IOPB COLUMN

Edited by Karol Marhold & Ilse Breitwieser

IAPT/IOPB chromosome data 20

Edited by Karol Marhold

DOI http://dx.doi.org/10.12705/646.42

Fahim Altınordu[1]* & Kateřina Šumberová[2]

1 *Department of Biology, Science Faculty, Selçuk University, Konya, Turkey*
2 *Department of Vegetation Ecology, Institute of Botany, the Czech Academy of Sciences, Lidická 25/27, 602 00 Brno, Czech Republic*
* Author for correspondence: *altinordu.fahim@gmail.com*

All materials CHN; collected in the Czech Republic; vouchers (= seeds) in Reference seed collection at the Institute of Botany CAS, Department of Vegetation Ecology, Brno (RSC-IB).

Financial support from Czech Science Foundation (Centre of Excellence PLADIAS, 14-36079G) and the Institute of Botany CAS (RVO 67985939) to K.Š.

ASTERACEAE
Bidens frondosa L., 2*n* = 48; 11 Sep 2008, *K. Šumberová s.n.*
Galinsoga quadriradiata Ruiz & Pav., 2*n* = 32; 25 Aug 2009, *K. Šumberová s.n.*

CARYOPHYLLACEAE
Gypsophila muralis L., 2*n* = 30; 23 Aug 2009, *K. Šumberová s.n.*

POACEAE
Echinochloa crus-galli (L.) P.Beauv., 2*n* = 36; 21 Sep 2008, *K. Šumberová s.n.*

ROSACEAE
Geum urbanum L., 2*n* = 42; 22 Sep 2008, *K. Šumberová s.n.*

Tatyana V. An'kova,[1]* Andrey S. Erst,[1,2] Igor V. Kuzmin,[3] Dmitriy N. Shaulo[1] & Yury V. Plugatar[4]

1 *Laboratory of Herbarium, Central Siberian Botanical Garden Siberian, Branch of the Russian Academy of Sciences, 101 Zolotodolinskaya str., Novosibirsk 630090, Russia*
2 *Tomsk State University, Laboratory of Ecology and Biodiversity, Tomsk 634050, Russia*
3 *Tyumen State University, 10 Semakova str., Tyumen 625023, Russia*
4 *Nikitskiy Botanical Garden, Yalta, Nikita 298648, Crimea*
* Author for correspondence: *ankova_tv@mail.ru*

All materials CHN; collected in France; collector: *AE* = Andrey Erst; vouchers in NS.

The study was financially supported by the Russian Foundation for Basic Research (grant no. 14-44-04021-r-sibir'-a) and Russian Science Foundation (grant no. 14-50-00079).

ASTERACEAE
Arctium minus (Hill) Bernh., 2*n* = 36; *AE AEK1.*
Centaurea jacea L., 2*n* = 44; *AE AEK42.*
Picris echioides L., 2*n* = 10; *AE AEK22*, *AE AEK36.*

BRASSICACEAE
Cardamine pratensis L., 2*n* = 28; *AE AEK27.*

CAPRIFOLIACEAE
Dipsacus fullonum L., *2n* = 18; *AE AEK34.*

CARYOPHYLLACEAE
Silene baccifera (L.) Roth, 2*n* = 24; *AE AEK8.*
Silene latifolia Poir., 2*n* = 24; *AE AEK39.*

PLANTAGINACEAE
Plantago major L., 2*n* = 12; *AE AEK14a*. 2*n* = 24; *AE AEK14b.*

SOLANACEAE
Solanum dulcamara L., 2*n* = 24; *AE AEK11*, *AE AEK47.*

Matthias Baltisberger

ETH Zürich, Plant Ecological Genetics, Institute of Integrative Biology, Universitätstr. 16, 8092 Zürich, Switzerland; balti@ethz.ch

All material CHN; collector: *MB* = Matthias Baltisberger; vouchers in Z+ZT unless otherwise stated.

LAMIACEAE
Stachys alpina L., 2*n* = 30; Italy, *MB & A. Widmer 13679*, *MB 13868.*
Stachys annua L., 2*n* = 34; Greece, *MB & U. Meili 11344*, *MB 11700*, *MB 11869*, *MB & U. Meili 11346*, *MB 11900*, *MB & W. Huber 12612*, *MB 12784*; Switzerland, *MB 12141*; Turkey, *M. Gasser MG5*, *MB 11991.*
Stachys argolica Boiss. (≡ *S. swainsonii* subsp. *argolica* (Boiss.) Phitos & Damboldt), 2*n* = 34; Greece, *MB & W. Frey 10612*, *MB 11586*, *M. Bandle & A. Lenherr 33205*, *MB 11182.*
Stachys atherocalyx K.Koch, 2*n* = 34; Armeniya, *N.S. Chanjian NSC 1*, *MB 13087*; Kosovo, *MB & U. Schäppi 12292*, *MB 12534*, *MB 13199*, *MB 13254*; Turkey, *D. Tasdemir 88-060*, *MB 12197.*
Stachys baldaccii (K.Maly) Hand.-Mazz. & Janch. (≡ *S. recta* subsp. *baldaccii* (K.Maly) Hayek), 2*n* = 34; Montenegro, *U. Hartwig & A. Lenherr 28340*, *MB 11160.*

All materials for the chromosome column should be submitted electronically to: Karol Marhold, karol.marhold@savba.sk (Institute of Botany, Slovak Academy of Sciences, SK-845 23 Bratislava, Slovakia, and Department of Botany, Charles University, CZ 128-01 Prague, Czech Republic). The full version of this contribution is available in the online edition of TAXON appended to this article. The following citation format is recommended: Baltisberger, M. & Voelger, M. 2006. *Sternbergia sicula*. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 1. *Taxon* 55: 444, E2.

Stachys beckeana Dörfl. & Hayek, 2*n* = 34; Montenegro, *U. Hartwig & A. Lenherr 28338*, *MB 11611*.
Stachys candida Bory & Chaub., 2*n* = 34; Greece, *MB & W. Frey 10591*, *MB 11112*, *MB 11599*.
Stachys candida Bory & Chaub. × *S. canescens* Bory & Chaub., 2*n* = 34; Greece, *MB 11845*, *MB 11846*.
Stachys canescens Bory & Chaub. (= *S. messeniaca* Boiss.), 2*n* = 34; Greece, *MB & W. Frey 10585*, *MB 11114*, *MB & W. Frey 10594*, *MB 11844*, *MB & U. Meili 11264*, *MB 11864*.
Stachys cassia Boiss. (≡ *S. cretica* subsp. *cassia* (Boiss.) Rech.f.), 2*n* = 30; Macedonia, *MB & A. Lenherr 83/716*.
Stachys chrysantha Boiss. & Heldr., 2*n* = 34; Greece, *MB & U. Meili 11250*, *MB 11695*, *MB & U. Meili 11258*, *MB 11863*, *MB & U. Meili 11263*, *MB 11696*, *MB & U.Meili 11266*, *MB 11697*.
Stachys cretica L. (≡ *S. cretica* L. subsp. *cretica*), 2*n* = 30; Greece, *MB 10503*, *MB & A. Widmer 13727*.
Stachys germanica L. (≡ *S. germanica* L. subsp. *germanica*), 2*n* = 30; Greece, *MB & A. Lenherr 83/350*, *MB 11157*, *MB 11701*, *MB & P. Matsoukas 12308*, *MB 12518*.
Stachys goulimyi Rech.f., 2*n* = 34; Greece, *B. Christensen & P. Hartvig 6505* (C), *MB 11736*, *MB & U. Schäppi 12318*, *MB 12569*, *MB 13197*.
Stachys heldreichii Boiss. (≡ *S. germanica* subsp. *heldreichii* (Boiss.) Hayek), 2*n* = 30; Greece, *MB & U. Meili 11315*, *MB 11996*; Turkey, *MB 12800*.
Stachys horvaticii Micevski, 2*n* = 34; Greece, *MB & U. Schäppi 12320*, *MB 12598*, *MB 13198*; Macedonia, *MB & U. Meili 11430*, *MB 11873*.
Stachys labiosa Bertol. (≡ *S. recta* subsp. *labiosa* (Bertol.) Briq. = *S. recta* subsp. *grandiflora* (Caruel) Arcang.), 2*n* = 34; Italy, *MB & A. Widmer 13696*, *MB 13767*.
Stachys melangavica (D.Perss.) Baltisb., **comb. & stat. nov.** ≡ *S. swainsonii* subsp. *melangavica* D.Perss., Biosyst. Stachys swainsonii: 29. 1981), 2*n* = 34; Greece, *M. Bandle & A. Lenherr 33257*, *MB 11585*.
Stachys menthifolia Vis., 2*n* = 34; Greece, *U. Hartwig & A. Lenherr 28033*, *MB 11594*; Montenegro, *MB & W. Frey 10884*, *MB 11116*.
Stachys mollissima Willd. (= *S. decumbens* Pers.), 2*n* = 34; Greece, *MB & A. Lenherr 83/244*, *MB 11595*, *MB & A. Lenherr 83/255*, *MB 11596*.
Stachys plumosa Griseb., 2*n* = 34; Greece, *MB & W. Frey 10682*, *MB 11592*, *MB & W. Frey 10692*, *MB 11119*, *MB & W. Frey 10695*, *MB 11591*, *MB & W. Frey 10764*, *MB 11847*, *MB & U. Meili 11382*, *MB 12570*, *MB & U. Schäppi 12312*, *MB 12539*; Macedonia, *MB & W. Frey 10825*, *MB 11117*, *MB & W. Frey 10831*, *MB 11593*, *MB & W. Frey 10847*, *MB 11118*.
Stachys recta L. (≡ *S. recta* L. subsp. *recta*), 2*n* = 34; Montenegro, *MB & A. Lenherr 80/1335*, *MB 11620*.
Stachys recta L. s.l., 2*n* = 34; Albania, *MB 11961*, *MB 12102*; Greece, *MB 12609*, *MB 13256*.
Stachys salviifolia Ten. (≡ *S. cretica* subsp. *salviifolia* (Ten.) Rech.f.), 2*n* = 30; Greece, *MB & A. Lenherr 83/252*, *MB 11628*, *MB & A. Lenherr 83/419*, *MB 11156*, *MB & U. Meili 11345*, *MB 11702*, *MB & U. Meili 11359*, *MB 11998*, *MB 12065*.
Stachys scyronica Boiss. (≡ *S. swainsonii* subsp. *scyronica* (Boiss.) Phitos & Damboldt), 2*n* = 34; Greece, *MB & W. Frey 10642*, *MB 11180*, *MB 11587*.
Stachys spinulosa Sm., 2*n* = 28; Greece, *M.Bandle & A. Lenherr 33160*, *MB 11626*, *M. Bandle & A. Lenherr 33271*, *MB 11625*, *M. Bandle & A. Lenherr 33317*, *MB 11133*.
Stachys spreitzenhoferi subsp. *virella* D.Perss., 2*n* = 34; Greece, *M. Bandle & A. Lenherr 33059*.
Stachys spruneri Boiss., 2*n* = 34; Greece, *MB & W. Frey 10631*, *MB 11123*, *MB 11589*, *MB & U. Meili 11277*, *MB 11865*.
Stachys subcrenata Vis. (≡ *S. recta* subsp. *subcrenata* (Vis.) Briq.), 2*n* = 34; Bosnia-Hercegovina, *MB & A. Lenherr 83/869*, *MB 11139*, *MB 11623*; Croatia, *MB & A. Lenherr 83/885*, *MB 11154*.
Stachys swainsonii Benth. (≡ *S. swainsonii* Benth. subsp. *swainsonii*), 2*n* = 34; Greece, *MB & W. Frey 10654*, *MB 11181*, *MB 11588*, *MB & U. Meili 11288*, *MB 11866*.
Stachys thirkei K.Koch, 2*n* = 30; Bosnia-Hercegovina, *MB & A. Lenherr 83/876*, *MB 11158*; Croatia, *MB & A. Lenherr 80/823*, *MB 11134*, *MB 11627*.

Luis Delgado,* Francisca Gallego Martín & Enrique Rico

Departamento de Botánica, Universidad de Salamanca, 37007 Salamanca, Spain
* Author for correspondence: *ldelsan@usal.es*

All materials CHN; collectors: *AG* = Álvaro Gallego, *AGT* = Alberto González-Talaván, *CF* = Carlos Fábregat, *CV* = Cipriano Valle, *ER* = Enrique Rico, *FA* = Francisco Amich, *FN* = Florentino Navarro, *IA* = Iñaki Aizpuru, *IS* = Ignasi Soriano, *JASA* = José Ángel Sánchez-Agudo, *JASR* = Juan Antonio Sánchez-Rodríguez, *JH* = F. Javier Hernández, *LD* = Luis Delgado, *MO* = Monserrat Martínez-Ortega, *MS* = María Santos-Vicente, *PB* = Patricio Bariego, *PF* = Pere Fraga, *RVQ* = Rafael V. Quadrada, *SA* = Santiago Andrés, *SB* = Sonia Bernardos, *TR* = Tomás Romero, *XG* = Ximena Giráldez.

This work has been supported by the Spanish Dirección General de Investigación Científica y Técnica through *Flora iberica* VI project (REN2002-04634-C05-02), *Flora iberica* VII (CGL2005-05471-C04-03), *Flora iberica* IX (CGL2011-28613-C03-03) and by the *Junta de Castilla y León* (Luis Delgado, 1998–2001) fellowship.

LINDERNIACEAE

Lindernia dubia (L.) Pennell, *n* = 10, 2*n* = 20; Portugal, *ER 7825* (SALA 110601); Spain, *ER 6795* (SALA 108144), *ER 7837* (SALA110602). 2*n* = 20; Spain, *ER 7857* (SALA 110600), *ER 7853* (SALA 110599), *ER 7838* (SALA 110603), *LD 816* (SALA 108123), *LD 813*, *AGT, MS* (SALA 108125), *ER 7211* (SALA 108120), *PB, LD 845 & MS* (SALA 108124).

OROBANCHACEAE

Bartsia alpina L., *n* = 12, 2*n* = 24; Spain, *LD 333 & IS* (SALA 110753), *LD 338 & IS* (SALA 110751). 2*n* = 24; Spain, *LD 263 & MO* (SALA 110752), *IS 98122 & RVQ* (BCN 32456).
Bartsia trixago L., *n* = 12; Spain, *LD L17 & JASA* (SALA 110756), *LD L24(1) MO, ER & JASA* (SALA 110758), *LD L3* (SALA 110754), *LD 26, MO, ER & JASA* (SALA 110757). *n* = 12, 2*n* = 24; Spain, *LD 303, MO & JASA* (SALA 110759). 2*n* = 24; Spain, Baleares, *LD 741, PF & JASA* (SALA 110755).
Euphrasia alpina Lam. subsp. *alpina*, *n* = 11; Spain, *LD 769 & ER* (SALA 110674). *n* = 11, 2*n* = 22; Spain, *LD 283 & MO* (SALA 110676), *LD 265 & MO* (SALA 110672), *LD 272 & MO* (SALA 110675). 2*n* = 22; Spain, *LD 9, ER, JASR & CV* (SALA 110673).
Euphrasia hirtella Jord. ex Reut., *n* = 11; Spain, *LD 32, XG & ER* (SALA 110670), *LD 856, CF & ER* (SALA 110671). *n* = 11, 2*n* = 22; Spain, *LD 36 & MO* (SALA 110668). 2*n* = 22; Spain, *LD 211 & MO* (SALA 110669).
Euphrasia salisburguensis Funck, *n* = 22, 2*n* = 44; Spain, *SB, LD 80 & JASA* (SALA 110679), *LD 264 & MO* (SALA 110678), *LD 271 & MO* (SALA 110677). 2*n* = 44; Spain, *LD 315 & MO* (SALA 110680).
Melampyrum cristatum L., *n* = 9; Spain, *LD 198 & MO* (SALA 110659). 2*n* = 18; Spain, *LD 934 & MS* (SALA 110658).
Melampyrum nemorosum subsp. *catalaunicum* (Freyn) Beauverd, 2*n* = 18; Spain, *TR 1* (SALA 110660).
Melampyrum pratense subsp. *latifolium* Schübl. & G.Martens, *n* = 9; Spain, *LD 209 & MO* (SALA 110664). *n* = 9, 2*n* = 18; Spain, *LD 193 & MO* (SALA 110666), *LD 278 & MO* (SALA 110662), *LD 178 & MO* (SALA 110661). 2*n* = 18; Spain, *LD, JH, MO & ER 6633* (SALA 95242).

Melampyrum pratense L. subsp. *pratense*, 2*n* = 18; Spain, *LD 339 & IS* (SALA 110665).
Nothobartsia asperrima (Link) Benedí & Herrero, 2*n* = 36; Portugal, *LD 292, MO, ER & JASA* (SALA 110762); Spain, *ER 7679* (SALA 110763).
Nothobartsia spicata (Ramond) Bolliger & Molau, *n* = 18, 2*n* = 36; Spain, *LD 614* (SALA 110760). 2*n* = 36; Spain, *LD 615* (SALA 110761).
Parentucellia latifolia (L.) Caruel, 2*n* = 48; Spain, *LD 163* (SALA 110766), *LD 99, MO & JASA* (SALA 110764), *LD 11 & ER* (SALA 110765), *LD, MO, ER 6508 & JASA* (SALA 96318).
Parentucellia viscosa (L.) Caruel, *n* = 24; Spain, *LD 164 & JASA* (SALA 110769); Spain, Baleares, *LD 663, PF & JASA* (SALA 110771). *n* = 24, 2*n* = 48; Spain, *LD L27, MO, ER & JASA* (SALA 110770). 2*n* = 48; Spain, *FA, SB, LD 123, ER & JASR* (SALA 110772), *LD 779 & XG* (SALA 110773), *LD 28, MO, ER & JASA* (SALA 110768).
Rhinanthus angustifolius C.C.Gmel., *n* = 7; Spain, *LD 771 & ER* (SALA 110830). *n* = 7, 7+4B; Spain, *SB, LD 86 & JASA* (SALA 110829). *n* = 7; Spain, *LD 11, ER, JASR & CV* (SALA 110828).
Rhinanthus minor L., *n* = 7; Spain, *LD 177 & MO* (SALA 110824). *n* = 7, 2*n* = 14+8B; Spain, *LD 39 & MO* (SALA 110825). 2*n* = 14+8B; Spain, *XG & ER 6974* (SALA 110823). 2*n* = 14, 14+8B; Spain, *LD 31, XG & ER* (SALA 110822).
Rhinanthus pumilus (Sterneck) Pau subsp. *pumilus*, *n* = 7; Spain, *LD 200 & MO* (SALA 110827), *LD 207, MO & IA* (SALA 110826).
Tozzia alpina L., 2*n* = 20; Spain, *LD 226 & MO* (SALA 110667).

PHRYMACEAE

Mimulus moschatus Douglas ex Lindl., *n* = 16; Spain, *LD 814, AGT & MS* (SALA 108137); 2*n* = 32; Spain, *SB, LD 58, FN & CV* (SALA 106063), *LD 924, SA & MS* (SALA 110591).

PLANTAGINACEAE

Bacopa monnieri (L.) Wettst., 2*n* = 32; Spain, *ER 7875* (SALA 110605), *LD 842* (SALA 108126).
Bacopa rotundifolia (Michx.) Wettst., 2*n* = 56; Spain, *ER 7856* (SALA 110604).
Erinus alpinus L., 2*n* = 14; Spain, *LD 196 & MO* (SALA 110607).
Gratiola linifolia Vahl, *n* = 48; Spain, *LD 841, AG & MS* (SALA 108134), *LD 821 & MS* (SALA 108121); *n* = 48, *2n* = 96; Spain, *LD 790* (SALA 108132); *2n* = 96; Portugal, *LD 942 & MS* (SALA 110595); Spain, *LD 783* (SALA 110598), *ER 7824 & PB* (SALA 110596), *LD 839, AG & MS* (SALA 108131).
Gratiola officinalis L., *n* = 16; Portugal, *ER 7826* (SALA 110594). *n* = 16, *2n* = 32; Portugal, *LD 941 & MS* (SALA 110592); Spain, *LD 823* (SALA 108133). 2*n* = 32; Portugal, *LD 940 & MS* (SALA 110593); Spain, *LD 612* (SALA 108130).
Sibthorpia europaea L., *n* = 9, 2*n* = 18; Spain, *LD 19, ER, JASR & CV* (SALA 108138). 2*n* = 18; Spain, *LD 832 & MS* (SALA 108141).

SCROPHULARIACEAE

Limosella aquatica L., 2*n* = 40; Spain, *LD 796* (SALA 110606), *PB, LD 846 & MS* (SALA 108136).

Graciela I. Lavia,[1,3]* Antonio Krapovickas[2] & María de los Ángeles Martínez[1]

1 *Instituto de Botánica del Nordeste (CONICET-UNNE, Fac. Cs. Agrarias), C.C. 209, 3400 Corrientes, Argentina*
2 *Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste (UNNE); Sgto. Cabral 2131, 3400 Corrientes, Argentina*
3 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE); Av. Libertad 5460, 3400 Corrientes, Argentina*
* Author for correspondence: *graciela.lavia@yahoo.com.ar*

This work was supported by Consejo Nacional de Investigaciones Científicas y Tecnológicas, CONICET, PIP 6265; Agencia Nacional de Promoción Científica y Tecnológica, PICTO-UNNE 2011-230 and Secretaría General de Ciencia y Técnica (UNNE), PI 12F016. M.A. Martínez is a fellow of Secretaría General de Ciencia y Técnica (UNNE), Argentina.

All numbers CHN; collectors: *Ab* = M.M. Arbo, *B* = S. Beck, *Cr* = C. Cristóbal, *F* = E. Flachsland, *Fr* = M.C. Franceschini, *K* = A. Krapovickas, *Ke* = H.A. Keller, *Kel* = C.J. Keller, *La* = G. Lavia, *P* = M.C. Peichoto, *Sc* = A. Schinini, *Se* = G. Seijo, *So* = V. Solís Neffa.

MALVACEAE

Abutilon pauciflorum A.St.-Hil., 2*n* = 14; Argentina, Corrientes, *La, Se & So 13* (BH, CTES, GH, LIL).
Abutilon terminale (Cav.) A.St.-Hil., 2*n* = 14; Argentina, Corrientes, *La, Se & So 10* (CTES, GH).
Gaya kelleri Krapov., 2*n* = 12; Argentina, Misiones, *Ke & Kel 10650* (CTES).
Herissantia intermedia (Hessl.) Krapov., 2*n* = 14; Argentina, Chaco, *Se 1007* (BAB, CTES).
Hibiscus sororius L.f., 2*n* = 52; Argentina, Corrientes, *Ab, Sc, P, Fr & F 8605* (CTES).
Hibiscus striatus Cav., 2*n* = 52; Argentina, Entre Ríos, *La, Se & So 16* (CTES, GH, LIL, MEXU, MGM, MO, SPF, TEX); Argentina, Corrientes, *Se 1025* (AAU, BH, CTES, TEX).
Malvastrum amblyphyllum R.E.Fr., 2*n* = 24; Paraguay, Presidente Hayes, *K, Cr & Sc 45256* (CTES); Paraguay, Boquerón, *K, Cr & Sc 45386* (CTES, F, G, GH, MEXU).
Malvastrum americanum (L.) Torr., 2*n* = 24; Paraguay, Presidente Hayes, *K, Cr & Sc 45528* (CTES, G, MO).
Malvastrum coromandelianum (L.) Garcke subsp. *coromandelianum*, 2*n* = 24; Paraguay, Boquerón, *K, Cr & Sc 45276* (CTES, G, TEX).
Malvastrum cristobalianum Krapov., 2*n* = 24; Paraguay, Boquerón, *K, Cr & Sc 45319* (CTES, FCQ, G, HILL, LIL, MO, NY, SI, SP).
Pavonia hastata Cav., 2*n* = 56; Uruguay, Maldonado, *La, Se & So 20* (BH, CTES, MEXU, TEX).
Pavonia morongii S.Moore, 2*n* = 56; Paraguay, Presidente Hayes, *K, Cr & Sc 45249* (CTES).
Pavonia sapucayensis R.E.Fr., 2*n* = 56; Argentina, Corrientes, *K 44410* (ASU, CHR, CTES, F, GH, LIL, MBM, MO, NSW, TEX, U, WIS).
Tarasa meyeri Krapov., 2*n* = 10; Argentina, Salta, *K 47841* (AAU, ASU, ESA, F, GH, LPB, MBH, MO, NY, SI, SP, US, WIS).
Urocarpidium limense (L.) Krapov., 2*n* = 30; Bolivia, La Paz, *B 17999* (CTES).
Wissadula subpeltata (Kuntze) R.E.Fr., 2*n* = 14; Argentina, Chaco, *Se 1008* (AAU, BH, CTES, CANB).

Yanina Lazaroff[1] & Viviana Solís Neffa[1,2]*

1 *Instituto de Botánica del Nordeste (UNNE-CONICET), C.C. 209, 3400 Corrientes, Argentina*
2 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE), Av. Libertad 5460, 3400 Corrientes, Argentina*
* Author for correspondence: *viviana@agr.unne.edu.ar*

All matherials CHN; collectors: *A* = R. Almada, *G* = M. Grabiele, *H* = D. Hojsgaard, *P* = A.F. Panseri, *R* = W. Reynoso, *S* = J.G. Seijo, *Sc* = A. Schinini, *SN* = V.G. Solís Neffa, *So* = M.M. Sosa; vouchers in CTES, vouchers from Bolivian specimens are also in LPB and duplicates in other herbaria of the world.

PASSIFLORACEAE

Turnera krapovickasii Arbo, *n* = 5; Argentina, Salta, *P, R, So & H 21*; *P, R, So & H 22*; *P, R, So & H 23*; *P, R, So & H 24*; *P, R, So & H 25*; *P, R, So & H 26*; *SN, S, G & R 1975*; Bolivia, Dpt. Chuquisaca, *SN, S, G & R 1513*; Bolivia, Dpt. Santa Cruz, *SN, S, Sc & A 1062*; *SN, S, G & R 1935*; *SN, S, SC & A 1055*; *SN, S, SC & A 1432*; *SN, S, G & R 1743*; Bolivia, Dpt. Tarija, *SN & S 1482*; *SN, S, G & R 1497*; *SN, S, G & R 1506*; *SN, S, G & R 1503*; *SN, S, G & R 1512*; *SN, S, G & R 1973. n* = 10; Argentina, Salta, *SN, S, G & R 1478*; *P, R, S & H 28*; Bolivia, Dpt. Santa Cruz, *SN, S, Sc & A 1315*; *SN, S, Sc & A 1285*; *SN, S, G & R 1546*; *SN, S, G & R 1547*; *SN, S, G & R 1917*; *SN, S, G & R 1922*; *SN, S, G & R 1927*; *SN, S, G & R 1876*; *SN, S, Sc & A 1273*; *SN, S, Sc & A 1278*; *SN, S, G & R 1749*; *SN, S, G & R 1766*; *SN, S, G & R 1770*; *SN, S, G & R 1777*; *SN, S, G & R 1784*; *SN, S, G & R 1796*; *SN, S, G & R 1799*; *SN, S, G & R 1866*; *SN, S, G & R 1877*; *SN, S, G & R 1888*; *SN, S, G & R 1913*; *SN, S, G & R 1915*; *SN, S, G & R 1932*; *SN, S, Sc & A 1266*; *SN, S, G & R 1908*; *SN, S, G & R 1545.*

Alejandra M. Ortiz,[1]* María Celeste Sivestri[1] & Graciela I. Lavia[1,2]

1 *Instituto de Botánica del Nordeste (CONICET-UNNE, Facultad de Ciencias Agrarias), C.C. 209, Corrientes, Argentina*
2 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE), Av. Libertad 5460, Corrientes, Argentina*
* Author for correspondence: *aortiz@agr.unne.edu.ar*

All numbers CHN; collectors: *Bi* = L.B. Bianchetti, *Ca* = A. Caballero, *Fa* = L.F. Freitas, *G* = W.C. Gregory, *Ge* = M. Gerin, *Gl* = M. Grabiele, *H* = R.O. Hammons, *He* = V. Hemsy, *K* = A. Krapovickas, *L* = W.R. Langford, *Ma* = L.A.Z. Machado, *Nc* = N.M.S. Costa, *Ov* = J.C. Oliveira, *P* = J.R. Pietrarelli, *Pe* = G. Pereira-Silva, *Po* = A. Pott, *Pz* = E. Pizarro, *R* = V.R. Rao, *Ry* = W. Reynoso, *S* = C.E. Simpson, *Se* = G. Seijo, *Sg* = A.K. Singh, *Sv* = G.P. Silva, *V* = J.F.M. Valls, *W* = W.L. Werneck.

This work was supported by Consejo Nacional de Investigaciones Científicas y Tecnológicas, CONICET, PIP 6265; Agencia Nacional de Promoción Científica y Tecnológica, PICTO-UNNE 2007-00099 and Secretaría General de Ciencia y Técnica, PI 038-2008.

FABACEAE

Arachis benthamii Handro, 2*n* = 20; Brasil, Mato Grosso do Sul, *Nc & Ma 3101* (CEN).
Arachis lignosa (Chodat & Hassl.) Krapov. & W.C.Gregory, 2*n* = 20; Brasil, Mato Grosso do Sul, *V, Ov, Sg & Sv 13570* (CEN).
Arachis macedoi Krapov. & W.C.Gregory, *2n* = 20; Brasil, Minas Gerais, *G, K & P 10127* (CEN, CTES, LIL).
Arachis major Krapov. & W.C.Gregory, 2*n* = 20; Brasil, Mato Grosso do Sul, *V, Po & Bi 9468* (CEN, CTES), *V, Pe, Ge & R 7632* (CEN, CTES).
Arachis matiensis Krapov. & W.C.Gregory, 2*n* = 20; Bolivia, Santa Cruz, *Se*, *Sn*, *Gl & Ry 3719* (CTES).
Arachis paraguariensis Chodat & Hassl. subsp. *paraguariensis*, 2*n* = 20; Paraguay, Concepción, *Ca 185* (CTES).
Arachis paraguariensis subsp. *capibariensis* Krapov. & W.C.Gregory, 2*n* = 20; Brasil, Mato Grosso do Sul, *H, L, K & He 565/566* (CEN, CTES).
Arachis pietrarellii Krapov. & W.C.Gregory, *2n* = 20; Brasil, Mato Grosso, *V, K, S & Sv 9000* (CEN, CTES), *V & K 12085* (CEN, CTES).
Arachis sylvestris (A.Chev.) A.Chev., 2*n* = 20, Brasil, Minas Gerais, *V, Fa, Pz & Sv 13107* (CEN).
Arachis triseminata Krapov. & W.C.Gregory, *2n* = 20; Brasil, Bahia, *W 144* (CEN).

Dolja Pavlova[1]* & Aida Bani[2]

1 *Department of Botany, Faculty of Biology, University of Sofia, blvd. Dragan Tzankov 8, 1164 Sofia, Bulgaria*
2 *Agro-Environmental Department, Faculty of Agronomy and Environment, Agricultural University of Tirana, Koder-Kamez, Tirana, Albania*
* Author for correspondence: *pavlova@biofac.uni-sofia.bg*

All materials CHN; collectors: *AB* = A. Bani, *DP* = D. Pavlova; vouchers in Sofia University (SO) and Agricultural University of Tirana (TIR).

The study was partially supported within project D "Rila" 01/7/21.06.2013 by the National Research Fund at the Ministry of Education and Science in Sofia.

ASTERACEAE

Inula aschersoniana Janka, 2*n* = 16; Bulgaria, *DP-14028* (SO).

BRASSICACEAE

Alyssum markgrafii O.E.Schulz, 2*n* = 32; Albania, *AB-2014001* (TIR).
Alyssum murale Waldst. & Kit., 2*n* = 32; Albania, *AB-2014002* (TIR).
Alyssum murale Waldst. & Kit., 2*n* = 16; Bulgaria, *DP-12024* (SO).
Arabis alpina L. subsp. *alpina*, 2*n* = 16; France, *DP-15006* (SO).
Arabis alpina subsp. *caucasica* (Willd.) Briq., 2*n* = 16; Bulgaria, *DP-12023* (SO), *DP-13013* (SO).

FABACEAE

Astragalus depressus L., 2*n* = 16; Bulgaria, *DP-15015* (SO).

Caroline do Amaral Polido, Ana Paula Moraes* & Eliana Regina Forni-Martins

Laboratório de Biossistemática e Polinização, Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, Rua Monteiro Lobato 255, Cidade Universitária Zeferino Vaz, 13083-862 Campinas, SP, Brazil
* Author for correspondence: *apaulademoraes@gmail.com*

All materials CHN.

This study was supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP – Brazil, grant 2010/19132-6 to E.R. Forni-Martins and 2011/22215-3 to A.P. Moraes), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq – Brazil, grants 471708/2010-0 and 306142/2011-2to E.R. Forni-Martins) and by Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES – Brazil, doctoral fellowship to C.A. Polido).

FABACEAE
Tribe Dalbergieae

Aeschynomene ciliata Vogel, 2*n* = 22; Brazil, Mato Grosso do Sul, *F.M. Alves & A.L.B. Sartori 487* (CGMS).
Aeschynomene falcata (Poir.) DC., 2*n* = 20; Brazil, Mato Grosso do Sul, *F.M. Alves 477* (CGMS).
Aeschynomene histrix Poir., 2*n* = 22; Brazil, Bahia, *C.A. Polido & al. 247* (RB); Brazil, Mato Grosso do Sul, *A.K.D. Salomão & F.M. Alves 329* (CGMS).
Aeschynomene paniculata Willd. ex Vogel, 2*n* = 20; Brazil, Mato Grosso do Sul, *L.C.P. Lima 72* (CGMS), *G.P. Nunes & al. 215* (CGMS); Brazil, Minas Gerais, *M.F.B. & al. 56* (UEC); Brazil, São Paulo, *C.A. Polido & al. 238* (UEC). 2*n* = 22, Brazil, Mato Grosso do Sul, *G.P. Nunes & al. 215* (CGMS).

Aeschynomene sensitiva Sw., 2*n* = 22; Brazil, Espírito Santo, *C.A. Polido & al. 272* (UEC).
Dalbergia sp., 2*n* = 20; Brazil, Bahia, *R.B. Pinto 239* (UEC).
Dalbergia cearensis Ducke, 2*n* = 20; Brazil, Ceará, 25 May 2009, *F.B.C. Nogueira s.n.* (EAC 42124).
Dalbergia ecastaphyllum (L.) Taub., 2*n* = 20; Brazil, Santa Catarina, Sep 2011, *P.Z. Souza s.n.* (UEC).
Dalbergia frutescens (Vell.) Britto, 2*n* = 20; Brazil, Minas Gerais, Apr 2010, *V. Mendonça-Filho s.n.* (UEC); Brazil, São Paulo, *C.A. Polido & R.B. Pinto 275* (UEC).
Dalbergia miscolobium Benth., 2*n* = 20; Brazil, Minas Gerais, São Roque de Minas, Apr 2010, *C.V. Mendonça-Filho s.n.*(UEC); Brazil, Minas Gerais, Diamantina, Apr 2010, *C.V. Mendonça-Filho s.n.* (UEC).
Dalbergia nigra (Vell.) Alemão ex Benth., 2*n* = 20; Brazil, Espírito Santo, *G.S. Siqueira 187* (CVRD), *C.A. Polido 256* (RB); Brazil, Rio de Janeiro, *L.F.G. da Silva 74* (RB); Brazil, São Paulo, *C.A. Polido & R.B. Pinto 282* (UEC).
Geoffroea striata (Will.) Morong, 2*n* = 20; Brazil, Mato Grosso do Sul, *F.M. Alves &A.L.B. Sartori 472* (CGMS). 2*n* = 40; Brazil, Mato Grosso do Sul, *F.M. Alves & A.L.B. Sartori 472* (CGMS).
Machaerium sp., 2*n* = 20; Brazil, São Paulo, *C.A. Polido & R.B. Pinto 278* (UEC).
Machaerium acutifolium Vogel, 2*n* = 20; Brazil, São Paulo, 20 Mar 2003, *L.S. Kinoshita & al. s.n.* (UEC).
Machaerium hirtum (Vell.) Stellfeld, 2*n* = 20; Brazil, São Paulo, *C.A. Polido & R.B. Pinto283* (UEC).
Machaerium nyctitans (Vell.) Benth., 2*n* = 20; Brazil, São Paulo, *C.A. Polido & R.B. Pinto 279* (UEC).
Machaerium vestitum Vogel, 2*n* = 20; Brazil, São Paulo, *C.A. Polido 281* (UEC).
Machaerium villosum Vogel, 2*n* = 20; Brazil, São Paulo, *C.A. Polido & R.B. Pinto 280* (UEC).
Stylosanthes hamata (L.) Taub., 2*n* = 40; Brazil, Mato Grosso do Sul, *B.E.M. Pinto 733* (CGMS).
Zornia reticulata Sm., 2*n* = 20; Brazil, Mato Grosso do Sul, *F.M. Alves & al. 446* (CGMS).

Nina S. Probatova,[1]* Sergey G. Kazanovsky,[2] Vyacheslav Yu. Barkalov,[1] Elvira G. Rudyka[1] & Anna V. Shatokhina[3]

1 *Institute of Biology & Soil Science, Far East Branch of the Russian Academy of Sciences, 159 Stoletya Prospect, 690022 Vladivostok, Russia*
2 *Siberian Institute of Plant Physiology & Biochemistry, Siberian Branch of the Russian Academy of Sciences, 132 Lermontov Str., 664033 Irkutsk, Russia*
3 *N.I. Vavilov Institute of General Genetics, Russian Academy of Sciences, 3 Gubkina Str., 119991 Moskva GSP-1, Russia*
* Author for correspondence: *probatova@ibss.dvo.ru*

All materials CHN; collectors: *SGK* = S.G. Kazanovsky, *VYB* = V.Yu. Barkalov.

This study was supported by grants nos. 11-04-00240 (to N.S. Probatova), 12-04-01586 (to A.V. Verkhozina), from the Russian Fund for Basic Research (RFBR), and by Interdisciplinary Integration Project Nr. 17, from the Siberian Branch of the Russian Academy of Sciences.

ACORACEAE

Acorus calamus L., 2*n* = 24; Russia, Primorskii Krai, *V.T. Lapenko 12683* (VLA).

ASTERACEAE

Artemisia laciniata Willd., 2*n* = 18; Russia, Republic of Buryatia, *SGK 12132* (IRK, VLA).
Artemisia ledebouriana Besser, 2*n* = 18; Russia, Republic of Buryatia, *SGK 12526* (IRK, VLA).
Artemisia mongolica Fisch. ex Besser, 2*n* = 18; Russia, Republic of Buryatia, *SGK 12506* (IRK, VLA).
Artemisia vulgaris L., 2*n* = 16; Russia, Republic of Buryatia, *SGK 12505* (IRK, VLA).
Carduus nutans L., 2*n* = 16; Russia, Irkutskaya Oblast', *SGK 12517* (IRK, VLA).
Heteropappus hispidus Less., 2*n* = 18; Russia, Republic of Buryatia, *SGK 12520* (IRK, VLA).
Hieracium veresczaginii Schischk. & Serg., 2*n* = 36; Russia, Irkutskaya Oblast', *Yu.N. Pochinchik 12509* (IRK, VLA).
Lactuca serriola L., 2*n* = 18; Russia, Altaiskii Krai, *SGK 12496* (IRK, VLA).
Leucanthemum ircutianum DC., 2*n* = 36; Russia, Irkutskaya Oblast', *SGK & Yu. N. Pochinchik 12136* (IRK, VLA); Russia, Republic of Buryatia, *V.V. Chepinoga 9423* (VLA).
Nabalus ochroleucus Maxim., 2*n* = 16; Russia, Primorskii Krai, *VYB 12624* (VLA).
Paraixeris serotina (Maxim.) Tzvelev, 2*n* = 10; Russia, Amurskaya Oblast', *T.V. Stupnikova 12564* (VLA).
Picris canescens (Steven) V.N.Vassil., 2*n* = 10+0–2B; Russia, Krasnodarskii Krai, *N.S. Probatova & V.P. Seledets 11476* (VLA).
Picris davurica Fisch. ex Hornem., 2*n* = 10; Russia, Khabarovskii Krai, *S.V. Babkina 7791* (VLA).
Saussurea pulchella Fisch. ex Colla, 2*n* = 26; Russia, Zabaikal'skii Krai, *SGK 12504* (IRK, VLA).
Saussurea salicifolia DC., 2*n* = 26+0–4B; Russia, Zabaikal'skii Krai, *SGK 12508* (IRK, VLA).
Saussurea subacaulis (Ledeb.) Serg., 2*n* = 52; Russia, Republic of Buryatia, *SGK 11746* (IRK, VLA).
Serratula coronata L., 2*n* = 22; Kazakhstan, *N.S. Probatova & V.P. Seledets 6879* (VLA).
Tephroseris palustris (L.) Rchb., 2*n* = 48; Russia, Zabaikal'skii Krai, *SGK 12480* (IRK, VLA).
Tripolium vulgare Nees, 2*n* = 18; Russia, Zabaikal'skii Krai, *SGK 12515* (IRK, VLA).
Youngia tenuifolia (Willd.) Babc. & Stebbins, 2*n* = 10; Russia, Republic of Altai, *SGK 12563* (IRK, VLA).

BRASSICACEAE

Cakile edentula (Bigelow) Hook., 2*n* = 18; Russia, Primorskii Krai, *VYB 12616* (VLA).
Dontostemon pinnatifidus (Willd.) Al-Shehbaz & H.Ohba, 2*n* = 14; Russia, Republic of Buryatia, *SGK 12499* (IRK, VLA).
Hesperis sibirica subsp. *pseudonivea* (Tzvelev) A.L.Ebel, 2*n* = 14; Russia, Republic of Altai, *SGK 12495* (IRK, VLA).
Neuroloma nudicaule DC., 2*n* = 14; Russia, Irkutskaya Oblast', *N.V. Stepantsova & E.S. Prelovskaya 12521* (IRK, VLA).

CAMPANULACEAE

Adenophora gmelinii Fisch., 2*n* = 68; Russia, Zabaikal'skii Krai, *SGK 12527* (IRK, VLA).
Platycodon grandiflorus A.DC., 2*n* = 18; Russia, Zabaikal'skii Krai, *SGK 12510* (IRK, VLA).

CARYOPHYLLACEAE

Neoussuria aprica (Turcz. ex Fisch. & C.A.Mey.) Tzvelev, 2*n* = 24; Russia, Zabaikal'skii Krai, *SGK 12511* (IRK, VLA).
Pseudostellaria heterophylla (Miq.) Pax, 2*n* = 32; Russia, Primorskii Krai, *VYB 12664* (VLA).
Stellaria longifolia Muhl. ex Willd., 2*n* = 26; Russia, Irkutskaya Oblast', *SGK 12708* (IRK, VLA).

DIPSACACEAE

Scabiosa ochroleuca L., 2*n* = 16; Russia, Republic of Altai, *SGK 12497* (IRK, VLA).

IRIDACEAE

Iris uniflora Pall. ex Link, 2*n* = 48; Russia, Primorskii Krai, *VYB 12574* (VLA).

LAMIACEAE

Dracocephalum peregrinum L., 2*n* = 12; Russia, Republic of Altai, *SGK 12498* (IRK, VLA).

Meehania urticifolia Makino, 2*n* = 18; Russia, Primorskii Krai, *VYB 12571* (VLA).

Mentha canadensis L., 2*n* = 36; Russia, Khabarovskii Krai, *N.S. Probatova & V.P. Seledets 7161* (VLA).

LINACEAE

Linum baicalense Juz. (*L. sibiricum* auct., non DC.), 2*n* = 18; Russia, Zabaikal'skii Krai, *SGK 12513* (IRK, VLA).

PAPAVERACEAE

Hylomecon vernalis Maxim., 2*n* = 24; Russia, Primorskii Krai, *VYB 12592* (VLA).

Papaver popovii Sipliv., 2*n* = ca. 56; Russia, Irkutskaya Oblast', *O.A. Chernysheva 12477* (IRK, VLA).

POACEAE

Achnatherum confusum (Litv.) Tzvelev, 2*n* = 24; Russia, Zabaikal'skii Krai, *SGK 225* (IRK, VLA).

Achnatherum sibiricum (L.) Keng ex Tzvelev, 2*n* = 24; Russia, Zabaikal'skii Krai, *SGK & E.A. Bondarevich 12523* (IRK, VLA).

Deschampsia cespitosa (L.) P.Beauv., 2*n* = 26; Russia, Republic of Buryatia, *SGK 11952* (IRK, VLA).

Elymus gmelinii (Ledeb.) Tzvelev, *2n* = 28; Russia, Irkutskaya Oblast', *SGK 12529* (IRK, VLA).

Eragrostis suaveolens Becker ex Claus, 2*n* = 40; Russia, Zabaikal'skii Krai, *SGK 12518* (IRK, VLA).

Festuca ovina L., 2*n* = 14; Russia, Primorskii Krai, *V.Yu. Barkalov 12644* (VLA).

Poa palustris L., 2*n* = 28; Russia, Irkutskaya Oblast', *SGK & V.V. Domrachev 12470* (IRK, VLA).

PRIMULACEAE

Androsace maxima L., 2*n* = 40; Russia, Republic of Altai, *SGK 12516* (IRK, VLA).

RANUNCULACEAE

Ranunculus natans C.A.Mey., 2*n* = 16; Russia, Republic of Buryatia, *SGK 220* (IRK, VLA).

ROSACEAE

Coluria geoides Ledeb., 2*n* = 14; Russia, Republic of Altai, *SGK 12512* (IRK, VLA).

Potentilla stolonifera Lehm. ex Ledeb., 2*n* = 14; Russia, Primorskii Krai, *VYB 12640* (VLA).

Potentilla tanacetifolia Willd. ex D.F.K. Schltdl., 2*n* = 28; Russia, Zabaikal'skii Krai, *SGK 12519* (IRK, VLA).

Sibiraea altaiensis (Laxm.) Schneider, 2*n* = 16; Russia, Republic of Altai, *SGK 12503* (IRK, VLA).

Spiraea humilis Pojark., 2*n* = 36; Russia, Khabarovskii Krai, *V.V. Yakubov 12707* (VLA).

Spiraea sericea Turcz., 2*n* = 18; Russia, Zabaikal'skii Krai, *SGK 209* (IRK, VLA).

RUBIACEAE

Galium verum L., 2*n* = 22; Russia, Novossibirskaya Oblast', *V.N. Kapustina 8386* (VLA).

SOLANACEAE

Solanum nigrum L., 2*n* = 72; Russia, Irkutskaya Oblast', *N.V. Dorofeev 12522* (IRK, VLA).

SPARGANIACEAE

Sparganium coreanum H.Lév., 2*n* = 30; Russia, Primorskii Krai, *N.S. Probatova, V.P. Seledets & G.M. Gulariants 6573* (VLA).

Nina S. Probatova,[1]* Elvira G. Rudyka,[1] Denis A. Krivenko,[2] Alla V. Verkhozina[2] & Vitaly A. Nechaev[1]

1 *Institute of Biology & Soil Science, Far East Branch of the Russian Academy of Sciences, 159 Stoletya Prospect, 690022 Vladivostok, Russia*

2 *Siberian Institute of Plant Physiology & Biochemistry, Siberian Branch of the Russian Academy of Sciences, 132 Lermontov Str., 664033 Irkutsk, Russia*

* Author for correspondence: *probatova@ibss.dvo.ru*

All materials CHN; collectors: *AVV* = A.V. Verkhozina, *DAK* = D.A. Krivenko, *VAN* = V.A. Nechaev.

This study was supported by grants nos. 11-04-00240 (to N.S. Probatova), 12-04-01586 (to A.V. Verkhozina), and 14-44-04105 (to D.A. Krivenko), from the Russian Fund for Basic Research (RFBR), and by Interdisciplinary Integration Project Nr. 17, from the Siberian Branch of the Russian Academy of Sciences.

ASTERACEAE

Cichorium intybus L., 2*n* = 18; Russia, Irkutskaya Oblast', *AVV 12494* (IRK, VLA).

Cirsium setosum M. Bieb., 2*n* = 34; Russia, Irkutskaya Oblast', *AVV & DAK 12501* (IRK, VLA).

Conyza crispa Rupr., 2*n* = 18; Georgia, Autonomous Republic of Abkhazia, *DAK 12536* (IRK, VLA).

Filifolium sibiricum (L.) Kitam., 2*n* = 18; Russia, Primorskii Krai, *VAN 11632* (VLA).

Tragopogon orientalis L., 2*n* = 12; Russia, Irkutskaya Oblast', *AVV & DAK 12558* (IRK, VLA).

BORAGINACEAE

Lappula redowskii (Hornem.) Greene, 2*n* = 24; Russia, Irkutskaya Oblast', *DAK 12543* (IRK, VLA).

BRASSICACEAE

Cakile edentula (Bigelow) Hook., 2*n* = 18; Russia, Primorskii Krai, *DAK 12535* (VLA).

Cardamine trifida (Lam. ex Poir.) B.M.G.Jones, 2*n* = 48; Russia, Primorskii Krai, *VAN 12555* (VLA).

Erucastrum armoracioides Litv., 2*n* = 30; Russia, Irkutskaya Oblast', *AVV & S.G. Kazanovsky 12514* (IRK, VLA).

Lepidium texanum Buckley, 2*n* = 16; Georgia, Autonomous Republic of Abkhazia, *DAK 12532* (IRK, VLA).

CAMPANULACEAE

Adenophora remotiflora Miq., 2*n* = 34; Russia, Primorskii Krai, *VAN 12676* (VLA).

CANNABACEAE

Cannabis sativa L., 2*n* = 20; Russia, Irkutskaya Oblast', *DAK 12542* (IRK, VLA).

CARYOPHYLLACEAE

Moehringia lateriflora Fenzl, 2*n* = 24; Russia, Primorskii Krai, *VAN 12611* (VLA).

CHENOPODIACEAE

Corispermum ulopterum Fenzl ex Ledeb., 2*n* = 18; Russia, Irkutskaya Oblast', *DAK 12544* (IRK, VLA).

Kochia densiflora Turcz. ex Moq., 2*n* = 18; Russia, Republic of Buryatia, *DAK 12538* (IRK, VLA).

EPHEDRACEAE

Ephedra pseudodistachya Pachom., 2*n* = 28; Kazakhstan, Pavlodarskaya Oblast', *DAK 12549* (IRK, VLA).

EUPHORBIACEAE

Euphorbia paralias L., 2*n* = 16; Georgia, Autonomous Republic of Abkhazia, *DAK 12531* (IRK, VLA).

POACEAE

Agrostis trinii var. *inermis* Tzvelev, 2*n* = 28; Russia, Primorskii Krai, *VAN 12146* (VLA).

Arctopoa subfastigiata (Trin.) Prob., 2*n* = 42; Russia, Primorskii Krai, *VAN 12572* (VLA).

Arundinella hirta (Thunb.) Tanaka, 2*n* = 34; Russia, Primorskii Krai, *VAN 11352* (VLA).

Echinochloa spiralis Vasinger, 2*n* = 36; Russia, Irkutskaya Oblast', *AVV 12046* (IRK, VLA).

Paspalum dilatatum Poir., 2*n* = 40; Georgia, Autonomous Republic of Abkhazia, *DAK 12533* (IRK, VLA).

Poa skvortzovii Prob., 2*n* = 28; Russia, Primorskii Krai, *VAN 11345* (VLA).

Setaria pumila (Poir.) Roem. & Schult., 2*n* = 36; Russia, Republic of Buryatia, *DAK 12545* (IRK, VLA).

Setaria viridis (L.) P.Beauv., 2*n* = 18; Georgia, Autonomous Republic of Abkhazia, *DAK 12547* (IRK, VLA).

POLYGONACEAE

Aconogonon sericeum (Pall.) Hara, 2*n* = 60; Russia, Irkutskaya Oblast', *DAK 12541* (IRK, VLA).

Persicaria lapathifolia (L.) Gray, 2*n* = 22; Russia, Irkutskaya Oblast', *DAK 12550* (IRK, VLA).

Persicaria maculosa Gray, 2*n* = 40; Russia, Irkutskaya Oblast', *AVV 12507* (IRK, VLA).

PRIMULACEAE

Anagallis arvensis L., 2*n* = 40; Georgia, Autonomous Republic of Abkhazia, *DAK 12530* (IRK, VLA).

Androsace amurensis Prob., 2*n* = 20; Russia, Irkutskaya Oblast', *DAK 12441* (IRK, VLA).

ROSACEAE

Potentilla argentea L., 2*n* = 28; Russia, Primorskii Krai, *VAN 10303* (VLA).

Potentilla pacifica Howell, 2*n* = 42; Russia, Primorskii Krai, *VAN 12585* (VLA).

Potentilla semiglabra Juz., 2*n* = 28; Russia, Primorskii Krai, *VAN 10278* (VLA).

SOLANACEAE

Physalis franchetii Mast., 2*n* = 24; Russia, Primorskii Krai, *VAN 12675* (VLA).

VIOLACEAE

Viola rupestris F.W.Schmidt, 2*n* = 20; Russia, Republic of Buryatia, *DAK 12554* (IRK, VLA).

María V. Romero-da Cruz* & Eliana R. Forni-Martins

Laboratório de Biossistemática e Polinização, Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, Rua Monteiro Lobato 255, Cidade Universitária Zeferino Vaz, 13083-862 Campinas, SP, Brasil
* Author for correspondence: *romero.mariav@gmail.com*

Financial support from CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico, nos. 162582/2013-7 and 306142/2011/2) from wich M.V. Romero-da Cruz is a postdoctoral fellow and FAEPEX (Fundo de Apoio ao Ensino, à Pesquisa e Extensão, no. 1182/13).

SOLANACEAE

Capsicum chinense Jacq., 2*n* = 24; CHN, Brasil, Roraima, *María V. Romero-da Cruz 9* (UEC)

Keir M. Wefferling,* Heather A. Owen & Sara B. Hoot

Department of Biological Sciences, P.O. Box 413, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, U.S.A.
* Author for correspondence: *wefferl2@uwm.edu*

All materials CHN; collector: *KMW* = K.M. Wefferling; vouchers in UWM.

The work was supported by the University of Wisconsin-Milwaukee (UW-M) Graduate School (Distinguished Dissertation Fellowship), UW-M Biological Sciences Department (Ruth Walker Grant-in-Aid Award), the American Society of Plant Taxonomists (R. McVaugh Graduate Student Research Grant), the Native Plant Society of Oregon, and the Washington Native Plant Society (all to KMW). Special thanks to J. Anderson (Jonny Native Seed), A. Bradshaw (Alplains Seeds), M. Majack (Colorado Natural Areas Program), J. Smith (Boise State University), L. Wefferling, and B. Wefferling for seed and plant collections, P. Engevold (UW-M) for help with germination and propagation, and N. Luebke (Milwaukee Public Museum), Q.-E. Yang (Institute of Botany, Chinese Academy of Sciences), A. López (Instituto de Botánica Darwinion), G. Meyer (UW-M), and J. Beck (Wichita State University) for help with chromosome squash technique and protocols.

RANUNCULACEAE

Caltha leptosepala DC., 2*n* = 72; U.S.A., Idaho State, *KMW 212rotA*, *KMW 216-4*. 2*n* = 96; U.S.A., Idaho State, *KMW JS6* from plants collected by J. Smith, *KMW 180-1*, *KMW AB1-1* from seeds collected by A. Bradshaw; U.S.A., Oregon State, *KMW CR5*; U.S.A., Washington State, *KMW WNPS3-1*, *KMW CR3*.

Caltha leptosepala subsp. *howellii* (Huth) P.G.Sm., 2*n* = 48; U.S.A., Oregon State, *KMW CR2*, *KMW JNS1-1a* from seeds collected by J. Anderson; U.S.A., Washington State, *KMW CR1*.

Caltha leptosepala DC. subsp. *leptosepala*, 2*n* = 48; U.S.A., Colorado State, *KMW MM1-1* from seeds collected by M. Majack; U.S.A., Idaho State, *KMW 212lepto*, *KMW 276-6*, *KMW 299-3*.

IOPB COLUMN

Edited by Karol Marhold & Ilse Breitwieser

IAPT/IOPB chromosome data 20 [extended online version]

Edited by Karol Marhold

Fahim Altınordu[1]* & Kateřina Šumberová[2]

1 *Department of Biology, Science Faculty, Selçuk University, Konya, Turkey*
2 *Department of Vegetation Ecology, Institute of Botany, the Czech Academy of Sciences, Lidická 25/27, 602 00 Brno, Czech Republic*
* Author for correspondence: *altinordu.fahim@gmail.com*

All cytological investigations have been carried out on root tips of seedlings. Methods for chromosome counts follow Peruzzi & Cesca & al. (2002).

Vouchers (= seeds) in Reference seed collection at the Institute of Botany CAS, Department of Vegetation Ecology, Brno (here further referred as RSC-IB)

Financial support from Czech Science Foundation (Centre of Excellence PLADIAS, 14-36079G) and the Institute of Botany CAS (RVO 67985939) to K.Š.

* First chromosome count for the Czech Republic

ASTERACEAE

Bidens frondosa L.

2*n* = 48, CHN. Czech Republic, South Bohemia, Hluboká nad Vltavou, fish storage pond complex on southern margin of the town, near the main drainage channel, 11 Sep 2008, *K. Šumberová s.n.* (RSC-IB) [Fig. 1A].

The species is known to have chromosome number 2*n* = 48 reported from Italy, Slovakia, Russia and Poland (Májovský & al., 1987; Romano & al., 1987; Rudyka, 1995). For the Czech Republic, the same chromosome count was published from North Bohemia (Štěpánková, 2004).

* *Galinsoga quadriradiata* Ruiz & Pav.

2*n* = 32, CHN. Czech Republic, South Bohemia, Hluboká nad Vltavou, fish storage pond complex on southern margin of the town, pond nr. 33, 25 Aug 2009, *K. Šumberová s.n.* (RSC-IB) [Fig. 1B].

The reported chromosome number for this species agrees with the earlier reports of 2*n* = 32 from Canary Islands, Slovakia, Sweden, Mexico, Canada, Nigeria, Italy and Poland (Goldblatt & Johnson, 1979+). Although the species has been already published in the Flora of the Czech Republic (Slavík, 2004), original chromosome count from this territory was not available and the chromosome number from abroad was referred to.

CARYOPHYLLACEAE

Gypsophila muralis L.

2*n* = 30, CHN. Czech Republic, South Bohemia, Hluboká nad Vltavou, fish storage pond complex on southern margin of the town, near the pond nr. 54, 23 Aug 2009, *K. Šumberová s.n.* (RSC-IB) [Fig. 1C].

The chromosome number of this species was reported as 2*n* = 34 for the Mediterranean, Russia, Poland and Slovakia (Váchová & Feráková, 1978; Izmailov, 1990; Probatova & al., 2005). From the Czech Republic, Měsíček & Javůrková-Jarolímová (1992) and Šourková (1990) reported the chromosome number of this species as 2*n* = 30. Our result is congruent with these reports. The cause of different gametophytic counts might be Robertsonian translocations, existence of B chromosomes in cytotypes 2*n* = 34 or detachment of secondary constrictions (SC), which can be counted as extra chromosomes. Remarkable is the broad ecological range of this species that occupies temporary wetlands as well as dry habitats with open sands; possible correlations between the chromosome number and the species' ecology should be investigated in future.

POACEAE

Echinochloa crus-galli (L.) P.Beauv.

2*n* = 36, CHN. Czech Republic, South Bohemia, Hluboká nad Vltavou, fish storage pond complex on southern margin of the town, pond nr. 52, 21 Sep 2008, *K. Šumberová s.n.* (RSC-IB) [Fig. 1D].

The gametophytic count was reported as *n* = 18 (Spies & Reinecke, 2010). 2*n* = 54 cytotypes were collected in the Czech Republic, Russia, Slovakia, Uzbekistan and Spain (Carretero, 1981; Krahulcová, 2003; Probatova & Seledets, 2008; Probatova & al., 2008). 2*n* = 56 cytotype has been reported from Bulgaria (Kožuharov & Petrova, 1991). Also the highest chromosome number of 2*n* = 90, has been recorded for *Echinochloa crus-galli* var. *breviseta* (Döll) Neilr. (Malik & Grover, 1972 sec. Moore, 1974). The present chromosome count of 2*n* = 36 is the first record of this chromosome count from the Czech Republic which agrees with the earlier reports from China, Krasnoyarsk region of Asian part of Russia (Stepanov & Muratova, 1992; Feng & Zhang, 1993; Probatova & al., 2009). The first chromosome number record for the Czech Republic was published by Krahulcová (2003) from

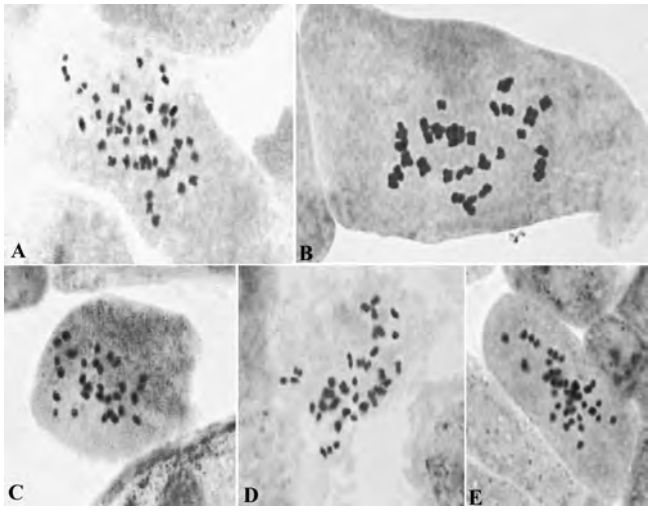

Fig. 1. A, *Bidens frondosa*, 2*n* = 48; **B,** *Galinsoga quadriradiata*, 2*n* = 32; **C,** *Gypsophila muralis*, 2*n* = 30; **D,** *Echinochloa crus-galli*, 2*n* = 36; **E,** *Geum urbanum*, 2*n* = 42.

north-eastern Bohemia; this number (2*n* = 54) is frequent throughout Europe (Krahulcová, 2003).

ROSACEAE

Geum urbanum L.

2*n* = 42, CHN. Czech Republic, South Bohemia, Hluboká nad Vltavou, fish storage pond complex on southern margin of the town, near the lower (= drainage) channel, 22 Sep 2008, *K. Šumberová s.n.* (RSC-IB) [Fig. 1E].

Two ploidy levels were reported in literature for this species, diploid cytotype from Georgia with 2*n* = 28 (Davlianidze, 1985), and triploid one with 2*n* = 42 known from many localities such as Slovakia, Poland, Belarus, Finland, Bulgaria and Portugal (Gajewski, 1948; Hallonová, 1982; Queirós, 1991; Baltisberger, 2006). From the Czech Republic, the same chromosome count was published from South Moravia (Smejkal, 1995).

Literature cited

Baltisberger, M. 2006. Cytological investigations on Bulgarian phanerogams. *Willdenowia* 36: 205–216. http://dx.doi.org/10.3372/wi.36.36117

Carretero, J.L. 1981. El género *Echinochloa* Beauv. en el suroeste de Europa. *Anales Jard. Bot. Madrid* 38: 91–108.

Davlianidze, M.T. 1985. Chromosome numbers in the representatives of the flora from Georgia. *Bot. Zhurn. (Moscow & Leningrad)* 70: 698–700.

Feng, J.H. & Zhang, T.B. 1993. Cytological study on Chinese species in the genus *Echinochloa*. *J. Wuhan Bot. Res.* 11: 293–299.

Gajewski, W. 1948. On the chromosome pairing in six hybrids among four *Geum* species. *Acta Soc. Bot. Poloniae* 19: 245–250.

Goldblatt, P. & Johnson, D.E. (eds.) 1979+. Index to plant chromosome numbers. http://www.tropicos.org/Project/IPCN (accessed 21 Jun 2011).

Hallonová, A. 1982. Floristické pomery horskej skupiny Skalky (Strážovské vrchy). *Stredné Slovensko* 2: 308–323.

Izmailov, R. 1990. Further studies in chromosome numbers of Polish angiosperms, part 23. *Acta Biol. Cracov., Ser. Bot.* 32: 173–177.

Kožuharov, S.I. & Petrova, A.V. 1991. Chromosome numbers of Bulgarian angiosperms. *Fitologiya (Sofia)* 39: 72–77.

Krahulcová, A. 2003. Chromosome numbers in selected monocotyledons (Czech Republic, Hungary, and Slovakia). *Preslia* 75: 97–113.

Májovský, J., Murín, A., Feráková, V., Hindáková, M., Schwarzová, T., Uhríková, A., Váchová, M. & Záborský, J. 1987. *Karyotaxonomický prehľad flóry Slovenska*. Bratislava: Veda.

Měsíček, J. & Javůrková-Jarolímová, V. 1992. *List of chromosome numbers of the Czech vascular plants*. Praha: Academia.

Moore, R.J. (ed.) 1974. Index to plant chromosome numbers for 1972. *Regnum Veg.* 91: 1–108.

Peruzzi, L. & Cesca, G. 2002. Chromosome numbers of flowering plants from Calabria, S Italy. *Willdenowia* 32: 33–44.

Probatova, N.S. & Seledets, V.P. 2008. *Echinochloa crus-galli* (L.) P.Beauv. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 5. *Taxon* 57: 557, E11.

Probatova, N.S., Shatokhina, A.V. & Rudyka, E.G. 2005. Chromosome numbers of some dicotyledons of the flora of the Amur Region. *Bot. Zhurn. (Moscow & Leningrad)* 90: 779–792.

Probatova, N.S., Rudyka, E.G., Seledets, V.P. & Nechaev, V.A. 2008. *Echinochloa crus-galli* (L.) P.Beauv. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 6. *Taxon* 57: 1270, E9.

Probatova, N.S., Seledets, V.P., Rudyka, E.G., Gnutikov, A.A., Kozhevnikova, Z.V. & Barkalov, V.Y. 2009. *Echinochloa spiralis* Vasinger. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 8. *Taxon* 58: 1286, E16.

Queirós, M. 1991. Números cromossómicos para a flora Portuguesa 104–105. *Bol. Soc. Brot.*, sér. 2, 64: 135–142.

Romano, S., Mazzola, P. & Raimondo, F.M. 1987. Numeri cromosomici per la flora Italiana. 1070–1081. *Inform. Bot. Ital.* 18: 159–167.

Rudyka, E.G. 1995. Chromosome numbers in vascular plants from the southern part of the Russian Far East. *Bot. Zhurn. (Moscow & Leningrad)* 80: 87–90.

Slavík, B. 2004. *Galinsoga* Ruiz et Pavón. Pp. 331–336 in: Slavík, B. & Štěpánková, J. (eds.), *Květena ČR*, vol. 7. Praha: Academia.

Smejkal, M. 1995. *Geum* L. Pp. 316–325 in: Slavík B. (ed.), *Květena ČR*, vol. 4. Praha: Academia.

Šourková, M. 1990. *Gypsophila* L. Pp. 192–198 in: Hejný, S. & Slavík, B. (eds.), *Květena ČR*, vol. 2. Praha: Academia.

Spies, J.J & Reinecke, S.M.C. 2010. *Echinochloa crus-galli* (L.) P.Beauv. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 9. *Taxon* 59: 1302, E14.

Štěpánková, J. 2004. *Bidens* L. Pp. 336–345 in: Slavík, B. & Štěpánková, J. (eds.), *Květena ČR*, vol. 7. Praha: Academia.

Stepanov, N.V. & Muratova, E.N. 1992. Chromosome numbers in some species of higher plants of flora of the Krasnoyarsk region. *Bot. Zhurn. (Moscow & Leningrad)* 77: 125–126.

Váchová, M. & Feráková, V. 1978: [Reports] in: Löve, Á. (ed.), IOPB chromosome numbers reports LXI. *Taxon* 27: 381–382. http://www.jstor.org/stable/1220381

Tatyana V. An'kova,[1*] Andrey S. Erst,[1,2] Igor V. Kuzmin,[3] Dmitriy N. Shaulo[1] & Yuri V. Plugatar[4]

1 *Laboratory of Herbarium, Central Siberian Botanical Garden Siberian, Branch of the Russian Academy of Sciences, 101 Zolotodolinskaya str., Novosibirsk 630090, Russia*
2 *Tomsk State University, Laboratory of Ecology and Biodiversity, Tomsk 634050, Russia*
3 *Tyumen State University, 10 Semakova str., Tyumen 625023, Russia*
4 *Nikitskiy Botanical Garden, Yalta, Nikita 298648, Crimea*
* Author for correspondence: *ankova_tv@mail.ru*

The study was financially supported by the Russian Foundation for Basic Research (grant 14-44-04021-r-sibir'-a) and Russian Science Foundation (grant no 14-50-00079).

ASTERACEAE

Arctium minus (Hill) Bernh.

2*n* = 36, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km S of Dourgne, roadside in the mountains, 43°28′N, 02°08′E, 2 Nov 2013, *A. Erst AEK1* (NS).

Centaurea jacea L.

2*n* = 44, CHN. France, Region Midi-Pyrénées, Departament Tarn-et-Garonne, vicinity of Montauban, dry meadow, 44°02′N, 01°21′E, 24 Nov 2013, *A. Erst AEK42* (NS).

Picris echioides L.

2*n* = 10, CHN. France, Region Aquitaine, Departament Pyrénées-Atlantiques, vicinity of Guéthary, roadside ditch, 43°25′N, 01°36′E, 31 Oct 2013, *A. Erst AEK22* (NS) [Fig. 2C]; France, Region Midi-Pyrénées, Departament Tarn, 2 km W of Labruguière, dry meadow, 43°32′N, 02°13′E, 2 Nov 2013, *A. Erst AEK36* (NS) [Fig. 2D].

BRASSICACEAE

Cardamine pratensis L.

2*n* = 28, CHN. France, Region Aquitaine, Departament Pyrenees-Atlantiques, vicinity of Guéthary, wet roadside ditch, 43°25′N, 01°36′E, 31 Oct 2013, *A. Erst AEK27* (NS) [Fig. 2A].

CAPRIFOLIACEAE

Dipsacus fullonum L.

2*n* = 18, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km W of Labruguière, dry meadow, 43°32′N, 02°13′E, 2 Nov 2013, *A. Erst AEK34* (NS) [Fig. 2B].

CARYOPHYLLACEAE

Silene baccifera (L.) Roth

2*n* = 24, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km S of Dourgne, roadside in the mountains, 43°28′N, 02°08′E, 2 Nov 2013, *A. Erst AEK8* (NS).

Silene latifolia Poir.

2*n* = 24, CHN. France, Region Midi-Pyrénées, Departament Tarn, 5 km NW of Mazamet, commune Caucalières, meadow on limestone mountain, 43°31′N, 02°18′E, 3 Nov 2013, *A. Erst AEK39* (NS).

PLANTAGINACEAE

Plantago major L.

2*n* = 12, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km S of Dourgne, roadside in the mountains, 43°28′N, 02°08′E, 2 Nov 2013, *A. Erst AEK14a* (NS) [Fig. 2E];

2*n* = 24, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km S of Dourgne, roadside in the mountains, 43°28′N, 02°08′E, 2 Nov 2013, *A. Erst AEK14b* (NS) [Fig. 2F].

SOLANACEAE

Solanum dulcamara L.

2*n* = 24, CHN. France, Region Midi-Pyrénées, Departament Tarn, 2 km S of Dourgne, damp meadow in the mountains, 43°28′N, 02°08′E, 2 Nov 2013, *A. Erst AEK11* (NS) [Fig. 2H]; France, Department Haute-Garonne, Toulouse, park around Cité de l'espace, 43°35′N, 01°29′E, 19 Nov 2013, *A. Erst AEK47* (NS) [Fig. 2G].

Matthias Baltisberger

ETH Zürich, Plant Ecological Genetics, Institute of Integrative Biology, Universitätstr. 16, 8092 Zürich, Switzerland; balti@ethz.ch

The chromosome numbers of 30 *Stachys* taxa and 1 hybrid are presented. Seeds of plants from 68 populations were sampled, and the plants from the germinated seeds were cultivated in a greenhouse in Zürich (Switzerland). The cytological investigations were carried out on root tips (method see Baltisberger & Widmer, 2009). Five to ten metaphases were counted for each individual investigated to determine chromosome numbers; the numbers of investigated individuals (N) per site are indicated in Table 1. Chromosome numbers in literature were checked with Goldblatt & Johnson (1979+). The chromosome numbers of *S. goulimyi* (with 2*n* = 34) and *S. spinulosa* (with 2*n* = 28) were not previously reported.

The taxa are discussed in alphabetical order, and results are summarized in Table 1. Nomenclature mostly corresponds to IPNI

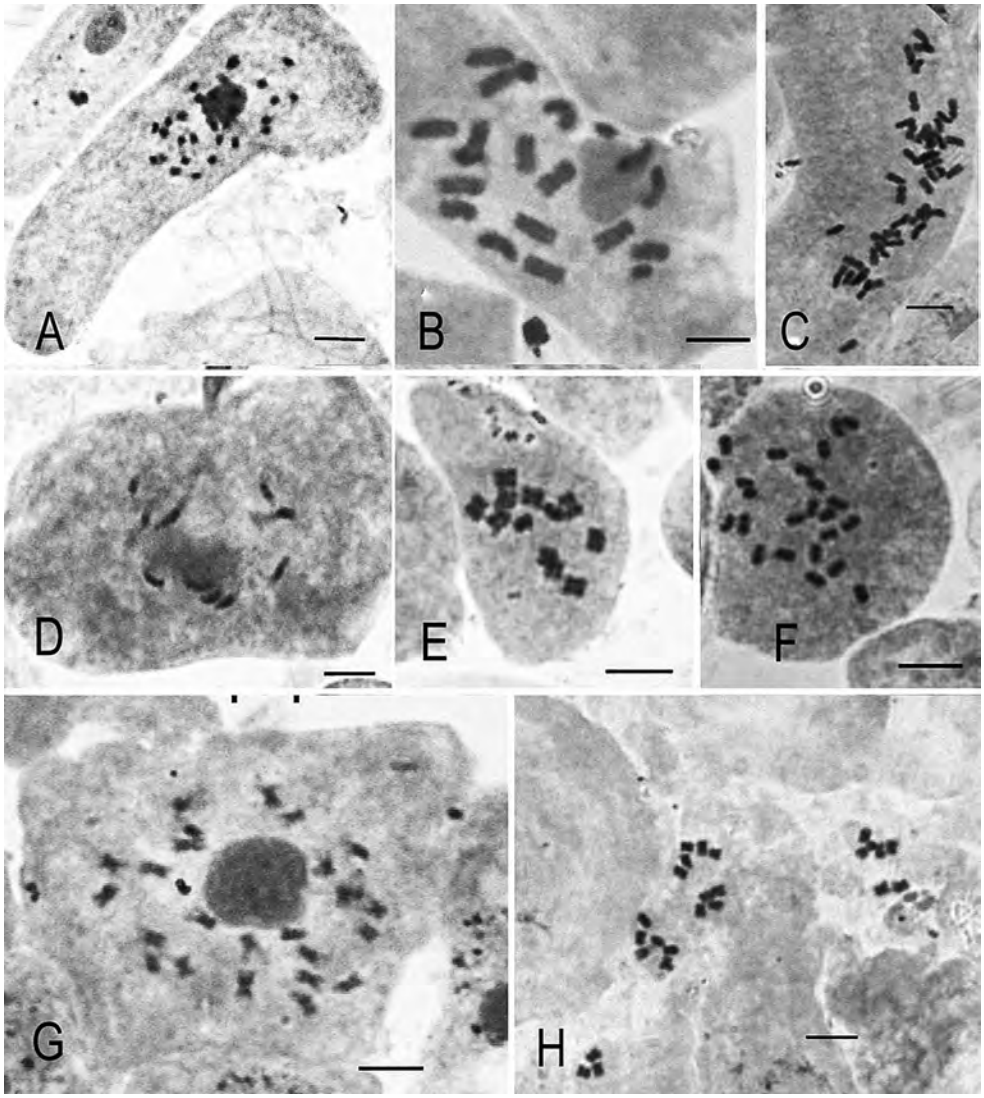

Fig. 2. Mitotic metaphase: **A,** *Cardamine pratensis* L., 2*n* = 28; **B,** *Dipsacus fullonum* L., 2*n* = 18; **C,** *Picris echioides* L., 2*n* = 10 (*AEK22*); **D,** *Picris echioides* L., 2*n* = 10 (*AEK36*); **E,** *Plantago major* L., 2*n* = 12; **F,** *Plantago major* L., 2*n* = 24; **G,** *Solanum dulcamara* L., 2*n* = 24 (*AEK47*); **H,** *Solanum dulcamara* L., 2*n* = 24 (*AEK11*). — Scale bar = 5 µm.

(2015), names not included in IPNI follow Med-Checklist (Greuter & al., 1986). Geographic indications of Greek sites have been adapted to the new organisation of Greece which was part of the "Kallikratis" administrative reform starting on 1 Jan 2011 (informations and maps, see https://en.wikipedia.org/wiki/Regional_units_of_Greece). Based on indications in Halacsy (1902), Hayek & Markgraf (1931), Ball (1972), Hess & al. (1980), Bhattacharjee (1982), and Baden (1991) geographic distribution and interesting systematic aspects are discussed within the respective taxa including further literature if needed. General systematic aspects are discussed in a final paragraph.

LAMIACEAE

Stachys alpina L.

2*n* = 30, CHN. Italy, Trentino, E-side of Lago di Garda, Mt. Baldo, SSE of Malcesine, E-exposed meadow, 1650–1750 m, 31 Jul 2000, *M. Baltisberger & A. Widmer 13679*, *M. Baltisberger 13868* (Z+ZT).

Stachys alpina belongs to the *S. germanica* group (see comment below under *S. germanica*). Most taxa of this group are variable and taxonomically very difficult but *S. alpina* is well characterised being morphologically rather homogenous and showing glandular hairs on the stems which is unique within the group. *Stachys alpina* occurs in mountains of central and southern Europe eastwards to the Caucasus. As all members of the *S. germanica* group, all plants investigated here had 2*n* = 30 chromosomes corroborating indications in literature.

Stachys annua L.

2*n* = 34, CHN. Greece, Thessaly, W of Trikala, roadside near Pertoulion, 1150 m, 21 Jun 1987, *M. Baltisberger & U. Meili 11344*, *M. Baltisberger 11700*, *M. Baltisberger 11869* (Z+ZT); Greece, Thessaly, WNW of Trikala, roadside on the road from Kastanea to Kranea, 1300 m, 22 Jun 1987, *M. Baltisberger & U. Meili 11346*, *M. Baltisberger 11900* (Z+ZT); Greece, Epirus, NNW of Ioannina, Mt. Timphi, between Aristi and Monodendrion, Vikos gorge, scree, 700–800 m, 27 Jun 1992, *M. Baltisberger & W. Huber 12612*, *M. Baltisberger 12784* (Z+ZT); Switzerland, ct. Schaffhausen, Beringen, ruderal place, 440 m, 21 Aug 1989, *M. Baltisberger 12141* (Z+ZT); Turkey, NNE of Ankara, near Kastamonu, field on the road from Arac to Ihsangazi, 6 Jun 1988, *M. Gasser MG5*, *M. Baltisberger 11991* (Z+ZT).

Stachys annua is mostly annual and grows as a weed in cultivated fields as well as on open ruderal places. Originally it is probably an E Mediterranean element but is now naturalised in most of Europe and also on other continents. Several indications in literature reveal the chromosome number of 2*n* = 34 which is confirmed by all plants from the five sites investigated here.

Stachys argolica Boiss. (≡ *S. swainsonii* subsp. *argolica* (Boiss.) Phitos & Damboldt)

2*n* = 34, CHN. Greece, Peloponnese, Argolis, N of Kranidion, on the road from Fourni to Kranidion, calcarous rocks on roadside, 16 May 1983, *M. Bandle & A. Lenherr 33205*, *M. Baltisberger 11182* (Z+ZT); Greece, Peloponnese, Argolis, S of Nafplio, S-exposed rocky slope, 100–150 m, 12 Jun 1985, *M. Baltisberger & W. Frey 10612*, *M. Baltisberger 11586* (Z+ZT).

Stachys argolica belongs to the *S. swainsonii* group (see comment below under *S. swainsonii*). The plants of both sites investigated here showed the chromosome number 2*n* = 34 confirming indications in literature.

Stachys atherocalyx K.Koch

2*n* = 34, CHN. Armeniya, ENE of Yerevan, basin of lake Sevan, Sevan mountain range, near Dzhil, 5 Aug 1990, *N.S. Chanjian NSC 1*, *M. Baltisberger 13087* (Z+ZT); Kosovo, SSW of Pristina, E of Prizren, Mt. Osljak, rocky meadow on limestone, 2200 m, 5 Aug 1990, *M. Baltisberger & U. Schäppi 12292*, *M. Baltisberger 12534*, *M. Baltisberger 13199*, *M. Baltisberger 13254* (Z+ZT); Turkey, ENE of Erzurum, near Sarikamis, 2100 m, 15 Jul 1988, *D. Tasdemir 88-060*, *M. Baltisberger 12197* (Z+ZT).

Stachys atherocalyx belongs to the rather difficult *S. recta* group (see comment below under *S. recta* s.l.). *Stachys atherocalyx* has a wide distribution occurring from the Balkan Peninsula eastwards to the Caucasus region. The plants investigated here cover the entire geographic distribution of the species. Confirming earlier counts, all investigated plants had 2*n* = 34 chromosomes which is common for all members of the *S. recta* group.

Stachys baldaccii (K.Maly) Hand.-Mazz. & Janch. (≡ *S. recta* subsp. *baldaccii* (K.Maly) Hayek)

2*n* = 34, CHN. Montenegro, S of Kotor, Mt. Lovcen, near Njegus Memorial, dry rocky slope, 1600 m, 9 Aug 1981, *U. Hartwig & A. Lenherr 28340*, *M. Baltisberger 11160* (Z+ZT).

Stachys baldaccii belongs to the rather difficult *S. recta* group (see comment below under *S. recta* s.l.). *Stachys baldaccii* occurs in Bosnia-Hercegovina, Montenegro, and northern Albania (Lenherr, 1983) but morphologically similar plants also occur outside this range (e.g., in central Albania [Baltisberger, 2002], in Greece in southern Pindus [Baden, 1991], in southern Italy [Baltisberger, 1990a], and probably elsewhere). As all members of the *S. recta* group the plants investigated here showed 2*n* = 34 chromosomes confirming earlier counts.

Stachys beckeana Dörfl. & Hayek

2*n* = 34, CHN. Montenegro, W of Andrjevica, near pass Cakor, 1600 m, 7 Aug 1981, *U. Hartwig & A. Lenherr 28338*, *M. Baltisberger 11611* (Z+ZT).

Stachys beckeana belongs to the rather difficult *S. recta* group (see comment below under *S. recta* s.l.) and is indicated from Bosnia-Hercegovina, Montenegro, and northern Albania (Lenherr, 1983; Lenherr & Baltisberger, 1984) but also occurs in Bulgaria (Baltisberger, 2006). The plants from Montenegro showed 2*n* = 34 chromosomes confirming earlier counts and corroborating the common number for the *S. recta* group.

Stachys candida Bory & Chaub.

2*n* = 34, CHN. Greece, Peloponnese, W side of Mt. Taiyetos, on the road from Sparta to Kalamata, rocky roadside near Kalamata, 300–350 m, 11 Jun 1985, *M. Baltisberger & W. Frey 10591*, *M. Baltisberger 11112*, *M. Baltisberger 11599* (Z+ZT).

The *Stachys candida* group comprises three species, besides *S. candida* it includes also *S. chrysantha* (see below) and *S. spreitzenhoferi* (see below). All taxa show petiolate leaves with ovate to circular blades. The plants have a mostly dense and lanate indumentum. They grow on rocks and screes in the southern part of Peloponnese (map see Persson, 1981). One species (*S. spreitzenhoferi*) has rather small flowers (calyx 4–7 mm, corolla tube 7.5–10.5 mm, upper lip 3.5–5 mm, lower lip 8–11 mm) while the other two species (*S. candida* and *S. chrysantha*) show distinctly larger flowers (calyx 7–10 mm, corolla tube 9–11 mm, upper lip 6–7 mm, lower lip 11–14 mm) (Persson, 1981). *Stachys candida* has a white corolla with purple spots (the corolla of *S. chrysantha* is yellow) and grows in Mt. Taiyetos. The observed chromosome number 2*n* = 34 corroborated previous counts.

Stachys canescens Bory & Chaub. (= *S. messeniaca* Boiss.)

2*n* = 34, CHN. Greece, Peloponnese, SW of Kalamata, Methoni, rocks and walls of the castle, 10–30 m, 11 Jun 1985, *M. Baltisberger & W. Frey 10585*, *M. Baltisberger 11114* (Z+ZT); Greece, Peloponnese, W side of Mt. Taiyetos, on the road from Sparta to Kalamata, rocky roadside near Kalamata, 300–350 m, 11 Jun 1985, *M. Baltisberger & W. Frey 10594*, *M. Baltisberger 11844* (Z+ZT); Greece, Peloponnese, SSE of Sparta, near Gythion, rocks on the road from Gythion to Areopolis, 30 m, 17 Jun 1987, *M. Baltisberger & U. Meili 11264*, *M. Baltisberger 11864* (Z+ZT).

Table 1. Alphabetical list (arranged in systematical groups) of investigated plants, with the site, the year of sampling, the voucher numbers referring to the herbarium specimens deposited in Z+ZT, the number of investigated individuals (N), and the chromosome number (2*n*).

Taxon and site	Year	Voucher	N	2*n*
Stachys annua L.				
Greece, Thessaly, W of Trikala, Pertoulion	1987	11344, 11869	11	34
Greece, Thessaly, WNW of Trikala, Kastanea	1987	11346, 11900	11	34
Greece, Epirus, NNW of Ioannina, Mt. Timphi, Vikos gorge	1992	12612, 12784	8	34
Switzerland, ct. Schaffhausen, Beringen	1989	12141	7	34
Turkey, NNE of Ankara, Kastamonu	1988	MG 5, 11991	4	34
Group of *Stachys candida*				
Stachys candida Bory & Chaub.				
Greece, Peloponnese, Kalamata	1985	10591, 11112, 11599	6	34
Stachys chrysantha Boiss. & Heldr.				
Greece, Peloponnese, SE of Sparta, Monemvasia	1987	11250, 11695	11	34
Greece, Peloponnese, SE of Sparta, Gefira	1987	11258, 11863	11	34
Greece, Peloponnese, SE of Sparta, Apidea	1987	11263, 11696	11	34
Greece, Peloponnese, E of Sparta, Kosmas	1987	11266, 11697	6	34
Stachys spreitzenhoferi subsp. ***virella*** D.Perss.				
Greece, Peloponnese, SE of Sparta, Monemvasia	1983	33059	6	34
Stachys canescens Bory & Chaub.				
Greece, Peloponnese, SW of Kalamata, Methoni	1985	10585, 11114	8	34
Greece, Peloponnese, Kalamata	1985	10594, 11844	9	34
Greece, Peloponnese, SSE of Sparta, Gythion	1987	11264, 11864	11	34
Stachys candida Bory & Chaub. × ***S. canescens*** Bory & Chaub.				
Greece, Peloponnese, Kalamata	1985	11845, 11846	8	34
Group of *Stachys germanica*				
Stachys alpina L.				
Italy, Trentino, Mt. Baldo	2000	13679, 13868	4	30
Stachys cassia Boiss. (≡ *S .cretica* subsp. *cassia* (Boiss.) Rech.f.)				
Macedonia, E of Prilep, Kavadarci	1983	83/716	4	30
Stachys cretica L. (≡ *S. cretica* L. subsp. *cretica*)				
Greece, Crete, NW of Neapolis, Vrachasion	1983	10503	6	30
Greece, Crete, WSW of Rethimno, Kournas	2000	13727	5	30
Stachys germanica L. (≡ *S. germanica* L. subsp. *germanica*)				
Greece, Central Greece, N of Karpenision, Kerasochorion	1983	83/350, 11157	4	30
Greece, Thessaly, W of Karditsa, Mt. Karava	1987	11701	3	30
Greece, West Macedonia, WSW of Grevena, Mt. Orliakas	1990	12308, 12518	7	30
Stachys heldreichii Boiss. (≡ *S. germanica* subsp. *heldreichii* (Boiss.) Hayek)				
Greece, Thessaly, W of Karditsa, Mt. Kasarma	1987	11315, 11996	3	30
Turkey, SE of Bolu, Kartalkaya	1986	12800	2	30
Stachys salviifolia Ten. (≡ *S. cretica* subsp. *salviifolia* (Ten.) Rech.f.)				
Greece, Epirus, SSE of Igoumenitsa, Paramythia	1983	83/252, 11628	5	30
Greece, West Macedonia, SSE of Grevena, Anixis	1983	83/419, 11156	6	30
Greece, Thessaly, W of Trikala, Pertoulion	1987	11345, 11702	6	30
Greece, Thessaly, WNW of Trikala, Kastanea	1987	11359, 11998, 12065	9	30
Stachys thirkei K.Koch				
Bosnia-Hercegovina, Mt. Biokovo, Veliko Brdo	1983	83/876, 11158	11	30
Croatia, ENE of Zadar, Policnik	1980	80/823, 11627	9	30

Table 1. Continued.

Taxon and site	Year	Voucher	N	2*n*
Stachys horvaticii Micevski				
Greece, West Macedonia, ESE of Grevena, Mt. Komvounia, near Deskati	1990	12320, 12598, 13198	7	34
Macedonia, ESE of Titov Veles, Sveti Ilija	1987	11430, 11873	11	34
Stachys menthifolia Vis.				
Greece, Epirus, NNW of Ioannina, Mt. Timphi, Vikos gorge	1981	28033, 11594	5	34
Montenegro, SW of Podgorica, Virpazar	1985	10884, 11116	11	34
Stachys mollissima Willd. (= *S. decumbens* Pers.)				
Greece, Epirus, SSE of Igoumenitsa, Paramythia	1983	83/244, 11595	11	34
Greece, Epirus, S of Igoumenitsa, Anthousa	1983	83/255, 11596	11	34
Stachys plumosa Griseb.				
Greece, Thessaly, N of Kalabaka, Meteora	1985	10682, 11592	6	34
Greece, Thessaly, NNW of Kalabaka, Elephtherochorion	1985	10692, 11119	11	34
Greece, West Macedonia, W of Kozani, Neapolis	1985	10695, 11591	6	34
Greece, Central Macedonia, W of Thessaloniki, Naousa	1985	10764, 11847	9	34
Greece, Central Macedonia, SSW of Katerini, Litochoron	1987	11382, 12570	11	34
Greece, West Macedonia, NE of Grevena, Paleokastron	1990	12312, 12539	5	34
Macedonia, SW of Skopje, Staklo	1985	10825, 11117	9	34
Macedonia, SW of Skopje, Klenovec	1985	10831, 11593	11	34
Macedonia, SW of Skopje, Matka	1985	10847, 11118	11	34
Group of *Stachys recta*				
Stachys atherocalyx K.Koch				
Armeniya, ENE of Yerevan, near Lake Sevan, Dzhil	1990	NSC 1, 13087	15	34
Kosovo, SSE of Pristina, E of Prizren, Mt. Osljak	1990	12292, 13254	11	34
Turkey, ENE of Erzurum, Sarikamis	1988	88-060, 12197	15	34
Stachys baldaccii (K.Maly) Hand.-Mazz. & Janch. (≡ *S. recta* subsp. *baldaccii* (K.Maly) Hayek)				
Montenegro, S of Kotor, Mt. Lovcen	1981	28340, 11160	12	34
Stachys beckeana Dörfl. & Hayek				
Montenegro, W of Andrjevica, pass Cakor	1981	28338, 11611	10	34
Stachys goulimyi Rech.f.				*
Greece, West Macedonia, SW of Kozani, Derniko	1977	11736	9	34
Greece, West Macedonia, NE of Grevena, Paleokastron	1990	12318, 12569, 13197	17	34
Stachys labiosa Bertol. (≡ *S. recta* subsp. *labiosa* (Bertol.) Briq. = *S. recta* subsp. *grandiflora* (Caruel) Arcang.)				
Italy, Trentino, WSW of Riva del Garda, pass Tremalzo	2000	13696, 13767	4	34
Stachys recta L. (≡ *S. recta* L. subsp. *recta*)				
Montenegro, Mt. Durmitor, Zabljak	1980	80/1335, 11620	4	34
Stachys recta L. s.l.				
Albania, district Shkodër, gorge of river Cem	1989	11961, 12102	10	34
Greece, West Macedonia, SSW of Kastoria, Eptachorion	1992	12609, 13256	6	34
Stachys subcrenata Vis. (≡ *S. recta* subsp. *subcrenata* (Vis.) Briq.)				
Bosnia-Hercegovina, Mt. Biokovo, Veliko Brdo	1983	83/869, 11139, 11623	8	34
Croatia, Mt. Velebit, W of Gospic	1983	83/885, 11154	11	34
Stachys spinulosa Sm.				*
Greece, Peloponnese, near Mistras	1983	33160, 11626	6	28
Greece, Ionian Islands, Kephallinia	1983	33271, 11625	8	28
Greece, Ionian Islands, Kerkira, Mt. Pantokrator	1983	33317, 11133	9	28

* chromosome number not known up to now

Table 1. Continued.

Taxon and site	Year	Voucher	N	2*n*
Group of *Stachys swainsonii*				
Stachys argolica Boiss. (≡ *S. swainsonii* subsp. *argolica* (Boiss.) Phitos & Damboldt)				
Greece, Peloponnese, Argolis, N of Kranidion	1983	33205, 11182	11	34
Greece, Peloponnese, Argolis, S of Nafplio	1985	10612, 11586	11	34
Stachys melangavica (D.Perss.) Baltisb. (≡ *S. swainsonii* subsp. *melangavica* D.Perss.)				
Greece, Peloponnese, N of Korinthos	1983	33257, 11585	11	34
Stachys scyronica Boiss. (≡ *S. swainsonii* subsp. *scyronica* (Boiss.) Phitos & Damboldt)				
Greece, Attica, W of Athens, Megara	1985	10642, 11180, 11587	11	34
Stachys spruneri Boiss.				
Greece, Attica, WNW of Athens, Nea Peramos	1985	10631, 11589	11	34
Greece, Central Greece, NE of Thivae, Ypation	1987	11277, 11865	11	34
Stachys swainsonii Benth. (≡ *S. swainsonii* Benth. subsp. *swainsonii*)				
Greece, Central Greece, Delphi	1985	10654, 11588	9	34
Greece, Central Greece, Pendeoria	1987	11288, 11866	11	34

Stachys canescens is an endemic species of S Greece growing in cliffs of southern Peloponnese (Persson, 1981). As we found this species also in walls of the castle above Kassiopi (northern Kerkira; 24 Sep 2014, *B. & M. Baltisberger 17486*, Z+ZT) the distribution area is apparently not confined to the Peloponnese. All plants investigated from the three sites from the Peloponnese showed 2*n* = 34 chromosomes which confirms the indications in literature.

Stachys candida Bory & Chaub. × *S. canescens* Bory & Chaub.

2*n* = 34, CHN. Greece, Peloponnese, W side of Mt. Taiyetos, on the road from Sparta to Kalamata, rocky roadside near Kalamata, 300–350 m, 11 Jun 1985, *M. Baltisberger 11845*, *M. Baltisberger 11846* (Z+ZT).

In Peloponnese where many species of *Stachys* occur, different species may grow in the same locality as was found for *S. candida* (see above) and *S. canescens* (see above) in the same rocky roadside at Kalamata. We sampled seeds from both species (*S. candida*, *M. Baltisberger & W. Frey 10591*; *S. canescens*, *M. Baltisberger & W. Frey 10594*). Germinating the seeds in the greenhouse in Zürich the offspring also contained eight intermediate plants, indicating that they are of hybrid origin. These hybrids grew well and flowered, and all showed the same chromosome number of 2*n* = 34 as both parents.

Stachys cassia Boiss. (≡ *S. cretica* subsp. *cassia* (Boiss.) Rech.f.)

2*n* = 30, CHN. Macedonia, E of Prilep, stony meadow between Prilep and Kavadarci, 450 m, 28 Jun 1983, *M. Baltisberger & A. Lenherr 83/716* (Z+ZT).

Stachys cassia belongs to the *S. germanica* group (see comment below under *S. germanica*). It has a disjunct distribution area occurring in S Anatolia (with the locus classicus) as well as in the central parts of the Balkan Peninsula. The plants investigated here showed 2*n* = 30 chromosomes confirming earlier counts and corroborating the common number for the *S. germanica* group.

Stachys chrysantha Boiss. & Heldr.

2*n* = 34, CHN. Greece, Peloponnese, SE of Sparta, Malea Peninsula, Monemvasia, rocks, 20–50 m, 17 Jun 1987, *M. Baltisberger & U. Meili 11250*, *M. Baltisberger 11695* (Z+ZT); Greece, Peloponnese, SE of Sparta, Malea Peninsula, Gefira, rocks, 20–50 m, 17 Jun 1987, *M. Baltisberger & U. Meili 11258*, *M. Baltisberger 11863* (Z+ZT); Greece, Peloponnese, SE of Sparta, Malea Peninsula, near Apidea, rocks on the road from Sparta to Monemvasia, 160 m, 17 Jun 1987, *M. Baltisberger & U. Meili 11263*, *M. Baltisberger 11696* (Z+ZT); Greece, Peloponnese, E of Sparta, Mt. Parnon, near Kosmas, rocky roadside on the road from Jerakion to Leonidion, 1000–1100 m, 18 Jun 1987, *M. Baltisberger & U. Meili 11266*, *M. Baltisberger 11697* (Z+ZT).

Stachys chrysantha belongs to the *S. candida* group (see above under *S. candida*) and looks rather similar to *S. candida* also showing the same size of flowers. *Stachys chrysantha* differs mainly in the colour of the corolla which is yellow (in *S. candida* the corolla is white with purple spots). *Stachys chrysantha* occurs in the southeastern part of Peloponnese E of Mt. Taiyetos, in Mt. Parnon and on Malea Peninsula. The plants from all four sites investigated showed 2*n* = 34 chromosomes which confirms the indications in literature.

Stachys cretica L. (≡ *S. cretica* L. subsp. *cretica*)

2*n* = 30, CHN. Greece, Crete, NW of Neapolis, near Vrachasion, pasture on the road from Selinaris to Vrachasion, 380 m, 25 Sep 1983, *M. Baltisberger 10503* (Z+ZT); Greece, Crete, WSW of Rethimno, olive grove near Kournas, 21 Mar 2000, *M. Baltisberger & A. Widmer 13727* (Z+ZT).

Stachys cretica belongs to the *S. germanica* group (see comment below under *S. germanica*). It occurs in Crete, but also in the Aegean region, Greece, and northwards to Albania (Baltisberger & Lenherr, 1984a; Baltisberger & Baltisberger, 1995). The plants investigated here proved to have 2*n* = 30 chromosomes as indicated in earlier counts and as all members of the *S. germanica* group.

Stachys germanica L. (≡ *S. germanica* L. subsp. *germanica*)

2*n* = 30, CHN. Greece, Central Greece, N of Karpenision, near Kerasochorion, sparse forest on the road from Kerasochorion to Marathos, 1400 m, 21 Jun 1983, *M. Baltisberger & A. Lenherr 83/350*, *M. Baltisberger 11157* (Z+ZT); Greece, Thessaly, W of Karditsa, Mt. Karava, scree, 1950–2000 m, 20 Jun 1987, *M. Baltisberger 11701* (Z+ZT); Greece, West Macedonia, WSW of Grevena, Mt. Orliakas, sparse forest, 1100 m, 8 Aug 1990, *M. Baltisberger & P. Matsoukas 12308*, *M. Baltisberger 12518* (Z+ZT).

Stachys germanica is the taxon that gives the name to the difficult *S. germanica* group. This group comprises about 10 species and several to many subspecies and varieties treated at various taxonomical levels and taxonomic combinations depending on author and source (e.g., Rechinger, 1937; Bhattacharjee, 1974; Falciani, 1997;

Akcicek & al., 2012; Dündar & al., 2013). Determination of given plants may be problematic due to great variability of taxa and the many intermediates occurring. The group covers a wide distribution area growing in central and southern Europe and eastwards to the Caucasus region. It belongs to *Stachys* sect. *Eriostomum* (Hoffmanns. & Link) Dumort. which is morphologically well characterised within the genus with mostly tomentose stems, verticillasters with at least six, mostly many flowers, bracteoles as long as or longer than calyx-tube, and a corolla with a mostly densely hairy upper lip. The group is cytologically uniform, having always 2*n* = 30 chromosomes. All *S. germanica* plants from the three investigated sites in Greece corroborate the chromosome number 2*n* = 30.

Stachys goulimyi Rech.f.

2*n* = 34, CHN. Greece, West Macedonia, SW of Kozani, Mt. Vourinos, Derniko near Paleokastron, SE-exposed rocky slope, 1500 m, 6 Jul 1977, *B. Christensen & P. Hartvig 6505* (C), *M. Baltisberger 11736* (Z+ZT); Greece, West Macedonia, NE of Grevena, E of Paleokastron, Mt. Vourinos, near Kataphygion, S-exposed rocky slope, 1350–1550 m, 9 Aug 1990, *M. Baltisberger & U. Schäppi 12318*, *M. Baltisberger 12569*, *M. Baltisberger 13197* (Z+ZT).

Stachys goulimyi is one of probably several local taxa within *S. recta* s.l. (see comment below under *S. recta* s.l.) growing on serpentine (Rechinger, 1957). It is an endemic species of Mt. Vourinos. The chromosome number of this species was not known up to now. With 2*n* = 34 (Fig. 3A) it shows the same number as all members of the *S. recta* group.

Stachys heldreichii Boiss. (≡ *S. germanica* subsp. *heldreichii* (Boiss.) Hayek)

2*n* = 30, CHN. Greece, Thessaly, W of Karditsa, top of Mt. Kasarma, 1950–1971 m, 20 Jun 1987, *M. Baltisberger & U. Meili 11315*, *M. Baltisberger 11996* (Z+ZT); Turkey, SE of Bolu, Kartalkaya, near Kartel Otel, 1900–2000 m, 15 Sep 1986, *M. Baltisberger 12800* (Z+ZT).

Stachys heldreichii belongs to the *S. germanica* group (see comment above under *S. germanica*). It occurs in the southern part of the Balkan Peninsula as well as in SW Turkey. As all members of the *S. germanica* group the investigated plants showed 2*n* = 30 chromosomes confirming earlier counts.

Stachys horvaticii Micevski

2*n* = 34, CHN. Greece, West Macedonia, ESE of Grevena, Mt. Kamvounia, Mt. Vounassa NW of Deskati, calcarous rocks and scree, 1500–1615 m, 9 Aug 1990, *M. Baltisberger & U. Schäppi 12320*, *M. Baltisberger 12598*, *M. Baltisberger 13198* (Z+ZT); Macedonia, ESE of Titov Veles, rocky slope of the hill Sveti Ilija, 450–500 m, 26 Jun 1987, *M. Baltisberger & U. Meili 11430*, *M. Baltisberger 11873* (Z+ZT).

In earlier times *Stachys iva* Griseb. was thought to be distributed in northern Greece and Macedonia (Hayek & Markgraf, 1931; Ball, 1972; Baden, 1991). Micevski (1969) investigated *S. iva* in Macedonia. He concluded that this complex comprises two species, viz. *S. iva* and the then newly decribed *S. horvaticii*. *Stachys iva* is characterised by crowded verticillasters and long aristated calyx teeth (teeth about as long as tube) and shows a rather narrow distribution area in the surroundings of Prilep (Macedonia) while *S. horvaticii* has distant verticillasters and shorter calyx teeth (teeth distinctly shorter than tube) without or with a very short arista and occurring in a much larger area from Kumanovo (NE of Skopje) southwards to the Greek border. Micevski (1969) did not investigate Greek material and therefore did not comment on Greek plants.

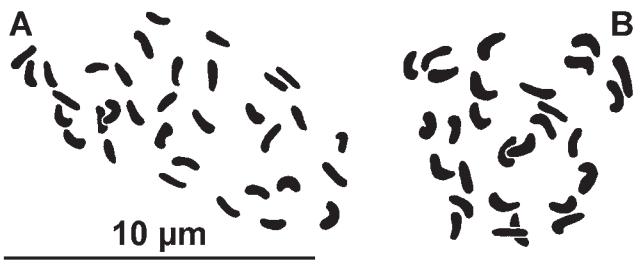

Fig. 3. Somatic metaphases of *Stachys*. **A,** *S.goulimyi* (2*n* = 34; *Matthias Baltisberger 12569*); **B,** *S. spinulosa* (2*n* = 28; *Matthias Baltisberger 11625*).

In Greece, *S. iva* s.l. is indicated from the Macedonian border southwards to Mt. Vourinos (Baden, 1991) but with the plants from Mt. Kamvounia (investigated here) the area goes even further south. We compared the specimens with Greek plants in Z+ZT (West Macedonia, SE of Kozani, near Servia, 30 Jul 1981, *U. Hartwig & A. Lenherr 28111*, *M. Baltisberger 11124*, *M. Baltisberger 11125*, *M. Baltisberger 11602*, *M. Baltisberger 11603*, *M. Baltisberger 11604*; West Macedonia, SE of Kozani, WNW of Servia, near Kranidia on the border of lake Aliakmon, 30 Jul 1981, *U. Hartwig & A. Lenherr 28134*; West Macedonia, SE of Kozani, near Neraida, 22 Jun 1983, *M. Baltisberger & A. Lenherr 83/426*, *M. Baltisberger 11107*, *M. Baltisberger 11601*). They all match with *S. horvaticii* as it is also indicated by Greuter (Greuter & Raus, 1985) for plants from Mt. Tzena (Greece, in the very North of West Macedonia, near the border between Greece and Macedonia). It seems that *S. iva* does not occur in Greece but is here replaced by *S. horvaticii*. This also fits with the morphological characters given in Baden (1991) for Greek *S. iva* which fit with *S. horvaticii*.

As *S. horvaticii* is mainly not accepted in literature but included in *S. iva*, most indications in literature are therefore given under the name *S. iva*. Based on the information discussed above we assume that all data for *S. iva* from Greece should be assigned to *S. horvaticii*. Accepting this assumption, the following literature records indicate the chromosome number for *S. horvaticii*: Baltisberger & Lenherr (1984b) cytologically investigated plants from two sites from West Macedonia, Greece (Servia, *28111*; Neraida, *83/426*), and Strid & Andersson (1985) counted the chromosomes on plants from Mt. Tzena, West Macedonia, Greece. Both records indicate the chromosome number of 2*n* = 34 for *S. iva* which in fact is *S. horvaticii* which was confirmed by Baltisberger (1990b) on plants of *S. horvaticii* from Kumanovo, Macedonia. Indications for real *S. iva* are based on plants from the region around Prilep, Macedonia (Markova, 1982; Baltisberger & Lenherr, 1984b). Both taxa show the same chromosome number 2*n* = 34 as do the plants of *S. horvaticii* from both sites investigated here.

Stachys labiosa Bertol. (≡ *S. recta* subsp. *labiosa* (Bertol.) Briq. = *S. recta* subsp. *grandiflora* (Caruel) Arcang.)

2*n* = 34, CHN. Italy, Trentino, WSW of Riva del Garda, near pass Tremalzo, 1700 m, 31 Jul 2000, *M. Baltisberger & A. Widmer 13696*, *M. Baltisberger 13767* (Z+ZT).

Stachys labiosa belongs to the rather difficult *S. recta* group (see comment below under *S. recta* s.l.). It has a rather wide distribution area occurring in the Alps, the Apennines, as well as in the northwestern part of the Balkan Peninsula. The plants investigated here showed the chromosome number of 2*n* = 34, confirming earlier counts and corroborating the common number for the *S. recta* group.

Stachys melangavica (D.Perss.) Baltisb. comb. & stat. nov. (≡ *S. swainsonii* subsp. *melangavica* D.Perss.)

2*n* = 34, CHN. Greece, Peloponnese, N of Korinthos, S-exposed rocky slope on the coast, 18 May 1983, *M. Bandle & A. Lenherr 33257*, *M. Baltisberger 11585* (Z+ZT).

Stachys melangavica belongs to the *S. swainsonii* group. The taxa of the group are morphologically similar but as they show disjunct

distribution areas and different flavonoid profiles we treat the taxa within this group at the species level (see comment below under *S. swainsonii*). *Stachys melangavica* was described as subspecies (Persson, 1981) and no name on the specific level is available. We therefore propose here the respective name as species. The chromosome number of 2*n* = 34 corroborates the indication in Persson (1981).

Stachys menthifolia Vis.

2*n* = 34, CHN. Greece, Epirus, NNW of Ioannina, Mt. Timphi, between Aristi and Monodendrion, Vikos gorge, near Vikos, rocky slope, 500–800 m, 29 Jul 1981, *U. Hartwig & A. Lenherr 28033*, *M. Baltisberger 11594* (Z+ZT); Montenegro, SW of Podgorica, near Virpazar, S-exposed rocks, 20 m, 22 Jun 1985, *M. Baltisberger & W. Frey 10884*, *M. Baltisberger 11116* (Z+ZT).

Stachys menthifolia grows in Montenegro, Albania and northwestern Greece (Lenherr, 1983). The plants from both sites investigated here showed the same chromosome number of 2*n* = 34 as do earlier indications in literature.

Stachys mollissima Willd. (= *S. decumbens* Pers.)

2*n* = 34, CHN. Greece, Epirus, SSE of Igoumenitsa, near Paramythia, rocky roadside, 140 m, 20 Jun 1983, *M. Baltisberger & A. Lenherr 83/244*, *M. Baltisberger 11595* (Z+ZT); Greece, Epirus, S of Igoumenitsa, NW of Pargas, near Anthousa, rocky roadside on the road from Igoumenitsa to Prevesa, 100 m, 20 Jun 1983, *M. Baltisberger & A. Lenherr 83/255*, *M. Baltisberger 11596* (Z+ZT).

Stachys mollissima is said to be an endemic species of coastal cliffs on Kerkira and in S Albania (Alston & Sandwith, 1940; Damboldt, 1976; Persson, 1981) but it is wider distributed in Albania (northwards till 25 km S of Vlora) and Greece (southwards till Pargas; map see Baltisberger, 1991a). As we found *S. mollissima* in rocks and scree on Mt. Pantokrator in northern Kerkira at an altitude of 880 m (which is near the top of 906 m; 28 Sep 2014, *B. & M. Baltisberger 17487*, Z+ZT) this species not only grows in coastal cliffs. The plants investigated here corroborate the chromsome number of 2*n* = 34.

Stachys plumosa Griseb.

2*n* = 34, CHN. Greece, Thessaly, N of Kalabaka, near Meteora, rocks and scree, 500–600 m, 16 Jun 1985, *M. Baltisberger & W. Frey 10682*, *M. Baltisberger 11592* (Z+ZT); Greece, Thessaly, NNW of Kalabaka, N of Elephtherochorion, rocks and scree, 500 m, 16 Jun 1985, *M. Baltisberger & W. Frey 10692*, *M. Baltisberger 11119* (Z+ZT); Greece, West Macedonia, W of Kozani, NNE of Neapolis, near the bridge over the river Aliakmon, S-exposed slope, 600 m, 16 Jun 1985, *M. Baltisberger & W. Frey 10695*, *M. Baltisberger 11591* (Z+ZT); Greece, Central Macedonia, W of Thessaloniki, near Naousa, roadside, 300 m, 18 Jun 1985, *M. Baltisberger & W. Frey 10764*, *M. Baltisberger 11847* (Z+ZT); Greece, Central Macedonia, SSW of Katerini, E side of Mt. Olympus, between Litochoro and Prioni, roadside in sparse forest, 550 m, 23 Jun 1987, *M. Baltisberger & U. Meili 11382*, *M. Baltisberger 12570* (Z+ZT); Greece, West Macedonia, NE of Grevena, E of Paleokastron, Mt. Vourinos, near Kataphygion, S-exposed rocky slope, 1350–1550 m, 9 Aug 1990, *M. Baltisberger & U. Schäppi 12312*, *M. Baltisberger 12539* (Z+ZT); Macedonia, SW of Skopje, near Staklo, on the road from Gostivar to Kicevo, rocky roadside, 550 m, 20 Jun 1985, *M. Baltisberger & W. Frey 10825*, *M. Baltisberger 11117* (Z+ZT); Macedonia, SW of Skopje, between Izvor and Klenovec, on the road from Debar to Kicevo, S-exposed rocks and scree, 800 m, 20 Jun 1985, *M. Baltisberger & W. Frey 10831*, *M. Baltisberger 11593* (Z+ZT); Macedonia, SW of Skopje, near Matka, shrubs and rocks, 350 m, 20 Jun 1985, *M. Baltisberger & W. Frey 10847*, *M. Baltisberger 11118* (Z+ZT).

Stachys plumosa grows on the Balkan Peninsula and occurs further South up to central Greece. We investigated plants from nine natural habitats, all showing 2*n* = 34 chromosomes confirming the indications in literature.

Stachys recta L. s.l.

2*n* = 34, CHN. Albania, district Shkodër, N of Shkodër, on the road from Shkodër to Tamarë, N-exposed rocks in the gorge of river Cem, 700 m, 13 Aug 1989, *M. Baltisberger 11961*, *M. Baltisberger 12102* (Z+ZT); Greece, West Macedonia, SSW of Kastoria, on the road from Neapolis to Konitsa, near Eptachorion, serpentinite scree, 800 m, 26 Jun 1992, *M. Baltisberger 12609*, *M. Baltisberger 13256* (Z+ZT).

Stachys recta is a difficult complex of many taxa at various taxonomical levels (compilations see Hayek & Markgraf, 1931; Lenherr, 1983). It can be characterised by stems without glandular hairs, leaves not tomentose, mostly inconspicuous bracteoles, mainly yellow (rarely whitish) corolla with a hooded (not flat) upper lip. As the variability of many taxa is not kown and intermediate plants occur, determination is often difficult. The centre of diversity and probably also the evolutionary centre of this group is on the Balkan Peninsula (Chrtek, 1992). Only a few taxa have a wide distribution (e.g., *S. atherocalyx* and *S. labiosa* [both see above] or *S. recta* and *S.subcrenata* [both see below]). In contrast, several taxa with narrow distribution areas are known from the Balkan Peninsula, e.g., *S. goulimyi* on Mt. Vourinos (see above), *S. recta* subsp. *olympica* Stoj. & Jordanov on Mt. Olympus (Central Macedonia, Greece; Stojanov & Jordanov, 1938; Baden, 1991; Baltisberger, 1994), *S. tetragona* Boiss. & Heldr. ex Boiss. on the peninsula Euboea and the islands Northern Sporades (Central Greece, Greece; Persson, 1981; Lenherr, 1983) as well as several taxa of uncertain identity and taxonomic level (Hayek & Markgraf, 1931).

Most investigated plants belonging to the *S. recta* group could be assigned to a known taxon and are mentioned under the respective names. Plants of populations, which do not match with any of the known taxa, are named as *S. recta* s.l. This was the case in one population between Mostar and Sarajevo (Baltisberger, 1990b) as well as two further populations, one from Albania and one from Greece (see below). Those populations show specific characters and might belong to taxa which are not known to science. All plants from the Albanian and the Greek sites investigated here showed the chromosome number of 2*n* = 34 as do all taxa of this group.

The Albanian site is located in the very North of the country. This region was not accessible for a long time not only because Albania was closed over decades but also because it was a military region. The plants sampled in 1989 at the natural site were in fruit and did no longer have a corolla. As the calyx is rather large the plants looked interesting even without flowers. The plants from germinated seeds flowered in the greenhouse and we could investigate the corolla. The plants showed the following characters: Stem erect, up to 60 cm high, branched, but only the main branch with flowers; lower leaves petiolate, the petiole half or as long as the blade; blades 1–2 times as long as wide, oblong-ovate to ovate, rounded or truncate at base, crenate-serrate; inflorescence dense, verticillasters with up to twelve flowers, crowed or the lower shortly distant; lower bracteoles as long as or longer than the calyx tube, upper bracteoles filiform and inconspicuous; calyx 9–11 mm long, rather densly covered with glandular hairs up to 0.5 mm long, the teeth ± equal, 4–5 mm, the tube a bit longer (5–6 mm); corolla yellow, rather large (up to 2 cm), upper lip without a flat apex, less than half as long as lower lip.

The Greek plants from Eptochorion grew on serpentine as several of (mostly not accepted) local taxa of the *S. recta* group (e.g., *S. goulimyi* [see above], *S. kuemmerleana* Jav., *S. serpentinica* K.Maly, *S. zepcensis* Formanek; see Hayek & Markgraf, 1931; Rechinger, 1957). The plants can be characterised as follows: Stems erect, up to 40 cm high, branched, with many flowering branches; lower leaves petiolate, the petiole half as long as the blade; blades 2–4 times as long as wide, oblong-ovate, truncate at base, crenate-serrate; inflorescence lax, verticillasters with up to eight flowers, distant; bracteoles mostly very narrow and as long as the calyx tube; calyx 7–8 mm long, glabrous or sparsely hairy with few glandular hairs, the tube 5–6 mm, the teeth ± equal, shortly spine tipped, ±2 mm, curved outwards; corolla yellow, 1–1.5 cm, upper lip without a flat apex, half to 2/3 as long as lower lip.

Extensive herbarium material from the natural sites as well as from cultivated plants (including more than 100 prepared leaves, calyces and corollas) of both origins is deposited in the herbarium Z+ZT.

Stachys recta L. (≡ *S. recta* L. subsp. *recta*)

2*n* = 34, CHN. Montenegro, Mt. Durmitor, near Zabljak, rocky meadow, 1460 m, 3 Aug 1980, *M. Baltisberger & A. Lenherr 80/1335*, *M. Baltisberger 11620* (Z+ZT).

Stachys recta belongs to the rather difficult *S. recta* group (see comment above under *S. recta* s.l.). It has the widest distribution of all taxa of the group occurring in central and southern Europe and extending eastwards to southern Ukraine, the Caucasus region, and Turkey (Chrtek, 1992). As all members of the group the investigated plants showed 2*n* = 34 chromosomes confirming the indications in literature.

Stachys salviifolia Ten. (≡ *S. cretica* subsp. *salviifolia* (Ten.) Rech.f.)

2*n* = 30, CHN. Greece, Epirus, SSE of Igoumenitsa, near Paramythia, rocky roadside on the road from Igoumenitsa to Prevesa, 100 m, 20 Jun 1983, *M. Baltisberger & A. Lenherr 83/252*, *M. Baltisberger 11628* (Z+ZT); Greece, West Macedonia, SSE of Grevena, near Anixis, pasture on the road from Grevena to Kalabaka, 550 m, 22 Jun 1983, *M. Baltisberger & A. Lenherr 83/419*, *M. Baltisberger 11156* (Z+ZT); Greece, Thessaly, W of Trikala, near Pertoulion, roadside, 1150 m, 21 Jun 1987, *M. Baltisberger & U. Meili 11345*, *M. Baltisberger 11702* (Z+ZT); Greece, Thessaly, WNW of Trikala, near Kastanea, sparse forest, 700 m, 22 Jun 1987, *M. Baltisberger & U. Meili 11359*, *M. Baltisberger 11998*, *M. Baltisberger 12065* (Z+ZT).

Stachys salviifolia belongs to the *S. germanica* group (see comment above under *S. germanica*). It is morphologically somewhat intermediate between *S. cretica* and *S. germanica* and therefore sometimes treated as subspecies of one or the other species. It occurs in the Mediterranean area. The plants investigated showed 2*n* = 30 chromosomes confirming earlier counts and corroborating the common number for the *S. germanica* group.

Stachys scyronica Boiss. (≡ *S. swainsonii* subsp. *scyronica* (Boiss.) Phitos & Damboldt)

2*n* = 34, CHN. Greece, Attica, W of Athens, near Megara, Kaki Skala, S-exposed rocks, 100–150 m, 13 Jun 1985, *M. Baltisberger & W. Frey 10642*, *M. Baltisberger 11180*, *M. Baltisberger 11587* (Z+ZT).

Stachys scyronica belongs to the *S. swainsonii* group (see comment below under *S. swainsonii*). The chromosome number of 2*n* = 34 corroborates the indication in Persson (1981).

Stachys spinulosa Sm.

2*n* = 28, CHN. Greece, Peloponnese, near Mistras, on the path to the castle, 10 May 1983, *M. Bandle & A. Lenherr 33160*, *M. Baltisberger 11626* (Z+ZT); Greece, Ionian Islands, Kephallinia, on the road from Samis to Argostoli, meadow near Samis, 50–150 m, 19 May 1983, *M. Bandle & A. Lenherr 33271*, *M. Baltisberger 11625* (Z+ZT); Greece, Ionian Islands, Kerkira, Mt. Pantokrator, near Spartilla, roadside, 21 May 1983, *M. Bandle & A. Lenherr 33317*, *M. Baltisberger 11133* (Z+ZT).

Stachys spinulosa is an annual species occurring in the Balkan Penisula. All plants of the three sites from Greece (in total 23 individuals) showed 2*n* = 28 chromosomes. There is only one indication in literature for *S. spinulosa* with 2*n* = 18 (Aydin, 1978) which is rather doubtful. In the same paper, Aydin (1978) gives the same chromosome number 2*n* = 18 for two other *Stachys* species, both also being very unlikely viz. *S. arvensis* L. (but *S. arvensis* uniformly shows 2*n* = 10 chromosomes) and *S. thirkei* (which has 2*n* = 30 chromosomes, see further comment below under *S. thirkei*). It is unclear if these indications of Aydin (1978) are due to misidentified plant material or (as the same false number 18 occurs three times!) are based on editorial errors. So the here communicated chromosome number of 2*n* = 28 for *S. spinulosa* is new (Fig. 3B).

Stachys spreitzenhoferi subsp. *virella* D.Perss.

2*n* = 34, CHN. Greece, Peloponnese, SE of Sparta, Monemvasia, rocks and walls above the village, 15 May 1983, *M. Bandle & A. Lenherr 33059* (Z+ZT).

Stachys spreitzenhoferi Heldr. belongs to the *S. candida* group (see above under *S. candida*). With a calyx of 4–7 mm, a corolla tube of 7.5–10.5 mm, an upper lip of 3.5–5 mm, and a lower lip of 8–11 mm it is the smallest-flowered species of the group. It occurs on the island Kithira and on Malea Peninsula (southeastern Peloponnese) on the SW-exposed coast in the surroundings of Neapolis (opposite to Kithira). An isolated population grows on Monemvasia Peninsula on the E-exposed coast about 20 km N of Neapolis (Greuter & Rechinger, 1967). Persson (1981) divided *S. spreitzenhoferi* into two subspecies separating the population of Monemvasia as subsp. *virella* from all other populations (subsp. *spreitzenhoferi*). The plants from Monemvasia show a sparse indumentum and therefore are green to greyish green while plants of subsp. *spreitzenhoferi* are lanate-tomentose and whitish grey. Additionally the calyx in subsp. *virella* is glandular but in subsp. *spreitzenhoferi* eglandular. The plants of *S. spreitzenhoferi* subsp. *virella* investigated here showed the chromosome number of 2*n* = 34 confirming the indication in Persson (1981).

Stachys spruneri Boiss.

2*n* = 34, CHN. Greece, Attica, WNW of Athens, N of Nea Peramos, Mt. Pateras, SE-exposed rocky slope, 250–350 m, 13 Jun 1985, *M. Baltisberger & W. Frey 10631*, *M. Baltisberger 11123*, *M. Baltisberger 11589* (Z+ZT); Greece, Central Greece, NE of Thivae, Mt. Messapion, near Ypation, SW-exposed rocks, 600 m, 18 Jun 1987, *M. Baltisberger & U. Meili 11277*, *M. Baltisberger 11865* (Z+ZT).

Stachys spruneri belongs to the *S. swainsonii* group (see comment below under *S. swainsonii*). *Stachys spruneri* occurs in Attica (from Mt. Pateras [N of Megara] eastwards to Mt. Parnis [N of Athens]) and northwards to Central Greece (till Mt. Messapion [NE of Thivae] and Mt. Ptoon [ENE of Akraifnion]) (map see Persson, 1981). All plants investigated showed the chromosome number of 2*n* = 34 confirming the indications in literature.

Stachys subcrenata Vis. (≡ *S. recta* subsp. *subcrenata* (Vis.) Briq.)

2*n* = 34, CHN. Bosnia-Hercegovina, N of Makarska, Mt. Biokovo, near Veliko Brdo, scree, 400–600 m, 2 Jul 1983, *M. Baltisberger & A. Lenherr 83/869*, *M. Baltisberger 11139*, *M. Baltisberger 11623* (Z+ZT); Croatia, Mt. Velebit, on the road from Karlobag to Gospic, rocky roadside, 350 m, 3 Jul 1983, *M. Baltisberger & A. Lenherr 83/885*, *M. Baltisberger 11154* (Z+ZT).

Stachys subcrenata belongs to the rather difficult *S. recta* group (see comment above under *S. recta* s.l.). It grows in the Balkan Peninsula and in western Turkey (Lenherr, 1983). The plants investigated showed the chromosome number of 2*n* = 34 confirming earlier counts and corroborating the common number for the *S. recta* group.

Stachys swainsonii Benth. (≡ *S. swainsonii* Benth. subsp. *swainsonii*)

2*n* = 34, CHN. Greece, Central Greece, S of Mt. Parnassos, on the road from Levadia to Amfissa, near Delphi, S-exposed rocks, 500–550 m, 14 Jun 1985, *M. Baltisberger & W. Frey 10654*, *M. Baltisberger 11181*, *M. Baltisberger 11588* (Z+ZT); Greece, Central Greece, S of Mt. Lidorikiou, on the road from Amfissa to Lidhorikion, near Pendeoria, S-exposed rocks, 650–700 m, 19 Jun 1987, *M. Baltisberger & U. Meili 11288*, *M. Baltisberger 11866* (Z+ZT).

The *Stachys swainsonii* group consists of three species, viz. *S. ionica* Halacsy (endemic on the southern Ionian Islands; Phitos & Damboldt, 1969; Persson, 1981), *S. spruneri* (see above), and the highly

variable *S. swainsonii* s.l. (Greuter & al., 1986). *Stachys swainsonii* s.l. can be divided into four units treated as species or subspecies (Strid, 1965; Phitos & Damboldt, 1969; Persson, 1981) namely *S. argolica*, *S. melangavica*, *S. scyronica*, and *S. swainsonii*. They are morphologically rather similar. The species mainly differ in the density of hairs on stems and leaves, in the size of leaves, in the number of flowers per verticillaster, and in the size of the corolla (Phitos & Damboldt, 1969; Persson, 1981) but intermediate plants also occur. In a chemotaxonomic study (Skaltsa & al., 2007), *S. argolica* and *S. swainsonii* (which are morphologically very similar) each showed unique flavonoid profiles characterising the two species while *S. melangavica* and *S. scyronica* (which are morphologically different) showed the same profile. The four taxa grow in adjacent areas which mostly do not overlap (map see Persson, 1981): *S. argolica* occurs in the northeastern part of Peloponnese (from Korinthos southwards to Nafplio and southeastwards to Ermioni including the island of Hydra); *S. melangavica* as narrow endemic species is confined to the region North of the isthmus of Korinthos (from Loutraki to Akr. Melangavi); *S. scyronica* is a very narrow endemic growing only in the rocks near Megara; *S. swainsonii* occurs in Mt. Lidorikiou and Mt. Parnassos and S of these mountains in hills and rocks down to the coast of Gulf of Korinthos. As the taxa of the group show disjunct distribution areas and different flavonoid profiles we treat them at the species level.

Plants of all four species were investigated (see under the respective names). The plants from both sites of *S. swainsonii* showed $2n$ = 34 chromosomes which corresponds with the indications in literature.

Stachys thirkei K.Koch

$2n$ = 30, CHN. Bosnia-Hercegovina, N of Makarska, Mt. Biokovo, near Veliko Brdo, scree, 400–600 m, 2 Jul 1983, *M. Baltisberger & A. Lenherr 83/876*, *M. Baltisberger 11158* (Z+ZT); Croatia, ENE of Zadar, Policnik, shrubbery on the road from Rijeka to Split, 23 Jul 1980, *M. Baltisberger & A. Lenherr 80/823*, *M. Baltisberger 11134*, *M. Baltisberger 11627* (Z+ZT).

Stachys thirkei belongs to the *S. germanica* group (see comment above under *S. germanica*) and grows in Turkey, the Balkan Peninsula (northwards to Croatia), and in southern Italy. There exist three previous counts on *S. thirkei* all indicated in Goldblatt & Johnson (1979+): Aydin (1978) is cited with n = 18 but in fact it should be cited as $2n$ = 18. Baltisberger (1991b) is indicated with $2n$ = 18 which is an error, the number published by Baltisberger (1991b) is $2n$ = 30. Falciani & Fiorini (1996) are correctly cited with $2n$ = 30. *Stachys thirkei* belongs to the *S. germanica* group (see above) with always $2n$ = 30 chromosomes. All 20 plants investigated here of both sites showed $2n$ = 30 chromosomes and corroborate two of the three indications in literature (Baltisberger, 1991; Falciani & Fiorini, 1996). The deviating number of $2n$ = 18 in Aydin (1978) might be due to misidentified plant material (see also comment under *S. spinulosa* above).

General discussion

Cytological data within taxa of any hierarchical level may vary (e.g., number of chromosomes, ploidy level, chromosome morphology, staining properties of chromosomes; Sharma & Sen, 2002). Such data are important characters for plant systematics and may reflect evolutionary processes (Stuessy & al., 2014; Baltisberger & Hörandl, in press).

Stachys s.l. as mostly accepted is a heterogeneous and rather large genus with about 300 species (Krestovskaja, 2004). Due to morphological variability several infrageneric classifications are proposed, the more recent ones being Ball (1972), Knorring (1977a), Koeva (1978), and Bhattacharjee (1980, 1982). The chromosome numbers in the genus are highly variable with $2n$ = 10, 16, 18, 24, 30, 32, 34, 42, 46, 48, 52, 54, 60, 64, 66, 68, 80, 82, 84, 96, 100, 102, 104 (Goldblatt & Johnson, 1979+) and $2n$ = 28 being an additional number (presented here for *S. spinulosa*). A comprehensive molecular investigation including most of the species of the genus *Stachys* is still lacking but in several available studies on subfamily Lamioideae or tribe Stachydeae, selected species of *Stachys* are included (Lindqvist & Albert, 2002; Scheen & al., 2010; Bendiksby & al., 2011; Dündar & al., 2013; Salmaki & al., 2013). They all show that *Stachys* s.l. is strongly polyphyletic but nevertheless some groups of *Stachys*-species are monophyletic. As some of these monophyletic groups additionally are morphologically and cytologically homogenous, *Stachys* s.l. probably should be split into smaller genera. Two examples are briefly discussed:

Reestablishing the genus *Betonica*

Based on molecular data, *Stachys officinalis* (L.) Trevis. and relatives are clearly separated from other *Stachys* species in all available molecular phylogenies (Lindqvist & Albert, 2002; Scheen & al., 2010; Bendiksby & al., 2011; Dündar & al., 2013; Salmaki & al., 2013). They are so distant that they have even been included in the outgroup, compared to the tribe Stachydeae (Salmaki & al., 2013). Besides this molecular separation and morphological features characterising these species, they in addition are cytologically unique within *Stachys* s.l. with all taxa showing a basic chromosome number of 8 large chromosomes (Koeva, 1977; Baltisberger, 1989). In contrast, *Stachys* have various basic numbers and small chromosomes. These findings (morphology, cytology, as well as molecular data) support the treatment of these species as genus *Betonica* L. separate from *Stachys* as it is the case in some Floras (e.g., Halacsy, 1902; Knorring, 1977b; Hess & al., 1980).

Section *Eriostomum* as separate genus

The section *Eriostomum* (Hoffmanns. & Link) Dumort. comprises more than 40 taxa and is morphologically well defined within *Stachys* s.l. (Falciani, 1997; Akcicek & al., 2012; Dündar & al., 2013). When species of this section were included in phylogenetic analyses, they always formed a distinct and monophyletic group within *Stachys* s.l. (Lindqvist & Albert, 2002; Scheen & al., 2010; Bendiksby & al., 2011; Dündar & al., 2013; Salmaki & al., 2013). Additionally, all species of sect. *Eriostomum* show the same chromosome number of $2n$ = 30. The section is homogeneous and different from other species of *Stachys* s.l. with respect to morphology, cytology, and molecular characters. It therefore should be re-established as separate genus *Eriostomum* Hoffmanns. & Link as it was originally published (Hoffmannsegg & Link, 1809).

As indicated by these two examples, chromosome numbers within the genus *Stachys* s.l. might be useful characters for defining natural groups and could therefore be important for systematic analyses. Further studies including more species of *Stachys* s.l. may shed further light onto this topic.

Literature cited

Akcicek, E., Dirmenci, T. & Dündar, E. 2012. Taxonomical notes on *Stachys* sect. *Eriostomum* (Lamiaceae) in Turkey. *Türk Bot. Derg* [*Turk. J. Bot.*] 36: 217–234.

Alston, A.H.G. & Sandwith, N.Y. 1940. Results of two expeditions to south Albania. *J. Bot.* 78: 119–127, 147–151, 167–174, 193–199, 219–224, 232–246.

Aydin, A. 1978. [Reports] in: Löve, A. (ed.), IOPB chromosome number reports LXI. *Taxon* 27: 375–376. http://www.jstor.org/stable/1220381

Baden, C. 1991. *Stachys* L. Pp. 97–107 in: Strid, A. & Tan, K. (eds.), *Mountain flora of Greece*, vol. 2. Edinburgh: Edinburgh University Press.

Ball, P.W. 1972. *Stachys* L. Pp. 151–157 in: Tutin, T.G., Heywood, V.H., Burges, N.A., Moore, D.M., Valentine, D.H., Walters, S.M. & Webb, D.A. (eds.), *Flora Europaea*, vol. 3. Cambridge: Cambridge University Press.

Baltisberger, M. 1989. Etudes biosystématiques du genre *Betonica*. Nombres chromosomiques. *Biocosme Mésogéen* 6: 1–19.

Baltisberger, M. 1990a. Zytologische Untersuchungen an einigen Arten aus Italien. *Arch. Bot. Ital.* 66: 153–165.

Baltisberger, M. 1990b. Chromosomenzahlen einiger Pflanzen aus Jugoslawien. *Candollea* 45: 439–446.

Baltisberger, M. 1991a. Chromosomenzahlen einiger Labiaten aus Albanien. *Ber. Geobot. Inst. E. T. H. Stiftung Rübel* 57: 165–181.

Baltisberger, M. 1991b. Cytological investigations of some plants from Turkey. *Willdenowia* 21: 225–232.

Baltisberger, M. 1994. Chromosome numbers in some species from Greece. *Bot. Chron. (Patras)* 11: 15–29.

Baltisberger, M. 2002. Cytological investigations on some Albanian plant species. *Candollea* 56: 245–259.

Baltisberger, M. 2006. Cytological investigations on Bulgarian phanerogams. *Willdenowia* 36: 205–216. http://dx.doi.org/10.3372/wi.36.36117

Baltisberger, M. & Baltisberger, E. 1995. Cytological data of Albanian plants. *Candollea* 50: 457–493.

Baltisberger, M. & Hörandl, E. In press. Karyotype evolution supports the molecular phylogeny in the genus *Ranunculus* (Ranunculaceae). Perspect. *Pl. Ecol. Evol. Syst.* http://dx.doi.org/10.1016/j.ppees.2015.11.001

Baltisberger, M. & Lenherr, A. 1984a. Labiaten aus Albanien. *Candollea* 39: 423–439.

Baltisberger, M. & Lenherr, A. 1984b. Neue Chromosomenzahlen aus der Gruppe der *Stachys recta* L. und anderen verwandten Artengruppen. *Ber. Geobot. Inst. E. T. H. Stiftung Rübel* 51: 39–62.

Baltisberger, M. & Widmer, A. 2009. Karyological data of angiosperms from Romania. *Willdenowia* 39: 353–363. http://dx.doi.org/10.3372/wi.39.39213

Bendiksby, M., Thorbeck, L., Scheen, A.-C., Lindqvist, C. & Ryding, O. 2011. An updated phylogeny and classification of Lamiaceae subfam. Lamioideae. *Taxon* 60: 471–484.

Bhattacharjee, R. 1974. Taxonomic studies in *Stachys* I: A new infrageneric classification of *Stachys* L. *Notes Roy. Bot. Gard. Edinburgh* 38: 65–96.

Bhattacharjee, R. 1980. Taxonomic studies in *Stachys* II: New species and infra-specific taxa from Turkey. *Notes Roy. Bot. Gard. Edinburgh* 33: 275–292.

Bhattacharjee, R. 1982. *Stachys* L. Pp. 199–262 in: Davis, P.H. (ed.), *Flora of Turkey*, vol. 7. Edinburgh: Edinburgh University Press.

Chrtek, J., jun. 1992. Taxonomical remarks on the *Stachys recta* group. *Folia Geobot. Phytotax.* 27: 177–183. http://dx.doi.org/10.1007/BF02856248

Damboldt, J. 1976. Beiträge zur Flora Ionica. VI. Karyologisch-systematische Bemerkungen zu einigen Labiaten. *Candollea* 31: 273–281.

Dündar, E., Akcicek, E., Dirmenci, T. & Akgün, S. 2013. Phylogenetic analysis of the genus *Stachys* sect. *Eriostomum* (Lamiaceae) in Turkey based on nuclear ribosomal ITS sequences. *Türk. Bot. Derg.* [*Turk. J. Bot.*] 37: 14–23.

Falciani, L. 1997. Systematic revision of *Stachys* sect. *Eriostomum* (Hoffmanns. & Link) Dumort. in Italy. *Lagascalia* 19: 187–238.

Falciani, L. & Fiorini, G. 1996. Mediterranean chromosome number reports 6 (679–682). *Fl. Medit.* 6: 243–247.

Goldblatt, P. & Johnson, D.E. (eds.) 1979+. Index to plant chromosome numbers. http://mobot.mobot.org/W3T/Search/ipcn.html (accessed 2 Oct 2015)

Greuter, W. & Raus, T. (ed.) 1985. Med-Checklist Notulae, 11. *Willdenowia* 15: 61–84.

Greuter, W. & Rechinger, K.H. 1967. Flora der Insel Kythera. *Boissiera* 13: 1–206

Greuter, W., Burdet, H.M. & Long, G. (eds.) 1986. *Med-Checklist*, vol. 3, *Dicotyledones (Convolvulaceae – Labiatae)*. Geneva: Editions Cons. Jard. Bot. Ville de Genève.

Halacsy, E. 1902. *Conspectus florae graecae*, vol. 2. Lipsiae [Leipzig]: sumptibus Guilelmi Engelmann. http://dx.doi.org/10.5962/bhl.title.9919

Hayek, A. & Markgraf, F. 1931. *Prodromus Florae peninsulae Balcanicae*, vol. 2, *Dicotyledoneae Sympetalae*. Dahlem bei Berlin: Verlag des Repertoriums.

Hess, H.E., Landolt, E. & Hirzel, R. 1980. *Flora der Schweiz und angrenzender Gebiete*, 2. Aufl., Band 3. Basel, Boston, Stuttgart: Birkhäuser. http://dx.doi.org/10.1007/978-3-0348-5382-8

Hoffmannsegg, J.C. & Link, H.F. 1809. *Flore Portugaise*, vol. 1. Berlin: de l'imprimerie de Charles Fréderic Amelang.

IPNI 2015. The International Plant Names Index. http://www.ipni.org (accessed 20 Oct 2015).

Knorring, O.E. 1977a. *Stachys* L. Pp. 141–172 in: Shishkin, B.K. (ed.), *Flora of the U.S.S.R.*, vol. 21. Jerusalem: Keterpress Enterprises.

Knorring, O.E. 1977b. *Betonica* L. Pp. 172–176 in: Shishkin, B.K. (ed.), *Flora of the U.S.S.R.*, vol. 21. Jerusalem: Keterpress Enterprises.

Koeva, J. 1977. Cytotaxonomical study of some Balkan endemic taxa of genus *Stachys* L. *Phytology* 6: 38–46.

Koeva, J. 1978. *Pontostachys* – a new section of the genus *Stachys* L. *Phytology* 10: 33–40.

Krestovskaja, T. 2004. *Stachys* L. P. 223 in: Kadereit, J.W. (ed.), *The families and genera of vascular plants*, vol. 7. Berlin, Heidelberg, New York: Springer.

Lenherr, A. 1983. *Biosystematische und chemotaxonomische Untersuchungen in der Artengruppe Stachys recta L.* Dissertation, ETH Nr. 7453, Zürich, Switzerland.

Lenherr, A. & Baltisberger, M. 1984. *Stachys beckeana* (Labiatae) in Albanien und Jugoslawien. *Pl. Syst. Evol.* 145: 97–104. http://dx.doi.org/10.1007/BF00984033

Lindqvist, C. & Albert, V.A. 2002. Origin of the Hawaiian endemic mints within North American *Stachys* (Lamiaceae). *Amer. J. Bot.* 89: 1709–1724. http://dx.doi.org/10.3732/ajb.89.10.1709

Markova, M. 1982. [Reports] in: Löve, A. (ed.), IOPB chromosome number reports LXXVII. *Taxon* 31: 761. http://www.jstor.org/stable/1219710

Micevski, K. 1969. *Stachys iva* Griseb. i *Stachys horvaticii* Micevski spec. nov. u Flori Makedonije. *Acta Bot. Croat.* 28: 449–454.

Persson, D. 1981. *Biosystematics of Stachys swainsonii Benth. (Lamiaceae) and its relations to some other chasmophytic Stachys species.* Ph.D. thesis, University of Lund, Lund, Sweden.

Phitos, D. & Damboldt, J. 1969. Beiträge zur Flora Ionica. I. Die *Stachys swainsonii*-Gruppe (Labiatae). *Ber. Deutsch. Bot. Ges.* 82: 595–601.

Rechinger, K.H. 1937. Revision des Formenkreises der *Stachys cretica*. *Ann. Naturhist. Mus. Wien* 48: 167–178.

Rechinger, K.H. 1957. Plantae novae graeco-macedonicae, imprimis serpentinicolae. *Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl.* 94(2): 21–27.

Salmaki, Y., Zarre, S., Rydin, O., Lindqvist, C., Bräuchler, C., Heubl, G., Barber, J. & Bendiksby, M. 2013. Molecular phylogeny of tribe Stachydeae (Lamiaceae subfam. Lamioideae). *Molec. Phylogen. Evol.* 69: 535–551. http://dx.doi.org/10.1016/j.ympev.2013.07.024

Scheen, A.-C., Bendiksby, M., Ryding, O., Mathiesen, C., Albert, V.A. & Lindqvist, C. 2010. Molecular phylogenetics, character evolution, and suprageneric classification of Lamioideae (Lamiaceae). *Ann. Missouri Bot. Gard.* 97: 191–217. http://dx.doi.org/10.3417/2007174

Sharma, A. & Sen, S. 2002. *Chromosome botany.* Enfield: Science Publishers.

Skaltsa, H., Georgakopoulos, P., Lazari, D., Karioti, A., Heilmann, J., Sticher, O. & Constantinidis, T. 2007. Flavonoids as chemotaxonomic markers in the polymorphic *Stachys swainsonii* (Lamiaceae). *Biochem. Syst. Ecol.* 35: 317–320. http://dx.doi.org/10.1016/j.bse.2006.10.014

Stojanov, N. & Jordanov, D. 1938. Botanische Studien auf dem thessalischen Olymp. *God. Sofijsk. Univ. Fiz.-Mat. Fak.* 34: 147–249.

Strid, A. 1965. Studies in the Aegean Flora. VI. Notes on some genera of Labiatae. *Bot. Not.* 118: 104–122.

Strid, A. & Andersson, I.A. 1985. Chromosome numbers of Greek mountain plants – an annotated list of 115 species. *Bot. Jahrb. Syst.* 107: 203–228.

Stuessy, T.F., Crawford, D.J., Soltis, D.E. & Soltis, P.S. 2014. *Plant systematics: The origin, interpretation, and ordering of plant biodiversity.* Regnum Vegetabile 156. Königstein: Koeltz Scientific Books.

Luis Delgado,* Francisca Gallego Martín & Enrique Rico

Departamento de Botánica, Universidad de Salamanca, 37007 Salamanca, Spain
* Author for correspondence: *ldelsan@usal.es*

All cytological investigations have been carried out on anthers and gynoecia. Material was fixed in 3 : 1 absolute ethanol-glacial acetic acid and stained in 2% acetic orcein (La Cour, 1945). The interchromosomal asymmetry index (A_2) was calculated according to the formula proposed by Romero Zarco (1986).

* First chromosome count for an Iberian accession.
** First chromosome count for a given taxon.
▲ First chromosome count for the genus.
Δ New chromosome number (cytotype) for a given taxon.

This work has been supported by the Spanish Dirección General de Investigación Científica y Técnica through *Flora iberica* VI project (REN2002-04634-C05-02), *Flora iberica* VII (CGL2005-05471-C04-03), *Flora iberica* IX (CGL2011-28613-C03-03) and by the *Junta de Castilla y León* (Luis Delgado, 1998–2001) fellowship.

LINDERNIACEAE

Δ**Lindernia dubia* (L.) Pennell

n = 10, 2*n* = 20, CHN. Portugal, Minho, Viana do Castello, Vilanova de Cerveira, Campos, 29TNG2548, 5 m, 5 Aug 2003, *E. Rico, ER 7825* (SALA 110601) [Fig. 4A]; Spain, Cáceres, Cuacos de Yuste, Torreseca, Tiétar River, 30TTK7834, 250 m, 24 Aug 1998, *E. Rico, ER 6795* (SALA 108144); Spain, Pontevedra, Goyán-Fontela, on the right of the pier, 29TNG2043, 5 m, 6 Jul 2003, *E. Rico, ER 7837* (SALA 110602) [Fig. 4B].

2*n* = 20, CHN. Spain, Badajoz, Santa Amalia, 30STJ4022, 264 m, 20 Aug 2003, *E. Rico, ER 7857* (SALA 110600); Spain, Cáceres, Madrigalejo, 30STJ7237, 300 m, 20 Aug 2003, *E. Rico, ER 7853* (SALA 110599); Spain, Pontevedra, Goyán-Fontela, 50 m, downstream of the pier, 29TNG2043, 5 m, 6 Jul 2003, *E. Rico, ER 7838* (SALA 110603); Spain, Salamanca, Cabrerizos, La Aldehuela de los Guzmanes, 30TTL7837, 780 m, 29 Sep 2001, *L. Delgado, LD 816* (SALA 108123); Spain, Salamanca, Sotoserrano, 29TQE4876, 400 m, 19 Sep 2001, *L. Delgado, A. González Talaván & M. Santos Vicente, LD 813* (SALA 108125); Spain, Toledo, Oropesa, downstream of Rosarito Dam, Tiétar River, 30TTK9942, 580 m, 20 Aug 1999, *E. Rico, ER 7211* (SALA 108120); Spain, Zamora, Moreruela de Tábara, Puente Quintos, 30TTM6937, 690 m, 6 Sep 2002, *P. Bariego, L. Delgado & M. Santos Vicente, LD 845* (SALA 108124).

Lindernia All. has wide chromosome diversity. Its chromosome numbers range from 2*n* = 18 to 2*n* = 54 (Bhattacharyya, 1968). This author suggests up to eight basic chromosome numbers (*x* = 7, 8, 9, 10, 11, 13, 15, 19) and *x* = 9 as the most frequent basic number. The reported chromosome number from the study on the 10 Iberian populations of *L. dubia* has been 2*n* = 20. This plant is allochthonous, and has its origins in North America. Our data differ from the chromosome counts obtained by Lewis & al. (1962) in populations found in the United States (*n* = 16; 2*n* = 32), and in *L. dubia* var. *inundata* (Pennell) Pennell, found in Canada (*n* = 9; 2*n* = 18; cf. Goldblatt & Johnson, 1979+). The reported chromosome number for *L. dubia* on the Iberian Peninsula also differs from that reported for *L. procumbens* (Krock.) Philcox, the other species of this genus known on this peninsula, originating from Eurasia and naturalized in North America and Australia. The chromosome numbers known for *L. procumbens* are 2*n* = 24, in Russia (Probatova & al., 2008) and 2*n* = 30, in Poland (Pogan & al., 1988, referred to as *L. pyxidaria* L.) and Japan (cf. Goldblatt & Johnson, 1979+).

OROBANCHACEAE

**Bartsia alpina* L.

n = 12, 2*n* = 24, CHN. Spain, Huesca, Ansó, Collado de Petrechema, 30TXN8452, 1700 m, 25 Jun 2000, *L. Delgado & I. Soriano, LD 333* (SALA 110753); Spain, Navarra, Isaba, Portillo de Arrasarguiat, 30TXN8259, 1700 m, 26 Jun 2000, *L. Delgado & I. Soriano, LD 338* (SALA 110751) [Fig. 4C].

2*n* = 24, CHN. Spain, Lérida, Cabdella, between the dam of Sallent and lake Gento, 31TCH30, 29 Jul 1999, *L. Delgado & M. Martínez Ortega, LD 263* (SALA 110752); Spain, Lérida, Pallars Jussà, La Torre de Cabdella, 31TCH3103, 1950 m, 11 Jul 1998, *I. Soriano & R.V. Quadrada, IG 98122* (BCN 32456).

Numerous chromosome counts are known for this circumboreal species (Darlington & Wylie, 1955; Bolkhovskikh & al., 1969; Moore, 1973, 1974, 1977; Goldblatt & Johnson, 1979+; Molau, 1990; Dobeš & Vitek, 2000), with 2*n* = 24 being the most frequent chromosome number. This number agrees with our count conducted for Iberian populations that we report for the first time. Other numbers reported for this species are 2*n* = 12, 28, 36 and 48.

Bartsia trixago L.

n = 12, CHN. Spain, Cáceres, Almaraz, Fuente El Agua, 30TTK7210, 340 m, 26 April 1998, *L. Delgado & J.A. Sánchez Agudo LI7* (SALA 110756); Spain, Ciudad Real, Fuencaliente, Alcudia Valley, 30TUH85, 12 May 1998, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, LD 24,1* (SALA 110758); Spain, Salamanca, Salamanca, around the Faculty of Pharmacy, 30TTL7438, 800 m, May 1998, *L. Delgado, L 3* (SALA 110754); Spain, Valladolid, Pinar de Ordoño, 30TUL6073, 750 m, 1 Jun 1998, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, LD 26* (SALA 110757) [Fig. 4D].

n = 12, 2*n* = 24, CHN. Spain, Jaén, road between Mancha Real and Pegalajar, 30SVG47, 13 May 2000, *L. Delgado, M. Martínez Ortega & J.A. Sánchez Agudo, LD 303* (SALA 110759) [Fig. 4E].

2*n* = 24; CHN. Spain, Islas Baleares, Menorca, Ferreríes, Albranca Vell, Barranco de Sa Cova, 31SEE8723, 100 m, 20 Apr 2001, *L. Delgado, P. Fraga & J.A. Sánchez Agudo, LD 741* (SALA 110755).

The obtained chromosome number agrees with that reported by Diosdado & al. (1993), González Zapatero & al. (1988) and Luque & Díaz Lifante (1991) on the Iberian Peninsula, as well as in other parts of its areas of distribution (Moore, 1973).

**Euphrasia alpina* Lam. subsp. *alpina*

n = 11, CHN. Spain, Asturias, Quirós, ascent to Gamoniteiro Peak, 30TTN6383, 1300 m, 6 Jun 2001, *L. Delgado & E. Rico, LD 769* (SALA 110674).

n = 11, 2*n* =22, CHN. Spain, Huesca, Hoz de Jaca, Sobocos Valley, Sabocos tarn, 30TYN22, 2220 m, 3 Aug 1999, *L. Delgado & M. Martínez Ortega, LD 283* (SALA 110676); Spain, Lérida, Cabdella, between the dam of Sallent and lake Gento, 31TCH30, 29 Jul 1999, *L. Delgado & M. Martínez Ortega, LD 265* (SALA 110672); Spain, Lérida, Bonaigua pass, 31TCG3425, 2150 m, 31 Jul 1999, *L. Delgado & M. Martínez Ortega*, *LD272* (SALA 110675).

2*n* = 22, CHN. Spain, Cantabria, Fuente Dé, 30TUN5278, 1200 m, 28 May 1998, *L. Delgado, E. Rico, J.A. Sánchez Rodríguez & C. Valle Gutiérrez, LD 9* (SALA 110673).

Our chromosomes counts match the numbers reported for this species from alpine populations (Favarger, 1969a, b; Vitek, 1985; Yeo, 1970).

**Euphrasia hirtella* Jord.

n = 11, CHN. Spain, Salamanca, Peñaparda, Perosín River, 29TPE9866, 860 m, 16 Jun 1998, *L. Delgado, X. Giráldez & E. Rico. LD 32* (SALA 110670); Spain, Teruel, Linares de Mora, Paulejas River, 30TYK0465, 1100 m, 13 Sep 2002, *L. Delgado, C. Fabregat & E. Rico, LD 856* (SALA 110671).

n = 11, 2*n* = 22, CHN. Spain, Ávila, Santiago del Collado, Peña Negra pass, 30TUK0378, 1500 m, 21 Jun 1998, *L. Delgado & M. Martínez Ortega, LD 36* (SALA 110668).

2*n* = 22, CHN. Spain, Asturias, Quirós, Llanuces, 30TTN6381, 1100 m, 26 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 211* (SALA 110669).

Chromosomes number obtained from the populations studied agrees with that obtained in C and E Europe (Yeo, 1954, 1956, 1970; Greilhuber & al., 1984; Vitek, 1985; Starlinger & al., 1994) and Russia (cf. Goldblatt & Johnson, 1979+).

* *Euphrasia salisburguensis* Funck

n = 22, 2*n* = 44, CHN. Spain, Huesca, Torla, Ordesa and Monte Perdido National Park, 30TYN42, 24 Jul 1998, *S. Bernardos, L. Delgado & J.A. Sánchez Agudo, LD 80* (SALA 110679) [Fig. 4F]; Spain, Lérida, Cabdella, between the dam of Sallent and lake Gento, 31TCH30, 29 Jul 1999, *L. Delgado & M. Martínez Ortega, LD 264* (SALA 110678); Spain, Lérida, Bonaigua pass, 31TCG3425, 2100 m, 31 Jul 1999, *L. Delgado & M. Martínez Ortega, LD 271* (SALA 110677).

2*n* = 44, CHN. Spain, Asturias, Quirós, ascent to Gamoniteiro Peak, 30TTN6383, 1300 m, 14 Jun 2000, *L. Delgado & M. Martínez Ortega, LD 315* (SALA 110680).

The ploidy level (4*x*) found in Iberian populations agrees with the number reported for central European populations, although, unlike the results obtained by Greihuber & al. (1984), 2*n* = 44±3, Starlinger & al. (1994), 2*n* = 40−50, and Vitek & Kiehn (2000), 2*n* = 44, 44±1–2, 44–48, no variation in chromosomes number has been observed.

* *Melampyrum cristatum* L.

n = 9, Spain, Huesca, Jaca, Atarés, 30TXN91, 820 m, 14 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 198* (SALA 110659).

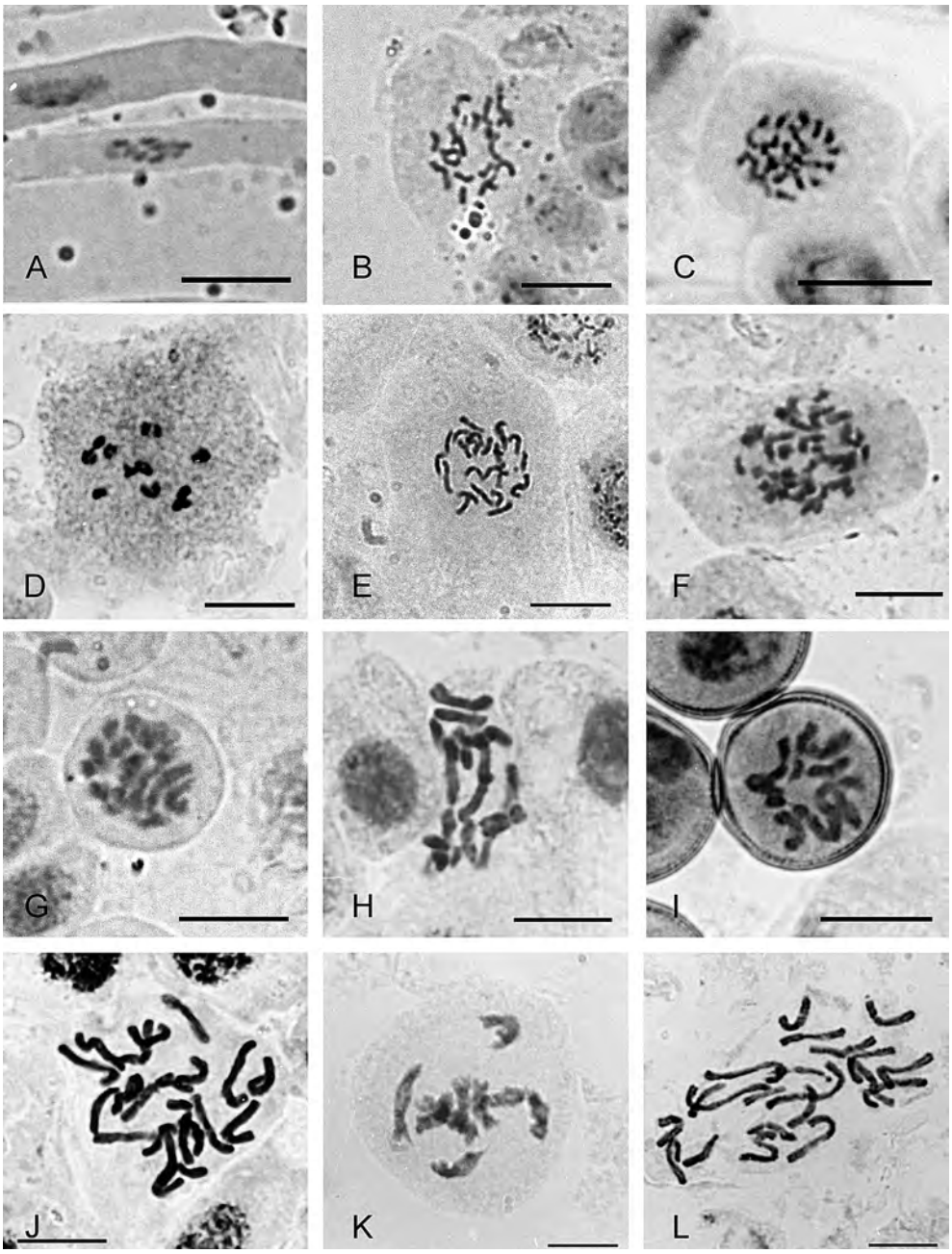

Fig. 4. A–B, *Lindernia dubia*: **A,** mitotic metaphase in pollinic tube, *n* = 10 (SALA 110601); **B,** mitotic metaphase, 2*n* = 20 (SALA 110602); **C,** *Bartsia alpina*, mitotic metaphase, 2*n* = 24 (SALA 110751); **D–E,** *B. trixago*: **D,** meiotic metaphase I in pollen mother cell, *n* = 12 (SALA 110757); **E,** mitotic metaphase, 2*n* = 24 (SALA 110759); **F,** *Euphrasia salisburgensis*, mitotic metaphase, 2*n* = 44 (SALA 110679); **G,** *Melampyrum cristatum*, mitotic metaphase, 2*n* = 18 (SALA 110658). **H,** *M. nemorosum* subsp. *catalaunicum*, mitotic metaphase, 2*n* = 18 (SALA 110660); **I–L,** *M. pratense* subsp. *latifolium*: **I,** mitotic metaphase in pollen grain, *n* = 9 (SALA 110664); **J,** mitotic metaphase, 2*n* = 18 (SALA 110666); **K,** meiotic prophase I in pollen mother cell, *n* = 9 (SALA 110661); **L,** mitotic metaphase, 2*n* = 18 (SALA 110661). — Scale bars = 10 µm.

2*n* = 18, Spain, Soria, Sotillo del Rincón, Molinos de Razón, 30TWM3244, 4 Aug 2004, *L. Delgado & M. Santos Vicente, LD 934* (SALA 110658) [Fig. 4G].

The reported chromosome number (2*n* = 18) agrees with that obtained by Speta (1971, 1975), Greilhuber (1973) and Kiehn & al. (2000) and from Austrian populations, and by Hambler (1954) from populations in the United Kingdom.

** *Melampyrum nemorosum* subsp. *catalaunicum* (Freyn) Beauverd

2*n* = 18, Spain, Huesca, Jaca, Monte del Boalar, 30TXN9314, *T. Romero*, *TR1* (SALA 110660) [Fig. 4H].

Melampyrum nemorosum s.l. is basically distributed across C Europe, where numerous chromosome counts have been reported (2*n* = 18; cf. Bolkhovskikh & al., 1969; Darlington & Wylie, 1955; Moore, 1977; Goldblatt & Johnson, 1979+; Dobeš & Vitek, 2000).

This is the first chromosome count for *M. nemorosum* subsp. *catalaunicum*. Within the *M. nemorosum* group, this Iberian population was found in the southernmost part of the distribution area.

* *Melampyrum pratense* subsp. *latifolium* Schübl. & G.Martens

n = 9, Spain, Asturias, Lena, Armada, 30TTN6682, 750 m, 26 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 209* (SALA 110664) [Fig. 4I].

n = 9, 2*n* = 18, Spain, Huesca, Santa Cruz de la Serós, 30TXN9109, 1100 m, 13 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 193* (SALA 110666) [Fig. 4J]; Spain, Lérida, Bonaigua pass, 31TCG3425, 2000 m, 31 Jul 1999, *L. Delgado & M. Martínez Ortega, LD 278* (SALA 110662); Spain, Zamora, San Martín de Castañeda, 29TPG8868, 1400 m, 6 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 178* (SALA 110661) [Fig. 4K–L].

2*n* = 18, Spain, Vitoria, Zalduendo, Sierra de Urkilla, Askiola, 30TWN5453, 1200 m, 23 Jun 1998, *L. Delgado, J. Hernández, M. Martínez Ortega & E. Rico, ER 6633* (SALA 95242).

* *Melampyrum pratense* L. subsp. *pratense*

2*n* = 18, Spain, Navarra, Isaba, Portillo de Arrasarguiat, 30TXN8259, 1700 m, 26 Jun 2000, *L. Delgado & I. Soriano, LD 339* (SALA 110665).

Chromosome counts obtained for the two *M. pratense* subspecies (2*n* = 18) agree with those obtained from populations studied in C and N Europe (cf. Bolkhovskikh & al., 1969; Moore, 1973, 1977; Goldblatt & Johnson, 1979+).

▲ *Nothobartsia asperrima* (Link) Benedí & Herrero

2*n* = 36, Portugal, Beira Litoral, Coimbra, between Traveira and Mata, 29TNE43, 16 Jun 1999, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, LD 292* (SALA 110762) [Fig. 5A–B]; Spain, Cádiz, Tarifa, Facinas, 30STF6099, 450 m, 5 Aug 2000, *E. Rico, ER 7679* (SALA 110763).

The reported number for *N. asperrima*, endemic to the W of the Iberian Peninsula and N of Morocco, was obtained from anthers and gynaecia cells in mitotic metaphase. Chromosomes have sizes between 1 and 1.3 µm, are metacentric and submetacentric, and the karyotype is symmetrical (A_2 = 0.17).

▲ *Nothobartsia spicata* (Ramond) Bolliger & Molau

n = 18, 2*n* = 36, CHN. Spain, Asturias, La Hermida, La Hermida gorge, path along the river Urdón, 30TUN6791, 200 m, 9 Sep 2000, *L. Delgado, LD 615* (SALA 110761) [Fig. 5C].

2*n* = 36, CHN. Spain, Asturias, Ribadesella, 30TUP3611, 100 m, 8 Sep 2000, *L. Delgado, LD 614* (SALA 110760).

The haploid number (*n* = 18) was counted in microspore mother cells in metaphase II, whereas the diploid number (2*n* = 36) was counted in gynaecium cells in mitotic metaphase (Fig. 5C). These chromosomes have sizes between 1.4 and 2.3 µm, and the asymmetry index is A_2 = 0.28.

The chromosome numbers indicated for these two species are the first counts reported for *Nothobartsia* Bolliger & Molau. This genus is endemic to the NW of Morocco, W and N of the Iberian Peninsula and S of France, and includes only these two species.

Parentucellia latifolia (L.) Caruel

2*n* = 48, CHN. Spain, Ávila, Villarejo del Valle, Pico pass, 30TUK2965, 1390 m, 15 May 1999, *L. Delgado, LD 163* (SALA 110766); Spain, Badajoz. Alburquerque, Santuario Nuestra Señora de Carrión, 29SPD6938, 300 m, 28 Mar 1999, *L. Delgado, M. Martínez Ortega & J.A. Sánchez Agudo, LD 99* (SALA 110764) [Fig. 5D]; Spain, Salamanca, Saucelle, 29TPF8545, 500 m, 6 Mar 1998, *L. Delgado & E. Rico, L-1* (SALA 110765); Spain, Toledo, Los Yébenes, Sierra del Rebollarejo, 30SVJ1871, 900 m, 9 May 1998, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, ER6508* (SALA 96318).

Our data match the chromosomes counts previously conducted by different authors (cf. Moore 1973, 1977) except the haploid number *n* = 8 reported by Fernandes & Queirós (1971). Due to the instability of the chromosome number in this species, this number is likely to be erroneous.

* *Parentucellia viscosa* (L.) Caruel

n = 24, CHN. Spain, Cáceres, Plasencia, 29TQE3622, 380 m, 22 May 1999, *L. Delgado & J.A. Sánchez Agudo, LD 164* (SALA 110769); Spain, Islas Baleares, Menorca, Es Migjor, Sant Agustí, 31SEE6620, 80 m, 16 Apr 2001, *L. Delgado, P. Fraga & J.A. Sánchez Agudo, LD 663* (SALA 110771).

n = 24, 2*n* = 48, CHN. Spain, Ciudad Real, Fuencaliente, 30TUH85, 12 May 1998, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, L-27* (SALA 110770).

2*n* = 48, CHN. Spain, Cádiz, Barbate, outskirts of the village, 30SQF5707, 20 m, 28 Apr 1999, *F. Amich, S. Bernardos, L. Delgado, E. Rico & J.A. Sánchez Rodríguez, LD 123* (SALA 110772); Spain, Pontevedra, El Grove, La Lanzada beach, 29TNH1000, 10 m, 12 Jun 2001, *L. Delgado & X. Giráldez, LD 779* (SALA 110773); Spain, Valladolid, Olmedo, 30TUL6073, 750 m, 1 Jun 1998, *L. Delgado, M. Martínez Ortega, E. Rico & J.A. Sánchez Agudo, LD 28* (SALA 110768) [Fig. 5E].

Our data match the chromosomes counts reported by Hambler (1954) from the United Kingdom (2*n* = 48) and by Chuang & Heckard (1992) from the United States (*n* = 24).

* *Rhinanthus angustifolius* C.C.Gmel.

n = 7, CHN. Spain, Asturias, Quirós, ascent to Gamoniteiro Peak, 30TTN6383, 1300 m, 6 Jun 2001, *L. Delgado & E. Rico, LD 771* (SALA 110830).

n = 7, 7+4B, CHN. Spain, Huesca. Ansó, shelter Zuriza, 30TXN74, 1300 m, 26 Jul 1998, *S. Bernardos, L. Delgado & J.A. Sanchez Agudo, LD 86* (SALA 110829) [Fig. 5F].

n = 7, CHN. Spain, Cantabria, Fuente Dé, 30TUN5278, 1100 m, 28 May 1998, *L. Delgado, E. Rico, J.A. Sánchez Rodríguez & C. Valle Gutiérrez, LD 11* (SALA 110828) [Fig. 5G].

For this species, widely distributed across Europe and W Asia, the following chromosome numbers were known: *n* = 7, 2*n* = 14 (Witsch, 1932); 2*n* = 14, 2*n* = 14+6B (cf. Bolkhovskikh & al., 1969) and 2*n* = 22 (cf. Goldblatt & Johnson, 1979+), referred to as *Alectorolophus glabrer* (Lam.) Beck.

* *Rhinanthus minor* L.

n = 7, CHN. Spain, Zamora, Galende, San Martín de Castañeda, 29TPG8867, 1200 m, 6 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 177* (SALA 110824).

n = 7, 2*n* = 14+8B, CHN. Spain, Ávila, Mengamuñoz, Menga pass, 30TUK2982, 1540 m, 21 Jun 1998, *L. Delgado & M. Martínez Ortega, LD 39* (SALA 110825) [Fig. 5H].

2*n* = 14+8B, CHN. Spain, Castellón, Vistabella del Maestrazgo, west of San Juan de Penyagolosa, 30TYK2359, 1350 m, 9 Jun 1999, *X. Giráldez & E. Rico, ER 6974* (SALA 110823).

2*n* = 14, 14+8B, CHN. Spain, Salamanca, Peñaparda, 29TPE9966, 860 m, 16 Jun 1998, *L. Delgado, X. Giráldez & E. Rico, LD 31* (SALA 110822).

Most chromosome counts conducted for this species correspond to those found in C Europe and N America (cf. Bolkhovskikh & al., 1969; Moore, 1973; Goldblatt & Johnson, 1979+).

* *Rhinanthus pumilus* (Sterneck) Pau subsp. *pumilus*

n = 7, CHN. Spain, Huesca, Aratorés, 30TXN92, 1000 m, 15 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 200* (SALA 110827); Spain, Navarra, Sierra de Aralar, Itimugarrieta Peak, 30TWN7962, 1300 m, 18 Jun 1999, *L. Delgado, M. Martínez Ortega & I. Aizpuru, LD 207* (SALA 110826) [Fig. 5I].

The chromosome number reported (*n* = 7) differs from that obtained by Campion-Bourget (1967) referred to as *Rh. mediterraneus* (Stern.) Soo, which is 2*n* = 22.

* *Tozzia alpina* L.

2*n* = 20, CHN. Spain, Asturias, Teverga, Ventana pass, 29TQH4173, 1200 m, 27 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 226* (SALA 110667) [Fig. 5J].

Chromosome count conducted on the Iberian population, very far from Central European populations studied by other authors (Witsch, 1932; Mattick-Ehrensberger, 1950; Greilhuber, 1971; Kiehn & al., 1991; cf. Bolkhovskikh & al., 1969), confirms the homogeneity of the chromosome number within this species.

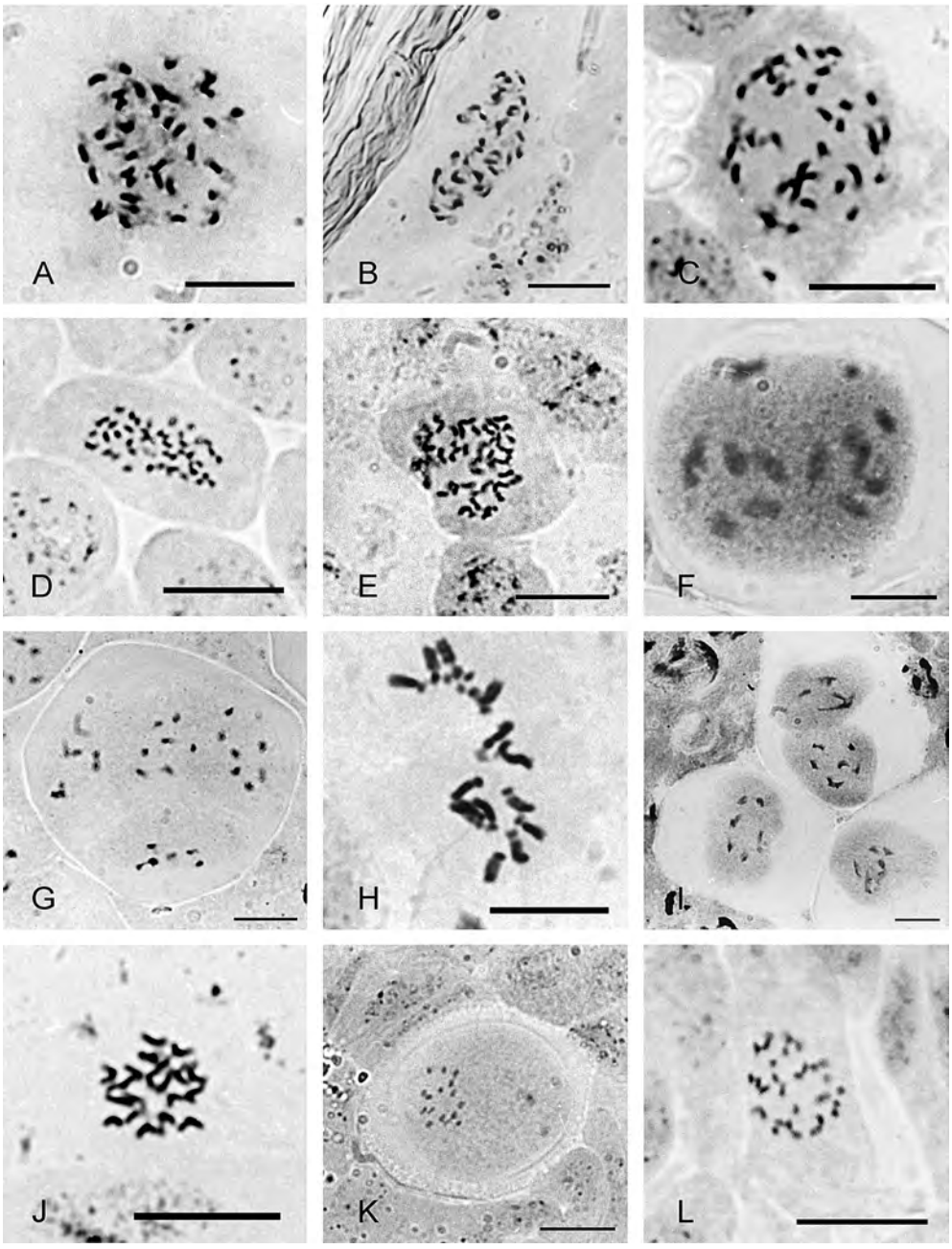

Fig. 5. A–B, *Nothobartsia asperrima*, mitotic metaphases, 2*n* = 36 (SALA 110762); **C,** *N. spicata*, mitotic metaphase, 2*n* = 36 (SALA 110761); **D,** *Parentucellia latifolia*, mitotic metaphase, 2*n* = 48 (SALA 110764); **E,** *P. viscosa*, mitotic metaphase, 2*n* = 48 (SALA 110768); **F–G,** *Rhinanthus angustifolius*: **F,** meiotic metaphase I in pollen mother cell, *n* = 7 (SALA 110829); **G,** meiotic anaphase II in pollen mother cell, *n* = 7 (SALA 110828); **H,** *Rh. minor*, mitotic metaphase, 2*n* = 14+8B (SALA 110825). **I,** *Rh. pumilus*, meiotic metaphase I in pollen mother cell, *n* = 7 (SALA 110826); **J,** *Tozzia alpina*, mitotic metaphase, 2*n* = 20 (SALA 110667); **K–L,** *Mimulus moschatus*: **K,** meiotic anaphase I in pollen mother cell, *n* = 16 (SALA 108137); **L,** mitotic metaphase, 2*n* = 32 (SALA 110591). — Scale bars = 10 µm.

PHRYMACEAE

* *Mimulus moschatus* Douglas ex Lindl.

n = 16, CHN. Spain, Salamanca, Sotoserrano, 29TQE4876, 400 m, 19 Sep 2001, *L. Delgado, A. González Talaván & M. Santos Vicente, LD 814* (SALA 108137) [Fig. 5K].

2*n* = 32, CHN. Spain, Salamanca, Candelario, highway bridge to Navacarros, 30TTL6772, 1100 m, 13 Jul 1998, *S. Bernardos, L. Delgado, F. Navarro & C. Valle Gutiérrez, LD 58* (SALA 106063); Spain, Salamanca, Candelario, Barquillo River, 30TTK6873, 1100 m, 10 Jul 2004, *L. Delgado, S. Andrés & M. Santos Vicente, LD 924* (SALA 110591) [Fig. 5L].

The ploidy level (4*x*) found in the populations studied matches the counts reported by McArthur (1974) from Great Britain, and by different authors from the United States (Bolkhovskikh & al., 1969; Moore, 1973; Goldblatt & Johnson, 1979+).

PLANTAGINACEAE

*Δ *Bacopa monnieri* (L.) Wettst.

2*n* = 32, CHN. Spain, La Coruña, Muros, Muro beach, 29TMH9234, 5 m, 4 Sep 2004, *E. Rico, ER 7875* (SALA 110605). Spain, Pontevedra. O Grove, La Lanzada beach, 29TNH1000, 20 m, 7 Aug 2002, *L. Delgado, LD 842* (SALA 108126) [Fig. 6A–B].

Bacopa monnieri chromosome number found in Iberian populations is the smallest for this species, and is different from the counts obtained by Vasudevan (1975) from Himalaya (*n* = 32), by Srinath (1934), Raghavan (1959), Chandran & Bhavanandan (1981) from India (*n* = 24, 2*n* = 64 and 2*n* = 68 respectively) and by Lewis & al. (1962) from the United States (2*n* = 64).

For this species, the fact that the lowest ploidy level known so far was found in Iberian population is surprising. It is an allochthonous plant on the Iberian Peninsula, where populations are far from their area of distribution (tropical and subtropical regions).

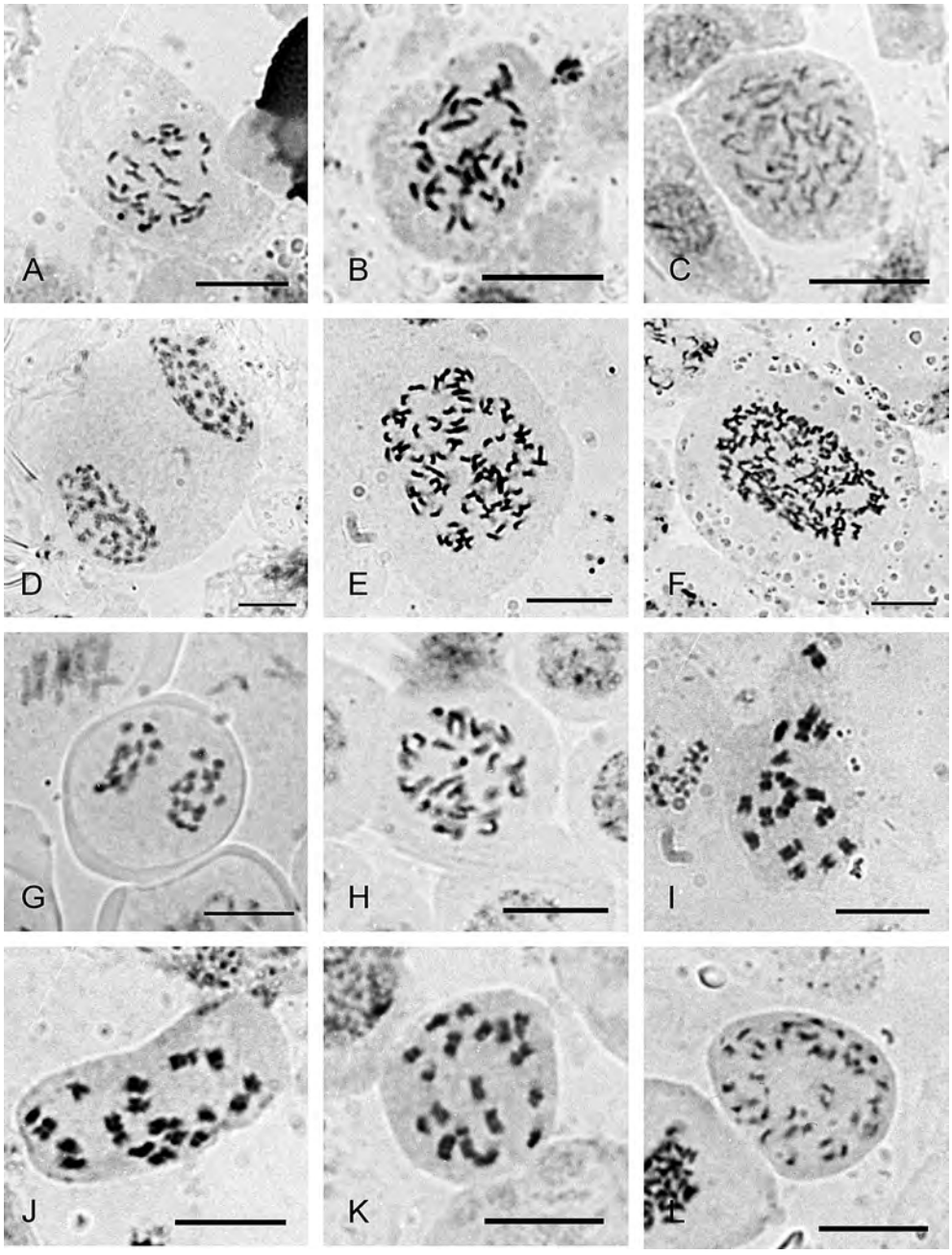

Fig. 6. A–B, *Bacopa monnieri*, mitotic metaphases, 2*n* = 32 (SALA 108126); **C,** *B. rotundifolia*, mitotic metaphase, 2*n* = 56 (SALA 110604); **D–F,** *Gratiola linifolia*: **D,** meiotic metaphase II in pollen mother cell, *n* = 48 (SALA 108134); **E,** mitotic metaphase, 2*n* = 96 (SALA 110598); **F,** mitotic metaphase, 2*n* = 96 (SALA 108131); **G–H,** *G. officinalis*: **G,** meiotic anaphase I in pollen mother cell, *n* = 16 (SALA 110592); **H,** mitotic metaphase, 2*n* = 32 (SALA 108133); **I–K,** *Sibthorpia europaea*, mitotic metaphases, 2*n* = 18 (SALA 108141); **L,** *Limosella aquatica*, mitotic metaphase, 2*n* = 40 (SALA 110606). — Scale bars = 10 μm.

* *Bacopa rotundifolia* (Michx.) Wettst.

2*n* = 56, CHN. Spain, Badajoz, Santa Amalia, 30STJ4022, 264 m, 20 Aug 2003, *E. Rico, ER 7856* (SALA 110604). [Fig. 6C].

The reported chromosome number (2*n* = 56) for this species, allochthonous on the Iberian Peninsula, agrees with that obtained by Barret & Strother (1978) from 10 populations in the United States.

* *Erinus alpinus* L.

2*n* = 14, CHN. Spain, Huesca, Ceresa, ascent to Peña Montañesa from Collado de Ceresa, 31TBH7109, 1850 m, 14 Jun 1999, *L. Delgado & M. Martínez Ortega, LD 196* (SALA 110607).

The chromosome number (2*n* = 14) agrees with the data published in literature (Bolkhovskikh & al., 1969; Goldblatt & Johnson, 1979+).

** *Gratiola linifolia* Vahl

n = 48, CHN. Spain, Cáceres, Hernán-Pérez, Arrago River, 29TQE1154, 360 m, 31 Jul 2002, *L. Delgado, A. Gallego & M. Santos Vicente, LD 841* (SALA 108134) [Fig. 6D]; Spain, Salamanca, Hinojosa de Duero, Cielo bridge, banks of river Camaces, 29TPF9042, 479 m, 6 Jun 2002, *L. Delgado & M. Santos Vicente, LD 821* (SALA 108121).

n = 48, 2*n* = 96, CHN. Spain, Ávila, Ojos-Albos, Voltoya River, 30TUL7008, 1100 m, 20 Jul 2001, *L. Delgado, LD 790* (SALA 108132).

2*n* = 96, CHN. Portugal, Douro Litoral, Porto, Amarante, Támega River, 29TNF7769, 70 m, 29 Jun 2005, *L. Delgado & M. Santos Vicente, LD 942* (SALA 110595); Spain, Salamanca, Berrocal de Huebra, Huebra River, 29TQF5010, 840 m, 16 Jun 2001, *L. Delgado, LD 783* (SALA 110598) [Fig. 6E]; Spain, Salamanca, Fuenteguinaldo, El Potril, Águeda River, 29TPE9669, 780 m, 24 Jun 2003, *E. Rico & P. Bariego, ER 7824* (SALA 110596); Spain, Salamanca, Zamarra, Águeda reservoir, 29TQE1390, 600 m, 31 Jul 2002, *L. Delgado, A. Gallego & M. Santos Vicente, LD 839* (SALA 108131) [Fig. 6F].

Gratiola L. includes some 20 taxa, for 13 of which the chromosomes numbers are known (Bolkhovskikh & al., 1969; Moore, 1973, 1974; Goldblatt & Johnson, 1979+). According to the published counts, in addition to the count for *G. linifolia* reported here, the genus has wide chromosomes diversity. In this genus, up to eight different chromosome numbers have been found (2*n* = 14, 16, 18, 28, 30, 32, 90, 96). The basic numbers suggested for this genus are *x* = 7, 8 (Lewis & al., 1962) and *x* = 15 (Hair, 1966).

This is the first chromosome count conducted on this endemic species in the CW and SW of the Iberian Peninsula. In the seven populations studied the chromosome number has always been 2*n* = 12*x* = 96 (*x* = 8). Despite the large number of chromosomes, no anomaly in the meiosis was observed. Chromosomes have sizes between 0.6 and 2.56 µm, with an average of 1.5 µm in length; the asymmetry index is $A_2 = 0.28$.

Gratiola linifolia is the species with the largest chromosome number (2*n* = 96) and highest ploidy level (12*x*) known so far in *Gratiola*, followed by *G. sexdentata* (2*n* = 6*x* = 90; *x* = 15), endemic to the SE of Australia and New Zealand (Hair & al., 1967; Lange & Murray, 2002).

Gratiola officinalis L.

n = 16, CHN. Portugal, Minho, Viana do Castello, Vilanova de Cerveira, Campos, 29TNG2548, 5 m, 5 Aug 2003, *E. Rico, ER 7826* (SALA 110594).

n = 16, 2*n* =32, CHN. Portugal, Douro Litoral, Porto, Amarante, Támega River, 29TNF7769, 70 m, 29 Jun 2005, *L. Delgado & M. Santos Vicente, LD 941* (SALA 110592) [Fig. 6G]; Spain, Zamora, Pueblica de Valverde, between Pueblica de Valverde and Tábara, Zamarrilla stream, 30TTM5642, 760 m, 16 Jun 2002, *L. Delgado, LD 823* (SALA 108133) [Fig. 6H].

2*n* = 32, CHN. Portugal, Douro Litoral, Amarante, Támega River, 29TNF7769, 70 m, 29 Jun 2005, *L. Delgado & M. Santos Vicente, LD 940* (SALA 110593). Spain, Salamanca, Pozos de Hinojo, Ituerino de Huebra, 29TQF2029, 720 m, 22 Aug 2000, *L. Delgado, LD 612* (SALA 108130).

The chromosome number reported for this species (2*n* = 4*x* = 32) agrees with that obtained on the Iberian Peninsula (Fernandes & al., 1977) and in numerous European populations (Löve & Löve, 1974; Moore 1974; Goldblatt & Johnson, 1979+).

* *Sibthorpia europea* L.

n = 9, 2*n* = 18, CHN. Spain, Asturias, Ribadedeva, San Emeterio lighthouse, 30TUP7506, 50 m, 29 May 1998, *L. Delgado, E. Rico, J.A. Sánchez Rodríguez & C. Valle Gutiérrez, LD 19* (SALA 108138).

2*n* = 18, CHN. Spain, Zamora, Mahíde, Boya, 29TQG1944, 860 m, 27 Jul 2002, *L. Delgado & M. Santos Vicente, LD 832* (SALA 108141) [Fig. 6I–K].

All chromosome numbers obtained from this species are 2*n* = 18 (cf. Bolkhovskikh & al., 1969; Goldblatt & Johnson, 1979+). This number agrees with that obtained from populations on the Iberian Peninsula.

SCROPHULARIACEAE

* *Limosella aquatica* L.

2*n* = 40, CHN. Spain, Zamora, Montamarta, banks of the reservoir, 30TTM6614, 690 m, 28 Jul 2001, *L. Delgado, LD 796*, (SALA 110606) [Fig. 6L]; Spain, Zamora, Otero de Bodas, Val de Santa María, banks of the reservoir of Nuestra Señora del Agabanzal, 30TQG2950, 800 m, 6 Sep 2002, *P. Bariego, L. Delgado & M. Santos Vicente, LD 846* (SALA 108136).

The reported chromosome number (2*n* = 40) matches that of the numerous counts conducted in Europe, N America and Asia (cf. Bolkhovskikh & al., 1969; Moore, 1973, 1974, 1977; Goldblatt & Johnson, 1979+).

Literature cited

Barret, S.C.H. & Strother, J.L. 1978. Taxonomy and natural history of *Bacopa* (Scrophulariaceae) in California. *Syst. Bot.* 3: 408–419. http://dx.doi.org/10.2307/2418753

Bhattacharyya, N.K. 1968. Chromosomal diversities in *Lindernia*. *Nucleus (Calcutta)* Suppl. vol. 1968: 102–114.

Bolkhovskikh, Z., Grif, V., Matvejeva, T. & Zakharyeva, O. 1969. *Chromosome numbers of flowering plants*. Leningrad: Nauka.

Campion-Bourget, F. 1967. Observations caryologiques sur quelques espèces du genre *Rhinanthus* L. *Compt. Rend. Séances Acad. Sci., Sér 3, Sci. Vie* 264: 2100–2102.

Chandran, R. & Bhavanandan, K.V. 1981. [Report] in: Löve, A. (ed.), IOPB Chromosome number reports LXXII. *Taxon* 30: 698. http://www.jstor.org/stable/1219963

Chuang, T.I. & Heckard, L.R. 1992. Chromosome numbers of some North American Scrophulariaceae, mostly Californian. *Madroño* 39: 137–149.

Darlington, C.D. & Wylie, A.P. 1955. *Chromosome atlas of fowering plants*. London: Allen & Unwin.

Diosdado, J.C., Santa-Bárbara, C., Vioque, J., Juan, R. & Pastor, J. 1993. [Report] in: Números cromosómicos para la Flora Española. 691–719. *Lagascalia* 17: 173–184.

Dobeš, C. & Vitek, E. 2000. *Documented chromosome number checklist of Austrian vascular plants*. Wien: Verlag des Naturhistorischen Museums Wien.

Favarger, C. 1969a. [Report] in: Löve, A. (ed.), IOPB Chromosome number reports, XXII. *Taxon* 18: 433–442. http://www.jstor.org/stable/1218477

Favarger, C. 1969b. Notes de caryologie alpine. V. *Bull. Soc. Neuchâtel. Sci. Nat.* 92: 13–30.

Fernandes, A. & Queirós, M. 1971. Sur la caryologie de quelques plantes récoltées pendant la IIIème Réunion de Botanique Péninsulaire. *Mem. Soc. Brot.* 21: 342–361.

Fernandes, A., Queirós, M. & Santos, M.F. 1977. Contribution à la connaissance citotaxonomique des Spermatophyta du Portugal XV. Scrophulariaceae. *Bol. Soc. Brot.*, ser 2, 51: 37–90.

Goldblatt, P. & Johnson, D.E. (eds.) 1979+. Index to plant chromosome numbers. http://www.tropicos.org/Project/IPCN (accessed Dec 2014).

González Zapatero, Mª.A., Elena-Rosselló, J.A. & Navarro Andrés, F. 1988. [Report] in: Números cromosómicos para la Flora Española. 504–515. *Lagascalia* 15: 112–119.

Greilhuber, J. 1971. Chromosomenzahlen von *Verbascum austriacum*, *V. lanatum* und einigen Rhinanthoideen (Scrophulariaceae). *Mitt. Bot. Arbeitsgem. Oberösterr.-Landesmus. Linz* 3: 31–35.

Greilhuber, J. 1973. Ueber die Entwicklung des Embryosacks von *Melampyrum* and *Parentucellia latifolia* (Scrophulariaceae, Pedicularieae). *Oesterr. Bot. Z.* 121: 81–97. http://dx.doi.org/10.1007/BF01373367

Greilhuber, J., Vitek, E. & Ehrendorfer, F. 1984. Evolution alpiner Populationen von *Euphrasia* (Scrophulariaceae): Chromosomenzählungen an diploiden und polyploiden Sippen in den Ostalpen. *Pl. Syst. Evol.* 144: 45–51. http://dx.doi.org/10.1007/BF00990799

Hair, J.B. 1966. Biosystematics of the New Zealand flora, 1945–1964. *New Zealand J. Bot.* 4: 559–595. http://dx.doi.org/10.1080/0028825X.1966.10430184

Hair, J.B., Beuzenberg, E.J. & Pearson, B. 1967. Contributions to a chromosome atlas of the New Zealand flora. 9. *New Zealand J. Bot.* 5: 185–196. http://dx.doi.org/10.1080/0028825X.1967.10428739

Hambler, D.J. 1954. Cytology of the Scrophulariaceae and Orobanchaceae. *Nature* 174: 838. http://dx.doi.org/10.1038/174838a0

Kiehn, M., Vitek, E., Hellmayr, E., Walter, J., Tschenett, J., Justin, C. & Mann, M. 1991. Beiträge zur Flora von Österreich: Chromosomenzählungen. *Verh. Zool.-Bot. Ges. Österreich* 128: 19–39.

Kiehn, M., Vitek, E. & Dobeš, C. 2000. [Report] in: Dobeš, C. & Vitek, E. (eds.), *Documented chromosome number checklist of Austrian vascular plants*. Wien: Verlag des Naturhistorischen Museums Wien.

La Cour, LF. 1945. Smear and squash techniques in plant cytology. *Lab. Pract.* 3: 326–330.

Lange, P.J. de & Murray, B.G. 2002. Contributions to a chromosome atlas of the New Zealand flora. 37. Miscellaneous families. *New Zealand J. Bot.* 40: 1–23. http://dx.doi.org/10.1080/0028825X.2002.9512767

Lewis, W.H., Stripling, L. & Ross, R.G. 1962. Chromosome numbers for some angiosperms of the southern United States and Mexico. *Rhodora* 64: 147–161.

Löve, A. & Löve, D. 1974. *Cytotaxonomical atlas of the Slovenian flora*. Lehre: Cramer.

Luque, T. & Díaz Lifante, Z. 1991. Chromosome numbers of plants collected during Iter Mediterraneum I in the SE of Spain. *Bocconea* 1: 303–364.

Mattick-Ehrensberger, R. 1950. [Report] in: Tischler, G. (ed.), *Die Chromosomenzahlen der Gefässpflanzen Mitteleuropas*. The Hague: W. Junk.

McArthur, E.D. 1974. The cytotaxonomy of naturalized British *Mimulus*. *Watsonia* 10: 155–158.

Molau, U. 1990. The genus *Bartsia* (Scrophulariaceae-Rhinanthoideae). *Opera Bot.* 102: 1–99.

Moore, R.J. 1973. *Index to plant chromosome numbers 1967–1971.* Regnum Vegetabile 90: 335–347.

Moore, R.J. 1974. *Index to plant chromosome numbers for 1972.* Regnum Vegetabile 91: 64–66.

Moore, R.J. 1977. *Index to plant chromosome numbers for 1973–1974.* Regnum Vegetabile 96: 195–198.

Pogan, E., Jankun, A. & Wcislo, H. 1988. Further studies in chromosome numbers of Polish angiosperms. Part XXI. *Acta Biol. Cracov., Ser. Bot.* 30: 119–136.

Probatova, N.S., Rudyka, E.G., Seledets, V.P. & Nechaev, V.A. 2008. [Report] in: Marhold, K. (ed.). IATP/IOPB chromosome data 6. *Taxon* 57: 1267–1273.

Raghavan, R.S. 1959. Chromosome numbers in Indian medicinal plants III. *Proc. Indian Acad. Sci., B* 49(4): 239–244.

Romero Zarco, C. 1986. A new method for estimating karyotype asymmetry. *Taxon* 35: 526–530. http://dx.doi.org/10.2307/1221906

Speta, F. 1971. Chromosomenzahlen einiger Angiospermen. *Österr. Bot. Z.* 119: 1–5. http://dx.doi.org/10.1007/BF01373104

Speta, F. 1975. Die Entwicklung des Endosperms von *Melampyrum cristatum* und *M. bihariense*. *Linzer Biol. Beitr.* 7: 393–402.

Srinath, K.V. 1934. Life history of *Herpestis monniera* H.B.& K. *Curr. Sci.* 3: 257–258.

Starlinger, F., Vitek, E., Pascher, K. & Kiehn, M. 1994. Neue Chromosomenzählungen für die Flora Rumäniens. Pp. 181–194 in: Heltmann, H. & Wendelberger G. (eds.), *Naturwissenschaftliche Forschungen über Siebenbürgen V: Beiträge zur Flora, Vegetation und Fauna von Siebenbürgen*. Köln: Böhlau.

Vasudevan, K.N. 1975. Contribution to the cytotaxonomy and cytogeography of the flora of the western Himalayas (with an attempt to compare it with the flora of the Alps). Part II. *Ber. Schweiz Bot. Ges.* 85: 210–252.

Vitek, E. 1985. Evolution alpiner Populationen von *Euphrasia* (Scrophulariaceae). *E. alpina* und *E. christii*. *Pl. Syst. Evol.* 149: 1–18. http://dx.doi.org/10.1007/BF00984151

Vitek, E. & Kiehn, M. 2000. [Report] in: Dobeš, C. & Vitek, E. (eds.), *Documented chromosome number checklist of Austrian vascular plants*. Wien: Verlag des Naturhistorischen Museums Wien.

Witsch, H. von 1932. Chromosomenstudien an mitteleuropäischen Rhinantheen. *Österr. Bot. Z.* 81(2): 108–141. http://dx.doi.org/10.1007/BF01255479

Yeo, P.F. 1954. The cytology of British species of *Euphrasia*. *Watsonia* 3: 101–109.

Yeo, P.F. 1956. Hybridization between diploid and tetraploid species of *Euphrasia*. *Watsonia* 3: 253–269.

Yeo, P.F. 1970. New chromosome counts in *Euphrasia*. *Candollea* 25: 21–24.

Graciela I. Lavia,[1,3]* Antonio Krapovickas[2] & María de los Ángeles Martínez[1]

1 *Instituto de Botánica del Nordeste (CONICET-UNNE, Fac. Cs. Agrarias), C.C. 209, 3400 Corrientes, Argentina*
2 *Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste (UNNE); Sgto. Cabral 2131, 3400 Corrientes, Argentina*
3 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE); Av. Libertad 5460, 3400 Corrientes, Argentina*
* Author for correspondence: *graciela.lavia@yahoo.com.ar*

This work was supported by Consejo Nacional de Investigaciones Científicas y Tecnológicas, CONICET, PIP 6265; Agencia Nacional de Promoción Científica y Tecnológica, PICTO-UNNE 2011-230 and Secretaría General de Ciencia y Técnica (UNNE), PI 12F016. M.A. Martínez is a fellow of Secretaría General de Ciencia y Técnica (UNNE), Argentina.

▼ First chromosome count for the species.
● First chromosome count for Argentina.
♣ First chromosome count for Paraguay.

MALVACEAE

Abutilon pauciflorum A.St.-Hil.

2*n* = 14, CHN. Argentina, Corrientes, Mercedes, route 123, km 65, way to Yofré, 4 Apr 1994, *G. Lavia, G. Seijo & V. Solís Neffa 13* (BH, CTES, GH, LIL).

Abutilon terminale (Cav.) A.St.-Hil.

2*n* = 14, CHN. Argentina, Corrientes, Mercedes, route 123, km 65, way to Yofré, 4 Apr 1994, *G. Lavia, G. Seijo & V. Solís Neffa 10* (CTES, GH) [Fig. 7A].

▼ *Gaya kelleri* Krapov.

2*n* = 12, CHN. Argentina, Misiones, San Ignacio, 27°12′55″ S, 55°35′39″ W, 26 Jan 2012, *H.A. Keller & C.J. Keller 10650* (CTES).

▼ *Herissantia intermedia* (Hessl.) Krapov.

2*n* = 14, CHN. Argentina, Chaco, 1ro. De Mayo, Colonia Benitez, río Tragadero, 2 May 1994, *G. Seijo 1007* (BAB, CTES).

▼ *Hibiscus sororius* L.f.

2*n* = 52, CHN. Argentina, Corrientes, Santo Tomé, between 28°05′77″ S, 56°41′13″ W and 28°04′91″ S, 56°42′07″ W, 20 Jan 2000, *M.M. Arbo, A. Schinini, M.C. Peichoto, M.C. Franceschini & E. Flachsland 8605* (CTES).

Hibiscus striatus Cav.

2*n* = 52, CHN. Argentina, Entre Ríos, Concepción del Uruguay, way to Campo Pelay, 5 Apr 1994, *G. Lavia, G. Seijo & V. Solís Neffa 16* (CTES, MGM, LIL, MEXU, SPF, GH, TEX, MO); Argentina, Corrientes, Capital, Riachuelo, 3 May 1994, *G. Seijo 1025* (AAU, BH, CTES, TEX) [Fig. 7B].

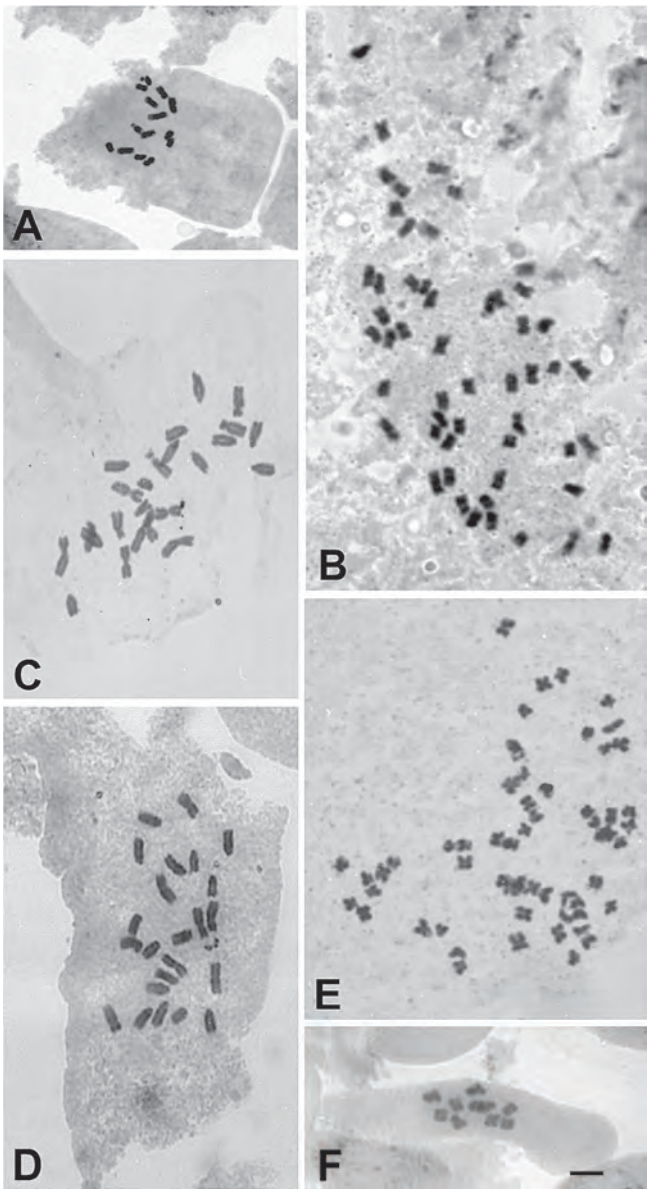

Fig. 7. Mitotic metaphases of Malvaceae species: **A,** *Abutilon terminale*, 2*n* = 14 (*G. Lavia, G. Seijo & V. Solís Neffa 10*); **B,** *Hibiscus striatus*, 2*n* = 52 (*G. Seijo 1025*); **C,** *Malvastrum cristobalianum*, 2*n* = 24 (*A. Krapovickas, C. Cristóbal & A. Schinini 45319*); **D,** *Malvastrum amblyphyllum*, 2*n* = 24 (*A. Krapovickas, C. Cristóbal & A. Schinini 45386*); **E,** *Pavonia morongii*, 2*n* = 56 (*A. Krapovickas, C. Cristóbal & A. Schinini 45249*); **F,** *Tarasa meyeri*, 2*n* = 10 (*A. Krapovickas 47841*). — Scale bar = 5 µm.

♣*Malvastrum amblyphyllum* R.E.Fr.

2*n* = 24, CHN. Paraguay, Presidente Hayes, Route Transchaco, estero Pirahu, 20 km SE of Pozo Colorado, 10 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45256* (CTES); Paraguay, Boquerón, Route Transchaco, 14 km SE of Nueva Asunción, 13 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45386* (CTES, F, G, GH, MEXU) [Fig. 7D].

♣*Malvastrum americanum* (L.) Torr.

2*n* = 24, CHN. Paraguay, Presidente Hayes, Remansito Bridge on the Paraguay river, 17 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45528* (CTES, G, MO).

♣*Malvastrum coromandelianum* (L.) Garcke subsp. *coromandelianum*

2*n* = 24, CHN. Paraguay, Boquerón, Route Transchaco, 20 km NW of Mariscal Estigarribia, 12 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45276* (CTES, G, TEX).

▼ *Malvastrum cristobalianum* Krapov.

2*n* = 24, CHN. Paraguay, Boquerón, Route Transchaco, 55 km NW of La Patria, 13 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45319* (CTES, FCQ, G, HILL, LIL, MO, NY, SI, SP) [Fig. 7C].

Pavonia hastata Cav.

2*n* = 56, CHN. Uruguay, Maldonado, Cerro Pan de Azúcar, 8 Apr 1994, *G. Lavia, G. Seijo & V. Solís Neffa 20* (BH, CTES, MEXU, TEX).

▼ *Pavonia morongii* S.Moore

2*n* = 56, CHN. Paraguay, Presidente Hayes, Route Transchaco, estero Pirahu, 20 km SE of Pozo Colorado, 10 May 1994, *A. Krapovickas, C. Cristóbal & A. Schinini 45249* (CTES) [Fig. 7E].

▼ *Pavonia sapucayensis* R.E.Fr.

2*n* = 56, CHN. Argentina, Corrientes, Capital, Facultad de Ciencias Agrarias, cultivada procede de Chaco, KC 13108, 3 Feb 1993, *A. Krapovickas 44410* (ASU, CHR, CTES, F, GH, LIL, MBM, MO, NSW, TEX, U, WIS).

Tarasa meyeri Krapov.

2*n* = 10, CHN. Argentina, Salta, Cachi, Piedra del Molino, 27 Apr 2001, *A. Krapovickas 47841* (AAU, ASU, ESA, F, GH, LPB, MBH, MO, NY, SI, SP, US, WIS) [Fig. 7F].

Urocarpidium limense (L.) Krapov.

2*n* = 30, CHN. Bolivia, La Paz, Murillo, Cota Cota, 28 May 1991, *S. Beck 17999* (CTES).

● *Wissadula subpeltata* (Kuntze) R.E.Fr.

2*n* = 14, CHN. Argentina, Chaco, 1ro. De Mayo, Colonia Benitez, río Tragadero, 2 May 1994, *G. Seijo 1008* (AAU, BH, CANB, CTES).

Malvaceae constitute a family of cosmopolitan distribution, with about 130 genera and 1600 species. Although many cytogenetic studies in *Gossypium* and *Malva* were carried out, knowledge of the rest of the family is scarce. Known chromosome numbers in Malvaceae ranging from 2*n* = 10 to 2*n* = 196 (in *Abelmoschus*), represent also different basic chromosome numbers: 5, 6, 7, 8, 10, 11, 12, 13, 15, 17, 18, 19, 20, 29, 36; turning it into a family of interest to cytogenetic and evolutionary studies (Fernández, 1974, 1981; Fernández & al., 2003).

In this work, we present chromosomic counts of 17 accessions of Malvaceae species in nine genera collected in four American countries, Argentina, Bolivia, Paraguay and Uruguay, in order to increase knowledge about this family and provide a basis for further studies as required.

Chromosome counts were carried out in actively growing root-tips (10–15 mm long) from germinating seeds in Petri dishes, pre-treated with 2 mM 8-hydroxyquinoline for 3 h at room temperature, and then fixed in absolute ethanol : glacial acetic acid (3 : 1) for 24 h, and preserved in ethanol 70%. The staining was performed using the technique of Feulgen.

Literature cited

Fernández, A. 1974. Recuentos cromosómicos en Malváceas. *Bol. Soc. Argent. Bot.* 15: 403–410.

Fernández, A. 1981. Recuentos cromosómicos en Malvales. *Bonplandia* 5: 63–71.

Fernández, A., Krapovickas, A., Lavia, G.I. & Seijo, G. 2003. Cromosomas de Malváceas. *Bonplandia* 12: 141–145.

Yanina Lazaroff[1] & Viviana Solís Neffa[1,2]*

1 *Instituto de Botánica del Nordeste (UNNE-CONICET), C.C. 209, 3400 Corrientes, Argentina*

2 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE), Av. Libertad 5460, 3400 Corrientes, Argentina*

* Author for correspondence: *viviana@agr.unne.edu.ar*

PASSIFLORACEAE

Turnera krapovickasii Arbo

n = 5, CHN. Argentina, Salta, Dpt. San Martín, Campo Durán, 22°11′59″ S, 63°39′29″ W, 465 m, 14 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 22* (CTES); Argentina, Salta, Río Negro III, 24°05′05″ S, 64°48′59″W, 441 m, 16 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 26* (CTES) [Fig. 8A]; Argentina, Salta, 23°00′17″ S, 63°53′17″ W, 341 m, 14 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 25* (CTES); Argentina, Salta, Dpt. San Martín, road 81 and road 34, 23°06′12″ S, 63°47′58″ W, 290 m, 13 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 21* (CTES); Argentina, Salta, Dpt. San Martín, road to Maravilla, 22°11′41″ S, 63°37′57″, 473 m, 13 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 23* (CTES); Argentina, Salta, Dpt. San Martín, Conepoi river, 22°06′47″ S, 63°42′28″ W, 511 m, 14 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 24* (CTES); Argentina, Salta, route 81, 23°06′20″ S, 63°47′43″ W, 259 m, 13 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1975* (ASU, CESJ, CTES, ESA, FCQ, HRB, HUEM, JUA, SI); Bolivia, Dpt. Santa Cruz, Prov. Cordillera, 19°20′43″ S, 63°29′12″ W, 930 m, 19 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1062* (CTES); Bolivia, Dpt. Tarija, Prov. Gran Chaco, 21°09′00″ S, 63°25′00″ W, 637 m, 2 Apr 2004, *V. Solís Neffa & G. Seijo 1482* (ASU, CTES, ESA, LPB, MA, MO, SI); Bolivia, Dpt. Tarija, Prov. Gran Chaco, 21°48′55″ S, 63°33′02″ W, 601 m, 9 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1497* (CTES, LPB, SI, SP); Bolivia, Dpt. Tarija, Prov. Gran Chaco, 21°20′47″ S, 63°17′30″ W, 340 m, 11 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1506* (ASU, BAB, CTES, ESA, FCQ, GH, HRB, HUEFS, LPB, MBM, SI); Bolivia, Dpt. Santa Cruz, Prov. Cordillera, 19°10′03″ S, 63°29′49″ W, 778 m, 11 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1935* (ASU, CTES, ESA, FCQ, HRB, HUEM, JUA, LPB, SI, SP); Bolivia, Dpt. Santa Cruz, Prov. Cordillera, Camiri, 20°00′42″ S, 63°32′42″ W, 799 m, 19 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1055* (ASU, BA, CANB, CTES, LPB, MBM, MICH, SI, SP); Bolivia, Dpt. Santa Cruz, Prov. Cordillera, 20°14′12″ S, 63°27′19″ W, 675 m, 5 Feb 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1432* (CTES, ESA, LPB, SI, SP); Bolivia, Dpt. Tarija, Prov. Gran Chaco, 21°43′23″ S, 63°33′50″ W, 636 m, 10 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1503* (CESJ, CTES, FCQ, HRB, LPB, NY, SI, SP); Bolivia, Dpt. Tarija, Prov. Gran Chaco, 21°10′06″ S, 63°25′21″ W, 484 m, 13 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1512* (CTES, FCQ, GH, LPB, SI); Bolivia, Dpt. Chuquisaca, Prov. Azero, 20°48′42″ S, 63°20′39″ W, 480 m, 13 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1513* (CTES, LPB, MO, NY, SI, SP); Bolivia, Dpt. Santa Cruz, Prov. Velasco, 16°52′57″ S, 60°38′55″ W, 355 m, 1 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1743* (CTES, HUEFS, LPB, SI); Bolivia, Dpt. Tarija, Prov. Cordillera, 20°46′04″ S, 63°05′36″ W, 676 m, 12 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1973* (CTES, FCQ, HUEFS, JUA, LPB, MO, SI).

n = 10, CHN. Argentina, Salta, Dpt. Anta, El Quebrachal, 25°21′24″ S, 64°01′09″ W, 358 m, 10 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1478* (CTES, ESA, MO, SI); Argentina, Salta, El Tunal, Juramento river, 25°14′40″ S, 64°23′43″ W 465 m, 14 Dec 2005, *A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 28* (CTES); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°42′36″ S, 61°14′04″ W, 403 m, 29 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1315* (BAB, CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, San José de Chiquitos, 27 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1285* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Ñuflo de Chavez, 16°56′36″ S, 61°51′01″ W, 430 m, 21 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1546* (CTES, HRB, K, LPB, MBM, SI); Bolivia, Dpt. Santa Cruz, Prov. Ñuflo de Chavez, 16°58′21″ S, 61°51′17″ W, 289 m, 21 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1547* (CTES, LPB, SI, ZT); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°09′15″ S, 60°03′17″ W, 383 m, 8 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1917* (ASU, CTES, FCQ, LPB,MO, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°06′17″ S, 60°05′11″ W, 382 m, 8 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1922* (BAB, CESJ, CTES, GH, LPB, SI) [Fig. 8B]; Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°57′50″ S, 60°18′45″ W, 426 m, 8 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1927* (CTES, FCQ, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°52′37″ S, 60°28′43″ W, 303 m, 5 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1876* (CTES, GH, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°47′41″ S, 60°43′54″ W, 268 m, 26 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1273* (BAA, CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, San José de Chiquitos, 27 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1278* (CTES, LPB, MO, SI); Bolivia, Dpt. Santa Cruz, Prov. Velasco, 16°54′06″ S, 60°37′34″ W, 324 m, 1 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1749* (CTES, JUA, LPB, NY, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°17′37″ S, 60°37′36″ W, 285 m, 1 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1766* (CTES, LPB, SI, MA); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°40′30″ S, 60°42′34″ W, 285 m, 1 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1770* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°47′42″ S, 60°43′54″ W, 279 m, 1 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1777* (CTES, LPB); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, Serranías de Chiquitos, 505 m, 2 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1784*

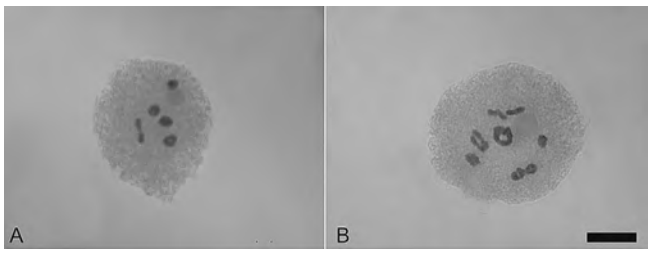

Fig. 8. *Turnera krapovickasii*. **A,** Diakinesis, 5II, *n* = 5 (*A. Panseri, W. Reynoso, M. Sosa & D. Hojsgaard 26*); **B,** Diakinesis, 7II+1IV, *n* = 10 (*V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1922*). Scale bar = 5 µm.

(CTES, LPB); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°07′17″ S, 60°50′13″ W, 331 m, 2 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1796* (CTES, LPB); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°09′19″ S, 60°50′21″ W, 810, m, 2 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1799* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°16′35″ S, 60°51′30″ W, 299 m, 4 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1866* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°52′36″ S, 60°26′52″ W, 366 m, 5 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1877* (CTES, HUEFS, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°25′11″ S, 59°50′04″ W, 237 m, 6 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1888* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°19′48″ S, 59°35′14″ W, 648 m, 7 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1913* (CTES, LPB); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, Roboré, 18°20′03″ S, 59°44′59″ W, 297 m, 7 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1915* (CTES, LPB, NY, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 17°38′48″ S, 61°20′24″ W, 280 m, 8 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1932* (CTES, ESA, JUA, LPB, NY, SI, SP); Bolivia, Dpt. Santa Cruz, Prov. José Miguel de Velasco, 17°22′55″ S, 60°40′27″ W, 290 m, 26 Jan 2004, *V. Solís Neffa, G. Seijo, A. Schinini & R. Almada 1266* (CTES, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Chiquitos, 18°38′26″ S, 60°03′46″ W, 331 m, 6 Feb 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1908* (CTES, JUA, LPB, SI); Bolivia, Dpt. Santa Cruz, Prov. Ñuflo de Chavez, 16°54′19″ S, 61°49′50″ W, 431 m, 21 Jan 2005, *V. Solís Neffa, G. Seijo, M. Grabiele & W. Reynoso 1545* (CTES, K, LPB, MA, NY, SI).

Alejandra M. Ortiz,[1]* María Celeste Sivestri[1] & Graciela I. Lavia[1,2]

1 *Instituto de Botánica del Nordeste (CONICET-UNNE, Facultad de Ciencias Agrarias), C.C. 209, Corrientes, Argentina*
2 *Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste (FaCENA-UNNE), Av. Libertad 5460, Corrientes, Argentina*
* Author for correspondence: *aortiz@agr.unne.edu.ar*

This work was supported by Consejo Nacional de Investigaciones Científicas y Tecnológicas, CONICET, PIP 6265; Agencia Nacional de Promoción Científica y Tecnológica, PICTO-UNNE 2007-00099 and Secretaría General de Ciencia y Técnica, PI 038-2008.

* First chromosome count for Brazil.
** First chromosome count from a Minas Gerais (Brazil) accession.

FABACEAE

Arachis benthamii Handro

2*n* = 20, CHN. Brasil, Mato Grosso do Sul, Campo Grande, BR-163, 30 Apr 1999, *N.M.S. Costa & L.A.Z. Machado 3101* (CEN).

**Arachis lignosa* (Chodat & Hassl.) Krapov. & W.C.Gregory

2*n* = 20, CHN. Brasil, Mato Grosso do Sul, Porto Murtinho, 21°31′ S, 57°49′ W, 17 May 1994, *J.F.M. Valls, J.C. Oliveira, A.K. Singh & G.P. da Silva 13570* (CEN). [Fig. 9G]

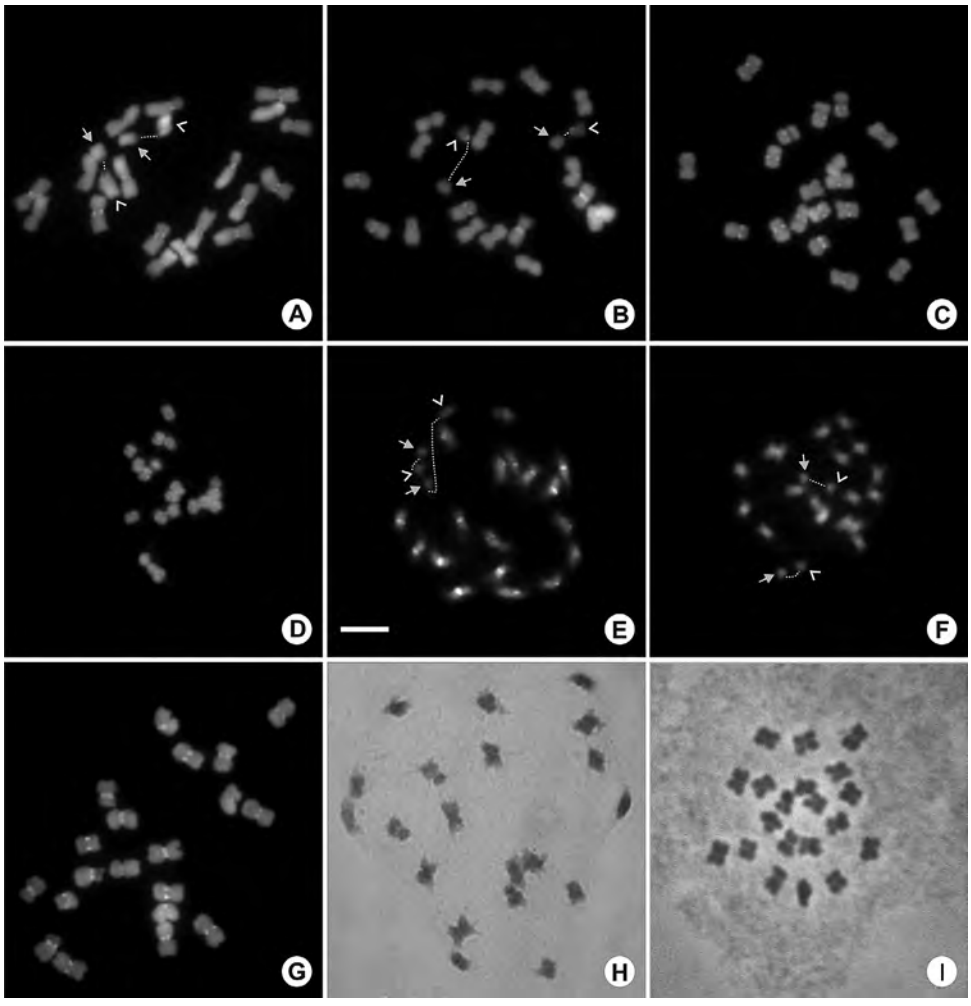

Fig. 9. Mitotic metaphases of *Arachis* species (2*n* = 20): **A,** *A. major*; **B,** *A. paraguariensis* subsp. *paraguariensis*; **C,** *A. paraguariensis* subsp. *capibariensis*; **D,** *A. sylvestris*; **E,** *A. pietrarellii*; **F,** *A. macedoi*; **G,** *A. lignosa*; **H,** *A. matiensis*; **I,** *A. triseminata*. — Arrowheads show the arms 1 + the proximal segments and arrows show the satellites of the chromosomes SAT. — Scale bar = 5 µm.

Arachis macedoi Krapov. & W.C.Gregory
2*n* = 20, CHN. Brasil, Minas Gerais, Capinópolis, 18°43′ S, 48°51′ W, 4 Apr 1961, *W.C. Gregory, A. Krapovickas & J.R. Pietrarelli 10127* (LIL, CEN, CTES). [Fig. 9F]

Arachis major Krapov. & W.C.Gregory
2*n* = 20, CHN. Brasil, Mato Grosso do Sul, Rio Negro, 19°24′ S, 55°14′ W, 29 Oct 1985, *J.F.M. Valls, A. Pott & L.B. Bianchetti 9468* (CEN, CTES); Brasil, Mato Grosso do Sul, Aquidauana, 20°20′ S, 56°06′ W, 19 Apr 1984, *J.F.M. Valls, G. Pereira-Silva, M. Gerin & V.R. Rao 7632* (CEN, CTES). [Fig. 9A]

Arachis matiensis Krapov. & W.C.Gregory
2*n* = 20, CHN. Bolivia, Santa Cruz, Sandoval, San Matías, 16°21′ S, 58°24′ W, 25 Jan 2005, *G. Seijo, V. Solís Neffa, M. Grabiele & W. Reynoso 3719* (CTES). [Fig. 9H]

Arachis paraguariensis Chodat & Hassl. subsp. *paraguariensis*
2*n* = 20, CHN. Paraguay, Concepción, 4 km N of the Loreto, 8 Mar 2008, *A. Caballero 185* (CTES). [Fig. 9B]

Arachis paraguariensis subsp. *capibariensis* Krapov. & W.C.Gregory
2*n* = 20, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, road to Jardim, 12 Jun 1968, *R.O. Hammons, W.R. Langford & V. Hemsy 565/566* (CEN, CTES). [Fig. 9C]

Arachis pietrarellii Krapov. & W.C.Gregory
2*n* = 20, CHN. Brasil, Mato Grosso, Nobres, 15 km N of the Rosario Oeste, 14°46′ S, 56°21′ W, 2 Jun 1985, *J.F.M. Valls, A. Krapovickas, C.E. Simpson & G.P. Silva 9000* (CEN, CTES); Brasil, Mato Grosso, Nobres, 900 m N of the Corrego Seco, 14°46′ S, 56°21′ W, 25 Jan 1989, *J.F.M. Valls & A. Krapovickas 12085* (CEN, CTES). [Fig. 9E]

** *Arachis sylvestris* (A.Chev.) A.Chev.
2*n* = 20, CHN. Brasil, Minas Gerais, Januária, 15°29′ S, 44°22′ W, 5 Jun 1991, *J.F.M. Valls, L.F. Freitas, E. Pizarro & G.P. Silva 13107* (CEN). [Fig. 9D]

Arachis triseminata Krapov. & W.C. Gregory
2*n* = 20, CHN. Brasil, Bahia, Iuiu, 14°39′ S, 43°29′ W, 5 Mar 1993, *W.L. Werneck 144* (CEN). [Fig. 9I]

Dolja Pavlova[1]* & Aida Bani[2]

1 *Department of Botany, Faculty of Biology, University of Sofia, blvd. Dragan Tzankov 8, 1164 Sofia, Bulgaria*
2 *Agro-Environmental Department, Faculty of Agronomy and Environment, Agricultural University of Tirana, Koder-Kamez, Tirana, Albania*
* Author for correspondence: *pavlova@biofac.uni-sofia.bg*

The study was partially supported within project D "Rila" 01/7/21.06.2013 by the National Research Fund at the Ministry of Education and Science in Sofia.

* First chromosome count for the species.
▼ First chromosome count from serpentine area.

ASTERACEAE

Inula aschersoniana Janka
▼ 2*n* = 16, CHN. Bulgaria, Central Rhodopes Mt., serpentine scree slope above the road, about 2 km south of Parvenetz village, 360 m, 42°03′N, 24°39′E, 28 Aug 2007, *D. Pavlova DP-14028* (SO) [Fig. 10A].

In Bulgaria this Balkan endemic species appears predominantly on calcareous terrains but it was found on serpentine rocky places in the Rhodope Mts. (Pavlova & al., 2003). The diploid chromosome number 2*n* = 16 confirms data previously reported for populations from Bulgaria (Kuzmanov & Nikolova, 1977; Kuzmanov & al., 1993).

BRASSICACEAE

Alyssum markgrafii O.E.Schulz
*▼ 2*n* = 4*x* = 32, CHN. Albania, Gjegjan region, near Fushe-Arrez village, 400 m, 41°55′47″ N, 20°00′09″ E, 12 Jul 2014, *A. Bani AB-2014001* (TIR) [Fig. 10B].

This is an endemic plant distributed mainly on serpentines in Albania, Serbia, Montenegro, and Kosovo (Marhold, 2011). It is one of nearly 50 taxa, all in *Alyssum* sect. *Odontarrhena* (C.A.Mey. ex Ledeb.) W.D.J.Koch that act as Ni hyperaccumulators (>1000 mg/kg or 0.1%; Reeves & Adigüzel, 2008). The chromosome number 2*n* = 32 is the first count for its populations from Albania.

Alyssum murale Waldst. & Kit.
▼ 2*n* = 32; CHN. Albania, near the town of Prrenjas, serpentine soils, 600 m, 41°04′13″ N, 20°33′53″ E, 12 Jul 2014, *A. Bani AB-2014002* (TIR) [Fig. 10C].
▼ 2*n* = 16; CHN. Bulgaria, Eastern Rhodope Mts., southward from Goljamo Kamenjane village, 414 m, 41°24′06.8″ N, 25°42′23.1″ E, 23 Jun 2012, *D. Pavlova DP-12024* (SO) [Fig. 10D].

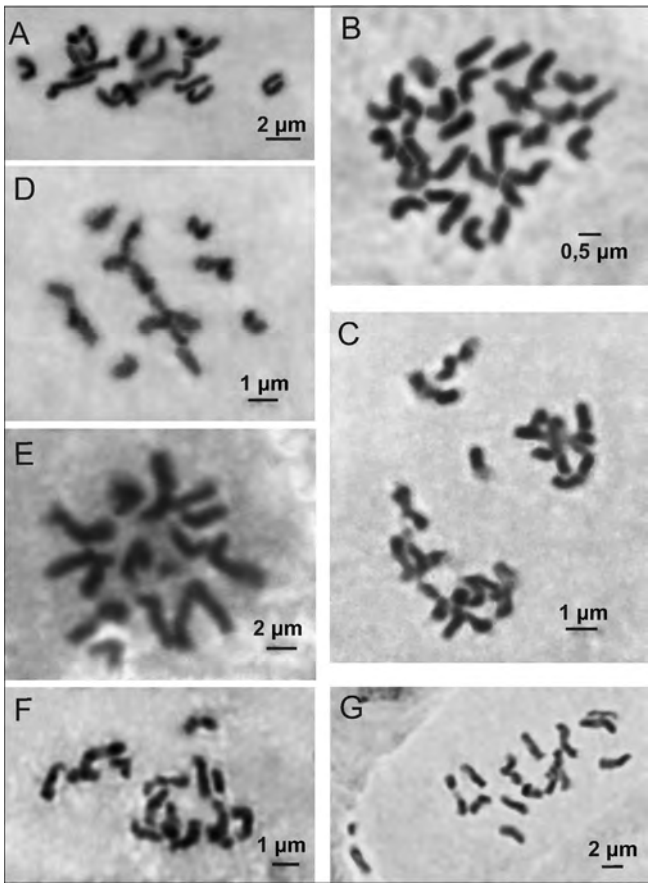

Fig. 10. Metaphase chromosome plate of: **A,** *Inula aschersoniana* (*DP-14028*); **B,** *Alyssum markgrafii* (*AB-2014001*); **C,** *A. murale* (*AB-2014002)*; **D,** *A. murale* (*DP-12024*); **E,** *Arabis alpina* subsp. *caucasica* (*DP-12023*); **F,** *A. alpina* subsp. *alpina* (*DP-15006*); **G,** *Astragalus depressus* (*DP-15015*).

The species is widely distributed both on and off serpentines. It is also a well known Ni hyperaccumulator. The diploid cytotype of $2n = 16$ from non-serpentine populations of the species was reported previously from different localities of its distribution area (Constandriopoulos, 1969; Anchev & Dudley, 1981; Van Loon & Van Setten, 1982;Anchev, 1991, 2001; Starlinger & al., 1994; Warwick & Al-Shehbaz, 2006; Öztürk & al., 2009). The chromosome number $2n = 32$ was reported for the first time by Constandriopoulos (1969) and was not confirmed later on. The chromosome number is the first report on Albanian accessions.

Arabis alpina L. subsp. *alpina*

$2n = 16$, CHN. France, the Alps, high mountain station of Lautaret, 2073 m, 45°02′10.34″ N, 06°23′58.95″ E, plants cultivated from seeds in the greenhouse of Sofia University collected by E. Ananiev, Jun 2015, *D. Pavlova DP-15006* (SO) [Fig. 10F].

The chromosome number is congruent with the report by Gadella & Kliphuis (1970) for plants from another locality in the French Alps.

Arabis alpina subsp. *caucasica* (Willd.) Briq.

▼ $2n = 16$, CHN. Bulgaria, Rila Mt., cirque of the Seven Rila Lakes (Sedemte Rilski Ezera), ophiolitic rocks near to the outflow of the lake Trilistnika, 2200 m, 42°12'27.85" N, 23°18'59.89" E, 23 Jul 2012, *D. Pavlova DP-12023* (SO) (Fig. 10E); Bulgaria, Rila Mt., cirque of the Seven Rila Lakes (Sedemte Rilski Ezera), on silicate, near to the outflow of the lake Bliznaka, 2254 m, 42°12′15.55″ N, 23°18′55.87″ E, 13 Jul 2013, *D. Pavlova DP-13013* (SO).

This subspecies is the only one occurring in Bulgaria. The same chromosome number was previously reported for accessions from non-serpentine area (Peev, 1975; Anchev, 2001, as *A. alpina* subsp. *flavescens*).

FABACEAE

Astragalus depressus L.

$2n = 16$, CHN. Bulgaria, Znepole region, Erma Gorge near Lomnitza village, calcareous rock near the path to the wooden bridge above Erma river, about 50 m before the bridge, 716 m, 42°51′39.039″ N, 22°38′49.899″ E, 4 Jun 2015, *D. Pavlova DP-15015* (SO) [Fig. 10G], *DP-107653* (SO).

The chromosome number $2n = 16$ confirms data previously reported for populations from the Pirin Mts. (Pavlova, 1988) and the Western Rhodopes Mts. (Pavlova & Tosheva, 2002).

Literature cited

Anchev, M. 1991. Genus *Alyssum* L. in Bulgarian flora. Pp. 85–117 in: Kozhuharov, S. & Kuzmanov, B. (eds.), *Evolution of flowering plants and florogenesis*, vol. 2, *Asteraceae, Brassicaceae, Poaceae, Cyperaceae*. Sofia: Publishing House Bulgarian Academy of Sciences. [in Bulgarian]

Anchev, M. 2001. *The family Brassicaceae Burnett (Cruciferae Jussieu) in Bulgarian the flora: Taxonomic structure, distribution, phytogeographic relations, mechanisms of speciation and evolutionary trends*. Dissertation, Sofia, Bulgaria. [in Bulgarian]

Anchev, M. & Dudley, T. 1981. [Reports] in: Löve, A. (ed.), IOPB chromosome number reports LXXIII. *Taxon* 30: 856. http://www.jstor.org/stable/1220093

Constandriopoulos, J. 1969. Contribution a l'etude cytotaxonomique des Alysseae Adams de Grece. *Ber. Schweiz. Bot. Ges.* 79: 313–334.

Gadella, Th. & Kliphuis, E. 1970. Chromosome studies in some flowering plants collected in French Alps (Haute Savoie). *Rev. Gén. Bot.* 77: 487–497.

Kuzmanov, B. & Nikolova, V. 1977. [Reports] in: Löve, A. (ed.), IOPB chromosome number reports LVIII. *Taxon* 26: 559. http://www.jstor.org/stable/1219650

Kuzmanov, B., Georgieva, S. & Nikolova, V. 1993. Karyological study of Bulgarian Asteraceae VII. *Fitologija* 44: 16–31. [in Bulgarian]

Marhold, K. 2011 [last updated January 2011]. Brassicaceae. In: Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/EuroPlusMed/ (accessed 20 Jun 2015).

Öztürk, M., Martin, E., Dinç, M., Duran, A., Özdemir, A. & Çetin, O. 2009. A cytogenetical study on some plants taxa in Nizip Region (Aksaray, Turkey). *Turk. J. Biol. (Ankara)* 33: 35–44.

Pavlova, D. 1988. Karyological study of several species from *Astragalus*. *Compt.-Rend. Acad. Bulg. Sci.* 41: 67–69.

Pavlova, D. & Tosheva, A. 2002. Reports 1284–1287 in: Kamari, G., Blanche, C. & Garbari, F. (eds.), Mediterranean chromosome number reports – 12. *Fl. Medit.* 12: 45–454.

Pavlova, D., Kozuharova, E. & Dimitrov, D. 2003. A floristic catalogue of the serpentine areas in the Eastern Rhodope Mountains (Bulgaria). *Polish J. Bot.* 48: 21–41.

Peev, D. 1975. Chromosome numbers and karyotypes. *Compt.-Rend. Acad. Bulg. Sci.* 28: 521–523.

Reeves, R. & Adigüzel, N. 2008. The nickel hyperaccumulating plants of the serpentines of Turkey and adjacent areas: A review with new data. *Turk. J. Biol. (Ankara)* 32: 143–153.

Starlinger, F., Vitek, E., Pascher, K. & Kiehn, M. 1994. Neue Chromosomenzählungen für die Flora Rumäniens. Pp. 181–194 in: Helmann, H. & Wendelberger, G. (eds.), *Naturwissenschaftliche Forschungen über Siebenbürgen V: Beiträge zur Flora, Vegetation und Fauna von Siebenbürgen*. Cologne: Böhlau.

Van Loon, J.C. & Van Setten, A.K. 1982. [Reports] in: Löve, A. (ed.), IOPB chromosome number reports LXXVI. *Taxon* 31: 589–592. http://www.jstor.org/stable/1220702

Warwick, S.I. & Al-Shehbaz, A.I. 2006. Brassicaceae: Chromosome number index and database on CD-Rom. *Pl. Syst. Evol.* 259: 237–248. http://dx.doi.org/10.1007/s00606-006-0421-1

Caroline do Amaral Polido, Ana Paula Moraes* & Eliana Regina Forni-Martins

Laboratório de Biossistemática e Polinização, Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, Rua Monteiro Lobato 255, Cidade Universitária Zeferino Vaz, 13083-862 Campinas, SP, Brazil

* Author for correspondence: *apaulademoraes@gmail.com*

* First chromosome count for the species.

§ The chromosome numbers ascertained here are different from those reported by other authors (Frahm-Leliveld, 1957; Krapovickas & Krapovickas, 1951; Berger & al., 1958; Miêge, 1960; Shibata, 1962; Vanni, 1983; Coleman, 1982; Mendonça Filho & al., 2002).

\+ Species with intra-specific cytotype variation in the same population.

This study was supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP – Brazil, Grant 2010/19132-6 to E.R. Forni-Martins and 2011/22215-3 to A.P. Moraes), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq – Brazil, Grants 471708/2010-0 and 306142/2011-2 to E.R. Forni-Martins) and by Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES – Brazil, doctoral fellowship to C.A. Polido).

FABACEAE

Tribe Dalbergieae

**Aeschynomene ciliata* Vogel

$2n = 22$, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Agro-Comercial Aubi, 21°41′03″ S, 57°41′17″ W, Chaco vegetation, 20 Nov 2008, *F.M. Alves & A.L.B. Sartori 487* (CGMS). [Fig. 11A]

Aeschynomene falcata (Poir.) DC.

$2n = 20$, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Agro-Comercial Aubi, 21°41′03″ S, 57°41′17″ W, Chaco vegetation, 20 Nov 2008, *F.M. Alves 477* (CGMS). [Fig. 11B]

§ *Aeschynomene histrix* Poir.

2*n* = 22, CHN. Brazil, Bahia, Barreiras, 12°08′54″ S, 44°59′33″ W, Cerrado biome, Nov 2011, *C.A. Polido & al. 247* (RB); Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Flores, 21°43′02″ S, 57°53′51″ W, Chaco vegetation, 20 Nov 2008, *A.K.D. Salomão & F.M. Alves 329* (CGMS). [Fig. 11C]

+ *Aeschynomene paniculata* Willd. ex Vogel

2*n* = 20, CHN. Brazil, Mato Grosso do Sul, Bonito, close to the routes MS-178 and MS-345 crossing point, 21°07′16″ S, 56°28′55″ W, transition between Cerrado and Semi-deciduous Forest, 24 May 2001, *L.C.P. Lima 72* (CGMS); Brazil, Mato Grosso do Sul, Porto Murtinho, dike 06 on the MS-267 roadside, Chaco vegetation, 15 May 2005, *G.P. Nunes & al. 215* (CGMS) [Fig. 11D]; Brazil, Minas Gerais, roadside between São Roque de Minas and São João Batista, 20°13′58″ S, 46°22′02″ W, Cerrado biome, Canastra mountain ridge, *M.F.B. & al. 56* (UEC); Brazil, São Paulo, Itirapina, 22°10′15″ S, 47°49′22″ W, Cerrado biome, 6 Oct 2009, *C.A. Polido & al. 238* (UEC).

* 2*n* = 22, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, dike 06 on the MS-267 roadside, Chaco vegetation, 15 May 2005, *G.P. Nunes & al. 215* (CGMS). [Fig. 11E]

§ *Aeschynomene sensitiva* Sw.

2*n* = 22, CHN. Brazil, Espírito Santo, Linhares, Natural Reserve from Vale Company, close to the Suruaca Lake, 19°06′ S, 39°45′ W, Atlantic Rainforest, 21 Nov 2011, *C.A. Polido & al. 272* (UEC). [Fig. 11F]

Dalbergia sp.

2*n* = 20, CHN. Brazil, Bahia, Feira de Santana, Campus of Feira de Santana State University (UEFS), close to the Herbarium section, 12°16′00.12″ S, 48°58′00.12″ W, Cerrado biome, 15 Jun 2011, *R.B. Pinto 239* (RB 512490).

Dalbergia cearensis Ducke

2*n* = 20, CHN. Brazil, Ceará, Quixadá, Farm Não Me Deixes, 04°49′34″ S, 38°58′09″ W, Caatinga biome, 25 May 2009, *F.B.C. Nogueira s.n.* (EAC 42124). [Fig. 12A]

Dalbergia ecastaphyllum (L.) Taub.

2*n* = 20, CHN. Brazil, Santa Catarina, Florianópolis, 27°45′39″ S, 48°32′58″ W, in thicket on coastal sand plain in Lagoinha do Leste Beach, Sep 2011, *P.Z. Souza s.n.* (UEC).

Dalbergia frutescens (Vell.) Britto

* 2*n* = 20, CHN. Brazil, Minas Gerais, São Roque de Minas, 20°13′58″ S, 46°22′02″ W, Cerrado biome, Apr 2010, *V. Mendonça-Filho s.n.* (UEC) [Fig. 12B]; Brazil, São Paulo, Águas de Lindóia, 22°28′36″ S, 46°38′01″ W, Atlantic Rainforest, 29 Aug 2011, *C.A. Polido & R.B. Pinto 275* (UEC).

Dalbergia miscolobium Benth.

* 2*n* = 20, CHN. Brazil, Minas Gerais, São Roque de Minas, 20°13′58″ S, 46°22′02″ W, Cerrado biome, Apr 2010, *C.V. Mendonça-Filho s.n.* (UEC) [Fig. 12C]; Brazil, Minas Gerais, Diamantina, 18°14′17″ S, 23°36′40″ W, Cerrado biome, Apr 2010, *C.V. Mendonça-Filho s.n.* (UEC).

Dalbergia nigra (Vell.) Alemão ex Benth.

2*n* = 20, CHN. Brazil, Espírito Santo, Linhares, Vale Natural Reserve from Vale Company, 19°23′28″ S, 40°04′20″ W, Atlantic Rainforest, 13 Sep 2005, *G.S. Siqueira 187* (CVRD); Brazil, Espírito Santo, Pinheiros, Victório Orletti Natural Reserve, 18°22′13″ S, 40°12′48″ W, Atlantic Rainforest, 19 Jul 2011, *C.A. Polido 256* (RB); Brazil, Rio de Janeiro, Rio de Janeiro, 22°54′13″ S, 43°12′35″ W, close to the Praça XV, Atlantic Rainforest, 5 Oct 2005, *L.F.G. da Silva 74* (RB) [Fig. 12D]; Brazil, São Paulo, Campinas, Campinas State University (UNICAMP), close to the Visitor Hotel, 22°48′53″ S,

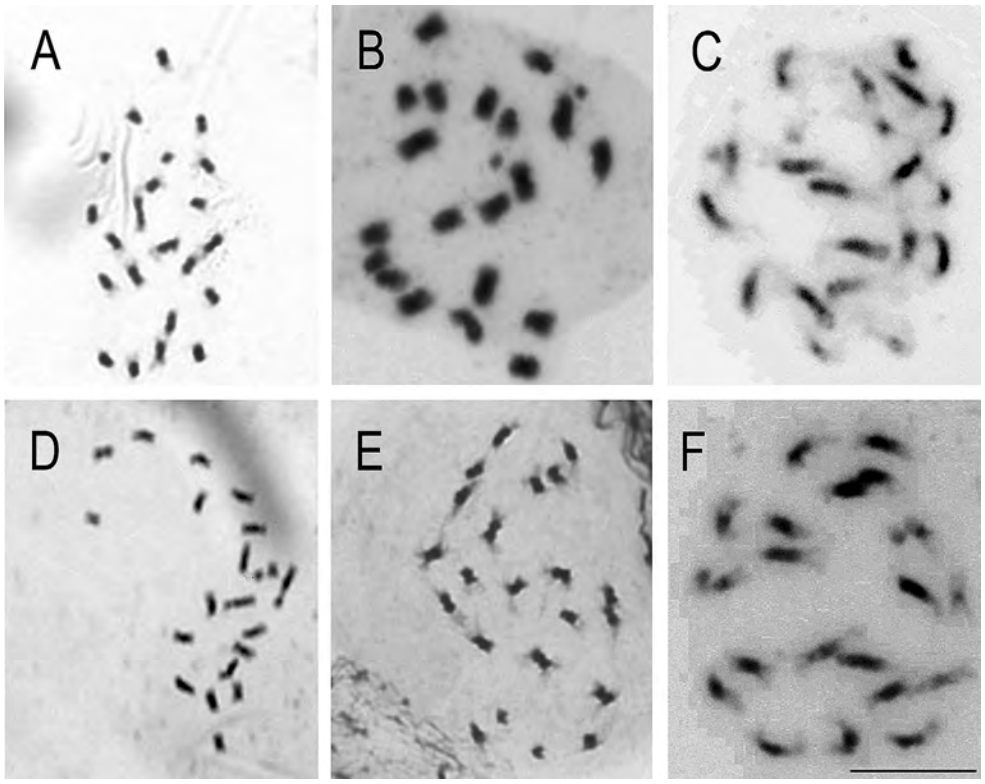

Fig. 11. *Aeschynomene* mitotic metaphases: **A,** *A. ciliata*, 2*n* = 22; **B,** *A. falcata*, 2*n* = 20; **C,** *A. histrix*, 2*n* = 22; **D,** *A. paniculata*, 2*n* = 20 (dots indicate the distended secondary constriction); **E,** *A. paniculata*, 2*n* = 22; **F,** *A. sensitiva*, 2*n* = 22. — Scale bar = 10 µm.

47°04′02″ W, in Semi-deciduous Forest, 14 Sep 2012, *C.A. Polido & R.B. Pinto 282* (UEC).

* + *Geoffroea striata* (Will.) Morong

2*n* = 20, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Agro Comercial Aubi, 21°41′03″ S, 57°41′17″ W, Chaco vegetation, 3 Dec 2008, *F.M. Alves & A.L.B. Sartori 472* (CGMS). [Fig. 12E]

2*n* = 40, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Agro Comercial Aubi, 21°41′03″ S, 57°41′17″ W, Chaco vegetation, 3 Dec 2008, *F.M. Alves & A.L.B. Sartori 472* (CGMS). [Fig. 12F]

Machaerium sp.

2*n* = 20, CHN. Brazil, São Paulo, Jundiaí, Municipal Biological Reserve of Japi mountain ridge, 23°14′ S, 46°58′ W, Semi-deciduous Forest, 2 Sep 2011, *C.A. Polido & R.B. Pinto 278* (UEC).

Machaerium acutifolium Vogel

2*n* = 20, CHN. Brazil, São Paulo, Porto Ferreira, 21°41′18″ S, 47°28′45″ W, Cerrado biome, 20 Mar 2003, *L.S. Kinoshita & al. s.n.* (UEC).

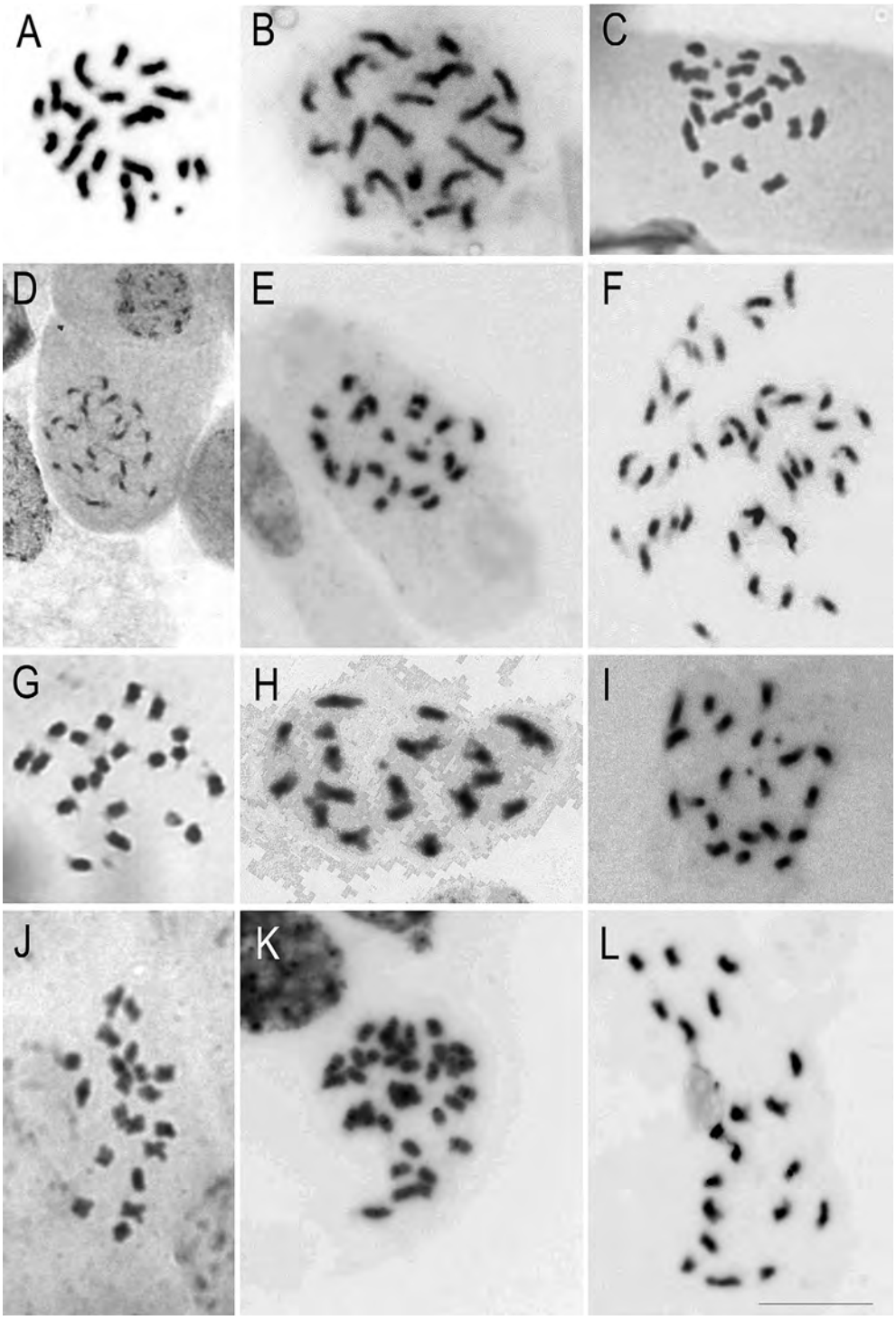

Fig. 12. Mitotic metaphases of Dalbergieae species: **A,** *Dalbergia cearensis*, 2*n* = 20; **B,** *D. frutescens*, 2*n* = 20; **C,** *D. miscolobium*, 2*n* = 20; **D,** *D. nigra*, 2*n* = 20; **E,** *Geoffroea striata*, 2*n* = 20; **F,** *G. striata*, 2*n* = 40; **G,** *Machaerium hirtum*, 2*n* = 20; **H,** *M. nyctitans*, 2*n* = 20; **I,** *M. vestitum*, 2*n* = 20; **J,** *M. villosum*, 2*n* = 20; **K,** *Stylosanthes hamata*, 2*n* = 40; **L,** *Zornia reticulata*, 2*n* = 20. — Scale bar = 10 µm.

Machaerium hirtum (Vell.) Stellfeld
§ 2*n* = 20, CHN. Brazil, São Paulo, Campinas, UNICAMP, close to the Visitor Hotel, 22°48′53″ S, 47°04′02″ W, Semi-deciduous Forest, 14 Sep 2012, *C.A. Polido & R.B. Pinto 283* (UEC) [Fig. 12G]

Machaerium nyctitans (Vell.) Benth.
§ 2*n* = 20, CHN. São Paulo, Jundiaí, Municipal Biological Reserve of Japi Mountain Ridge, 23°14′ S, 46°58′ W, Semi-deciduous Forest, 2 Sep 2011, *C.A. Polido & R. B. Pinto 279* (UEC). [Fig. 12H]

Machaerium vestitum Vogel
* 2*n* = 20, CHN. Brazil, São Paulo, Campinas, UNICAMP, close to the Visitor Hotel, 22°48′53″ S, 47°04′02″ W, Semi-deciduous Forest, 14 Sep 2012, *C.A. Polido 281* (UEC). [Fig. 12I].

Machaerium villosum Vogel
2*n* = 20, CHN. Brazil, São Paulo, Jundiaí, Municipal Biological Reserve of Japi Mountain Ridge, 23°14′ S, 46°58′ W, Semi-deciduous Forest, 2 Sep 2011, *C.A. Polido & R.B. Pinto 280* (UEC). [Fig. 12J]

Stylosanthes hamata (L.) Taub.
2*n* = 40, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Retiro Conceição, 21°41′00.5″ S, 57°43′46″ W, 23 Jan 2010, Chaco vegetation, *B.E.M. Pinto 733* (CGMS). [Fig. 12K]

Zornia reticulata Sm.
2*n* = 20, CHN. Brazil, Mato Grosso do Sul, Porto Murtinho, Farm Agro-Comercial Aubi, 21°41′03″ S, 57°41′17″ W, Chaco vegetation, 27 Aug 2007, *F.M. Alves & al. 446* (CGMS). [Fig. 12L]

Table 2. Vegetation formation, chromosome number (obtained here and previously published), and TKL mean for Dalbergieae species.

Genus/subgenus	Species	Vegetation formation	2*n* Present work	2*n* Published (reference)	Chromosome size (μm)	TKL (μm)
Aeschynomene L.						
sect. *Aeschynomene*	*Aeschynomene ciliata* Vogel*	Chaco	22		0.99–4.10	45.32[b]
	A. sensitiva Sw.§	Atlantic rainforest	22	20 (F57, KK57, B58, M60, S62, V83)	1.08–2.92	48.78[a]
sect. *Ochopodium* Vogel	*A. falcata* (Poir.) DC.	Chaco	20	20 (CD80)	0.84–2.88	23.05[c]
	A. histrix Poir.§	Cerrado	22	20 (C82)	0.36–1.14	15.22[d]
		Chaco	22	20 (C82)	0.41–1.17	14.05[d]
	A. paniculata Willd. ex Vogel	Cerrado	20	20 (V83, SV99)	0.77–2.55	23.60[c]
		Cerrado	20		0.68–2.73	23.90[c]
		Cerrado	20		0.80–2.78	24.01[c]
		Chaco	20		0.82–2.46	23.17[c]
		Chaco	22+		0.60–2.77	24.05[c]
Dalbergia L.f.	*Dalbergia* sp.	Cerrado	20		1.14–2.44	32.73[c]
	D. cearensis Ducke	Caatinga	20	20 (B74)	1.11–2.36	34.17[b]
	D. ecastaphyllum (L.) Taub.	Thicket on coastal sand plain	20	20 (MM62)	1.25–2.13	32.63[c]
	D. frutescens (Vell.) Britto*	Semi-deciduous forest	20		1.27–3.83	58.20[a]
		Cerrado			1.23–3.77	57.12[a]
	D. miscolobium Benth.*	Cerrado	20		1.20–2.31	33.10[b,c]
		Cerrado			1.18–2.35	31.88[b,c]
	D. nigra (Vell.) Alemão ex Benth.	Semi-deciduous forest	20	20 B74	1.29–2.06	32.50[c]
		Atlantic rainforest			1.23–2.13	30.97[c]
		Atlantic rainforest			1.19–2.18	31.23[c]
		Atlantic rainforest			1.26–2.15	32.04[c]
Machaerium Pers.	*Machaerium* sp.	Semi-deciduous forest	20		0.89–2.27	29.67[a]
	M. acutifolium Vogel	Cerrado	20	20 (B74, MF02)	0.98–2.24	28.80[a]
	M. hirtum (Vell.) Stellfeld§	Semi-deciduous forest	20	40 (MF02)	0.96–2.03	29.30[a]
	M. nyctitans (Vell.) Benth.	Semi-deciduous forest	20	40 (MF02)	0.95–2.45	30.49[a]
	M. vestitum Vogel*	Semi-deciduous forest	20		0.86–1.92	29.47[a]
	M. villosum Vogel	Semi-deciduous forest	20	20 (MF02)	0.96–2.02	29.38[a]

* Previously unpublished data. — § Data divergent from previously published data. — + Intraspecific variation.

TKL mean – Total karyotype length. Different superscript letters following KL means indicate differences in TKL means ($P \leq 0.05$).

References of previously published chromosome numbers are coded as follows: **B58,** Berger & al., 1958; **B74,** Bandel, 1974; **C82,** Coleman, 1982; **CD80,** Coleman & DeMenezes, 1980; **F57,** Frahm-Leliveld, 1957; **KK57,** Krapovickas & Krapovickas, 1951; **M60,** Miêge, 1960; **MF02,** Mendonça-Filho & al., 2002; **MM62,** Mangenot & Mangenot, 1962; **S62,** Shibata, 1962; **SV99,** Seijo & Vanni, 1999; **V83,** Vanni, 1983.

The tribe Dalbergieae s.l. (Klitgaard & Lavin, 2005) comprises ca. 1325 species in 49 genera occurring in the tropical regions. As frequently observed in neotropical plant families, the chromosome numbers in Dalbergieae are poorly known. In the genus *Aeschynomene* L., the chromosome number is known for 24 out of 160 species, in *Dalbergia* L.f. for 27 out of 287 species, in *Machaerium* Pers. for 18 out of 157 species, in *Geoffroea* Spreng. for 1 out of 5 species, and in *Zornia* J.F.Gmel. for 9 out of 86 species. However, *Stylosanthes* Sw. is a special case with 60% of its species with determined chromosome numbers (27 out of 47 species) (The Plant List, 2013; Rice & al., 2014).

To clarify whether karyotypes are taxonomically informative in Dalbergieae and which mechanisms are involved in karyotype evolution, we determined the chromosome numbers for 20 species from 6 genera, *Aeschynomene*, *Dalbergia*, *Geoffroea*, *Machaerium*, *Stylosanthes* and *Zornia*, and compared the total karyotype length (TKL) among *Aeschynomene*, *Dalbergia* and *Machaerium* species. When possible, multiple populations per species were analysed. Methods for chromosome preparation followed Guerra & Souza (2002). The best metaphases were photographed under a Olympus BX51 microscope using camera CCD digital Evolution MT and software Image ProPlus v.6 (Media Cybernetics). The chromosome size was determined using Adobe Photoshop CS4 (Adobe Systems) and TKLs were analysed using ANOVA test, followed by Tukey's test ($\alpha = 0.05$). Graphs were designed using boxplot in BioEstat 5.0 (Ayres & al., 2007).

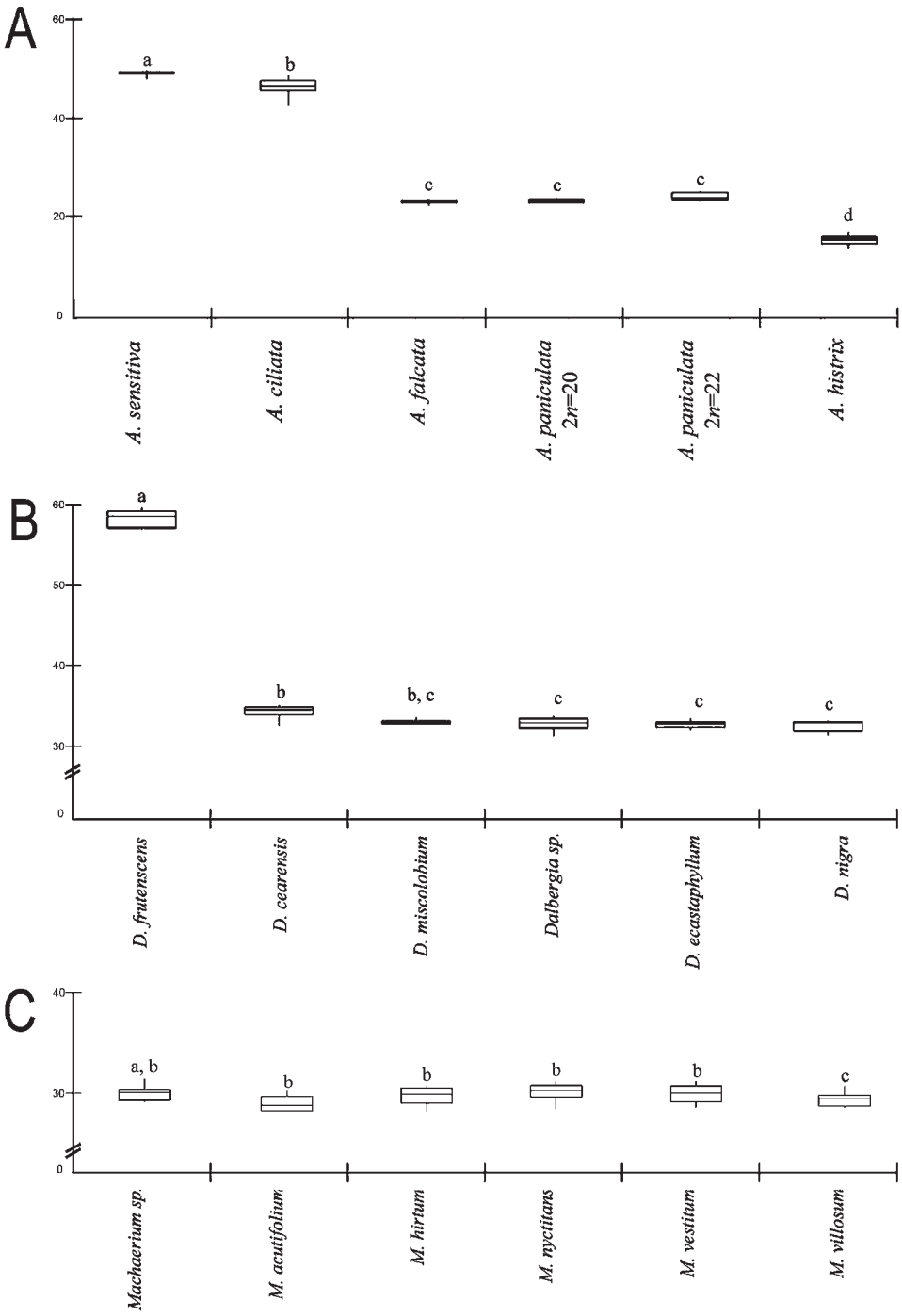

Fig. 13. Total karyotype length in: **A,** *Aeschynemene*; **B,** *Dalbergia*; **C,** *Machaerium*. The boxplot indicates the mean value (line inside the box) and variation around the mean (perpendicular bars). Different letters above boxplots indicate significant differences in TKL ($P \leq 0.05$).

The chromosome counts for 5 out of 20 species are ascertained for the first time (*Aeschynomene ciliata* [Fig. 11A], *Dalbergia frutescens* [Fig. 12B], *D. miscolobium* [Fig. 12C], *Geoffroea striata* [Fig. 12E–F] and *Machaerium vestitum* [Fig. 12I]). For four other species (*Aeschynomene histrix* [Fig. 11C], *A. sensitiva* [Fig. 11F], *Machaerium hirtum* [Fig. 12G] and *M. nyctitans* [Fig. 12H]) our data disagreed with previously published data, which may indicate the occurrence of multiple cytotypes (individuals from the same species, but with different chromosome numbers), so frequent in species from tribe Dalbergieae. The most frequent chromosome number was $2n = 20$, but in *Aeschynomene* four species presented $2n = 22$ (Fig. 11), with, at least, three of them representing different cytotypes (Table 1). Polyploid species with $2n = 40$ were observed twice: in *Geoffroea striata* (Fig. 12E–F) and *Stylosanthes hamata* (Fig. 12H), representing cytotype variation in *G. striata* ($2n = 20/40$).

The chromosomes size varied from 0.36 µm in *A. histrix* to 4.1 µm in *A. ciliata*. Such variation was also reflected in the total karyotype length (TKL) – from 14.6 µm in *A. histrix* to 58.20 µm in *D. frutescens* (Table 2). *Aeschynomene* presented the largest interspecific variation (Fig. 13A), followed by *Dalbergia* (Fig. 13B) and no variation was observed among *Machaerium* species (Fig. 13C). Mercado-Ruaro & Delgado-Salinas (1998) considered that TKL differences among species in *Phaseolus* L. were correlated with chromosome rearrangements, e.g., aneuploidy, and with the variation of heterochromatic blocks in the karyotype. Since the TKL variation observed in *Aeschynomene* does not seem to be related with aneuploidy and no big heterochromatic blocks are observed in the chromosomes (C.A. Polido, unpub. data), the TKL variation should be caused by accumulation of disperse repetitive DNA sequences, especially in *A. ciliata* and *A. sensitiva* (Table 2). On the other hand, *A. histrix*, with the lowest chromosome numbers and TKL, should have the lowest accumulation of disperse repetitive DNA sequences. The TKL variation observed in *Dalbergia*, a genus without aneuploid variation, is also due to accumulation of disperse repetitive DNA sequences that should have increased the chromosome size, especially in *D. frutescens*.

The chromosome number in Dalbergiae is quite conserved, $2n = 20$ being frequently observed. Numerical chromosome rearrangements, such as polyploidy and aneuploidy, seem to be frequent in the tribe. Polyploid species and multiple cytotypes were reported more frequently in the following genera: *Aeschynomene* (5 spp. with $2n = 40$, 1 with $2n = 80$ and 3 aneuploid cytotypes; Rice & al., 2014), *Machaerium* (1 polyploid sp. plus 2 with additional polyploid cytotype; Rice & al., 2014) and *Stylosanthes* (3 spp. with $2n = 40$, 1 with $2n = 60$ and 3 spp. with $2n = 20/40$ cytotypes; Rice & al., 2014). The aneuploid variation was reported in a lower frequency in *Aeschynomene* (*A. aspera* L. with $n = 18$ and 19 and *A. indica* L. with $n = 19$, plus the aneuploidies observed here in *A. sensitiva* and *A. paniculata*, both with $2n = 20/22$ cytotypes), *Dalbergia* (*D. volubilis* Roxb. with $2n = 20/22$ cytotypes) and *Zornia* (*Z. diphylla* (L.) Pers. and *Z. sericea* Moric presenting $2n = 20/22$ cytotypes) (Rice & al., 2014).

Two of the polyploid species observed here, *Stylosanthes hamata* and *Geoffroea striata*, occurred in the Chaco vegetation, a region with extreme environmental conditions, presenting high temperature variation and prolonged dry season. Our data agrees with the Stebbins's (1971) suggestion about the occurrence of polyploid cytotypes related with extreme environmental conditions. The aneuploid variation also presented relation with extreme environmental as the *Aeschynomene paniculata* cytotype with $2n = 22$ came from Chaco vegetation.

Based on chromosome data available to Dalbergieae, we could confirm base chromosome number $x = 10$, as already suggested by Goldblatt (1981). However, considering the large karyotype variability observed among genera, such information does not help in the taxonomic delimitation of Dalbergieae. Ribeiro & al. (2007), based on sequences of chloroplast and nuclear DNA, suggested the separation of *Aeschynomene* sect. *Ochopodium* in a new genus, which is not supported by karyotype data. The genera *Dalbergia* and *Machaerium* presented a conserved intrageneric karyotype, with no clear differential karyotype characteristics for each genus.

The Dalbergieae chromosome numbers seem to confirm the aneuploidy and polyploidy as the two principal chromosome rearrangements involved in karyotype evolution of Dalbergieae, with ca. 16.7% of species presenting aneuploid/polyploid cytotypes. However, despite the frequent occurrence of aneuploidy and polyploidy, the accumulation of repetitive DNA, increasing the TKL, probably affecting the genome size, seem to be crucial in species diversification in Dalbergieae tribe and, probably even more relevant than the numerical chromosome rearrangements in its karyotype evolution.

Literature cited

Ayres, M., Ayres, M., jun., Ayres, D.L. & Santos, A.A.S. 2007. Bio-estat: Aplicações estatísticas nas áreas das ciências bio-médicas. Belém, Pará: ONG Mamiraua. http://www.mamiraua.org.br/pt-br/downloads/programas/bioestat-versao-53/ (accessed 26 Jul 2015).

Bandel, G. 1974. Chromosome numbers and evolution in the Leguminosae. *Caryologia* 27: 17–32.

Berger, C.A., Witkus, E.R. & McMahon, R.M. 1958. Cytotaxonomic studies in the Leguminosae. *Bull. Torrey Bot. Club* 85: 405–414. http://dx.doi.org/10.2307/2483163

Coleman, J.R. 1982. Chromosome numbers of angiosperms collected in the state of São Paulo. *Revista Brasil. Genet.* 5: 533–549. http://hdl.handle.net/11449/30948

Coleman, J.R. & DeMenezes, E.M. 1980. Chromosome number in the Leguminosae from the state of São Paulo, Brazil. *Rhodora* 82: 475–481.

Frahm-Leliveld, J.A. 1957. Chromosome numbers in leguminous plants. *Acta Bot. Neerl.* 9: 327–329. http://dx.doi.org/10.1111/j.1438-8677.1960.tb00662.x

Goldblatt, P. 1981. Cytology and phylogeny of Leguminosae. Pp. 427–463 in: Polhill, R.M. & Raven, P.H. (eds.). *Advances in legume systematics.* Kew: Royal Botanical Gardens.

Guerra, M. & Souza, M.J. 2002. *Como observar cromossomos*: *Um guia de técnicas em citogenética vegetal*, *animal e humana*, 1st ed. Ribeirão Preto: FUNPEC.

Klitgaard, B.B. & Lavin, M. 2005. Dalbergieae sensu lato. Pp. 309–335 in: Lewis, G.P., Schire, B., Mackinder, B. & Lock, M. 2005. *Legumes of the World*. Kew: Royal Botanic Gardens.

Krapovickas, A. & Krapovickas, A.M.F. 1951. Notas citológicas sobre Leguminosas. *Darwiniana* 9: 612–613.

Mangenot, S. & Mangenot, G. 1962. Enquêle surles nombres chromosomiques dans une collection d'espéces tropicales. *Rev. Cytol. Biol. Vég.* 25: 411–447.

Mendonça-Filho, C.V., Forni-Martins, E.R. & Tozzi, A.M.G.A. 2002. New chromosome counts in Neotropical *Machaerium* Pers. species (Fabaceae) and their taxonomic significance. *Caryologia* 55: 111–114. http://dx.doi.org/10.1080/00087114.2002.10589265

Mercado-Ruaro, P. & Delgado-Salinas, A. 1998. Karyotypic studies on species of *Phaseolus* (Fabaceae: Phaseolinae). *Amer. J. Bot.* 85: 1–9. http://dx.doi.org/10.2307/2446547

Miêge, J. 1960. Troisieme liste de nombres chromosomiques d'espéces d'Afrique Occidentale. *Ann. Fac. Sci. Univ. Dakar* 5: 75–85.

Ribeiro, R.A., Lavin, M., Lemos-Filho, J.P., Filho, C.V.M., Santos & F.R., Lovato, M.B. 2007. The genus *Machaerium* (Leguminosae) is more closely related to *Aeschynomene* sect. *Ochopodium* than to *Dalbergia*: Inferences from combined sequence data. *Syst. Bot.* 32: 762–771. http://www.bioone.org/doi/pdf/10.1043/06-79.1

Rice, A., Glick, L., Abadi, S., Einhorn, M., Kopelman, N. M., Salman-Minkov, A., Mayzel, J., Chay, O. & Mayrose, I. 2014. The Chromosome Counts Database (CCDB) – A community resource of plant chromosome numbers. *New Phytol.* 206: 19–26. http://onlinelibrary.wiley.com/doi/10.1111/nph.13191

Seijo, G. & Vanni, R. 1999. Números cromossómicos em leguminosae de Paraguay. *Bol. Soc. Argent. Bot.* 34: 119–122.

Shibata, K. 1962. Estudios citologicos de plantas colombianas silvestres y cultivadas. *J. Agric. Sci.* 8: 49–62.
Stebbins, G.L. 1971. *Chromosomal evolution in higher plants*. Reading: Addison-Wesley.
The Plant List 2013. Version 1.1. http://www.theplantlist.org/ (accessed 10 Jul 2013).
Vanni, R. 1983. Recuentos cromosómicos en Hedysareae (Leguminosae-Papilionoideae). *Bonplandia* 5: 227–233.

Nina S. Probatova,[1]* Sergey G. Kazanovsky,[2] Vyacheslav Yu. Barkalov,[1] Elvira G. Rudyka[1] & Anna V. Shatokhina[3]

1 *Institute of Biology & Soil Science, Far East Branch of the Russian Academy of Sciences, 159 Stoletya Prospect, 690022 Vladivostok, Russia*
2 *Siberian Institute of Plant Physiology & Biochemistry, Siberian Branch of the Russian Academy of Sciences, 132 Lermontov Str., 664033 Irkutsk, Russia*
3 *N.I. Vavilov Institute of General Genetics, Russian Academy of Sciences, 3 Gubkina Str., 119991 Moskva GSP-1, Russia*
* Author for correspondence: *probatova@ibss.dvo.ru*

This study was supported by grants nos. 11-04-00240 (to N.S. Probatova), 12-04-01586 (to A.V. Verkhozina), from the Russian Fund for Basic Research (RFBR), and by Interdisciplinary Integration Project Nr. 17, from the Siberian Branch of the Russian Academy of Sciences.

ACORACEAE

Acorus calamus L.

2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Mikhailovskii Raion, 4 km E of Pavlovka village, former river-bed of the Abramovka River, 17 Sep 2014, *V.T. Lapenko 12683* (VLA).

ASTERACEAE

Artemisia laciniata Willd.

2*n* = 18, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, near Zhemchug village, right riverside of the Irkut River, locality Vyshka, 693 m, grassy-forb meadow, 11 Oct 2011, *S.G. Kazanovsky 12132* (IRK, VLA).

This plant was misidentified as "*Artemisia tanacetifolia*" in Probatova & al. (2012).

Artemisia ledebouriana Besser

2*n* = 18, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, near Zun-Murino village, Biological station of the Siberian Institute of Plant Physiology & Biochemistry, the Khyr-Gorkhon River, 704 m, sandy slope, 25 Sep 2012, *S.G. Kazanovsky 12526* (IRK, VLA).

Artemisia mongolica Fisch. ex Besser

2*n* = 18, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, right riverside of the Margasan River, 5 km S of the summer dwelling house, at the base of abrupt rocky SE slope, 25 Sep 2012, *S.G. Kazanovsky 12506* (IRK, VLA).

Artemisia vulgaris L.

2*n* = 16, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, the valley of the Kharagun River, 9 km S of Okhor-Shibir' village, mineral springs Khangor-Ula, the *Betula*, *Larix* and *Pinus* forb forest edge, 24 Sep 2012, *S.G. Kazanovsky 12505* (IRK, VLA).

Carduus nutans L.

2*n* = 16, CHN. Russia, East Siberia, Irkutskaya Oblast', Tulunskii Raion, near Zausaevo village, on the territory of abandoned farm, 11 Aug 2013, *S.G. Kazanovsky 12517* (IRK, VLA).

Heteropappus hispidus Less.

2*n* = 18, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, right riverside of the Margassan River, 5 km S of the summer dwelling house, the abrupt rocky SE slope, 25 Sep 2012, *S.G. Kazanovsky 12520* (IRK, VLA).

Hieracium veresczaginii Schischk. & Serg.

2*n* = 36, CHN. Russia, East Siberia, Irkutskaya Oblast', Ol'khonskii Raion, left riverside of Zunduk River, mixed valley forest, 8 Aug 2009, *Yu.N. Pochinchik 12509* (IRK, VLA).

Lactuca serriola L.

2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Tret'yakovskii Raion, 17–18 km of Barnaul city, along Chuiskii route, on the roadside near the service station, among ruderal vegetation, 31 Dec 2012, *S.G. Kazanovsky 12496* (IRK, VLA).

Leucanthemum ircutianum DC.

2*n* = 36, CHN. Russia, East Siberia, Irkutskaya Oblast', Slyudyanskii Raion, lower course of the Solzan River, left riverside, on pebbles, 29 Aug 2009, *S.G. Kazanovsky & Yu.N. Pochinchik 12136* (IRK, VLA); Russia, East Siberia, Republic of Buryatia, Pribaikal'skii Raion, Turka settlement, the lakeside of the Baikal Lake, *Pinus sibirica* forest with *Bergenia crassifolia,* 11 Sep 2004, *V.V. Chepinoga 9423* (VLA).

The specimen *12136* was misidentified as "*Leucanthemum vulgare*" in Probatova & al. (2012).

Nabalus ochroleucus Maxim.

2*n* = 16, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, the Reid Pallady Gulf, Mt. Mramornaya, forb meadow on the slope, 16 Jun 2014, *V.Yu. Barkalov 12624* (VLA).

Paraixeris serotina (Maxim.) Tzvelev

2*n* = 10, CHN. Russia, Far East, Amurskaya Oblast', Blagoveshchenskii Raion, right riverside of Zeya River, near the base of the Blagoveshchenskii State Pedagogical University, 30 Aug 2013, *T.V. Stupnikova 12564* (VLA).

Picris canescens (Steven) V.N.Vassil.

2*n* = 10+0–2B, CHN. Russia, North Caucasus, Krasnodarskii Krai, Abinskii Raion, outskirts of Abinsk town, as a weed at the road, 6 Sep 2009, *N.S. Probatova & V.P. Seledets 11476* (VLA).

Picris davurica Fisch. ex Hornem.

2*n* = 10, CHN. Russia, Far East, Khabarovskii Krai, Komsomol'skii Raion, Komsomol'sk-na-Amure city, on the waste ground in vicinity of the Drama theatre, 25 Jul 1998, *S.V. Babkina 7791* (VLA).

Saussurea pulchella Fisch. ex Colla

2*n* = 26, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Voznessenka village, 731 m, the grassy-forb meadow steppe, 29 Aug 2013, *S.G. Kazanovsky 12504* (IRK, VLA).

Saussurea salicifolia DC.

2*n* = 26+0–4B, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Gornyi Zerentui village, 613 m, tiff ridges of rocky shows on the top of a mountain, 29 Aug 2013, *S.G. Kazanovsky 12508* (IRK, VLA).

Saussurea subacaulis (Ledeb.) Serg.

2*n* = 52, CHN. Russia, East Siberia, Republic of Buryatia, Okinskii Raion, East Sayan, upper course of the Oka River, right riverside, 1873 m, swampy meadow, 29 Aug 2010, *S.G. Kazanovsky 11746* (IRK, VLA).

Serratula coronata L.
2*n* = 22, CHN. Kazakhstan, near Alma-Ata city, Bol'shoe Alma-Atinskoe canyon, 1700−1800 m, 2 Sep 1988, *N.S. Probatova & V.P. Seledets 6879* (VLA).

Tephroseris palustris (L.) Rchb.
2*n* = 48, CHN. Russia, East Siberia, Zabaikal'skii Krai, Ononskii Raion, the Barun-Torey Lake, Kulusutai village, 624 m, the bottom of dried up lake, near the small lake, 18 Jul 2010, *S.G. Kazanovsky 12480* (IRK, VLA).

Tripolium vulgare Nees
2*n* = 18, CHN. Russia, East Siberia, Zabaikal'skii Krai, Borzinskii Raion, in vicinity of Borzya town, 668 m, the lakeside of saline lake, 30 Aug 2013, *S.G. Kazanovsky 12515* (IRK, VLA).

Youngia tenuifolia (Willd.) Babc. & Stebbins
2*n* = 10, CHN. Russia, West Siberia, Republic of Altai, Chemal'skii Raion, Chemal town, right riverside of the Katun' River, between Patmos Isl. and Chemal'skaya hydroelectric power station, 435 m, rocky slope, covered with forest vegetation, on the rocks, 30 Aug 2012, *S.G. Kazanovsky 12563* (IRK, VLA).

BRASSICACEAE
Cakile edentula (Bigelow) Hook.
2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, the Reid Pallady Gulf, Mramornaya Bay, coastal sands, 16 Jun 2014, *V.Yu. Barkalov 12616* (VLA).

Dontostemon pinnatifidus (Willd.) Al-Shehbaz & H.Ohba
2*n* = 14, CHN. Russia, East Siberia, Republic of Buryatia, Okinskii Raion, the route Mondy–Orlik, East Sayan, the upper part of the Irkut River, right riverside, 1619 m, rubbly slide-rocks, 28 Aug 2010, *S.G. Kazanovsky 12499* (IRK, VLA).

Hesperis sibirica subsp. *pseudonivea* (Tzvelev) A.L.Ebel
2*n* = 14, CHN. Russia, West Siberia, Republic of Altai, Chemal'skii Raion, Chemal town, right riverside of the Katun' River, between Patmos Isl. and Chemal'skaya hydroelectric power station, 435 m, rocky slope, on the rocks, 30 Aug 2012, *S.G. Kazanovsky 12495* (IRK, VLA).

Neuroloma nudicaule DC.
2*n* = 14, CHN. Russia, East Siberia, Irkutskaya Oblast', Kachugskii Raion, Baikalo-Lenskii nature reserve, right riverside of the Chanchur River, 664 m, stony SW slope, 11 Jul 2012, *N.V. Stepantsova & E.S. Prelovskaya 12521* (IRK, VLA).

CAMPANULACEAE
Adenophora gmelinii Fisch.
2*n* = 68, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Voznessenka village, 731 m, the grassy-forb meadow steppe, 29 Aug 2013, *S.G. Kazanovsky 12527* (IRK, VLA).

Platycodon grandiflorus A.DC.
2*n* = 18, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Voznessenka village, 731 m, the grassy-forb meadow steppe, 29 Aug 2013, *S.G. Kazanovsky 12510* (IRK, VLA).

CARYOPHYLLACEAE
Neoussuria aprica (Turcz. ex Fisch. & C.A.Mey.) Tzvelev
2*n* = 24, CHN. Russia, East Siberia, Zabaikal'skii Krai, Borzinskii Raion, in vicinity of Borzya town, 708 m, ruderal plant community, 28 Aug 2013, *S.G. Kazanovsky 12511* (IRK, VLA).

Pseudostellaria heterophylla (Miq.) Pax
2*n* = 32, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, near the Ptich'e Lake, Mt. Priozernaya, stony slope, at the rocks, among shrubs under forest canopy, 17 Jun 2014, *V.Yu. Barkalov 12664* (VLA).

Stellaria longifolia Muhl. ex Willd.
2*n* = 26, CHN. Russia, East Siberia, Irkutskaya Oblast', Shelekhovskii Raion, near Bol'shoi Lug village, the Olkha River, 482 m, at forest road, 19 Aug 2012, *S.G. Kazanovsky 12708* (IRK, VLA).

DIPSACACEAE
Scabiosa ochroleuca L.
2*n* = 16, CHN. Russia, West Siberia, Republic of Altai, Ongudaiskii Raion, near Ongudai village, 958 m, stony S steppe slope, 30 Aug 2012, *S.G. Kazanovsky 12497* (IRK, VLA).

IRIDACEAE
Iris uniflora Pall. ex Link
2*n* = 48, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, upper course of the Nezhinka River, Ploskii mountain ridge, stony slope along the watershed, 23 May 2014, *V.Yu. Barkalov 12574* (VLA).

LAMIACEAE
Dracocephalum peregrinum L.
2*n* = 12, CHN. Russia, West Siberia, Republic of Altai, Ongudaiskii Raion, near Ongudai village, 958 m, stony S slope with steppe vegetation, 30 Aug 2012, *S.G. Kazanovsky 12498* (IRK, VLA).

Meehania urticifolia Makino
2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, middle course of the Nezhinka River, valley forest, 24 May 2014, *V.Yu. Barkalov 12571* (VLA).

Mentha canadensis L.
2*n* = 36, CHN. Russia, Far East, Khabarovskii Krai, right riverside of the Ussuri River, 5th km of the route Bychikha–Kazakevichevo, moist places along the forest road, 30 Aug 1993, *N.S. Probatova & V.P. Seledets 7161* (VLA).

LINACEAE
Linum baicalense Juz. (*L. sibiricum* auct., non DC.)
2*n* = 18, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Nerchinskii Zavod settlement, 582 m, the grassy-forb steppe with *Bromopsis* and legumes, 29 Aug 2013, *S.G. Kazanovsky 12513* (IRK, VLA).

PAPAVERACEAE
Hylomecon vernalis Maxim.
2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, middle course of the Nezhinka River, valley forest, 24 May 2014, *V.Yu. Barkalov 12592* (VLA).

Papaver popovii Sipliv.
2*n* = ca. 56, CHN. Russia, East Siberia, Irkutskaya Oblast', Bratsk city, the dam of the hydroelectric power station, rocks on the right riverside of the Angara River, 19 Jul 2011, *O.A. Chernysheva 12477* (IRK, VLA).

POACEAE
Achnatherum confusum (Litv.) Tzvelev
2*n* = 24, CHN. Russia, East Siberia, Zabaikal'skii Krai, Dul'durginskii Raion, near Ara-Ilya village, the cordon of national park "Alkhanai", locality Dybyksa, abrupt slope, stony steppe, 21 Jul 2010, *S.G. Kazanovsky 225* (IRK, VLA).

Achnatherum sibiricum (L.) Keng ex Tzvelev

2*n* = 24, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Nerchinskii Zavod settlement, 534 m, abrupt stony S slope, stony steppe, 29 Aug 2013, *S.G. Kazanovsky & E.A. Bondarevich 12523* (IRK, VLA).

Deschampsia cespitosa (L.) P.Beauv.

2*n* = 26, CHN. Russia, East Siberia, Republic of Buryatia, Kabanskii Raion, Tankhoi settlement, 500 m alt., grassy-forb meadow, 15 Aug 2011, *S.G. Kazanovsky 11952* (IRK, VLA).

Elymus gmelinii (Ledeb.) Tzvelev

2*n* = 28, CHN. Russia, East Siberia, Irkutskaya Oblast', Tulunskii Raion, Zaussaevo village, right riverside of the Kurzanka River, abrupt slope to the river, 11 Aug 2013, *S.G. Kazanovsky 12529* (IRK, VLA).

Eragrostis suaveolens Becker ex Claus

2*n* = 40, CHN. Russia, East Siberia, Zabaikal'skii Krai, Borzinskii Raion, Borzya town, 708 m, Karl Marx Street, building 73, ruderal plant community at the riverside, 28 Aug 2013, *S.G. Kazanovsky 12518* (IRK, VLA).

Festuca ovina L.

2*n* = 14, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, the Reid Pallady Gulf, Mt. Mramornaya, stony slope, 16 Jun 2014, *V.Yu. Barkalov 12644* (VLA).

Poa palustris L.

2*n* = 28, CHN. Russia, East Siberia, Irkutskaya Oblast', Irkutsk city, near Akademgorodok, left riverside of the Angara River, 423 m, sandy-pebbly bank, 15 Sep 2013, *S.G. Kazanovsky & V.V. Domrachev 12470* (IRK, VLA).

PRIMULACEAE

Androsace maxima L.

2*n* = 40, CHN. Russia, West Siberia, Republic of Altai, Ongudaiskii Raion, between Kupchegen' and Malyi Yaloman villages, left riverside of the Katun' River, 680 m, stony steppe with *Caragana*, *Artemisia* and various herbs, 25 Jun 2013, *S.G. Kazanovsky 12516* (IRK, VLA).

RANUNCULACEAE

Ranunculus natans C.A.Mey.

2*n* = 16, CHN. Russia, East Siberia, Republic of Buryatia, the Tunkinskaya valley, the mouth of the Belyi Irkut River, left riverside, 1550 m, in water, 29 Aug 2010, *S.G. Kazanovsky & E.S. Prelovskaya 220* (IRK, VLA).

ROSACEAE

Coluria geoides Ledeb.

2*n* = 14, CHN. Russia, West Siberia, Republic of Altai, Ongudaiskii Raion, between Kupchegen' and Malyi Yaloman villages, left riverside of the Katun' River, 799 m, stony SW slope with grassy-forb steppe vegetation, 25 Jun 2013, *S.G. Kazanovsky 12512* (IRK, VLA).

Potentilla stolonifera Lehm. ex Ledeb.

2*n* = 14, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, the Reid Pallady Gulf, Mramornaya Bay, sandy-pebbly marine terrace, 16 Jun 2014, *V.Yu. Barkalov 12640* (VLA).

Potentilla tanacetifolia Willd. ex D.F.K.Schltdl.

2*n* = 28, CHN. Russia, East Siberia, Zabaikal'skii Krai, Nerchinsko-Zavodskii Raion, near Voznessenka village, 731 m, the grassy-forb meadow steppe, 29 Aug 2013, *S.G. Kazanovsky 12519* (IRK, VLA).

Sibiraea altaiensis (Laxm.) Schneider

2*n* = 16, CHN. Russia, West Siberia, Republic of Altai, Ust'-Kanskii Raion, near Yaboganskii Pass, between Oro and Verkhneye Elo villages, 1282 m, among shrubs in the steppe, 23 Jun 2013, *S.G. Kazanovsky 12503* (IRK, VLA).

Spiraea humilis Pojark.

2*n* = 36, CHN. Russia, Far East, Khabarovskii Krai, Verkhnebureinskii Raion, outskirts of Chegdomyn settlement, *Larix* forest edge, among shrubs, 22 Aug 2014, *V.V. Yakubov 12707* (VLA).

Spiraea sericea Turcz.

2*n* = 18, CHN. Russia, East Siberia, Zabaikal'skii Krai, Mogochinskii Raion, near Pokrovka village, left riverside of the Amur River, 410 m, dry rocky slope with steppe vegetation, 9 Jul 2011, *S.G. Kazanovsky* 209 (IRK, VLA).

RUBIACEAE

Galium verum L.

2*n* = 22, CHN. Russia, West Siberia, Novossibirskaya Oblast', 10 km of Novossibirsk city, Kamenka village, Aug 2000, *V.N. Kapustina 8386* (VLA).

SOLANACEAE

Solanum nigrum L.

2*n* = 72, CHN. Russia, East Siberia, Irkutskaya Oblast', Ussol'skii Raion, near Zheleznodorozhnyi settlement, as a weed in potato plantation, 30 Aug 2012, *N.V. Dorofeev 12522* (IRK, VLA).

SPARGANIACEAE

Sparganium coreanum H.Lév.

2*n* = 30, CHN. Russia, Far East, Primorskii Krai, Dal'negorskii Raion, the road from Monomakhovo village to Rudnaya Pristan' settlement, the former river-bed in the Rudnaya River flood plain, 17 Sep 1985, *N.S. Probatova, V.P. Seledets & G.M. Gulariants 6573* (VLA).

Literature cited

Probatova, N.S., Kazanovsky, S.G., Shatokhina, A.V., Rudyka, E.G., Verkhozina, A.V. & Krivenko, D.A. 2012. [Reports]. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 14. *Taxon* 61: 1342–1344, E23–E28.

Nina S. Probatova,[1]* Elvira G. Rudyka,[1] Denis A. Krivenko,[2] Alla V. Verkhozina[2] & Vitaly A. Nechaev[1]

1 *Institute of Biology & Soil Science, Far East Branch of the Russian Academy of Sciences, 159 Stoletya Prospect, 690022 Vladivostok, Russia*

2 *Siberian Institute of Plant Physiology & Biochemistry, Siberian Branch of the Russian Academy of Sciences, 132 Lermontov Str., 664033 Irkutsk, Russia*

* Author for correspondence: *probatova@ibss.dvo.ru*

This study was supported by grants nos. 11-04-00240 (to N.S. Probatova), 12-04-01586 (to A.V. Verkhozina), and 14-44-04105 (to D.A. Krivenko), from the Russian Fund for Basic Research (RFBR), and by Interdisciplinary Integration Project Nr. 17, from the Siberian Branch of the Russian Academy of Sciences.

ASTERACEAE

Cichorium intybus L.

2*n* = 18, CHN. Russia, East Siberia, Irkutskaya Oblast', Nizhne-Ilimskii Raion, near Khrebtovaya settlement, 592 m, forb meadow at the road, 14 Aug 2012, *A.V. Verkhozina 12494* (IRK, VLA).

Cirsium setosum M.Bieb.
2*n* = 34, CHN. Russia, East Siberia, Irkutskaya Oblast', Irkutsk city, left riverside of the Angara River, near the road fork of Akademicheskii bridge, 436 m, in shrubs, ruderal community, 19 Jul 2012, *A.V. Verkhozina & D.A. Krivenko 12501* (IRK, VLA).

Conyza crispa Rupr.
2*n* = 18, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Tsandripsh settlement, near the health centre Psou, ruderal community at the dwelling, 23 Jul 2013, *D.A. Krivenko 12536* (IRK, VLA).

Filifolium sibiricum (L.) Kitam.
2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Khankaiskii Raion, near Turii Rog settlement, shrub-grass community, 11 Jul 2010, *V.A. Nechaev 11632* (VLA).

Tragopogon orientalis L.
2*n* = 12, CHN. Russia, East Siberia, Irkutskaya Oblast', Irkutsk city, the Angara River, left riverside, near Akademicheskii bridge, 436 m, ruderal community among shrubs, 19 Jul 2012, *A.V. Verkhozina & D.A. Krivenko 12558* (IRK, VLA).

BORAGINACEAE
Lappula redowskii (Hornem.) Greene
2*n* = 24, CHN. Russia, East Siberia, Irkutskaya Oblast', Ol'khonskii Raion, the Baikal Lake, Ol'khon Island, locality Peschanka, 467 m, on sands, 17 Aug 2012, *D.A. Krivenko 12543* (IRK, VLA).

BRASSICACEAE
Cakile edentula (Bigelow) Hook.
2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, Gamova Peninsula, Astaf'eva Bay, sandy beach, 19 Oct 2013, *D.A. Krivenko 12535* (VLA).

Cardamine trifida (Lam. ex Poir.) B.M.G.Jones
2*n* = 48, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, in vicinity of Tavrichanka settlement, the coast of Amurskii Bay, a wood of *Alnus japonica*, 2 May 2014, *V.A. Nechaev 12555* (VLA).

Erucastrum armoracioides Litv.
2*n* = 30, CHN. Russia, East Siberia, Irkutskaya Oblast', Nukutskii Raion, Bratskoe reservoir, near Nukuty village, shore of Zalari Bay, 400 m, 27 Aug 2008, *A.V. Verkhozina & S.G. Kazanovsky 12514* (IRK, VLA).

Lepidium texanum Buckley
2*n* = 16, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Gegskii waterfall, N spur of the Gagrskii mountain ridge, left side of the Gega River valley, 6 km of its confluence with Yupshara River, 530 m, ruderal community in the ravine, 23 Jul 2013, *D.A. Krivenko 12532* (IRK, VLA).

CAMPANULACEAE
Adenophora remotiflora Miq.
2*n* = 34, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, 10 km W of Razdol'noe settlement, the upper course of a mountain river, broadleaved forest with *Pinus koraiensis*, 2 Aug 2014, *V.A. Nechaev 12676* (VLA).

CANNABACEAE
Cannabis sativa L.
2*n* = 20, CHN. Russia, East Siberia, Irkutskaya Oblast', Ust'-Ordynskii Buryatskii Natsional'nyi Okrug, Erikhit-Bulagatskii Raion, 51-th km of the Kachugskii tract, 9 km SE of Zady village, forb-grass meadow-steppe, 16 Aug 2011, *D.A. Krivenko 12542* (IRK, VLA).

CARYOPHYLLACEAE
Moehringia lateriflora Fenzl
2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, near Tavrichanka settlement, *Betula* and *Quercus* forest, 17 May 2014, *V.A. Nechaev 12611* (VLA).

CHENOPODIACEAE
Corispermum ulopterum Fenzl ex Ledeb.
2*n* = 18, CHN. Russia, East Siberia, Irkutskaya Oblast', Ol'khonskii Raion, the Baikal Lake, Ol'khon Island, locality Peschanka, 467 m, on sands, 17 Aug 2012, *D.A. Krivenko 12544* (IRK, VLA).

Kochia densiflora Turcz. ex Moq.
2*n* = 18, CHN. Russia, East Siberia, Republic of Buryatia, outskirts of Ulan-Ude city, right riverside of the Selenga River, near the buddhists' temple "Rhinpoche Baksha", 730 m, abrupt slope near the car park, 26 Sep 2013, *D.A. Krivenko 12538* (IRK, VLA).

EPHEDRACEAE
Ephedra pseudodistachya Pachom.
2*n* = 28, CHN. Kazakhstan, Pavlodarskaya Oblast', Bayanaul'skii Raion, near the Birzhankol' Lake, 402 m, stony feather-grass steppe, 25 Jun 2013, *D.A. Krivenko 12549* (IRK, VLA).

EUPHORBIACEAE
Euphorbia paralias L.
2*n* = 16, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Tsandripsh settlement, the coast of the Black Sea, sandy-pebbly beach, 20 Jul 2013, *D.A. Krivenko 12531* (IRK, VLA).

POACEAE
Agrostis trinii var. *inermis* Tzvelev
2*n* = 28, CHN. Russia, Far East, Primorskii Krai, Oktyabr'skii Raion, Novogeorgievka village, sandy riverside of the Razdol'naya (Suifun) River, 7 Jul 2012, *V.A. Nechaev 12146* (VLA).

Arctopoa subfastigiata (Trin.) Prob.
2*n* = 42, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, near Tavrichanka settlement, coastal meadow inshore, 25 May 2014, *V.A. Nechaev 12572* (VLA).

Arundinella hirta (Thunb.) Tanaka
2*n* = 34, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, Krabbe Peninsula, seacoast, sandy spit, 16 May 2009, *V.A. Nechaev 11352* (VLA).

Echinochloa spiralis Vasinger
2*n* = 36, CHN. Russia, East Siberia, Irkutskaya Oblast', Ussol'skii Raion, Ussol'ye-Sibirskoe town, 442 m, a park near the Culture house "Khimik", overgrown flower-bed, 23 Aug 2008, *A.V. Verkhozina 12046* (IRK, VLA).

Paspalum dilatatum Poir.
2*n* = 40, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Tsandripsh settlement, near the health centre Psou, ruderal grass community, 23 Jul 2013, *D.A. Krivenko 12533* (IRK, VLA).

Poa skvortzovii Prob.
2*n* = 28, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, Krabbe Peninsula, rocky slope to the sea, 16 May 2009, *V.A. Nechaev 11345* (VLA).

Setaria pumila (Poir.) Roem. & Schult.
2*n* = 36, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, near Shimki village, right riverside of the Bol'shaya Taiturka River – right tributary of the Irkut River, 776 m, high carbonate river bank, 12 Aug 2012, *D.A. Krivenko 12545* (IRK, VLA).

Setaria viridis (L.) P.Beauv.
2*n* = 18, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Tsandripsh settlement, near the health centre Psou, ruderal grass community, 23 Jul 2013, *D.A. Krivenko 12547* (IRK, VLA)

POLYGONACEAE
Aconogonon sericeum (Pall.) Hara
2*n* = 60, CHN. Russia, East Siberia, Irkutskaya Oblast', Ol'khonskii Raion, the Baikal Lake, Ol'khon Island, locality Peschanka, 467 m, on sands, 17 Aug 2012, *D.A. Krivenko 12541* (IRK, VLA).

Persicaria lapathifolia (L.) Gray
2*n* = 22, CHN. Russia, East Siberia, Irkutskaya Oblast', Irkutsk city, Akademgorodok, at the building 277, 451 m, ruderal community, 22 Aug 2013, *D.A. Krivenko 12550* (IRK, VLA).

Persicaria maculosa Gray
2*n* = 40, CHN. Russia, East Siberia, Irkutskaya Oblast', Slyudyanskii Raion, SE outskirts of Solzan settlement, near the bridge on the Bol'shaya Ossinovka River, right riverside, 484 m, at the water edge, abundant, 22 Aug 2013, *A.V. Verkhozina 12507* (IRK, VLA).

PRIMULACEAE
Anagallis arvensis L.
2*n* = 40, CHN. Georgia, Autonomous Republic of Abkhazia, Gagrskii Raion, Tsandripsh settlement, near the health centre Psou, abandoned garden, 22 Jul 2013, *D.A. Krivenko 12530* (IRK, VLA).

Androsace amurensis Prob.
2*n* = 20, CHN. Russia, East Siberia, Irkutskaya Oblast', Ust'-Ordynskii Buryatskii Okrug, Ossinskii Raion, the Bratskoe reservoir, Obussa Bay, near Kutanka village, 451 m, W slope, the grass-sedge-forb steppe, 26 Jun 2010, *D.A. Krivenko 12441* (IRK, VLA).

ROSACEAE
Potentilla argentea L.
2*n* = 28, CHN. Russia, Far East, Primorskii Krai, Shkotovskii Raion, 1 km of Shkotovo settlement, disturbed dry meadow, 2 Jul 2006, *V.A. Nechaev 10303* (VLA).

Potentilla pacifica Howell
2*n* = 42, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, near Tavrichanka settlement, coastal meadow inshore, 25 May 2014, *V.A. Nechaev 12585* (VLA).

Potentilla semiglabra Juz.
2*n* = 28, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, near Schmidtovka village, the coast of Amurskii Bay, 17 Jun 2006, *V.A. Nechaev 10278* (VLA).

SOLANACEAE
Physalis franchetii Mast.
2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, 10 km W of Razdol'noe settlement, at the edge of broadleaved forest with *Pinus koraiensis*, 2 Aug 2014, *V.A. Nechaev 12675* (VLA).

VIOLACEAE
Viola rupestris F.W.Schmidt
2*n* = 20, CHN. Russia, East Siberia, Republic of Buryatia, Tunkinskii Raion, near Shimki village, right riverside of the Bol'shaya Taiturka River – right tributary of the Irkut River, 776 m, high carbonate river bank, 12 Aug 2012, *D.A. Krivenko 12554* (IRK, VLA).

María V. Romero-da Cruz* & Eliana R. Forni-Martins

Laboratório de Biossistemática e Polinização, Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, Rua Monteiro Lobato 255, Cidade Universitária Zeferino Vaz, 13083-862 Campinas, SP, Brasil
* Author for correspondence: *romero.mariav@gmail.com*

Financial support from CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico, nos. 162582/2013-7 and 306142/2011/2) from wich M.V. Romero-da Cruz is a postdoctoral fellow and FAEPEX (Fundo de Apoio ao Ensino, à Pesquisa e Extensão, no. 1182/13).

SOLANACEAE
Capsicum chinense Jacq.
2*n* = 24, CHN. Brasil, Roraima, Cantá, in open areas of Amazon rainforest, 02°30′52.2″ N, 60°47′48.5″ W, 87 m, 17 Sep 2014, *Maria V. Romero-da-Cruz 9* (UEC). [Figs. 14–15]

Capsicum chinense is one of the five domesticated chilli peppers, with several commercial varieties. The species is native of the South America with center of diversity in the Amazon biome (Pickersgill & al., 1979; Romero, 2013). It grows as herb or shrub with stellate

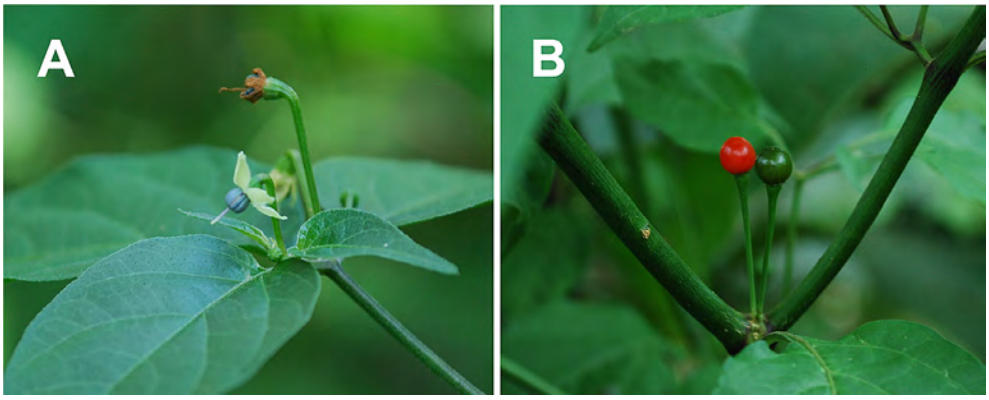

Fig. 14. *Capsicum chinense*: **A,** stellate greenish flower detail; **B,** constriction at the base of the calyx and mature/inmature erect fruit detail.

greenish or white flowers (Fig. 14A), and red fruits (more variable in cultivated forms; Fig. 14B) (Romero, 2013). Its name, *C. chinense*, was given by Jacquin in 1776. Barbosa & al. (2002) identified the first wild specimens of *C. chinense* in Roraima (Brazil), showing the characteristics shared by the wild species of *Capsicum* (e.g., small erect deciduous red fruits) and the presence of constriction at the base of the calyx. This taxon belongs to the *C. annuum* complex (i.e., *C. annuum* L., *C. chinense*, *C. frutescens* L.); however, each of these three species possesses at least one unique characteristic that permits its clear distinction. Thus the same feature should be retained by the domesticated forms (Carvalho & al., 2014). The cytogenetic study of *C. chinense* is only available for the cultivated forms (Moscone & al., 1996; Romero, 2013)

Seeds from a wild *C. chinense* population were germinated and somatic chromosomes were observed in squashed root meristems. For details of preparing mitotic figures by p-dichlorobenzene, fixation, and enzyme maceration see Moscone & al. (1993). Constitutive heterochromatin was analyzed by fluorescence bandings (CMA/DA/DAPI) according to Schweizer & Ambros (1994) and ribosomal loci (rDNA) by fluorescent in situ hybridization (FISH) following the protocol of Schwarzacher & Heslop-Harrison (2000), with minor modifications. We obtained by PCR probes species-specific for in situ hybridization. The 5S and 18S rDNA probes were obtained from total genomic DNA of domesticated *C. chinense* using the primers 5′-GTG CTT GGG CGA GAG TAG TA-3′ and 5′-GGT GCG TTA GTG CTG GTA TG-3′ (Kitamura & al., 2001) and 5′-GTA GTC ATA TGC TTG TCT C-3′ and 5′-CTT CCG TCA ATT CCT TTA AG-3′ (White & al., 1990) respectively. The probes were labelled by *nick translation* with Digoxigenin-11-dUTP and Biotin-14-dATP (Roche). Satellites terminology follows Battaglia (1955) with Moscone & al. (1995) modifications. The satellite length was excluded for calculation of the arm ratio of st chromosomes. For karyotype description, six metaphase plates were measured and chromosomes were arranged in groups according to centromere position and in decreasing order of size within each type. The chromosome terminology follows Levan & al. (1964).

Capsicum chinense presented karyotype formulae 11m+1st chromosomes and haploid karyotype length 53.01 µm. The short arms of pair 12 (*st*) presents a terminal satellite (Fig. 15A, C, D). The karyotype is very similar to those found on commercial varieties of *C. chinense* (Fig. 16) (Romero, 2013).

Capsicum chinense presented small GC-rich regions at the chromosome terminal of short or long arms of four chromosome pairs including the linear satellite of pair #12 and one small intercalary CMA+ band on short arm of a metacentric chromosome pair (Fig. 15A, B). Moreover, this taxon showed absence of DAPI-enhanced chromosomal regions (DAPI+).

The 5S rDNA probe showed two strong hybridization signals in interstitial region, consistent with the intercalary CMA+ band. FISH with 18S rDNA probes showed one signal pair in a sub telocentric chromosome (#12) (Fig. 15C, D).

Many authors have questioned the species status of *C. chinense* (Heiser & Pickersgill, 1969; Pickersgill, 1971; McLeod & al., 1979; Walsh & Hoot, 2001). Perhaps because it is the least known of the five domesticated taxa with respect to center of origin and probable progenitor, some possible candidates have been proposed for the wild ancestor of domesticated *C. chinense*. Pickersgill & al. (1979) indicate two candidates: on the one hand, wild *C. frutescens* and on the other hand a genuine wild form within *C. chinense* with small erect deciduous red fruits and the calyx constrictions. The presence of wild *Capsicum* morphological characters together with karyotypic similarities with domesticated *C. chinense* support the hypothesis of a true wild *C. chinense* as progenitor.

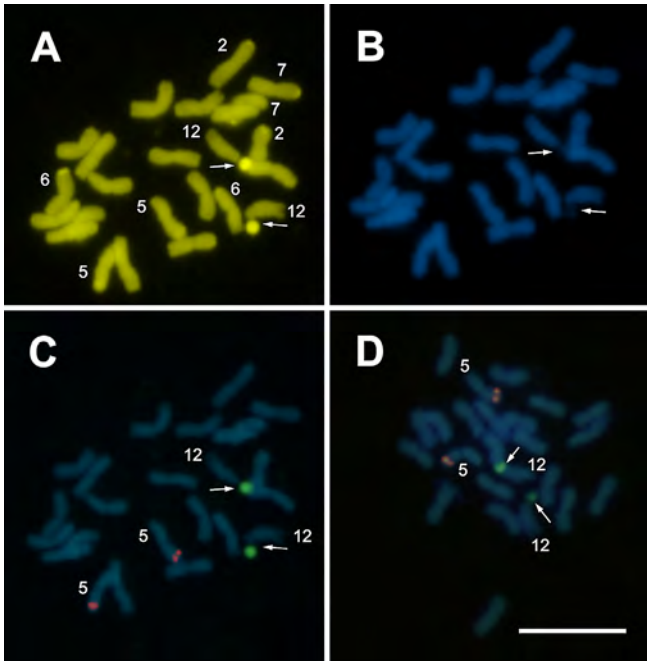

Fig. 15. Somatic chromosomes of *Capsicum chinense*: **A–B,** fluorescent chromosome banding with CMA/DA/DAPI; **A,** CMA/DA fluorescence (yellow); **B,** DA/DAPI fluorescence (blue). Arrows indicate $CMA^+/DAPI^-$ NOR heterochromatin. **C–D,** fluorescent in situ hybridization with 18S (green) and 5S (red) rDNA probe. Arrows indicate 18S and 5S rDNA. Homologous chromosomes are indicated with the same number. — Scale bar = 10 µm.

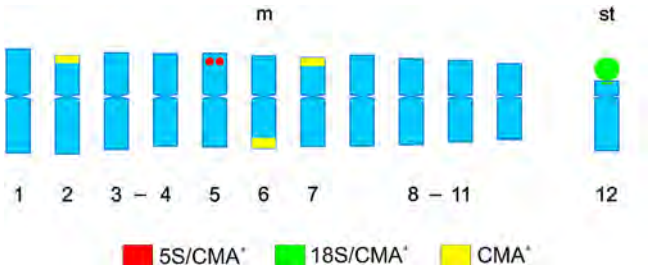

Fig. 16. Idiogram, cytological markers permit to identify five chromosomes pairs. Scale bar = 5 µm.

Literature cited

Battaglia, E. 1955. Chromosome morphology and terminology. *Caryologia* 8: 179–187. http://dx.doi.org/10.1080/00087114.1955.10797556

Barbosa, R.I., Luz, F.J.F., Nascimento Filho, H.R. & Maduro, C.B. 2002. Pimentas do gênero *Capsicum* cultivadas em Roraima, Amazônia Brasileira. I. Espécies domesticadas. *Acta Amazonica* 32: 177–192. http://dx.doi.org/10.1590/S0044-59672007000400011

Carvalho, S.I.C., Ragassi, C.F., Bianchetti, L.B., Reifschneider, F.J.B., Buso, G.S.C. & Faleiro, F.G. 2014. Morphological and genetic relationships between wild and domesticated forms of peppers (*Capsicum frutescens* L. and *C. chinense* Jacquin). *Genet. Molec. Res.* 13: 7447–7464. http://dx.doi.org/10.4238/2014

Heiser, C.B., jr. & Pickersgill, B. 1969. Names for the cultivated *Capsicum* species (Solanaceae). *Taxon* 18: 277–283. http://dx.doi.org/10.2307/1218828

Levan, A., Fredga, L. & Sandberg, A. 1964. Nomenclature for centromeric position on chromosomes. *Hereditas* 52: 201–220. http://dx.doi.org/10.1111/j.1601-5223.1964.tb01953.x

Kitamura, S., Inoue, M., Shikazono, N. & Tanaka, A. 2001. Relationships among *Nicotiana* species revealed by the 5S rDNA spacer sequence and fluorescence in situ hybridization. *Theor. Appl. Genet.* 103: 678–686. http://dx.doi.org/10.1007/s001220100643

McLeod, M.J., Eshbaugh, W.H. & Guttman, S.I. 1979. A pre-liminary biochemical systematic study of the genus *Capsicum*-Solanaceae. Pp. 701–713 in: Hawkes, J.G., Lester, R.N. & Skelding, A.D. (eds.), *The biology and taxonomy of the Solanaceae*. New York: Academic Press.

Moscone, E.A., Lambrou, M., Hunziker, A.T. & Ehrendorfer, F. 1993. Giemsa C-banded karyotypes in *Capsicum* (Solanaceae). *Pl. Syst. Evol.* 186: 213–229. http://dx.doi.org/10.1007/BF00940799

Moscone, E.A., Loidl, J., Ehrendorfer, F. & Hunkiker, A.T. 1995. Analysis of active nucleolus organizing regions in *Capsicum* (Solanaceae) by silver staining. *Amer. J. Bot.* 82: 276–287. http://dx.doi.org/10.2307/2445534

Moscone, E.A., Lambrou, M. & Ehrendorfer, F. 1996. Fluorescent chromosome banding in the cultivated species of *Capsicum* (Solanaceae). *Pl. Syst. Evol.* 202: 37–63. http://dx.doi.org/10.1007/BF00985817

Pickersgill, B. 1971. Relationships between weedy and cultivated forms in some species of chili peppers (genus *Capsicum*). *Evolution* 25: 683–691. http://dx.doi.org/10.2307/2406949

Pickersgill, B., Heiser, C.B. & McNeill, J. 1979. Numerical taxonomic studies on variation and domestication in some species of *Capsicum*. Pp. 679–700. In: Hawkes, J.G., Lester, R.N. & Skelding, A.D. (eds.). *The biology and taxonomy of the Solanaceae*. Linnean Society Symposium Series No. 7. London: Academic Press.

Romero, M.V. 2013. *Caracterización genómica y taxonómica de ajíes del complexo C. annuum (C. annuum, C. chinense, C. frutescens).* Dissertation, Universidad Nacional de Córdoba, Argentina.

Schwarzacher, T. & Heslop-Harrison, P. 2000. *Practical in situ hybridization*. New York: Springer.

Schweizer, D. & Ambros, P.F. 1994. Chromosome banding: Stain combinations for specific regions. Pp. 97–112 in: Gosden, J.R. (eds.), *Chromosome analysis protocols.* Methods in Molecular Biology 29. Totowa: Humana Press. http://dx.doi.org/10.1385/0-89603-289-2:97

Walsh, B.M. & Hoot, S.B. 2001. Phylogenetic relationships of *Capsicum* (Solanaceae) using DNA sequences from two noncoding regions: The chloroplast *atpB-rbcL* spacer region and nuclear *waxy* introns. *Int. J. Pl. Sci.* 162: 1409–1418. http://dx.doi.org/10.1086/323273

White, T.J., Bruns, T., Lee, S. & Taylor, J.W. 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. Pp. 315–322 in: Innis, M.A., Gelfand, D.H., Sninsky, J.J., White, T.J. (eds.), *PCR protocols: A guide to methods and applications*. New York: Academic Press. http://dx.doi.org/10.1016/b978-0-12-372180-8.50042-1

Keir M. Wefferling,* Heather A. Owen & Sara B. Hoot

Department of Biological Sciences, P.O. Box 413, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, U.S.A.
* Author for correspondence: *wefferl2@uwm.edu*

The work was supported by the University of Wisconsin-Milwaukee (UW-M) Graduate School (Distinguished Dissertation Fellowship), UW-M Biological Sciences Department (Ruth Walker Grant-in-Aid Award), the American Society of Plant Taxonomists (R. McVaugh Graduate Student Research Grant), the Native Plant Society of Oregon, and the Washington Native Plant Society (all to KMW). Special thanks to J. Anderson (Jonny Native Seed), A. Bradshaw (Alplains Seeds), M. Majack (Colorado Natural Areas Program), J. Smith (Boise State University), L. Wefferling, and B. Wefferling for seed and plant collections, P. Engevold (UW-M) for help with germination and propagation, and N. Luebke (Milwaukee Public Museum), Q.-E. Yang (Institute of Botany, Chinese Academy of Sciences), A. López (Instituto de Botánica Darwinion), G. Meyer (UW-M), and J. Beck (Wichita State University) for help with chromosome squash technique and protocols.

* New chromosome number (cytotype) for the genus.

RANUNCULACEAE

Caltha leptosepala DC.

* 2*n* = 72, CHN. U.S.A., Idaho State, Custer County, east side Sawtooth Range, Sawtooth National Recreation Area, Elk Meadows, 44°16′00.11″ N, 115°05′41.83″ W, 2060 m, 15 Jun 2015, *K. Wefferling 212rotA* (UWM) [Fig. 17H]; U.S.A., Idaho State, Custer County, east side Sawtooth Range, Sawtooth National Recreation Area, Elk Meadows, 44°16′00.11″ N, 115°05′41.83″ W, 2060 m, 6 Aug 2015, *K. Wefferling 216-4* (UWM) [Fig. 17I].

2*n* = 96, CHN. U.S.A., Idaho State, Valley County, Bear Valley Road (FS579), Boise National Forest, old burned forest along small creek south of Bruce Meadows, 44°22′01.42″ N, 115°16′28.67″ W, 2184 m, 9 Jun 2015, *K. Wefferling JS6* from plants collected by J. Smith (UWM) [Fig. 18D]; U.S.A., Idaho State, Boise County, Salmon River Mountains, Boise National Forest, Canyon Creek at pullout along ID21, 44°17′18.14″ N, 115°13′37.17″ W, 2060 m, 6 Aug 2015, *K. Wefferling 180-1* (UWM) [Fig. 18E]; U.S.A., Idaho State, Idaho County, Square Mountain, edge of Gospel Hump Wilderness, 45°35′45.43″ N, 115°52′58.33″ W, 2260 m, 5 May 2015, *K. Wefferling AB1-1* from seeds collected by A. Bradshaw (UWM) [Fig. 18F]; U.S.A., Oregon State, Hood River County, Mount Hood Wilderness, NW end of Elk Meadows, 45°20′42.9″ N, 121°37′13.90″ W, 1570 m, 15 Jan 2015, *K. Wefferling CR5* (UWM) [Fig. 18C]; U.S.A., Washington State, Kittitas County, Wenatchee Mountains, 47°25′12.0″ N, 120°56′24.0″ W, 1187 m, 13 May 2015, *K. Wefferling WNPS3-1* (UWM) [Fig. 18A]; U.S.A., Washington State, Skamania County, Gifford-Pinchot National Forest, Takhlakh Meadow, 46°16′10.94″ N, 121°35′19.23″ W, 1400 m, 13 May 2015, *K. Wefferling CR3* (UWM) [Fig. 18B].

Caltha leptosepala subsp. *howellii* (Huth) P.G.Sm.

2*n* = 48, CHN. U.S.A., Oregon State, Hood River County, Mount Hood Wilderness, NW end of Elk Meadows, 45°20′42.9″ N, 121°37′13.90″ W, 1570 m, 13 May 2015, *K. Wefferling CR2* (UWM) [Fig. 17F]; U.S.A., Oregon State, Jackson County, Klamath National Forest, Mount Ashland, Pacific Crest Trail, 42°04′35.76″ N, 122°43′04.8″ W, 2012 m, 5 May 2015, *K. Wefferling JNSI-1a* from seeds collected by J. Anderson (UWM) [Fig. 17G]; U.S.A., Washington State, Skamania County, Gifford-Pinchot National Forest, Takhlakh Meadow, 46°16′10.94″ N, 121°35′19.23″ W, 1400 m, 27 Feb 2015, *K. Wefferling CR1* (UWM) [Fig. 17E].

Caltha leptosepala DC. subsp. *leptosepala*

2*n* = 48, CHN. U.S.A., Colorado State, Grand County, Arapaho National Forest, on trail to Lost Lake, 40°17′50.06″ N, 105°57′42.74″ W, 2970 m, 16 Apr 2015, *K. Wefferling MM1-1* from seeds collected by M. Majack (UWM) [Fig. 17D]; U.S.A., Idaho State, Custer County, east side Sawtooth Range, Sawtooth National Recreation Area, Elk Meadows, 44°16′00.11″ N, 115°05′41.83″ W, 2060 m, 27 Feb 2015, *K. Wefferling 212lepto* (UWM) [Fig. 17A]; U.S.A., Idaho State, Custer County, Sawtooth National Recreation Area, south end of Decker Flat, south of junction of FR 315 and FR 037, 44°01′08.56″ N, 114°51′32.01″ W, 2090 m, 27 Feb 2015, *K. Wefferling 276-6* (UWM) [Fig. 17B]; U.S.A., Idaho State, Custer County, Challis National Forest, Pioneer Mountains, at pass between Summit Creek and Right Fork Kane Creek, 43°48′08.89″ N, 114°12′11.43″ W, 2890 m, 16 Apr 2015, *K. Wefferling 299-3* (UWM) [Fig. 17C].

Mitotic chromosomes were counted in metaphase cells from root tips harvested from seedlings (*K. Wefferling 276-6*, *K. Wefferling MM1-1*, *K. Wefferling JNSI-1a*, *K. Wefferling 216-4*, *K. Wefferling WNPS3-1*, *K. Wefferling 180-1*, and *K. Wefferling AB1-1*) or

field-collected plants (*K. Wefferling 212lepto*, *K. Wefferling 299-3*, *K. Wefferling CR1*, *K. Wefferling CR2*, *K. Wefferling 212rotA*, *K. Wefferling CR3*, *K. Wefferling CR5*, and *K. Wefferling JS6*) raised in a growth chamber or windowsill. Root tips were pretreated in 1°C distilled water for ca. 24 h, then fixed in a mixture of 95% ethanol and glacial acetic acid (3 : 1) for 30 min at room temperature (ca. 20°C), then ca. 24 h in a 4°C refrigerator. Pretreated and fixed root tips were stored in a −20°C freezer in 70% ethanol until squashing, as follows: Root tips were hydrolyzed in 60°C 1N hydrochloric acid for 10 min, rinsed for 15 min in 95% ethanol, then transferred to Wittman's (1962) aceto-iron hematoxylin (50 ml 45% acetic acid, 2 g hematoxylin, 0.5 g ferric ammonium sulfate) ca. 45 min to 1 h, destained ca. 5–15 min in glacial acetic acid. The cells were broken apart and spread with a brass rod in Hoyer's solution (Anderson, 1954; 25 ml distilled water, 15 g gum arabic, 100 g chloral hydrate, 10 g glycerol) diluted to 50% strength with distilled water, and covered with a number 1.5 coverslip. The slide was placed on a slide warmer set to 45°C for 30 s, then squashed by hand, and the edges of the coverslip were sealed with clear nail polish.

Slides were inspected on a Nikon Eclipse 80i light microscope and images of countable spreads were captured using a Nikon Plan Apo VC 100×/1.40 oil-immersion lens (except Fig. 18C, D, captured with a Nikon Plan Apo 40x/0.95 lens) with a QImaging Retiga 2000R Fast 1394 digital camera and Q-Capture Pro v.7 software. Images were cropped, and brightness and contrast applied uniformly to the entire image using Adobe Photoshop v.5.5.

Caltha L. is a relatively small genus, comprising 10–12 species widely distributed in both Northern and Southern Hemispheres, in maritime to subalpine habitats (Smit, 1973; Hoffmann, 1999; Schuettpelz & Hoot, 2004; Cheng & Xie, 2014). Polyploidy is proposed to have played an important role in diversification of the genus *Caltha* (Gregory, 1941), and may be an important mechanism driving divergence within our study group, the *Caltha leptosepala* species complex. *Caltha leptosepala* s.l. presents unique taxonomic challenges. While Greene (1899) segregated the species complex into nine species based on morphology, Ford (1997) groups all these taxa into a single species with no infraspecific taxa recognized. Most authors regard the species complex as comprising two subspecies of *Caltha leptosepala*, most often as *C. leptosepala* DC. subsp. *leptosepala* and *C. leptosepala* subsp. *howellii* (Huth) P.G.Sm., and sometimes as two species, *Caltha leptosepala* DC. and *C. biflora* DC. We here follow the nomenclature of Smit (1973) based on the work of Smit & Punt (1969), who described two subspecies and a "hybrid swarm"

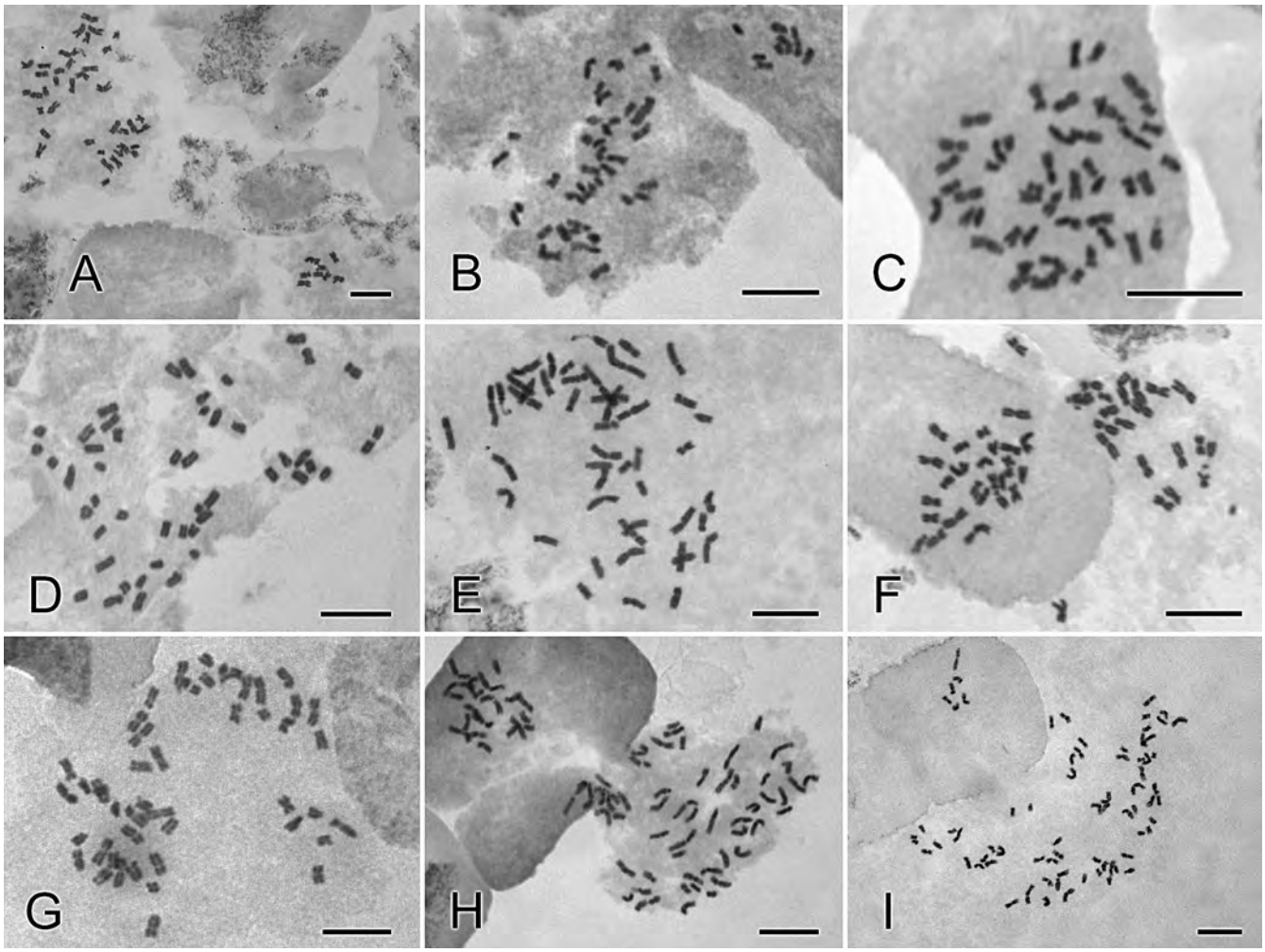

Fig. 17. Mitotic metaphases: **A–D,** *Caltha leptosepala* subsp. *leptosepala*; **A,** *K. Wefferling 212lepto*, 2*n* = 48; **B,** *K. Wefferling 276-6*, 2*n* = 48; **C,** *K. Wefferling 299-3*, 2*n* = 48; **D,** *K. Wefferling MM1-1*, 2*n* = 48. **E–G,** *Caltha leptosepala* subsp. *howellii*; **E,** *K. Wefferling CR1*, 2*n* = 48; **F,** *K. Wefferling CR2*, 2*n* = 48; **G,** *K. Wefferling JNS1-1a*, 2*n* = 48. **H–I,** *Caltha leptosepala*; **H,** *K. Wefferling 212rotA*, 2*n* = 72; **I,** *K. Wefferling 216-4*, 2*n* = 72. — Scale bars = 10 µm.

of *C. leptosepala*, citing observed differences in leaf, flower, and pollen morphology, and corresponding with three major geographic regions in western North America: "narrow-leaved" or "elkslip marsh-marigold" (*C. leptosepala* subsp. *leptosepala*) occurring in the southern Rocky Mountains; "broad-leaved" or "twin-flowered marsh-marigold" (*C. leptosepala* subsp. *howellii*) occurring in the Sierra, Cascade and Klamath Mountain ranges; and morphologically intermediate *C. leptosepala* s.l. in the northern Rocky and Coastal Mountains, with an apparently broad region of sympatry of these three entities in the Pacific Northwest.

Previous cytological work in the species complex has found some chromosome number variation, including hexaploids (6*x*) and dodecaploids (12*x*; based on *x* = 8; Gregory, 1941): using somatic material, Langlet (1932) found 2*n* = 48 from *Caltha leptocephala* [sic!] (material of an unknown source); Taylor & Mulligan (1968) counted 2*n* = 48 from *C. biflora* (= *Caltha leptosepala* subsp. *howellii*; three specimens from Queen Charlotte Islands, British Columbia, Canada); Smit & Punt (1969) found 2*n* = 96 (from a Grenoble, France, botanical garden, wild source unknown), 2*n* = 96 (from Winnemucca Lake, California, U.S.A.), and 2*n* = 48 (from Kangaroo Lake, California, U.S.A.) all material listed as "*C. leptosepala* coll."; Löve & al. (1971) counted 2*n* = 48 from *C. leptosepala* (= *C. leptosepala* subsp. *leptosepala*?; from Bear Lake and Niwot Ridge, Colorado State, U.S.A.). Using gametic material, Morris (1971) found *n* = 24 in *C. leptosepala* (= *C. leptosepala* subsp. *leptosepala*?; from Mirror Lake, Utah State, U.S.A.). All the above data cast doubt on the aneuploid counts by Wiens & Halleck (1962; *n* = 22 for material from Niwot Ridge) and Mosquin (1968; 2*n* = 46 for material from SW of Bear Tooth Pass, Wyoming State, U.S.A.; also see Morris, 1972, for discussion invalidating the aneuploid counts).

For the present study, sampling of subspecies and putative hybrids in the taxonomically challenging species complex was geographically and morphologically diverse; 15 specimens were counted from 11 populations. For the first time, sympatry of cytotypes was documented: hexaploid and dodecaploid cytotypes in the Cascades of southern Washington State; hexaploids and dodecaploids in the Cascades of northern Oregon State; and hexaploids and nonaploids (9*x*; the nonaploid cytotype documented here for the first time) in the central Rockies of southwest Idaho State. Using molecular data in a genus-wide study of *Caltha*, both Schuettpelz & Hoot (2004) and Cheng & Xie (2014) resolved the two subspecies of *C. leptosepala* as paraphyletic to one another or unresolved, and sister to a clade of Southern Hemisphere species (*Caltha* sect. *Psychrophila*). The present cytological study is intended to lay the groundwork for further phylogenetic and cytogeographical work in the *C. leptosepala* species complex.

Literature cited

Anderson, L.E. 1954. Hoyer's Solution as a rapid permanent mounting medium for bryophytes. *Bryologist* 57: 242–244. http://dx.doi.org/10.1639/0007-2745(1954)57[242:HSAARP]2.0.CO;2

Cheng, J. & Xie, L. 2014. Molecular phylogeny and historical biogeography of *Caltha* (Ranunculaceae) based on analyses of multiple nuclear and plastid sequences. *J. Syst. Evol.* 52: 51–67. http://dx.doi.org/10.1111/jse.12051

Ford, B.A. 1997. *Caltha*. Pp. 185, 187–189 in: Flora of North America Editorial Committee (eds.), *Flora of North America north of Mexico*, vol. 3. New York (New York), Oxford (U.K.): Oxford University Press.

Greene, E.L. 1899. Segregates of *Caltha leptosepala* DC. *Pittonia* 4: 73–81.

Gregory, W.C. 1941. Phylogenetic and cytological studies in the Ranunculaceae Juss. *Trans. Amer. Philos. Soc.* 31: 443–521. http://dx.doi.org/10.2307/1005611

Hoffmann, M.H. 1999. Biogeographical and evolutionary patterns in the genus *Caltha* L. (Ranunculaceae). *Bot. Jahrb. Syst.* 121: 403–421.

Langlet, O. 1932. Über Chromosomenverhältnisse und Systematik der Ranunculaceae. *Svensk Bot. Tidskr.* 26: 381–400.

Löve, Á., Löve, D. & Kapoor, B.M. 1971. Cytotaxonomy of a century of Rocky Mountain orophytes. *Arctic Alpine Res.* 3: 139–165. http://dx.doi.org/10.2307/1549983

Morris, M.I. 1971. [Report] in: Löve, A. (ed.), IOPB chromosome number reports. XXXIV. *Taxon* 20: 785–797. http://www.jstor.org/stable/1218605

Morris, M.I. 1972. A biosystematic analysis of the *Caltha leptosepala* (Ranunculaceae) complex in the Rocky Mountains I. Chromatography and cytotaxonomy. *Brittonia* 24: 177–188. http://dx.doi.org/10.2307/2805868

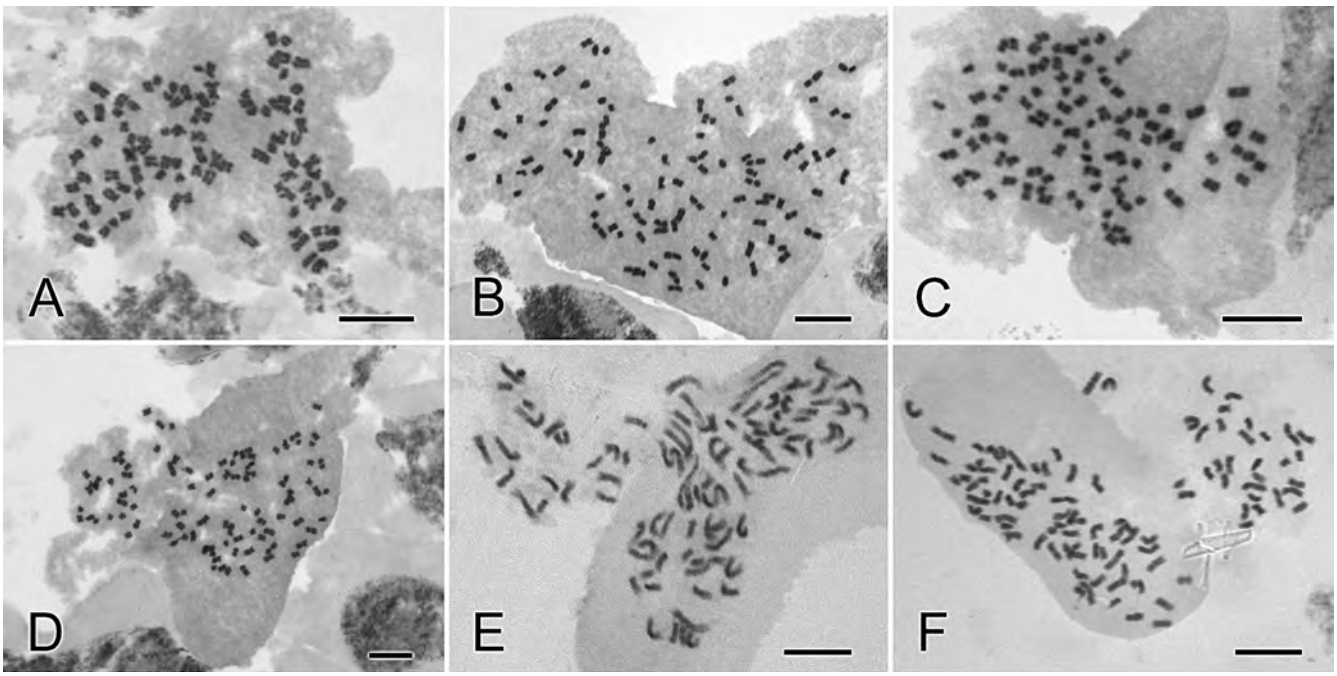

Fig. 18. Mitotic metaphases of *Caltha leptosepala*: **A,** *K. Wefferling WNPS3-1*, 2*n* = 96; **B,** *K. Wefferling CR3*, 2*n* = 96; **C,** *K. Wefferling CR5*, 2*n* = 96; **D,** *K. Wefferling JS6*, 2*n* = 96; **E,** *K. Wefferling I80-1*, 2*n* = 96; **F,** *K. Wefferling AB1-1*, 2*n* = 96. — Scale bars = 10 µm.

Mosquin, T. 1968. [Report] in: Löve, A. (ed.), IOPB chromosome number reports XV. *Taxon* 17: 91–104. http://www.jstor.org/stable/1216171

Schuettpelz, E. & Hoot, S.B. 2004. Phylogeny and biogeography of *Caltha* (Ranunculaceae) based on chloroplast and nuclear DNA sequences. *Amer. J. Bot.* 91: 247–253. http://dx.doi.org/10.3732/ajb.91.2.247

Smit, P.G. 1973. A revision of *Caltha* (Ranunculaceae). *Blumea* 21: 119–150.

Smit, P.G. & Punt, W. 1969. Taxonomy and pollen morphology of the *Caltha leptosepala* complex. *Proc. Kon. Ned. Akad. Wetensch. C* 72: 16–27.

Taylor, R.L. & Mulligan, G.A. 1968. Flora of the Queen Charlotte Islands. Part 2: Cytological aspects of the vascular plants. *Monogr. Res. Branch Canada Dept. Agric.* 4(2): 1–148.

Wiens, D. & Halleck, D.K. 1962. Chromosome numbers in Rocky Mountain plants. I. *Bot. Not.* 115: 455–464.

Wittman, W. 1962. Aceto-iron haematoxylin for staining chromosomes in squashes of plant material. *Stain Technol.* 37: 27–30. http://dx.doi.org/10.3109/10520296209114565