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The influence of predation by Gammaridae on invertebrates

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With 3 tables

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The feeding on freshwater invertebrates was studied. The results show that there is a great impact on the number of invertebrates in waterbodies where Gammaridae occur. The impact is greatest when collected material is transported in buckets.

1 The locality

On 20 May 2009 macrofauna were collected from brooks in The Netherlands. The standard method for sampling was used and two localities were visited, starting with the brook Rovertsche Leij near Tilburg. At this site many Simuliidae larvae and pupae are attached to the stems and leaves of *Glyceria fluitans*. By the banks *Callitriche* was growing. The invertebrates comprised a great number of the Gammaridae species *Gammarus pulex*. Some leaves of *Glyceria fluitans* with larvae and pupae of Simuliidae were taken by hand and put into a separate bucket. Some material, taken with a net from Callitriche, was added to this bucket.

2 In the laboratory

Analysing started with the bucket filled with plant material. The other buckets were put in a cold room. During the analysis of the sample I could not find any Simuliidae and only a few Chironmidae larvae. Later, when analysing the main bucket I found few chironomid larvae. Platvoet describes the voracity of the Gammaridae species *Dikerogammarus villosus* and the predation of larvae of the chironomid Chironomus (Platvoet, 2007: 41).

3 Field and laboratory

Some days later, at the same locality, the sample was taken again but the analysis was done at the same time in the field using trays. In table 1 is given the result of both methods.

4 The tests

For these tests a tray was used (51x36 cm) with 5 cm depth of site water.

Test 1, 24 05-2009

To find what is happening a simple laboratory experiment was developed. Into the tray were put some plants and 30 *Gammarus pulex*, the species that occurs in the Rovertsche Leij, at 15.00 PM. Then 40 larvae of Tanypodinae (bloodworms) and some Oligochaeta were added. At 16.30 PM 15 bloodworms remained and at 17.00 PM all bloodworms and worms appeared to have been consumed by *Gammarus*.

Test 2, at 25 May 2009

The test was repeated with the same tray. 90 Chironomidae larvae and 40 Oligochaeta were added. After one and a half hours only 15 larvae and 6 Oligochaeta could be found. After two hours not one larva or worm could be found in the tray.

Test 3, at 6 June 2009

At 20.00 PM some plants and 40 *Gammarus pulex* were put into a tray (51x36 cm) with 5 cm of site water. To this were added 90 Chironomidae larvae, 40 worms (Tubificidae), 55 Asellidae, 31 Corixidae larvae and 2 *Cloeon* larvae (Ephemeroptera). The animals were counted 5 times starting at 21.30 PM and ending the next day at 14.00 PM. At 14.00 (Tab. 2) all *Cloeon*, some Chironomidae and worms and the most Asellidae had been eaten, but the Corixidae were not eaten.

Tab 1: Comparison of sorting invertebrates later in the laboratory and straight in the field

ROVERTSCHE LEIJ	sorted in the laboratory 20-05-2009	sorted in the field 23-05-2009
Tubificidae	108	161
Baetis vernus	99	82
Simuliidae larvae	19	150
Procladius		1
Psectrotanypus varius		2
Odontomesa fulva	1	2
Prodiamesa olivacea	6	13
Cricotopus gr sylvestris		6
Tvetenia discoloripes agg.	3	8
Chironomus	1	22
Cryptochironomus defectus	1	5
Paracladopelma laminata agg.	2	27
Paratendipes albimanus	1	7
Phaenopsectra		2
Polypedilum scalaenum	11	1
Tanytarsus mendax gr	1	
Ceratopogonidae	1	1
Total taxa	254	490

Tab. 2: Tray with some invertebrates and 40 *Gammarus pulex* observed during 16 hours overnight. Column "n" gives the number of remaining invertebrates.

6 July 2009: time	20:00	21:30	23:00	10:00	14:00
Gammarus pulex: 40					
Other invertebrates	n	n	n	n	n
Asellidae	55			39	36
Corixidae	31	31		31	31
Cloeon	2	2		1	0
Chironomidae: Chironomus	69	20	10	10	1
Oligochaetae: Lumbriculus	60		30	8	4

The Corixidae were not eaten because they produce a defence liquid when they are attacked. This is well known from terrestrial living Heteroptera and it seems the aquatic living species also do. Dr. Dirk Platvoet observed that the gammarid directly releases the bug when starting to eat. Then the Gammaridae makes movements which seems to be cleaning its mouth.

5 Storing samples and the feeding of Gammaridae

What happened in the tray is also happening in the bucket when driving home after collecting. Gammarids eat animals whereever they are. Also when the sample is stored overnight in the laboratory, which is done in a standard procedure. Dr. Dirk Platvoet informed me about the feeding of all species in Gammaridae:
1 - Gammaridae always eat where they feel comfortable and they are never satisfied
2 - Most consuming takes place at a temperature of 15° C and under 5° C they hardly eat at all
3 - Gammaridae avoid strong sunlight

This information motivated three colleagues Roel Boerma, Mieke Moeleker and Claudia Schuurmans to do another test. The experience should make clear what the Gammaridae eat during a storage over the night. With three buckets they created different situations by changing the water level, organic material and temperature. Into all buckets were added 50 Gammaridae and 100 Chironomidae larvae (Tab. 3).

Tab. 3: Buckets with a different combination of organic material and waterlevel. There were added 100 larvae of *Chironomus* and a mix of *Gammarus roeseli* and *G. pulex* and stored overnight. The column "result" gives the number of *Chironomus* remaining after one night

bucket	waterlevel	organic material	Gammarus	Chironomus	period	temp	result
1	⅓ bucket	no	50	100	overnight	4 ° C	22
2	2 cm	yes	50	100	overnight	4 ° C	89
3	2 cm	yes	50	100	overnight	“room”	74

Table 3 shows that the most animals are eaten when stored in a bucket with a water column of more then 2 cm.

6 Conclusions

The results generate three points to think over.

1 -The results of the tests give a strong indication that when the sample is in a bucket for shorter or longer period the results of quantitative analyses is influenced.
2 - Predation by Gammaridae is a factor that should not be ignored as well in the natural situation as in the laboratory.
3 - We recommend to avoid predation by Gammaridae sorting them out at the same time that the samples are taken in the field. It is better to remove at least the bigger Gammaridae.
4 - The results of earlier collection programs should be considered in the light of these above findings, especially where large numbers of Gammaridae were present in the samples.
5 - In waterbodies where many Gammaridae occur the number of some macrofauna will be reduced.

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References

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