DISTRIBUTION OF SPIDERS ALONG AN ALTITUDINAL GRADIENT

Species richness

The two prominent altitudinal patterns of species richness revealed by the data are a broad peak in overall species richness in middle elevation and a marked downhill decline for most taxa between 1500 and 2000 m (Fig. 4). There is a mid-elevation peak in overall species richness at 1000 m (108 species) followed by a modest downhill decline between 1000 m (108 species) and 1500 m (90 species) and a steep decrease of species richness between 1500 m and 2000 m (from 90 to 41 species). However, some families do not correspond to this general pattern (Figs. 6- 7).

Number of individuals

The general altitudinal variation in the abundance of spiders parallels the altitudinal variation in species richness (Fig. 5). The number of individuals peaks at mid-elevation and undergoes a dramatic drop above 1500 m. Variation in numbers of specimens collected for different taxa is presented in Fig. 8-11.

Faunal turnover and β diversity

Faunal turnover and similarity index revealed in Table 3 and 4 indicate three separated zones of spider communities in the national park.

Altitudinal range

The spiders are divided into four groups according to their altitudinal occurrences (Fig. 12). The first group contains spiders inhabiting both the lowlands and high altitudes. Spiders which are abundant in the lowlands and rare or absent in the mountains are placed in the second group. Spiders which are rare or absent in the lowlands and abundant in the mountains are considered the third group. The fourth group incorporates the spiders inhabiting only the high-altitude zone.

Only a few species occurred in all altitudes, namely *Gamasomorpha* sp. A, *Dipoena* sp., *Batueta* sp., *Pronasoona aurata*, *Pardosa songa*, *Coelotes cf. uncinatus*, and *Pseudopoda exigua*.

Liphistius yamasakii appears to be restricted to its type locality (Doi Inthanon, 1500-1700 m) and could not be found elsewhere. Mygalomorph spiders occur in three

different altitudinal zones. *Angka hexops*, *Conothele* sp. and *Sinopesa maculata* are high altitude species, whereas *Damarchus* sp. and *Phlogiellus* sp. have a wide distributional range, extending from 1000 m to the summit. *Macrothele* sp. was found at the lower elevations of the mountain.

Pritha cf. papilionaceus (Filistatidae) and *Boagrius* (Palpimanidae) are limited to mixed deciduous dipterocarp forest of low elevation.

Scytodidae clearly divides into low-altitude (*Scytodes*) and high-altitude (*Stedocys*) species.

Althepus stonei, *Psiloderces septentrionalis* (Ochyroceratidae), *Chavia monticola* and *Perania nasuta* (Tetrablemmidae) are restricted to hill evergreen forest at about 1500 m.

Pholcidae and Oonopidae can be found at all elevation. However, there is altitudinal separation within the families. *Gamasomorpha* spp. occur along the whole altitudinal transect, whereas a single *Orchestina* specimen was found only at 1500 m. Most oonopids, as well as, *Pholcus* spp. and *Psilochorus* are common on the forest floor up to 1500 m. Only *Spermophora* inhabits the high-altitude zone.

Members of the Hersiliidae and Uloboridae occur at lower altitudes (500-1000 m) of the national park, whereas *Colopea virgata* (Stenochilidae) prefers intermediate elevations.

Each *Nesticella* (Nesticidae) species, represented by only a single specimen, inhabits damp places of dipterocarp with pine forest and hill evergreen forests.

Dipoena spp. and *Moneta* spp. are distributed from the lowlands to the summit, while several other theridiid species inhabit only the lowlands (*Archaearanea* sp., *Argyrodes* spp., *Coscinida* sp., *Chrysso* spp., Theridiidae, gen. sp. A and Theridiidae gen. sp. C) or the high altitude zone area (*Carniella siam*). *Moneta* spp. and *Colesoma* sp. occur in the intermediate zone between the lowlands and the summit.

Ogulnius sp. (Theridiosomatidae) is a high-altitude species occurring in hill evergreen forest from 1500 m elevation to the summit.

Metanapis (Anapidae) is presented only in hill evergreen forest at 1500 m.

Two species of Mysmenidae were found along the entire altitudinal transect.

Neriene sp. B occurs at lower elevation, whilst *Linyphia* sp., *Neriene* sp. A and *Neriene* sp. C inhabit higher parts of the mountain. *Batueta* sp. and *Pronasoona aurata* entirely distribute along the altitudinal transect while *Bathyphantes* sp. and *Oedothorax*

cf. hulongensis are dominant at high altitudes with a few specimens occurring further down in dipterocarp with pine forest.

The majority of *Leucauge* spp. and *Tylorida striata* are common at low elevations up to 1500 m, whereas *Pachygnatha* sp. inhabits only the summit area. *Tetragnatha maxillosa* occurs from 500 m up to hill evergreen forest at 2000 m, while *T. nitens* is restricted to dipterocarp with pine forest at 1000 m.

Most araneids occur in more than one altitudinal zone with the exception of *Chorizopes bengalensis* being limited to the high-altitude zone. Altitudinal separation is also found in members of *Gasteracantha* and *Nephila*. *N. clavata* inhabits higher elevations, while *N. pilipes* is common in the lowlands. *G. geminata* occurs in the forest of higher altitudes whereas *G. hasselti* and *G. kuhli* are dominant in mixed deciduous forest further down.

Despite low numbers of individuals, Lycosidae can be found at all elevations, while *Hygropoda* (Pisauridae) is limited to the low elevations as are all species of Oxyopidae.

Ctenus spp. (Ctenidae) are common ground hunters that peak at the middle elevations, whereas *Coelotes* spp. (Amaurobiidae) are typically found in high-altitude zones.

Hahniidae and Agelenidae seem to prefer higher elevations, while Miturgidae and Dictynidae are restricted to lower slopes of the mountain.

Most members of Liocranidae and Corinnidae inhabit the lowlands, with two exceptions: *Otacilia zebra* and *Utivarachna cf. kinabaluensis* are common at high altitudes.

Asceua sp. A and *Asceua* sp. B are predominant species mostly found above 1500 m, while *Asceua* sp. C is common on the lower slope of the mountain. *Mallinella* spp., *Storenomorpha* sp. and Zodariidae gen. sp. inhabit the forest floor of intermediate zones. Large *Cydrela* species are distributed in the high-altitude zones.

Most Gnaphosidae are abundant in the lowlands, with a single species, *Hitobia* sp., occurring in hill evergreen forest.

Heteropoda sp., *Pseudopoda schwendingeri* and Sparianthinae gen. sp. inhabit the forest floor of the lowlands up to 1500 m. Only *Pseudopoda cf. parvipunctata* occurs along the whole altitudinal gradient.

The majority of Thomisidae are restricted to the lowlands, except *Lysiteles cf. kunmingensis* which is common in hill evergreen forest.

Members of Salticidae commonly occupy mixed deciduous and dipterocarp with pine forest, with a few species inhabiting hill evergreen forest.

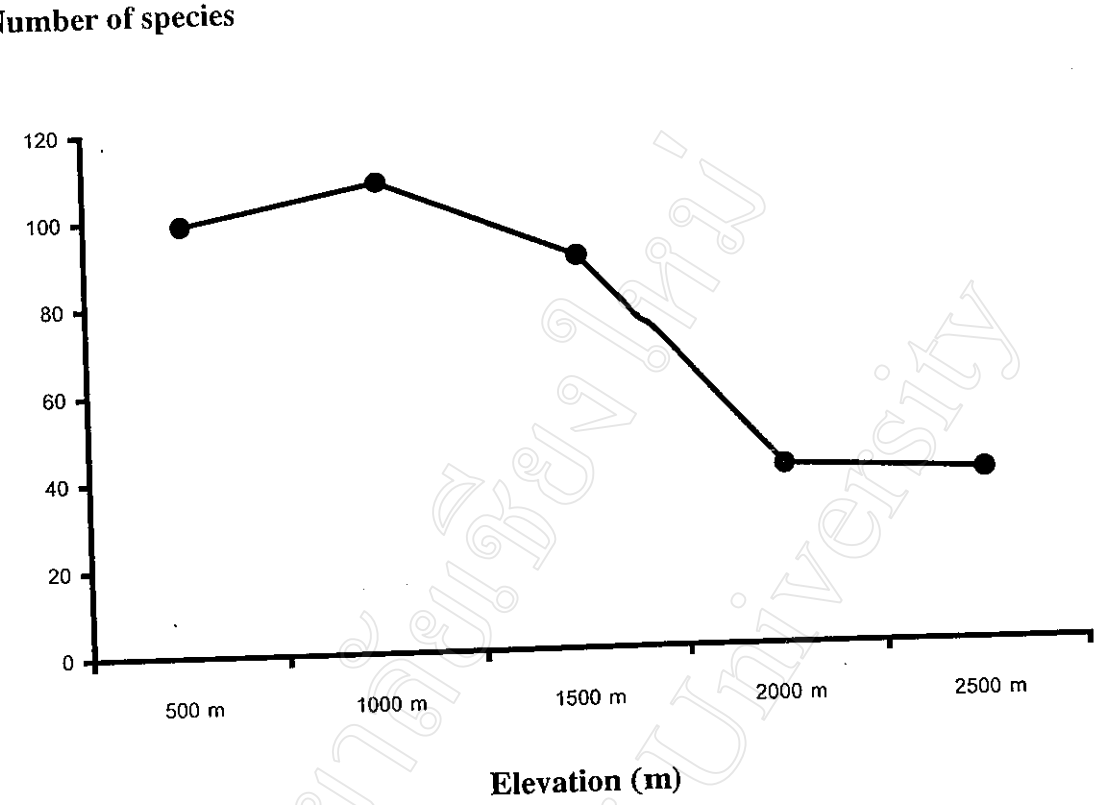

Fig. 4. The total number of spider species collected at each elevation.

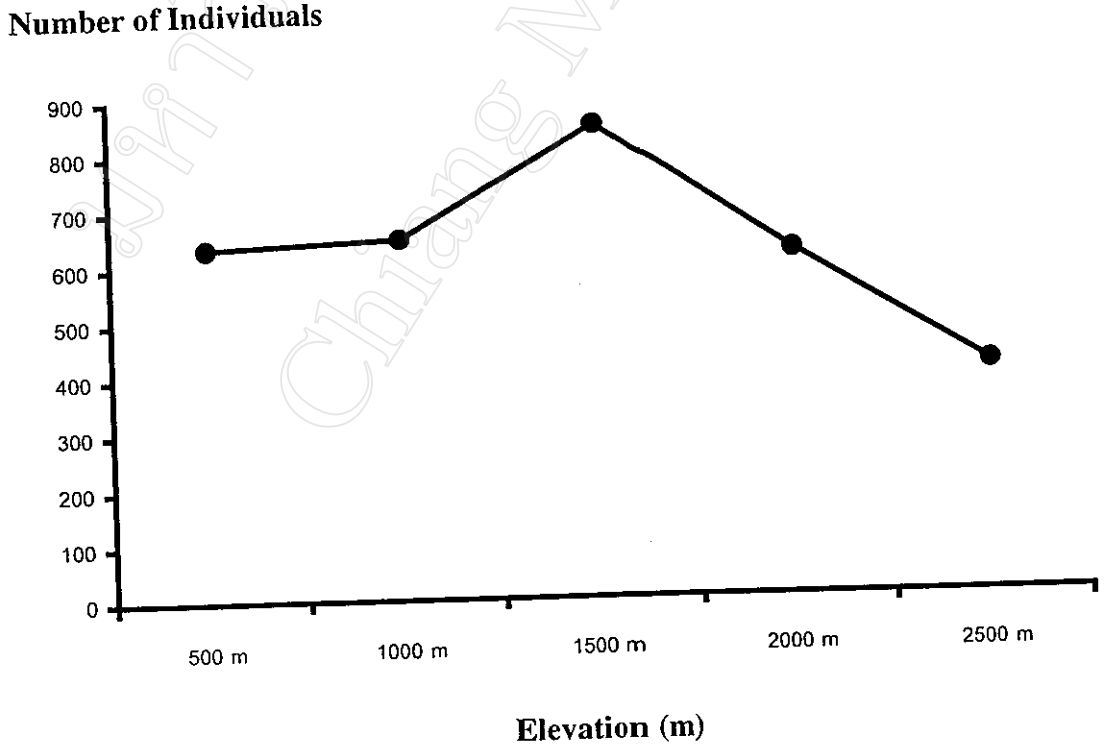

Fig. 5. The total number of spider individuals collected at each elevation.

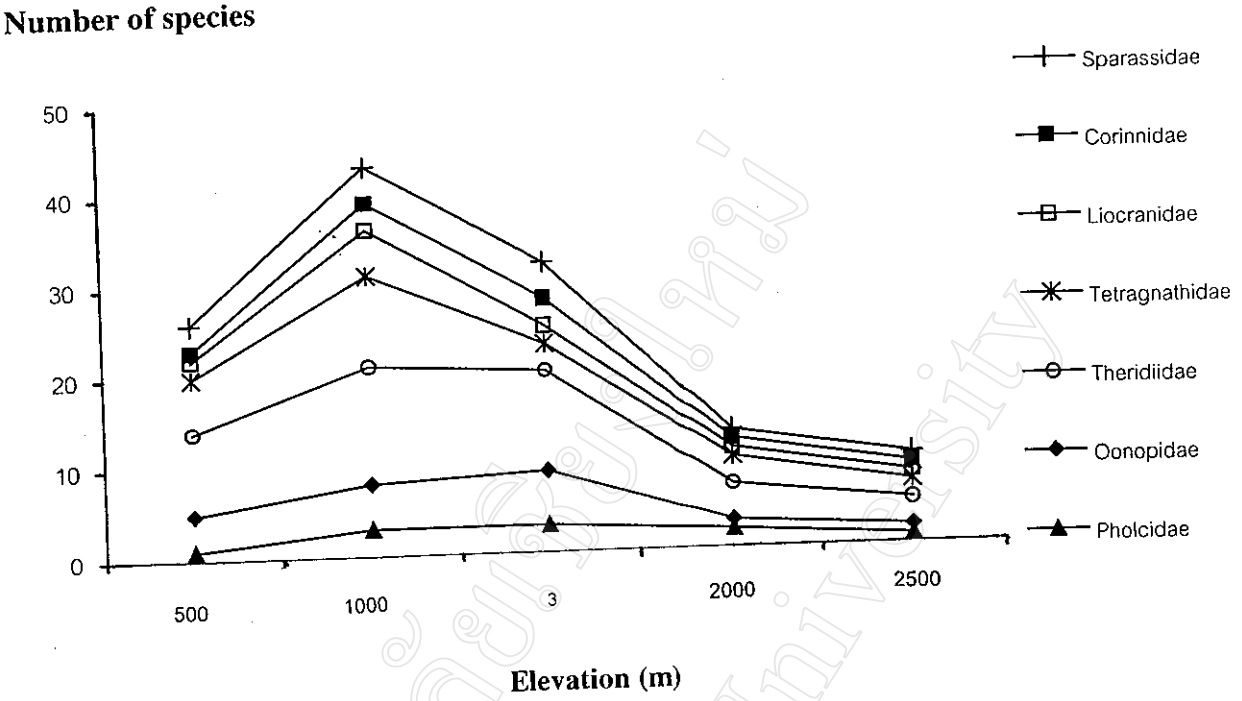

Fig. 6. The number of species of Pholcidae, Oonopidae, Theridiidae, Tetragnathidae, Liocranidae, Corinnidae and Sparassidae sampled at each elevation.

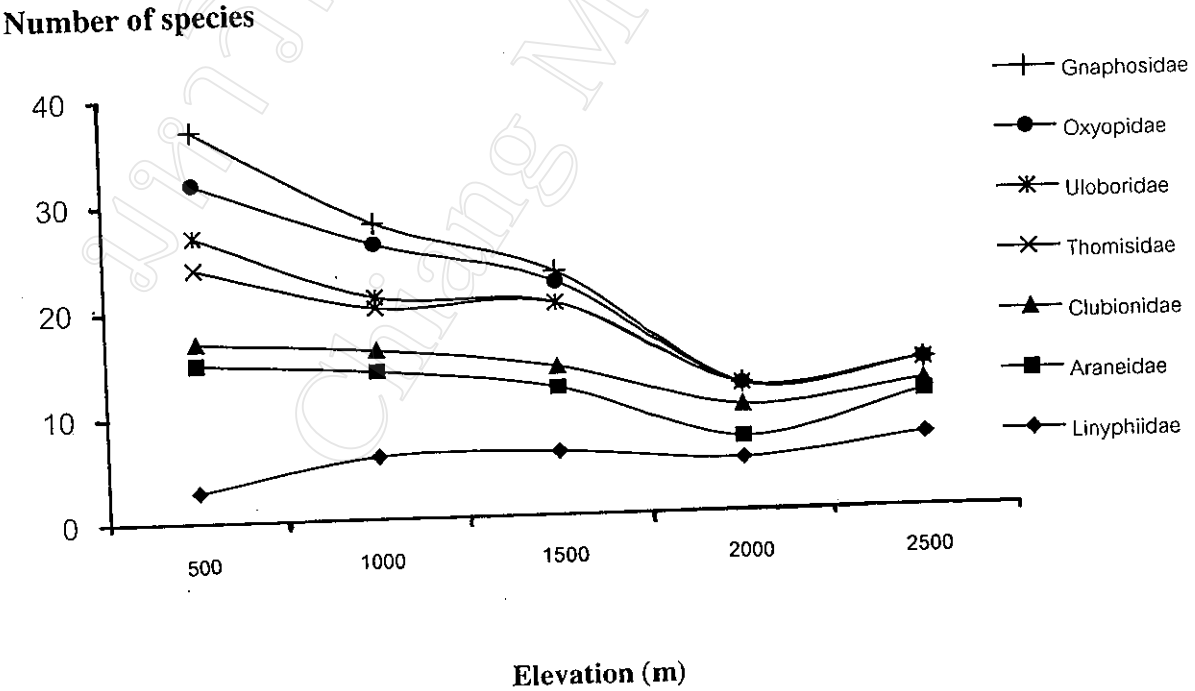

Fig. 7. The number of species of Linyphiidae, Araneidae, Clubionidae, Thomisidae, Uloboridae, Oxyopidae and Gnaphosidae at each elevation.

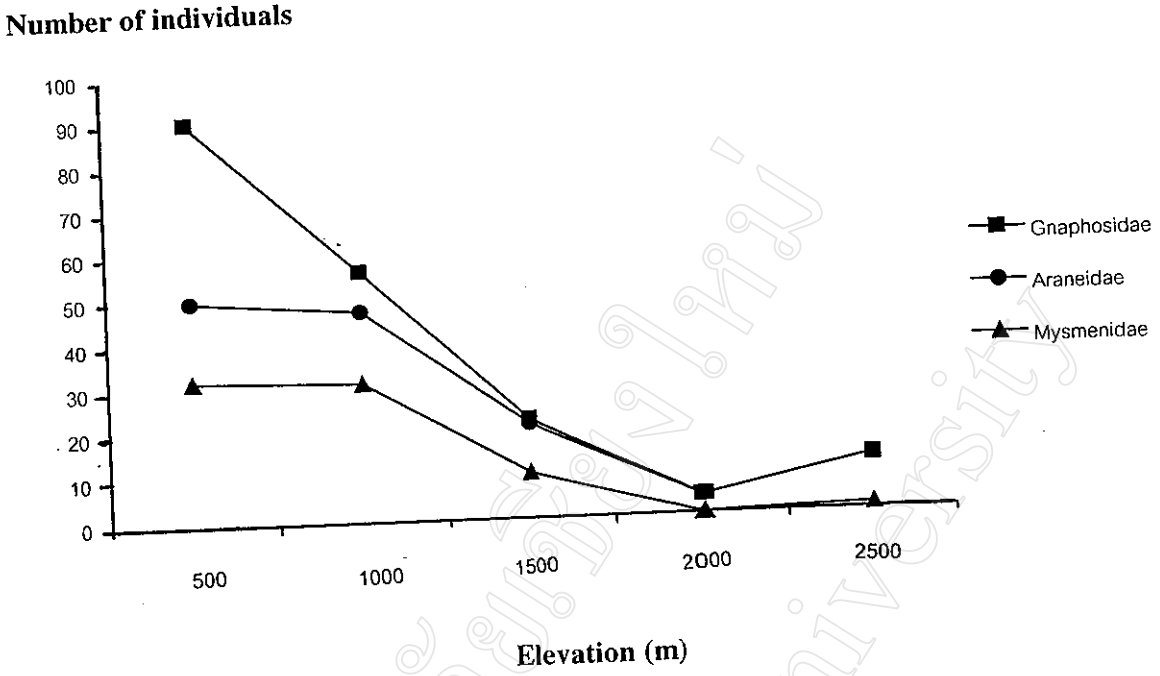

Fig. 8. The number of individuals of Mysmenidae, Araneidae and Gnaphosidae sampled at each elevation.

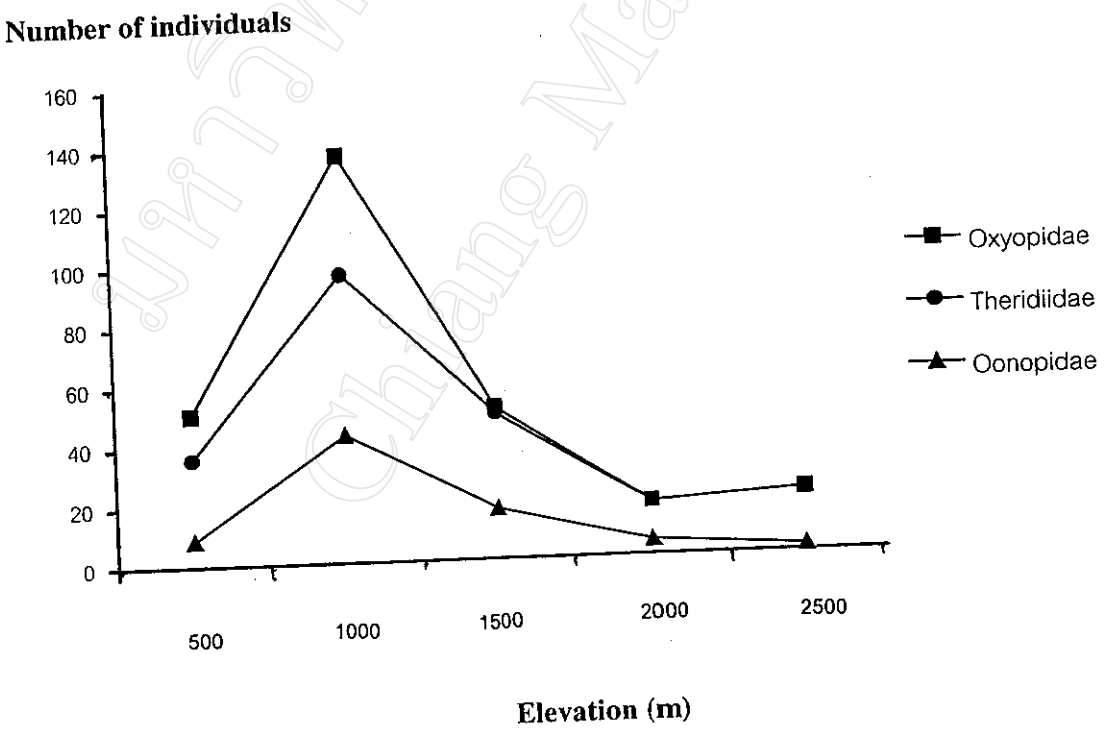

Fig. 9. The number of individuals of Oonopidae, Theridiidae and Oxyopidae sampled at each elevation.

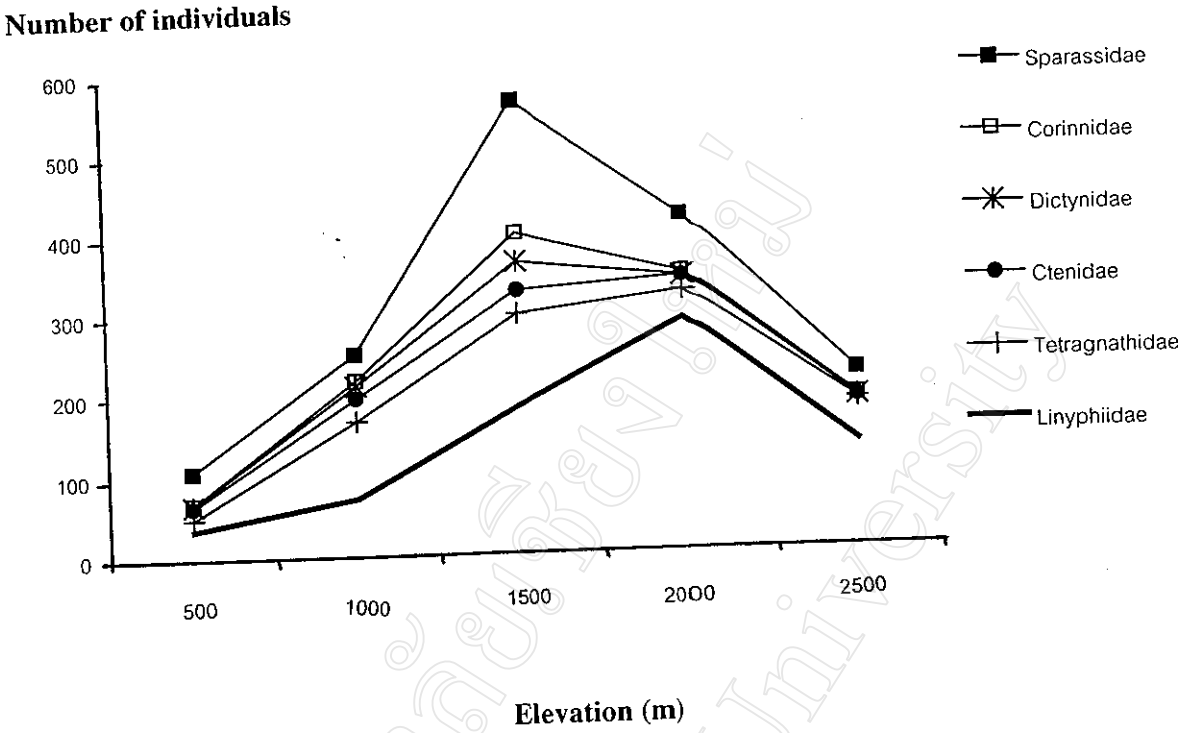

Fig. 10. The number of individuals of Linyphiidae, Tetragnathidae, Ctenidae, Dictynidae, Corinnidae and Sparassidae sampled at each elevation.

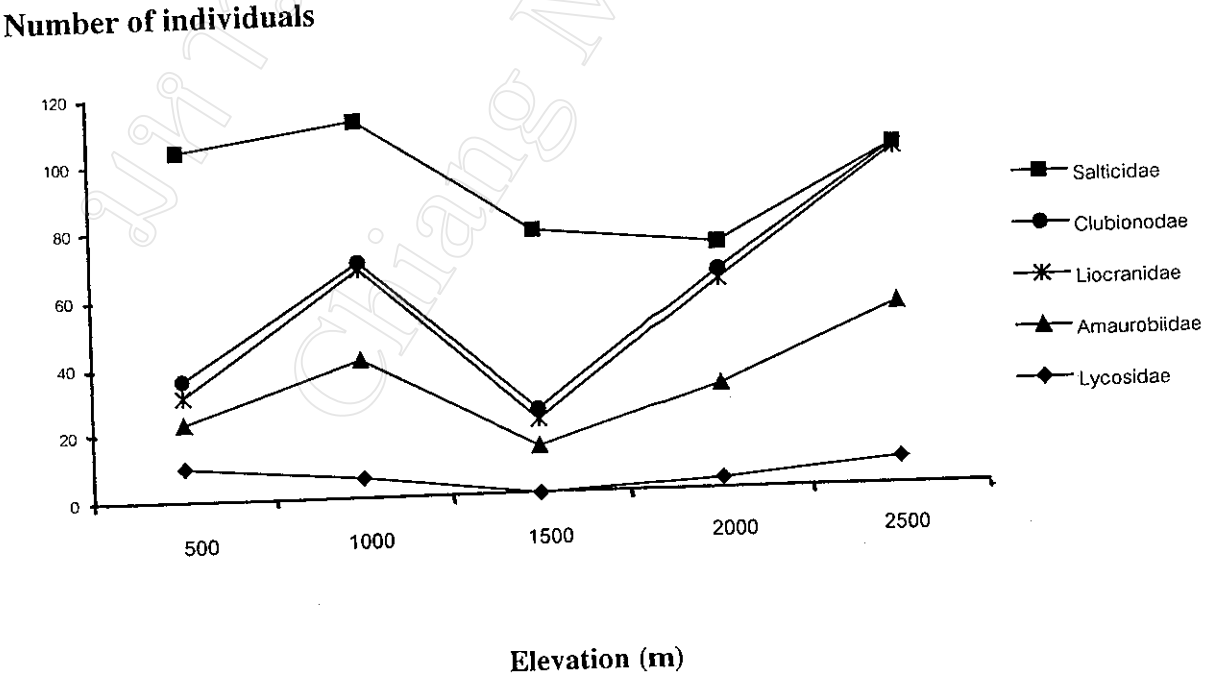

Fig. 11. The number of individuals of Lycosidae, Amaurobiidae, Liocranidae, Clubionidae and Salticidae sampled at each elevation.

Fig. 12. Altitudinal distribution of spider families at each elevation.

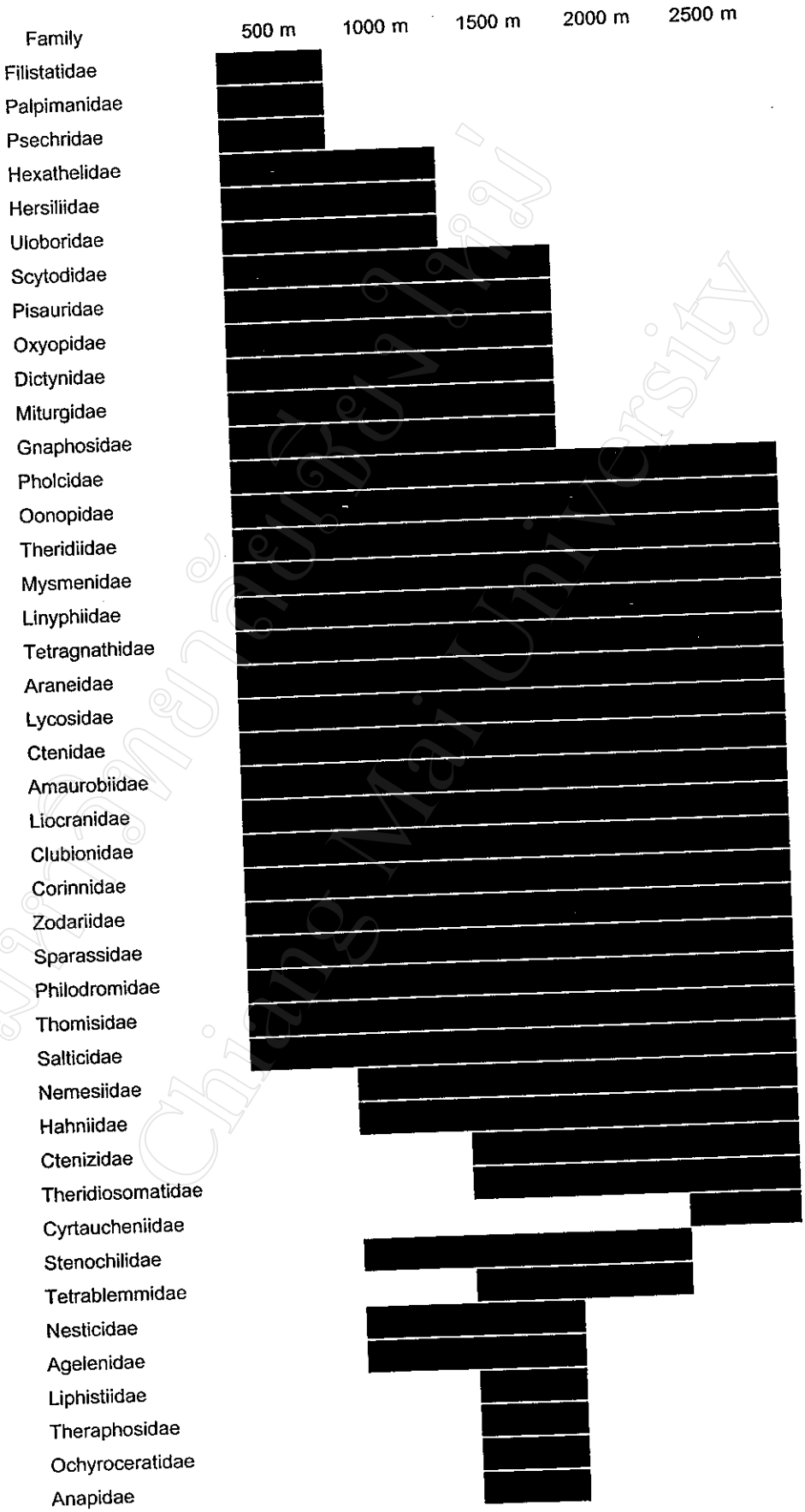

Table 3. Faunal turnover of a given sample shared with each of the other samples along the altitudinal gradient. The table reads top to bottom: e.g., the community at 2500 m has 25% of spider species in common with the community at 500 m, but only 39% of the community at 500 m are identical with the community at 2500 m.

Comparison sample	Reference sample				
	500	**1000**	**1500**	**2000**	**2500**
500	-	0.56	0.37	0.41	0.25
1000	0.61	-	0.38	0.73	0.43
1500	0.34	0.32	-	0.78	0.71
2000	0.41	0.27	0.35	-	0.76
2500	0.39	0.15	0.31	0.73	-

Table 4. Sørensen's coefficients of similarity for spider species. Values in italics represent comparisons of altitudinally adjacent samples.

Altitude	500	1000	1500	2000	2500
500	-	***0.294***	0.171	0.129	0.125
1000	-	-	***0.176***	0.201	0.111
1500	-	-	-	***0.244***	0.217
2000	-	-	-	-	***0.375***