

A note on multispecies aggregative webs due to spiders (Araneae) escaping floods in Finland

Niclas R. Fritzén

Fritzén, N. R., Klemetsögatan 7 B7, FI-65100 Vasa, Finland. E-mail: nrfritzen@gmail.com

Multispecies aggregative spider webs consisting mainly of linyphiids are reported from the municipality of Vörå in Finland. The dominant species were *Erigone atra* Blackwall, 1833 and *Savignia frontata* Blackwall, 1833 and most of these represented by males. The spider assemblage consisted of at least 13 species altogether. The reason for the aggregations was habitat disturbance caused by flooded cultivated fields.

Introduction

At the beginning of October 2012 many parts of Ostrobothnia in Western Finland were severely flooded due to heavy rains on already water-saturated soil. The water level in many rivers reached new records and thousands of hectares of arable land were covered by water. On 8 October 2012 Tomas Klemets noted thousands of small spiders running on sheets of silk covering the tops of grasses and other plants (Figs 1–2) along the ditches of a small tractor road crossing flooded cultivated fields in the municipality of Vörå (N63°08' E22°24'). The phenomenon was observed in an area of approximately 1x50 meters, but the area where it occurred was probably much larger. On my request he went back to collect some of the vegetation covered by spider silk and small spiders one week later, on 16 October. At this time the amount of silk and number of spiders were smaller. However, three pieces of vegetation, a straw of *Phleum pratense*, some straws of *Deschampsia cespitosa* spun together by silk and the tip of a willow bush, were collected in a plastic bag and put in a freezer. Only a few of the spiders running freely on top of the silk cov-

er were apparently collected with the vegetation, but inside the dense silk wrapped around the plant pieces there were spiders packed like sardines (Fig. 3). The spiders were picked and determined by me. Based on the photographs taken by Klemets the spiders in the aggregative webs could be counted in tens of thousands rather than thousands and the spider assemblage could also additionally become identified based on these.

Results

The collected material consisted of a total of 128 spider specimens representing at least eight species of four different families, 91 of which were adults and determined to species level (Table 1). All but two of the juvenile specimens belonged to the family Linyphiidae. Of the adult specimens 93 % were represented by two linyphiid spiders, *Erigone atra* (72 %) and *Savignia frontata* (21 %). 75 % of these were males. Only single or a few specimens represented other species. Based on the photographs the following taxa representing an additional five species could be determined: *Microlinyphia pusilla* (Linyphiidae), *Tetragnatha*



Fig. 1. Linyphiids escaping floods in Vörå in Western Finland. In this photo almost 300 spiders can be counted. Photo: Tomas Klemets



Fig. 2. Linyphiids escaping floods in Vörå in Western Finland. The flooded cultivated field can be seen in the background. In the upper left corner an *Araniella* sp. sharing the aggregative web can also be seen. Photo: Tomas Klemets

cf. *extensa* (Tetragnathidae), *Araniella* cf. *displicata* (Araneidae), cf. Lycosidae gen. sp. (2 exx) and Araneoidea gen. sp.

Discussion

Spiders disperse by moving on the ground, by ballooning (aerial dispersal) by producing a strand of silk that carries the spider through the air (Bristowe 1958) or through the "drop and swing" behaviour by swinging in the wind from

plant to plant by the means of a safety thread (Barth 2002). Massive non-social webs of spiders probably consist of the ballooning threads or draglines left by moving spiders or a combination of these. Jäger (2002) hypothesized two main reasons for the sporadic occurrence of non-social aggregative spider webs: 1) Optimal conditions for ballooning behavior with following mass occurrence of spiders in the vegetation covering it with their draglines. 2) Disturbances in the spider habitat causing movements of spiders to higher strata. The phenomenon observed in Finland was similar



Figure 3. The top of the grass *Phleum pratense* wrapped in spider silk was opened and contained 91 linyphiids of four species packed like sardines. Photo: N. R. Fritzén

to the ones reported on and described from Central Europe by Heer (1997), Komposch & Natmessnig (2001) and Jäger (2002). These mainly concerned *Nusoncus* (sub. *Troxochrus*) *nasutus*, *Ostearius melanopygius* (both Linyphiidae) and *Anelosimus vittatus* (Theridiidae). The one described by Framenau et al. (2011) from Australia concerning mainly Lycosidae was also similar but on a much larger scale. The causes of some of these were apparently optimal conditions and for the others disturbance in wooded habitats. The occurrence of dense carpets of spider silk due to mass escapes from floods is known from a few instances in Asia and Australia, mainly from newspaper and other internet web pages (e.g. International Business Times 2012). The cause of the phenomenon in Finland was without doubt also disturbance, namely flooding of the

habitats in cultivated fields. Most of the spiders gathered together making the aggregative webs probably originated from the flooded cultivated fields. Due to the late date, some of the spiders had perhaps already moved to the vegetation strip along the ditch prior to the flood, since the vegetation of unploughed margins might provide suitable overwintering structures for spiders inhabiting the crop fields during the summer (Pffiffer & Luka 2000, Lemke & Poehling 2002). The spiders in the fields then escaped to the strip of vegetation along a ditch of the tractor road with water on both sides (Fig. 4) or were forced from the ground layer of this strip to its higher stratum. The present results show that the escaping spiders were mainly linyphiids. The two commonest species were *E. atra* and *S. frontata*, both known to be typical ballooning (Bristowe 1958). *E. atra* is also often a dominant species in cultivated fields (Öberg et al. 2008). Due to the collecting method and the small sample size but also based on the photos, larger spiders of other families were to some extent underrepresented at least in the collected material. On the other hand, some of the spiders seen in the photos probably already occurred in the vegetation along the ditch and were not necessarily escaping individuals. The single female of *Clubiona stagnatilis* in the material was probably nesting under a leaf of the collected willow bush. Anyway, these spiders shared the aggregative webs with the escaping linyphiids. The observations reported on here are based on a very limited material and some questions arise. By what means do the spiders aggregate, how do they behave and interact in the aggregative multispecies webs and why do they aggregate inside densely spun nest-like structures at the tops of plants (Fig. 3)? The next time such an interesting phenomenon is observed, more systematic observations should be done and more extensive material collected in order to explore this interesting behaviour of spiders.

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Table 1. List of species, family, gender and age of the collected spiders escaping the flood.

Species	Family	Male	Female	Juvenile	Total
<i>Erigone atra</i>	Linyphiidae	49	17		66
<i>Savignia frontata</i>	Linyphiidae	16	3		19
<i>Erigone dentipalpis</i>	Linyphiidae	1	1		2
<i>Cnephalocotes obscurus</i>	Linyphiidae	2			2
<i>Oedothorax apicatus</i>	Linyphiidae		1		1
<i>Xysticus</i> sp.	Thomisidae			1	1
<i>Philodromus</i> sp.	Philodromidae			1	1
<i>Clubiona stagnatilis</i>	Clubionidae		1		1
Linyphiidae spp.	Linyphiidae			35	35
Total		68	23	37	128



Figure 4. The strip of vegetation to which the spiders escaped sided by flooded fields. Photo: Tomas Klemets

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