RAN, 1987]) and some adventive volcanic craters (e.g. the Rano Raraku, the crater where the pascuan megaliths were sculptured).

The climate on Easter Island is oceanic and subtropical with slight annual variation. Annual mean temperature is about 20 °C (somewhat higher from December until March) and annual precipitation about 1130 mm without very distinct dry or wet periods (HAJEK & ESPINOZA, 1987; WALTER *et al.*, 1975).
There are no permanent streams on Easter Island. Surface water or lakes with associated swamps (Figure 1) can only be found in the depths of three volcanic craters or in small temporary pools and rivulets.
The diversity of habitat types on Easter Island is low and has been extremely influenced by man. Most of the island's surface is now covered by pasture, which is sometimes burned (Figure 3) and, on most sites, overgrazed by introduced cattle herds. Some of these grasslands are shortgrazed and continuous, others are more mixed with open sites, some herbs or small shrubs and an abundance of lava stones (Figure 4). At present there are several large *Eucalyptus* plantations (Figure 2) and a relatively diverse secondary woodland near the crater lake of Rano Kao, but all these plant species have been introduced and nothing is left of the more natural woodland that probably once occurred on the island (HOFFMANN & MARTICORENA, 1987; ZIZKA, 1990). Other available habitats are some very small sand dunes along the northern coast of the island near Anakena (Figure 5), lava tunnels and caves, small marshy habitats near water bodies, and an expanding cultivated zone near Hanga Roa (just north of the Rano Kao) (Figure 7).

Studies of the insects of Easter Island have been rare; sampling was mostly unsystematic or casual and started in the 20th century only (CAMPOS & PEÑA, 1973). There is not a single recent study wherein terrestrial arthropods of all the available habitats have been examined in detail. The ecology and biology of the species present have nearly completely been neglected.

During December 1993, we stayed on Easter Island and sampled as many habitats and microhabitats as possible for their terrestrial arthropod fauna. We also investigated some ecological aspects (especially habitat and microhabitat preference) of the abundant species. Our main interests and efforts were directed to arachnids and beetles. In addition, unstudied arthropods obtained during previous Belgian expeditions to Easter Island were studied as well (S. Jacquemart, R.B.I.N.Sc., Brussels, 1976; H. Dumont, J. Mertens and D. Verschuren, Univ. Ghent, 1990).
In an earlier paper (DESENDER & BAERT, in press) we have already described the detailed distribution of the two species of ground beetles that occur on Easter Island, and have commented on their biology and ecology.
Here we report on the complete beetle fauna of Easter Island and, for every species, present data on their detailed distribution. In addition, we comment on more general aspects of their biology and distribution and attempt to trace the origin of the beetle faunal elements.

Material and Methods

The Belgian mission to Easter Island, ('Diving Investigation Scientific Rapa Nui 270'), remained nearly one month on the island in December 1993. Sixty six localities were sampled over 21 days, yielding a total of 153 samples. All sampling sites are briefly described in Table 1; their localization is shown in the upper map of Figure 7. Sampling sites have been arranged in Table 1 according to different sectors of the island.

A total of 28 of these sites was sampled continuously during approximately three weeks (30 November - 20 December 1993) by means of three pitfall traps in each site. The traps (glass or plastic jars, 10 cm diameter, filled partly with a 10 % formalin solution) were emptied at approximately weekly intervals. Some of these permanent sampling stations were along an altitudinal gradient on the slopes and in the craters of the three main volcanoes of Easter Island. Additional pitfall trapping stations were in other lowland habitats, e.g., in the small but unique dune formation at Anakena, the populated and cultivated zone of Hanga Roa and around the crater lake of Rano Raraku. The sampling sites were described in terms of their vegetation type and cover, and their microclimate in relation to elevation (measurements of temperature, relative humidity and wind speed along transects during time intervals as short as possible). A first analysis of these microclimatological data (DESENDER & BAERT, in press) has revealed higher temperatures as well as lower mean relative humidities at lower elevations.

Complementary sites were sampled by hand collecting (standardized time effort) at 49 localities. On some occasions high concentrations of beetles were found underneath lava-stones and even in cavities inside these stones (Figure 6). Several pitfall trapping stations were also sampled by standardized hand collecting in an attempt to calibrate pitfall and hand catches. The obtained estimates of relative abundance enabled a quantitative assessment of habitat and microhabitat preference (cfr. DESENDER & BAERT, in press).

Different lava tunnels (several hundreds of meters) and caves were prospected in detail, but appeared to lack any typical cavernicolous fauna and, at most, contained some arthropods near the entrances.

Flying insects were collected at night on some 10 occasions by a transportable UV-Black-light-trap. Each sampling session started before dusk and ran continuously until the next morning. Meteorological data for the entire sampling period were obtained from the local station at the airport of Mataveri, situated north of Rano Kao and about 2 km from the site where most light-trapping was performed.

Sector	Nr	ALT (m)	LOCALITY NAME	SHORT DESCRIPTION	SAMPLING METHOD
A	1	1	Hanga Nui	lava beach with *Ipomoea sp.*	HC
A	2	5	Hanga Nui	grass pampa, under stones	HC
A	3	5	Motu Ariki	grass pampa, under stones	HC
A	4	65		pampa with 70% grass cover	HC/PF
A	5	150	Cape O'Higgins	pampa 1 km east of Maunga Parehe	HC
A	6	170	Maunga Parehe	pampa	HC
A	7	190	Cape Roggeveen	edge of *Eucalyptus*-woodland (Figure 2)	HC
A	8	200		pampa with 60% grass cover	HC/PF
A	9	235	Cape Cumming	pampa	HC
A	10	265	Maunga Vai Havea	pampa, white hill	HC
A	11	375		SW crater rim, pampa with 100% grass cover, wind protected area	HC/PF
A	12	375		crater floor, small *Eucalyptus*-woodland with some ferns	HC/PF
A	13	380		NE crater rim, pampa with 75 % cover of grasses and small herbs	HC/PF
B	14	35	Vinapu, Ahu Tahira	pampa, under stones and between grasses	HC
B	15	200		*Eucalyptus*-woodland with well developed litter layer	PF
B	16	200		pampa with 50% of vegetation cover of grasses and small shrubs	PF
B	17	300	Orongo	pampa with nearly 100% grass cover	HC
B	18	300	Vai a Tare	E of Rano Kao crater, pampa with dense vegetation of grasses and herbs, numerous lava stones (Figure 4)	HC
B	19	300		W crater rim, pampa with 95% grass cover, 5% small shrubs (*Aguyava sp.*)	PF
B	20	305	Kari-Kari	E of crater, *Juniperus*-plantation	HC
B	21	200		inside crater rim, 95% of grasses, between rocks	PF
B	22	130		crater floor, mixed dense secundary woodland	PF
B	23	125		crater floor, secundary woodland, edge of crater lake	PF
C	24	50		surroundings of Casa Guardia Parque with few big trees	HC
C	25	65		edge zone of crater lake (dense *Polygonum* -vegetation)	PF
C	26	65		gradient near E edge of crater lake, pampa with 100% cover of grasses	PF
C	27	70		E crater rim, very dry with 80% grass cover	PF
C	28	75		S inner crater rim, 100% grass cover	LT
C	29	100		near, at the basis and on statues in crevices and cavities, S inner crater rim	HC/PF/LT

Table 1.– (continued).

Sector	Nr	ALT (m)	LOCALITY NAME	SHORT DESCRIPTION	SAMPLING METHOD
D	30	130		'encañada' at 11.5 km of Hanga Roa, pampa vegetation	HC
D	31	170		grassland with lava stones	HC
D	32	175	Vaitea	*Eucalyptus*-woodland	HC
D	33	185	Vaitea	*Eucalyptus*-woodland	PF
D	34	210		'encañada' at 11.5 km of Hanga Roa, pampa vegetation	HC
D	35	300	N of Maunga te Honga	pampa with grass tussocks and lichens, recently burned area	HC
D	36	370		edge of small waterbody with tall grasses and *Polygonum*-vegetation	HC/PF
D	37	380		pampa near site 36, 100% cover of grasses	PF
D	38	425	Rano Aroi	edge of crater swamp with *Scirpus riparius*, *Polygonum*-vegetation and grasses (Figure 1)	HC/PF
D	39	445	Maunga Terevaka	subtop, pampa with 20% grasses, 75% lichens	HC/PF
D	40	450	Maunga Terevaka	edge of *Eucalyptus*-plantation near Rano Aroi, 95% cover of mosses	PF
D	41	490	Maunga Terevaka	top zone, pampa	HC/PF
E	42	1	Ovahe	small sandy beach	HC
E	43	5	Hanga o Miti	pampa, under stones	HC
E	44	5	Anakena	sand dunes with grass tussocks (Figure 5)	PF
E	45	10	Anakena	tall grasses, regularly burned	PF
E	46	15	Anakena	NW of Maunga Puha, shortgrazed pampa on rocky soil	PF
E	47	15		W of Anakena, pampa with numerous stones	HC
E	48	20	Maunga Puha	basis of Maunga; shortgrazed vegetation with stones	HC
E	49	20	Te Pito Kura	shortgrazed, with bigger stones (Figure 6)	HC
E	50	45		1.5 km W of Anakena; grassland with numerous stones	HC
F	51	1	Vaihu Hanga Tee	litoral zone, between stones	HC
F	52	5	Vaihu Hanga Tee	shortgrazed pampa	HC
F	53	10	Cape Eu, Ahu o Pipiri	pampa, under stones	HC
F	54	15	Hanga Tuu Hata	shortgrazed pampa with small herbs and 80% grasses	PF
F	55	40	Maunga te Miro Oone	S basis of Maunga; mainly covered with stones and rocks	HC

Table 1. – (continued).

Sector	Nr	ALT (m)	LOCALITY NAME	SHORT DESCRIPTION	SAMPLING METHOD
G	56	5	Puerto	surroundings of small house	HC
G	57	5	O Orongo	N of port, under stones and between grasses	HC
G	58	20	Ana Kai Tangata	shortgrazed grassland along the coast	HC
G	59	40	Residencial Gomero	culture zone, garden with open grassland (60% cover)	HC/PF/LT
G	60	40	Residencial Gomero	garden with banana-trees	HC/PF
G	61	40	Residencial Gomero	samples taken inside house and barn	HC
G	62	75	Ahu te Pehu	grassland, collecting under stones	HC
G	63	100	Ana te Pahu	cave entrances (lava tubes)	HC
G	64	130	Ahu Akivi	grassland with small shrubs of *Aguyava*	HC
G	65	135		1 km N of Te Pehu; pampa with numerous stones	HC
G	66	140	Puna Pau	continuous (100%) shortgrazed pampa	HC

Table 1. – Short description of sites sampled for invertebrates on Easter Island between 30.11.1993 and 21.12.1993; *sectors*: A = Poike peninsula, B = Rano Kao, C = Rano Raraku, D = Maunga Terevaka, E = northern coast, F = southern coast, G = Hanga Roa and surroundings; numbers (second collumn) refer to Figure 7 (upper map); ALT = altitude; sampling methods: HC = handcollecting (includes sweepnetting in the case of taller vegetation), PF = pitfall trapping, LT = light trapping

The sampling sites that contained beetles or spiders from the Jacquemart (1976)-expedition are also briefly described (Table 2), whereas their localization is shown in the lower map of Figure 7.

All beetles were, as much as possible, identified to species level, in many cases with the invaluable help of other specialist beetle taxonomists. Collected specimens were compared to the museum collections of the Royal Belgian Institute of Natural Sciences. Carabid beetles were studied in more detail (dissection of beetles, biometry) and these data reported in another paper (DESENDER & BAERT, in press). Easter Island distribution data have been mapped for all species, except for those mentioned in the literature without details on their exact location.

Results and discussion

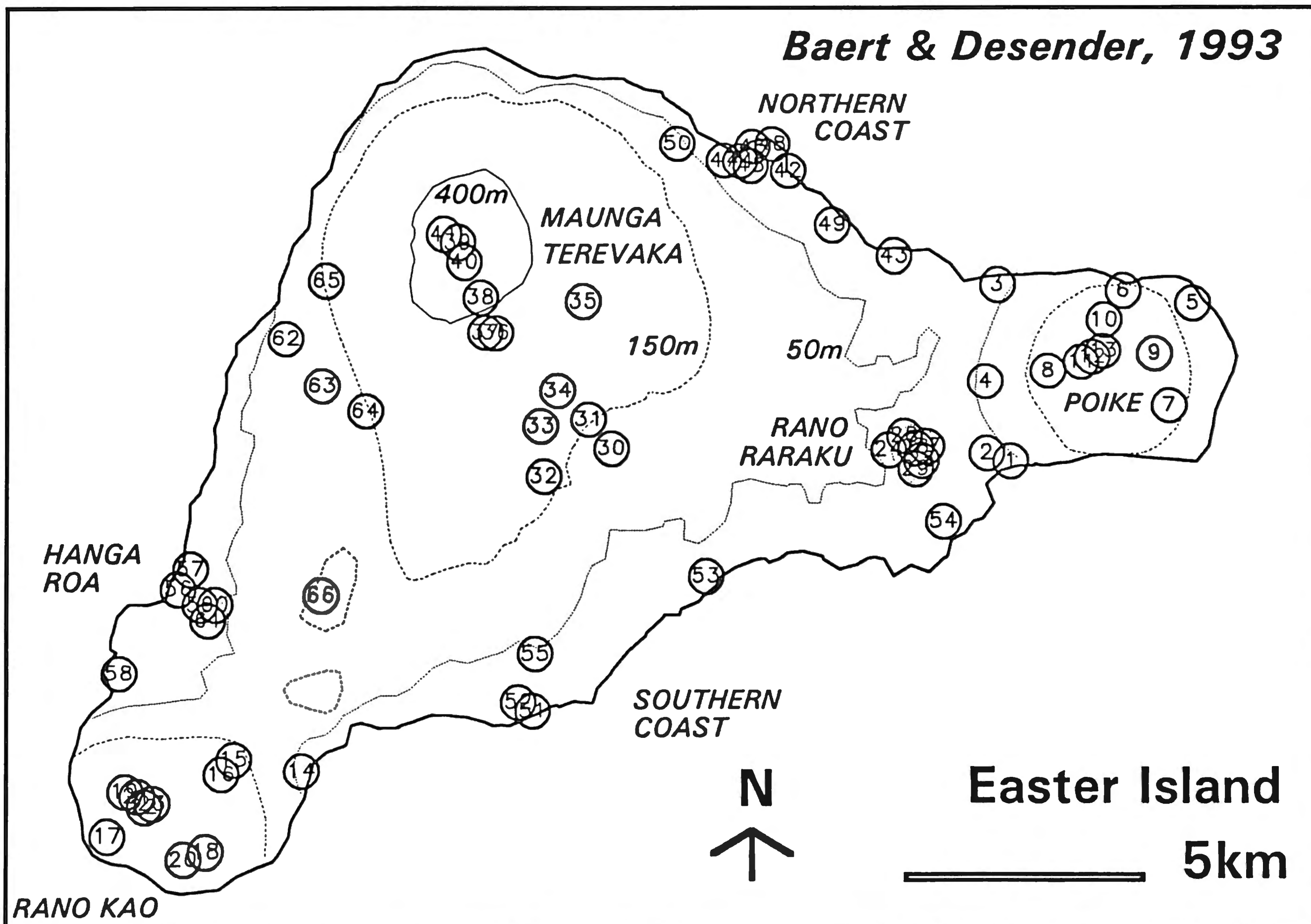
1. An annotated checklist of the beetles of Easter Island

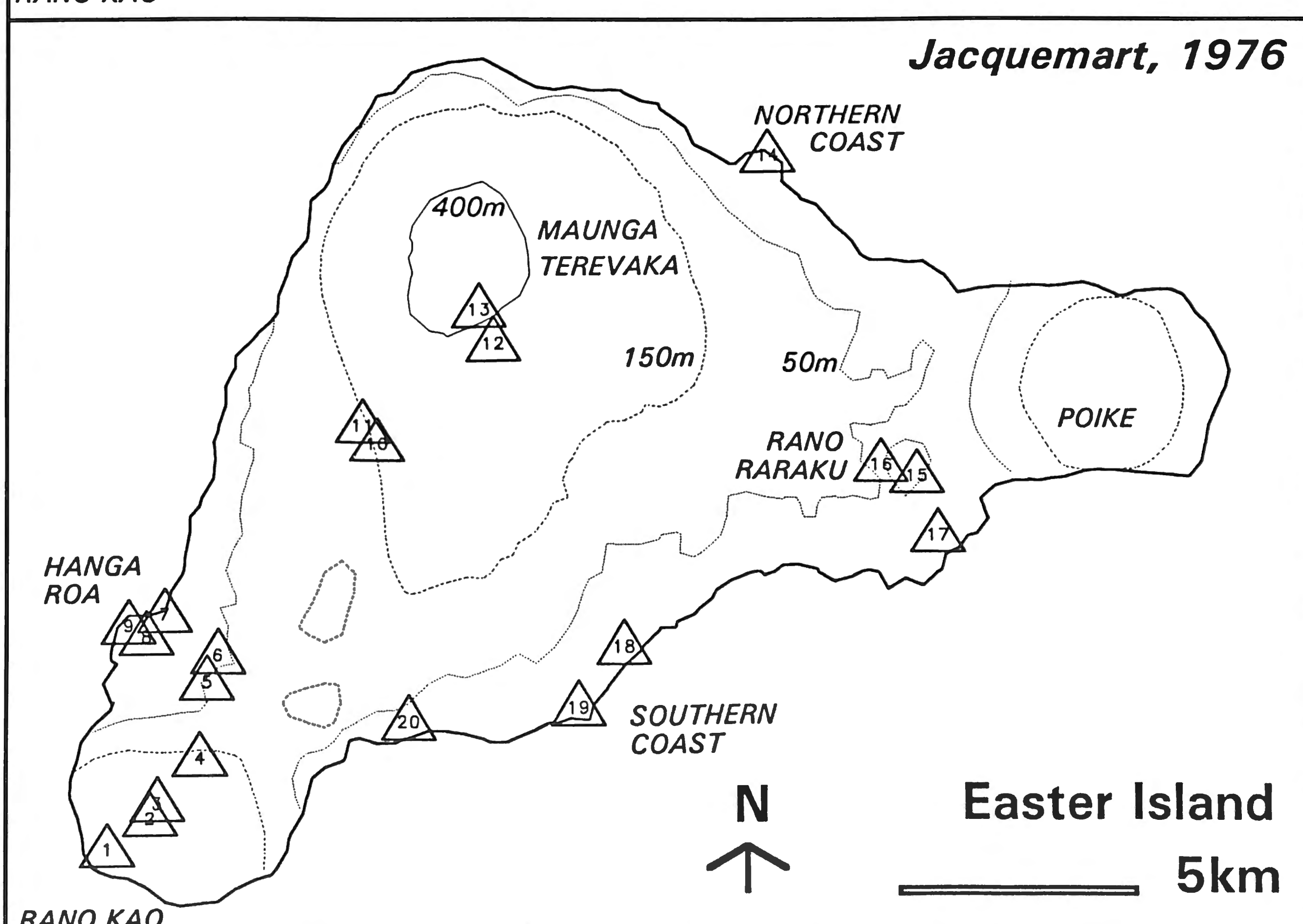
A total of 44 beetle species (some only identified to genus or family level) were obtained in our samples. This increases the number of species known hitherto from Easter Island from 28 to no fewer than 56. CAMPOS & PEÑA (1973) listed 28 species, including two curculionid species, now considered as synonyms, but on the other hand did not mention a staphylinid species, reported earlier in the literature for Easter Island (BERNHAUER, 1921). Our intensive sampling thus has doubled the known beetle fauna of Easter Island.

Twelve already known species were not recovered in our samples: one species of the Anthribidae, Bruchidae, Chrysomelidae, Cleridae, Curculionidae and Dytiscidae, two species of Staphylinidae and all previously known Dermestidae. These species possibly were overlooked in our sampling (especially with regard to the last-mentioned family) or have to be interpreted as unsuccessful introductions. The fact that only one or few specimens of some of these species had been found in previous investigations (CAMPOS & PEÑA, 1973) is another argument that these species not necessarily could establish a population on Easter Island. Nevertheless, it will be clear from our detailed further account that many man-mediated introductions of beetles to Easter Island, whether or not they were accidental, 'unfortunately' have been successful.

→

Fig. 7. – Sampling sites for spiders and beetles on Easter Island: upper figure: Baert & Desender, 1993-expedition; lower figure: Jacquemart, 1976-expedition (see Table 1 and 2 for further details on the sampling sites)


Baert & Desender, 1993
NORTHERN
COAST
400m
MAUNGA
TEREVAKA
150m
50m
RANO
RARAKU
POIKE
HANGA
ROA
SOUTHERN
COAST
RANO KAO
N
Easter Island
5km


Jacquemart, 1976
NORTHERN
COAST
400m
MAUNGA
TEREVAKA
150m
50m
RANO
RARAKU
POIKE
HANGA
ROA
SOUTHERN
COAST
RANO KAO
N
Easter Island
5km

Sector	Nr	ALT (m)	LOCALITY NAME	SHORT DESCRIPTION	SAMPLING METHOD
B	1	300	Orongo	along walls and under stones	HC
B	2	125	Rano Kao crater	along lake border	HC
B	3	125	Rano Kao crater	in *Melia*-wood and *Polygonum*-zone	HC
B	4	300	Rano Kao	along the road to Orongo, under stones	HC
G	5	50	Mataveri	in garden and in *Aguyava* stand	HC
G	6	50	Mataveri	surroundings of houses, *Aguyava* shrubs	HC
G	7	20	Mataveri	grassland near Ahu Mamara Nui	HC
G	8	5	Mataveri	litoral zone, along drift-line	HC
G	9	10	Mataveri	grassland near Ahu Makere	HC
D	10	150	a few km from Ahu Akivi	small *Melia*-wood under stones	HC
D	11	150	Ahu Akivi	grassland , under stones	HC
D	12	370	Maunga Terevaka	edge of small waterbody with tall grasses and *Polygonum*-vegetation	HC
D	13	425	Rano Aroi	in *Scirpus riparius* and *Polygonum*-vegetation and in nearby *Eucalyptus*-plantation	HC
E	14	20	near Maunga Puha	grassland	HC
C	15	65	Rano Raraku	along crater lake, in *Scirpus riparius* and *Polygonum*-vegetation and between *Spirobolus*-tussocks	HC
C	16	50	western slope of Rano Raraku	near Casa Guardia Parque	HC
F	17	10	Ahu Onemahiki	short grassland	HC
F	18	10	Ahu Moe O Pope	short grassland	HC
F	19	10	Ahu Tarakui	short grassland	HC
F	20	10	Ahu Temanga	short grassland	HC

Table 2. – Short description of sites sampled for invertebrates on Easter Island by S. Jacquemart (February 1976); *sectors*: A = Poike peninsula, B = Rano Kao, C = Rano Raraku, D = Maunga Terevaka, E = northern coast, F = southern coast, G = Hanga Roa and surroundings; numbers (second collumn) refer to Figure 7 (lower map); see legend Table 1 for further explanation.

Table 3 presents the annotated checklist (with a species code number corresponding to those mentioned on the distribution maps; see below) arranged according to the different families (ordered alphabetically; species within each family also in alphabetic order).

Members of 19 different beetle families are now known to occur on Easter Island, five of which are mentioned here for the first time: Bostrichidae, Cryptophagidae, Lyctidae, Mycetophagidae and Tenebrionidae.

2. Detailed distribution of the beetle fauna on Easter Island

2.1. *Members of the Anthribidae, Bostrichidae and Bruchidae*

Figure 8 shows distribution maps for these species on Easter Island. These families are represented by respectively three, one and one species. None of these beetles seems to be common on Easter Island, although many of

FAMILY	CODE NR	SPECIES	SYNONYM(S) or REMARKS
Anthribidae	1	*Araecerus fasciculatus* (De Geer)	
	•2	*Anthribidae spec. 2*	
	3	*Proscopus veitchi* Jordan	
Bostrichidae	•4	*Bostrichidae spec. 1*	
Bruchidae	5	*Acanthoscelides obtectus* Say	
Carabidae	6	*Notiobia cupripennis* Germar	subgenus *Anisotarsus*
	•7	*Metius chilensis* Dejean	
Chrysomelidae	8	*Diabrotica viridula* F.	
Cleridae	9	*Necrobia rufipes* F.	
Coccinellidae	10	*Adalia bipunctata* (L.)	
	11	*Eriopis connexa* Germar	
	•12	*Heterodiomus spec. 1*	
	•13	*Hippodamia variegata* Goeze	
	•14	*Hyperaspis festiva* Mulsant	
	•15	*Lindorus lophantae* Blaisdell	
	•16	*Scymnus loewii* Mulsant	subgenus *Pullus*
Cryptophagidae	•17	*Atomaria spec. 1*	
Cucujidae	18	*Psammoecus desjardinsi* (Guér.)	
Curculionidae	•19	*Cosmopolites sordidus* (Germar)	
	•20	*Cryptorhynchinae spec. 1*	
	21	*Listroderes obliquus* Klug	=?*Sericotrogus*
	22	*Naupactus leucoloma* (Boheman)	= *Graphognathus*, =?*Pantomorus*
	23	*Pancidonus bryani* (Swezey)	=? *Pentarthrum paschale* Aurivillius
	24	*Pantomorus fulleri* (Horn)	= *Aramigus*, = *Asynonychus cervinus* (Boheman), = *Pantomorus godmani* Crotch
	•25	*Pantomorus spec. 2*	
	26	*Sitophilus oryzae zea-mays* Mot.	
Dermestidae	27	*Dermestes maculatus* De Geer	
	28	*Dermestes oblongus* Sol.	
	29	*Dermestes rufofuscus* Sol.	
	30	*Dermestes vulpinus* Fabr.	
	31	*Dermestes spec. 5*	
Dytiscidae	32	*Bidessus skottsbergi* Zimmermann	
Elateridae	33	*Simodactylus delfini* Fletiaux	
Lyctidae	•34	*Lyctus ?brunneus*	

Table 3. – (continued)

FAMILY	CODE NR	SPECIES	SYNONYM(S) or REMARKS
Mycetophagidae	•35	*Mycetophagus spec. 1*	
	•36	*Mycetophagidae spec. 2*	
Nitidulidae	•37	*Carpophilus dimidiatus* Fabr.	= *Myothorax*
	•?38	*Carpophilus oculatus* Murr.	=? *C. maculatus*, Campos & Peña (1973)
	•39	*Epuraea concolor* Murr.	= *Haptoncus*
	•40	*Urophorus humeralis* (Fabr.)	= *Anophorus*
Scarabaeidae	41	*Aphodius pseudolividus* Balth.	
	(•)42	*Onitis vanderkelleni* Lansb.	deliberately introduced
	(•)43	*Onthophagus gazella* (F.)	deliberately introduced
	44	*Pleurophorus micros* (Bates)	
Staphylinidae	•?45	*Atheta spec. 1*	subgenus *Mycota*
	•?46	*Atheta spec. 2*	
	•47	*Creophilus erythrocephalus* F.	
	•48	*Lithocharis spec. 1*	
	•49	*Oxytelus spec. 1*	
	•50	*Philonthus spec. 2*	
	51	*Philonthus longicornis* Steph.	not mentioned by Campos & Peña (1973)
	52	*Spatulonthus perplexus* (Fairm. & Germ.)	
	•53	*Trogophloeus spec. 1*	
	•54	*Trogophloeus spec. 2*	subgenus *Taenosoma*
Tenebrionidae	•55	*Blapstinus punctulatus* Solier	
	•56	*Cymatothes tristis* (Laporte de Castelnau)	= *Pyanisia*

Table 3. – Annotated checklist of the beetles of Easter Island; species mentioned for the first time for Easter Island are marked by a dot.

the members of these beetle families are well-known agricultural pests with a cosmopolitan distribution.

Within the fungus weevils (Anthribidae), *Araecerus fasciculatus* (the coffee bean weevil), although known as a widespread pest of coffee, lives in seeds and all sorts of dried plant materials from banana flour to strychnine (ARNETT, 1968). It has been found in different parts of Easter Island, and apparently survives on many different host plants. This species is long known to be cosmopolitan (AURIVILLIUS, 1931; ZIMMERMAN, 1938). *Proscopus veitchi*, known to inhabit several Polynesian islands (ZIMMERMAN, 1938), is known for Easter Island from two specimens only in the Rano Kao volcanic crater (CAMPOS & PEÑA, 1973). The species was recently also mentioned for Henderson (Pitcairn Islands) (BENTON, 1995).
From the bean weevil *Acanthoscelides obtectus* (Bruchidae), known as pest on cereals, only a single specimen was collected near Hanga Roa (CAMPOS & PEÑA, 1973).

2.2. *Members of the Carabidae, Chrysomelidae and Cleridae*

Figure 9 shows distribution maps for these species on Easter Island. These families are represented by respectively two, one and one species.

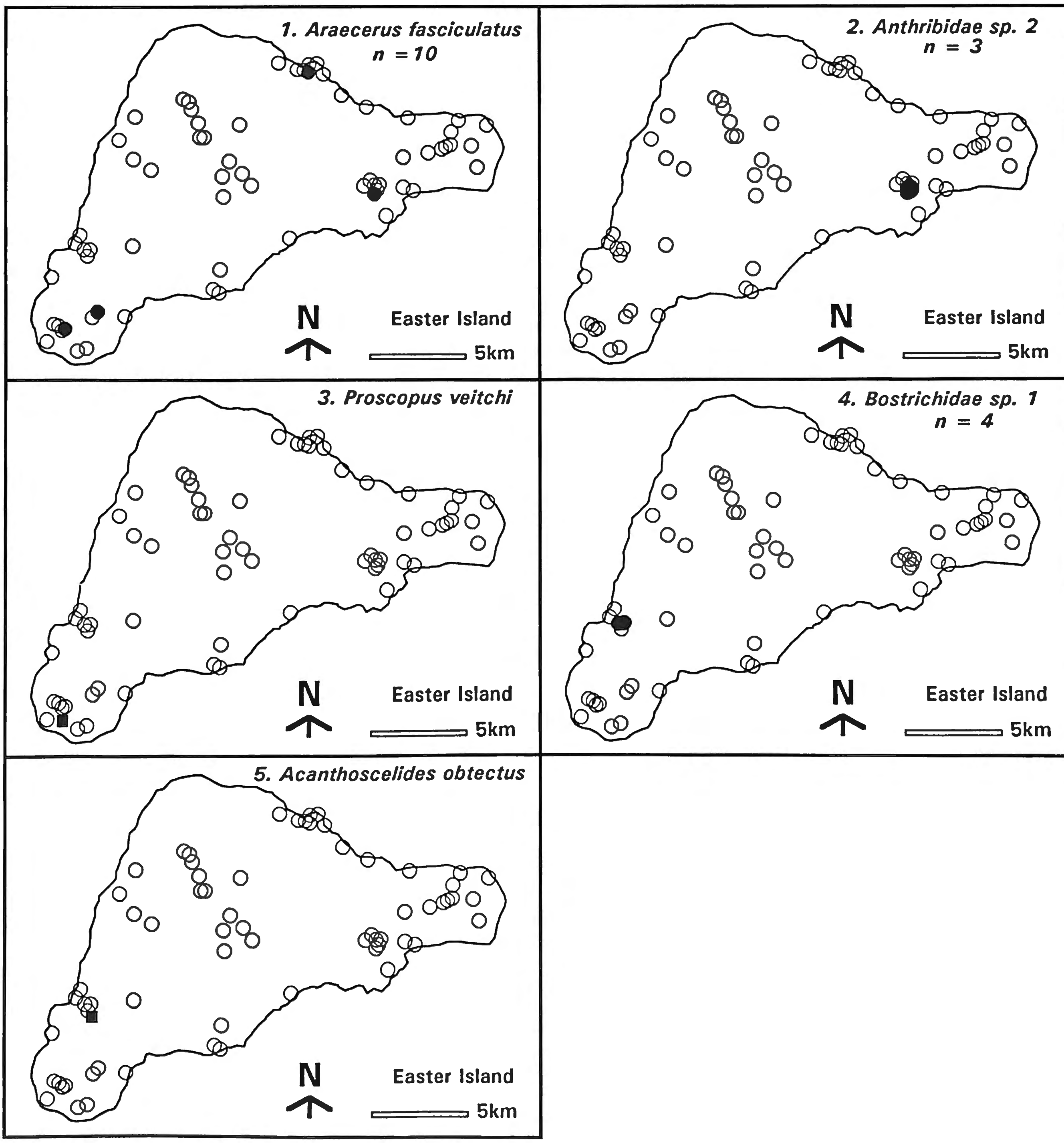


Fig. 8. – Distribution of Anthribidae (species 1 - 3), Bostrichidae (species 4) and Bruchidae (species 5) on Easter Island: circles indicate sites sampled during our stay in 1993; black dots indicate the presence of the species; triangles show additional sites as derived from the material collected by Jacquemart (1976) or Dumont et al. (1990); black squares show data from the literature.

The carabid beetle *Notiobia cupripennis* is one of the most common beetles on Easter Island (see also Figure 6). In an earlier paper, we concluded that this species, as well as the other ground beetle from Easter Island, *Metius chilensis*, probably have been introduced unintentionally from South America. Both species appear to be well established on the island, although the data for *Metius chilensis* are still limited. The dates of the initial introductions are unknown, but most probably can be situated in the early seventies of this century (Desender & Baert, in press). Accidental introduction of *N. cupripennis* on Easter Island is supported by its natural occurrence in South America to the east side of the Andes only, suggesting at the same time an introduction into Easter Island from Argentina (where the beetle is most abundant). For *M. chilensis*, on the other hand, Chile seems the only possible source.

Notiobia cupripennis shows a clear preference for mixed open grasslands and more specifically for the sand dunes. *Eucalyptus* plantations, mixed secondary woodlands and more humid to wet waterside vegetation sites are clearly avoided as habitats (DESENDER & BAERT, in press). A detailed examination of the altitudinal distribution on Easter Island (Figure 9) moreover suggests a higher abundance at lower elevation, a result also obtained by a more numerical analysis of our data (DESENDER & BAERT, in press): environmental factors possibly accounting for this altitudinal preference are higher temperatures and/or lower mean relative humidities at lower elevations.

The leaf beetle *Diabrotica viridula* (Chrysomelidae), a species known from Central and South America, is known from a single specimen on Easter Island, captured in the central agricultural settlement of Vaitea (CAMPOS & PEÑA, 1973). Similarly, the checkered beetle *Necrobia rufipes* (Cleridae) is also known from a single beetle found under debris washed ashore at the beach of Anakena (CAMPOS & PEÑA, 1973). Both species are most likely man-mediated introductions.

2.3. *Members of the Coccinellidae*

Seven species of ladybird beetles have been found on Easter Island (Figure 10), including 5 species previously unknown for the island.

Several of these species are widespread and common on Easter Island. *Eriopis connexa*, widely distributed from the southern USA to the southernmost tip of South America, is very common in Chile, wherefrom it most probably was introduced (CAMPOS & PEÑA, 1973). *Hyperaspis festiva* shows a more or less similar natural geographic distribution area, whereas *Hippodamia variegata* is mainly known from Europe, Africa and Asia. The other species, which have been found in very low numbers only and mainly in the immediate surroundings of the village (gardens) and cultivated zone of Hanga Roa, most probably have to be interpreted as accidental introductions as well: *Adalia bipunctata*, more or less cosmopolitan, *Lindorus lophantae*, an Australian species, known to have been introduced in California and *Scymnus loewii*, known from southern USA and Central America. According to GORDON (pers. comm.), the single *Heterodiomus* specimen (female) from our samples in all likelihood represents an undescribed species from this genus, mainly composed of South American species. Again we consider this most likely to be an introduced species.

2.4. *Members of the Cryptophagidae and Cucujidae*

Data on these beetle families, each represented by only one species, are given in Figure 11.

The flat bark beetles (Cucujidae) are represented by *Psammoecus desjardinsi*, a widespread species (ARNETT, 1968) very common throughout Easter Island. It was regularly caught in a light trap during night-time flight activity. Several species of this family are not necessarily living under bark: according to CAMPOS & PEÑA (1973) this is the case for *P. desjardinsi* which is probably predatory.

2.5. *Members of the Curculionidae*

Eight species of weevils (Figure 12), including three species never mentioned before (*Cosmopolites sordidus*, an unidentified Cryptorhynchinae- and *Pantomorus*- species), are now known to occur on Easter Island.

SWEZEY (1921) described the small species *Sericotrogus bryani* (presently known under its generic name *Pancidonus*) from material collected on Easter Island under bark of *Broussonetia papyrifera* (this is a Polynesian tree species, most probably introduced to Easter Island in ancient times, ZIZKA, 1990).
AURIVILLIUS (1931) described the same species (according to CAMPOS & PEÑA, 1973) as *Pentarthrum paschale*, a probably endemic species, known to be common under bark in the Rano Kao. We recovered two specimens of this species in the same area. KUSCHEL (1963) considered the genus *Pancidonus* to be widely distributed through the Pacific and the species *P. bryani* as one of the very few supposed endemic species of Easter Island, although even this is subject to discussion. Future detailed taxonomic studies should aim at elucidating this problem. In our opinion, it seems indeed plausible that the species could have been introduced in ancient times by the Polynesians (cfr. introduction of *Broussonetia*?).

AURIVILLIUS (1931) mentioned the occurrence of *Pantomorus fulleri*, a wingless species which had been introduced from North America in many parts of the world like the Azores, Hawaii, Italy, Brazil, and apparently also Easter Island. CAMPOS & PEÑA (1973) cited the species, as well as *Pantomorus godmani*, this name however being a synonym of *P. fulleri*.

The other weevil species that could be identified show a widespread to cosmopolitan distribution, but mostly were found on Easter Island in low numbers only. Whether these species are well-established on the island remains an open question.

2.6. *Members of the Dermestidae and Dytiscidae*

Most skin beetles (Dermestidae) for which the feeding habits are known are scavengers, feeding on dried animal or plant materials. Members of the genus *Dermestes* are commonly found in animal carcasses in a late state of decomposition. CAMPOS & PEÑA (1973) list at least 5 *Dermestes* species for Easter Island, although only one with precise location (see Figure 13). Presumably, these beetles are introduced species, many members of this genus being known as cosmopolitan.

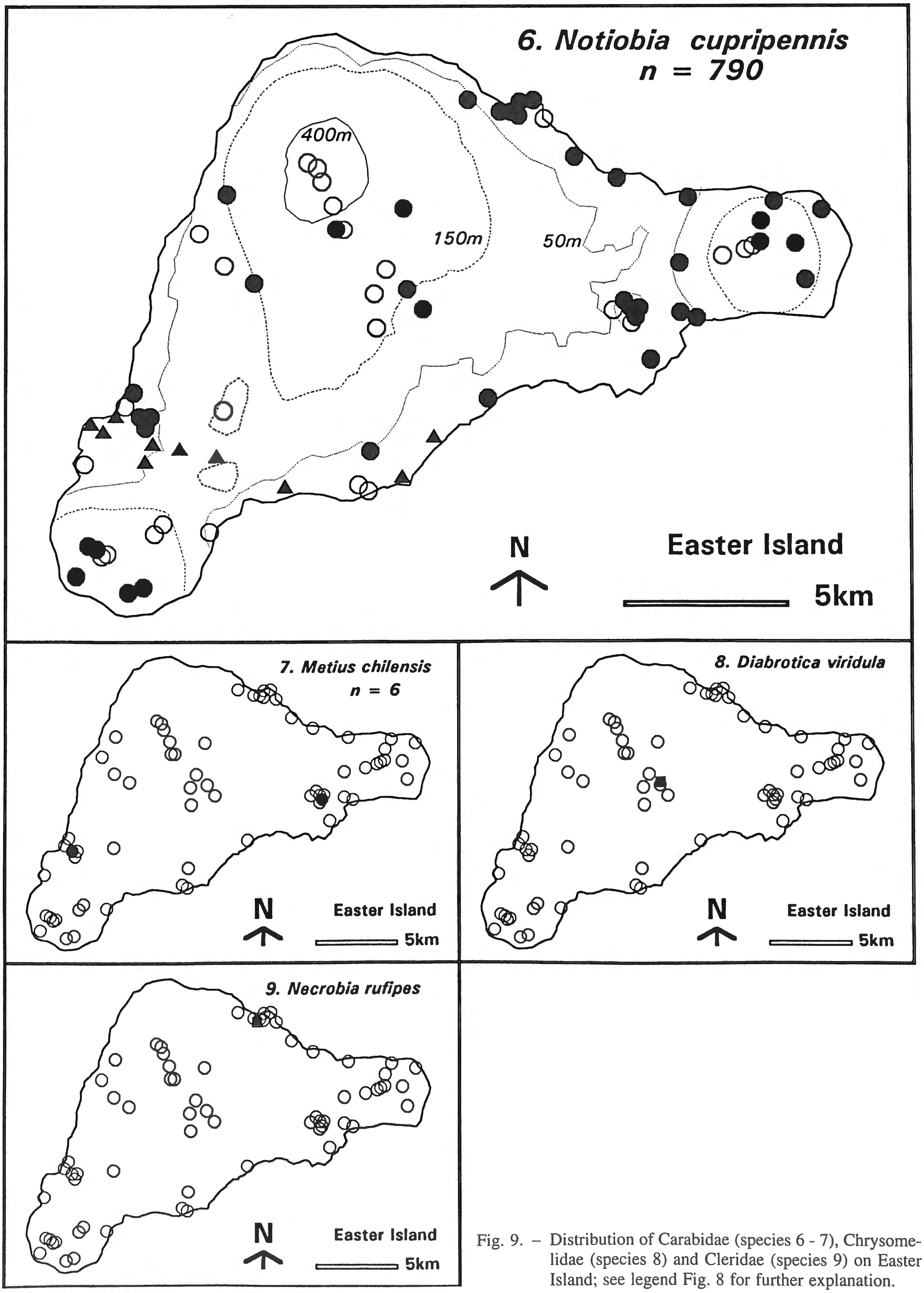


Fig. 9. – Distribution of Carabidae (species 6 - 7), Chrysomelidae (species 8) and Cleridae (species 9) on Easter Island; see legend Fig. 8 for further explanation.

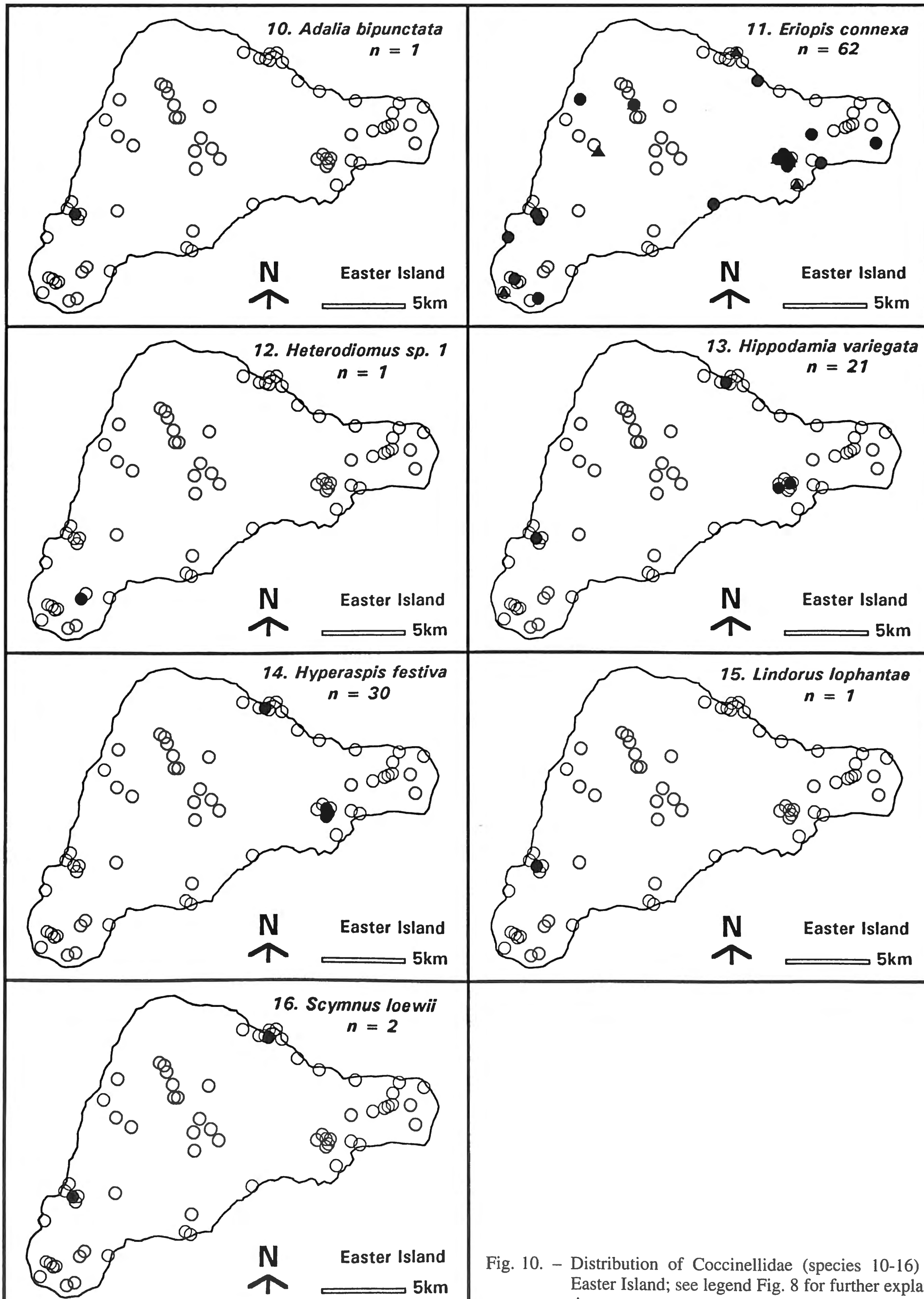


Fig. 10. – Distribution of Coccinellidae (species 10-16) on Easter Island; see legend Fig. 8 for further explanation.

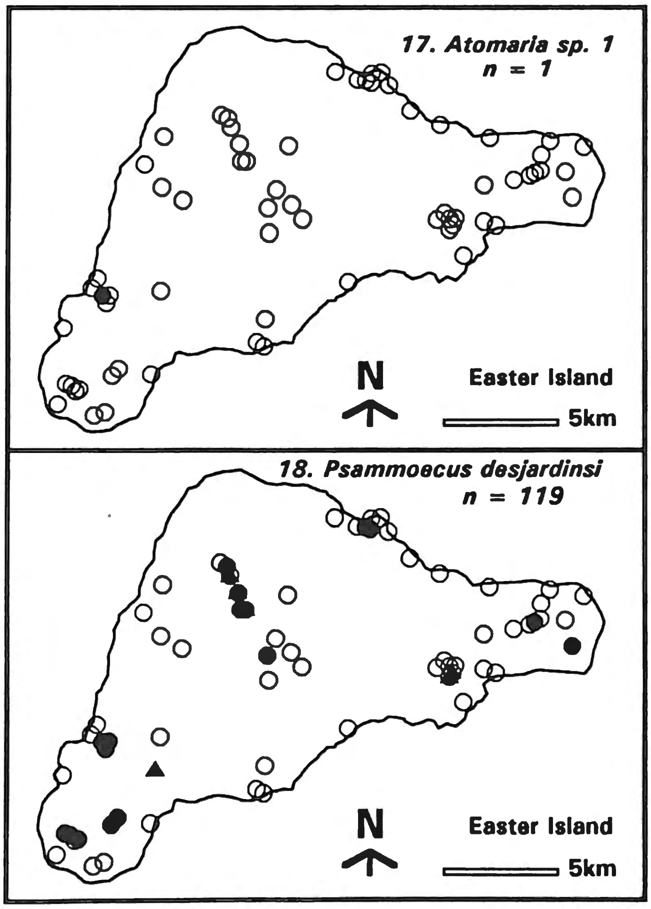


Fig. 11. – Distribution of Cryptophagidae (species 17) and Cucujidae (species 18) on Easter Island; see legend Fig. 8 for further explanation.

The small predacious diving beetle *Bidessus skottsbergi* (Dytiscidae) was described from the Rano Kao crater lake on Easter Island by ZIMMERMANN (1924) and considered for a long time to be a true endemic species. KUSCHEL (1963) regarded it to be very related (synonymous?) to some Australian species, in this way acknowledging that it may not be an endemic species (CAMPOS & PEÑA, 1973). As far as we know, again, there are no recent studies clarifying this matter. On the other hand there are no more recent captures of these beetles on Easter Island either.

2.7. *Members of the Elateridae, Lyctidae and Mycetophagidae*

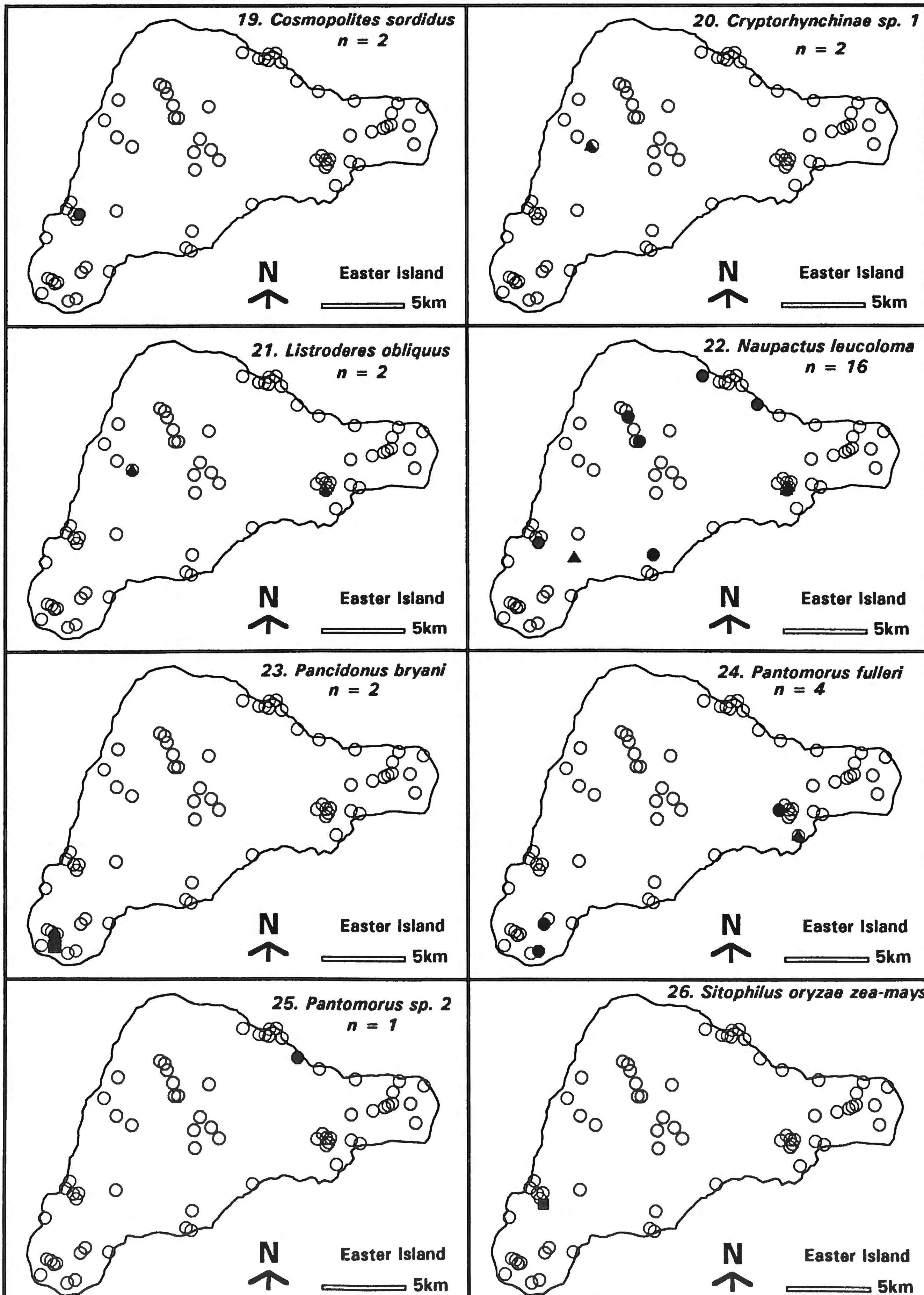
One click beetle (Elateridae), *Simodactylus delfini*, was described in 1907 from material of Easter Island and Chile as the 'first species of this genus encountered on the South American coast of the Pacific'. It was then considered to be closely related to the Polynesian species *S. cinnamomeus* (Boisduval) (FLEUTIAUX, 1907). Later, FLEUTIAUX (1924) and VAN ZWALUWENBERG (1959) found the references to the occurrence of *S. delfini* on the American mainland to be erroneous, implying that this species seemed one of the few (or maybe the only) endemic beetle species for Easter Island. Very recently, however, *S. delfini* has been discovered during extensive collections (1991) on Henderson (Pitcairn Islands) (BENTON, 1995), which yields an interesting 'Polynesian' connection. The detailed distribution on Easter Island (Figure 14) shows that most of the specimens have been collected on the Poike Peninsula, which is the oldest part of Easter Island.

Lyctid powder-post beetles (Lyctidae) have never been reported before for Easter Island. Adults and larvae of these beetles live in wood and lumber and are of great economic importance. One specimen only was caught in the surroundings of Hanga Roa at light. Hairy fungus beetles (Mycetophagidae; two unidentified species) were only found in low numbers in Hanga Roa as well (Figure 14). These beetles most probably again have to be interpreted as recent man-mediated accidental introductions.

2.8. *Members of the Nitidulidae*

Especially in tropical regions, the sap beetles (Nitidulidae) represent a diverse family of insects, feeding on a variety of substrates including decaying fruits and vegetables, carrion, pollen, flowers and stored products (DOBSON, 1955; BLACKMER & PHELAN, 1995). As a consequence, many species are a worldwide pest of fruits and grains, both before and after harvest, have a cosmopolitan distribution and are amongst potential candidates for man-mediated introductions.

PIC (1924) has already mentioned an unidentified *Carpophilus* species as common on Easter Island based on a sample obtained in 1917 between *Melia* fruits. CAMPOS & PEÑA (1973) reported the capture of some specimens of *Carpophilus maculatus* Murray, a widespread tropical species, during their survey on the island. Our samplings revealed four different species, all caught in relatively high to very high numbers and on numerous sampling sites on Easter Island (Figure 15). Many of the beetles were trapped during flight activity. Obviously *Carpophilus oculatus* is now extremely common on Easter Island. The species was superabundant in the Rano Kao secondary woodland along the crater lake as well as in an investigated garden of Hanga Roa (near decaying fruit and vegetables). Sap beetles can indeed readily be attracted to a variety of fermenting materials (DOWD, 1995). *C. oculatus* is also known from the Society Islands and somewhat resembles *C. maculatus* with which it formerly might have been confused (KIREJTSHUK, pers. comm.). Although the restricted total distribution area of *C. oculatus* could suggest an ancient introduction by Polynesians or even an indigenous occurrence on Easter Island through natural colonization from the western Pacific, it is somewhat difficult to believe that this species would have been overlooked in earlier investigations. Re-examination of the earlier samples with *Carpophilus* specimens from Easter Island could elucidate this problem.
From the other nitidulid species, caught on Easter Island, *C. dimidiatus* has a cosmopolitan distribution, whereas


19. Cosmopolites sordidus
n = 2
N
Easter Island
5km
20. Cryptorhynchinae sp. 1
n = 2
N
Easter Island
5km
21. Listroderes obliquus
n = 2
N
Easter Island
5km
22. Naupactus leucoloma
n = 16
N
Easter Island
5km
23. Pancidonus bryani
n = 2
N
Easter Island
5km
24. Pantomorus fulleri
n = 4
N
Easter Island
5km
25. Pantomorus sp. 2
n = 1
N
Easter Island
5km
26. Sitophilus oryzae zea-mays
N
Easter Island
5km

Urophorus humeralis is known from Tropical Africa, Madagascar, the Seychelles, Burma, Java, Sumatra (Kirejtshuk, 1990) and known as a serious pest from e.g. southern Australia (James et al., 1994) and southern California (Bartelt et al., 1994). *Epuraea concolor* occurs in New Guinea and India, apparently is widespread too in the Pacific and is reported from Henderson as well (Pitcairn Islands). On the latter site it was extracted from soil and rotting wood from all over the island (Benton, 1995).
In conclusion, all the sap beetles reported here most probably have been introduced to Easter Island by man.

2.9. *Members of the Scarabaeidae*

Campos & Peña (1973) mention two scarab beetles (Scarabaeidae) for Easter Island, both belonging to the Aphodiiniae: *Aphodius pseudolividus*, a cosmopolitan species, most probably introduced from Chile, and *Pleurophorus micros*, a small species known from the western United States, Mexico and Central America (Cartwright, 1948), and most likely introduced as well. These two species nowadays are common in many sites of Easter Island (Figure 16) and are regularly caught at light.
Two more dung beetle species are found on Easter Island in high abundances: *Onitis vanderkelleni* and *Onthophagus gazella*. Both species apparently occur throughout the island (Figure 16), and especially were caught by means of light-trapping. *Onitis vanderkelleni* is a large species from central Africa (Janssens, 1937) which has deliberately been introduced into Australia, and recently into Chile, including Easter Island (Ripa & Rodriguez, 1990). *Onthophagus gazella* is of Afro-Asian origin and has been introduced into many parts of the world such as Hawaii, Australia and some regions of the USA (Barbero & Lopez-Guerrero, 1992; Bornemiszza, 1970; Rougon & Rougon, 1980). From there this species has spread naturally and subsequently extended its distribution area in the USA and Mexico. Imported dung beetles have been used to enhance manure degradation in order to control fly pests that breed in the dung of domestic animals. According to Ripa & Rodriguez (1990) the increasing abundance of cattle on Easter Island had raised the abundance of flies to such a level that some kind of biological control measure was needed. The introduction of both species (into continental Chile as well as into Easter Island) took place in 1990 and apparently has been successful in Easter Island. Unfortunately, as pointed out by Zunino & Barbero (1993), this action was not accompanied by detailed bionomic studies on the introduced species nor by ecological studies on the native communities. This is especially important for continental Chile as there are a number of indigenous coprophagous species which could be outcompeted or displaced by aggressive species such as *Ontophagus gazella* (cfr. Howden & Scholtz, 1986). As far as we know, there were no monitoring studies neither before nor after the release of beetles on Easter Island.

←
Fig. 12. – Distribution of Curculionidae (species 19-26) on Easter Island; see legend Fig. 8 for further explanation.

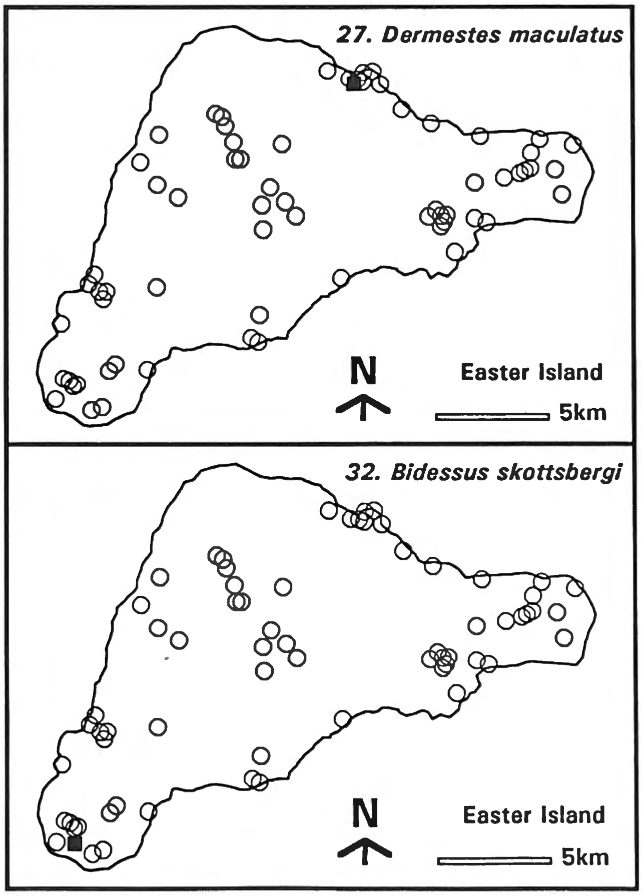


Fig. 13. – Distribution of Dermestidae (species 27) and Dytiscidae (species 32) on Easter Island; see legend Fig. 8 for further explanation.

2.10. *Members of the Staphylinidae*

Figure 17 shows the detailed distribution of most of the ten rove beetle species (Staphylinidae) that have been collected on Easter Island. Some former data (Campos & Peña, 1973) are known for three species only. As only few species have been identified so far (especially difficult in the Aleocharinae), few comments can be made about the origin of Easter Island staphylinids. *Philonthus longicornis*, a widespread species, was already reported by Bernhauer (1921), but not by Campos & Peña (1973). The most conspicuous recent addition to the staphylinid fauna of Easter Island is *Creophilus erythrocephalus*, of which we collected two specimens under an old dung pad. This species is known from Australia, Tasmania, Tonga, Tahiti and Chile, wherefrom it probably recently has been introduced to Easter Island. Many of the remaining staphylinid species have been collected in one or a few specimens and only in the surroundings of Hanga Roa

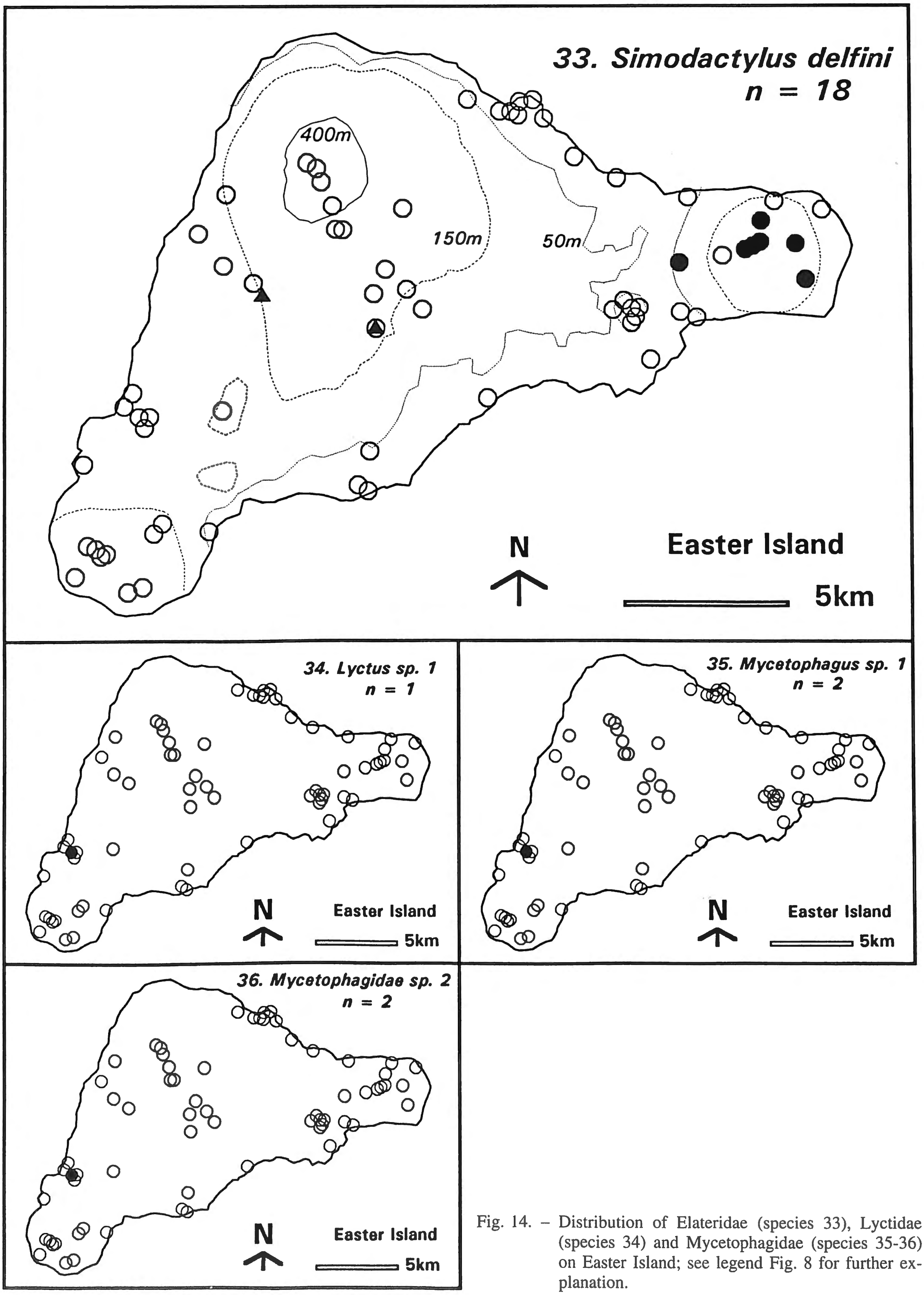


Fig. 14. – Distribution of Elateridae (species 33), Lyctidae (species 34) and Mycetophagidae (species 35-36) on Easter Island; see legend Fig. 8 for further explanation.

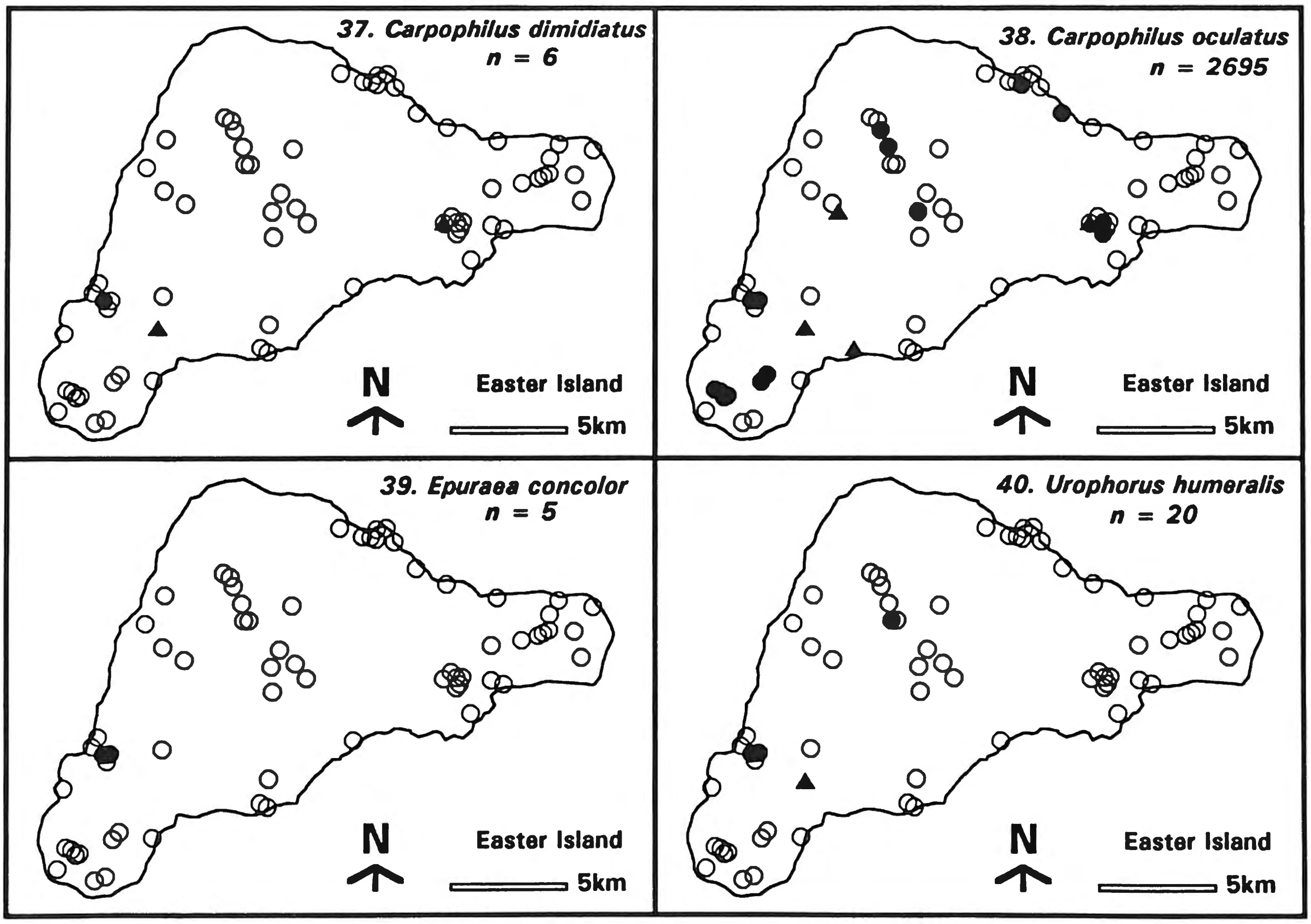


Fig. 15. – Distribution of Nitidulidae (species 37 - 40) on Easter Island; see legend Fig. 8 for further explanation.

(Figure 17), indicating that these species could have been introduced recently to Easter Island.

2.11. *Members of the Tenebrionidae*

Two species of darkling beetles, a beetle family never reported before on Easter Island, were present in our material (Figure 18).

Blapstinus punctulatus, widely distributed in southern South America and also known from Juan Fernandez (Gebien, 1921), was found on several lowland sites of Easter Island. In addition, one specimen of *Cymatothes tristis* was collected in an *Eucalyptus* woodland along the northern slope of the Rano Kao volcano. This darkling beetle is distributed from the USA through Mexico and Central America to Panama, but unknown to South America (Merkl, pers. comm.). Most probably both these species have been introduced into Easter Island in recent decades.

General Discussion

Kuschel (1963) first summarized and compared the available data on the entire terrestrial fauna (79 species) of Easter Island and some other Pacific islands. He concluded that the cosmopolitan element in the Easter Island fauna was very high, that there were some Australasian (Pacific) elements, whereas only few species were noted as endemic (and even this seemed a matter of discussion).

Based on more recent collections, Campos & Peña (1973) reviewed the insects of Easter Island and produced an annotated list of 142 species, including 28 Coleoptera. These authors concluded that Easter Island probably never had an endemic insect fauna, acknowledging, however, that the island had been very modified by anthropogenic action. Although it is very difficult to evaluate how detailed the earlier samplings on the island were, Peña (1987) interpreted the growing number of known insects of Easter Island as a sign of increasing arrival of introduced species.

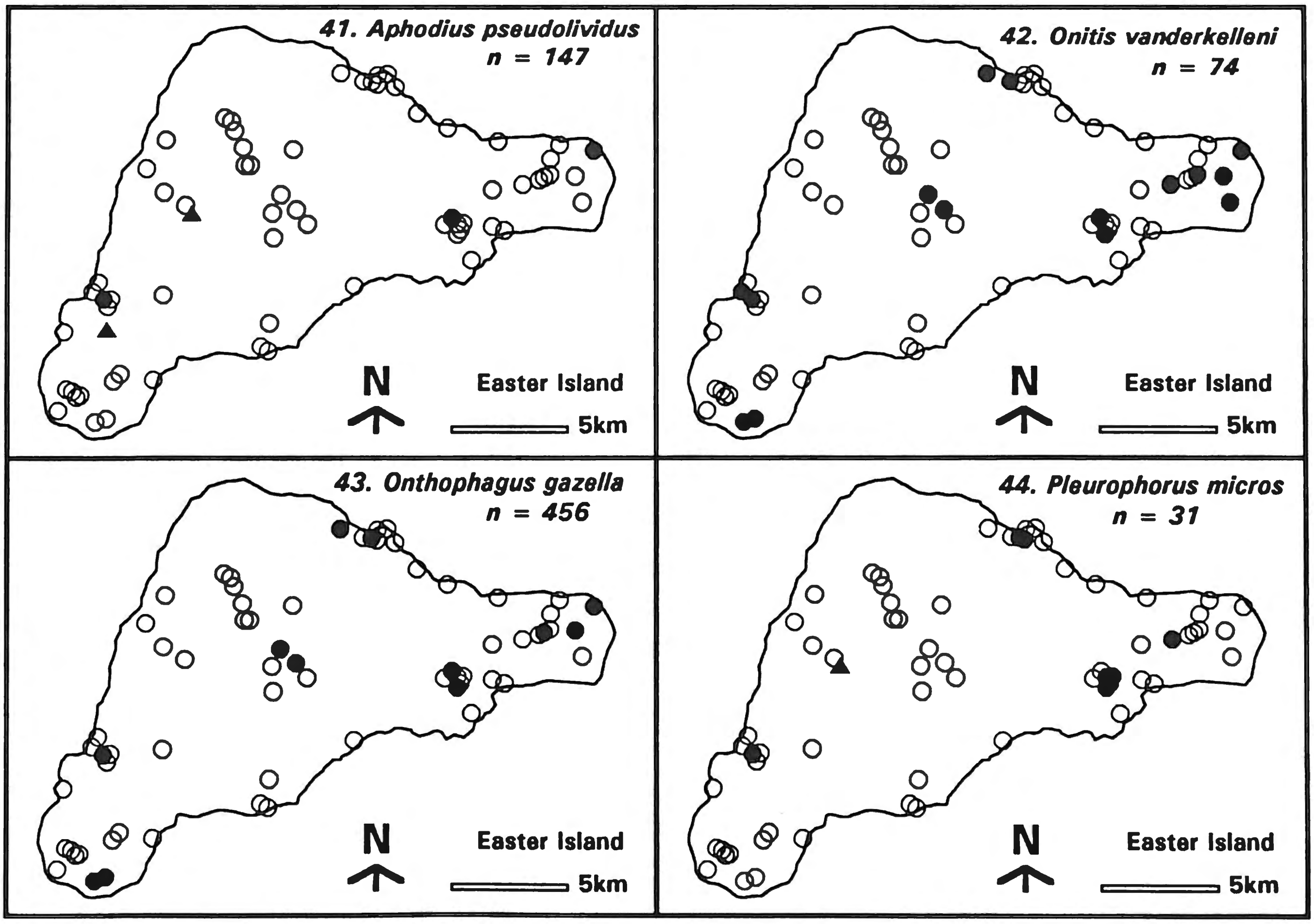


Fig. 16. – Distribution of Scarabaeidae (species 41 - 44) on Easter Island; see legend Fig. 8 for further explanation.

Nevertheless, many sites of the island (especially at higher altitude) never or almost never appear to have been sampled quantitatively and in detail. Our results are based on intensive sampling campaigns and double the number of beetle species from Easter Island. Our additions to the fauna however most likely all concern recently introduced species, which, where documented, appear to originate mainly from the South American mainland, i.e., Chile.

Besides the mild climatic conditions on Easter Island (within the range of conditions found in the natural area of many of these species), an important reason for these successful introductions could be that many of these beetles are adapted to grassy or man-made habitats and are most probably opportunistic or phytophagous in their feeding habits. This could mean that they are preadapted to the habitat conditions (highly influenced by man) on Easter Island. PERRAULT (1984) suggested the absence of competition by other species of Carabidae on the island as a hypothesis explaining the rapid increase of the population of *N. cupripennis*. It is however not clear whether the presence or absence of other beetles could have had an influence on the establishment of additional species on Easter Island.

In conclusion, our detailed account on the beetles of Easter Island increases the known beetle fauna to 56 species. Although this still is a relatively depauperate fauna due to the extreme isolation of this remote island, a large majority of these species is widespread and some are even documented to have been introduced by man to the island. The fauna includes some Pacific elements and probably no endemics. The arguments for the presence of true endemics (*Bidessus skottsbergi* and *Pancidonus bryani*) have been questioned and the taxonomic status of these species needs confirmation.

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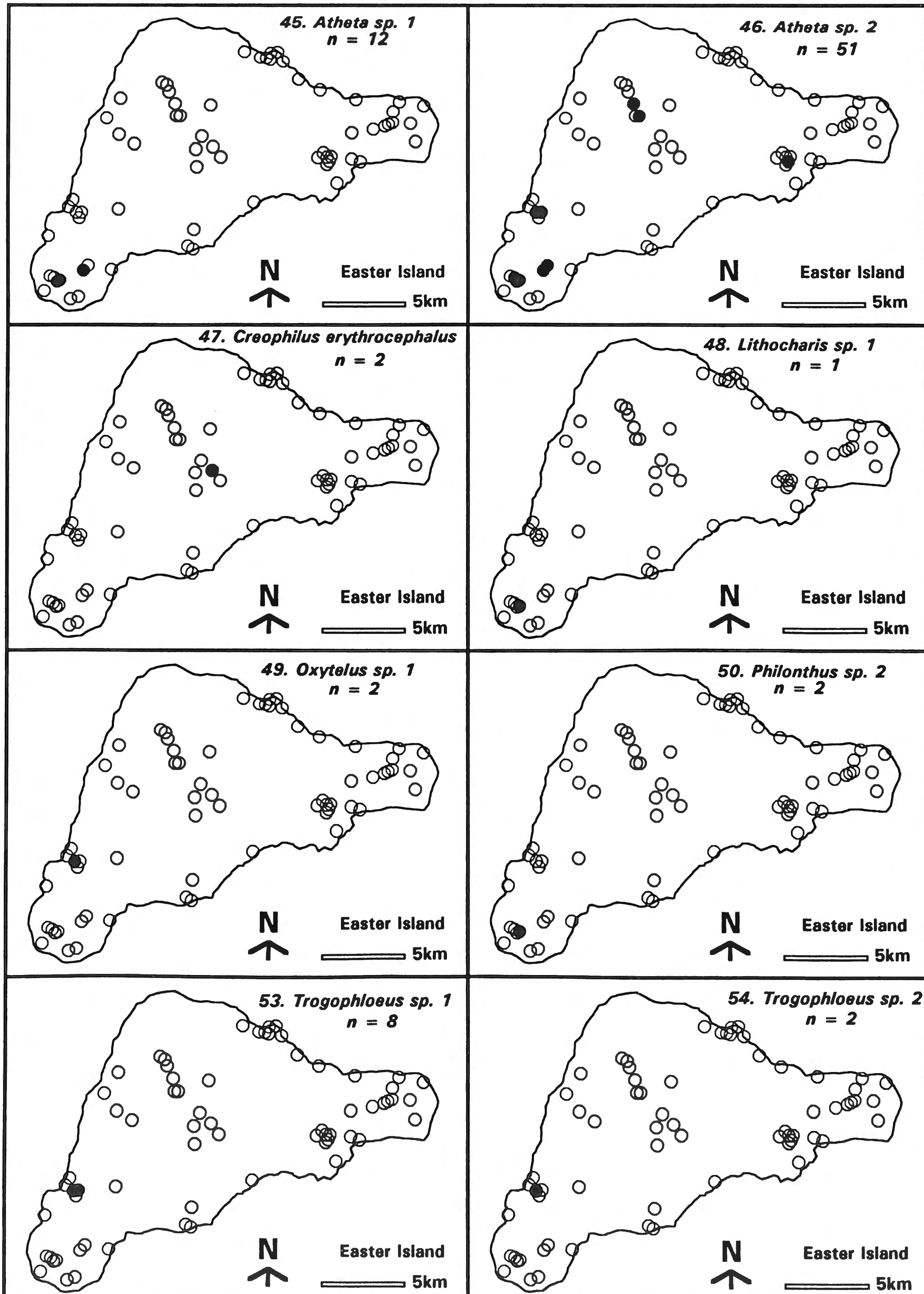
Fig. 17. – Distribution of Staphylinidae (species 45-54) on Easter Island; see legend Fig. 8 for further explanation.


45. Atheta sp. 1
n = 12
N
Easter Island
5km
46. Atheta sp. 2
n = 51
N
Easter Island
5km
47. Creophilus erythrocephalus
n = 2
N
Easter Island
5km
48. Lithocharis sp. 1
n = 1
N
Easter Island
5km
49. Oxytelus sp. 1
n = 2
N
Easter Island
5km
50. Philonthus sp. 2
n = 2
N
Easter Island
5km
53. Trogophloeus sp. 1
n = 8
N
Easter Island
5km
54. Trogophloeus sp. 2
n = 2
N
Easter Island
5km

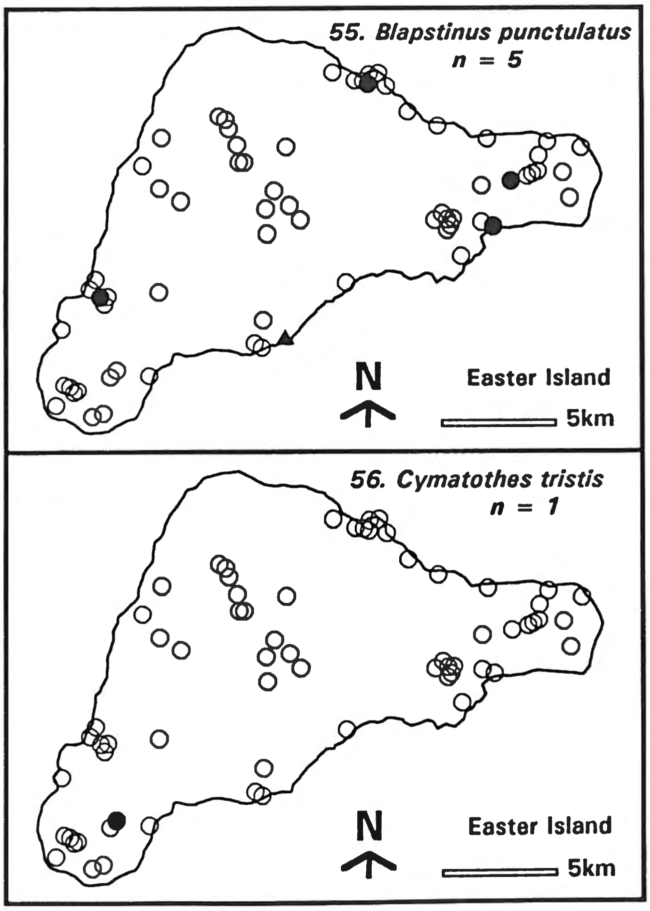


Fig. 18. – Distribution of Tenebrionidae (species 55-56) on Easter Island; see legend Fig. 8 for further explanation.

Although Pacific elements with a high dispersal power might have naturally colonized this remote island, they could as well have been introduced in ancient times by the Polynesians during their early voyages and their own colonization of the Pacific. It is indeed highly probable that during these events many widespread introductions of plants, hence phytophagous insects or species living in the soil, have occurred, whereas at the same time indigenous or possibly even endemic forms were lost on many islands due to habitat degradation or even destruction. The history of human occupation on Easter Island (with estimates of the prehistoric human populations of Easter Island varying between 2000 to as much as 7000, CASTILLA & OLIVA, 1987; DISALVO et al, 1988 and references therein) is much in support of this hypothesis and the island most recently has suffered even more introductions by humans. Nowadays, there is a continuous transport from Chile by the Chilean Armada, there are irregular visits of US Navy vessels, especially from Hawaii, and, moreover, there is a growing influence by tourism as well as by the normal traffic of Pascuans from and to Tahiti or Chile (PEÑA, 1987).

Because on Easter Island terrestrial natural habitats and their fauna have been destroyed nearly completely, we unfortunately have to conclude that the potentially high intrinsic values for biogeographic and evolutionary ecological studies of this extremely isolated, in theory unique, island have been reduced dramatically.

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Several beetle taxonomists kindly accepted to identify or check species: B. Davidson (Carnegie Museum, Pittsburgh) and J. K. Liebherr (Cornell University) aided in the identification of the *Metius* species, R. Gordon (National Museum of Natural History, Washington D.C.) helped with Coccinellidae, A.G. Kirejtshuk (Zoological Institute, Academy of Sciences, St Petersburg) with Nitidulidae, I. Schatz (Institut für Zoologie der Universität Innsbruck) and O. Merkl (Hungarian Natural History Museum, Budapest) with Tenebrionidae, J. Scheuern (Westum, Germany) with Scarabaeidae, J. Coulon (RBINSc, Brussels) with various smaller families, D. Drugmand and G. Haghebaert (RBINSc, Brussels) with Staphylinidae, O. Missa (RBINSc, Brussels) with Curculionidae.

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G. Wauthy corrected the résumé.

P. Grootaert, A. Huysseune and D. Kime commented on earlier versions of the manuscript.

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Konjev DESENDER, Léon BAERT
Entomology Department,
Royal Belgian Institute
of Natural Sciences,
Vautierstraat, 29
B-1000 Brussel, Belgium