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Floristic Checklist of the Peruvian *Lomas* Formations
Catálogo florístico de las *Lomas* peruanas

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Abstract

A floristic checklist of the Peruvian *lomas* formations is presented consisting of one Gnetophyta (gymnosperm); 14 families, 68 genera, and 145 species of Liliopsida (monocotyledons); and 68 families, 316 genera, and 701 species of Magnoliopsida (dicotyledons) for a grand total of 83 families, 385 genera, and 847 species. The checklist is but a snapshot of this flora; our sources of records includes many years of field collecting, recording *lomas* plants herbaria in Peru, the United States and Europe. Records are supported with vouchers, of which, the majority are accessible via a searchable database and associated with digitized herbarium images. A brief description of the Peruvian *lomas* formations, a review of historical collecting efforts, and a discussion of factors influencing *lomas* dynamics are presented. Locality maps and a listing of *lomas* formations with approximate coordinates are provided.
Key words: Peru, checklist, *lomas* formation.

Resumen

Se presenta un catálogo floristico de las *lomas* costeras del Perú que consiste de una Gnetophyta (gimnosperma); 14 familias, 68 generos y 145 especies de Liliopsida (monocotiledoneas); y 68 familias, 316 generos y 701 especies de Magnoliopsida (dicotiledoneas), haciendo un total de 83 familias, 385 generos y 847 especies. El catálogo constituye un consolidado de la flora lomal; cuyas fuentes de registros incluyen muchos años de recoleccion de muestras en el campo, asi como consultas en herbarios de Perú, Estados Unidos y Europa. Los registros estan respaldados por colecciones de herbario, de las cuales, la mayoría son accesibles via bases de datos y asociadas con imagenes de herbario digitalizadas. Se presenta tambien una breve descripcion de las *Lomas* peruanas, una revision histórica de los esfuerzos de recolección, y una discusion de los factores que influyen en la dinámica *lomal*. Asi mismo se proporcionan mapas de localidades y una lista de formaciones de *lomas* con coordenadas aproximadas.
Palabras clave: Perú, catálogo, formación *lomal.*

Introduction

For nearly 3500 km along the western coast of South America [5°-30°S latitude], the Peruvian and Atacama deserts form a continuous, hyper-arid belt, broken only by occasional rivers valleys from the Andean Cordillera. Native vegetation of the deserts consists of over 1200 species, many highly endemic and largely restricted to the fog-zone locations or *lomas* formations ("small hills"). The floristic communities of the *lomas* formations essentially function as terrestrial islands separated by hype-arid habitat where virtually no plants exist. In Peru, no fewer than 50 localities have been recognized as unique assemblages, although some are now completely destroyed due to the actions

Fig.1. Localities of coastal *Lomas* Formations in Peru. (Adapted from Dillon 1997)

of expanding human populations. The plants within the *lomas* formations have diverse origins including amphitropic disjuncts, semi-arid Ecuadorian and central Chilean species, montane Andean disjuncts, and many *lomas* endemics.

The phytogeography and ecology of the deserts of western South America have been reviewed in detail (Rundel *et al*. 1991; 2007). While the desert is continuous from Peru to Chile, the topography, climate, and vegetation of each desert is distinct. Aridity is controlled by three climatic anomalies. The first, an abrupt climatic transition both to the north and south resulting in a poorly developed steppe climate along the margins; second, brief periods of heavy rainfall and relatively high temperatures associated with rare, but recurrent, El Niño events (see Dillon 1985, Dillon & Rundel 1990) occasionally affect parts of the desert, bringing wet tropical conditions; and the third, the remarkable temperature homogeneity along the entire latitudinal extent of the deserts. This pattern of temperature stability results from the influence of cool, sea-surface temperatures associated with the south to north flow of the Humboldt or Peruvian Current. Also important is the influence of strong atmospheric subsidence associated with a positionally stable, subtropical anticyclone. The result is a mild, uniform coastal climate with the regular formation of thick stratus cloud banks below 1000 m during the winter months. Where coastal topography is low and flat, this stratus layer dissipates inland with little biological impact, but where isolated mountains or steep coastal slopes intercept the clouds, a fog-zone develops with a stratus layer concentrated against the hillsides. These fogs, termed "*garúa*" are the key to the extent and diversity of vegetation throughout the deserts of the western coast. While the extent of the Peruvian desert actually covers nearly 1600 kms in coastline, the area covered by vegetation, even during exceptional years is less than 5,000 sq. km.

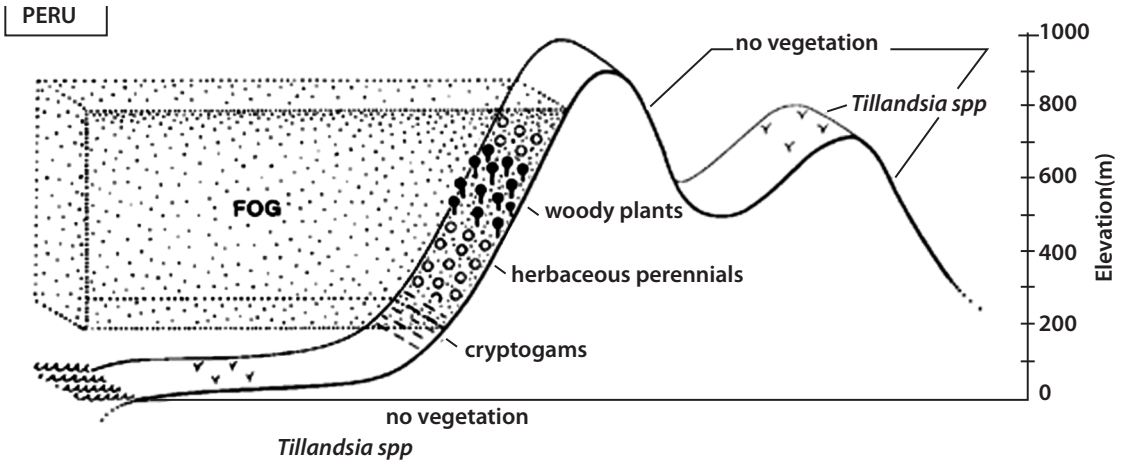

Fig. 2. Diagram illustrating interaction of fog and vegetation in the *Lomas* Formations. (Adapted from Rundel *et al*. 1991)

The *lomas* formations are a clearly delimited ecosystem, unique within the context of South American ecology and floristic composition. Without recurrent El Niño events, those plants that truly needed the recurrent El Niño resources would surely disappear over time. Those that do not need recurrent El Niños for their existence would likely continue to exist, but perhaps at lower populations levels and reduced ranges. Data or observations concerning direct El Niño effects is lacking for most of the coast. El Niño events could also have been active throughout the Pleistocene (+/- 1.8 million years ago).

In addition to El Niño phenomenon, longer-term climatic changes have been associated with glacial cycles (13,000--200,000 year cycles); and there have been at least 20 glacial cycles during the Pleistocene, each of approximately 200,000 years. The formation of glaciers on mountains and poles has caused sea levels to fluctuate dramatically. Estimates of sea level fluctuation range between 400—750 ft (120--230 m) and this lowering would have significantly changed the position of the seashore 18,000 years ago, in relation to that today. This drop would have exposed a considerable area of the continental shelf and displaced *lomas* formations, especially between 5° to 15° S latitude. Glacial cycles would also have had a profound influence on the flora and fauna of the coastal deserts by providing geographic isolation at certain times, and at other times, opportunities for merging species, thereby allowing for gene exchange. Paradoxically, this would have also allowed for fragmenting populations, shifting their ranges in relation to the near-ocean environments, adapting to changing conditions *in situ*, or undergoing range reductions and extinction.

The distribution patterns of *lomas* species can be roughly grouped into broad distributional categories, including (1) pan-tropical or weedy species, (2) long-distance disjunctions from the Sonora Desert or Baja California, (3) species disjunct from the adjacent Andean Cordillera, and (4) plants restricted to the coastal deserts, sometimes in a single locally. Further, the composition of the desert flora may be divided into two broad categories, taxa that are known - "*desert dwellers*"- meaning that they or their near relatives are members of desert communities of North America (Mojave, Sonoran, or Chihuahua Deserts) or semi-arid environments in central South America (i.e., Monte of Argentina). Typical desert dwellers would be Cactaceae or Boraginaceae, among others. These plants have morphological or anatomical adaptations associated with desert existence. -- *They belong in deserts*". Another group would be the -- *non-desert dwellers*" meaning plants that have little in the way of morphological or anatomical adaptations to support their existence in the deserts. Rather, since they are often annuals or short-lived perennials, they flourish

in the deserts when conditions permit, i.e., during high precipitation episodes when water is not a limiting factor. If they have observable adaptive traits, they may well be in the area of enhanced physiological or water use capabilities. They make the most with the available water and may have accelerated maturation patterns. Some weedy species, especially European weeds, find their way into the *lomas* formations, often through the activities of man, these plants usually do not persist, rather they are out-competed rather quickly and go extinct.

Information on breeding patterns, genetic diversity, and speciation patterns in *lomas* plants is largely lacking. The search continues for evolutionary forces or processes responsible for shaping the flora found in the driest place on Earth, western coast of South America. Scientists are just beginning to appreciate the impact of El Niño (ENSO) events upon biological communities; therefore, it is not surprising that little has been written about the evolutionary effects of the phenomenon. The importance of El Niño events on marine communities has been observed with the disruption of the food-chain for marine organisms, most notable marine mammals and birds (Vermeij 1990). The effects of El Niño an event upon terrestrial communities is not as well documented (Dillon & Rundel 1990). In discussing the ecological impacts of El Niño in the eastern Pacific, Vermeij (1990) listed four attributes to be considered in mass extinction events: 1) the variability of ENSO from the norm, 2) frequency of occurrences, 3) severity as regards levels of extinction, and 4) geographic extent. Possible consequences to be considered are: 1) shifts in selection pressures with changing backgrounds, 2) extinction of populations, 3) splitting of populations (vicariance), and 3) founder effects in speciation events (long-distance dispersal).

The *lomas* formations have acted as an important source of fresh water, food, and construction materials for early coastal natives (Beresford-Jones, 2004; Lanning, 1965). The presence of vegetation, often forageable, would have attracted the native camelids, for example, guanaco, and deer, both of which were game for early man. Supplies of seeds and insects would have made *lomas* sites havens for native bird species. The native flora does contain some edible fruits, for example, *Jaltomata* and *Solanum* (~*Lycopersicon*) both members of the Solanaceae family that have tomato-like, edible berries. Edible roots from diverse plant families might also have provided some nourishment which could have been utilized periodically, for example, *Argylia radiata* (Bignoniaceae), *Begonia octopetala* (Begoniaceae), *Oxalis dombeii* (Oxalidaceae), *Solanum montanum* (Solanaceae) and *Tropaeolum peltophorum* (Tropaeolaceae). Agriculture may also have been practiced at some locations, especially during exceptional years associated with El Niño events. Today, crops are cultivated in the *lomas* formations when opportunities are provided by increased available moisture. Corn was planted at Cerro Cabezón in northern Peru during an El Niño event in March 1998, and both corn and wheat were cultivated in the *lomas* between Moquegua and Tacna in 1983.

The influence of man on the *lomas* formations, especially over the last 1500 years, should not be underestimated. Many native woody species have been severely depleted for firewood and construction.

It may be assumed that native tree species, such as *Caesalpinia spinosa* (tara), *Carica candicans* (mito), or *Myrcianthes ferreyrae* had wider distributions and larger populations prior to the arrival of man. The removal of woody vegetation most certainly would have changed the extent of herbaceous plants a profound effect on the current composition. Movement of livestock between the interior and coast has led to the introduction of many Andean weeds. Historical introduction of alien or exotic species, such as Australian trees (*Eucalyptus* and *Casuarina*), has changed the character of the landscape. Perhaps the worst plague that man as set upon the *lomas* formations since the arrival of Europeans are herbivores such as goats, which are very destructive in the native communities. Historically, wet coastal conditions associated with El Niño have resulted in dry condition in the adjacent high sierra. For that reason, there is a history of large cattle and livestock "drives" down to the coast. They transport drinkable water and graze their livestock for several months, until the *lomas*

Fig. 3. A. *Lomas* Formation at Cerro Reque, Department of Lambayeque. Vegetation is confined to the upper portion of the mountain (500 m); B. Cerro Cabezón, Department of La Libertad, was in 1998 at the peak of the El Niño effects

formations dried up.

The stories of how each taxon reached the *lomas* formations are, to some extent, "independent" events. They have a wide number of sources and they have reacted to long- and short- term "processes" as independent lineages, not necessarily a community response. As mentioned previously, El Niño is likely important for long-term maintenance of seed banks, but morphological and physiological characteristics of the phenotype will be necessary for all those years when it is only fog that provides moisture. If you consider sea level lowering events as opportunities for mass extinction or major displacement at least, then the most disruption was to have been above 15° South Latitude. There the amount of space between the small coastal mountains were the *lomas* now exist would have been several more kms and certainly they would have been out of the original fog belt. These events not only eliminated some "arid" elements, but it also allowed for the establishment of typical sierra species which are now isolated at the upper portions of the *lomas* peaks, typically above 600 m. This effect is most pronounced in the north and that is why Cerro Cabezón, Cerro Campaña, etc. These sites have higher proportions of adjacent Andean taxa. In Arequipa, Moquegua and Tacna, the *lomas* formations are not confined to small mountains, rather the cover wider, more extensive areas comprising many hectares. It is clear that every *lomas* formation is unique in its topology, size, and species composition. *Lomas* formations are classic examples of islands with floras consisting of disharmonious associations.

Antecedents

The arid coasts of Peru and Chile were initially explored by the Spanish in the 1500s and the first records of the description of plants in the Lima area are in 1568 by Spanish soldier, Pedro de Osma. In the early 1700s, the coast was visited by passing ships and often naturalists visited for the purpose of making scientific collections and observation. Louis Éconches Feuillée (b.1660-d.1732) was a French priest and student of J. D. Cassini. He spent nine months botanizing in Peru in 1710, collecting in the coastal region of Ilo and is credited as the first botanist to scientifically study the flora of Peru. Hipólito Ruiz López (b.1754-d.1815, José Antonio Pavón (b.1754-d.1844), Joseph Dombey (b.1742-d.1794) and Juan José Tafalla Navascués (b.1755, d. 1811) were members of collecting team sent to South America by the King Carlos III of Spain with the Expedición del Perú, y de la Real Academia Médica de Madrid. They spent a total of ten years in what is modern day Peru and Chile and their efforts resulted in 2264 drawings and approximately 3000 species descriptions, of which no fewer than 64 are found within the *lomas* formations (Ruiz & Pavón, 1799; Steele, 1982).

In the 1800s, Franz Julius Ferdinand Meyen (b.1804-1840) collected along coastal Peru 1830-1832, and Charles Gaudichaud-Beaupré (b.1789-d.1854) visited coastal Peru twice, first in 1830-32 and again in 1836-37, collecting and describing desert vegetation. But, the entire Peruvian coastal desert did not become botanically well-known until Antonio Raimondi (b.1824-d.1890) visited several *lomas* formations, north and south of Lima in 1863 and 1868 (Raimondi, 1929). Agusto Weberbauer (b.1871- d.1948) arrived in Peru in 1901 and began his extensive botanical explorations with collections in the *lomas* formations on the hills surroundings of Lima (see Weberbauer 1945). Today those localities are destroyed by human occupation.

Weberbauer (1939) was the first botanist to actually comment on the complex distribution of plant species within the *lomas* and offer causal mechanisms. Further, he commented on the endemic distribution of *Nolana* (Solanaceae) and *Palaua* (Malvaceae) in southern Peru and northern Chile; he speculated on connections between coastal Peru and the Galápagos Islands; and made the connection between Peru and the Argentine Andes (e.g., *Bulnesia retama* - Zygophyllaceae).

In 1921 and 1922, J. Francis MacBride (b. 1892 - d. 1976) made about 125 collections of *lomas* plants, primarily in the areas around Lima which included San Gerónimo, Lurín, Chorrillos and Lurigancho. These sites have largely been overrun with houses and human expansion.

Fig. 4. A. *Lomas* formations at Pachacamac, Department of Lima; B. *Lomas* Formations near Arequipa, Department of Arequipa. Fog clouds or "garua" can be seen laying on hillsides in the morning.

In the strong El Niño year of 1925, both Francis W. Pennell (b.1886-d.1962) and Ivan Murray Johnston (b.1898-d.1960) collected in the *lomas* formations of southern Peru. Erich Werdermann (b.1892-d.1959), a botanist with the Berlin Dahlm Botanical Museum, also collected in southern Peru in 1925. An amateur botanist from England, Dora B. Stafford, made a series of collections from departments in southern Peru between 1932 and 1937 (cf. Stafford, 1939). Her efforts yielded many collections from the *lomas* formations, especially in the Mollendo area. T. Harper Goodspeed (b.1887-d.1966), from the University of California at Berkeley, initiated a series of expeditions to Peru. Goodspeed (1961) published an account of the expeditions in his book, Plant Hunters in the Andes. During a strong El Niño year of 1942, he visited the *Lomas* of Lachay and Lurín with Weberbauer and described the *lomas* formations as -- "*Meadows on the Desert*". Additional collectors in his group included A. A. Beetle (b.1913-d.2003), H. E. Stork (b. 1890-d.1959), O. B. Horton, C. R. Worth (b.1903), J. L. Morrison (b.1911), R. D. Metcalf, P. C. Hutchison (b.1924-d.1997), J. West (b.1886-d.1939), and J. K. Wright.

Ramón Ferreyra Huerta (b.1910-d.2005) was a student of Weberbauer and published the first systematic compilation of plants found within the *lomas* formations (Ferreyra, 1953, 1961). Nicolás Angulo Espino (1888-1969), Arnaldo López Miranda (b.1922-d.2010) and Abundio Sagástegui Alva all have collected within the *lomas* formations of Peru. The latter collector made extensive collections on Cerro Campana and surrounding areas, during the strong El Niño years of 1982-83. Those collections provided the basis for an inventory of the regions *lomas* formations (Sagástegui *et al*., 1988). Mikio Ono, of the Tokyo Metropolitan University, Japan, directed a series of expeditions to coastal Peru and Chile in the 1980's. He and his colleagues conducted a wide variety of investigations within the *lomas* formations, including counting chromosomes of *lomas* species, calculating biomass, and documenting seed banks (Ohga 1986, 1991, 1992; Oka & Ogawa 1984; Ono 1982, 1986).

Beginning in the strong El Niño year of 1983, M.O. Dillon began collecting within the *lomas* formations which culminated in several thousands of accessions and a series of papers describing the vegetation of coastal Peru and Chile (see Dillon 1985, 1989, 1997, 2005; Dillon

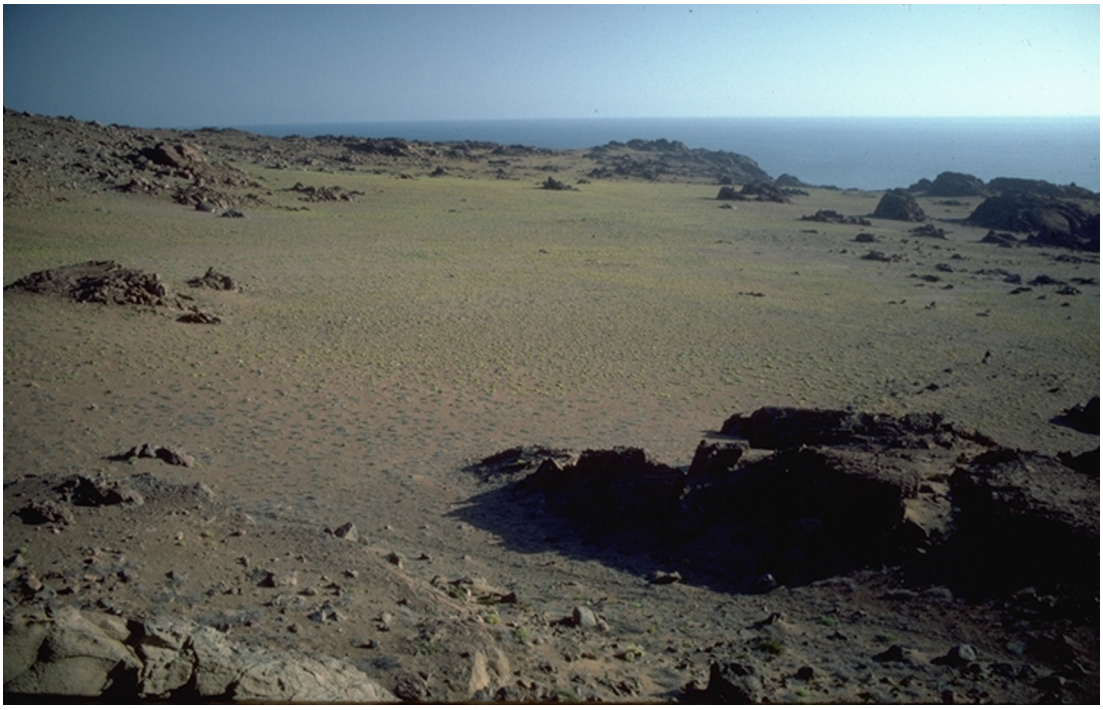

Fig. 5. *Lomas* formation near Atiquipa, Department of Arequipa.

& Rundel, 1990; Rundel *et al*. 1991, 2007). A floristic database covering the entire area is available (see Dillon 1994). Collecting expeditions were conducted during and after strong El Niño years of 1983/84, 1997/98, 1987/88, and 2002/03. These efforts have yielded several taxa new to science (Dillon *et al.* 2007, Elisens 1992; Gómez-Sosa 1986; Krapovickas 1996; Robinson & Moore 2004).

Several studies have contributed to the general knowledge and description of the Peruvian Desert and *lomas* formations (e.g., Dillon 1997; Ferreyra 1953, 1961, 1983; Leiva *et al*. 2008; Rundel *et al*. 1996, 2007), and some have addressed biogeographic questions from the point of view of its flora (Galán de Mera *et al*. 1997; Lezama & Dillon (in prep.); Masuzawa 1986, Rundel & Dillon 1998; Dillon 2005; Pinto & Luebert 2009). Other authors have studies the community ecology and productivity of regional formations (cf. Jiménez *et al*. 1998, 2004; Péfaur, 1982). A few studies have approached biogeographical questions involving plants of the *lomas* formation from an explicit phylogenetic framework (Dillon *et al*. 2009; Gengler-Nowak 2002, Huertas *et al*., 2007; Luebert & Wen 2008; Moore & Jansen 2006; Simpson *et al*. 2005).

Overall Diversity

Lomas communities, like any other plant formation, are not static; rather their composition is in constant change while some species are constant, others come and go with each season. During and after strong El Niño events, rare species are recorded that may not be encountered in intervening years. The listing of plants we present is a long-term compilation drawn from years of observation and herbarium study. Current estimates for the total number of species represented within the Peruvian *lomas* formations consists of 83 families, 385 genera, and ca. 850 species.

Table 1. Families represented within the *Lomas* Formations of Peru with high diversity at the generic or species level.

Families	Genera
Bromeliaceae	[3 genera, 14 spp], *Tillandsia* 12 spp
Poaceae	[38 genera, 84 spp], *Eragrostis* 10 spp, *Paspalum* 9 spp
Asteraceae	[44 genera, 78 spp], *Ophyrosporus* 7 spp, *Senecio* 10 spp.
Boraginaceae	[7 genera, 27 spp.], *Heliotropium* 7 spp, *Tiquilia* 9 spp.
Brassicaceae	[11 genera, 26 spp].
Cactaceae	[19 genera, 31 spp], *Neoporteria* 6 spp
Fabaceae	[31 genera, 64 spp].
Malvaceae	[21 genera, 52 spp], *Palaua* 12 spp
Solanaceae	[16 genera, 91 spp], *Nolana* 38+ spp, *Solanum* 20 spp.
Calceolariaceae	*Calceolaria* 8 spp
Cyperaceae	[3 genera, 12 spp.], *Cyperus* 9 spp
Amaranthaceae	[8 genera, 24 spp.], *Alternanthera* 9 spp
Oxalidaceae	*Oxalis* 9 spp
Piperaceae	*Peperomia* 8 spp
Aizoaceae	[2 genera, 8 spp.], *Tetragonia* 7 spp
Convolvulaceae	[8 genera, 22 spp.], *Ipomoea* 9 spp.
Santalaceae	*Quinchamalium* 7 spp

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Fig. 6. *Lomas* formations near the Lagunas de Mejia in 1983, Department of Arequipa.

mention for her efforts at identifing and annotating collections. The authors accept any and all errors, omissions, or misapplication of names in the list.

Literature cited

Anderson, E. F. 2001 . The cactus family. Timber Press, Portland, Oregon, USA.

Barthlott , W. , and D. R. Hunt. 1993 . Cactaceae. *In* K. Kubitzki [ed.], The families and genera of vascular plants. Springer-Verlag, New York, New York, USA.

Beresford-Jones, D.G. 2004. Chapter 3. The Genus *Prosopis* on the South Coast. Pp. 45-120. *In:* Pre- Hispanic *Prosopis*-Human Relationships on the South Coast of Peru: Riparian Forests in the Context of Environmental and Cultural Trajectories of the Lower Ica Valley. PhD Dissertation, Magdalene College, University of Cambridge, UK.

Brako, L. & J. L. Zarucchi. 1993. Catalogue of the flowering plants & gymnosperms of Peru. (Monographs in Systematic Botany Vol. 45.) Missouri Botanical Garden, St. Louis, MO. 1286 pp.

Dillon, M. O. 1985. The Botanical Response of the Andean Desert Lomas Formations to the 1982-83 El Niño Event. Abstract Amer. J.Bot. 72: 950.

Dillon, M. O. 1989. Origins and diversity of the lomas formations in the Atacama and Peruvian Deserts of western South America. Abstract Amer. J. Bot. 76 (6): 950. 212.

Dillon, M. O. 1994. Andean Botanical Information System/Sistema de Información Botánica Andina. URL:http://www.sacha.org/, accessed 18 November 2010.

Dillon, M.O. 1997. Lomas Formations-Peru, pp. 519-527. *In:* S. D Davis, V. H. Heywood, O. Herrera- McBryde, J. Villa-Lobos and A. C. Hamilton (eds.), Centres of Plant Diversity, A Guide and Strategy for their Conservation. WWF, Information Press, Oxford, U.K.

Dillon, M.O. 2005. Solanaceae of the Lomas formations of Coastal Peru and Chile. Pp. 131-155 *In*: Hollowell, V., Keating, T., Lewis, W. & Croat, T. (eds.), *A Festschrift for William G. D'Arcy: The Legacy of a Taxonomist*. Monogr. Syst. Bot. Ann. Missouri Bot. Gard. 104.

Dillon, M. O. 2011. Flora of the Lomas Formations. URL:http://emuweb.fieldmuseum.org/botany/search_lomas.php, accessed 1 Jan 2011.

Dillon, M.O. & P. W. Rundel. 1990. The botanical response of the Atacama and Peruvian Desert Flora to the 1982-83 El Niño event. Pp. 487-504. *In:* P. W. Glynn (ed.), Global Ecological Consequences of the 1982-83 El Niño- Southern Oscillation, Elsevier Science Publishers, New York.

Dillon, M.O. , S. Leiva, & V. Quipuscoa. 2007. Five new species of *Nolana* (Solanaceae-Nolaneae) from Peru and notes on the classification for additional taxa. Arnaldoa 14: 171-190.

Dillon, M.O., T. Tu, A. Soejima, T. Yi, Z. Nie, A. Tye, & J. Wen. 2007. Phylogeny of *Nolana* (Nolaneae, Solanoideae, Solanaceae) as inferred from granule-bound starch synthase I (GBSSI) sequences. Taxon 56: 1000-1012.

Dillon, M.O., T. Tu, L. Xie, V. Quipuscoa S., & J. Wen. 2009. Biogeographic diversification in *Nolana* (Solanaceae), a ubiquitous member of the Atacama and Peruvian Deserts along the western coast of South America. Journal of Systematics & Evolution, 47(5): 457-476.

Duncan, T. & M.O. Dillon. 1991. Numerical analysis of the floristic relationships of the lomas of Peru and Chile. Abstr. Abstract Amer. J. Bot. 78: 183.

Elisens, W.J. 1992. Genetic divergence in *Galvezia* (Scrophulariaceae): evolutionary and biogeographic relationships among South American and Galápagos species. American Journal of Botany 79:198-206

Ferreyra, R. 1953. Comunidades vegetales de algunas lomas costaneras del Perú. Estac. Exp. Agricola La Molina, Bol. 53: 1-88.

Ferreyra, R. 1961. Las Lomas Costaneras del extremo sur del Perú. Boletín de la Sociedad Argentina de Botánica, 9:87-120.

Ferreyra, R. 1983. Los tipos de vegetación de la costa peruana. Anales Jard. Bot. Madrid 40(1): 241-256.

Fryxell, P. A. 1996. *Fuertesimalva*, a new genus of neotropical Malvaceae. Sida 17(1): 69–76.

Galán de Mera, A., J.A. Vicente-Orellana, J.A. Lucas García & A. Probanza Lobo. 1997. Phytogeographical sectoring of the Peruvian coast. Global Ecol. Biogeogr. Lett. 6: 349-367. Gengler-Nowak, K. M. 2002. Reconstruction of the biogeographical history of Malesherbiaceae. Botanical Review 68(1): 171–188.

Gómez-Sosa, E. 1986. *Astragalus neobarnebyanus* (Leguminosae): A New Species from Peru. Brittonia 38(4): 427- 429.

Goodspeed, T.H. 1961 [1941]. Plant Hunting In The Andes. Berkeley: University of California Press, 429 pp.

Huertas, M. L., J. V. Schneider, & G. Zizka. 2007. Phylogenetic Analysis of *Palaua* (Malveae, Malvaceae) based on Plastid and Nuclear Sequences. Sys. Bot. 32: 157-165

Hunt , D. , N. P. Taylor , & G. Charles. 2006 . The new cactus lexicon. dh Books, Milborne Port, UK.

Jiménez, P., F. Villasante, C. Talavera, L. Villegas, E. Huaman, & A. Ortega. 1998. Southern Peru Loma's Flora. Pp. 409-411. *In*: Schemenauer, R. (ed). Proceedings of the First International Conference on Fog and Fog Collection, 19-24 July 1998, Vancouver, Canada. pp. 492.

Jiménez, P.M., C. Talavera, L. Villegas, F. Villasante, A. Ortega, & M. Jiménez. 2004. BI035. Atiquipa: Isla de Biodiversidad en el Desierto Costero Perúano. II Congreso Internacional de Científicos Peruanos, Lima. Abstract p. 42.

Krapovickas, A. 1996. Sinopsis del género *Gaya* (Malvaceae). Bonplandia 9(1-2): 57-88.

Lanning, E. P. 1965. Early Man in Peru. Scientific American, 213: 68-76.

León B., A. Cano, & K. R. Young. 2002. Los helechos de las lomas costeras del Perú / Ferns of the fog vegetation of coastal Peru. Arnaldoa 9(2): 7-41.

Leiva-G.,S., M. Zapata C., G. Gayoso B., P. Lezama A., V. Quipuscoa S., & M.O. Dillon. 2008. Diversidad florística de la Loma Mongón, Provincia Casma, Departamento Ancash, Perú - Floristic diversity of Loma Mongon, Casma Province, Ancash Department, Peru. Arnaldoa 15(1): 45-62.

Lezama-A, P. & M.O. Dillon. 2011. Numerical Analysis of the Peruvian Lomas Formations. Arnaldoa: In Press.

Luebert, F. & J. Wen. 2008. Phylogenetic Analysis and Evolutionary Diversification of *Heliotropium* Sect. *Cochranea* (Heliotropiaceae) in the Atacama Desert. Systematic Botany 33: 390–402.

Masuzawa, T. 1986. Structure of *Tillandsia* lomas community in Peru coast. In: Taxonomic and ecological studies on the lomas vegetation in the Pacific coast of Peru, 79-88. Geographical Reports of Tokyo Metropolitan University. Tokyo. No. 19.

Moore M. J. & R. K. Jansen. 2006. Molecular evidence for the age, origin, and evolutionary history of the American desert plant genus *Tiquilia* (Boraginaceae) Molecular Phylogenetics and Evolution. 39: 668-687.

Ohga, N. 1986. Dynamics of the buried seed population in soil, and the mechanisms of maintenance of the herbaceous lomas vegetation in the coastal desert of central Peru. *In* Ono, M. (ed.), Taxonomic and ecological studies on the lomas vegetation in the Pacific coast of Peru. Makino Herbarium, Tokyo Metropol. University, Tokyo. Pp. 53-78.

Ohga, N. 1991. Distribution Patterns of Buried Seeds in the Herbaceous Lomas Community over the Entire Plateau on Loma Ancon in the Coastal Desert of Central Peru. Journal of Arid Land Studies 1: 41-51.

Ohga, N. 1992. Buried seed population in the herbaceous lomas on Loma Ancon in the coastal desert of central Peru. Ecological Research 7: 341-353.

Oka, S. & H. Ogawa. 1984. The distribution of lomas vegetation and its climatic environments along the pacific coast of Perú, 113-125. In: Geographical Reports of Tokyo Metropolitan University. Tokyo. No. 19.

Olmstead, R.G, C.W. Depamphilis, A.D. Wolfe, N.D. Young, W.J. Elisons, & P. A. Reeves. 2003. Disintegration of the Scrophulariaceae. Amer. J. Bot. 88(2): 348–361.

Ono, M. 1982. A Preliminary Report of Taxonomic and Ecological Studies on the Lomas Vegetation in the Pacific Coast of Peru, 1-80. In: M. Ono (ed.). Makino Herbarium. Tokyo Metropolitan University.

Ono, M. 1986. Taxonomic and Ecological Studies on the Lomas Vegetation in the Pacific Coast of Peru. Pp. 1-88 *In:* M. Ono (ed.). Makino Herbarium. Tokyo Metropolitan University.

Péfaur, J. E. 1982. Dynamics of plant communities in the Lomas of Southern Peru. Vegetatio 49: 163 - 171.

Pinto, R., & F. Luebert. 2009. Datos sobre la flora vascular del desierto costero de Arica y Tarapacá, Chile, y sus relaciones fitogeográficas con el sur de Perú. Gayana Botánica 66: 28–49.

Price, R. A. 1996. Systematics of the Gnetales: a review of morphological and molecular evidence. International Journal of Plant Sciences 157(6) Supp: Biology and Evolution of Gnetales: S40-S49.

Raimondi, A. 1929. El Perú; itinerario de viajes (versión literal de las libretas originales) Lima. Imprenta Torres Aguirre.

Robinson, H. & A. J. Moore. 2004. New species and new combinations in *Rhysolepis* (Heliantheae: Asteraceae) Proc. Biol. Soc. Wash. 117(3): 423-446.

Ruiz-López, H. & J. Pavón. 1799. Flora Peruviana, et Chilensis, sive descriptiones, et icones Plantarum Peruvianarum, et Chilensium, secundum systema Linnaeanum digestae, cum characteribus plurium generum evulgatorum reformatis. v. 2: 6-8, plates CXII, CXIII.

Rundel, P.W., M.O. Dillon, H. A. Mooney, S.L. Gulmon, & J.R. Ehleringer. 1991. The phytogeography and ecology of the coastal Atacama and Peruvian Deserts. Aliso 13: 1-50.

Rundel, P. & M.O. Dillon. 1998. Ecological patterns in the Bromeliaceae of the lomas formations of Coastal Chile and Peru. Plant Syst. Evo. 212: 261-278.

Rundel , P.W., P.E Villagra, M.O. Dillon, S. Roig-Juñent and G. Debandi. 2007. Chapter 11. Arid and semi-arid ecosystems. Pp. 158-183. *In:* Veblen, T.T., K. R. Young & A. R. Orme (eds.) The Physical Geography of South America, Oxford University Press: Oxford, UK, 368 pp.

Sagástegui, A., J. Mostacero, & S. López. 1988. Fitoecología del Cerro Campana. Bol. Soc. Bot. La Libertad 14: 1-47.

Simpson, B. B., Tate, J. A. and Weeks, A. (2005), The biogeography of *Hoffmannseggia* (Leguminosae, Caesalpinioideae, Caesalpinieae): a tale of many travels. Journal of Biogeography, 32: 15–27.

Steele, A. R. 1982. Flowers for the King: The expedition of Ruiz and Pavón and the Flora of Peru.

Stafford, D. 1939. On the Flora of Southern Peru. Proc. Linnean Soc. London. 151(3): 172-181.

Tryon, R. 1960. The Ecology of Peruvian Ferns American Fern Journal 50 (1); 46-55.

Vermeij, G.J. 1990. An ecological crisis in an evolutionary context: El Niño in the eastern Pacific. Pp. 505–517. *In:* P.W. Glynn (ed.), Global Ecological Consequences of the 1982–83 El Niño- Southern Oscillation. Amsterdam: Elsevier.

Weberbauer, A. 1939. La influencia de cambios climáticos y geológicos sobre la vegetación de la costa peruana. Academia Nacional de Ciencias Exactas, Físicas y Naturales. 2: 201-209.

Weberbauer, A. 1945. El Mundo Vegetal de los Andes Peruanos. Estudio Fitogeográfico. Estación Experimental Agrícola de La Molina. Ministerio de Agricultura, Lima. 776 pp.

Fig. 7. *Lomas* Formations, A. *Lomas* near Chapi, Department of Arequipa; B. *Lomas* north of Tacna in 1983, Department of Tacna.

Checklist

The checklist presented here provides the names of flowering plants and one gynmosperm (*Ephedra*) recorded from the *lomas* formations of Peru, roughly from Cerro Reque (Dept. Lambayeque) in the north, to Tacna (Dept. Tacna) in the south. For a listing of *lomas* formation pteridophytes (ferns and fern relatives), consult León *et al*. (2002) and Tryon (1960). The list presented here has been compiled from personal observations, collecting by all the authors over many years, visiting herbaria throughout Peru, Europe, and the United States. Familial constructs for the Scrophulariaceae follow those suggestions by Olmsted *et al.* (2001). Generic boundaries in the Cactaceae and the recognition of species largely depends upon which author is followed (Anderson, 2001; Barthlott & Hunt, 1993; Hunt , Taylor, & Charles, 2006). This family is in need of systematic and collecting attention. No publication citations are provided and no voucher specimens are cited here, however, vouchers are available as individual records and scanned herbarium sheets that can be accessed at URL: http://emuweb.fieldmuseum.org/botany/search_*lomas*.php. Synonymy largely follows Brako & Zarucchi (1993).

Collections that are only recorded from Cerro Reque or other sites in Lambayeque, but may be found further south, are designated with an asterisk (*). Cultivated species which have been recorded from the *lomas* formations are designated with a symbol (+).

Gymnospermae (Gymnosperms)

1 EPHEDRACEAE [1 /1]
Ephedra americana Humb. & Bonpl. ex Willd.

Liliopsida (Monocotyledons) [68/ 145]

2 ASPARAGACEAE [=AGAVACEAE] [4/5]
Agave americana L.
Anthericum eccremorrhizum Ruiz & Pav.
Anthericum viruense Ravenna
Furcraea occidentalis Trel.
Oziroe biflora (Ruiz & Pav.) Speta

3 ALLIACEAE [1/2]
Nothoscordum gracile (Aiton) Stern
Nothoscordum inodorum (Aiton) Asch. & Graebn.

4 ALSTROEMERIACEAE [2/5]
Alstroemeria chorillensis Herb.
Alstroemeria violacea Phil.
Bomarea cornuta Herb.
Bomarea dolichocarpa Killip
Bomarea ovata (Cav.) Mirb.

5 AMARYLLIDACEAE [6/8]
Chlidanthus fragrans Herb.
Ismene amancaes (Ruiz & Pav.) Herb.
Paramongaia weberbaueri Velarde
Pyrolirion albicans Herb.
Clinanthus coccineus (Ruiz & Pav.) Meerow
Clinanthus incarum (Kraenzl.) Meerow
Clinanthus recurvatus (Kraenzl.) Meerow
Stenomesson flavum (Ruiz & Pav.) Herb.

6 ARACEAE [1/1]
Gorgonidium vargasii Bogner & Nicolson

7 BROMELIACEAE [3/14].
Pitcairnia lopezii L.B.Sm.
Puya ferruginea (Ruiz & Pav.) L.B.Sm.
Tillandsia capillaris Ruiz & Pav.
Tillandsia disticha Kunth
Tillandsia landbeckii Phil.
Tillandsia latifolia Meyen
Tillandsia marconae W. Till & Vitek
Tillandsia multiflora (Benth.) M. A. Spencer *&* L. B. Sm.
Tillandsia paleacea C. Presl
Tillandsia purpurea Ruiz & Pav.
Tillandsia recurvata (L.) L.
Tillandsia somnians L.B.Sm.
Tillandsia usneoides (L.) L.*
Tillandsia werdermannii Harms

8 COMMELINACEAE [2/5]
Commelina diffusa Burm. f.
Commelina fasciculata Ruiz & Pav.
Commelina hispida Ruiz & Pav.
Commelina longicaulis Jacq.
Tinantia erecta (Jacq.) Schlecht.

9 CYPERACEAE [3/12]
Cyperus articulatus L.
Cyperus eragrostis Lam.

Cyperus esculentus L.
Cyperus haematodes Endl.
Cyperus hermaphroditus (Jacq.) Standl.
Cyperus laevigatus L.
Cyperus ochraceus Vahl.
Cyperus rigens J. Presl. & C. Presl.
Cyperus rotundus L.
Kyllinga brevifolia Rottb.
Schoenoplectus americanus (Pers.) Volkart ex Schinz & R. Keller
Schoenoplectus californicus (C.A. Mey.) Soják

10 DIOSCOREACEAE [1/1]
Dioscorea chancayensis R. Knuth

11 IRIDACEAE [2/3]
Sisyrinchium chilense Hook.
Sisyrinchium micranthum Cav.
Tigridia pavonia (L.f.) DC.

12 JUNCACEAE [1/1]
Juncus bufonius L.

13 ORCHIDACEAE [3/3]
Chloraea undulata Raimondi ex Colunga
Malaxis termensis (Kraenzl.) C. Schweinf.
Pelexia matucanensis (Kraenzl.) Schltr.

14 POACEAE [38/84]
Agrostis koelerioides E. Desv.
Anthephora hermaphrodita (L.) Kuntze*
Aristida adscensionis L. +
Aristida glabrata (Vasey) Hitchc.
Avena barbata Pott ex Link
Avena fatua L. +
Avena sterilis L. +
Bouteloua aristidoides (Kunth) Griseb*
Bouteloua curtipendula (Michx.) Torr.*
Bouteloua disticha (Kunth) Benth.*
Brachiaria fasciculata (Sw.) Parodi
Brachiaria mutica (Forssk.) Stapf
Briza minor L.
Bromus catharticus Vahl
Cenchrus brownii Roem. & Schult.
Cenchrus echinatus L.
Cenchrus incertus M. A. Curtis
Cenchrus tribuloides L.
Chloris halophila Parodi
Chloris radiata (L.) Sw.
Chloris virgata Sw.
Cynodon dactylon (L.) Pers.
Dactyloctenium aegyptium (L.) Willd.
Distichlis spicata (L.) Greene
Echinochloa colona (L.) Link
Echinochloa crus-pavonis (Kunth) Schult.
Elymus agropyroides J. Presl.
Eragrostis attenuata Hitchc.
Eragrostis cilianensis (Bellardi) Vegnolo ex Janch.
Eragrostis ciliaris (L.) R. Br.
Eragrostis japonica (Thunb.) Trin. *
Eragrostis lurida J. Presl.
Eragrostis mexicana (Hornem.) Link
Eragrostis nigricans (Kunth) Steud.
Eragrostis pectinacea (Michx.) Nees
Eragrostis peruviana (Jacq.) Trin.
Eragrostis weberbaueri Pilg.
Eriochloa pacifica Mez
Eriochloa peruviana Mez
Eriochloa punctata (L.) Desv. ex Ham.
Gastridium ventricosum (Gouan) Schinz & Thell.
Lamarckia aurea (L.) Moench
Leptochloa fusca subsp. *uninervia* (J.Presl) N.Snow
Leptochloa mucronata (Michx.) Kunth
Leptochloa scabra Nees
Melinis repens (Willd.) Zizka
Pappophorum pappiferum (Lam.) Kuntze
Paspalidium geminatum (Forssk.) Stapf
Paspalum candidum (Humb. & Bonpl. ex Flüggé) Kunth
Paspalum denticulatum Trin.
Paspalum distichum L.
Paspalum flavum J. Presl.
Paspalum penicillatum Hook. f.
Paspalum polyphyllum Nees ex Trin.
Paspalum pygmaeum Hack.
Paspalum racemosum Lam.
Paspalum vaginatum Sw.
Pennisetum annuum Mez
Phalaris canariensis L.
Phragmites australis (Cav.) Trin. ex Steud.
Piptochaetium montevidense (Spreng.) Parodi
Poa annua L.

Polypogon elongatus Kunth
Polypogon interruptus Kunth
Polypogon monspeliensis (L.) Desf.
Polypogon viridis (Gouan) Breistr.*
Rostraria trachyantha (Phil.) Tzvelev ex Soreng
Setaria lachnea (Ness) Kunth
Setaria parviflora (Poir.) Kerguélen
Setaria verticillata (L.) P.Beauv.
Sorghum bicolor (L.) Moench +
Sporobolus indicus (L.) R.Br.
Sporobolus virginicus (L.) Kunth
Stipa annua Mez
Stipa ichu (Ruiz & Pav.) Kunth
Stipa mucronata Kunth
Stipa nardoides (Phil.) Hack. ex Hitchc.
Stipa neesiana Trin. & Rupr
Stipa pachypus Pilg.
Tragus berteronianus Schult.
Tragus racemosus (L.) All.
Trisetum spicatum (L.) K. Richt.
Vulpia australis (Nees ex Steud.) C. H. Blom.
Vulpia myuros (L.) C. C. Gmel.

15 TECOPHILAEACEAE [1/1]
Tecophilaea violiflora Bertero ex Colla

Magnoliopsida (Dicotyledons) [316/701]

16 ACANTHACEAE [7/11]
Blechum pyramidatum (Lam.) Urb.*
Dicliptera montana Lindau
Dicliptera peruviana (Lam.) Juss.
Dicliptera tomentosa (Vahl) Nees
Dyschoriste repens (Nees) Kuntze
Elytraria imbricata (Vahl) Pers.*
Justicia carthaginensis Jacq.
Ruellia ciliatiflora Hook.
Ruellia floribunda Hook.
Ruellia schlechtendaliana (Nees) Hemsl.*
Tetramerium nervosum Nees*

17 AIZOACEAE [2/8]
Sesuvium portulacastrum (L.) L.
Tetragonia crystallina L'Hér.
Tetragonia macrocarpa Phil.
Tetragonia maritima Barnéoud
Tetragonia microcarpa Phil.
Tetragonia ovata Phil.
Tetragonia pedunculata Phil.
Tetragonia vestita I.M. Johnst.

18 ANACARDIACEAE [1/1]
Schinus molle L.

19 AMARANTHACEAE [8/24]
Alternanthera albotomentosa Suess.
Alternanthera caracasana Kunth
Alternanthera eupatorioides (Remy) Mears, ined.
Alternanthera ferreyrae Mears ined.
Alternanthera halimifolia (Lam.) Standl. ex Pittier
Alternanthera peruviana (Moq.) Suess.
Alternanthera porrigens (Jacq.) Kuntze
Alternanthera pubiflora (Benth.) Kuntze
Alternanthera villosa Kunth
Amaranthus caudatus L. +
Amaranthus dubius Mart. ex. Thell.
Amaranthus hybridus L.
Amaranthus spinosus L.
Amaranthus viridis L.
Atriplex peruviana Moq.
Atriplex rotundifolia Dombey ex Moq.
Atriplex semibaccata R. Br.
Chenopodium album L.
Chenopodium murale L.
Chenopodium petiolare Kunth
Dysphania ambrosioides (L.) Mosyakin & Clemants
Froelichia interrupta (L.) Moq.
Sarcocornia fruticosa (L.) A.J. Scott
Suaeda foliosa Moq.

20 APIACEAE [10/15]
Ammi visnaga (L.) Lam.
Apium graveolens L. +
Bowlesia palmata Ruiz & Pav.
Conium maculatum L. +
Cyclospermum laciniatum (DC.) Constance
Cyclospermum leptophyllum (Pers.) Sprague ex Britton & P. Wilson
Daucus montanus Humb. & Bonpl. ex Spreng. +
Domeykoa amplexicaulis (H. Wolff) Mathias & Constance
Domeykoa saniculifolia Mathias & Constance

Eremocharis ferreyrae Mathias & Constance
Eremocharis longiramea (H. Wolff) I.M.Johnst.
Eremocharis piscoensis Mathias & Constance
Hydrocotyle alchemilloides A. Rich.
Hydrocotyle bonariensis Lam.
Spananthe paniculata Jacq.

21 APOCYNACEAE [4/4]
Nerium oleander L. +
Cynanchum formosum N.E.Br.
Matelea aliciae Morillo
Philibertia solanoides Kunth

22 ASTERACEAE [44/78]
Acmella alba (L'Hér.) R.K.Jansen
Acmella oleracea (L.) R.K.Jansen
Ageratina articulata (Sch. Bip. ex Hieron.) R. M. King & H.Rob.
Ageratina azangaroensis (Sch. Bip. ex Wedd.) R. M. King & H.Rob.
Ageratina sternbergiana (DC.) R.M.King & H.Rob.
Ageratum conyzoides L.
Amblyopappus pusillus Hook. & Arn.
Ambrosia artemisioides Meyen & Walp. ex Meyen
Ambrosia dentata (Cabrera) M.O.Dillon
Ambrosia peruviana Willd.
Baccharis glutinosa Pers.
Baccharis linearifolia (Lam.) Pers.
Baccharis salicifolia (Ruiz & Pav.) Pers.
Baccharis scandens (Ruiz & Pav.) Pers.
Bidens pilosa L.
Bidens triplinervia Kunth
Centaurea melitensis L.
Chersodoma juanisernii (Cuatrec.) Cuatrec.
Chionopappus benthamii S.F.Blake
Conyza bonariensis (L.) Cronquist
Conyza canadensis (L.) Cronquist
Cotula australis (Sieber ex Spreng.) Hook. f.
Encelia canescens Lam.
Eclipta prostrata (L.) L.
Erigeron leptorhizon DC.
Flaveria bidentis (L.) Kuntze
Galinsoga caligensis Canne
Galinsoga parviflora Cav.
Galinsoga quadriradiata Ruiz & Pavón
Gamochaeta purpurea (L.) Cabrera
Grindelia buphthalmoides DC.
Grindelia glutinosa (Cav.) Mart.
Helogyne hutchisonii R.M.King & H.Rob.
Heterosperma diversifolium Kunth
Heterosperma ferreyrii H.Rob.
Jungia axillaris (Lag. ex DC.) Spreng.
Malacothrix clevelandii A.Gray
Malacothrix coulteri Harv. & A.Gray
Mutisia acuminata Ruiz & Pav.
Onoseris humboldtiana Ferreyra
Onoseris odorata (D.Don) Hook. & Arn.
Onoseris parva Muschl.
Ophyosporus anomalus R.M.King & H.Rob.
Ophryosporus floribundus (DC.) R.M.King & H.Rob.
Ophryosporus galioides (DC.) R.M.King & H.Rob.
Ophryosporus hartwegii (B.L.Rob.) R.M.King & H.Rob.
Ophryosporus hoppii (B.L.Rob.) R.M.King & H.Rob.
Ophryosporus peruvianus (J. F. Gmel.) R.M.King &H.Rob.
Ophryosporus pubescens (Sm.) R.M.King & H.Rob.
Perityle emoryi Torr.
Philoglossa peruviana DC.
Philoglossa purpureodisca H.Rob.
Pluchea chingoyo (Kunth) DC.
Polyachyrus annuus I.M.Johnst.
Proustia cuneifolia D.Don
Pseudognaphalium dombeyanum (DC.) Anderb.
Rhysolepis dilloniorum A.J. Moore & H. Robinson
Senecio abadianus DC.
Senecio acarinus Cabrera
Senecio arnaldii Cabrera
Senecio calcicola Meyen & Walp. ex Meyen
Senecio icaensis H.Beltrán & A.Galán
Senecio lomincola Cabrera
Senecio okopanus Cabrera
Senecio smithianus Cabrera
Senecio truxillensis Cabrera
Senecio vulgaris L.
Siegesbeckia flosculosa L'Hér.
Siegesbeckia orientalis L.
Simsia dombeyana DC.

Sonchus oleraceus L.
Spilanthes urens Jacq.
Stevia melissiaefolia (DC.) Sch. Bip.
Trixis calcalioides (Kunth) D. Don
Villanova oppositifolia Lag.
Verbesina saubinetioides S.F.Blake
Viguiera weberbaueri S.F.Blake (~ *V. procumbens* (Pers.) S.F. Blake)
Wedelia latifolia DC.

23 BASELLACEAE [1/1]
Anredera diffusa (Moq.) Sperling

24 BATACEAE [1/1]
Batis maritima L.

25 BEGONIACEAE [1/2]
Begonia geraniifolia Hook.
Begonia octopetala L'Hér.

26 BIGNONIACEAE [3/3]
Argylia radiata (L.) D.Don
Tecoma fulva subsp. *arequipensis* (Sprague) J.R.I. Wood
Tourrettia lappacea (L'Hér.) Willd. ex L. f.

27 BORAGINACEAE [7/27]
Cordia lutea Lam.
Cordia macrocephala (Desv.) Kunth.
Cryptantha filaginea (Phil.) Reiche
Cryptantha granulosa (Ruiz & Pav.) I.M.Johnst.
Cryptantha limensis (A.DC.) I.M.Johnst.
Cryptantha parviflora (Phil.) Reiche
Heliotropium angiospermum Murray
Heliotropium arborescens L.
Heliotropium curassavicum L.
Heliotropium krauseanum Fedde
Heliotropium lanceolatum Ruiz & Pav.
Heliotropium pilosum Ruiz & Pav.
Heliotropium submolle Klotzsch
Nama dichotomum (Ruiz & Pav.) Choisy
Pectocarya lateriflora (Lam.) DC.
Pectocarya linearis (Ruiz & Pav.) DC.
Tiquilia conspicua (I.M.Johnst.) A.T. Richardson
Tiquilia dichotoma (Ruiz & Pav.) Pers.
Tiquilia ferreyrae (I.M.Johnst.) A.T. Richardson
Tiquilia grandiflora (Phil.) A.T. Richardson
Tiquilia litoralis (Phil.) A.T. Richardson
Tiquilia paronychioides (Phil.) A.T. Richardson
Tiquilia parviflora (Phil.) A. T. Richardson
Tiquilia simulans (I.M.Johnst.) A.T. Richardson
Tiquilia tacnensis A.T. Richardson
Tournefortia lilloi I.M.Johnst.
Tournefortia microcalyx (Ruiz & Pav.) I.M.Johnst.

28 BRASSICACEAE [11/26].
Brassica rapa L.
Capsella bursa-pastoris (L.) Medik.
Cremolobus chilensis (Lag. ex DC.) DC.
Dictyophragmus englerianus (Muschl.) O.E.Schulz
Draba araboides Wedd.
Lepidium auriculatum Regel & Körn.
Lepidium bonariense L.
Lepidium crassius (C. L. Hitchc.) Al-Shehbaz
Lepidium cyclocarpum Thell.
Lepidium didymus L. (~ *Coronopus didymus* (L.) Sm.)
Lepidium johnstonii C. Hitchc.
Lepidium raimondii O.E.Schulz
Lepidium spathulatum Phil.
Mathewsia incana Phil.
Mathewsia linearifolia Turcz.
Mathewsia nivea (Phil.) O.E.Schulz
Mathewsia peruviana O.E.Schulz
Menonvillea chilensis (Turcz.) B. D. Jacks.
Menonvillea litoralis (Barnéoud) Rollins
Menonvillea orbiculata Phil.
Mostacillastrum morrisonii (Al-Shehbaz) Al-Shehbaz
Mostacillastrum sagittatum (Hook. & Arn.) Al-Shehbaz
Schizopetalon biseriatum Phil.
Sisymbrium irio L.
Sisymbrium lanatum (Walp.) O. E. Schulz.
Sisymbrium llatasii Al-Shehbaz

29 CACTACEAE [19/31]
Armatocereus riomajensis Rauh & Backeb.
Cleistocactus sextonianus (Backeb.) D.R. Hunt
Corryocactus brachypetalus (Vaupel) Britton & Rose
Cumulopuntia sphaerica (C.F. Först.) E.F. Anderson
Cylindropuntia tunicata (Lehman) F.M. Knuth
Echinopsis chalaensis (Rauh & Backeb.) Friedrich & G.D. Rowley
Echinopsis cephalomacrostibas (Werderm. &

Backeb.) Friedrich & G.D.Rowley
Eriosyce islayensis (C.F. Först.) Katt.
Eulychnia iquiquensis subsp. *ritteri* (Cullman) D.R.Hunt
Espostoa melanostele (Vaupel) Borg
Haageocereus australis Backeb.
Haageocereus limensis (Salm-Dyck) F. Ritter
Haageocereus decumbens (Vaupel) Backeb.
Haageocereus multangularis (Willd.) F. Ritter
Haageocereus subtilispinus F. Ritter
Maihueniopsis ovata (Pfeiff.) F. Ritter
Melocactus peruvianus Vaupel
Mila caespitosa Britton & Rose
Neochilenia jussieui (Monv.) Backeb.
Neoporteria aricensis (F.Ritter) Donald & G.D.Rowley
Neoporteria glaucescens (F.Ritter) Donald & G.D. Rowley (~ *Eriosyce taltalensis* (Hutch.) Katt.)
Neoporteria iquiquensis (F.Ritter) Donald & G.D. Rowley
Neoporteria napina (Phil.) Backeb.
Neoporteria occulta (Phil.) Britton & Rose
Neoporteria rupicola (F.Ritter) Donald & G.D.Rowley
Neoraimondia arequipensis (Meyen) Backeb.
Opuntia quitensis F.A.C. Weber (~ *Opuntia ovata* Pfeiff.)
Opuntia pubescens J.C. Wendl. Ex Pfeiff.
Pygmaeocereus bylesianus Andreae & Backeberg
Pygmaeocereus familiaris F. Ritter
Weberbauerocereus weberbaueri (K.Schum. ex Vaupel) Backeb.

30 CALCEOLARIACEAE [1/8]
Calceolaria ajugoides Kranzl.
Calceolaria angustiflora Ruiz & Pav.
Calceolaria chelidonioides Kunth
Calceolaria dichotoma Lam.
Calceolaria pinnata L.
Calceolaria rugulosa Edwin*
Calceolaria tripartita Ruiz & Pav.
Calceolaria utricularioides Benth.

31 CAMPANULACEAE [2/2]
Lobelia decurrens Cav.
Triodanis perfoliata (L.) Nieuwl.

32 CAPPARACEAE [2/5]
Capparis avicennifolia Kunth
Capparis crotonoides (Kunth) Iltis & Cornejo
Capparis petiolaris Kunth
Capparis scabrida Kunth
Cleome chilensis DC. [= CLEOMACEAE]
33 CARICACEAE [1/1]
Carica candicans A.Gray

34 CARYOPHYLLACEAE [6/12]
Cerastium glomeratum Thiull.
Drymaria paposana Phil.
Sagina apetala Ard.
Silene gallica L.
Spergularia collina I.M.Johnst.
Spergularia congestifolia I.M.Johnst.
Spergularia fasiculata Phil.
Spergularia stenocarpa (Phil.) I.M.Johnst.
Stellaria cuspidata Willd. ex Schltdl.
Stellaria media (L.) Vill.
Stellaria micrantha Spruce ex Rohrb.
Stellaria ovata Willd. ex Schltdl.

35 CELASTRACEAE [1/1]
Maytenus octogona (L'Hér.) DC.

36 CONVOLVULACEAE [8/22]
Convolvulus chilensis Pers.
Cressa truxillensis Kunth
Cuscuta foetida Kunth
Cuscuta grandiflora Kunth
Cuscuta haughtii Yunck.
Cuscuta hitchcockii Yunck.
Cuscuta odorata Ruiz & Pav.
Dichondra sericea Sw.
Evolvulus lanatus Helwig
Evolvulus villosus Ruiz & Pav.
Ipomoea alba L.
Ipomoea asarifolia (Desr.) Roem. & Schult.
Ipomoea rubiflora (L.) O'Donell
Ipomoea dubia Roem. & Schult.
Ipomoea dumetorum Willd. ex Roem. & Schult.
Ipomoea indica (Burm.) Merr.
Ipomoea nationis (Hook.) G.. Nicholson

Ipomoea pes-caprae (L.) R. Br.
Ipomoea purpurea (L.) Roth
Jacquemontia unilateralis (Roem. & Schult.) O'Donell
Merremia aegyptia (L.) Urb.
Merremia quinquefolia (L.) Hallier f.

37 CRASSULACEAE [1/1]
Crassula connata (Ruiz & Pav.) A. Berger

38 CUCURBITACEAE [4/7]
Apodanthera ferreyrana Mart.Crov.
Apodanthera weberbaueri Harms
Citrullus lanatus (Thunb.) Matsum. & Nakai +
Cyclanthera mathewsii Arn. ex A.Gray
Sicyos baderoa Hook. & Arn.
Sicyos gracillimus Cogn.
Sicyos kunthii Cogn.

39 EUPHORBIACEAE [6/18]
Andrachne microphylla (Lam.) Baill.
Croton alnifolius Lam.
Croton ruizianus Müll. Arg.
Croton spurcus Croizat
Euphorbia heterophylla L.
Euphorbia hirta L.
Euphorbia hypericifolia L.
Euphorbia lasiocarpa Klotzsch
Euphorbia meyeniana Klotzsch
Euphorbia ophthalmica (Pers.) D.G. Burch
Euphorbia peplus L.
Euphorbia peruviana L. C. Wheeler
Euphorbia serpens Kunth
Euphorbia tacnesis Phil.
Euphorbia viridis (Klotzsch & Garcke) Boiss.
Jatropha macrantha Müll.Arg.
Phyllanthus graveolens Kunth* [= PHYLLANTHACEAE]
Ricinus communis L. +

40 FABACEAE [31/64]
Acacia huarango J.F.Macbr.
Acacia macracantha Willd.
Adesmia muricata (Jacq.) DC.
Aeschynomene scabra G. Don
Astragalus neobarnebyanus Gómez-Sosa
Astragalus sprucei I.M.Johnst.
Astragalus triflorus (DC.) A.Gray
Bauhinia aculeata L.
Caesalpinia spinosa (Molina) Kuntze
Calliandra taxifolia (Kunth) Benth.
Coursetia weberbaueri Harms
Crotalaria incana L.
Dalea cylindrica Hook.
Dalea leporina (Aiton) Bullock
Dalea onobrychis DC.
Dalea pennellii (J.F.Macbr.) J.F.Macbr.
Desmanthus virgatus (L.) Willd.
Desmodium adscendens (Sw.) DC.
Desmodium glabrum (Mill.) DC.
Desmodium limense Hook.
Desmodium scorpiurus (Sw.) Desv.
Desmodium tortuosum (Sw.) DC.*
Geoffroea decorticans (Gillies ex Hook. & Arn.) Burkart
Hoffmannseggia miranda Sandwith
Hoffmannseggia prostrata DC.
Hoffmannseggia stipulata Sandwith
Hoffmannseggia ternata Phil.
Hoffmannseggia viscosa Hook. & Arn.
Indigofera suffruticosa Mill.
Indigofera truxillensis Kunth
Lathyrus magellanicus Lam.
Lupinus mollendoensis Ulbr.
Macroptilium atropurpureum (DC.) Urb.
Macroptilium bracteatum (Nees & C. Mart.)Marechal & Bau.
Macroptilium lathyroides (L.) Urb.
Medicago polymorpha L.
Melilotus indicus (L.) All.
Mimosa albida Willd.
Mimosa pellita Willd.
Mimosa sensitiva L.
Neptunia lutea (Leavenw.) Benth.*
Neptunia plena (L.) Benth.*
Otholobium pubescens (Poir.) J.W. Grimes
Parkinsonia aculeata L.
Parkinsonia praecox (Ruiz & Pav.) Hawkins
Prosopis juliflora (Sw.) DC.
Prosopis pallida (Willd.) Kunth
Rhynchosia minima (L.) DC.
Senna bicapsularis (L.) Roxburgh

Senna birostris (Vogel) H.S.Irwin & Barneby
Senna brongniartii (Gaudich.) H.S.Irwin & Barneby
Senna cumingii (Hook. & Arn.) H.S.Irwin & Barneby
Senna incarnata (Benth.) H.S.Irwin & Barneby
Senna pistaciifolia (Kunth) H.S.Irwin & Barneby*
Tephrosia cinerea (L.) Pers.
Trifolium polymorphum Poir.
Trifolium repens L.
Vicia graminea Sm.
Vicia lomensis J.F.Macbr.
Vigna adenantha (G. Mey.) Marechal *& al*.
Vigna luteola (Jacq.) Benth.
Vigna vexillata (L.) A. Rich.
Weberbauerella brongniartioides Ulbr.
Weberbauerella raimondiana Ferreyra

41 FRANKENIACEAE [1/1]
Frankenia chilensis C.Presl

42 GENTIANACEAE [3/3]
Centaurium erythraea Rafn.
Cicendia quadrangularis (Lam.) Griseb.
Zeltnera quitense (Kunth) G. Mans.*

43 GERANIACEAE [2/4]
Erodium cicutarium (L.) L'Hér.
Erodium malacoides (L.) L´Hér.
Erodium moschatum (L.) L'Her.
Geranium limae R. Knuth

44 HYPERICACEAE [1/1]
Hypericum silenoides Juss.

45 KRAMERIACEAE [1/1]
Krameria lappacea (Dombey) Burdet & B.B.Simpson

46 LAMIACEAE [7/18]
Hyptis elongata Benth.
Hyptis eriocephala Benth.
Hyptis pectinata (L.) Poit.
Hyptis sidifolia (L'Hér.) Briq.
Hyptis suaveolens (L.) Poit.
Lepechinia lamiifolia (Benth.) Epling
Marrubium vulgare L.
Minthostachys spicata (Benth.) Epling
Salvia formosa L'Hér.
Salvia paposanna Philippi
Salvia rhombifolia Ruiz & Pav.
Salvia tubiflora J.E.Sm.
Stachys aperta Epling
Stachys arvensis L.
Stachys herrerae Epling
Stachys peruviana Dombey ex Benth.
Stachys truncata Kunze ex Benth.
Teucrium vesicarium Mill.

47 LINACEAE [1/1]
Linum prostratum Dombey ex Lam. (incl. *L. p.* var. *parvum* (I.M. Johnst.) Mildner.)

48 LOASACEAE [4/8]
Loasa nitida Desr.
Loasa tricolor Ker Gawl.
Mentzelia aspera L.
Mentzelia scabra Kunth
Nasa chenopodiifolia (Desr.) Weigend
Nasa triphylla (Juss.) Weigend*
Nasa urens (Jacq.) Weigend
Presliophytum incanum (Graham) Weigend

49 LYTHRACEAE [2/2]
Cuphea strigulosa Kunth
Lythrum maritimum Kunth

50 MALESHERBIACEAE [1/2]
Malesherbia arequipensis Ricardi
Malesherbia tubulosa (Cav.) J. St. Hil.

51 MALVACEAE [21/51]
Abutilon mollissimum (Cav.) Sweet*
Abutilon reflexum (Lam.) Sweet
Abutilon virgatum (Cav.) Sweet
Anoda cristata (L.) Schltdl.
Bastardia bivalvis (Cav.) Kunth
Bastardia limensis R.E.Fr.
Cristaria aspera Gay (~ *C. a*. var. *formosula*(I.M.Johnst.) Muñoz-Schick)
Cristaria gracilis Gay
Cristaria multifida Cav.
Fuertesimalva chilensis (A. Braun & C.D. Bouché) Fryxell
Fuertesimalva limensis (L.) Fryxell
Fuertesimalva pennellii (Ulbr.) Fryxell

Fuertesimalva peruviana (L.) Fryxell
Gaya mollendoensis Krapov.
Gaya pilosa K.Schum.
Gaya weberbaueri Ulbr.
Guazuma ulmifolia Lam.
Herissantia crispa (L.) Brizicky
Hibiscus brasiliensis L. +
Malachra alceifolia Jacq.
Malva parviflora L.
Malva sylvestris L.
Malvella leprosa (Ort.) Krapov.
Melochia pyramidata L
Palaua camanensis Ferreyra & Chanco
Palaua dissecta Benth.
Palaua guentheri F.Burns
Palaua inconspicua I.M.Johnst.
Palaua malvifolia Cav.
Palaua moschata Cav.
Palaua rhombifolia R. Graham
*Palaua sandemani*i (Sandwith) Fryxell
Palaua tomentosa Hochr.
Palaua trisepala Hochr.
Palaua velutina Ulbrich. & Hill
Palaua weberbaueri Ulbr.
Sida ciliaris L.*
Sida jatrophoides L'Hér.
Sida oligandra K.Schum.
Sida palmata Cav.
Sida patuliloba R.E.Fr.
Sida rhombifolia L.
Sida spinosa L.
Sidastrum paniculatum (L.) Fryxell
Sphaeralcea obtusiloba (G.) Don
Tarasa cardenasii Krapov.
Tarasa operculata (Cav.) Krapov.
Tarasa thyrsoidea Krapov.
Triumfetta semitriloba Jacq.
Urocarpidium albiflorum Ulbr.
Waltheria ovata Cav.

52 MOLLUGINACEAE [2/2]
Glinus radiatus (Ruiz & Pav.) Rohrb.*
Mollugo verticillata L.

53 MYRTACEAE [1/1]
Myrcianthes ferreyrae (McVaugh) McVaugh

NOLANACEAE [See *Nolana*, SOLANACEAE]

54 NYCTAGINACEAE [5/13]
Allionia incarnata L.
Boerhavia coccinea Mill.
Boerhavia diffusa L.
Boerhavia erecta L.
Boerhavia verbenacea Killip
Bougainvillea pachyphylla Heimerl ex Standl.
Cryptocarpus pyriformis Kunth
Mirabilis campanulata Heimerl
Mirabilis elegans (Choisy) Heimerl
Mirabilis expansa (Ruiz & Pav.) Standl.
Mirabilis intercedens Heimerl
Mirabilis prostrata (Ruiz & Pav.) Heimerl
Mirabilis viscosa Cav.

55 OLEACEAE [1/1]
Olea europaea L. +

56 ONAGRACEAE [2/9]
Ludwigia octovalvis (Jacq.) P. H. Raven
Ludwigia palustris (L.) Elliot
Ludwigia peploides (Kunth) P. H. Raven
Ludwigia peruviana (L.) Hara
Oenothera arequipensis Munz & I.M.Johnst.
Oenothera drummondii Hook.
Oenothera laciniata Hill.
Oenothera nocturna Jacq.
Oenothera rosea L'Hér. ex Aiton

57 OROBANCHACEAE [1/1]
Orobanche weberbaueri Mattf.

58 OXALIDACEAE [1/9]
Oxalis corniculata L.
Oxalis debilis Kunth (~ incl. *O. d*. var. *corymbosa* (DC.) Lourteig)
Oxalis dombeyi St. Hil.
Oxalis latifolia Kunth
Oxalis laxa Hook. & Arn.
Oxalis lomana Diels
Oxalis megalorrhiza Jacq.
Oxalis pachyrrhiza Wedd.
Oxalis spiralis G. Don

59 PAPAVERACEAE [2/3]
Argemone mexicana L.

Fumaria capreolata L.
Fumaria parviflora Lam.

60 PASSIFLORACEAE [1/3]
Passiflora foetida L.
Passiflora peduncularis Cav.
Passiflora suberosa L.

61 PIPERACEAE [1/8]
Peperomia crystallina Ruiz & Pav.
Peperomia dolabriformis Kunth
Peperomia galioides Kunth
Peperomia hillii Trel.
Peperomia inaequalifolia Ruiz & Pav.
Peperomia limaensis Trel.
Peperomia umbelliformis C.DC.
Peperomia umbilicata Ruiz & Pav.

62 PLANTAGINACEAE [6/10]
Bacopa monnieri (L.) Wettst.
Galvezia fruticosa J. F.Gmel.
Galvezia elisensii Quipuscoa & M.O. Dillon (sp.nov. inéd.)
Nuttallanthus canadensis (L.) D. A. Sutton
Plantago australis Lam.
Plantago lanceolata L.
Plantago limensis Pers.
Plantago major L.
Scoparia dulcis L.
Veronica persica Poir.

63 PLUMBAGINACEAE [1/2]
Plumbago coerulea Kunth
Plumbago zeylanica L.

64 POLEMONIACEAE [2/3]
Bryantiella glutinosa (Phil.) J.M. Porter
Gilia laciniata Ruiz & Pav.
Gilia lomensis V. E. Grant

65 POLYGALACEAE [1/3]
Pteromonnina herbacea (DC.) B. Eriksen
Pteromonnina macrostachya (Ruiz & Pav) B. Eriksen
Pteromonnina pterocarpa (Ruiz & Pav.) B. Eriksen

66 POLYGONACEAE [3/4]
Coccoloba gracilis Kunth
Persicaria glabra (Willd.) M. Gómez
Persicaria hydropiperoides (Michx.) Small
Rumex conglomeratus Murray

67 PORTULACACEAE [4/11]
Calandrinia alba (Ruiz & Pav.) DC.
Calandrinia ciliata (Ruiz & Pav.) DC.
Cistanthe calycina (Phil.) Carolin ex M.A.Hershkovitz
Cistanthe celosioides (Phil.) Kuntze
Cistanthe lingulata (Ruiz & Pav.) Hershkovitz
Cistanthe paniculata (Ruiz & Pav.) Hershkovitz
Portulaca nivea Poellnitz
Portulaca oleracea L.
Portulaca philippi I.M.Johnston
Portulaca pilosa L.
Talinum triangulare (Jacq.) Willd.

68 POTAMOGETONACEAE [1/1]
Zannichellia palustris L.

69 PRIMULACEAE [2/3]
Anagallis arvensis L.
Centunculus erectus Phil.
Centunculus minimus L.

70 RANUNCULACEAE [1/1]
Clematis haenkeana C. Presl

71 RHAMNACEAE [1/1]
Scutia spicata (Humb. & Bonpl ex Willd.) Weberb.

72 RUBIACEAE [6/9]
Arcytophyllum thymifolium (Ruiz & Pav.) Standl.
Diodella teres (Walter) Small
Galium aparine L.
Galium arequipicum Dempster
Spermacoce ocimifolia Willd. ex Roem & Schult.
Randia rotundifolia Ruiz & Pav.
Richardia brasiliensis Gomes*
Richardia lomensis (K. Krause) Standl.
Richardia scabra L.

73 SALICACEAE [1/1]
Salix humboldtiana Willd.

74 SANTALACEAE [1/7]
Quinchamalium brevistaminatum Pilg.
Quinchamalium carnosum Phil.
Quinchimalium chilense Molina
Quinchamalium excrescens Phil.
Quinchamalium lomae Pilg.

Quinchamalium procumbens Ruiz & Pav.
Quinchamalium thesioides Phil.

75 SAPINDACEAE [3/3]
Cardiospermum corindum L.
Dodonaea viscosa Jacq.
Sapindus saponaria L.

76 SCROPHULARIACEAE [4/5]
Alonsoa meridionalis (L.f.) Kuntze
Capraria biflora L.
Capraria peruviana Benth.
Castilleja scorzonerifolia Kunth
Mimulus glabratus Kunth

77 SOLANACEAE [16/91]
Acnistus arborescens (L.) Schltdl.
Browallia americana L.
Capsicum annuum L.*
Cestrum auriculatum L'Hér.
Cestrum tomentosum L. f.
Datura inoxia Mill. +
Datura stramonium L. +
Exodeconus maritimus (Benth.) D'Arcy
Exodeconus prostratus (L'Hér.) Raf.
Grabowskia boerhaaviifolia (L.f.) Schltdl.
Jaltomata aspera (Ruiz & Pav.) Mione
Jaltomata atiquipa Mione & S. Leiva
Jaltomata hunzikeri Mione
Jaltomata lomana Mione & S. Leiva
Jaltomata umbellata (Ruiz & Pav.) Mione & M. Nee
Leptoglossis darcyana Hunz. & Subils
Leptoglossis ferreyraei Hunz. & Subils
Leptoglossis lomana (Diels) Hunz.
Leptoglossis schwenckioides Benth.
Lycianthes lycioides (L.) Hassl.
Lycium americanum Jacq.
Lycium distichum Meyen
Lycium leiostemum Wedd.
Lycium stenophyllum J. Rémy
Nicandra physalodes (L.) Gaertn.
Nicandra yacheriana S. Leiva
Nicotiana glauca Graham
Nicotiana glutinosa L.
Nicotiana knightiana Goodspeed
Nicotiana paniculata L.
Nolana adansonii (Roem. & Schult.) I. M. Johnst.
Nolana anenigma M.O.Dillon, S. Leiva & Quipuscoa
Nolana arenicola I. M. Johnst.
Nolana arequipensis M.O.Dillon & Quipuscoa
Nolana aticoana Ferreyra
Nolana cerrateana Ferreyra
Nolana chancoana M.O. Dillon & Quipuscoa
Nolana confinis (I. M. Johnst.) I. M. Johnst.
Nolana coronata Ruiz & Pav.
Nolana gayana (Gaudich.) Koch
Nolana guentheri I. M. Johnst.
Nolana humifusa (Gouan) I. M. Johnst.
Nolana inflata Ruiz & Pav.
Nolana insularis (I. M. Johnst.) I. M. Johnst.
Nolana ivaniana Ferreyra
Nolana jaffuelii I. M. Johnst.
Nolana johnstonii Vargas
Nolana latipes I. M. Johnst.
Nolana lycioides I. M. Johnst.
Nolana mariarosae Ferreyra
Nolana minor Ferreyra
Nolana pallida I. M. Johnst.
Nolana pallidula I. M. Johnst.
Nolana pearcei I. M. Johnst.
Nolana pilosa I. M. Johnst.
Nolana platyphylla (I. M. Johnst.) I. M. Johnst.
Nolana plicata I. M. Johnst.
Nolana polymorpha Gaudich.
Nolana revoluta Ruiz & Pav.
Nolana scaposa Ferreyra
Nolana spathulata Ruiz & Pav.
Nolana thinophila I. M. Johnst.
Nolana tomentella Ferreyra
Nolana tovariana Ferreyra
Nolana volcanica Ferreyra
Nolana weberbauerii I.M.Johnst.
Nolana weissiana Ferreyra
Nolana willeana Ferreyra
Physalis angulata L.
Physalis peruviana L.
Physalis pubescens L.
Solanum agrimoniifolium Rydb.
Solanum andersonii Ochoa
Solanum chancayense Ochoa

Solanum chilense (Dunal) Reiche
Solanum edmondstonei Hook.f.
Solanum ferreyrae Ugent,
Solanum fragile Wedd.
Solanum habrochaites S. Knapp & D.M. Spooner
Solanum immite Dunal
Solanum medians Bitter
Solanum mochiquense Ochoa
Solanum montanum L.
Solanum multifidum Lam.
Solanum neoweberbaueri Wittm.
Solanum pennellii Correll
Solanum peruvianum L.
Solanum pimpinellifolium L.
Solanum radicans L.f.
Solanum tuberosum L. +
Solanum wittmackii Bitter

78 TROPAEOLACEAE [1/4]
Tropaeolum ferreyrae Sparre
Tropaeolum majus L.
Tropaeolum minus L.
Tropaeolum peltophorum Benth.

79 TURNERACEAE [1/2]
Turnera orientalis (Urb.) Arbo
Turnera pumilea L.

80 URTICACEAE [4/5]
Parietaria debilis G.Forst.
Phenax hirtus (Sw.) Wedd.
Pilea lamioides Wedd.
Pilea nitida Wedd.
Urtica urens L.

81 VALERIANACEAE [2/3]
Astrephia chaerophylloides (Sm.) DC.
Valeriana interrupta Ruiz & Pav.
Valeriana pinnatifida Ruiz & Pav.

82 VERBENACEAE [9/13]
Aloysia minthiosa Mold.
Citharexylum flexuosum (Ruiz & Pav.) D.Don
Clerodendrum chinense (Osbeck) Mabb.
Duranta erecta L.
Duranta triacantha Juss.
Glandularia clavata (Ruiz & Pav.) Botta
Lantana horrida Kunth
Lantana scabiosiflora Kunth
Lippia alba (Mill.) N.E.Br. ex Britton & P. Wilson
Lippia nodiflora (L.) Michx.
Pitraea cuneato-ovata (Cav.) Caro
Verbena ferreyrae Moldenke
Verbena litoralis Kunth

83 ZYGOPHYLLACEAE [3/4]
Bulnesia retama (Gillies x Hook. & Arn.) Griseb.
Fagonia chilensis Hook. & Arn.
Tribulus longipetalus Viv.
Tribulus terrestris L.

Table 2. Geographic localities of major Peruvian *Lomas* Formations.

Departamento Lambayeque	
Cerro Reque	06°14'S, 79°42'W
Departamento La Libertad	
Cerro Cabezón	07°54'S, 79°05'W
Cerro Campana	07°58'S, 79°06'W
Cerro Prieto	07°59'S, 79°03'W
Cerro Cabras	08°03'S, 79°02'W
Cerro Chiputur	08°10'S, 78°55'W
Cerro Negro	08°18'S, 78°49'W
Virú	08°19'S, 78°48'W
Departamento Ancash	
Cerro Chimbote	09°04'S, 78°38'W
Casma	09°28'S, 78°19'W
Mongon	09°36'S, 78°17'W
Lupín	10°33'S, 77°50'W
Departmento Lima	
Pativilca (Pacar)	10°42'S, 77°47'W
Lachay	11°21'S, 77°23'W
Iguanil (Chancay)	11°24'S, 77°14'W
Pasamayo	11°38'S, 77°11'W
Ancon	11°42'S, 77°09'W
Lurigancho	12°00'S, 76°59'W
Lima	12°00'S, 77°03'W
Cajamarquilla	12°00'S, 77°02'W
Morro Solar	12°00'S, 77°02'W
Amancaes	12°01'S, 77°02'W
Cerro Agustino	12°04'S, 77°00'W
Isla San Lorenzo	12°05'S, 77°15'W
Atocongo	12°08'S, 76°56'W
Manchay	12°09'S, 76°52'W
Chorrillos	12°10'S, 77°02'W
Manzano	12°15'S, 76°55'W
Lurin	12°17'S, 76°52'W
Pachacamac	12°18'S, 76°55'W
Punta Hermosa	12°20'S, 76°52'W
Caracoles	12°23'S, 76°45'W
Asia	12°47'S, 76°30'W
Quilmana	12°52'S, 76°26'W
Cañete	13°05'S, 76°24'W
Departmento Ica	
Pisco	13°42'S, 76°13'W
Isla San Gallan	13°50'S, 76°28'W
Bahía La Independencia	14°15'S, 76°10'W
Amara	14°42'S, 75°42'W
San Nicolas	15°13'S, 75°15'W
Departmento Arequipa	
Jahuay	15°22'S, 74°54'W
Lomas	15°34'S, 74°50'W
Atiquipa	15°48'S, 74°22'W
Capac	15°49'S, 74°06'W
Cháparra	15°50'S, 74°00'W
Chala	15°53'S, 74°12'W
Atico	16°14'S, 73°39'W
Ocoña	16°30'S, 73°06'W
Camaná	16°35'S, 73°06'W
Mollendo	16°55'S, 72°17'W
Cachendo	17°00'S, 71°45'W
Mejia	17°07'S, 71°55'W
Departamento Moquegua	
Ilo	17°45'S, 71°10'W
Departmento Tacna	
Sama Grande	17°48'S, 70°30'W
Tacna	17°50'S, 70°15'W

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