The Biological Reserve of San Francisco (Ecuador): revision of the syntaxonomy and nomenclature of the vegetation

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After a revision of the syntaxonomy and nomenclature made by R.W. Bussmann of the vegetation of the Reserva Biológica San Francisco, Cordillera Oriental, in the south of Ecuador, new syntaxa and new names are proposed.

Keywords: ICPN application, Ecuadorean tropical forests, Páramos, Bunchgrasses, Nectandro laurel-Licarietea canellae, Miconio jahnii-Weinmannietalia pinnatae, Gaultherio glomeratae-Puyetalia nitidae, Hesperomelo ferruginae-Weinmannietea reticulatae.

INTRODUCTION

At the end of the 1990s, Rainer W. Bussmann made a detailed analysis of the Andean vegetation in the south of Ecuador, in the area around the Biological Reserve of San Francisco, which is located in the Cordillera de Consuelo (part of the larger Cordillera Real or Cordillera Oriental), on the eastern slopes of the Andes in the province of Zamora-Chinchipe. His study concentrated on the altitudinal belt ranging from 1,800 to 3,150 m and dealt with different kinds of vegetation: low to high forests (which he identified with the so-called jalca) and the scrub and grass formations peculiar to the paramos. His study included more than 300 relevés which, when arranged into tables, provide evidence for the description of a score of associations and a large number of higher ranked syntaxa. These descriptions are accompanied by vegetation transects and references to the soil type of the plant communities.

R.W. Bussmann published the results of his research at different times and by different means. At all events, his studies constitute the first phytosociological approach to the vegetation of the south of Ecuador, particularly of the complex tropical forests which are very rich in species.

In recent years I have conducted field work in the southern part of the Andes in Ecuador, in the provinces of Azuay, Loja and Zamora-Chinchipe. The results of my research led me to revise the syntaxonomical and nomenclatural contributions made by R.W. Bussmann and to produce a new set of proposals which I put forward in this article.

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MATERIALS AND METHODS

For my analysis I have relied on the different studies on the Andean vegetation in the area around the Biological Station of San Francisco carried out by R. W. Bussmann. The first mention of this vegetation was in the book of abstracts of the Congreso sobre la Conservación de la Biodiversidad de los Andes y la Amazonía (Bussmann & Lange, 2001). The fully developed paper was published the following year in digital form (Bussmann, 2002a) and printed in the Herbario LOJA series (Bussmann, 2002b). A year later, new publications reproduced almost exactly these previous papers in the digital journal Lyonia (Bussmann, 2003a) and in paper form (Bussmann, 2003b). Although there are other publications on the vegetation in the area surrounding the Biological Station, none of them present syntaxonomical proposals (Bussmann, 2005, 2008).

The nomenclatural analyses are based on the International Code of Phytosociological Nomenclature (ICPN) (Webber & al., 2000), which came into effect on 01/01/2002.

The analysis follows the ICPN cascade procedure, namely: effective publication and valid publication regardless of other non-applicable options. For a valid consideration, the following criteria were taken into account: if the original diagnosis is sufficient and, more precisely, if the ranks above the rank of association include a syntaxon of the next subordinate principal rank assigned to it and published with a valid name (Art. 2b, Art. 8, Art. 17); if it is clear from what taxon name(s) (species or infraspecific taxa) it is formed (Art. 3g); if it has been published and indicated expressis verbis as new (Art. 3i); if the name includes at least the name of a plant of the highest dominant stratum (Art. 3k, Art. 29b); if typification is correct (Art. 3o); if the term typus (holotypus, lectotypus, neotypus) is indicated expressis verbis (Art. 5); if the type relevé contains the name or names used for the construction of the name-giving taxon (taxa) (Art. 16). Following the ICPN, the names published invalidly according to articles 2-9 are treated as not published names (Def. IV).

Provisional names have been omitted in the analysis, since the ICPN (Art. 3b) regards them as invalid. The names of subassociations have not been analysed either. These are all invalid, as stipulated by Article 5. Finally, the proposals of facies, a rank not affected by the ICPN (Principle II), have also not been considered.

RESULTS AND DISCUSSION

SYNTAXONOMICAL AND NOMENCLATURAL ANALYSIS

The book of abstracts (Bussmann & Lange, 2001) is an effective publication in all respects (ICPN Art. 1). However, it contains no precise nomenclatural proposals. The next publication of the research was in the form of a CD-ROM (Bussmann, 2002a), but an electronic publication fails to comply with the requirements for an effective publication (Art. 1). The publication by the herbarium LOJA (Bussmann, 2002b), dated after 01/01/2002, complies with the requirements for an effective print publication as stated in Article 1. The proceedings about the conservation of biodiversity of Andes and the Amazon (Bussmann, 2003a) in paperback complies with the requirements for an effective publication according the Art. 1 of the ICPN. Finally, for the publication of the research in the journal Lyonia (Bussmann, 2003b), it must be pointed out that “Lyonia is an electronic, peer-reviewed, interdisciplinary journal...” and, consequently, it also fails to meet the requirements for an effective publication (Art. 1) and its nomenclatural proposals are deemed not published (Definition III). Consequently, the only publications with concrete syntaxonomical proposals are those included in the Herbario LOJA (Bussmann, 2002b) and the hard copy with the contributions to the Congress in Cuzco (Peru; Bussmann, 2003a), which provide, without distinction (they both contain the same syntaxonomical proposals), the basis for this analysis.

The phytosociological behaviour and the distribution of species were analysed in order to compose the new names and arrange the lists of characteristic species.

For a better understanding of the analysis, I have followed the same descriptive model used in the mentioned publications.
Low mountain belt

Forests located between 1,800-2,150 m, usually in inaccessible valleys and on 30-50% slopes with an annual average rainfall of 2,500 l/m²/year. Table 1 (columns 48-58 excluded) gives a depiction of these forests. They have 2-3 tree strata with the highest one reaching 25-30 m in height. The tree canopy presents an average covering rate of about 75%, the scrub stratum of 50% and the grass stratum of 35%. These forests are very rich in species, particularly in epiphytes and trees, with more than 300 species in both cases in the Table of this unit. Two thirds of the relevés contain more than 100 species and have an average number of 70 species.

Graffenriedo emarginatae-Clethretum revolutae Izco ass. nova
(Nectandro acutifoliae-Endlicherietum sericeae, BUSSMANN 2002b, Tab. 1, cols. 1-11. Invalid name: Arts. 3o, 5 and 16).
Holotypus: BUSSMANN 2002b, Tab. 1, rel. 175.

Pruno opacae-Alchorneetum pearcei Izco ass. nova
(Alzateetum verticillatae typicum and Alzateetum verticillatae Elaphoglossum cuspidatum facies, Bussmann 2002 b, Tab. 1, cols. 12-27. Invalid names: Arts. 3o and 5).
Holotypus: BUSSMANN 2002b, Tab. 1, rel. 157.

Chusqueo dombeyanae-Dictyocarietum lamarc-kiani Izco ass. nova
(Alzateetum verticillatae-Dictyocaryetum lamarckiana, BUSSMANN 2002b, Tab. 1, columns 28-30. Invalid name: Arts. 3f, 3o and 5).
Holotypus: BUSSMANN 2002b, Tab. 1, rel. 2.

Mauro membranifoliae-Podocarpion sprucei Izco all. nova
(Alzation [errore, recte Alzateion] verticillatae, BUSSMANN 2002b, Table 1, cols. 1-33). The text does not clearly indicate the characteristic or differential species. The wording suggests that the list of characteristic taxa provided corresponds to the order. However, the inclusion of a series of species in a box in Table 1, under the heading “Ch Alzation verticillatae”, can be accepted as compliant with the requirements of Art. 8, paragraph 2. Invalid name: Arts. 2b, 3o, 5 and 8 paragraph 1.
Holotypus: Graffenriedo emarginatae-Clethretum revolutae Izco

Tibouchino lepidotae-Cecropietum montanae Izco ass. nova
(Cecropio montanae-Isertiuetum laevis, BUSSMANN 2002b, Tab. 1, cols. 34-47. Invalid name: Arts. 3i, 3o and 5).
Holotypus: Bussmann 2002 b, Tab. 1, rel. 187.

Tibuchino lepidotae-Vismion tomentosae Izco all. nova
(Cecropio montanae-Isertiuetum laevis, BUSSMANN 2002b, Tab. 1, cols. 34-47. Invalid name: Arts. 2b, 3o, 5 and 8).
Holotypus: Tibuchino lepidotae-Cecropietum montanae Izco.
The vegetation is first-colonizing wood clearings and made up of fast-growing trees and large-sized shrubs belonging to Mauro membranifoliae-Podo-carpion sprucei.
Characteristic species. Alchornea grandiflora, Cousapea villosa, Cecropia montana, Cecropia polyphle-bia, Tibuchina lepidota, Vismia tomentosa.

Nectandro laevis-Clusietalia emarginartae Izco ord. novus
(Alzateetalia verticillatae, BUSSMANN 2002b. Invalid name: Arts. 2b, 3o, 5 and 8).
Holotypus: *Maurio membranifoliae-Podocarpion sprucei* Izco

Characteristic species. The order shares characteristic species with the alliances *Maurio membranifoliae-Podocarpion sprucei* and *Tibuchino lepidotae-Vismion tomentosae*. In addition, the following characteristic trees: *Clusia magnolifolia emarginata*, *Cyathea caracasana*, *Eleagia karstenii*, *Graffenrieda emarginata*, *Hyerominia marizii*, *Naucleopsis glabra*, *Nectandra laevis*, *Prumnopitys montana*. Epiphytes: *Anthurium breviscapum*, *Anthurium truncicola*, *Asplenium harpeodes*, *Dryadella perpusilla*, *Pitcairnia riparia*, *Peperonia eburnea*, *Polypodium subandinum*, *Racinaea manticola*.

Nectandro laurel-Licarietea canellae Izco classis nova
Holotypus: *Nectandro laevis-Clusietalia emarginatae* Izco

Characteristic species. The class shares characteristic species with the order *Nectandro laevis-Clusietalia emarginatae* (Art. 8). Also are characteristic the following trees and epiphytes: *Guzmania killipiana*, *Licaria canella*, *Mauria heterophylla*, *Mauria sempervirens*, *Nectandra laurel*, *Persea caerulea*, *Pouteria bangii*, *Terpsicore dependens*, *Trichila maynasiana*, *Weinmannia pubescens*.

Incertae sedis

Brachyoto campanulare-Axinaeetum quitensis Izco ass. nova

(Axineo quitensis-Dicranopteretum flexuosae, BUSSMANN 2002b, Tab. 1, cols. 48-58. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002b, Tab. 1, rel. 88.

This is a scrub formation found in the altitudinal range peculiar to low mountain forests, with a low number of species and a low tree cover rate (*Cletrakajifolia*, *Miconia rivetii*, *Clusia magnifolia*, *Graffenrieda emarginata*). The species of *Nectandro laurel-Licarieta canellae* are so rarely found that no link with the class can be claimed.

High mountain belt

Tables 2, 3 and 4 (BUSSMANN, 2002b) give the results of the analysis at this level. This vegetation is found between 2, 100 and 2, 650/2, 750 m asl and made up of “one single tree stratum of 5-10 m in height, very seldom reaching 15 m”. As can be seen in the relevés of Table 2, the total floristic richness is not as high as in the lower belt, with less than 200 tree species as a whole and a lower average number of species per relevé. The number of epiphytes is still high, with about 250 species. Orchids are extremely abundant, particularly those of the genera *Lepanthes* and *Pleurothallis*, and the same is true of some epiphytic polypodiaceae (*Terpsichore* and *Melproneme*).

Table 3 gives a description of some subassociations of *Purdiaeeetum [recte Purdiaeeetum] nutantis*. As mentioned above, these are not dealt with in this analysis. At all events, all these proposals are invalid (Arts. 3o and 5).

Graffenriedo harlingii-Purdiaeetum nutantis Izco ass. nova

(*Purdiaeetum [errore, recte Purdiaeeetum] nutantis*, BUSSMANN 2002b, [Tab. 4]).

There is no table with that number. It presumably corresponds to the table located between numbers 3 and 5, pp. 71-76, cols. 110-125, 133-161. Invalid name: Arts. 3o and 5. The double proposal and corresponding typification of the association *Purdiaeeetum nutantis* and “Purdiaeeetum nutantis –estado de vejez” has no nomenclatural effect. The repetition of species in the table (*Mysrine andina*, *Miconia rivetii*, *Clusia multiflora*, *Clusia eliptica*), with different indices in some relevés are not considered as a cause of invalidation either.

Holotypus: BUSSMANN 2002b, [Tab. 4], pp. 71-76, rel. 6.

Panopsio ferrugineae-Frezieretum canescens Izco ass. nova

(*Clusietum latipes*, BUSSMANN 2002b, [Tab. 4], cols. 1-63, 126-132. Invalid name: Arts. 3o and 5). The repetition of species in the table (*Myrsine andina*, *Miconia rivetii*, *Clusia multiflora*, *Clusia eliptica*) with different indices in some relevés is not considered a cause of invalidation.

Holotypus: Bußmann 2002b, [Tab. 4], pp. 71-76, rel. 285.
Schefflero pentandrae-Cinchonion mutisii Izco ord. nov
(Purdiaenion nutantis, BUSSMANN 2002b, [Tab. 4], pp. 71-76, cols. 110-161. Invalid name: Arts. 2b, 3o, 5 and 8).

Holotypus: Graffenriedo harlingii-Purdiaetum nutantis Izco
Characteristic species: Cinchona mutisii, Freziera canescens, Graffenrieda harlingii, Guzmania diffusa, Guzmania vanvolxemii, Manettia pichinchensis, Maxillaria kingii, Miconia rivetii, Myrsine andina, Schefflera acuminata, Schefflera pentandra, Schefflera sodiroi, Symploco coriacea.

Miconio jahnii-Weinmannietalia pinnatae Izco ass. novus
(Purdiaeetalia [errore, recte Purdiaetalia] nutantis, BUSSMANN 2002b, [Tab. 4], pp. 71-76, cols. 1-63, 110-161. Invalid name: Arts. 3k, 3o and 5).

Holotypus: Schefflero pentandrae-Cinchonion mutisii Izco
Characteristic species: Clusia daucoides, Clusia multiflora, Cyathea straminea, Dendrophthora densiflora, Disterigma alaternoides, Faramea flavicans, Geonoma densa, Graffenrieda emarginata, Nepanthes numularia, Masdevallia carruthersiana, Miconia jahnii, Miconia tinifolia, Ototoglossum breviflorum, Panopsis ferruginea, Persea mutisii, Purdaea nutans, Semiramisia speciosa, Schefflera ferruginosa, Terpsichore asopteris, Tibaudia floribunda, Tristerix longebracteatus, Weinmannia elliptica, Weinmannia pinnata.

Incertae sedis

Table 2 includes 63 relevés taken at altitudes ranging from 2,050 to 2,550 m asl. These relevés support the idea of numerous subassociations of Neurolepietum [recte Neurolepidetum] elatae. In these subassociations the grass stratum reaches 100% of the cover rate of all the relevés in the Table, mostly due to Neurolepis elata, a small-sized bamboo, 3 m high, which is present in 70% of the relevés and has a cover rate of ≥ 3. On the other hand, the tree stratum has an average cover rate of 27% for all the relevés considered globally, although 70% of them present a cover rate ≤ 25%.

However weakly, these data support the application of Articles 10 and 29 for syntaxon names making use of names of taxa from the lower stratum under a higher stratum exhibiting a cover rate over 25%, or equivalently, a minimum value of 3 on the Braun-Blanquet abundance-dominance scale. According to Article 3k, such names are invalid. However, it must be said that the names of the association and its subassociations are also invalid because the requirements mentioned in Articles 3o and 5 are not met.

Neurolepidio elatae-Purdiaetum nutantis Izco ass. nova
( Neurolepietum elatae, BUSSMANN 2002b, Tab. 2, cols. 1-63. Invalid name: Arts. 3k, 3o and 5).

Holotypus: BUSSMANN 2002b, Table 1, rel. 161.

Andean Ceja forest

This kind of vegetation corresponds to a part of what BUSSMANN (2002b) calls Jalca, subalpine forest or Andean Ceja. These are highly dense and intricate belt, small-sized scrub formations with a very rich epiphytic stratum and a grass stratum with low or medium cover rate (< 50%). These plants are usually located between 2,750 (exceptionally, communities at lower altitudes too) and a little over 3,000 masl. The Rynchosporetum kunthii community, with species peculiar to flooded soils, is not included in this vegetation group. The community also fails to comply with the requirements to have a valid name and its presence in the Table is probably conditioned by the size of the sampling area, 225 m² in all cases.

Geissantho vanderwerffii-Panopsietum ferrugineae Izco ass. nova
(Clusio ellipticae-Weinmannietum cochensis, BUSSMANN 2002b, Tab. 5, cols. 1-15. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002 b, Table 5, rel. 200.

Brachyoto andreani-Axinaeetum macrophyllae Izco ass. nova

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The relevés ascribed to this association in Table 5 differ considerably from those of the associations Geissantho vanderwervfi-Panopsietum ferrugineae and Brachyotum andreanum-Axinaeetum macrophyllae as is clearly revealed by the absence or very rare presence of trees and shrubs and the high number of characteristic grasses belonging to the order and the class.


Very compact shrub-like communities in well-developed stages but relatively sparse in juvenile stages with many small-sized trees; immature formations and those in wind-swept places host many of the species of the arbustive páramos located at higher altitudes. The class is found at 2,500 to 3,000 m on the eastern side of the southern Ecuadorian Andes. Characteristic species: those of the order Freziero karstemiana-Weinmannietalia cocheni.

Páramo belt

This vegetation is found at relatively high altitudes (from 2,750 to 3,100 masl, which corresponds to the low páramo). The cover rate of the grass stratum is very high, over 80-90%, and reaches 100% in 62% of the relevés. As is usually the case in a typical pajonal, perennial species are dominant. The floristic richness of this stratum is also worthy of note. The scrub stratum covers 10-30% of the surface and there is no tree stratum.
Holotypus: BUSSMANN 2002b, Table 6, rel. 134. Puyo eryngioidis-Chuquiragion jussieui Izco all. nova (Puyo [errore, recte Puyion] eryngioidis. BUSSMANN 2002b, Tab. 6, cols. 22-42). The association Puyetum nitidae (Tab. 6, reLS. 43-45) proposed by Bussmann is excluded from the alliance. The presence of Isoetes ecuadorensis, Isolepis inundata, Pinguicula calyptrata, Ranunculus peruvianus, etc., together with species of relatively dry environments reveals that these relevés belong to a different kind of vegetation, peculiar to peaty, flooded soils. Probably the area of the sampled sites (225 m² in all the cases) has something to do with this fact, because they include vegetation mosaics. Invalid name (Arts. 2b, 3o, 5, 8).

Holotypus: Puyo eryngioidis-Calamagrostietum intermediae Izco
Characteristic species: Bomarea brachysepala, Bomarea uncifolia, Chuquiraga jussieui, Gaultheria manigera, Gaultheria tomentosa, Lupinus interflorens, Puya eryngioides, Puya nitida.

Gaultherio glomeratae-Puyetalia nitidae Izco ord. novus (Neurolepio-Puyetalia, BUSSMANN 2002b, Tab. 6, cols. 22-42). Gynoxion [errore, recte Gynoxydion] cuicochensis excluded. The original name does not indicate the specific epithets, nor is it evident which one must be used, because Neurolepis laegaardii, N. weberbaueri, N. nana, N. asymetrica, N. aristata are present in Table 6, but Puya eryngioidis and P. nitida are also mentioned. Invalid name: Arts. 2b, 3g, 3o, 5 and 8.

Holotypus: Puyo eryngioidis-Chuquiragion jussieui Izco
Characteristic species: those of the alliance Puyo eryngioidis-Chuquiragion jussieui and Chusquea perligulata, Chusquea tesselata, Dorobaea pimpinellifolia, Gaultheria amoena, Gaultheria glomerata, Huperzia hypogea, Neurolepis asymetrica, Oritrophium peruvianum, Rumex tolimensis, Papalanthus meridensis.

Incertae sedis, páramo belt

In the paramo belt Bussmann (2002b) describes a series of associations differing from the others included in Table 6. Their ascription to higher ranks requires further information for an adequate systematic arrangement.

Neurolepidio laegaardii-Geonometum weberbaueri Izco ass. nova (Neurolepio [errore, recte Neurolepidio] laegaardii-Geonometum weberbaueri, BUSSMANN 2002b, Tab. 6, cols. 1-3. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002b, Tab. 6, rel. 128.

Neurolepidio laegaardii-Brachyotetum campanulare Izco ass. nov (Neurolepietum laegaardii, Bussmann 2002b, Tab. 6, cols. 4-11. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002b, Tab. 6, rel. 226.

Both plant communities, Neurolepio laegaardii-Geonometum weberbaueri and Neurolepio laegaardii-Brachyotetum campanulare, subordinate to the alliance Neurolepon [errore, recte Neurolepidion] laegaardii (BUSSMANN 2002 b), seem to correspond to a kind of vegetation different from the achupallales of Puya eryngioides and Puya nitida. There is even doubt as to whether both associations belong to the same vegetation group. The nomenclatural proposal of the alliance is nevertheless invalid (Arts. 2b, 3o, 5 and 8).

Neurolepidio laegaardii-Chusqueetum loxensis Izco ass. nova (Gynoxietum cuicochensis, BUSSMANN 2002b, Tab. 6, cols. 12-16. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002b, Table 6, rel. 230.

Neurolepidio aristatae-Chusqueetum leonardiori Izco ass. nova (Neurolepietum [errore, recte Neurolepidetum] aristatae, BUSSMANN 2002b, Tab. 6, cols. 17-21. Invalid name: Arts. 3o and 5).

Holotypus: BUSSMANN 2002b, Tab. 6, rel. 147.

These last two associations, subordinate to the alliance Gynoxyon [errore, recte Gynoxydion] cuicochensis in the publication by BUSSMANN (2002b), differ from the others included in Table 6. Regardless of any possible relationship bet-
ween the two, integration into higher units requires further investigation. The nomenclatural proposal of the alliance is nevertheless invalid (Arts. 2b, 3o, 5 and 8).

CONCLUSIONS

Of R. W. Bussmann’s published contributions on the vegetation of the Estación Biológica San Francisco, on the eastern slopes of the Andes which include syntaxonomical proposals, only two (BUSSMANN, 2002b, 2003a) meet the requirements for an effective publication (ICPN Art. 1). As stated in the both publications, the publication date of the contribution is > 1.1.2002. In all cases, the nomenclatural proposals are accompanied by the word “holotípo” and, therefore, they fail to comply with the rigorous requirements demanded by the ICPN Arts. 3o and 5: “On or after 1.1.2002 the Latin word ‘typus’ (‘holotypus’, ‘lectotypus’, ‘neotypus’) is to be used expressis verbis for the designation of the type of a syntaxon name” . In some cases the requirements stated in Articles 2b, 3f, 3g, 3i, 3k, 8, 16 and 17 are not met either. The mere non compliance with Articles 3o and 5 means that the proposal is invalid and, according to Definition IV, invalid names must be treated as “not published names”, which justifies new proposals for adequate naming of syntaxa. The subassociations proposed in Bussmann’s works are also invalid as a result of non compliance with Articles 3o and 5. Some of the associations or high-ranked syntaxa proposed merit complementary documentation before any decision is taken as to their acceptance or rejection.

As a result of the previous observations, propose the following syntaxonomical classification is proposed:

**Low mountain forest belt**

*Nectandro laurel-licarietea canellae Izco classis nova*

*Nectandro laevis-Clusietalia emarginartae Izco ord. novus*  
(Alzteatetalia verticillatae nom. inval.)

*Mauro membranifoliae-Podocarpion sprucei Izco all. nova*  
(Alzation verticillatae nom. inval.)

*Pruno opacae-Alchorneetum pearcei Izco ass. nova*  
(Alzateetum verticillatae typicum nom. inval.)

*Chusqueo dombyanea-Dictyocaricietum lamarckiani Izco ass. nova*  
(Alzateo verticillatae-Dictyocaryetum lamarckianae nom. inval.)

*Graffenriedo emarginatae-Clethretum revolutae Izco ass. nova*  
(Nectandro acaulis-Endlicherietum sericeae nom. inval.)

*Tibouchino lepidotae-Vismion tomentosae Izco ass. nova*  
(Cecropio montanae-Isertietum laevis nom. inval.)

*Brachyoto campanulare-Axinaetum quitensis Izco ass. nova*  
(Axineo quitensis-Dicranopteretum flexuosae nom. inval.)

**Incertae sedis. Low mountain forest belt**

*Brachyoto campanulare-Axinaetum quitensis Izco ass. nova*

**High mountain forest belt**

*Miconio jahnii-Weinmannietalia pinnatae Izco ord. novus*  
(Purdiaeaetalia nutantis nom. inval.)

*Schefflero pentandraceae-Cinchonietion mutisii Izco all. nova*
(Puriaeion nutantis nom. inval.)
Graffenriedo harlingii-Puriaeetum nutantis Izco ass. nova
(Puriaeetum nutantis nom. inval.)
Panopsio ferrugineae-Frezieretum canescentis Izco ass. nova
(Clusietum latipedis nom. inval.)

Incertae sedis. High mountain forest belt
Neurolepidio elatae-Puriaeetum nutantis Izco ass. nova
(Neurolepietum elatae nom. inval.)

Andean Ceja forest
HESPEROMELO FERRUGINAE-WEINMANNIETEA RETICULATAE Izco classis nova
Freziero karstemianae-Weinmannietalia cochensis Izco ord. novus
(Clusio ellipticae-Weinmannietalia cochensis nom. inval.)
Ilici rimbachii-Hedyosmion luteynii Izco all. nova
(Clusio ellipticae-Weinmannion cochensis nom. inval.)
Brachyoto andreani-Axinaeetum macrophyllae Izco ass. nova
(Axinieetum macrophyllae nom. inval.)
Disterigmo pentandri-Chusqueetum loxensis Izco ass. nova
(Chusqueetum loxensis nom. inval.)
Geissantho vanderwerrfi-Panopsietum ferrugineae Izco ass. nova
(Clusio ellipticae-Weinmannietum cochensis nom. inval.)

Páramo belt
Gaultherio glomeratae-Puyetalia nitidae Izco ord. novus
(Neurolepio-Puyetalia nom. inval.)
Puyo eryngioidis-Chuquiragion jussieui Izco all. nova
(Puyon eryngioidis nom. inval.)
Epidendro frigidae-Calamagrostietum intermediae Izco ass. nova
(Epidendretum frigidae nom. inval.)
Puyo eryngioidis-Calamagrostietum intermediae Izco ass. nova
(Puyetum eryngioidis nom. inval.)

Incertae sedis. Páramo belt
Neurolepidio laegaardii-Geonometum weberbaueri Izco ass. nova
(Neurolepio laegaardii-Geonometum weberbaueri nom. inval.)
Neurolepidio laegaardii-Brachyotetum campanulare Izco ass. nova
(Neurolepietum laegaardii nom. inval.)
Neurolepidio laegaardii-Chusqueetum loxensis Izco ass. nova
(Gynoxtetum cuicochensis nom. inval.)
Neurolepidio aristatae-Chusqueetum leonardiori Izco ass. nova
(Neurolepietum aristatae nom. inval.)

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