

## Habitat of *Neoregelia cruenta* (Bromeliaceae) in coastal sand dunes of Maricá, Brazil

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**Resumen:** Se realizó un estudio de los habitats utilizados por *N. cruenta* (R. Graham) L. Smith en un ecosistema costero de dunas de arena en Barra de Maricá, Rio de Janeiro. Los resultados demuestran que esta especie tiene la capacidad de mantener una elevada densidad en ambientes normalmente adversos, através de epifitismo facultativo.

The family Bromeliaceae is widespread throughout the Neotropics. It is subdivided into three subfamilies distinguished by floral and seed morphology (Smith and Downs, 1974). However, it can also be subdivided into ecological groups based on mechanisms of water and nutrient absorption (Pittendrigh, 1948). The types of habitats used by different species of bromeliads are many (Pittendrigh, 1948, Aragão, 1967; Medina, 1974). One aspect of habitat use in the Bromeliaceae is facultative epiphytism, present in each of the subfamilies (Medina 1974).

The present study deals with habitat use by *Neoregelia cruenta* (R. Graham) L. Smith in the Barra de Maricá, a coastal sand dune ecosystem, approximately 35 km E of Rio de Janeiro, Brazil (22° 57' S, 43° 08' W). The local bromeliad flora consists of *N. cruenta*, *Bromelia antiacantha* Bertol, *Tillandsia* spp. and *Aechmea* sp.. Of these only *N. cruenta* exploits both terrestrial and epiphytic habitats. This species is one of the dominants in this system (Lacerda and Hay 1977) and important in improving soil chemistry (Hay and Lacerda 1980; Hay *et al.*, 1981).

The area studied can be divided into four distinct zones, with increasing distance from the ocean, based on differences in plant species

composition and horizontal and vertical structure (see Hay and Lacerda, 1980 for a complete description). The study was done in the two intermediary zones 2 and 3. Once in the other extreme zones, plant communities are herbaceous, thus precluding the possibility of epiphytic habitats. Zone 2 is located in the valley behind the primary dunes and exhibits a clumped plant distribution ( $\pm 1-2$  m in height, coverage  $\pm 25\%$ ). It gradually gives way to Zone 3 which is denser, featuring smaller and fewer open areas ( $\pm 6-7$  m in height, coverage  $> 75\%$ ). These transitions occur within 300 m.

Habitat use by *N. cruenta* was quantified using a line-intercept technique. Two line transects, perpendicular to the ocean and the vegetation zones, were established in Zones 2 and 3. All individuals of *N. cruenta* within 2 m of each transect were counted and their habitat recorded. Specifically, we noted if the individual was associated with another species, and if so, whether it was growing as an epiphyte. An individual was considered to be associated if it was within 15 cm of at least one other species, and classified as epiphytic when no part was in contact with the soil surface.

*Neoregelia cruenta* can be found in all zones of the Barra de Maricá, but it is most abundant in Zones 2 and 3 where it attains a similar

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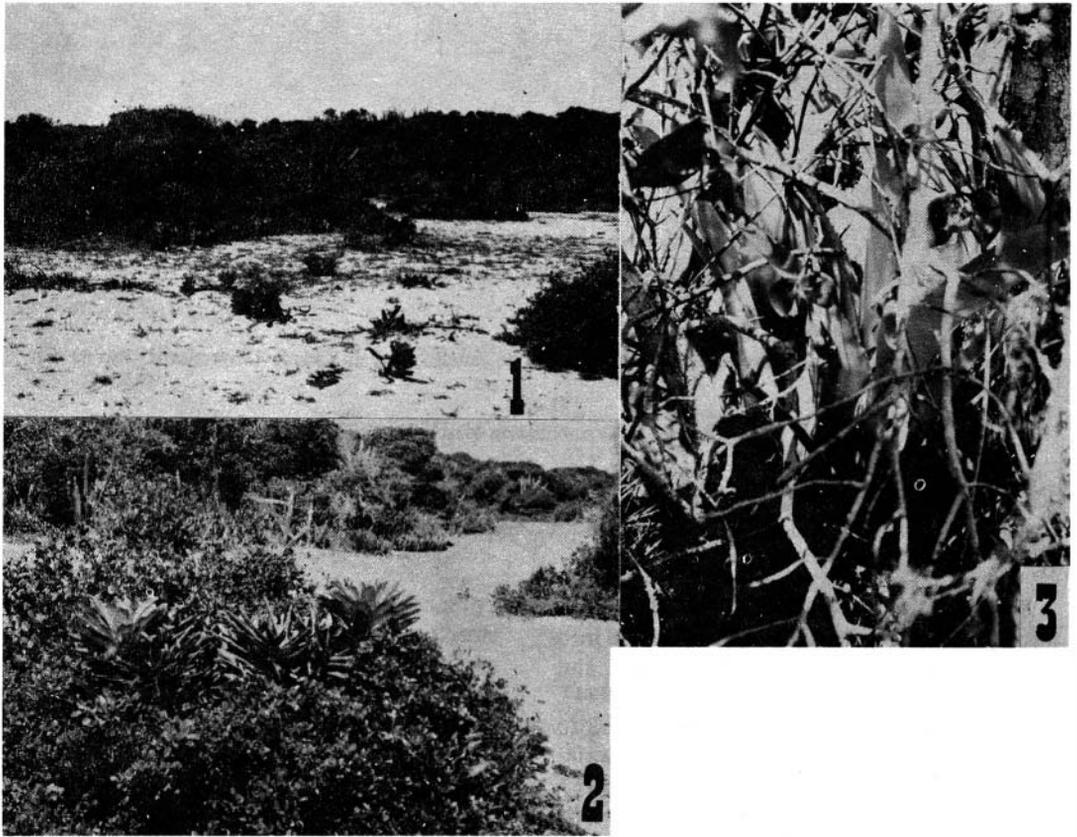


Fig. 1. Group of terrestrial individuals of *Neoregelia cruenta* in the open areas of the second vegetation zone of the Barra de Maricá (RJ). Epiphytic forms are also present in the background, along with the third vegetation zone.

Fig. 2. Epiphytic forms of *N. cruenta* in the second vegetation zone of the Barra de Maricá (RJ).

Fig. 3. Epiphytic form of *N. cruenta* in the canopy of the third vegetation zone of the Barra de Maricá (RJ).

density of approximately 86 individuals/100 m<sup>2</sup> (Lacerda and Hay 1977). This maintenance of density with a change in habitats appears to be accomplished through epiphytism since insufficient open ground remains to support an equivalent number of terrestrial individuals.

Typical habitat use by *N. cruenta* in Zones 2 and 3 is shown in Figs. 1, 2, 3. Figure 1 shows a group of individuals of *N. cruenta* in the open areas of Zone 2. Figures 2 and 3 show examples of the use of the epiphytic habitat. In Fig. 2 *N. cruenta* is epiphytic on a community group in

Zone 2, while in Fig. 3 it is present within the tree canopy in Zone 3. When *N. cruenta* was present in Zone 3 as a terrestrial, it occurred on the periphery of the closed communities or within the open areas.

The results of this study are shown in Table 1. A total of 222 individuals of *N. cruenta* were encountered in Zone 2 and 298 in Zone 3. A comparison (Dixon and Massey 1968) of the percentages of the total number of plants associated and of the epiphytes showed that in both cases Zone 3 was significantly different from Zone 2;  $z = 2.63$  ( $p < 0.01$ ) for the percentage of plants associated and  $z = 2.32$  ( $p < 0.01$ ) for the percentage of epiphytes, supporting our hypothesis that the degree of epiphytism increased between the second and third zones.

A possible advantage for facultative epiphytism would be reduced competition for light. Light has been shown by Pittendrigh (1948), Veloso and Klein (1957) and Aragão (1967) to be important in determining bromeliad distribution in ecosystems. Being a

TABLE 1

Comparison of the percentage of *Neoregelia cruenta* in  
Barra de Maricá (R. J.)

The figures in parentheses refer to the percentage of the subtotal

|                | ZONE 2  |        | ZONE 3     |        |
|----------------|---------|--------|------------|--------|
|                | Number  | %      | Number     | %      |
| Associated     |         |        |            |        |
| Terrestrial    | 92 (92) |        | 138 (81.6) |        |
| Epiphytic      | 8 (8)   |        | 31 (18.4)  |        |
| Subtotal       | 100     | 45.05  | 169        | 56.71  |
| Not Associated |         |        |            |        |
| Terrestrial    | 122     | 54.95  | 129        | 43.29  |
| Total:         | 222     | 100.00 | 298        | 100.00 |

“tank” bromeliad, *N. cruenta* is independent of the soil and receives nutrients and water from atmospheric sources. It is also possible to speculate on the evolutionary history of the Bromeliaceae. In this family, the obligatory epiphytes are considered to be the most highly evolved (Smith and Downs 1974); thus the capability for facultative epiphytism might represent a transitory phase in the evolutionary history of the family.

In summary, observations on habitat use by *N. cruenta* show that it is capable of exploitation of different habitats within the coastal sand dune ecosystem. The mechanism used is facultative epiphytism, possibly in response to a requirement of high light intensity for germination or growth.

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