Human Occupation and Resources in a Fog-Covered Site in Alto Patache (South of Iquique, Northern Chile)

Dr. Horacio Larrain (IECTA, UNAP, Iquique), Pilar Cereceda (Universidad Católica, Santiago), Dr. Robert S. Schemenauer, Metheorogical Service, Canada, Pablo Osses, Geographer, Pedro Lázaro, Architect, Gobierno Regional Tarapacá, Alfredo Ugarte, Enthomologist, (Inst. Estudios y Publicaciones Juan Ignacio Molina, Santiago.

Abstract: The presence of a rich archeological site of fishermen and foragers, in a mesa at 800 m altitude facing the sea, is explained by the persistence, for many months, of several species of flora and fauna and even game, whose vigorous growth and predominance permitted the collection and hunting of many species, greatly contributing with complementary diet to their marine living. A water spring seems to have been present at the site.The paper demonstrates the variety and richness of the flora and fauna found as a product of rains (El Niño) and of the humidity of (Camanchaca), persistent through the whole year.

INTRODUCTION

Several authors have studied the "loma" botanical formations in Southern Peru, where a highly adapted vegetation and fauna has permitted in the Past and even now the presence and temporal cultural and economic activity of human groups (See Engel, 1963; 1973; 1989-90; Núñez & Varela, for Northern Chile, 1965; Péfaur, 1972; Torres & López, 1981; Rundel et al. 1991;These typical "loma" formations extend from Northern Peru southly to the Northern Coastal Provinces of Chile, occupying the top of high ridges of the Coastal Cordillera. They give birth there to "Mist Oasis", "Oasis de Neblina" or "Nebeloasen", as they have been named by Geographers (See Weischet, 1966, 1975), These strange temporary fog-covered oasis show the presence, during several months, of rich botanical and faunistic specimens, particularly during the events caused by "El Niño" Current, typical to the Pacific Coast of South America.(Sielfeld et al, 1995). These events cause local and regional precipitations and concentrated periods of very strong humidity ("garúas"), as has been early observed by Bowman (1924: 59). Heavy precipitations concentrate, in specific areas, generally in one or two short events, and produce rapid plant growth, attracting, consequently, big game (guanaco) and other mammals, reptiles and birds. Several Genera of Arthropods appears also at the time, showing a notable richness and variety of Species.

Geographic, Biological and Archeological Observations.

Our Figure 1 shows this variety, considering mainly some Coleoptera and Lepidoptera Genera and Species represented, and omitting other typical minor animals, also present through the year (**Arachneae** and other tiny Insects, like **Tysanura**). For the Genera represented, see Figs. 2 and 3).

Sielfeld, Torres and Miranda (1995: 6, Maps) have detected the presence of at least 9 such coastal fog-oasis, located between 18° 30' S. and 22° 00' S., at altitudes between 700 m. and 950 m. high.

Among these sites, Alto Patache (S. 20° 49' 15" and W. 70° 09' 18") at 800-860 m. altitude, shows several significant topographic and biogeographic features which greatly facilitated in the Past, the subsistence activities of coastal fishermen living nearby, at the coastal terrace extending to the sea, giving so a logical explanation to the presence of a rich archaeological site.

The site has been protected by total geographical isolation due to the lack of trails. Our fog-oasis developed strong life from July 1997 to March 1998 showing its greatest intensity in terms of flora an fauna from September to December. There we found, scattered in the ground, thousands of stone flakes, worked by ancient people, broken or complete instruments revealing intense lithic workshop activity at the place for centuries, or perhaps, millennia. This protected area, close to their coastal encampments located at the foot of the ridge, offered old fishermen and foragers protection and access to many new biotic resources, coming from eventual local flora and fauna. The discarded or broken implements remained untouched, in situ, forgotten for centuries. Our systematic collection of surface elements, gave us the chance of reconstructing their way of life as hunters and gatherers along this fragile coastal ecosystem. So far, we have found here some 150 lithic implements. of different types and forms (hammers, scrapers, arrow points, knifes) in an area no greater than 1/2 sq. km., and many thousands of flint, basalt, and metamorphic flakes, demonstrating an active and

uninterrupted occupation of the site by producing implements to be used in their marine way of life.

Favored local Topography for catching fog

Altitude, local topography and favored exposition to the South and Southwest Trade Winds seem here particularly apt for fog collection, as have been proved by water collection through 8 months in our SFC collectors in place (See Cereceda et al., 1997). The main axis of hill top ridges, at Alto Patache, shows a frank S. and SW. orientation, facing directly the watercharged clouds coming from the open sea, permitting the arrival of myriads of tiny "camanchaca" droplets horseriding on them. Measurements made at different hours when heavy fog transported by strong Trade Winds (with speeds up to 20 m/sec), normally occurs , show a constant orientation of 180° - 190° (SSW).

Effects of "El Niño Current" on the local Biota

These topographic features are clearly local, and according to the Map, they constitute a unique exception in relationship to the general west or southwest orientation of the Chilean Coastal slopes, at these latitudes. These and similar topographic coastal features, not yet fully understood, apparently explain or facilitate the occurrence of rain, of clearly local character. Thus, only few segments of the coastal ridge have been visited by rain, during the events of days 15, 16 and 17 August 1997, due to the effects of the "El Niño Current" still present at our Coast. These rains greatly favored in our area the rapid apppearance and explosive growth of many species of plants, perennial and annual, whose development and later flowering permitted rapid local evolution of several Arthropod species, specially Insects, as shown in Fig. 1. Local biogeographic traits include the presence of about 30 species of plants (See Sielfeld et al., 1995; and Fig 1) most of them annual, and many of them having edible bulbs, roots or leaves.They are visited today by rodents and foxes, and attract a huge amounts of Insects, distributed in several Genera. (See Fig. 2,3). Our fauna and flora collections, made from July 1997 to March 1998. (35 expeditions), give us at present a much more complete view on the richness and variety of species represented, particularly in the field of Arthropods, notably expanding our previous knowledge of the area biota. Fig.1 shows also the different birds observed in the area, their number and exact time of appearance. The same Figure 1 present us the evolution of plant growth through a period of eight months of observation, focused on 13 plant species. Figure 1 offers us, also, a direct relationship with our collections of enthomological fauna. (See Figs 2,3). The heavy concentration of Insects, in numbers and percentages, and the evolution of the species through time, with a total capture of over 6.500 insects, is presented in Figs 2-3, showing the different life cycles of each species. The relationship with water collection in our SFC located at 860 m. high, is highly suggestive.

Archeological Perspectives

The study of Alto Patache archaeological site, planned for a near future, may offer us some clues as to the frequence of fog events and the taxonomic list of biotic resources obtained here by ancient people in the Past. Comparisons with present Plant species may be eloquent. Very recently we have discovered a nearby rocky area, crowded with many hundreds of pottery sherds, fragments of huge water jars and vessels, and disseminated in a very small area. The site lies at 750 m. altitude, at the foot of huge flat rocks facing the S.W. and S. At present such flat surface rocks, almost vertical in position, collect camanchaca droplets, creating an ideal place for lichens who prosper in their exposed faces. This fact points out to the probable existence of ancient water springs, as is suggested by Sielfeld et al., and proved by Núñez et Varela for a nearby fog-site at Punta Gruesa. Our "spring" is located no more than 200 m. from the core of the site and only 35 m. under it, going down the coastal slope, facing the Sea. Other signs, like the presence of small stone walls, at the foot of the vertical rocks, strongly speak in favor of our suspicion. Apparently, this "spring" was active by 1400 D.C., since typical "Pocoma" style clay vessels, nicely decorated, have been found there by us.

Conclusions.

1. The hills around our "mesa" are litterally covered with visible guanaco trails (Lama guanicoe) crossing in all directions our fog-oasis. We know well guanaco was one of the preferred game for hunting. Arrow points were certainly used in hunting them, and were found at place, close to their resting places, or trails.
2. We found several spots with guanaco and fox (Pseudalopex griseus domeykoanus) feces, as also "revolcaderos" (typical of american Camelids) demonstrating the frequent presence of these mammals in the area , in a near Past.
3. No less than three species of reptiles Gen. **Tropidurus, Liolaemus** and **Homonota** (Fam. **Gekkonidae**) are present today in the area. Reptiles,

FLORA & FAUNA SPECIMENS THROUGH YEAR IN ALTO PATACHE (1997 - 1998)

Figure 1

Observation Days	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Ñ	O	P	Q	R	S	T	U	V	W
	INSECTS (*)						PLANTS														BIRDS			
July 25			S				N	(#)	N	N	N	N	N	N	(#)	N	N	(#)					A	
August 04		S	S			S																		R
August 15				R			N		In	In	In	In											A	
August 20			S				S																	
August 24		S		S																				
August 31							S		In	In	In	In												
September 6							S		R															R
September 13							N				R													
September 17	S	S		S			S																	R
September 27	R	R							R	R	R													R
October 04	A		S	S			N		R	R	R		R	R										
October 19	EA						R						R	R										R
October 25					S		R							R										
November 09	EA											R	R											R
November 16							A					R		De		R								
November 23	EA	EA	A				A								R							S		
November 30	EA	EA				A	A												R					R
December 07	R	EA		S		A	EA											R	R					R
December 13	S	R	A		A	A	EA				R	R			R			R	R	R				
December 20			N		N		EA											R						R
December 28	S		N		N				De			R			R		R		R					
December 31	N		N		N	S	EA													R				
January 10	N	N	N		N	N	EA						R			R	R							R
January 15	N		N		N	N	EA																	
January 25	N	S	N	A	N	N	EA					De								R				R
February 16	N	S	N	A	N	N	EA				R		De			R				De				R
February 21	N	S	N	R	N	N	A		De	De	R	De	De			De							R	
March 02	N	N	N		N	N	S				R													R
March 06	N	N	N	R	N	N	R										R						S	R
March 11	N	N	N	R	N	N	R				R						De				S		S	R
March 16	S	N	N	R	N	N	R	R															R	R
March 22	N	N	N	A	N	N	R														N	N	N	S

(*) The most common species have been here considered.
(#) Perennial plants

SPECIES

A : Vanessa carye
B : Pyrgus sp.
C : Hyles annei
D : Lucanidae (Fam.)
E : Ichneumonidae (Fam.)
F : Pseudomeloe sp.
G : Calosoma rufipennis
H : Opuntia ovata
I : Leucocoryne spp.
J : Oxalis sp.
K : Nolana spp.
L : Alstroemeria sp.
M : Cristaria sp.
N : Calandrinia sp.
Ñ : Eulychnia iquiquensis
O : Solanum sp.
P : Quinchamalium sp.
Q : [illegible]
R : Perityle emoryi
S : Leguminosae (Fam.)
T : Buteo polyosoma
U : Polyborus plancus plancus
V : Geositta sp.
W : Cathartes aura

OTHER SYMBOLS

A : Abundant
R : Regular presence
S : Scarce
N : Nul (non existent)
EA : Extreme abundant
In : Initial growth
R : Flowering
De : Decaying (In seed)

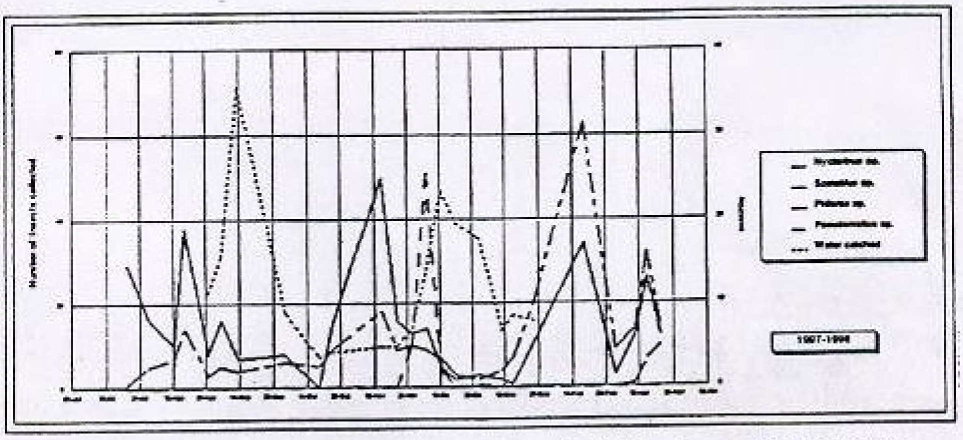

Figure 2 Yearly Evolution of Coleoptera in Alto Patache versus Water Collection

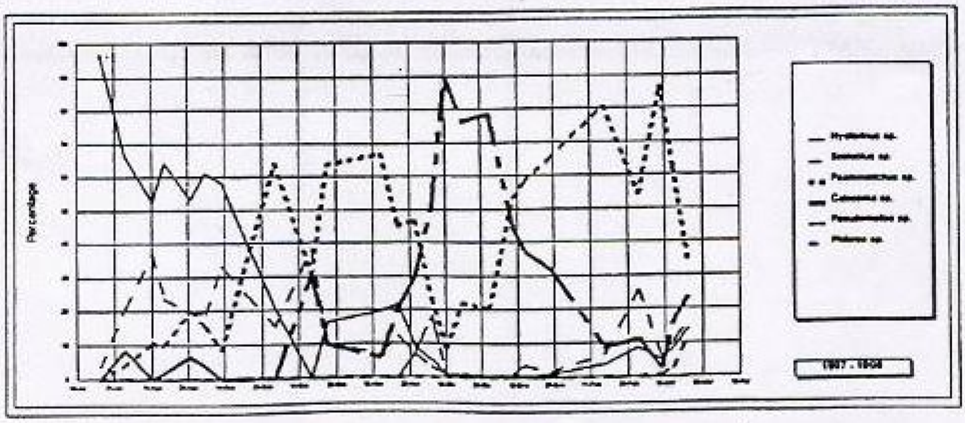

Figure 3 Yearly Evolution of Coleoptera Fauna in Alto Patache

as known, were frequently hunted by hunters for food. Also birds use to visit the area, even now. (See Fig. 1).

4. According to our experience, few species of birds live regularly or visit frequently the site, as shown in Fig. 1, which could be hunted in place as the numerous arrowheads found by us come to prove.

5. Many peoples of ancient world use to eat insects, specially beetles (Coleoptera) and Orthoptera. This may well have been the case here. The huge numbers we detected in traps, fully justify the possibility of consuming huge amounts of them (See Peña, 1966).

6. Land snails of three species are also present. They were certainly edible and served as food in coastal Peru (Engel, 1963, 1973).

7. Ancient fishermen and foragers, living at the coast, or moving from the highlands to the Coast and viceversa, found at this normally fog-covered site of Alto Patache not only water from a spring, but a very rich biotic system, maintained alive by fog through many months , providing them extra food specially in winter or spring times, when the sea was less apt for capturing fish (v.gr. protein and carbohydrates of animal and vegetal origin) .

Acknowledgements

My special thanks to the IECTA members , Secretary Miss Sofia Choque, and Gonzalo Torrico, Librarian, for their help in printing the Manuscript. To my loyale collaborators in the field, Marta Peña, Jorge Silva, Claudia Moreira, Cristian Leyton, José Bustamante, Alfonso Campos and Erik Cisternas, for their support in field campaigns in Alto Patache. Also to the Catholic Universty Students of Geography, who helped us so much in field collection of archeological materials. To all of them my particular recognition.

REFERENCES

Bowman, Isaiah, 1924, Desert Trails of Atacama. *American Geographical Society*, Spec. Publ. N° 5, New York.

Cereceda, P., 1997, "La Vegetación del Desierto Costero de Tarapacá y su relación con los factores de presencia de Niebla", Paper presented to *Anales del Congreso de Geografía, (in press).*

Engel, Fréderic,1963, A Preceramic Settlement in the Central Coast of Peru, Asia, Unit 1, *The Am. Phil. Society,* New Series, Vol. 53, Part 3, Philadelphia, 1963, 1-139.

Engel, Fréderic, 1973, "New Facts about Pre-Columbian Life in the Andean Lomas", *Current Anthropology,* 14, N° 3, 271-286.

Engel, Fréderic, 1989-90, "Oasis de Neblina y Napas Freáticas: Un desierto dominado", *Zonas Aridas,* N° 6 Centro de Investigaciones de Zonas Aridas, Lima, 7-14.

Goodall, J. D. et al., 1951, Las Aves de Chile, Su conocmiento y sus costumbres, *Tomo II, Platt Establecimientos Gráficos*, Buenos Aires,

Larrain, Horacio, 1987, Etnogeografia de Chile, *Colección Geografia de Chile*, Instituto Geográfico Militar, Vol. 16, (see pages 70-81).

Núñez, L. and J. Varela, 1965. "Sobre los recursos de agua y el poblamiento prehispánico de la costa del Norte Grande de Chile", *Estudios Arqueológicos,* Depart. Arqueol.. y Museos, Universidad de Chile, Antofagasta, N° 3-4, 1-41.

Péfaur, Jaime E., 1972, Composition and Structure of Communities in the Lomas of Southern Peru, M.A. *Thesis, University of Kansas*, 66 p.

Peña, Luis E., 1966. Catálogo de los **Tenebrionidae (Coleoptera)** de Chile, *Entomologische Arbeiten aus dem Museum* G. Frey, Tutzing, Band 17, 397-453.

Rundel, P.W. et al., 1991 "The Phytogeography and Ecology of the Coastal Atacama and Peruvian Deserts", *ALISIO,* 13 (1), 1-49.

Sielfeld, et al, 1995, Información Preliminar sobre los Oasis de Niebla de la Costa de la Primera Región de Tarapacá, Universidad A. Prat, Progr. de Rec. Hídricos y Naturales Renovables (*Preliminary Edition*), 56 p.

Weischet,W., 1966, "Zur Meteorologie der Nordchilenischen Wüste", *Meteorologische Rundschau,* 19 Jahrg. Heft 1, 1-4.

Weischet, W., 1975, "Las Condiciones climáticas del desierto de Atacama, como desierto extremo de la tierra". *Revista de Geografía Norte Grande.* Instituto de Geografía Universidad Católica de Chile. Vol. 1, 3-4 363-373