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Additional observations on the biogeography of the Amotape-Huancabamba zone in Northern Peru: Defining the South-Eastern limits

Observaciones adicinales sobre la biogeografía de la zona de Amotape-Huancabamba en el norte del Perú: definiendo el límite suroriental

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Resumen

Observaciones de Loasaceae y *Ribes* (Grossulariaceae) obtenidos durante estudios de campo en el Perú nos permiten definir el límite suroriental de la zona Amotape Huancabamba con gran precisión. El límite se encuentra entre la zona directamente al NE de Otuzco (departamento La Libertad, prov. Otuzco, sistema Río Chicama: 07° 50,315´ S, 078° 29,076´ W) hacía el abra entre Parcoy y Buldibuyo (departamento La Libertad, provincia Pataz, N del Río Cajas: 08° 04,619´ S, 077° 25,457´ O). Los grupos de plantas típicas de la zona Amotape Huancabamba (grupo *N. triphylla*, *N*. ser. *Alatae,* grupo *Ribes andicola*, *Nasa picta* subsp. *picta*) tienen sus límites suroriental de distribución en el Norte de la provincia de Pataz (La Libertad), y se encuentran reemplazadas por grupos de los Andes Centrales (grupo *N. poissoniana*, *Ribes viscosum*) inmediatamente al sur de esta abra.

Key words: biogeografía, Andes, Zona Amotape-Huancabamba

Abstract

Data from Loasaceae and *Ribes* (Grossulariaceae) obtained during field studies in Peru allow us to define the southeastern limit of the Amotape-Huancabamba Zone with remarkable precision. The limit runs in slightly southeasterly direction from NE of Otuzco (department La Libertad, province Otuzco, Río Chicama drainage system: S 07° 50,315´, W 078° 29,076´) to the mountain pass between Parcoy and Buldibuyo (department La Libertad, province Pataz, N of the Río Cajas: S 08° 04,619´, W 077° 25,457´). The plant groups typical of the Amotape Huancabamba Zone (*N. triphylla* group, *N*. ser. *Alatae, Ribes andicola* group, *Nasa picta* subsp. *picta*) find their southeastern distribution limit in the northern part of the province Pataz, and are replaced by their southern counterparts (*N. poissoniana* group, *Ribes viscosum*) immediately south of this pass height.

Key words: biogeography, Andes, Amotape-Huancabamba Zone

Introduction

The Amotape Huancabamba Zone is situated between the Río Jubones system in Ecuador and the Río Chamaya system in Peru and includes the area called the Huancabamba Depression where the Andean Cordillera is partly interrupted by the Río Chamaya/Río Marañón system and the Andes have a very low region at the Abra de Porculla (2145 m, department Lambayeque, Duellman, 1979). The Amotape Huancabamba Zone was proposed as a region of particular diversity by P.C. Berry (1982), Young and Reynel (1997) and Hensold (1999) and this observation was underscored by observations on various plant groups by Weigend (2002). According to Weigend (2002) the southern limit of the Amotape-Huancabamba Zone on the Peruvian coast lies south of the Río Chicama drainage system (Trujillo, department La Libertad, Peru), the highlands of Conchucos (Peru, department Ancash, province Corongo) and Tayabamba (Peru, department La Libertad, province Pataz) and its northern limit are the Río Jubones (Ecuador, province El Oro, Machala) and Río Zamora (Ecuador, province Zamora-Chinchipe) drainage systems (Fig. 1). The zone as such is held together by various characteristic species and species groups and

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even endemic genera, and these form close ties both along the Andes (north - south) and across the Andes (east - west). For the *Passiflora lobbii* group, Grossulariaceae and Loasaceae it has been shown that levels of diversity in the Amotape-Huancabamba Zone are roughly six to eight times higher than in the Central and Northern Andes and some groups (genera, species groups) are endemic to the region.

This view is in contrast to the interpretation that the lowering and partial interruption of the Andean chain (variously called the Northern Peruvian Low, Huancabamba Deflexion, Piura Divide, or Huancabamba Depression) mainly acts as a barrier (Ayers, 1999; Molau, 1988; Prance, 1989; Vuilleumier, 1968).

The primary aims of the present paper are a) complementing the distribution data provided in Weigend (2002) with new observations and b) defining the southeastern limit of the Amotape-Huancabamba Zone.

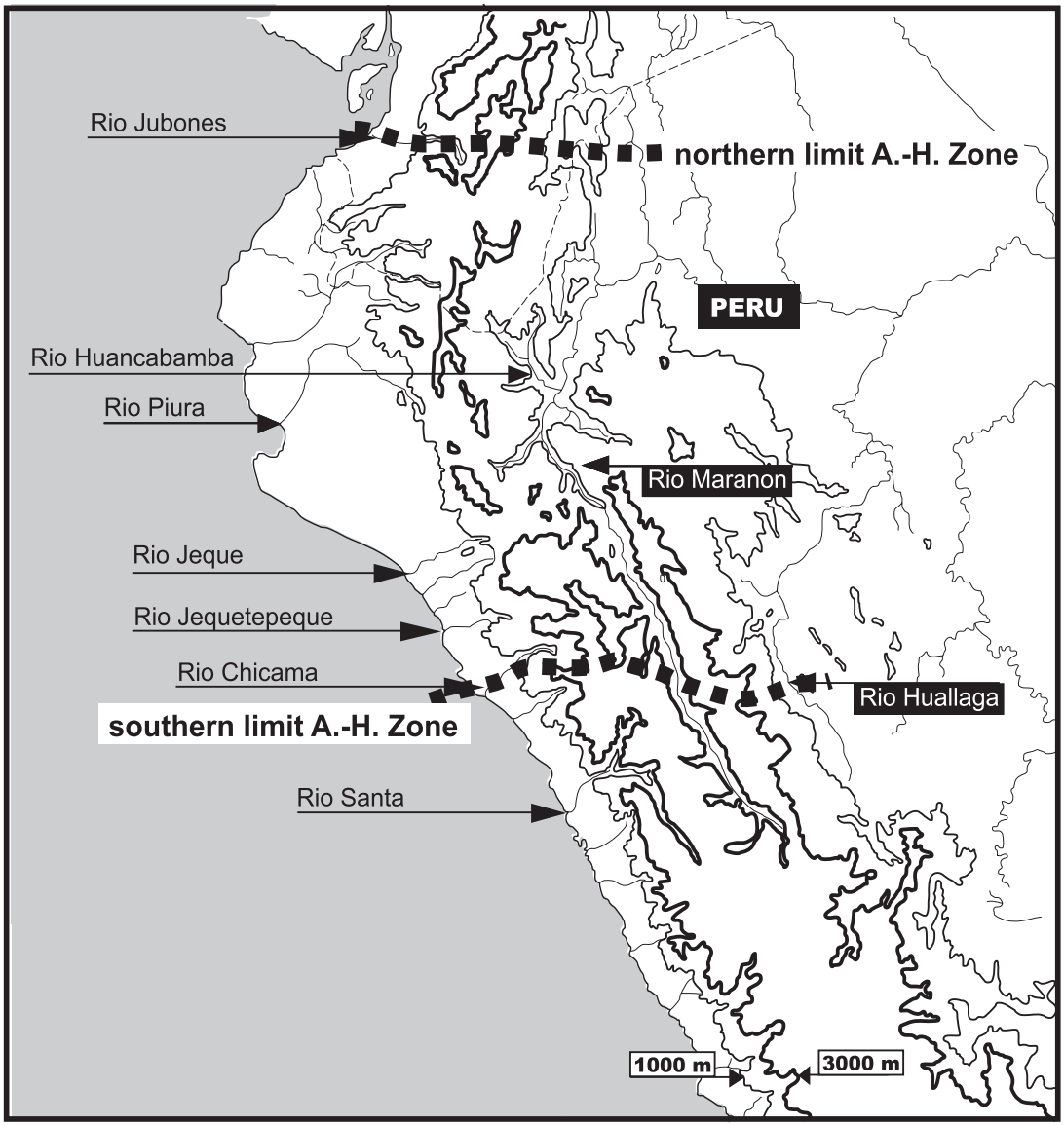

Figure 1. Simplified overview of the Amotape-Huancabamba Zone and adjacent areas (modified from Weigend 2002).

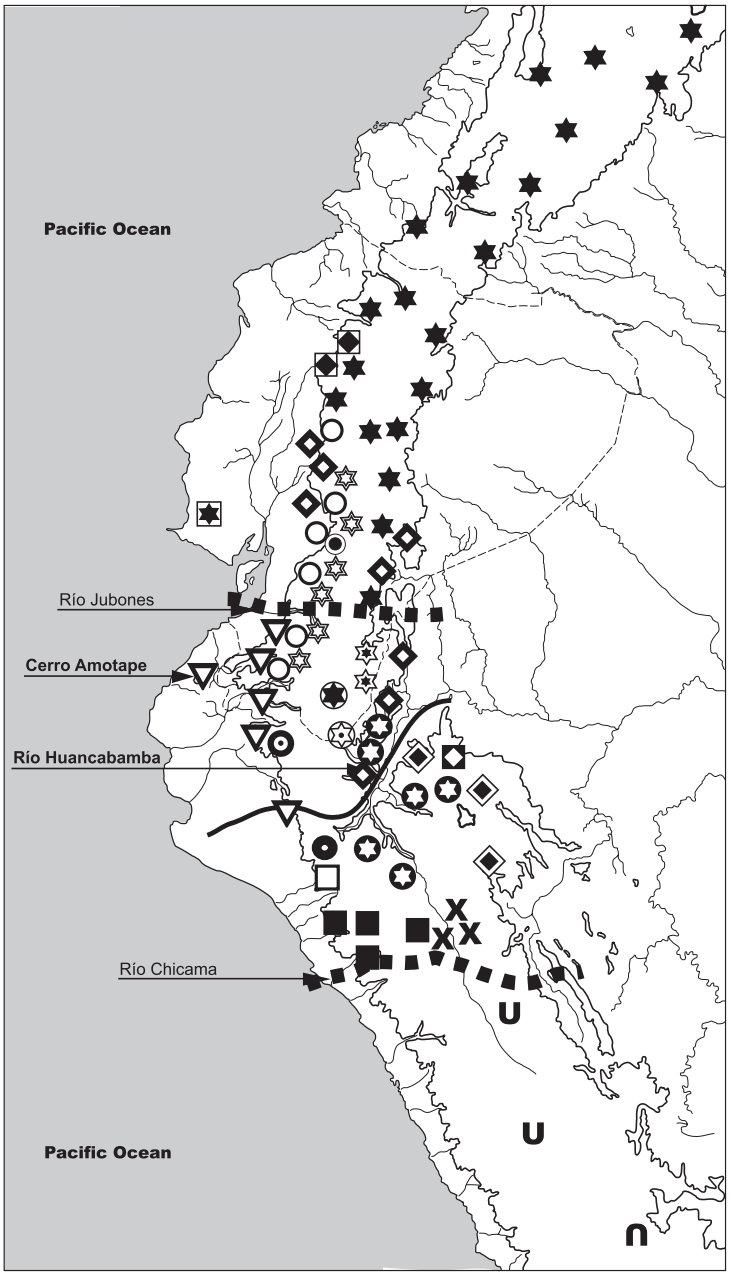

Figure 2.
Distribution patterns of various taxa of the *Nasa triphylla* group and *N. poissoniana* group (*Nasa* ser. *Saccatae*) in the Amotape-Huancabamba Zone and adjacent areas, modified from Weigend (2002). *N. triphylla* group: *Nasa bicornuta* (inverted triangles), *N. humboldtiana* (4 subspecies – subspecies *roseoalba*: white circle with bold margin; subspecies *humboldtiana*: black circle in white circle; subsp. *tricolor*: black dot in white circle in black circle, subsp. *obliqua*: white dot in black circle), *N. triphylla* (7 subspecies – stars and all combinations with stars, not differentiated), *N. dyeri* (2 subspecies – subsp. *dyeri*: white rhomboid in black rhomboid; subspecies *australis*: black rhomboid in white rhomboid), *N. aequatoriana* (black rhomboid in white square) and *N. colanii* (white rhomboid in black square) and *N. pteridophylla* (2 subspecies: subsp. *pteridophylla*: black squares; subsp. *geniculata*: empty square), new species from La Libertad (**X**). *N. poissoniana* group: northernmost taxa of the *N. poissoniana* group (*N. cf. poissoniana*: **U**; *N. vargasii*: inverted **U**).

Methods

Weigend (2002) was based on the revision of copious herbarium material (Dostert & Weigend, 1999; Rodríguez & Weigend, 1999; Weigend, 1998, 2000a, b; Weigend & Rodríguez 1998; Weigend et al., 1998) and field studies in all relevant provinces of Ecuador and the departments Amazonas, Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca, Cuzco, Huánuco, Huancavelica, Ica, Junín, La Libertad, Lambayeque, Lima, Moquegua, Pasco, Piura, Puno, San Martín and Tacna of Peru. Since then additional publications on particular species groups have been published (Jørgensen & Weigend, 2004; Rodriguez et al., 2002; Skrabal et al., 2001; Weigend, 2004; Weigend & Rodriguez, 2002; 2003; Weigend et al., 2004a) and a first phylogeny of Loasaceae subfam. Loasoideae has been provided, elucidating some relationships within the genus *Nasa* (Weigend et al., 2004b).

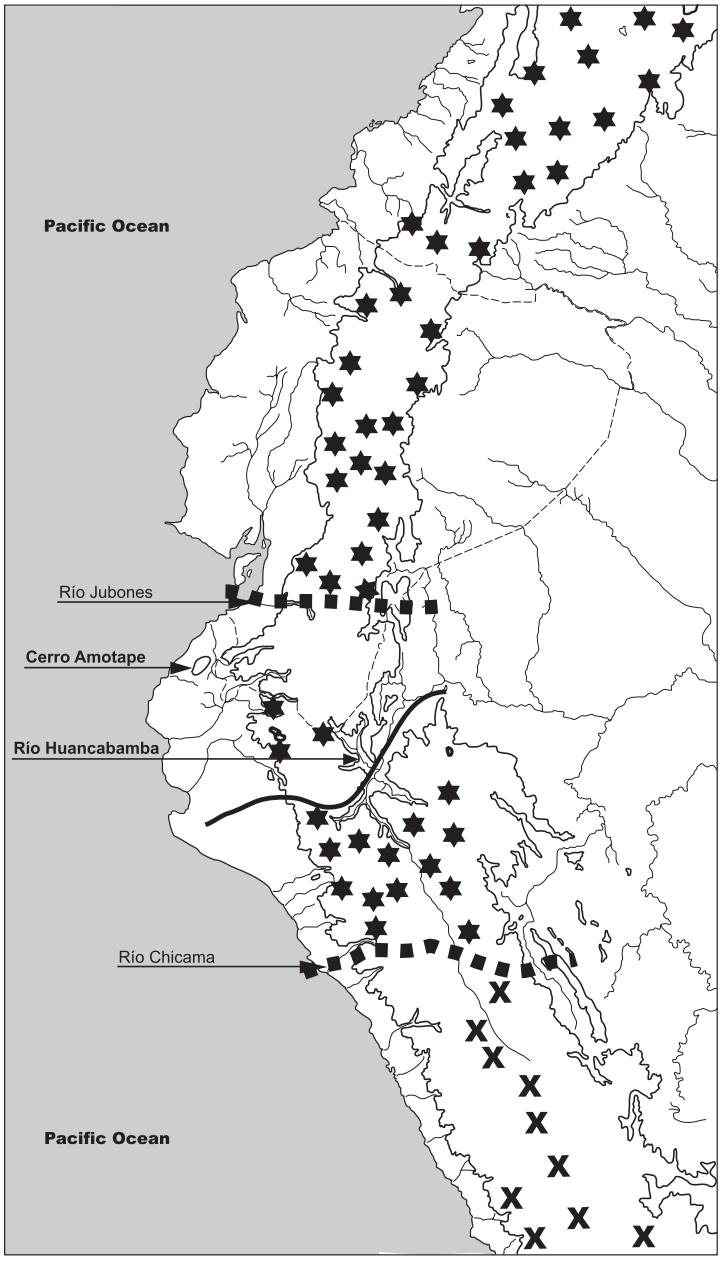

Figure 3. Distribution patterns of *Ribes andicola* group (stars) and *R. viscosum* (X) in the Amotape-Huancabamba Zone and adjacent areas.

Additionally, new collections in the department Cajamarca (Provinces Monte Seco, San Miguel, Santa Cruz) were made in 2003, complementing some distribution data. In Weigend (2002) the southeastern limit of the Amotape-Huancabamba Zone was only tentatively defined, since large parts of the crucial area were completely unknown (department La Libertad, province Pataz & Sánchez Carrión; San Martín, province Mariscal Cáceres) or incompletely known (department Ancash, province Síhuas). However, A. Sagástegui A. (Universidad Antenor Orrega, Trujillo) together with E. Rodriguez R. (Universidad Nacional de Trujillo, Trujillo) carried out field studies in that area in 2003 and these collections were complemented by my own field studies in that region in 2004, largely closing this gap.

Results

The *Nasa triphylla* complex has its centre of diversity in the Amotape-Huancabamba Zone (Dostert & Weigend, 1999, Weigend, 2002; Fig. 2). Rodriguez et al. (2002) report the presence of *Nasa dyeri* (Urb. & Gilg) Weigend subsp. *dyeri* from Cajamarca, province San Ignacio, a taxon previously only known from Ecuador. Its neighbouring subspecies *australis* Dostert & Weigend was described from the E part of the Amotape-Huancabamba Zone (Dostert & Weigend, 1999), so that both subspecies of the species are now known from the Amotape-Huancabama Zone, underscoring the fact that the *Nasa triyphylla* complex likely diversified in this area, and some taxa subsequently migrated northwards (Weigend et al., 2004b).

Moreover, a new southernmost species (*Nasa cf. triphylla* spec. nov. ined.) of the complex has now been discovered in La Libertad, province Sánchez Carrión (M. Weigend & Ch. Schwarzer 7913 - HUT, B, USM) and province Pataz (A. Sagastegui A. et al. 17255, 17251 - HAO, HUT, B).

The *Nasa poissoniana* complex (Weigend et al., 2004b; Fig. 2) is a group of some 7 species, around *N. poissoniana, N. ferruginea* and *N. vargasii*, all of which were described from the departments Apurímac, Cuzco and Puno. Recent collections brought material closely allied to *N. vargasii* from the department of Huánuco (province Ambo: Weigend et al. 5463 – HUT, B, USM) and a species closely allied to *N. poissoniana* from La Libertad, province Pataz (M. Weigend & Ch. Schwarzer 8007 - HUT, B, USM) and Ancash, province Piscobamba (M. Weigend et al. 5114 - HUT, B, USM). This shows that the *N. poissoniana* complex is not restricted to southern Peru at all, but is widespread in interandean valleys to the north of Peru.

Looking more closely at the distribution patterns and ecology of the *N. triphylla* and the *N. poissoniana* complexes it becomes clear, that they are ecologically very similar, and their distributions are mutually exclusive, with the *N. triphylla* complex finding its southern limit on the northern part of the province Pataz and the *N. poissoniana* complex finding its northern limit in the southern part of the province Pataz. The pass height between Parcoy and Buldibuyo marks the limit between these two groups.

A very similar pair of species/species groups is found in *Ribes* with the *Ribes andicola* group widespread from Venezuela to North of Peru, with a centre of diversity (ca. 4 undescribed species) in the Amotape Huancabamba Zone and *Ribes viscosum* replacing it further south (Weigend & Binder, 2001; Fig. 3). The precise distribution limits were not known until recently, but the new collections showed that *Ribes andicola* s.l. abounds on the ascent from Parcoy to the pass height towards Buldibuyo (province Pataz, M. Weigend & Ch. Schwarzer 7934 – HUT, B, USM), and is immediately replaced by *R. viscosum* on the southern side of the pass between Buldibuyo and Tayabamba (province Pataz, M. Weigend & Ch. Schwarzer 8012 – HUT, B, USM).

Nasa picta (Hook.f.) Weigend subsp. *picta* of *Nasa* ser. *Saccatae* is very widespread in northern Peru and occurs in most of the Amotape-Huancabamba Zone, it is replaced by subsp. *pamparomasii* in the Cordillera Negra (Weigend & Rodriguez, 2001). The southeastern limit of this taxon was until recently believed to be in department Amazonas, province Chachapoyas. However, recent collections provided ample material from department La Libertad, province Pataz (E. Rodriguez R. & V. Medina I. 2567, 2555, A. Sagástegui et al. 17220, 17264, 17417 – HAO, HUT, B), while further southeast of that region the taxon seems to be absent.

Nasa ser. *Alatae* is a speciose group of taxa, which is largely restricted to cloud forest habitats on the eastern side of the Andean cordillera in Peru in most of the country.

However, there are a few taxa on the western slope and in relic forests in interandean valleys in northern Peru (Weigend, 2000a; 2004; Fig. 4), so that this apparently originally eastern species group has here entered and crossed the Andes in westerly direction and given rise to endemic taxa on the western slope (*N. dillonii* Weigend, *N. sagasteguii* Weigend, *N. lambayequensis* Weigend, *N. pongalamesa* Weigend). Recent collections in Cajamarca revealed some species from other plant groups on the western slope of the Andes, which were previously thought to be restricted to the eastern slope, amongst these are *Passiflora viridescens* L.Escobar (T. Henning & C. Schneider 192 – B, HUT) from the province of San Miguel and *Bomarea distichifolia* (Ruiz & Pav.) Baker (M. Weigend et al. 7250 – USM). A closer investigation of the flora of the region, especially the forest fragments and the dry valleys, will undoubtedly reveal additional taxa from the eastern slope as occurring on the western side of the Andes as well.

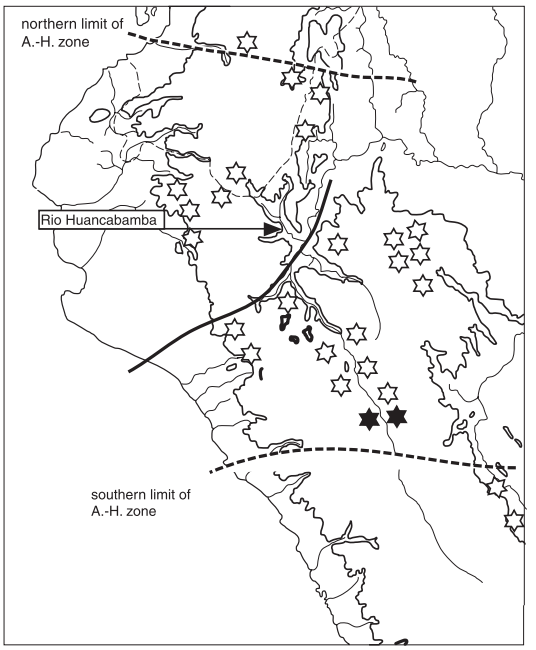

Figure 4. Distribution of *Nasa* Ser. *Alatae* in the Amotape-Huancabamba Zone, white stars: previously documen-ted distribution (Weigend 2000a, b, 2004), black stars: new records of *Nasa cf. stolonifera*.

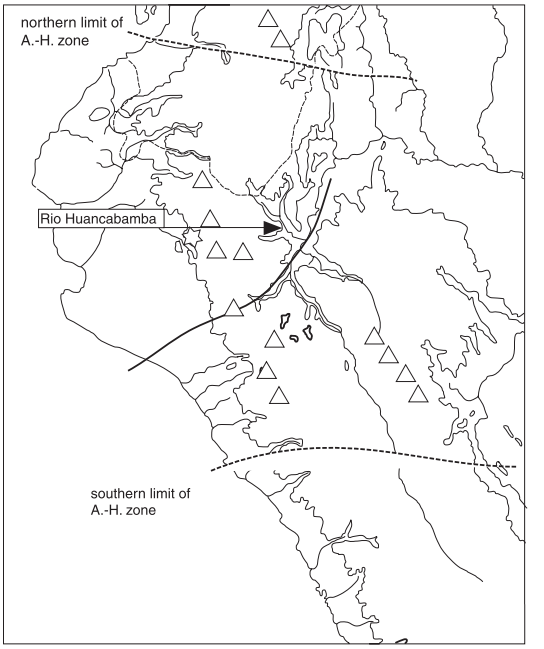

Figure 5. Distribution of the *N. grandiflora* group (*Nasa* Ser. *Grandiflorae*) in the the Amotape-Huancabamba Zone (triangles).

The southernmost taxa of *Nasa* ser. *Alatae* so far reported from interandean valleys were from department Cajamarca, province Celendín (*N. urentivelutina* Weigend) and department La Libertad, province Bolívar (*Nasa stolonifera* Weigend). Recent collections provided various collections of a taxon closely allied to *N. stolonifera* from the department La Libertad, province Sánchez Carrión (M. Weigend & Ch. Schwarzer 7910 – HUT, B, USM) and province Bolivar (E. Rodriguez R. & V. Medina I. 2557, 2559, 2610 - HUT, HAO, B), considerably extending the limit southwards. South of that area *Nasa* ser. *Alatae* is apparently entirely restricted to the eastern slope of the Andes [*Nasa lenta* (Urb. & Gilg) Weigend, *N. pascoensis* Weigend].

The *Nasa grandiflora* group is quite speciose in Ecuador and Colombia, and has only three species in Peru (Rodriguez & Weigend, 1999; Weigend & Rodriguez, 2003; Fig. 5), all three species are endemic to the Amotape-Huancabamba Zone in Peru and two of the taxa are endemic to the northernmost

outliers of the Cordillera Central in this region (department Amazonas, province Chachapoyas), underscoring the relationships of even the interrupted eastern cordillera with the Northern Andes in this region.

Conclusions

The scattered data here presented on *Ribes* (Grossulariaceae) and Loasaceae underscore the conclusions drawn by Weigend (2002). There is now additional evidence for the isolation of the flora of the Amotape-Huancabamba Zone and the characteristic distribution patterns indicated in Weigend (2002) are further documented by the new collections. The southern limits of the Amotape-Huancabamba Zone can now be drawn most accurately. The limit runs in slightly southeasterly direction from NE of Otuzco (department La Libertad, province Otuzco, Río Chicama drainage system: S 07° 50,315´, W 078° 29,076´) to the mountain pass between Parcoy and Buldibuyo (department La Libertad, province Pataz, N of the Río Cajas: S 08° 04,619´, W 077° 25,457´). The crucial groups typical of the inneranden part of the Amotape Huancabamba Zone (*N. triphylla* group, *N.* ser. *Alatae, Ribes andicola* group, *Nasa picta* subsp. *picta*) find their southeastern distribution limit in the northern part of the province Pataz, and are replaced by their southern counterparts (*N. poissoniana* group, *Ribes viscosum*) immediately south of this pass height.

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