Seasonal and cyclical fluctuations in New Zealand flatworm populations

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The New Zealand flatworm *(Arthurdendyus triangulatus)* (Fig. 1) is an alien terrestrial planarian which is widely distributed in Scotland (Boag and Yeates 2001) which feeds on earthworms and can significantly reduce their numbers. Little is know about their ecology under field conditions in the British Isles but seasonal fluctuations have been recorded in Northern Ireland in their numbers and it has been suggested there might be a long term predator prey cycle over a number of years.

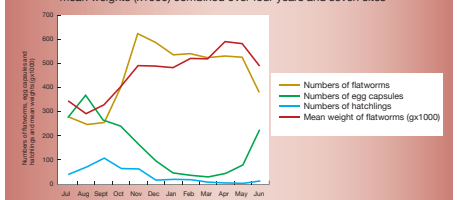
Fig 1.
New Zealand Flatworm and egg capsule

To investigate these phenomena 10 "traps"(600mm x 200mm black plastic bags filled with 6kg soil and sealed) were examined monthly at 7 sites in Scotland (Dundee, Edinburgh (2), Perth, Connel Bridge, Sandbank and Dunoon) and number and weight of the flatworms were recorded as were the numbers of egg capsules and hatchlings, temperature and soil moisture.

Results - Within Seasonal fluctuations

The within season fluctuations from 7site over a 6 year period of flatworm numbers, their mean weights, egg capsules and hatchlings can be seen in Fig.2. Numbers of flatworms were greatest from November to May and their mean weights doubled from less than 0.3g in August to over 0.59g in March. Egg capsule numbers were greatest in August and hatchling a month later in September. These trends were consistently seen at all sites and in every year.

Fig 2 Annual cycle of flatworm, egg capsule and hatching numbers plus mean weights (x1000) combined over four years and seven sites



Results - Season to season fluctuations

At some sites e.g. Dundee flatworm numbers remained relatively constant while at others they decreased e.g. Perth (Fig. 3) and at others they increased e.g. Connel Bridge (Fig. 4).

The decrease at Perth, which occurred gradually over a 3 year period, was accompanied by a decrease in flatworm weights (Fig.5) and of egg capsule numbers (Fig.6).

Fig 3 Decline in flatworm numbers at Perth

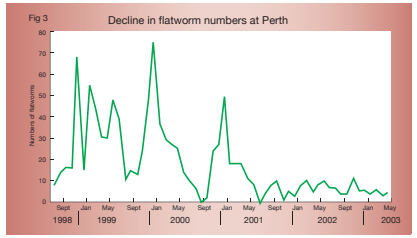


Fig 5 Decline in flatworm weights at Perth

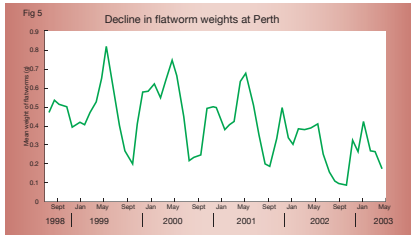


Fig 4 Increase in flatworm numbers at Connel Bridge

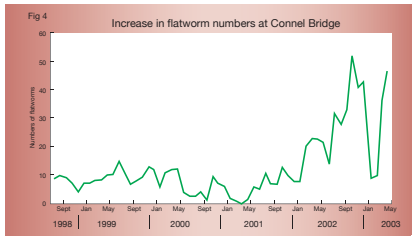
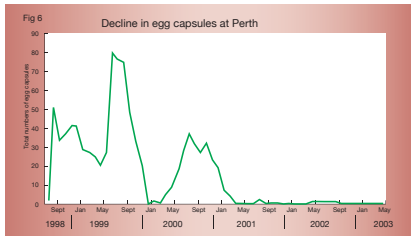


Fig 6 Decline in egg capsules at Perth



Discussion

The within season fluctuations detected in flatworm numbers, weights, egg capsules and hatchlings from Scotland would suggest that in the summer, while flatworms are reproducing and laying their egg capsules, they are unable to feed enough (due to the unavailability of earthworms) to maintain their weight. In the autumn they stop laying their egg capsules, their prey again becomes available and they gradually put on weight throughout the winter. Also during the late summer and autumn the egg capsules hatch and young flatworms are recruited into the population.

At some sites the population of flatworms are possibly in equilibrium with earthworm populations and these conditions perpetuate. However at others e.g. Perth the flatworm population over exploits the earthworm population which leads to too few earthworms and the flatworms starve, loose weight (Fig. 5) and are unable to reproduce (Fig. 6) leading to a reduction in their numbers (Fig. 3).

Evidence from others sites e.g. Connel Bridge would suggest that the converse is true and flatworm numbers can recover (Fig. 4) leading to the possibility that flatworms and earthworms populations may settle down to a long term (8 -10 year ?) predator prey cycle. However, other evidence from the west of Scotland has suggested that the composition of the earthworm community is irreversibly altered (Jones et al. 2001) and the larger anecic species, which are the main source of food for both animals and birds and help drain the soil, are unlikely to fully recover in such a long term cycle. Further long term research is required to determine the extent of any possible long term detrimental affect the New Zealand flatworm might have on the environment.

References

Boag, B. & Yeates G.W. (2001) Ecological Applications 11: 1276-1286.

Jones H.D., Santos G., Boag B. & Neilson R. (2001) Annals of Applied Biology 139: 75-92.