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Spider communities of Isla Santa Cruz (Galápagos, Ecuador)

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Abstract. The various vegetation zones of the central Galápagoan island, Santa Cruz, have been sampled for spiders on three occasions, in 1982, 1986 and 1988. This paper deals with the synecological analyses (DECORANA, TWINSPAN) of the spider composition of the different vegetation zones of the island. There is an important variation in the composition of the spider communities of Santa Cruz coinciding mainly with altitudinal variation. As for plants, this relationship is different for the northern as compared to the southern side. Only on the southern slope are there agricultural activities and human settlements. Although this has led to an increase in the spider faunal diversity, the balance for nature conservation has clearly to be interpreted as negative.

Key words. Galápagos, Araneae, spider communities.

INTRODUCTION

In 1982 we started sampling campaigns in the Galápagos archipelago. The islands were visited on three occasions: 1982, 1986 and 1988 (Baert & Maelfait, 1986b; Baert, Maelfait and Desender, 1989a), during the warm/wet season, in the months of February, March and April. All major islands and volcanoes were sampled along an altitudinal gradient.

This study was started not only to have an idea of the spider species composition of the various islands belonging to that archipelago, but was also carried out in such a way that we could use the collected data for biogeographical and ecological analyses. At the start of this investigation, only a general list of the spiders of Galápagos was available (Roth & Craig, 1970).

From the material collected during our sampling campaigns, and after examination of nearly all existing collections made recently or in the past and deposited in various Institutions, we were able to discern 103 spider species, eighty of which are described in the literature. Of these eighty species, forty-six (58%) are known only from Galápagos, and a good deal of these are probably true endemics, although the spider fauna of the Central and Southern American mainland is far from well known. Some twenty-three species are still to be identified or described, a difficult and time-consuming task due to the lack of general revisions for most spider families and the lack of good descriptions and adequate drawings of the known neotropical species.

To start an ecological analysis of the spider fauna of the archipelago, we concentrated our efforts, in the first place, upon the centrally located island of Santa Cruz, as 76% of the total amount of spider species (seventy-eight species described or not) of the Galápagos occur on this island.

In general, six major vegetation zones can be discerned on the higher islands (exceeding an altitude of 500 m) of Galápagos. Those zones are all present and very clearly delimited on Santa Cruz, with its 875 m of elevation and its priviledged position within the global climatological system of the archipelago. Moreover, on this island, we have been able to sample different altitudinal gradients, including more or less complete transects on the southern as well as the northern slope, and this on several occasions.

The spider species richness of the island may be explained by the existence of these fairly well-developed and clearly bound vegetation zones, along with its moderately old age (within the 0.7–1.5×10^6 years range) as compared to, for example, the much younger more western and northern islands (Simkin, 1984).

MATERIALS AND METHODS

Study area: Isla Santa Cruz

There is, on Santa Cruz, a definite increase in precipitation with altitude due to the highlands intercepting the cloud-carried moisture. Rainfall in the arid lowlands ranges between 0 and 300 mm annually, while in the highlands the range is between 300 and 1700 mm (Jackson, 1987). The climate also becomes cooler and more cloudy with increasing altitude. There is therefore a gradient or zonation, in plant communities. The altitudes reached by the various vegetation zones on the northern and southern slopes differ according to a different rainfall regime, the southern slope receiving more precipitation due to prevailing winds from the southeast. The following vegetation zones can be distinguished:

1. The Littoral Coastal Zone: a very small evergreen zone beginning at the seashore and reaching some metres

inland; directly influenced by salt. In this zone we find salt-marshes, lagoons, mangroves, stands of *Sesuvium, Spirobolus*–grasses and *Cryptocarpus* saltbushes.

2. The Arid Zone: a clearly xerophytic vegetation of spiny bushes, dominated by tree cacti (*Opuntia, Jasminocereus*). This zone extends from the littoral zone up to approximately 80 m of altitude along the southern slope and up to 350 m of altitude along the northern slope of the island.

3. The Transition Zone: an evergreen zone composed of some xerophytic plants that have extended from the arid zone, intermingling with more mesophytic representatives of the moister *Scalesia* zone situated higher. Typical for this zone is the presence of epiphytes, lichens and bryophytes living on the trees. A well-developed understorey is present. This zone extends between 80 and 200 m of altitude along the southern slope, and between 350 and 500 m along the northern one.

4. The *Scalesia* Zone is characterized by the occurrence of the evergreen tree composite *Scalesia*. This zone extends between *c*. 200 m and 400 m of altitude along the southern slope, and can reach an altitude up to 600 m along the northern slope. On the inhabited islands, as Santa Cruz, this zone, as well as the previous one, are largely occupied by crop fields and pastures, and are called the culture zone. On Santa Cruz, the culture zone only occurs on the Southern slope.

5. The *Miconia* Zone: a vegetation belt almost exclusively composed of the evergreen bush *Miconia*. These shrubs are densely coated with epiphytes and can reach an upper limit of approximately 625 m according to the orientation of the slope; the zone is absent from the northern slope.

6. The Fern-Sedge Zone or *Pampa*. This vegetation belt is composed of perennial ferns, sedges and some herbs. *Lycopodium* and *Sphagnum* bogs may occur in very humid depressions. On higher altitudes (top zone) tree ferns grow. The lower limit is about 500 m of altitude in cleared areas, but it generally starts at about 600 m of elevation. This zone extends to the top.

For a schematic representation, and for more details on plant communities, we refer to Stewart (1911), Bowman (1961, 1963), Laruelle (1965), Wiggins & Porter (1971), Reeder & Riechert (1975), Hamann (1981) and Jackson (1987).

Methods

Forty different sites (Table 1, Fig. 1), distributed along a south/north altitudinal transect and spread over the different vegetation zones, were sampled in a standardized manner by means of handcatches (timed effort), pitfall trapping and sweeping. Sites were not however sampled at the same moment, but over the periods of three sampling campaigns (1982, 1986 and 1988). Furthermore, each sampling method yielded different data according to the vertical layer to which the sampling method fitted best (soil, soil surface, vegetation). The qualitative data obtained were pooled over the three years. An ordination technique (Detrended Correspondence Analysis or DCA), as well as a divisive classification technique (Two-Way INdicator SPecies ANAlysis or TWINSPAN), were applied for the analysis of the data based on presence/absence of the species caught (sixty-three species). The programs DECORANA (Hill, 1979a) and TWINSPAN (Hill, 1979b) were used as software.

Material

The nomenclature is principally based on the species list of Roth & Craig (1970), revisions (Levi, 1977), and publications of a late date (Baert, 1987, 1990; Baert & Maelfait, 1983, 1984, 1986a; Cutler, 1971; Galiano & Baert, 1990; Opell, 1979; Platnick & Murphy, 1987).

RESULTS AND DISCUSSION

Segregation of the sampling sites based on their spider fauna

The Detrended Correspondence Analysis (DCA) resulted in an ordination (Fig. 2) accounting for 63.4% of the total variation along the first and second axis together. The first axis can be interpreted as a gradient from low to high altitude, and consequently from dry to humid habitats (vegetation zones). The second axis separates natural against disturbed sites. The sites which are directly influenced by humans (sites located along southern slope, tourist sites, implantation sites of the CDRS) or by introduced animals (in this case the little fire ant, *Wasmannia auropunctata*), are situated under the horizontal axis of the ordination, while the more natural sites (sites located along the northern slope and highlands) are found above this axis.

Although the amount of variation explained by the third axis (23.2%) approximates to the value of the second axis (26.2%), plotting the third axis against the first did not introduce new elements in our interpretations.

The classification of habitats of spiders, as interpreted from TWINSPAN end groups, is given in Fig. 3, together with the characteristic species (indicator species given by TWINSPAN indicated with a +) at each division.

The frequency of occurrence (number of localities) of the most important spider species in the eight habitat end groups as obtained and interpreted from the TWINSPAN analysis are given in Table 2.

Eight end groups were recognized at the third division in the following dichotomous hierarchy (Fig. 3):

Humid Habitats (end groups A, B, C and D): comprising the Transition, Culture, *Scalesia, Miconia* and Fern-Sedge zones (alt. > 140 m).

1. End group **A:** comprises the Fern-Sedge zone situated in the 'Media Luna' *altiplano*, a slightly ascending plain (between 600 and 700 m of altitude) south of Cerro Crocker. Indicator species are *Neocautinella ochoai* (species endemic to the archipelago) and *Erigone atra* (native species also occurring on the American mainland).

2. End group **B:** comprises the *pampa* zone on top of Cerro Crocker (825–875 m), the *Scalesia* and *Miconia* zones. Indicator species are *Camillina galapagoensis*, *Calomyspoena santacruzi* and *Olios galapagoensis* as endemics and *Scytodes hebraica sensu* Roth, 1970 (probably a n.sp. according to pers. comm. Lehtinen).

TABLE 1. Sampled localities.

No.	Locality name	Zone specification	Altitude
1	CDRS-buildings	Arid zone	S5m
2	CDRS	Littoral zone	S0m
3	CDRS-Barranco	Arid zone (semi-open dry deciduous forest)	S20m
4	Bahía Tortuga	Littoral zone	SW0–5m
5	Bahía Conway	Arid zone	NW0–2m
6	Bahía Tiburon	Littoral zone (laguna)	NW0–2m
7	Isla Venecia	Arid zone	NW2m
8	Caseta Occidente	Transition zone	SW170m
9	Caseta Tortuga	Transition zone with *Scalesia*	S150m
10	El Chato	Transition zone with *Scalesia*	SW190m
11	Southern slope	A.Z. (semi-open semi-dry deciduous forest)	S50m
12	Southern slope	Culture zone (forest)	S140m
13	Southern slope	Culture zone (open vegetation)	S230m
14	Southern slope	Culture zone (meadow)	S350m
15	Southern slope	C.Z. (meadow with *Scalesia*)	S500m
16	Los Gemelos	*Scalesia*-wood (left pitcrater)	S570m
17	Los Gemelos	*Scalesia*-wood (right pitcrater)	S570m
18	Los Gemelos	Clearing in *Scalesia*-wood (right crater)	S570m
19	Northern slope	Transition zone (closed deciduous forest)	N500m
20	Northern slope	Transition zone (closed deciduous forest)	N400m
21	Northern slope	A.Z. (semi-open semi-dry deciduous forest)	N350m
22	Northern slope	A.Z. (semi-open semi-dry deciduous forest)	N300m
23	Northern slope	A.Z. (semi-open dry deciduous forest)	N250m
24	Northern slope	A.Z. (semi-open dry deciduous forest)	N150m
25	Northern slope	A.Z. (open dry deciduous forest)	N50m
26	Bellavista trail	Culture zone (Aguayava orchard)	S350m
27	Bellavista trail	clearing in *Miconia*-wood	S500m
28	Bellavista trail	*Miconia*-wood	S550m
29	Media Luna area	Pampa	H600m
30	Highland	Pampa	H700m
31	Highland	Pampa	H750m
32	Highland	*Lycopodium/Sphagnum* bog	H825m
33	Crater bottom	Pampa	H800m
34	Cerro Crocker Top	Pampa	H875m
35	NE Highland	Pampa	HNE650m
36	NE Highland	Pampa	HNE680/700m
37	NE *Scalesia*	*Scalesia*-wood	NE570m
38	NE *Scalesia*	Pampa area surrounded by *Scalesia*-wood	NE570m
39	Bellavista area	Culture zone (orchards)	S200–400m
40	Northern slope	Transition zone	N560m

Characteristic species for both end groups are *Coryssocnemis conica, Sitticus uber*, Araneidae spec. 6 and *Trochosa* spec. 4 as endemics, and *Oxyopes gracilis*, *Coleosoma floridanum* and *Laminacauda dentichelis* as native species.

3. End group **C:** comprises the Transition zone (with or without *Scalesia* elements) along the S-SW slope of the island and a closed *Aguayava*-orchard in the Culture zone near Bellavista (alt. 350 m). As indicator species, we have the native species *Notiohyphantes excelsa*.

4. End group **D**: comprises the Transition zone along the northern slope of the island (between 140 and 500 m of altitude).

Characteristic species for both end groups are *Meioneta galapagosensis*, *Theotima galapagosensis* and *Trochosa* spec. 3 as endemic species, and Oonopidae spec. 4 (probably an introduced species).

Dry and Coastal Habitats (end groups E, F, G and H): comprises the Littoral, the Arid coastal and Dry arid zones.

5. End group **E:** the locality comprising the CDRS-buildings is separated as an end group due to the presence of a number of synanthropic species: *Heteropoda venatoria, Scytodes longipes, Theridion rufipes* (probably an introduced species), and *Coryssocnemis insularis* (endemic).

6. End group **F:** comprises the Littoral and Arid coastal zone. Characteristic species are *Metepeira desenderi* (endemic), *Argiope argentata* and its cleptoparasite *Argyrodes elevatus* (both natives).

Indicator species for both end groups are *Metepeira desenderi, Metacyrba insularis* (both endemics), *Selenops galapagoensis* and *Argiope argentata* (both natives).

7. End group **G:** comprises the southern (up to 50 m of altitude) and northern (between 50 and 350 m of altitude)

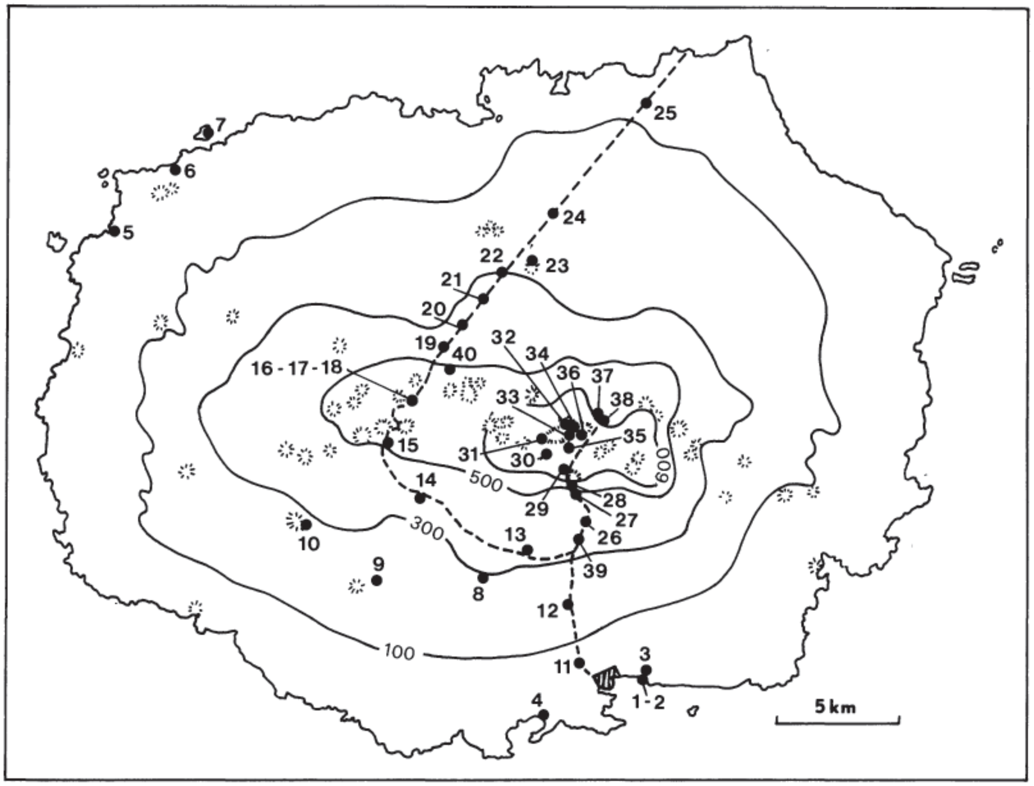

FIG. 1. Localities sampled on Isla Santa Cruz.

arid zones. Characteristic species are *Meioneta galapagosensis* and *Meioneta arida* (both endemics).

8. End group **H:** comprises the localities situated in the northwestern coastal arid zone. The indicator species is *Argiope argentata*. A characteristic species is its cleptoparasite *Argyrodes elevatus*.

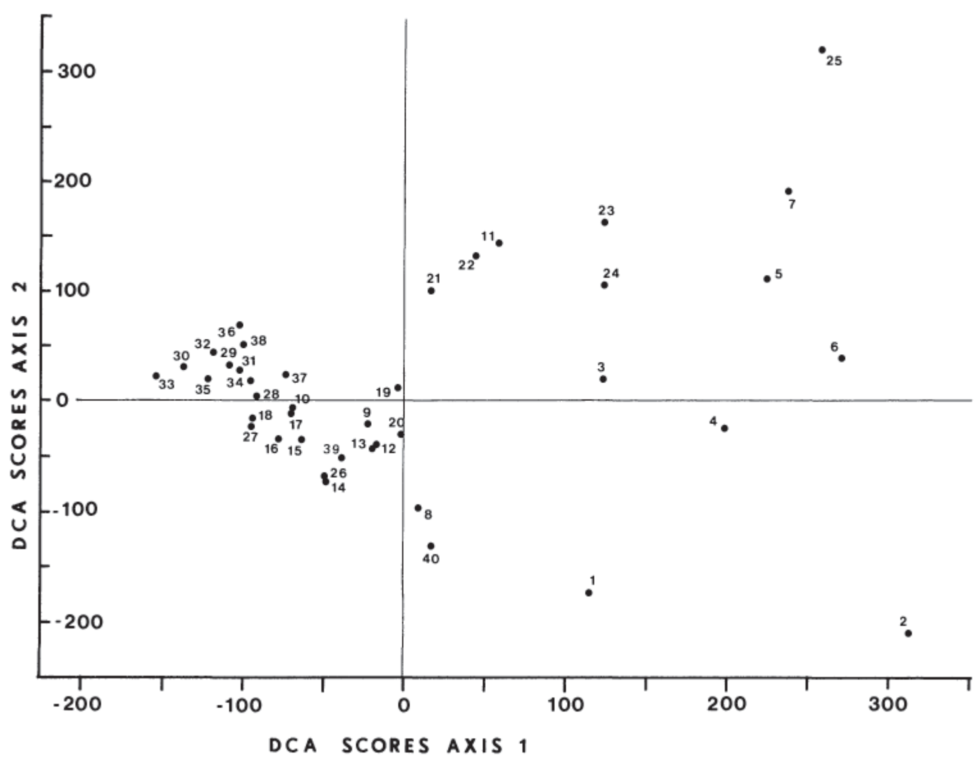

FIG. 2. Two-dimensional ordination (DCA) of the forty sampling sites. The site numbers used are explained in Table 1.

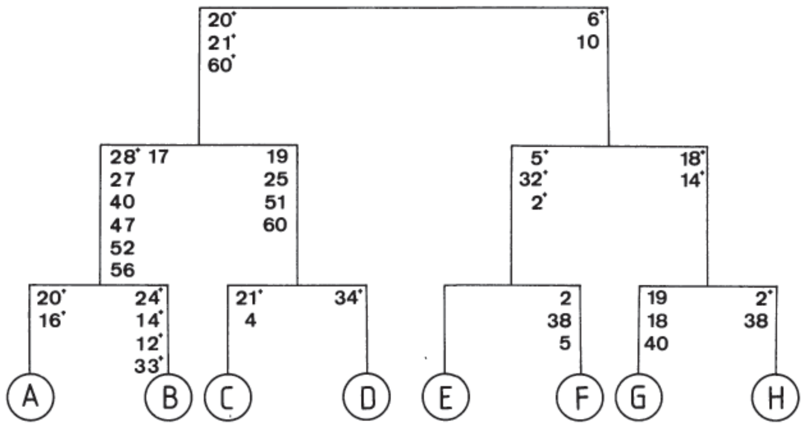

FIG. 3. TWINSPAN classification. The characteristic species (indicator species given by Twinspan analysis in bold characters) at each division are given as numbers which refer to the species list in Table 2.

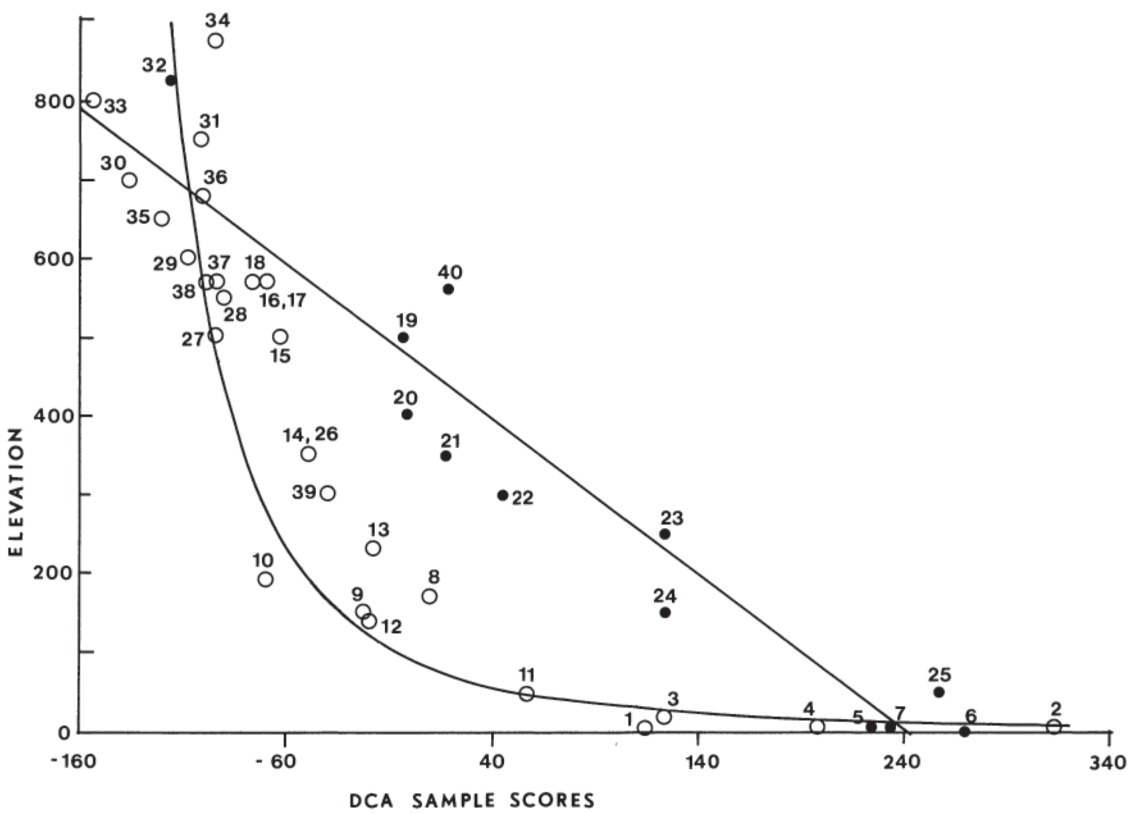

FIG. 4. DCA sample scores for the sample sites along the northern (black dots) and the southern (open circles) slopes separately plotted against elevation (handfitted curves).

Indicator species for both end groups are *Meioneta arida* and *Camillina galapagoensis*.

The upper limits of the vegetation zones extend to higher altitudes along the northern slope as a result of the differential climatological circumstances, for instance less rainfall. This phenomenon also occurs in the spider fauna, as can be seen from the above classification. There is a significant negative correlation between the elevation and the DCA sample scores on both transects (R(Spearman)=–0.93 for northern transect and R(Spearman)= –0.94 for the southern transect). Handfitted curves (added on Fig. 4) seem, moreover, to suggest a different relationship for both transects.

A progressive araneofaunal change occurs along the northern slope according to the increasing altitude. The changes along the southern slope are very drastic for the first 200 m increase in altitude (Littoral, Arid, Transition and Culture zones), while they are relatively small for higher zones. The faunal composition of the Littoral zone, coastal Arid zone, and top zone along the northern and southern slopes are, on the other hand, comparable.

TABLE 2. The frequency of occurrence (number of localities) of the most important spider species in the eight habitat end groups as obtained and interpreted from the TWINSPAN analysis. The species order is derived from the TWINSPAN classification. The numbers before each species are those used in Fig. 3. Species endemic to the Galápagos are marked by an asterix.

Twinspan end group: No. of localities:	A 6	B 7	C 7	D 7	E 1	F 4	G 6	H 2	
33. *Scytodes hebraica* (*sensu* Roth)		3							*?
27. *Oxyopes gracilis*	5	4							
47. Araneidae spec. 6	2	4							*?
16. *Erigone atra*	3								
17. *Laminacauda dentichelis*	6	5							
28. *Coryssocnemis conica*	6	7							*
52. Lycosidae spec. 4	6	7	2						*
56. *Sitticus uber*	3	4	1						*
20. *Neocautinella ochoai*	6	7	4	4					*
22. *Leucauge bituberculata*	4	5	4						*
21. *Notiohyphantes excelsa*	3	5	7	1					
57. Oonopidae spec. 1	2	4	4	4					
25. *Theotima galapagosensis*	1	1	3	4					*
60. Oonopidae spec. 4		3	6	7					
36. *Glenognatha maelfaiti*	4	3	5	1		1			*
11. *Heteropoda venatoria*		1	3	2	1				
24. *Calomyspoena santacruzi*		3	5	4		2			*
34. *Scytodes longipes*				5	1				
19. *Meioneta galapagosensis*	2		6	6			4		*
4. *Gasteracantha servillei*			4			2			
51. Lycosidae spec. 3			3	6		3		1	*
12. *Olios galapagoensis*		3	1	2	1				*
14. *Camillina galapagoensis*		4		1		1	4	2	
30. *Darwinneon crypticus*	2	4	2	5		2	5	2	*
40. *Coleosoma floridanum*	5	5	1			2	5		
6. *Neoscona cooksoni*	3			1		2	3	2	*
18. *Meioneta arida*				1			5		*
2. *Argiope argentata*						4		2	
10. *Tivyna spathula*					1	3	3		*
38. *Argyrodes elevatus*			1			4	1	2	
5. *Metepeira desenderi*		1				4			*
32. *Metacyrba insularis*		1			1	2			*
44. *Theridion rufipes*					1				
29. *Coryssocnemis insularis*		1			1				*

The zones with most spider species are the two altitudinal extremes, the coastal littoral zone (twenty-seven species) and the top zone (*pampa* zone) (twenty-four species). The poorest communities are found in the arid zones (five to thirteen species) and the *Miconia zone* (fourteen species), while the centrally located Transition, Culture and *Scalesia* zones are intermediate in species richness (respectively seventeen, twenty-two and twenty species). Obviously humidity, in the form of fog, must play an important part in the determination of species richness. This is corroborated by the higher number of species occurring along the more humid (higher rainfall) southern slope (fifty-six species), in contrast with the lower number of species occurring along the much dryer northern slope (thirty species).

The richness of the Littoral zone can be explained by the fact that web-building species occurring in the adjacent arid zone find suitable space for web-building in the mangroves too (considered as part of the littoral vegetation), as well as in the low scrubs (e.g. the saltbush *Cryptocarpus*) that grows along the often small zones between beach and *laguna*.

The spider species richness of the Culture zone is certainly due to the diversification of that zone as a result of human agricultural activities, yielding a higher diversity in vegetation structure and composition than the original *Scalesia* wood. In this zone we find vegetation types varying from open meadows to very closed orchards. The transformation of the original *Scalesia* zone into the culture zone, however, results in a qualitative impoverishment of the original fauna. Seven 'endemic' and two native species disappear, and are replaced by four 'endemic' species, coming from the lower arid zones, and by one native, three synanthropic and two introduced species, which obviously have a lower value for nature conservation and the maintenance of biodiversity overall.

The Arid and Transition zones are quite uniform in vegetation which could explain their lower spider species diversity.

A tremendous problem on Santa Cruz is the expansion of the introduced little fire ant (*Wasmannia auropunctata*). In *Wasmannia*-infested areas most of the arthropod fauna has disappeared (Lubin, 1984, 1985), and only those species can survive which are able to adapt to this aggressive ant species, such as Oonopidae and the ochyroceratid *Theotima galapagosensis*.

CONCLUSION

There is important variation in the composition of the spider communities of Santa Cruz, coinciding mainly with altitudinal gradients. As in plants, this relation is different for the northern as compared to the southern side: on the northern slope, species of the arid zone extend to higher altitudes. Also, as a consequence of the differing vegetation zonation between southern and northern slopes, agricultural activities are confined to the southern slope, such as native fruit and sugar cane plantations, but especially pastures. It is on this slope that the spider fauna has evidently been mostly altered by human activities (agricultural fields, as well as settlements). Although this has led to an actual increase in the spider faunal diversity, the biodiversity quality of the fauna has decreased, and the balance for nature conservation has clearly to be interpreted as negative. Further expansion of cultivation or settlements should therefore be prevented.

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APPENDIX 1

Distribution of spider species over the sampled localities.

Anyphaenidae

(1) *Anyphaenoides pacifica* (Banks, 1902): 1, 8, 24.

Araneidae

(2) *Argiope argentata* (Fabricius, 1755): 2–7.
(3) *Cyclosa turbinata*. (Walckenaer, 1841): 5.
(4) *Gasteracantha servillei* (Guérin, 1825): 3, 4, 8, 9, 26, 39.
(5) *Metepeira desenderi* Baert, 1987: 2–6, 37.
(6) *Neoscona cooksoni* (Butler, 1877): 3, 5–7, 13, 22–24, 29, 36, 38.

(46) Araneidae spec. 3: 1, 4.
(47) Araneidae spec. 6: 17, 28, 34, 35, 37, 38.
(48) Araneidae spec. 8: 1.

Clubionidae

(7) *Corinna wollebooki* Banks, 1930: 1, 3, 12, 13, 23, 26, 40.

Ctenidae

(8) *Odo insularis* Banks, 1902: 7.

Dictynidae

(9) *Phantina remota* (Banks, 1924): 2, 6.
(10) *Tivyna spathula* (Gertsch & Davis, 1937): 1, 2, 4, 6, 23–25.

Eusparassidae

(11) *Heteropoda venatoria* (Linnaeus, 1767): 1, 8, 13, 14, 18, 26, 39.
(12) *Olios galapagoensis* Banks, 1902: 1, 16, 17, 19, 20, 22, 32, 34.

Filistatidae

(13) *Filistatoides fasciatus* (Banks, 1902): 4, 39.

Gnaphosidae

(14) *Camillina galapagoensis* (Banks, 1902): 4, 5, 7, 19, 21–24, 28, 31, 32, 34.
(15) *Trachyzelotes kulckzynskii* (Bösenberg, 1902): 12, 19, 20.

Linyphiidae

(16) *Erigone atra* (Blackwall, 1841): 29, 35, 36.
(17) *Laminacauda dentichelis* Millidge, 1985: 18, 28–36, 38.
(18) *Meioneta arida* Baert, 1990: 11, 19, 22–25.
(19) *Meioneta galapagosensis* Baert, 1990: 8–15, 19–22, 24, 26, 27, 35, 36, 39.
(20) *Neocautinella ochoai* Baert, 1990: 10, 13–19, 26–38.
(21) *Notiohyphantes excelsa* (Keyserling, 1886): 8–10, 15–18, 26–31, 34, 35, 39.

Lycosidae

(51) Lycosidae spec. 3: 3, 4, 6, 7, 10, 12–16, 18–20, 27.
(52) Lycosidae spec. 4: 1–18, 28–39.

Metidae

(22) *Leucauge bituberculata* Baert, 1987: 9, 10, 17, 27–29, 32–35, 37–39.

Mimetidae

(23) *Ero gemelosi* Baert & Maelfait, 1984: 18.

Mysmenidae

(24) *Calomyspoena santacruzi* Baert & Maelfait, 1983: 2, 3, 8–10, 12–18, 26, 28, 31.

Ochyroceratidae

(25) *Theotima galapagosensis* Baert & Maelfait, 1986: 8, 12–15, 26–29.

Oecobiidae

(26) *Oecobius concinnus* Simon, 1892: 1, 4.

Oonopidae

(57) *Triaeris stenaspis* Simon, 1891: 8, 9, 12–15, 18, 26–29, 31, 37, 38.
(58) Oonopidae spec. 2: 2.
(59) Oonopidae spec. 3: 23.
(60) Oonopidae spec. 4: 8, 9, 12–18, 19, 20, 26–28, 39, 40.
(61) Oonopidae spec. 5: 2.
(62) Oonopidae spec. 6: 2.
(63) Oonopidae spec. 8: 8, 10, 16, 18, 20.

Oxyopidae

(27) *Oxyopes gracilis* Keyserling, 1877: 15, 17–19, 29–31, 34–36, 38.

Pholcidae

(28) *Coryssocnemis conica* Banks, 1902: 17, 18, 28–38.
(29) *Coryssocnemis insularis* Banks, 1902: 1, 34.
(53) Pholcidae spec. 3: 7.
(54) Pholcidae spec. 6: 25.

Salticidae

(30) *Darwinneon crypticus* Cutler, 1971: 2, 3, 5, 7–9, 11–13, 15, 17–24, 28, 29, 37, 38.
(31) *Frigga crocuta* (C. L. Koch, 1846): 4, 6, 8, 17, 20, 39.
(32) *Metacyrba insularis* (Banks, 1902): 1, 2, 4, 17.
(49) *Sitticus phaleratus* Galiano & Baert, 1990: 4.
(50) Salticidae spec. 4: 2, 8.
(56) *Sitticus uber* Galiano & Baert, 1990: 17, 18, 27–30, 32, 35.

Scytodidae

(33) *Scytodes hebraica* Simon, 1891 (*sensu* Roth & Craig, 1970): 1, 17, 34, 37.
(34) *Scytodes longipes* Lucas, 1845: 1, 13–15, 19, 40.

Selenopidae

(35) *Selenops galapagoensis* Banks, 1902: 1, 2, 4, 8, 18, 19, 35, 39, 40.

Tetragnathidae

(36) *Glenognatha maelfaiti* Baert, 1987: 3, 9, 10, 15, 16, 18, 27–31, 33, 35, 39.

Theridiidae

(37) *Achaearanea hirta* (Taczanowski, 1872): 3, 4.
(38) *Argyrodes elevatus* Taczanowski, 1872: 2–7, 9, 24.
(39) *Argyrodes fictilium* (Hentz, 1850): 3.
(40) *Coleosoma floridanum* Banks, 1900: 3, 4, 10, 17, 18,. 21–25, 29–31, 34–38.
(41) *Latrodectus apicalis* Butler, 1877: 4.
(42) *Theridion calycinatum* Holmberg, 1876: 17, 29, 35, 37–39.
(43) *Theridion coldeniae* Baert & Maelfait, 1986: 4, 6, 7, 25.
(44) *Theridion rufipes* Lucas, 1846: 1.
(55) Theridiidae spec. 10: 37.

Thomisidae

(45) *Misumenops inclusus* (Banks, 1902): 2.