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ORCHID DIVERSITY AND DISTRIBUTION ON A TREE AT RESERVA FORESTAL DE SAN RAMON, COSTA RICA

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ABSTRACT

Epiphytic orchids on a single *Protium* sp. tree in Reserva Forestal de San Ramón, Costa Rica, are determined and their distribution on the phorophyte is discussed. Notes on site preferences of different taxa are suggested.

Apart from the detailed samples by Went (1940) and Sanford (1968) on local orchid distribution in Malaysian and Nigerian forests, a few ecological studies on epiphytic Orchidaceae have been done in the last two decades (Johansson 1974,1975; Benzing 1979; Madison 1979; Yeaton & Gladstone 1982; Catling *et al.* 1986; for a complete survey of pertinent literature see Benzing 1990). Fewer still are studies on the colonization and distribution of epiphytic orchids in montane and cloud forests. Due to tree height and the danger of the actual means of exploring forest canopies, adequate sampling of the epiphytic flora in tropical forests is generally difficult. A unique quantitative survey of orchid population on a single tree in Venezuelan montane rain forest was carried out by Dunsterville (1961), but no host tree was determined (Dressler 1981).

During our first stay in 1991 in Reserva Forestal de San Ramón (RFSR), Costa Rica, in order to begin the collections devoted to the orchid florula of the protected area, we had the opportunity to record the occurrence of epiphytic orchids on a *Protium* sp. tree recently fallen. The easy access to the tree, along the principal trail to the Biological Station of the reserve, allowed us to gather information and quantitative data on orchid epiphyte distribution on a single phorophyte in a premontane tropical rain forest.

METHODS

The studied tree lies along the trail to the Biological Station of RFSR, at about 1.350 meters elevation. The protected area is approximately 50 kilometers east of San Ramón, close to the little village of Esparza. It is located along the northeastern watershed of the Cordillera de Tilarán, with an altitudinal range varying from 600 to about 1.600 meters, and extends for about 8.000 ha. of primary forest (fig. 1). According to

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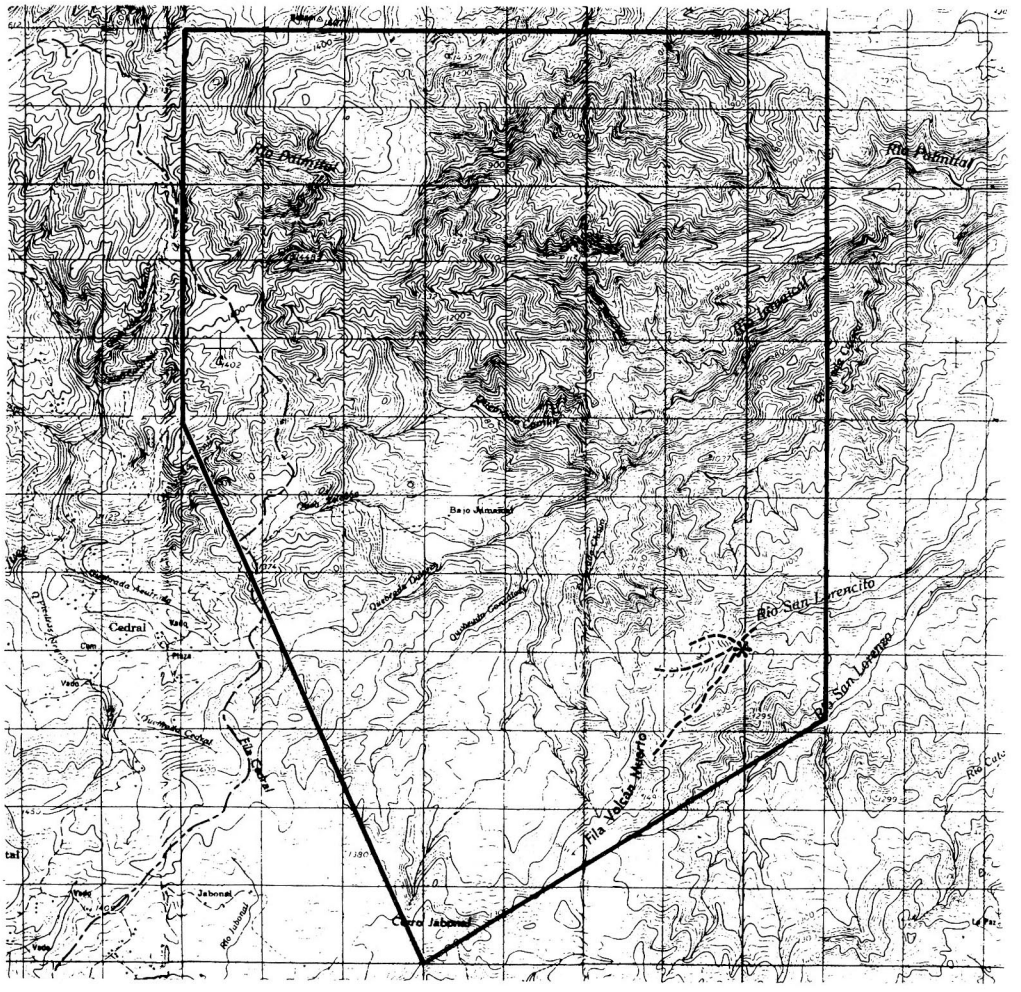

Fig. 1 Altimetric map showing the protected area of Reserva Forestal de San Ramón.

the classification by Köppen (1984), the area presents a temperate wet climate, but on the basis of relative temperatures, rains and water deficit of the soils, Herrera (1986) finds six different climatic types within the reserve (fig. 2). The climate of the study area can be characterized as excessively wet, temperate, without water deficit, with an average of 5.000 to 8.000 mm of rain a year. According to the vegetative maps by Gómez (1986), the tree was growing in a wet premontane forest. Epiphytes had never been removed from the trees.

A recently fallen tree (*Protium* sp.), 28 meters tall was divided in to five sectors on the basis of trunk and four branch diameter categories (<1 cm, 1-3 cm, 3-15 cm, 15-60 cm, >60 cm = trunk) (fig. 3). Each sector were delimited by plastic bands, and plastic labels was imployed to indicate relative heights along the trunk and the branches. Beginning with the first sector, a representative specimen of any orchid species within the sector was collected and determined. All the individuals pertaining to the same species were successively recorded for each sector. Individual clones had either a single-stem or formed well defined clumps of several stems. Juvenile individuals were not determined and considered for the purpose of the study only on a

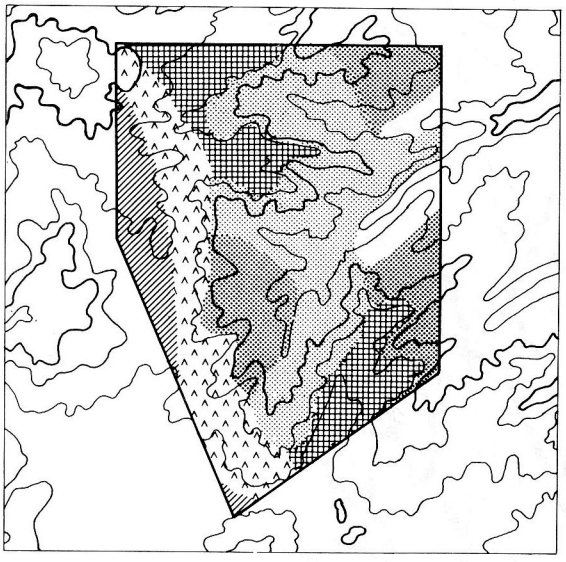

Fig. 2 Map of the climatic types within Reserva Forestal de San Ramón (Herrera 1986). Sparse dotted: excessively wet, warm climate, with very reduced hydric deficit. Dense dotted: wet, warm climate, with moderate water deficit. Squared: excessively wet, temperate climate, without water deficit. Ruled: wet, temperate climate, with reduced water deficit. White: very wet, warm climate, without water deficit. Arrows: very wet, temperate climate, without water deficit.

numeric basis. Sterile individuals were classified with progressive numeration, and grouped on the basis of their vegetative morphologic characters. Samples of each group were cultivated in Italy and determined when flowering occurred. Uncertain species were simply determined at generic level. Voucher specimens of most of the species were deposited at the herbarium of the Universidad de Costa Rica (USJ). Quantitative data and distribution patterns were analyzed through summary tables and histograms.

RESULTS

Thirdy-nine orchid species and 504 individual plants were recorded on the tree (table 1). The largest number of plants (278 individuals) was found on branches with 1 to 3 cm diameter (fig. 4). Also, the diversity of the epiphytic orchids (27 species) was greatest on the medium-sized branches (fig 5).

The tendency for orchid species to be associated with a specific branch category is shown in figure 6. As an example, *Pleurothallis convallarioides*, *Maxillaria neglecta* and *Pleurothallis* sp. were predominant on the thin branches less than 3 cm in diameter. Distribution on the phorophyte may be significantly affected by branch size in *Acostaea costaricensis*, *Cryptocentrum standleyi*, *Masdevallia pygmaea*, and *Scaphyglottis mesocopis*, all of them restricted to a single branch category. Position within the canopy is flexible for a certain taxa (i.e. *Sigmatostalix macrobulbon*, *Stelis purpurea*, *Masdevallia nidifica*, *Trichosalpinx blaisdellii*), and some species are ubiquotous (*Stelis purpurea*, fig. 6).

DISCUSSION

These data only partially agree with that of Johansson (1974, 1975) and Catling *et al.* (1986). In fact, though Johansson and Catling reported the highest orchid diversity for the medium sized branches in West African and Belize forests, they also found the lowest diversity on the outer branches of the trees. Such differences in epiphyte distribution in geographically distinct areas can be easily explained with climatic conditions and moisture availability. Pressure by hydric stress on twig epiphytes is consistenly reduced in premontane wet forests, which may explain the high orchid diversity (26,5%) found on twigs at RFSR.

Site preferences of epiphytic orchids within the canopy in natural forests is determined by many factors. Reduced light levels are probably responsible for the fewer species found on the trunk and in the inner branches. Moisture and light intensity are important factors in accounting for

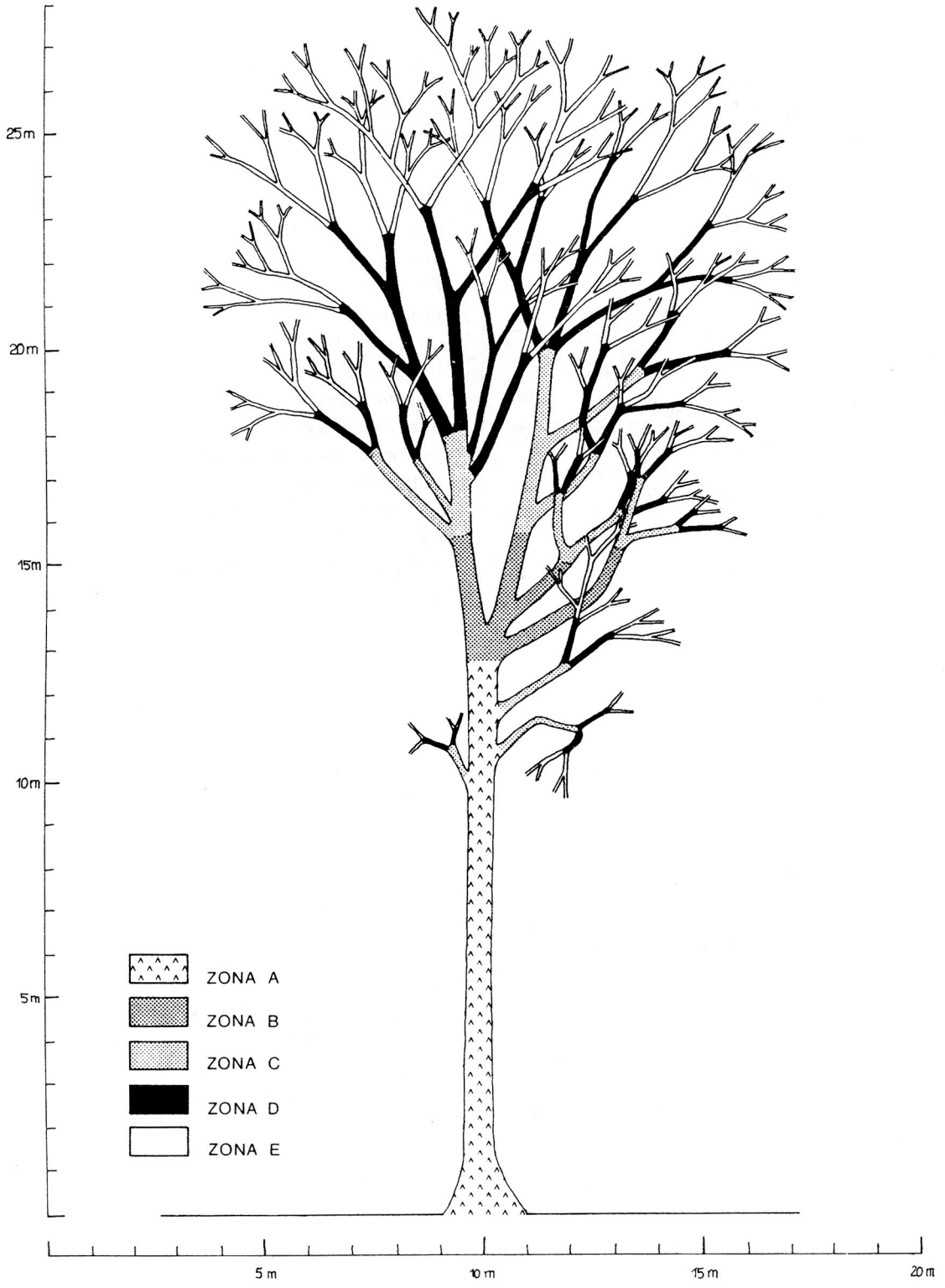

Fig. 3 Subdivisions of the studied tree into five sectors on the basis of trunk and four branch diameter categories (Zone A: >60 cm = trunk; Zone B: 15-60 cm; Zone C: 3-15 cm; Zone D: 1-3 cm; Zone E: <1 cm).

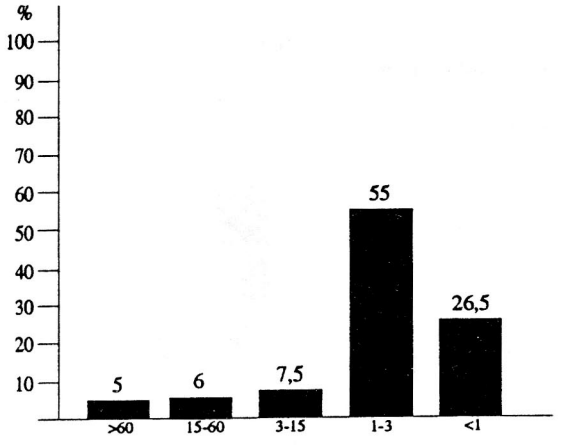

Fig. 4 Distribution of epiphytic orchids expressed as a percentage of total individuals among five branch size categories of the tree.

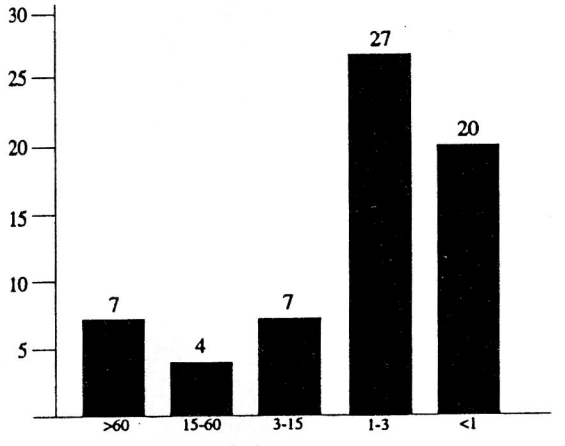

Fig. 5 Diversity of epiphytic orchids expressed as number of species among five branch size categories of the tree.

the presence and abundance of briophytes, that consistently affect populations of miniature orchid species. Most of the diminutive Pleurothallidinae established on the studied phorophyte were found exclusively on twigs or little branches, where mosses are absent or very reduced on the bark. The distribution of these little orchids may be much a response to avoideing the bryophyte flora as to preference strong light.

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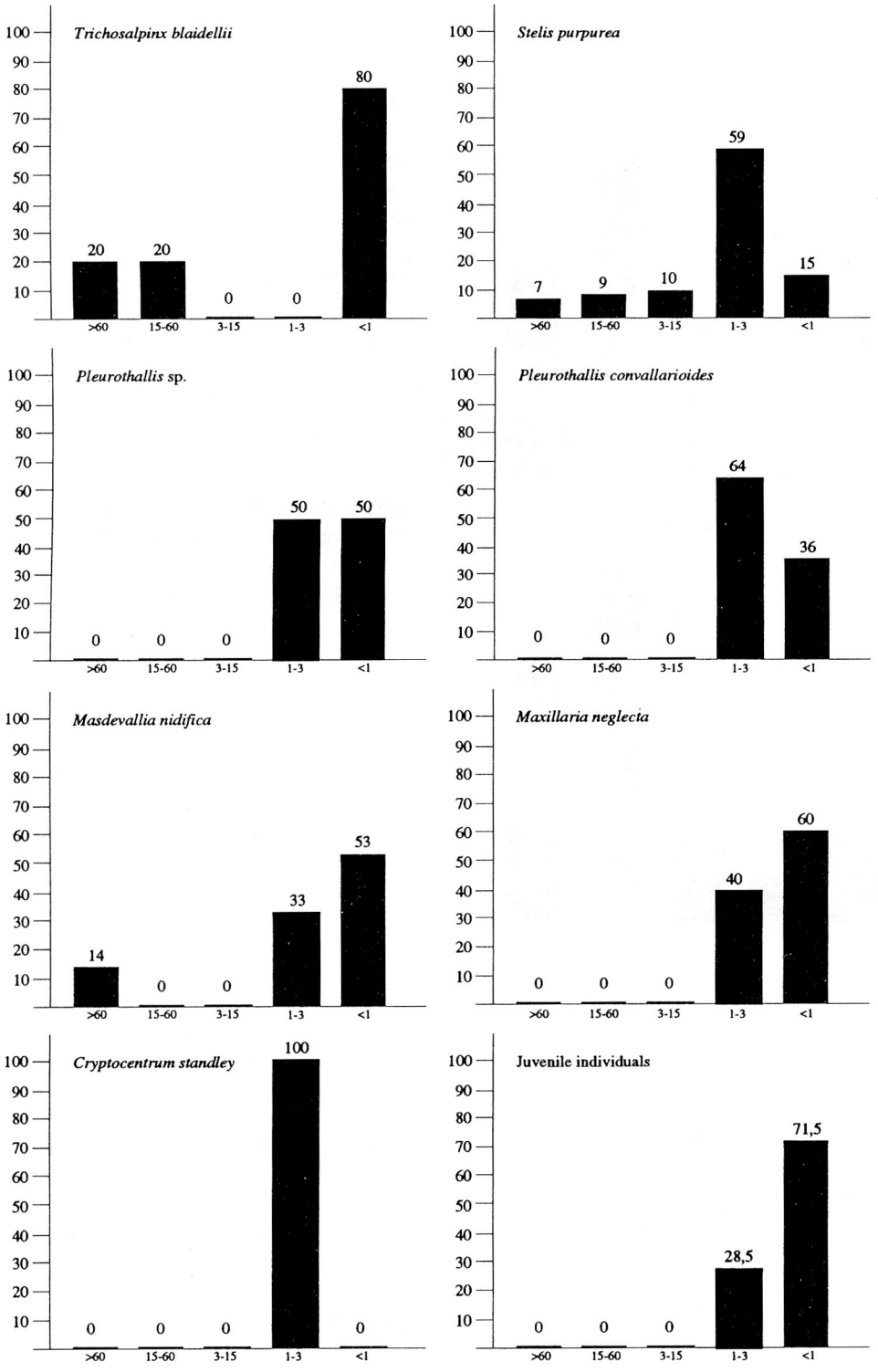

Fig. 6 Distribution of 8 epiphytic orchids, expressed as a percentage of total individuals of a species, among five branch size categories of the tree.

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Table 1. Number of individuals per species for each of the five sectors considered. Totals of individuals are given for each species and for each sector; percentage of individuals is given for each sector.

	Total No. Plants	>60 (trunk)	15-60	3-15	1-3	<1
Acostaea costaricensis	7					7
Cischweinfia dasyandra	2				2	
Cryptocentrum standleyi	22				22	
Dichaea muricata	2				2	
Dichaea trulla	4				4	
Elleanthus alberti	2				2	
Epidendrum cf. *incomptum*	2			2		
Epidendrum alfaroi	1				1	
Huntleya burtii	2			1	1	
Lepanthes blepharistes	3				2	1
Lepanthes sp. #1	9				9	
Lepanthes sp. #2	1					1
Lepanthes sp. #3	5			1	2	2
Masdevallia chasei	1	1				
Masdevallia erinacea	4				3	1
Masdevallia nidifica	15	2			5	8
Masdevallia pygmaea	6				6	
Maxillaria alba	1	1				
Maxillaria dendrobioides	3					3
Maxillaria fulgens	1			1		
Maxillaria neglecta	10				4	6
Maxillaria sp.	2					2
Platystele caudatisepala	5				1	4
Platystele jungermannioides	2					2
Pleurothallis convallarioides	14				9	5
Pleurothallis costaricensis	3	1	2			
Pleurothallis deregularis	2				2	
Pleurothallis pachyglossa	8					8
Pleurothallis sp.	12				6	6
Scaphyglottis tenella	4				1	3
Scaphyglottis mesocopis	7				7	
Sigmatostalix macrobulbon	7	1	2	2	2	
Sobralia sp.	6				4	2
Stelis leucopogon	3			3		
Stelis purpurea	280	20	25	27	166	42
Stelis sp. #1	2				2	
Stelis sp. #2	8				3	5
Trichosalpinx blaisdellii	10	1	1			8
Juvenile individuals (not determined)	28				8	20
Total	**506**	**27**	**30**	**37**	**278**	**134**
Percentage	100	5,0	6,0	7,5	55,0	26,5