Phenology and Habitat-selection of "xerothermic" spiders in Austria (Lycosidae, Gnaphosidae)

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Ground-spider communities at mosaic-structured xerothermic sites are very rich and diverse. The importance of xerothermic localities in the eastern Alps as habitats for many rare and zoogeographically remarkable species has been pointed out by several authors recently: e.g. POLENEC (1978, 1985), HEBAR (1980), THALER (1985), STEINBERGER (1986, 1988), HORAK (1987, 1988), NOFLATSCHER (1988). According to HAENGGI (1987a, b), disturbance of the environment by exploitation should be the main cause for the limitation of many "xerophilic" spiders to semi-natural habitats. On the other hand very few is known about the spatial and temporal niche differentiation of species within the xerothermic mosaic. Amongst ground spiders many Lycosidae and Gnaphosidae (especially Zelotes spp.) can be characterized as typical thermophilic species. Pitfall-investigations at 2 "xerothermic" sites in Austria (North Tyrol: Martinswand, 1985-86; Burgenland: Nickelsdorfer Hutweide, 1988-89) are therefore compared concerning annual activity and spatial distribution of Lycosidae and Gnaphosidae (Zelotes spp.).

S i t e s i n v e s t i g a t e d:

Martinswand (Northern Tyrol) 650 - 850m: south exposed stone heath with xerothermic pine-wood contrasting to open areas with dry-meadow vegetation, 1985-86 (30 pitfalls). A: open stone heath, B: narrow grassy strip between rocks, C: open area with dense dry meadow, D: open pine stand on bare ground, E: pine wood, undergrowth Ericaceae.

Nickelsdorfer Hutweide (Burgenland, eastern Austria) 140m: Semi-natural xerothermic dry-meadow site (extensive sheep-pastures) without higher vegetation, located on 2 adjacent sun-exposed smooth hills enclosing a hay meadow, 1988-89 (15 pitfalls). A: dry-meadow on shallow, stony underground, B: dense dry-meadow on deep, humose soil situated at the adjacent elevation, C: hay meadow.

R e s u l t s: (Fig.1, 2, Table 1)

L y c o s i d a e (Fig. 1):

Martinswand: 5 species are dominating, their activity peaks very distinct (Fig.1). Alopecosa accentuata appears in early spring concentrated at the most xerothermic site A (Table 1), followed by overwintered specimens of Trochosa terricola trapped in all habitats. No species show high activity in May (A.pulverulenta and Tricca lutetiana were caught only in low numbers). Pardosa lugubris s.l. and Aulonia albimana were found successively in beginning and end of June. P.bifasciata (not included in the figure), a characteristic thermophilic element, occurs simultanously with lugubris, but mostly in the dense dry-meadow whereas lugubris seems to be a typical ecotone-spider. Xerolycosa nemoralis is the latest summer-stenochronous Lycosidae at the Martinswand, a few old females have been found even until April. The annual Lycosidae-activity is completed in autumn by the new generation of T.terricola.

Nickelsdorf: The temporal separation between the frequent species is not so clear. High activity is concentrated in May, compared to the Martinswand a lack of summer-activity is obvious (X.nemoralis is absent, in adjacent arable sites occurs X.miniata with maximum in May and June). Alopecosa cuneata and pulverulenta are dominating the spring-aspect. A.cuneata was found in all habitats, A.pulverulenta mostly in the dense dry-meadow (Site B) and the hay meadow (C). The diplochronous Trochosa terricola and robusta differ in

Fig.1: Annual activity of Lycosidae at the Martinswand and at the "Nickelsdorfer Hutweide". Pitfall traps: abundance-percentage.

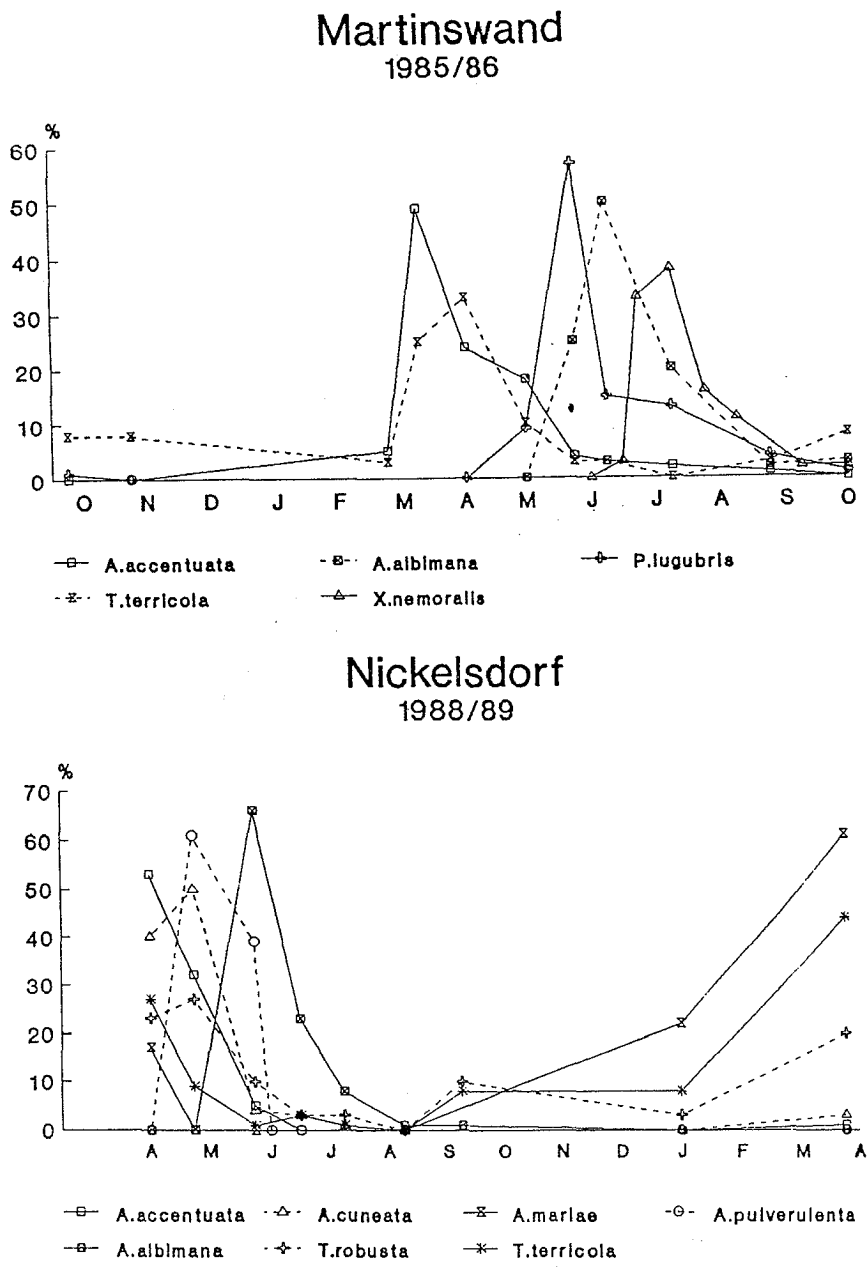
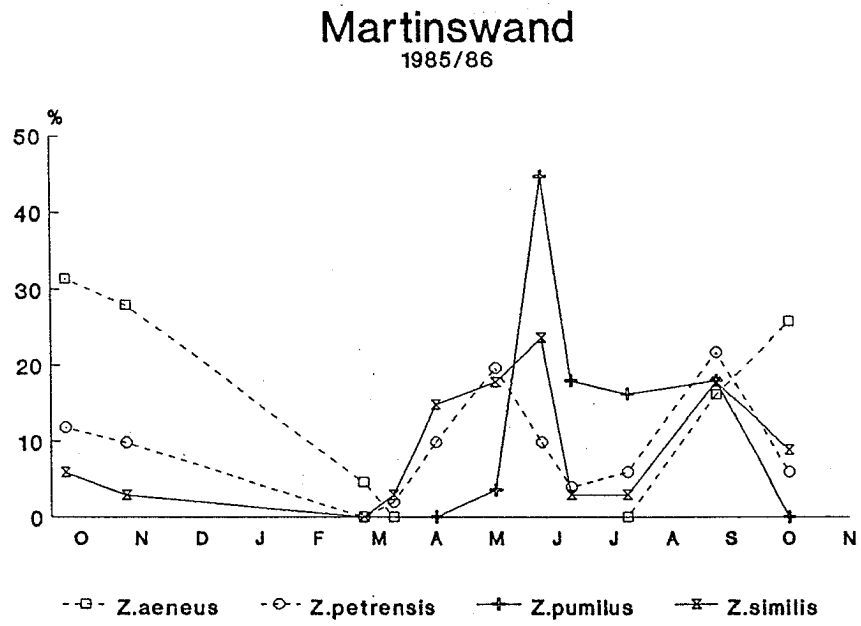
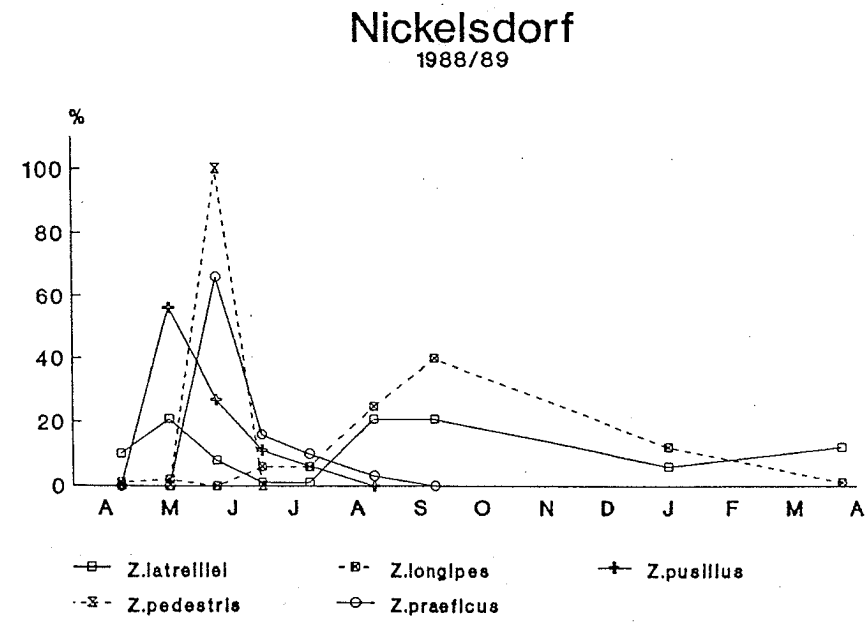


Fig 2: Annual activity of Zelotes spp. at the Martinswand and at the "Nickelsdorfer Hutweide. Pitfall-traps: abundance-percentage.





their distribution as well, terricola occured mainly in the dense dry-meadow (B). Aulonia albimana is very abundant in late May at B, avoiding the extreme insolated areas (A). Alopecosa mariae, a rare diplochronous species and A.accentuata (as usual in Austria in early spring) prefer site A, documenting their special thermophilic character.

G n a p h o s i d a e (Z e l o t e s spp.) (Fig.2):

Martinswand: 4 species were caught in higher numbers: Z.aeneus, activity peak from august to october at the most insolated site A (Table 1), whereas NOFLATSCHER (1988) found aeneus diplochronous at xerothermic sites in south Tyrol. Z.pumilus is summer-stenochronous (maximum June), mainly caught in the narrow strip between rocks (site B). Z.similis and Z.petrensis are diplochronous, the latter seems more thermophilic, similis is present inside the stand (site E) too. A remarkable situation is found within the thermophilic ant-feeder Callilepis: Both mid-european species, widely distributed C.nocturna and south-eastern C.schuszteri occur simultaneously (Maximum June) in the same habitat (>80% presence at site B) at the Martinswand. In Carinthia (southern Austria), where only schuszteri has been recorded till now, this species is occuring also in eco-tones (STEINBERGER 1989).

Nickelsdorf: The pattern of Zelotes-activity is rather similar to the Martinswand, whereas species-composition differs totally. Z.latreillei is diplochronous, appearing August-September and April-May in the less extreme habitats (B,C). The seasonal activity and habitat preference of Z.longipes occuring at the most insolated area (A) with maximum in September resembles Z.aeneus from the Martinswand. Additionally, there are three summer-species: Z.pusillus (maximum may) and Z.pedestris (max. June), distributed mainly in the hay meadow, were trapped only in small numbers in the real xerothermic areas, whereas Z.praeficus, obviously more thermophilic, is present also in

Table 1: Distribution of Lycosidae and Gnaphosidae (Zelotes spp.) in different habitats at the Martinswand and the "Nickelsdorfer Hutweide". Pitfall-traps: abundance - percentage. Signatures see text. Gradient in humidity from left (very dry) to right.

L y c o s i d a e

Martinswand:	A	B	C	D	E	Nickelsdorf:	A	B	C
A.accentuata	49	14	30	7	-	A.accentuata	86	-	14
X.nemoralis	42	14	-	44	-	A.mariae	80	5	15
P.bifasciata	3	6	50	41	-	A.cuneata	42	29	29
A.albimana	10	8	16	33	25	A.albimana	1	79	20
T.terricola	11	13	20	28	28	T.robusta	20	11	69
P.lugubris	2	8	8	23	59	T.terricola	-	67	33
						A.pulverulenta	6	39	55

Z e l o t e s s p p .

Martinswand:	A	B	C	D	E	Nickelsdorf:	A	B	C
Z.aeneus	63	9	4	14	-	Z.longipes	67	7	26
Z.similis	44	12	-	40	4	Z.latreillei	3	53	44
Z.pumilus	15	57	12	16	-	Z.praeficus	19	40	41
Z.petrensis	21	11	64	4	-	Z.pedestris	10	13	77
						Z.pusillus	-	10	90

D i s c u s s i o n:

Differences in annual activity of Lycosidae and Gnaphosidae between the two xerothermic sites in the Alps (Martinswand) and in eastern-Austria (Nickelsdorf) are obvious. In the hot and dry pannonic climate the abundant summer-Lycosidae appear earlier, late summer-activity is low. There is no such clear separation of Lycosidae-species activity as at the Martinswand. Concerning Zelotes the temporal distribution-patterns are surprisingly similar, although formed by different species.

In most cases of syntopic occurence of thermophilic species of the investigated groups there is biological isolation (TRETZEL 1954): at the mosaic-structured inner-alpine stone-heath as well as at the more uniform looking secondary dry-meadow site. Species with similar annual activity are separated in their spatial distribution, there are only few exceptions (e.g. Callilepis). More eurytopic elements as some Lycosids tend to a clear temporal isolation (especially in the stone-heath mosaic). Therefore biological isolation is evident in these species. Its ultimate cause is still obscure: field experiments by SCHAEFER (1980) and TOFT (1987) failed to discover competitive effects. A comparison of seasonal-activity and life-cycle of further species from "xerothermic" sites would be interesting.

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