarius* specialized on gorse, or a sibling species within the "*T. telarius* group". The mite covers the plants with conspicuous webs, causes chlorosis of the leaves and may induce die-back of single

branches or even of whole plants. The mite may infest areas measuring up to 7-8 m in diameter, but the infestations always remain restricted and do not kill the whole gorse population of the locality concerned.

Aceria genistae Nal. (Acarina, Eriophyidae) - The mites attack the tips of the shoots which swell and show a fuzzy white growth. Attacked plants appear severely affected.

Gargara genistae F. (Membracidae), *Arytaena genistae* Latr. (Psyllidae) and *Pergandeida ulicis* Walk. (Aphididae) feed on the shoots and leaves of *Ulex* and some closely related genera, but do not cause much harm to their host. Of the large number of Hemiptera collected from gorse only *Piezodorus lituratus* F. (Pentatomidae), *Pachylops bicolor* Dgl. & Sc., *Asciodema obsoletum* Fieb. (both Miridae) and possibly *Heterocordylus parvulus* Reut. (Miridae) seem to be restricted to *Ulex*.

Asphondylia ulicis Ver. (Cecidomyiidae) - The larvae of this midge live in flower-buds, which are transformed into globular galls. The species is only recorded from *Ulex* spp.

Scythris grandipennis Hw. and *S. gallicella* d.Joannis (Scythrididae) - The larvae of these stenophagous moths feed in webs and silken tubes on the shoots. *Coleophora albicosta* Hw. (Coleophoridae) destroys the seeds of *Ulex*, whilst larvae of several other *Coleophora* species have been found mining in the leaves.

Anarsia spartiella Schr., *Gelechia* spp., *Depressaria costosa* Hw. and *D. umbellana* Stph. (Gelechiidae) - The larvae of these stenophagous moth species feed on the leaves, shoots, flowers, and young pods of *Ulex*. In our observation area *D. umbellana* was a very common species which attacks the shoots from silken tubes made between spun leaves. Occasionally more than half of the shoots of gorse are inhabited by individual larvae, and this may then visibly affect the plant. *D. umbellana* oviposits from mid-March to mid-April, the larval feeding period lasts from April/May to July, pupation takes place in July, and the moths emerge in early August. After emergence the adults enter a diapause, which under laboratory conditions could be terminated by exposing the moths for 55 to 65 days to a temperature of + 4/6°C. The French populations of *D. umbellana* were parasitized by a Tachinid, *Actia crassicornis* Meig., a Braconid, *Rhogas* sp., several Ichneumonids and a

gregarious Chalcid. Preliminary feeding tests with medium-sized larvae of *D. umbellana* suggest a very high degree of host-specificity. This species warrants further studies.

Laspeyresia lathyrana Hb., *L. succedana* Schiff., *L. internana* (Tortricidae) - The larvae of *L. lathyrana* mine within the distal parts of the shoots where they destroy the tips, later in the season they appear to migrate to the subterranean parts of the stem and to the roots. The larvae of the other two *Laspeyresia* species feed within the seed-pods.

Sitona tibialis Herbst, *S. regensteinensis* Herbst (Curculionidae) - Adults of both species frequently feed on shoots of gorse and related genera, whilst the larvae attack the roots. The degree of host-specificity of the larvae is as yet unknown.

Apion (*Lepidapion*) *pseudogallaecianum* Hoffm., *A.* (*Exapion*) *uliciperda* Pand., *A.* (*Exapion*) *ulicis* Forst., *A.* (*Exapion*) *lemovicinum* Hoffm., *A.* (*Exapion*) *difficile* Herbst, subsp. *crassiusculum* Desbr., *A.* (*Exapion*) *elongatulum* Desbr., *A.* (*Pirapion*) *striatum* Kirby and *A.* (*Eutrichapion*) *scutellare* Kirby (Curculionidae) - Larvae of these species of *Lepidapion* and *Exapion* live within the pods of *Ulex* spp. (*A. elongatulum* is also recorded from *Cytisus*). *A. uliciperda* shows a preference for *Ulex nanus* Forst. whilst *A. ulicis* seems to prefer *U. europaeus*. The taxonomy of the *Exapion* spp. presents considerable difficulties and a number of the *Exapion* spp. collected on gorse could not be identified with certainty. *A.* (*Pirapion*) *striatum* and *A.* (*Eutrichapion*) *scutellare* inhabit ovoid galls on the twigs and shoots of gorse and may cause die-back of the attacked parts. Preliminary feeding tests with adults of *A. scutellare* showed slight feeding on *Lupinus*, occasional nibbling on *Medicago* and *Trifolium*, but no feeding on *Sarothamnus*, *Robinia*, *Colutea*, *Anthyllis*, *Lotus*, *Onobrychis*, *Melilotus*, *Lathyrus*, *Pisum*, *Phaseolus*, and *Laburnum*. *A. striatum* refused *Anthyllis*, *Lotus*, *Onobrychis*, *Trifolium*, and *Phaseolus*, but fed upon *Lupinus* and *Laburnum*. Nibbling occured on *Sarothamnus*, *Robinia*, *Colutea*, *Medicago* and *Melilotus*. Both species warrant further study.

Phloeophthorus rhododactylus Marsh. (Scolytidae) - This bark-beetle is common in dead or dying stems of *Ulex*, but also attacks related genera.

Some rather euryphagous insects (*Subcoccinella* 24-*punctata* L. (Coccinellidae), *Strophosomus* spp. (Curculionidae), *Tortrix pronuba* Hb. (Tortricidae)) were

locally common on gorse and caused considerable damage to the plants.

Of the insects observed in France the Gelechid *D. umbellana* and the weevil *A. scutellare* may be considered as potential insects for the biological control of gorse in New Zealand. Both species are capable of causing considerable damage to the vegetative parts of gorse and may hence complement the seed-feeding *A. ulicis* which is already established in New Zealand. Since *D. umbellana* and *A. scutellare* occupy different feeding sites they do not interfere with each other. The climatic conditions of New Zealand should be suitable to both species, as is indicated by the abundance of the host-plant in both western France (Brittany) and New Zealand. According to available literature records, present field observations and preliminary feeding tests *D. umbellana* and *A. scutellare* appear to be highly restricted in their host selection. Some additional tests, however, should be made to confirm the "safety" of these insects.

References

Chater, E.H., 1931. A contribution to the study of the natural control of gorse. Bull. ent. Res., 22: 225-235.

Davies, W.M., 1928. The bionomics of *Apion ulicis* F. (gorse weevil), with special reference to its role in the control of *U. europaeus* in New Zealand. Ann. appl. Biol., 15: 263-286.