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PREDATORY SOIL MITES (ACARI, MESOSTIGMATA, GAMASINA) FROM THE WESTERN BALTIC COAST OF LATVIA

by I. SALMANE 1* and S. HELDT 2

(Accepted April 2000)

SUMMARY: Sampling (organic debris of the driftline and rhizosphere of characteristic plants of the primary and yellow dunes) was made at six sites along the Kurzeme Coast of Latvia (Eastern Europe). Among 37 Gamasina species recorded, 14 were new for fauna of Latvia. Yellow dunes were the most rich in species (25 species), then driftline habitats (18 species) and primary dunes with 16 species. The maximum of abundance was found in driftline habitats followed by yellow and primary dunes. At the investigated habitats distinct Gamasina communities were found, with about 2/3 of all species being typical for each habitat stand. Great differences in the numbers of individuals among the investigated habitat types revealed consequences of the diversity of ecological conditions.

Minirhodacarellus minimus seems to have a preference for Festuca rubra (s.l.).

INTRODUCTION

Gamasina mites play an important role in the coastal ecosystems (KOehler et al. 1995). Important predators on the arthropods and nematodes in the soil, they contribute to the regulation of their population dynamics and, in relation to that, to force dune sand stabilization. KADITE described Gamasina species from the seashore habitats of the Baltic Sea Coast (EITMINAVICHUTE, 1976), including some coastal habitats of Latvia. Unfortunately, this study gave only weak evidence on the Latvian Gamasina mites' fauna of the seashore habitats. The project “Coastal Ecosystems of the Baltic Sea and Bioindication” within the twinning of the Universities of Bremen and Riga was started in 1992. Thus led to the increased research activities in the coastal habitats (KOehler et al. 1992, 1995; KOehler msc. 1994;

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MELECIS et al. 1995; PAULINA & SALMANE 1996). The present paper discusses data from the sampling carried out at six sites of the North-western Baltic Coast of Latvia. We used semi-quantitative sampling to investigate the species spectrum of Gamasina taxocenoses. As well we wanted to investigate possible correlations of Gamasina species' occurrences in the rhizospheres of the specific plant species (KOEHLER et al. 1992). For this purpose sampling was made in the rhizosphere of the selected characteristic plants.

**Material and Methods**

Six sites of the Kurzeme Coast, North-western of Riga – Roja (22°45'/57°30'), Kolkasrags (22°30'/57°40'), Luzna (21°55'/57°35'), Ventspils (21°30'/57°25'), Pavilosta (21°15'/56°55') and Liepaja (21°0'/56°30') (fig.1) were investigated. The distances between sampling sites vary between 30 and 50 km.

Altogether 128 soil samples were taken, 22 of them at each sampling site: 6 from the driftlines, 8 from the primary and 8 from the yellow dunes. The last two habitats are generally characterized by their specific vegetation (ELLENBERG, 1986). In Liepaja, the number of driftline samples was reduced to 2, as a distinct driftline was missing. Each sample comprised approximately 350 cm³ of organic debris and sand (driftline) or fine roots and sand (primary and yellow dunes).

As known from the our own investigations (HELDT, unpubl.; SALMANE, 1999; 2000) and literature (ANDRÉ et al. 1994), the dispersion of Gamasina in the sandy habitats shows aggregations to the rhizosphere of plants. Density of the individuals in the bare sand is very low with the exception of the driftline areas rich in washed ashore material. Sampling was carried out by hand and material was taken to the laboratory in the plastic bags. Half of the samples from each site were extracted on the Tullgren funnels exposed to 25° C for a period of 14 days. For the second half, extraction in a MacFadyen canister type apparatus was practised. Temperature was raised every 24 hours for 5° C from 25 to 60° C.

The determination and nomenclature of Gamasina species are based upon the keys of BRIEGTOVA (1977) and KARG (1993). Additionally, the keys of BLASZAK & EHNSBERGER (1993), EVANS & HYATT (1960), HIRSCHMANN (1960, 1971), KOLODOCHKA (1978), LAPINA (1976 a, b), and SCHERBAK (1980) were used.

The occurrence of those species, which were found at least at three sites, was examined more closely concerning preferences for specific plants' rhizospheres, and the frequencies (cf. TISCHLER, 1984) of species' occurrences were determined. Data for Table 2 were interpreted in the following way: in the case of rooting systems in a respective soil sample consisting of more than one plants' roots, determined individuals are quoted once for each plant species found in the respective soil sample.

**Results**

Altogether 37 species were found in the seashore habitats of the Kurzeme Coast (Table 1). The number of species ranged from 18 to 25. About 2/3 of the species are typical for one of the three habitat types showing three distinct Gamasina communities in the driftline, the primary and the yellow dunes. Some of these species were recorded from a wide range of various habitats in Latvia (Tab. 3).
<table>
<thead>
<tr>
<th>Species</th>
<th>Driftline</th>
<th>Primary yellow dunes</th>
<th>Species number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheirotrogus neozoniger (Osedom, 1903)</td>
<td>37.29</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hololaelaps baeticus Willmann, 1957</td>
<td>23.65</td>
<td>18.79</td>
<td>4</td>
</tr>
<tr>
<td>Thinosurus spinosus Willmann, 1939</td>
<td>11.79</td>
<td>0.87</td>
<td>1.39</td>
</tr>
<tr>
<td>Parasitus kemperi Osedom, 1902</td>
<td>12.07</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Hololaelaps incius Ryst, 1956</td>
<td>5.46</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Arctusurus ctenius (Sellenick, 1940)</td>
<td>6.69</td>
<td>19.36</td>
<td>1.19</td>
</tr>
<tr>
<td>Gamasodes tronquius (Hubert, 1935)</td>
<td>1.91</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Amblyseius narirus (Willmann, 1952)</td>
<td>0.75</td>
<td>0.87</td>
<td>0.60</td>
</tr>
<tr>
<td>Hololaelaps narius (Brady, 1875)</td>
<td>0.75</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lasionoeus sp. (sobgen. Cricidae) arg, 1980</td>
<td>0.34</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hololaelaps sp. (sobgen. Hololaelaps Berl jo &amp; Truvsat, 1889)</td>
<td>0.34</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dendrolaelaps fofetus (Letten, 1949)</td>
<td>0.07</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Amblyseius argentus (Karg, 1909)</td>
<td>0.61</td>
<td>0.20</td>
<td>0.40</td>
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<tr>
<td>Parasitus haptphilus (Sellenick, 1957)</td>
<td>0.27</td>
<td>7.80</td>
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<tr>
<td>Dendrolaelaps nevriovermut Hirschmann &amp; Winsteadii, 1952</td>
<td>0.34</td>
<td>1.33</td>
<td>2.78</td>
</tr>
<tr>
<td>Leionoeus insignis Hirschmann, 1963</td>
<td>0.07</td>
<td>4.62</td>
<td>18.49</td>
</tr>
<tr>
<td>Amblyseius bicaudatus Weinstein, 1962</td>
<td>0.14</td>
<td>1</td>
<td>0.80</td>
</tr>
<tr>
<td>Gamasodes vagabundus Karg, 1968</td>
<td>0.07</td>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td>Leionoeus bicolor (Berljo, 1948)</td>
<td>0.07</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Dendrolaelaps arenarius Karg, 1971</td>
<td>0.07</td>
<td>14.45</td>
<td>2.78</td>
</tr>
<tr>
<td>Procercon trigardti (Hibberd, 1923)</td>
<td>0.07</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rhodacarus sitellus Willmann, 1935</td>
<td>0.28</td>
<td>1</td>
<td>1.19</td>
</tr>
<tr>
<td>Seilus sp.</td>
<td>0.07</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Procercon radiatus Berljo, 1914</td>
<td>0.29</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Amblyseius sp.</td>
<td>0.29</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Minithodacarus minimus (Karg, 1961)</td>
<td>0.29</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Leionoeus sp.</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Rhodacarus haarkor Shcherbak, 1977</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis aurvelser (Canestrini, 1883)</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis scelentenus Costa, 1968</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis simillimus Karg, 1965</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis kargi Costa, 1968</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Dendrolaelaps angolensis Willmann, 1936</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis weaver (Michael, 1891)</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Amblyseius burkeri (Hughes, 1948)</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Leionoeus sp.</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Hypoaspis sp. Canestrini, 1885</td>
<td>0.29</td>
<td>14.85</td>
<td>5.77</td>
</tr>
<tr>
<td>Total number of individuals</td>
<td>1467</td>
<td>346</td>
<td>503</td>
</tr>
<tr>
<td>species number</td>
<td>18</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

Table I. — Gamasina species and their relative abundances in the driftlines, primary and yellow dunes of the Kurzemes Coast, Latvia. (Relative abundances calculated from the total number of individuals).
The yellow dunes were the richest habitat with 25 Gamasina species, while from the driftline habitats and primary dunes 18 and 16 species, respectively, were gained (Tab. 1). In turn, the highest abundances of the individuals were found in the driftline habitats represented by washed ashore material and followed by the yellow and primary dunes.

 Respectively, 7, 4 and 11 species were exclusively restricted to the specific habitats. About 40% of the individuals from the driftline were Cheiroseius necorniger and about 20% belonged to Halolaelaps balticus. In the dune samples only the individuals of M. minimus from the yellow dunes made up to 20%. Species with the dominance of more than 1%, showing a concentration in the driftline habitats are C. necorniger, H. balticus, Thinoseius spinosus, Parasitus kemperi, Halolaelaps incisus, Arctoseius cetratus and Gamasodes bispinosus. In the primary dunes these species were Arctoseius cetratus, Leioseius bicolor, Parasitus halophilus, Dendrolaelaps nostricornutus and Dendrolaelaps arenarius, and in the yellow dunes Leioseius insignis, Rhodacarellus silesiacus, M. minimus.
Amblyseius agrestis  
plants, Fragaria sp., mosses, dunes, washed ashore, fields, meadows

Amblyseius barkeri  
soil, plants, in greenhouses

Amblyseius bicolor  
plants, grasses, Fragaria sp., litter, dunes, washed ashore, inland and coastal meadows

Amblyseius marinus  
dunes, washed ashore

Arctoseius cetratus  
humus, forests, agroecosystems, washed ashore, dunes, inland and coastal meadows

Cheiroseius neocorniger  
humus, agroecosystems, calcareous bog, inland and coastal meadows, washed ashore

Dendrolaelaps angulosus  
coastal meadows, dunes, compost

Dendrolaelaps arenarius  
dunes, washed ashore, coastal meadows, humus, roots of Cakile maritima

Dendrolaelaps fallax  
rotting substrates, litter, dunes

Dendrolaelaps nostricornutus  
washed ashore, dunes

Gamasesdes bispinosus  
washed ashore

Halolea/uls balticus  
washed ashore

Halolea/uls inciseus  
washed ashore

Halolea/uls marinus  
washed ashore

Hypoaspis aculeifer  
forests, inland and coastal meadows, agroecosystems, washed ashore, dunes, compost, nests of swallows, rodent burrows

Hypoaspis kargi  
forest, gardens, rodent burrows, inland and coastal meadows, dunes

Hypoaspis sclerotarsa  
dunes

Hypoaspis simulicetae  
dunes

Hypoaspis vacua  
byrophytic inland meadows, coastal meadows, bogs, agroecosystems, forests, mosses, dunes, rodent burrows, nests of ants

Lasioseius sp.  
washed ashore

Leioseius bicolor  
forests, agroecosystems, xerophytic meadows, inland and coastal meadows, washed ashore, dunes, humus

Leioseius insignis  
inland and coastal meadows, dunes, washed ashore

Minihodacarellus minimus  
dunes

Parasitus halophilus  
washed ashore, dunes, coastal meadows, banks of ditches

Parasitus kemperi  
washed ashore

Parazercon radiatus  
forests, bogs, mosses, inland and coastal meadows, washed ashore, dunes, litter

Pergamasus vagabundus  
forests, bogs, agroecosystems, inland and coastal meadows, washed ashore, dunes, Acer sp., nests of wildfowl

Prazercon trigradhi  
fi-groves, forests, gardens, litter, nests of waterfowl, inland and coastal meadows, washed ashore, dunes

Rhodacarus haarlovi  
dunes

Rhodacarellus silesiacus  
forests, agroecosystems, washed ashore, dunes, coastal meadows

Thinoseius spinosus  
washed ashore, dunes, coastal and calcareous meadows, wet mixed forest

Table 3. — Gamasina occurrences in different habitats of Latvia based on LAPINA, 1963; 1976 a, b; 1988; PETROVA et al., 1997; SALMANE, 1999; SALMANE et al., 1999.

mus, Lasioseius sp., Rhodacarus haarlovi, Hypoaspis aculeifer, and Hypoaspis sclerotarsa.

Four species were recorded at the all six sampling sites: A. cetratus, P. halophilus, L. insignis, and L. bicolor; T. spinosus, Dendrolaelaps nostricornutus, and R. haarlovi in five sites and H. balticus, Amblyseius marinus, and M. minimus in four sites were stated.

C. neocorniger, H. balticus, T. spinosus, P. kemperi, H. incisus, G. bispinosus, A. marinus, Halolea/uls marinus, and Amblyseius agrestis were found as characteristic species of driftline. Lasioseius sp. up to now was reported only from the yellow dunes by KOEHLER et al. (1995). As characteristic for primary dunes P. halophilus and D. arenarius and for yellow dunes M. minimus and probably Leioseius sp. can be regarded.

Only for M. minimus a preference for the rhizosphere of certain plant species could be detected (tab. 2). All the determined individuals of the species M. minimus were found in the rooting systems of the F. rubra alone or in the mixed rooting systems of it and other plant species. In such a way the main occurrence of this species was found in the samples taken from the rooting systems with F. rubra (s.l.).

Fourteen species were found for the first time in the fauna of Latvia:
Amblyseius agrestis, Amblyseius marinus, Dendrolaelaps angulosus (key of HIRSCHMANN 1960, 1971 used), Dendrolaelaps fallax (in Latvia up to now described as D. trapezoides), Dendrolaelaps nostricornutus, Gamasodes bispinosus, Halolaelaps marinus, Hypoaspis sclerotarsa, Hypoaspis similisetae, Lasioseius sp., Leioseius nov. spec., Minirhodacarellus minimus, Parasitus kemperi, Rhodacarus haarlovi.

DISCUSSION

In comparison with the driftline habitats, the abundances were about five times lower in the primary and yellow dunes. These differences can be explained by the diverse ecological conditions and differing amount of food at these habitat types. In the most cases driftline habitats were the richest in organics deposited by the sea. In such way, there are favourable life conditions for Gamasina mites and other soil fauna, on which they prey on. Dune habitats have a much lesser content of organics in the soil, especially in the relation to the primary dunes, which had a small number of individuals.

Ten Gamasina species are mainly known from non-coastal habitats (LAPINA, 1988). Eight of them were found in low numbers: Dendrolaelaps fallax, A. bicaudus, Parazercon radiatus, Hypoaspis sclerotarsa, Hypoaspis similisetae, Hypoaspis kargi, D. angulosus, and Amblyseius barkeri. D. nostricornutus, known to live under the bark of trees (KARG 1993), was abundant in the primary dunes and R. haarlovi, known from the meadows (KARG 1993), was abundant in the yellow dunes.

KOELHOR (mscr. 1994) and Salmane (SALMANE 1999; 2000; SALMANE et al., 1999) have been recorded the presence of the Gamasina species D. arenarius in the seashore habitats of Latvia. Concerning Lasioseius sp., this is definitely identical with "Lasioseius sp." collected by KOELHOR in the dunes of Slowinski National Park in Poland (KOELHOR et al. 1995).

Up to now there was only weak evidence for a correlation of single Gamasina species with certain plants (KOELHOR et al. 1992). However, M. minimus seems to have a preference for the F. rubra (s.l.) (tab. 2.). KOELHOR et al. (1995) found M. minimus in the grey dunes of Spiekeroog (North Sea), in samples from the rhizosphere of F. rubra, and PURVIS (1982) found M. minimus in dunes with F. rubra in Southeast Ireland. M. minimus is known from a variety of habitats (tab. 3). It is not evident, why its appearance in coastal dunes should be associated with a certain plant species. Maybe the structure of the habitat, fine root system of F. rubra is a decisive factor.

It is evident that further research concerning the Gamasina in the coastal ecosystems is needed, especially, when keeping in mind a regulatory function these predatory mites have in the biogenic dune sand stabilization.

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