

A CHECKLIST OF THE NATIVE ANNUAL FLORA OF CONTINENTAL CHILE

UN CATALOGO DE LA FLORA ANUAL NATIVA DE CHILE CONTINENTAL

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ABSTRACT

A checklist of the native annual species of continental Chile is provided. Observations on 4408 native species (over 99% of the total native vascular flora of continental Chile) indicate the presence of the annual habit in 692 species (15.7% of the flora). Annuals occurs in 196 genera (24.7%) and 53 families (31.2%). There are proportionately more annuals among dicotyledons (19.3%) than among monocotyledons (4.3%), a trend also seen to be statistically significant at the generic level. 358 (51.7%) annual species are fairly certainly endemic to continental Chile, while an additional 18 species (2.6%) are characterized by endemic Chilean infraspecific taxa. A further 20 species are probably endemic to continental Chile as are varieties of 3 species. Seven of Chile's endemic genera (10.4%) are exclusively annual (*Cyphocarpus* (Campanulaceae); *Microphyes* (Caryophyllaceae); *Moschardia* (Asteraceae); *Agallis* (Cruciferae); *Scyphanthus* (Loasaceae); *Homalocarpus* (Umbelliferae); *Araeoandra* (Vivianaceae)). The frequency of the annual habit in Chile is briefly compared with that of other arid and semi-arid regions.

KEYWORDS: Annual habit; flora of continental Chile; endemic species and genera; mediterranean-type climate.

RESUMEN

Se presenta un catálogo de las especies anuales de la flora nativa de Chile continental. Observaciones en 4408 especies (más del 99% de la flora vascular nativa total de Chile continental) indica la presencia del hábito anual en 692 especies (15,7% de la flora). Las anuales pertenecen a 196 géneros (24,7%) y 53 familias (31,2%). La frecuencia del hábito anual es significativamente mayor en las dicotiledóneas (19,3%) que en las monocotiledóneas (4,3%), una tendencia que también es estadísticamente significativa al nivel de género. 358 (51,7%) de las especies anuales son endémicas a Chile continental, en tanto que 18 (2,6%) especies presentan variedades chilenas endémicas. 20 especies adicionales probablemente son endémicas tal como lo son variedades de 3 especies adicionales. Siete de los géneros endémicos de Chile continental (10,4% del total) son exclusivamente anuales (*Cyphocarpus* (Campanulaceae); *Microphyes* (Caryophyllaceae); *Moschardia* (Asteraceae); *Agallis* (Cruciferae); *Scyphanthus* (Loasaceae); *Homalocarpus* (Umbelliferae); *Araeoandra* (Vivianaceae)). Se compara la frecuencia del hábito anual en la flora nativa de Chile continental con la de otras áreas áridas y semi-áridas.

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INTRODUCTION

A significant proportion of continental Chile is characterized by arid to semi-arid climates with strongly seasonal or highly irregular rainfall (di Castri & Hajek, 1976). Desert to semi-desert climates extend along the coast and far inland to above 2000 m from the far north (17°S) to

around 26°S (Arroyo et al., 1988). In central Chile from 32° - 38°S and in interior valleys as far south as 40°S the climate is typically mediterranean (di Castri, 1988). A semi-mediterranean-type climate appears in the extreme eastern border of the Chilean Patagonia (di Castri & Hajek, 1976).

Many temperate semi-arid and arid regions are known to support taxonomically diverse and speciose native annual assemblages. The State of California, with a predominantly mediterranean-type climate, supports 28.6% native annuals (Raven & Axelrod, 1978) while the Sonoran desert is characterized by 21.4% (Shreve & Wiggins, 1964). The flora of Israel, with only 1.7% aliens across all life-forms, supports more than 50% annuals (Eig, 1931, 1932; Danin & Orshan, 1990). A notable exception to this rule, is the mediterranean-type climate Cape region of South Africa with only 6.4% native annuals (Goldblatt, 1978). Vegetation studies also suggest a relatively low percentage of annuals for mediterranean-type climate areas in southern Australia (Adamson, 1927). Interestingly, both mediterranean-type climate areas with lower percentages of annuals are found in the southern hemisphere.

Chile, mainly as a result of a lack of a comprehensive floristic treatment for the country, is one of the last mediterranean-type climate regions to be surveyed for the annual habit. Some data has been forthcoming from vegetation plots, small scale floristic studies and other ecological studies (e.g. Schlegel, 1966; Mooney et al., 1977; Arroyo & Squeo, 1990; Arroyo & Uslar, 1990). Additional information for a few areas may be gleaned from regional floras (e.g. Moore, 1982; Arroyo et. al., 1984; Arroyo et. al., 1988; Arroyo et. al., 1989). However the present state of knowledge of the frequency of the annual habit is insufficient for characterizing the Chilean flora in general.

Here we provide a complete checklist of the native annual species of continental Chile. The information has been gathered in relation to a more comprehensive study of similarities and differences between the vascular floras of Chile and California, to be presented elsewhere. Given the lack of a modern flora, publication of a checklist of the native annuals of Chile seems timely. Such information should be useful to professional

plant ecologists who are presently forced to work with limited botanical literature. Secondly, agronomists interested in native forage crops should benefit from the availability of such a checklist. The checklist has been compiled to a large degree from literature sources. In that some authors give more attention to life-form than others, further observations by field biologists using it constitute the best avenue for its perfection.

INFORMATION SOURCES

To assess the incidence of the annual habit in continental Chile a data base of all native vascular plant species occurring there was developed. By continental Chile we mean *mainland Chile excluding the Juan Fernández Islands, the San Ambrosio and San Felix Islands and Easter Island*, all under Chilean jurisdiction. The data base relied on the checklist of the Chilean flora published by Marticorena & Quezada (1985), as baseline information, modified as follows. Species in the Marticorena & Quezada (1985) checklist restricted to the forementioned island territories of Chile and all introduced species in the list were excluded. The reduced list was further emended for new species, numerous synonymy changes published after 1985 and corrections of the alien status of some species. Intraspecific taxa are not considered. The final data base contained 4443 native vascular plants species distributed in 793 genera and 170 families.

For assessing the annual habit the relevant life-form information for many species was obtained directly from recent generic revisions. For others we found it necessary to rely on the older Reiche (1896-1911) flora, local floras for Argentina and Chile (e.g. Moore, 1982; Correa, 1971) and original species descriptions. Such information was complemented with our own field knowledge of life-forms and consultation of herbarium material.

Fairly reliable information was found for a total of 4408 (>99% of the 4443) names in the continental checklist. For the present purposes, 20 species, given as "probably annual" are given the benefit of the doubt. Species varying in habit from an annual to biennial or perennial herb are designated as facultatively annual. Annual spe-

cies and genera with annuals endemic to continental Chile are indicated.

CHECKLIST OF THE NATIVE ANNUALS OF CONTINENTAL CHILE

(fa) following the specific epithet indicates a *facultative annual*. *Probable annuals* are followed by (a?). All other species are considered *obligate annuals*. Annual species *endemic* to continental Chile are indicated by (e). Annual species which contain an *endemic variety* in Chile are indicated by (ev). Genera endemic to Chile with annuals are designated by (E). The questioned endemics (?) are unsure endemics. (nv) following a specific epithet indicates a species occurring in Chile represented by a native variety in addition to an alien variety.

PTERIDOPHYTA

SALVINIACEAE

Azolla

filiculoides Lam.

ANGIOSPERMAE: DICOTYLEDONEAE

AIZOACEAE

Tetragonia

copiapina Phil. (e)
espinosae Muñoz (e)
macrocarpa Phil. (ev)
pedunculata Phil.
tenella Johnst. (e)
trigona Phil. (fa)(e)

AMARANTHACEAE

Amaranthus

asplundii Thell.
looseri Suess. (e)

Gomphrena

umbellata Remy

ASTERACEAE

Agoseris

chilensis (Less.) Greene (e)
coronopifolia (D'Urv.) Chamb. ex D.M. More (fa)

Amblyopappus

pusillus H. et A.

Bidens

andicola Kunth. (fa)

Blennosperma

chilense Less. (e)

Chaetanthera

aymarae Martic. et Quez. (e)
ciliata R. et P. (e)
euphrasioides (DC.) Meigen
flabellata D. Don (e)
flabellifolia Cabr. (e)
glabrata (DC.) Meigen (e)
gnaphalioides (Remy) Johnst.
incana Poepp. ex Less. (e)
leptocephala Cabr. (e)
limbata (D. Don) Less. (e)
linearis Poepp. ex Less. (e)
microphylla (Cass.) H. et A. (ev)
minuta (Phil.) Cabr.
moenchioides Less. (e)
planiseta Cabr. (e)
pusilla (D. Don) H. et A.
splendens (Remy) B.L. Rob.
tenella Less. (e)

Conyza

artemisiifolia Meyen et Walp.
bustillosiana Remy (e)
copiapina Phil. (a?)(e)
floribunda H.B.K. (fa)
glabrata Phil. (fa)(e)
hirtella (DC.) Martic. (e)*
lechleri (Sch. Bip.) Cabr.
minutiflora Phil. (e)

* *Conyza hirtella* (De Candolle) Marticorena, nov. comb.
 Basiónimo: *Erigeron hirtellus* De Candolle, Prodr. 5: 290. 1836.

Cotula

mexicana DC.

Doniophyton

anomalum (D. Don) Kurtz
patagonicum (Phil.) Hieron.

Eclipta

prostrata (L.) L. (fa)

Erechtites

leptantha (Phil.) Cabr. (e)

Facelis

plumosa (Wedd.) Sch. Bip.
retusa (Lam.) Sch. Bip. (ev)

Flaveria

bidentis (L.) O.K.

Galinsoga

parviflora Cav.
quadriradiata R. et P.

Gamochaeta

monticola (Phil. ex Reiche) Cabr.
simplicicaulis (Willd. ex Sprengel) Cabr.
sphacelata (H.B.K.) Cabr.
stachydifolia (Lam.) Cabr.

Gnaphalium

aldunateoides Remy
cheiranthifolium Lam. (fa)
cymatoides Kunze ex DC. (ev)
diminutivum Phil. (e?)
heterotrichum Phil. (e)
moelleri Phil.
perpusillum Phil. (e?)
phaeolepis Phil. (e)
pratense Phil.
ramosum Phil. (e)

Helenium

aromaticum (Hook.) Bailey (fa)(e)
atacamense Cabr. (fa)(e)
ovallense Bierner (fa)(e)
urmenetae (Phil.) Cabr. (fa)(e)
vallenariense (Phil.) Bierner (fa)(e)

Heterosperma

nanum (Nutt.) Sherff
ovatifolium Cav.

Hieracium

antarcticum D'Urv.

Lasthenia

kunthii (Less.) H. et A. (e)

Leucheria

cerberoana Remy (e)
cumingii H. et A. (e)
glabriuscula (Phil.) Reiche (e)
glandulosa D. Don (e)
menana Remy (e)
oligocephala Remy (e)
senecioides H. et A. (e)
tenuis Less. (e)

Madia

chilensis (Nutt.) Reiche (e)
sativa Mol.

Malacothrix

chevelandii A. Gray
coulteri A. Gray

Micropsis

nana D.C.

Microseris

pygmaea D. Don

Moschardia (E)

pinnatifida R. et P. (e)
solbrigii Crisci (e)

Polyachyrus

annuus Johnst.

Psilocarphus

brevissimus Nutt.

Schkuhria

multiflora H. et A.
pinnata (Lam.) O.K.

Senecio

truncosii Phil. (e)

Sigesbeckia

chorullensis H.B.K.

Soliva

pterosperma (A.L. Juss.) Less.
sessilis R. et P. (e)
stolonifera (Brot.) Loud.
valdiviana Phil.

Tagetes

biflora Cabr.
minuta L.
multiflora H.B.K.

Triptilion

achilleae DC. (fa)
berteroi Phil. (a?)(e)
capillatum (D. Don) DC. (e)
cordifolium Lag. ex Lindl. (e)
diffusum (D. Don) DC. (a?)(e)
digitatum Phil. (e)
dusenii O. Hoffm. (e)
euphrasioides Bert, ex DC. (e)
gibbosum Remy (e)

Verbesina

encelioides (Cav.) B. et H. ex A. Gray (fa)

Villanova

oppositifolia Lag.

Xanthium

argenteum Widder (e)

BORAGINACEAE

Amsinckia

calycina (Moris) Chater
tessellata A. Gray

Cryptantha

alfalfalis (Phil.) Johnst. (e)
aspera (Phil.) Grau (e)
calycina (Phil.) Reiche (e)
calycotricha Johnst. (e)
chaetocalyx (Phil.) Johnst. (e)
chispae Grau (e)
clandestina (Trev.) Johnst. (e)
cynoglossoides (Phil.) Johnst.
dichita (phil.) Johnst. (e)

diffusa (Phil.) Johnst.
dimorpha (Phil.) Greene (e)
diplotricha (Phil.) Reiche
dolichophylla (Phil.) Reiche (e)
filaginea (Phil.) Reiche
filiformis (Phil.) Reiche (e)
gayi Johnst. (fa)(e)
globulifera (Clos) Reiche
glomerata Lehm. (e)
haplostachya (Phil.) Johnst. (e)
hispida (Phil.) Reiche (e)
involucrata (Phil.) Reiche (fa)(e)
kingii (Phil.) Reiche (e)
marticorenae Grau (e)
parviflora (Phil.) Reiche
phaceloides (Clos) Reiche (e)
romanii Johnst. (e)
taltalensis Johnst. (e)
volckmannii (Phil.) Johnst. (e)
werdermanniana Johnst. (e)

Heliotropium

geissei F. Phil. (e)
microstachyum R. et P.
paronychioides A.DC.

Myosotis

antarctica Hook, f. (fa)

Pectocarya

anomala Johnst.
dimorpha (Johnst.) Johnst.
linearis (R. et P.) DC.
pusilla (A.DC) A. Gray

Plagiobothrys

armeriifolius (Phil.) Johnst. (e)
calandrinoides (Phil.) Johnst.
collinus (Phil.) Johnst. (e)
corymbosus (R. et P.) Johnst. (e)
fulvus (H. et A.) Johnst. (e)
gracilis (R. et P.) Johnst. (e?)
myosotoides (Lehm.) Brand
oppositifolius (Phil.) Johnst. (e)
polycaulis (Phil.) Johnst. (fa)(e)
pratensis (Phil.) Johnst. (e)
procumbens (Colla) A. Gray
pulchellus (Phil.) Johnst. (e)
uliginosus (Phil.) Johnst. (e)
verrucosus (Phil.) Johnst.

CALLITRICHACEAE

Callitriche

- antarctica Engelm, ex Hegelm.
- hermafroditica L.
- lechleri (Hegelm.) Fassett
- palustris L.
- terrestris Rafin.

CALYCERACEAE

Boopis

- gracilis Phil.
- pusilla Phil. (e)

Calycera

- eryngioides Remy
- integrifolia (Phil.) Reiche (e)
- leucanthema (Poepp.) Reiche (e?)
- sessiliflora Phil. (e)

Moschopsis

- monocephala (Phil.) Reiche (fa)

CAMPANULACEAE

Cyphocarpus (E)

- innocuus Sandw. (e)
- psammophilus Ricardi (e)
- rigescens Miers (e)

Downingia

- pusilla (Poepp. ex Cham.) Torr.

Legenere

- valdiviana (Phil.) Wimmer (fa)

Lobelia

- alata Labill.

Triodanis

- biflora (R. et P.) Greene

CAPPARACEAE

Cleome

- chilensis DC. (ev?)

CARYOPHYLLACEAE

Arenaria

- oligosperma Naud. (a?)(e?)

Drymaria

- cordata (L.) Willd. ex Roem. et Schult.
- engleriana (Muschl.) Baehni et MacBr.
- paposana Phil. (ev)

Microphyes (E)

- litoralis Phil. (e)
- minimus (Bertero ex Colla) (Briq.) (e)
- robustus Ricardi (e)

Minuartia

- acutiflora (Fenzl) Mattf.

Sagina

- apetala Ard. (ev?)
- chilensis Naud.

Spergularia

- cremnophila Johnst. (fa)(e)
- denticulata Phil. (e)
- platensis (Cambess) Fenzl
- stenocarpa (Phil.) Johnst. (fa)

Stellaria

- abortiva Naud. (e?)

CHENOPODIACEAE

Atriplex

- chilensis Colla (e)
- myriophylla Phil.
- oreophila Phil.
- peruviana Moq.
- philippii R. E. Fries (e)

Chenopodium

- ambrosioides L. (fa)
- antarcticum (Hook. f.) Hook. f.
- carnosulum Moq.
- frigidum Phil.
- macrospermum Hook. f.
- papulosum Moq.
- petiolare H.B.K.
- philippianum Aellen
- quinoa Willd.

Nitrophila

atacamensis (Phil.) Hieron. ex Ulbr. (fa)

Suaeda

patagonica Speg.

CRASSULACEAE

Crassula

closiana (Gay) Reiche (e)
connata (R. et P.) Berger
decumbens Thunb.
moschata G. Forster
ovallei (Phil.) Reiche (e)
peduncularis (J.E. Sm.) Meigen
solieri (Gay) Meigen
tillaea Lest.-Garl.

CRUCIFERAE

***Agallis* (E)**

lanata (Barn.) Gilg et Muschl. ex O.E.
Schultz (e)

Cardamine

chilensis (e?) DC.
nivalis Gill. ex Hook. et Arn. (e)
solisii Phil. (e?).

Coronopus

leptocarpus Boelcke (e)

Cremolobus

chilensis (Lag. ex DC.) DC.

Descurainia

cumingiana (Fisch. et Mey.) Prantl (fa)(ev)
diversifolia O.E. Schulz (e)
glaucescens (Phil.) O.E. Schulz (fa)
nuttallii (Colla) O.E. Schulz (a?)(e)
pinnata (Walter) Britton
stricta (Phil.) Prantl ex Reiche (fa)(ev)

Diplotaxis

chilensis Barn. (e)

Draba

australis R. Br.

Lepidium

aletes Macbr.
angustissimum Phil. (e)
auriculatum Regel et Koern. (fa)(e)
bipinnatifidum A.N. Desv. (fa)
brevicaule Barn. (e)
curicoanum Phil. (e)
johnstonii C. Hitch. (e)
myrianthum Phil.
nitidum Nutt. ex Torr. et Gray (e)
pseudo-didymus Thell. ex Druce (fa)
pubescens A.N. Desv.
rahmeri Phil. (fa)
raimondii O.E. Schulz
strictum (S. Wats.) Rattan.
subvaginatum Steud. ex Thell. (fa)

Menonvillea

chilensis (Turcz.) Jacks. (e)
filifolia Fischer et C. Meyer (fa)(e)
gayi Phil.
linearis DC. (fa)(e)
litoralis (Barn.) Rollins (e)
minima Rollins (e)
orbiculata Phil. (fa)(e)
pinnatifida Barn. (fa)(e)

Rorippa

austroamericana Mart.-Lab. (fa)
philippiana (Speg.) Maclosk. (fa)

Schizopetalon

arcuatum Al-Shehbaz (e)
bipinnatifidum Phil. (e)
biseriatum Phil. (e)
brachycarpum Al-Shehbaz (e)
corymbosum Al-Shehbaz (e)
dentatum (Barn.) Gilg et Muschl. (e)
maritimum Barn. (e)
rupestre (Barn.) Reiche
tenuifolium Phil. (e)
walkeri Hook. (e)

Thlaspi

alpestre (ev?)

ELATINACEAE

Elatine

triandra Schkuhr (fa)

EUPHORBIACEAE

Euphorbia

- germainii Phil. (e)
- meyeniana Klotzsch (fa)
- minuta Phil.
- pygmaea Phil. (e)
- tarapacana Phil. (e)
- verna Phil. (e)

GENTIANACEAE

Centaurium

- cachanlahuen (Mol.) B.L. Rob.

Cicendia

- quadrangularis (Lam.) Griseb.

Gentiana

- lactea Phil. (e)
- prostrata Haenke (fa)

Gentianella

- magellanica (Gaud.) Fabris ex D.M. Moore (fa)

GERANIACEAE

Geranium

- intermedium Colla, ex Savi (e)

HYDROPHYLLACEAE

Nama

- dichotomum (R. et P.) Choisy
- undulatum H.B.K. (ev).

Phacelia

- brachyantha Benth.
- cumingii (Benth.) A. Gray
- nana Wedd.
- pinnatifida Griseb. ex Wedd. (fa)
- setigera Phil.

LABIATAE

Salvia

- paposana Phil.

Stachys

- eremicola Epling (e)
- gilliesii Benth. (fa)
- truncata Kunze ex Benth. (e)

LOASACEAE

Caiophora

- contorta (Desr.) Urban et Gilg
- dissecta (Hook.) Urban et Gilg (fa)(e)
- tomentosula Urban et Gilg (fa)(e)

Loasa

- aphanantha Urban et Gilg
- artemisiifolia (Poepp.) Urban et Gilg (fa)(e)
- bertrandii Phil. (e)
- caespitosa Phil. (e)
- chilensis (gay) Urban et Gilg (e)
- floribunda H. et A. (e)
- gayana Urban et Gilg (e)
- intricata Gay (e)
- lateritia Gill. ex Arn.
- longiseta Phil. (e)
- malesherbioides Phil. (e)
- martinii Phil. (e)
- micrantha Poepp. (e)
- multifida Gay (a?)(e)
- pallida Gill. ex Arn. (e)
- tricolor Ker-Gawl. (ev)
- triloba Domb. ex A.L. Juss. (e)
- urens Jacq.
- urmenetae Phil. (e)
- volubilis Domb. ex A.L. Juss. (fa)(e)

Mentzelia

- bartonioides (K. Presl) Urban et Gilg
- pinnatifida (Phil.) Urban et Gilg
- solieri (Gay) Urban et Gilg

Scyphanthus (E)

- elegans D. Don (fa)(e)
- stenocarpus (Poepp.) Urban et Gilg (fa)(e)

LYTHRACEAE

Pleurophora

- polyandra H. et A. (e)
- pusilla H. et A. (e)

MALESHERBIACEAE

Malesherbia

- gabrielae* Ricardi (e)
- humilis* Poepp. (e)
- multiflora* Ricardi (e)
- taltalina* Ricardi (e)

MALVACEAE

Cristaria

- adenophora* Johnst. (e)
- australis* Phil. (e)
- cyanea* Phil ex E. Baker (e)
- dissecta* H. et A.
- divaricata* Phil. ex E. Baker
- diversifolia* Phil. (e)
- elegans* Gay (a?)(e)
- eriantha* H. et A. (fa)(e)
- flexuosa* Phil. (a?)(e)
- formosula* Johnst.
- glandulosa* Phil. (e)
- heterophylla* (Cav.) H. et A. (e)
- hirsuta* K. Presl (e)
- humilis* Phil. (e)
- inconspicua* F., Phil. ex Phil. (e)
- integerrima* Phil. (fa)(e)
- intermedia* Gay (fa)(e)
- intonsa* Johnst. (e)
- molinae* Gay (e)
- ovallea* Gay (e)
- patens* Phil. (e)
- pinnatifida* H. et A. (e)
- ranunculifolia* Phil. ex E. Baker (e)
- rotundifolia* Phil. (e)
- saniculifolia* Phil. ex E. Baker (e)
- sundtii* Phil. (e)
- trifida* Phil. (e)
- univittata* Hochr. (e)

Lecanophora

- heterophylla* (Cav.) Krap. (e)

Nototriche

- diminutiva* (Phil.) Johnst. (e)
- nana* A.W. Hill
- pusilla* A.W. Hill
- pygmaea* (Remy) A.W. Hill
- sarmentosa* A.W. Hill

Palaua

- inconspicua* Johnst.
- modesta* (Phil.) Reiche (e)

Tarasa

- antofagastana* (Phil.) Krap.
- congestiflora* (Johnst.) Krap.
- tarapacana* (Phil.) Krap.
- tenella* (Cav.) Krap.
- umbellata* Krap. (e)

Urocarpidium

- chilense* (Braun et Bouché) Krap.
- peruvianum* (L.) Krap.

MOLLUGINACEAE

Glinus

- radiatus* (Ruiz et Pavón) Rohrb.

NOLANACEAE

Nolana

- aplocaryoides* (Gaud.) Johnst. (e)
- baccata* (Lindl.) Dunal (e)
- gracillima* Johnst.
- intonsa* I.M. Johnst. (fa)(e)
- parviflora* (Phil.) Phil. (e)
- pterocarpa* Phil. ex Wettst. (e)
- rhombifolia* Martic. et Quez. (e)

ONAGRACEAE

Camissonia

- dentata* (Cav.) Reiche (ev)

Clarkia

- tenella* (Cav.) Lewis et Lewis (ev)

Gayophytum

- humile* A.H.L. Juss.
- micranthum* H. et A.

Oenothera

- affinis* Cambess.
- arequipensis* Munz et Johnst.
- coquimbensis* Gay (e)
- grisea* W. Dietr. (e)

magellanica Phil. (fa)
 nana Griseb. (fa)
 odorata Jacq.
 peruana W. Dietr. (fa)
 picensis Phil.
 ravenii W. Dietr. (fa)(ev)
 rubida Rusby
 sandiana Hassk.
 villaricae W. Dietr. (fa)

OXALIDACEAE

Oxalis

aberrans Reiche (e)
 clandestina Phil. (fa)(e)
 compacta Gill. ex Hook. et Arn. (fa)(ev)
 laxa H. et A.
 leptocaulos Phil. (fa)(e)
 ovalleana Phil. (e)
 pubescens H.B.K.
 rigida (Barn.) Lourt.
 rosea Jacq. (e)
 valdiviensis Barn. (fa)

PAPAVERACEAE

Argemone

hunnemannii Otto et Dietr. (fa)(e)
 rosea Hook. (e)
 subfusiformis Ownbey

PAPILIONACEAE

Adesmia

capitellata (Clos) Haum.
 eremophila Phil. (fa)(e)
 filifolia Clos (e)
 micrantha Phil. (e)
 multicuspis Clos (e)
 muricata (Jacq.) DC.
 parviflora Clos (e)
 pusilla Phil. (e)
 rahmeri Phil. (fa)
 tenella H. et A. (e)

Astragalus

berteroanus (Moris) Reiche (e)
 coquimbensis (H. et A.) Reiche (e)

dodtii Phil. (e)
 paposanus Johnst. (e)
 pissisii (phil.) Johnst. (e)
 triflorus (DC.) A. Gray

Dalea

moquehuana Macbr.

Lathyrus

campestris Phil.
 crassipes Gill. ex H. et A.

Lotus

subpinnatus Lag.

Lupinus

microcarpus Sims

Trifolium

chilense H. et A. (e)
 circundatum Kunze (e)
 depauperatum A.N. Desv.
 macraei H. et A.
 microdon H. et A.
 physanthum H. et A. (e)
 triaristatum Bert. et Savi
 vernum Phil. (e)

Vicia

acerosa Clos
 berteriana Phil. (a?)(e?)
 ciliaris Phil. (a?)(e?)
 graminea J.E. Sim.
 inconspicua Phil. (e?)
 leyboldii Phil. (fa)(e?)
 magnifolia Clos (e?)
 micrantha H. et A. (e?)
 modesta Phil. (e?)
 moorei Phil. (a?)(e?)
 sessiliflora Clos (a?)(e?)
 subserrata Phil. (e?)
 truncata Phil. (a?)(e?)
 vicina Clos (e?)

PLANTAGINACEAE

Plantago

firma Kunze et Walp.
 hispidula R. et P. (e)
 limensis Pers.

litorea Phil. (e)
pulvinata Speg. (fa)
rancagua Steud. (e)

POLEMONIACEAE

Collomia

biflora (R. et P.) Brand
cavanillesii H. et A. (e)

Gilia

crassifolia Benth.
glutinosa Phil.
laciniata R. et P.
valdiviensis Griseb.

Ipomopsis

gossypifera (Gill. ex Benth.) Grant

Linanthus

pusillus (Benth.) Greene (e)

Microsteris

gracilis (Dougl. ex Hook.) Greene

Navarretia

involucrata R. et P.

Polemonium

micranthum Benth

POLYGALACEAE

Polygala

gayi A. Benn. (fa)(e)

POLYGONACEAE

Chorizanthe

commisuralis Remy (e)

Lastarriaea

chilensis Remy (e)

Oxytheca

dendroidea Nutt.

PORTULACACEAE

Calandrinia

acuminata Phil. (e)
arenaria Cham. (e)
bandurriae Phil.
berteroana Phil. (e)
cachinalensis Phil. (e)
cephalophora Johnst. (e)
chrysantha Johnst. (e)
ciliata (R. et P.) DC. (a?)
compressa Schrad. ex DC. (e)
coquimbensis Barn. (e)
cumingii H. et A. (e)
cymosa Phil. (e)
demissa Phil. (e)
densiflora Barn.
erythrocoma Phil. (e)
glaucopurpurea Reiche (e)
glomerata Phil. (e)
litoralis Phil. (e)
longiscapa Barn. (e)
modesta Phil.
oblongifolia Barn. (e)
parviflora Phil. (e)
polycarpoides Phil.
ramosissima H. et A. (e)
speciosa Lehm. (e)
spicata Phil. (e)
spicigera Phil. (e)
stricta Phil. (e)
thyrsoidea Reiche (e)
trifida H. et A. (e)
villanuevae Phil. (a?)(e)

Monocosmia

monandra (R. et P.) Baillon

Montia

fontana L.

Philippiamra

amaranthoides (Phil.) O.K. (e)
celosioides (Phil.) O.K. (e)
fastigiata (Phil.) Pax ex K. Hoffm. (e)

PRIMULACEAE

Anagallis

minima (L.) Krause

Androsace

salasii Kurtz

Pelletiera

verna St.-Hil.

RANUNCULACEAE

Myosurus

apetalus Gay

patagonicus Speg.

Ranunculus

apiifolius Pers.

bonariensis Poir.

chilensis DC.

flagelliformis J.E. Sm.

pseudotrullifolius Skottsb.

ROSACEAE

Aphanes

berteroana Rothm. (e)

looseri (Rothm.) Rothm. (e)

neglecta (Rothm.) Rothm.

RUBIACEAE

Cruckshanksia

pumila Clos (e)

tripartita Phil. (fa)(e)

Galium

fuegianum Hook. f. (fa)

aparine L.**

SANTALACEAE

Quinchamalium

berteroanum Phil. (e)

bracteosum Phil. (e)

carnosum Phil. (fa)(e)

excrecens Phil. (e)

litorale Phil. (e)

parviflorum Phil. (e)

**The status of *Galium aparine* L. in Chile is complex. Dempster (1981) states "it is highly probable that South American plants are for the most part native, but that the species has also been introduced from Europe...".

SAXIFRAGACEAE

Lepuropetalon

spathulatum (Muhl.) Elliot

SCROPHULARIACEAE

Bartsia

chilensis Benth. (e)

Calceolaria

bipinnatifida Phil.

hollermayeri Kraenzl. (e)

scabiosifolia Sims

Euphrasia

antarctica Benth.

meiantha Clos (fa)

perpusilla Phil. (e)

Limosella

australis R. Br.

Lindernia

dubia (L.) Pennell (fa)

Mimulus

acaulis Phil. (e)

bridgesii (Benth.) Clos (e)

depressus Phil. (e)

glabratus H.B.K.

luteus L. (fa)(ev)

nanus Phil.

Orthocarpus

attenuatus A. Gray

laciniatus (H. et A.) Keck

SOLANACEAE

Cacabus

flavus Johnst.

integrifolius Phil. (e)

Nicandra

physalodes (L.) Gaertn.

Nicotiana

acuminata (Graham) Hook. (ev)

corymbosa Remy
linearis Phil.
longibracteata Phil.
miersii Remy (e)
noctiflora Hook. (fa)
pauciflora Remy (e)
petunioides (Griseb.) Millan
undulata R. et P.

Reyesia

parviflora (Phil.) Hunz.

Schizanthus

alpestris Poepp. ex Benth. (e)
candidus Lindl. (fa)(e)
grahamii Gill. ex Hook.
hookeri Gill. ex Graham (fa)(e)
integrifolius Phil. (e)
lacteus Phil. (e)
laetus Phil. (e)
litoralis Phil. (e)
parvulus Sudzuki (e)
pinnatus R. et P. (e)
porrigens Graham (e)
tricolor Grau et Gronb. (e)

Solanum

andinum Reiche (a?)(e)
euacanthum Phil.
furcatum Dunal ex Poir.
gaudichaudii Dunal (e)
heterantherum Witasek ex Reiche (e)
maritimum Meyen ex Nees (e)
nigrum L. (ev)
patagonicum Morton (fa)
pentlandii Dunal

UMBELLIFERAE

Apium

laciniatum (DC.) Urban (ev)
leptophyllum (Pers.) F. Muell. ex Benth.

Asteriscium

aemocarpon Clos (e)
closii (O.K.) Math. et Const. (e)

Bowlesia

incana R. et P.
macrophysa Zoell. (e)

paposana Johnst. (e)
sodiroides Wolff
uncinata Colla (e)

Daucus

montevidensis Link ex Sprengel (a?)

Domeykoa

oppositifolia Phil. (e)

Eryngium

anomalum H. et A. (e)
coquimbantum Phil. ex Urban (e)
depressum H. et A. (e)
macracanthum Phil. (e)
pulchellum Phil. (e)

Homalocarpus (E)

bowlesioides H. et A. (e)
dichotomus (Poepp. ex DC.) Math. et Const. (e)
digitatus (Phil.) Math. et Const. (e)
dissectus Math. et Const. (e)
integerrimus (Turcz.) Math. et Const. (e)
nigripetalus (Clos) Math. et Const. (e)

URTICACEAE

Parietaria

debilis G. Forster

Urtica

berteroana Phil.
flabellata H.B.K.

VALERIANACEAE

Plectritis

samolifolia (DC.) Hoeck (e)

Valeriana

aequiloba Clos (e)
crispa R. et P. (e)
floribunda Phil. (e)
grandifolia Phil. (e)
oreocharis Phil. (e)
polemoniifolia Phil.
sphaerocarpa Phil. (e)
valdiviana Phil. (e)
virescens Clos

VERBENACEAE

Verbena

dissecta Willd. (a?)

VIOLACEAE

Viola

araucaniae Becker (e)
aurata Phil. (e)
auricula Leyb. (e)
bicolor Reiche (e)
brachypetala Gay (a?)(e)
calderensis Becker (e)
chamaedrys Leyb. (e)
chrysantha Phil.
domeykoana Gay
frigida Phil. (ev)
glechomoides Leyb. (e)
godoyae Phil. (e)
johnstonii Becker (e)
litoralis Phil. (e)
llullaillacoensis Becker (e)
minutiflora Phil. (e)
nubigena Leyb. (e)
ovalleana Phil. (e)
polypoda Turcz. (e)
pulchella Leyb. ex Reiche (e)
pulvinata Reiche (e)
pusilla Poepp. (e)
rhombifolia Leyb. (e)
taltalensis Becker (e)
vallenarensis Becker (e)
werdermannii Becker (e)

VIVIANACEAE

Araeoandra (E)

tenuicaulis (Barn.) Lefor (e)

ANGIOSPERMAE:

MONOCOTYLEDONEAE

AMARYLLIDACEAE

Alstroemeria

graminea Phil. (e)

CYPERACEAE

Cyperus

rivularis Kunth
volckmannii Phil. (e)

Scirpus

cernuus Vahl (nv)

GRAMINEAE

Agrostis

gelida Trin. (e)
oligoclada Phil. (e)
serranoi Phil. (e)

Alopecurus

heleochloides Hackel (e)

Bouteloua

simplex Lag.

Bromidium

anomalum (Trin.) Doell
trisetoides (Steud.) Rugolo (e)

Bromus

berterianus Colla
gunckelii Matthei (e)

Chaetotropis

chilensis Kunth

Deschampsia

airiformis (Steud.) Benth.
berteroana (Kunth) Trin. (e)
danthonioides (Trin.) Munro ex Benth. (e)
looseriana Parodi (e)
monandra Parodi (e)

Diplachne

uninervia (J. Presl) Parodi

Eragrostis

mexicana (Hornem.) Link
virescens J. Presl

Hordeum

pusillum Nutt.

Koeleria
grisebachii Domin

Muhlenbergia
peruviana (P. Beauv.) Steud.

Munroa
andina Phil.
decumbens Phil.

Phalaris
amethystina Trin.
angusta Nees ex Trin.

Poa
pumila Phil. (a?)

Polypogon
linearis Trin. (e)

Stipa
annua Mez

Trichoneura
weberbaueri Pilger

Vulpia
antofagastensis Parodi
australis (Nees) Blom
eriolepis (Desv.) Blom

JUNCACEAE

Juncus
bufonius L.
capitatus Weigel

LILAEACEAE

Lilaea
scilloides (Poir.) Haum.

CONCLUDING REMARKS

692 (15.7%) of the native vascular plant species of continental Chile are annual or facultatively annual (Table 1). The annual habit is found in 196 (24.7%) native genera and 53 (31.2%) native plant families (Table 1). The frequency of the annual habit is significantly higher among dicotyledons than among monocotyledons at the species, generic and familial levels (Table 1). The ten largest genera for annuals in continental Chile are: *Calandrinia* (Portulacaceae) - 31 spp.; *Cryptantha* (Boraginaceae) - 29 spp.; *Cristaria* (Malvaceae) - 27 spp.; *Viola* (Violaceae) - 26 spp.; *Loasa* (Loasaceae)- 20 spp.; *Chaetanthera*

TABLE I. Summary of frequency of annual habit in the native flora of continental Chile

	N° species studied	Obligate annuals	Facultat. annuals	Probably annuals	Total species		Genera		Families	
					N	%	N	%	N	%
ANGIOSPERMAE	4282	592	79	20	691	16.14	195	26.17	52	34.90
Dicotyledoneae	3374	554	79	19	652	19.32	171	29.38	47	37.90
Monocotyledoneae	908	38	0	1	39	4.30	24	14.72	5	20.00
GYMNOSPERMAE	16	0	0	0	0	0	0	0	0	0
PTERIDOPHYTA	110	1	0	0	1	0.91	1	2.56	1	5.88
TOTAL VASCULAR FLORA	4408	593	79	20	692	15.70	196	24.72	53	31.18
G = 150.34*** (dicots. versus monocots. - species level); G = 15.42*** (dicots. versus monocots. - generic level); G = 3.090; NS (dicots. versus monocots. - familial level).										

(Asteraceae) - 18 spp.; *Lepidium* (Cruciferae) - 15 spp.; *Plagiobothrys* (Boraginaceae) and *Vicia* (Papilionaceae) - 14 spp.; *Oenothera* (Onagraceae) - 13 spp. However it should be noted that many of the annuals cited for *Vicia* require further confirmation. Moreover *Calandrinia*, *Cristaria*, *Viola*, *Loasa*, *Plagiobothrys* and *Vicia* require revision. The final number of annual species in these genera judging by the trend seen in other recently revised Chilean genera, might turn out to be lower than presently indicated. Other important genera for annuals in Chile are *Schizanthus* (Solanaceae) with 12 species, and *Gnaphalium* (Asteraceae), *Schizopetalon* (Cruciferae), *Oxalis* (Oxalidaceae), and *Adesmia* (Papilionaceae), all with 10 species.

358 (51.7%) annual species are fairly certainly endemic to continental Chile, while an additional 18 species (2.6%) are characterized by endemic Chilean infraspecific taxa. A further 20 species are probably endemic to continental Chile as are varieties of 3 species. Recent work (Marticorena, unpublished) has shown that 67 (8.5%) of native genera are endemic to continental Chile. Interestingly, seven endemic genera (10.4%) are exclusively annual to facultatively annual in habit (*Cyphocarpus* (Campanulaceae); *Microphytes* (Caryophyllaceae); *Moscharia* (Asteraceae); *Agallis* (Cruciferae); *Scyphanthus* (Loasaceae); *Homalocarpus* (Umbelliferae); *Araeoandra* (Vivianaceae)). These genera, all small, undoubtedly evolved very recently in Chile, as of the Tertiary with the development of arid climates (Arroyo et al., 1988). Such genera constitute interesting material for detailed evolutionary studies in that their ancestors are very likely to be found directly in the extant Chilean flora.

Continental Chile clearly possesses proportionately fewer annuals than the State of California (Raven & Axelrod, 1978) yet more than the Cape floristic region of South Africa (Goldblatt, 1978). Because continental Chile extends further into higher and lower latitudes than California, relatively fewer annuals in continental Chile in relation to California is not entirely unexpected (cf. Arroyo et al., 1988). California is more perfectly matched physiographically and climatically to central

Chile. Work is now in progress in order to determine whether central Chile contains proportionately as many native annuals as California.

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