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Arachnological investigations on primary succession of an artificial island in southern Austria (Arachnida: Opiliones, Araneae)

Christian KOMPOSCH
Institute of Zoology, Department of Morphology and Ecology, Universitätsplatz 2, A-8010 Graz, Austria

Arachnological investigations on primary succession of an artificial island in southern Austria (Arachnida: Opiliones, Araneae). - Arachnological investigations of an artificial island in a storage lake in southern Carinthia, Austria resulted in findings of 5 species of harvestmen and 58 species of spiders; faunistics, ecology and phenology of some remarkable species are discussed. The rapid change of biotic and subsequently abiotic factors on the island are charakteristic to areas being in succession. Due to this changing of environmental parameters a shift of the species spectrum and abundances could be recorded.

Key-words: succession - island - nature reserve - Carinthia - Austria - Opiliones - Araneae.

INTRODUCTION

In 1990 and 1991 the island of Neudenstein was built in a storage lake near Völkermarkt in southern Carinthia, Austria by removing 790.000 m3 earth and stone material remaining from the motorway construction (REICHELT 1993). The formation of the island – measuring about 16 ha – is an effort to create a great number of different biotope types: shallow water areas and wetlands alternating with dry rocky steppes, in addition with a high structural diversity (mounds, stone stacks, tree stumps, etc.) allow the settlement of a great number of species. The aim of creating this anthropogenic island was to make a nature reserve.

This is a rare opportunity for science to document the proceedings of a primary succession in Central Europe. Investigations have been conducted on the development of vegetation and of different animal groups — especially Trichoptera, Lepidoptera, Odonata, Coleoptera, Pisces and Aves (WIESER *et al.* 1993); the first arachnological results are shown in the following.

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MATERIAL AND METHODS

The area of investigation is the island of Neudenstein in the storage lake of Völkermarkt (river Drau) in southern Carinthia, Austria at a height of 391 metres; the geographical co-ordinates are 46°38'N and 14°35'E. The (water) distance from the mainland is at least 50 metres.

To register the species spectrum the combined application of Barber traps, sweep net, light-traps and capture by hand was used. Faunistic investigations were carried out in the vegetation periods from 1992 to 1994. All specimens were collected and preserved in formalin (2%) and ethanol (70%) respectively.

LIST OF REGISTERED SPECIES

Collecting dates are condensed to months and shortened as Roman numerals; in each case the first and last month of appearance are registered. Furthermore the total number of specimens from Barber traps is given. The taxonomic designation just as the systematic order follow in general MARTENS (1978) and PLATNICK (1993) respectively.

Opiliones

Species	1992	1993	1994
Phalangiidae			
1. *Phalangium opilio* Linnaeus	V-VII (3)	IV-IX (11)	V (5)
2. *Oligolophus tridens* (C.L. Koch)			V-VII (3)
3. *Lacinius ephippiatus* (C.L. Koch)		VI-VII (1)	V-VI (9)
4. *Astrobunus laevipes* (Canestrini)	VI (1)		V-IX (6)
5. *Nelima semproni* Szalay		IX	

Araneae

Species	1992	1993	1994
Pholcidae			
1. *Pholcus opilionoides* (Schrank)			VII
Nesticidae			
2. *Nesticus cellulanus* (Clerck)			VIII (1)
Theridiidae			
3. *Enoplognatha tecta* (Keyserling)			V (1)
4. *Robertus arundineti* (O. P.-Cambridge)			IV
5. *Theridion instabile* O. P.-Cambridge	VI (1)		
6. *Theirdion pictum* (Walckenaer)		VII	
Linyphiidae			
7. *Bathyphantes gracilis* (Blackwall)	IV-VII (23)		IV-VIII (2)
8. *Ceratinella brevis* (Wider)		IX	
9. *Diplostyla concolor* (Wider)		IV-VIII (2)	IV-VII (5)
10. *Erigone atra* (Blackwall)	IV-V (3)	VI-IX (2)	V-VII (3)
11. *Erigone dentipalpis* (Wider)	IV-VI (2)	VI (3)	IV-VII (1)

12. *Linyphia triangularis* (Clerck)		VII	VII
13. *Meioneta rurestris* (C.L. Koch)		VI	VII (2)
14. *Neriene clathrata* (Sundevall)			VII
15. *Oedothorax apicatus* (Blackwall)	IV-VII (130)	IV-IX (154)	IV-IX (111)
16. *Oedothorax fuscus* (Blackwall)	VI-VII (2)	VI-VII (6)	
17. *Oedothorax retusus* (Westring)			IV-IX (19)
18. *Porrhomma microphthalmum* (O. P.-Cambridge)			VI (1)
19. *Walckenaeria vigilax* (Blackwall)			IV
Tetragnathidae			
20. *Pachygnatha clercki* Sundevall	IV-VII (33)	IV-IX (31)	IV-VIII (13)
21. *Pachygnatha degeeri* Sundevall	VI (1)		IV (1)
22. *Pachygnatha listeri* Sundevall		IX	
23. *Tetragnatha extensa* (Linnaeus)	IV (1)	VI-IX	IV-IX
24. *Tetragnatha nigrita* Lendl		VI	IV
25. *Tetragnatha shoshone* Levi		IX	VI
26. *Tetragnatha striata* (L. Koch)			IV-IX
27. *Zygiella atrica* (C.L. Koch)		IX	IX
Araneidae			
28. *Araniella* sp.			IV
29. *Argiope bruennichi* (Scopoli)		VI (1)	
30. *Larinioides folium* (Schrank)		VII-IX	V-IX
31. *Larinioides patagiatus* (Clerck)		VIII	VI
32. *Mangora acalypha* (Walckenaer)		IX	
33. *Singa hamata* (Olivier)		VIII	IV-V
Lycosidae			
34. *Arctosa leopardus* (Sundevall)	VI (1)		V (3)
35. *Aulonia albimana* (Walckenaer)			V (1)
36. *Pardosa amentata* (Clerck)	IV (1)	V-VII (4)	V-VI (13)
37. *Pardosa nebulosa* (Thorell)			V-IX
38. *Pardosa palustris* (Linnaeus)	V (1)		
39. *Pardosa prativaga* (L. Koch)		IV-VII (4)	V (4)
40. *Pardosa torrentum* Simon	IV-VII (9)	IV-IX (30)	IV-IX (69)
41. *Pirata latitans* (Blackwall)	V-VII (15)	V-VII (8)	V-VIII (47)
42. *Pirata piraticus* (Clerck)	V (2)		
43. *Trochosa ruricola* (De Geer)	IV-VII (13)	IV-IX (76)	IV-IX (181)
Agelenidae			
44. *Tegenaria silvestris* L. Koch	IV (2)		
Hahniidae			
45. *Antistea elegans* (Blackwall)	V (1)		
Liocranidae			
46. *Agraecina striata* (Kulczynski)		IV (3)	IV-V (1)
Clubionidae			
47. *Clubiona lutescens* (Westring)	VI-VII (2)		
48. *Clubiona phragmitis* C.L. Koch	VI (1)	V-IX (1)	IV-VII
49. *Clubiona similis* L. Koch		IV-IX (3)	III-IX (4)
Gnaphosidae			
50. *Micaria nivosa* L. Koch			IV-V
Philodromidae			
51. *Philodromus* sp.			IV
Thomisidae			
52. *Diaea dorsata* (Fabricius)			IV
53. *Misumenops tricuspidata* (Fabricius)		IX	
54. *Ozyptila rauda* Simon	IV-VI (2)		VII-VIII (2)
Salticidae			
55. *Heliophanus auratus* C.L. Koch	VII (1)	VI-IX	V
56. *Myrmarachne formicaria* (De Geer)	V-VII (3)	VII-IX	V-IX (7)
57. *Salticus scenicus* (Clerck)		VII	V
58. *Sitticus zimmermanni* (Simon)		VII-IX (1)	

RESULTS

In the area 1327 specimens – 5 harvestmen and 58 spider species – were recorded between 1992 and 1994. They are spread over the years in the following way (number of species/specimens; arachnid data from 1992 come only from Barber traps!):

	1992	1993	1994	Total
Opiliones	2/4	3/12	4/26	5/42
Araneae	23/250	33/329	44/706	58/1284

Especially the first years of primary succession show the obvious increase of the species number, due to introduction, immigration and passive dispersal. The relative higher number of spider species compared to the harvestmen can be explained by the possibility of ballooning.

The order Opiliones is represented exclusively by long-legged species of the family Phalangiidae; soil-inhabiting species of nemastomatids and trogulids have not

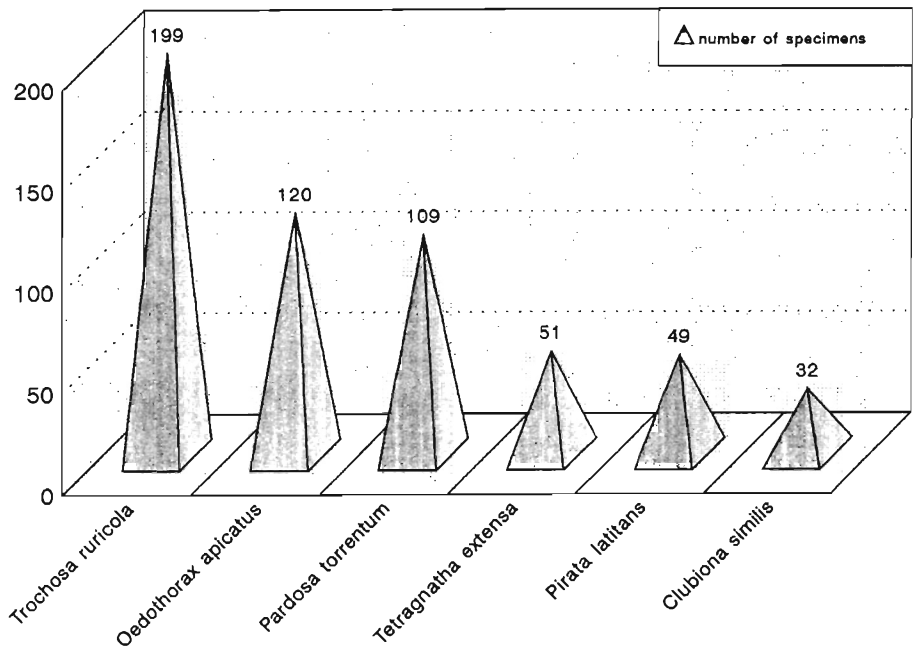

FIG. 1: Abundance of frequent spider species in 1994.

reached the island yet. With the exception of the common heliophilous *Phalangium opilio* all found harvestmen are thermophilic (*Astrobunus laevipes*, *Nelima semproni*) or hygrophilous (*Oligolophus tridens*, *Lacinius ephippiatus*).

Concerning to the number of spider species in 1994 Linyphiidae (11), Lycosidae (8) and Tetragnathidae (7) are dominant, followed by Araneidae (4) and Salticidae (3); with a view to the abundance the lycosid spiders dominated with 380 individuals, followed by Linyphiidae (161), Tetragnathidae (80) and Clubionidae (39).

Typical to areas in primary succession is the dominance of a small number of species, in this case *Trochosa ruricola*, *Oedothorax apicatus* and *Pardosa torrentum* (Fig. 1).

The rapid change of biotic and subsequently abiotic factors on the island are characteristic to areas being in succession. Due to this changing of environmental parameters a shift of the spectrum of species and abundances can be recorded.

The development of the population density of some frequent spider species shows different patterns; for a better comparison in this case only Barber traps data are used.

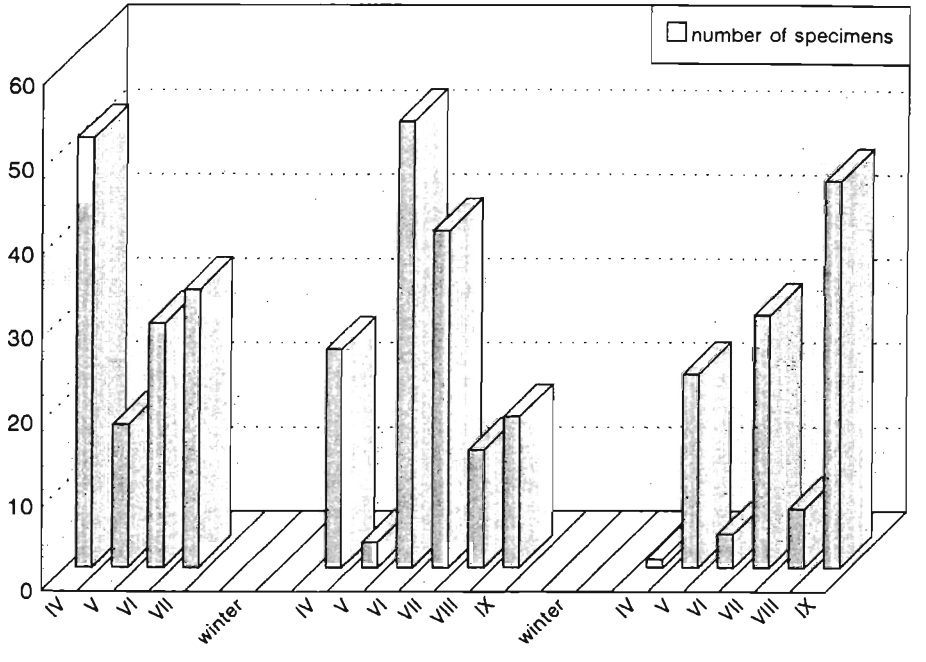

FIG. 2: Activity-density of *Oedothorax apicatus*, Barber traps 1992–1994.

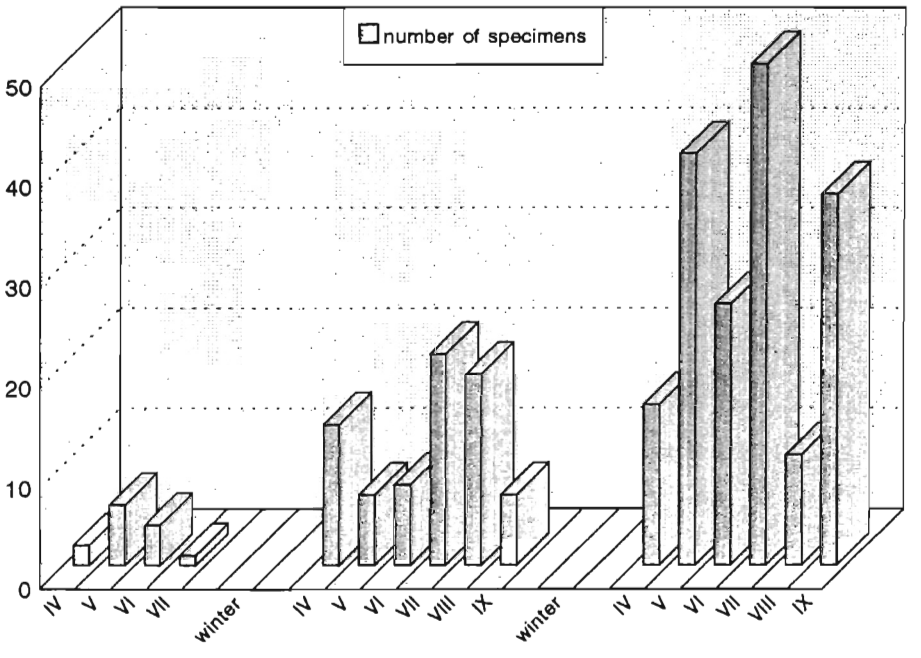

FIG. 3: Activity-density of *Trochosa ruricola*, Barber traps 1992–1994.

The activity-density of the common linyphiid spider *Oedothorax apicatus* is during the investigation period remarkable constant (Fig. 2), whereas both lycosid spiders *Trochosa ruricola* and *Pardosa torrentum* – with very small populations in 1992 – developed in 1994 to the most frequent and third frequent spider species of the island respectively (Fig. 3-4).

NEW AND REMARKABLE SPIDERS TO AUSTRIA

The very rare theridiid spider *Enoplognatha tecta* (Keyserling) *sensu* ROBERTS (1993) – the males of this species are characterized by their noticeable chelicere serration –, in Europe known from Great Britain, France, Germany and Switzerland as well as the hidden, just above the water surface living (UHL *et al.* 1992) tetragnathid spider *Tetragnatha shoshone*, recently described from North America, are new to Austria (KOMPOSCH 1995).

Particularly the following remarkable species – they are all new to Carinthia – have to be pointed out:

Pardosa nebulosa: The very large *Pardosa* species is distributed in southern and eastern Europe.

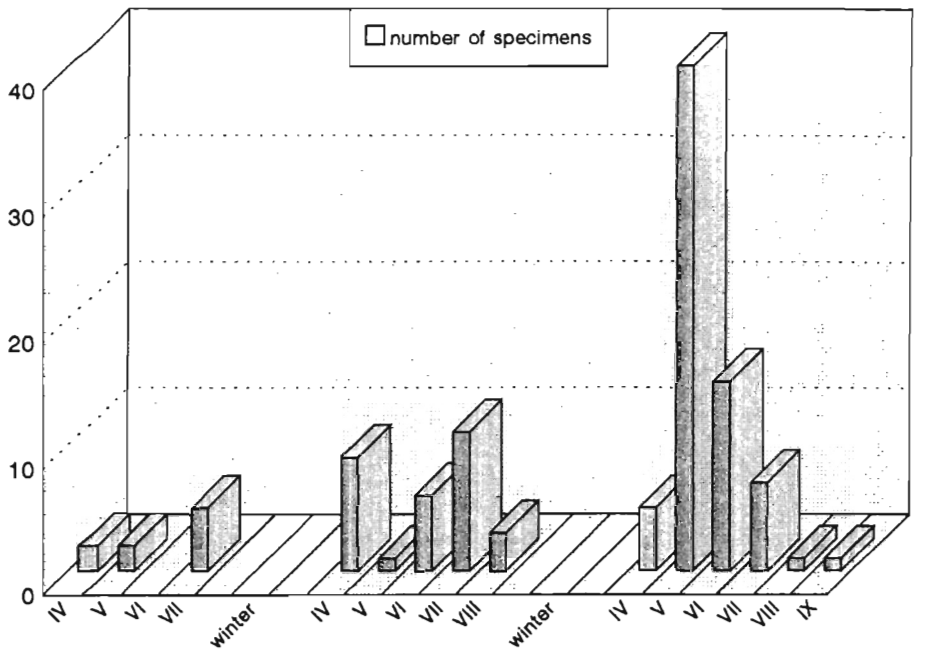

FIG. 4: Activity-density of *Pardosa torrentum*, Barber traps 1992–1994.

Pardosa torrentum: This lycosid spider, only known from a few localities in South and Central Europe, lives on the banks of brooks, rivers and lakes.

Micaria nivosa: The ecological existence of this very rare ants imitating gnaphosid spider is still unknown.

Ozyptila rauda: This thermophilic thomisid (MAURER & HÄNGGI 1990) is been considered as a very rare species of the Alps and Siberia.

Sitticus zimmermanni: HARM (1973) designates this interesting spider as a xerobiotic representative from the East; it is known from Austria, Poland, Hungary and Greece. Furthermore it has been recorded from Sweden and Finland sub *Sitticus tullgreni* (HOLM 1944, KLEEMOLA 1969).

CONCLUSIONS

The mosaic-like side by side of different biotope types – marshy areas alternate with arid ones – combined with a high structural diversity makes this anthropogenic storage lake island to a precious biotope with good conditions for a high biodiversity.

A problem of this young biotopes is the growth of weeds: a great number of rare spider species of the island are dependant on an open landscape, wasteland and

rocky areas. As the obvious increase of shrubs and trees is a threat to many of these stenoecious species, the author pleads for a habitat management – a preservation of an early phase of succession in the nature reserve island of Neudenstein.

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