

First American Records of *Aphis intybi* (Hemiptera: Aphididae) with Notes on Two Other Related Adventive Species in Argentina

Authors: Durante, M. Pilar Mier, Foottit, Robert, Dohlen, Carol D. Von, and Ortego, Jaime

Source: Florida Entomologist, 95(4) : 1154-1162

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.095.0446>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

FIRST AMERICAN RECORDS OF *APHIS INTYBI* (HEMIPTERA: APHIDIDAE) WITH NOTES ON TWO OTHER RELATED ADVENTIVE SPECIES IN ARGENTINA

M. PILAR MIER DURANTE¹, ROBERT FOOTITT², CAROL D. VON DOHLEN³ AND JAIME ORTEGO⁴

¹Departamento de Biodiversidad y Gestión Ambiental, Universidad de León, 24071 León, Spain

E-mail: mpmied@unileon.es

²Invertebrate Biodiversity, Canadian National Collection of Insects, Agriculture and Agri-Food Canada, K. W. Neatby Building., 960 Carling Av., Ottawa K1A 0C6, Ontario, Canada

E-mail: Robert.Footitt@agr.gc.ca

³Department of Biology, 5305 Old Main Hill, Utah State University, Logan Utah 84322 USA

E-mail: carol.vondohlen@usu.edu

⁴INTA EEA Mendoza, San Martín 3853, 5507 Luján de Cuyo, Mendoza, Argentina

E-mail: jortego@mendoza.inta.gov.ar

ABSTRACT

Aphis intybi Koch is recorded for the first time in North and South America. Measurements for the identification of this species in comparison with *Aphis craccivora* Koch are given. *Aphis cytisorum* Hartig is recorded for the third time in Argentina. Data on morphological variation, geographical distribution, and host plants of these species in Argentina are provided. Their morphological identification is supported by comparison of DNA sequences of the mitochondrial cytochrome oxidase subunit 1 (DNA barcode) and subunit 2.

Key Words: aphids, cytochrome oxidase 1, cytochrome oxidase 2, DNA barcode, Argentina, Canada, *Aphis intybi*, *Aphis cytisorum*, *Aphis craccivora*

RESUMEN

Aphis intybi Koch se cita por primera vez tanto en América del Sur como del Norte. Se aportan características métricas para la identificación de la especie en comparación con *Aphis craccivora* Koch. *Aphis cytisorum* Hartig se cita por tercera vez en la Argentina. Se aportan datos sobre la variación morfológica, así como sobre la distribución geográfica y las plantas hospedadoras en Argentina de esas especies. Las identificaciones morfológicas han sido corroboradas mediante comparaciones de las secuencias de la citocromo oxidasa I (DNA barcode) y de la citocromo oxidasa II del DNA mitocondrial.

Palabras Clave: pulgones; citocromo oxidasa I; citocromo oxidasa II; código de barras molecular, Argentina, Canadá, *Aphis intybi*, *Aphis cytisorum*, *Aphis craccivora*.

Seventy percent of the aphid species recorded so far in South America (233 of 335) are not native to the subcontinent, and this figure is increasing continually (Mier Durante et al. 2011). A study of *Aphis* Linnaeus, 1758 samples from Argentina, deposited in the Zoology Collection of the University of León (CZULE), enabled *Aphis intybi* Koch, 1855 to be recorded for the first time in South America, and increased our knowledge of the presence of *A. cytisorum* Hartig, 1841 and *Aphis craccivora* Koch, 1854 in Argentina. Both of the latter species are also adventive in South America and are phylogenetically related to *Aphis intybi* Koch, 1855. Although recorded as a frequent interception at ports of entry in the USA (Stoetzel & Russell 1991), specimens (Canadian National

Collection of Insects, Ottawa, Canada) of *A. intybi* from the Montréal region, Québec, Canada provide the first indication of its presence in North America.

MATERIALS AND METHODS

Specimens of viviparous females in all cases and alate viviparous females in most of the 118 samples were studied (Table 1). They were collected by M. P. Mier Durante, J. M. Nieto Nafraía and J. Ortego during 4 expeditions carried out in Jan 2000, Nov 2002, Nov 2006, and Dec 2009, and by J. Ortego at different times from 1994 onwards.

Sample colonies were split, with a part preserved in 70% ethanol for morphological study

TABLE 1. LIST OF THE STUDIED ARGENTINEAN SAMPLES. GENBANK ACCESSION NUMBERS ARE GIVEN IN PARENTHESES BELOW VOUCHER IDENTITIES (ARG- PLUS NUMBER) IN THE UNIVERSITY OF LEON ZOOLOGICAL COLLECTION.

APHID SPECIES	HOST PLANT	PLANT FAMILY	PROVINCE	LOCALITY	DATE	ARG-
<i>Aphis intybi</i>	<i>Cichorium intybus</i>	Asteraceae	Mendoza	Luján de Cuyo	23-Sep-09	1705
	<i>Cichorium intybus</i>		Mendoza	Tunuyán	07-Jan-11	1706
	<i>Cichorium intybus</i>		Neuquen	La Rinconada	13-Dec-09	1629
	<i>Cichorium intybus</i>		Río Negro	General Enrique Godoy	11-Dec-09	1530
	<i>Cichorium intybus</i>		Río Negro	Pomona	10-Dec-09	1514 (HQ971363)
<i>Aphis cytisorum</i>	<i>Cytisus scoparius</i>	Fabaceae	Mendoza	Potrerosillos	21-Nov-02	685
	<i>Cytisus scoparius</i>		Mendoza	San Rafael	10-May-99	606
	<i>Cytisus scoparius</i>		Mendoza	Villavicencio	30-Nov-02	775
	<i>Cytisus scoparius</i>		Neuquen	Chos Malal	27-Jan-00	502
	<i>Cytisus scoparius</i>		Río Negro	Santuario Virgen Misionera	10-Dec-09	1502 (HQ971362)
	<i>Cytisus</i>		Santa Cruz	Caleta Olivia	14-Dec-04	1045
	<i>Spartium junceum</i>		Mendoza	Guaymallén	13-Jun-11	1707
	<i>Adesmia</i>		Chubut	Tecka (15 km N ruta 40)	06-Dec-09	1396
	<i>Adesmia</i>		Jujuy	Iturbe	07-Nov-06	1176 (JX624088)
	<i>Adesmia</i>		Jujuy	Yavi	27-May-03	971
<i>Aphis craccivora</i>	<i>Adesmia</i>	Fabaceae	Mendoza	La Carrera	21-Nov-02	695
	<i>Adesmia</i>		Mendoza	Malargüe	30-Dec-94	94
	<i>Adesmia</i>		Mendoza	Tupungato: Cruz Negra	21-Nov-02	711 (JX624103)
	<i>Adesmia</i>		Neuquen	La Lipela	13-Dec-09	1641
	<i>Adesmia</i>		Neuquen	La Rinconada	23-Jan-00	466
	<i>Adesmia</i>		Neuquen	Varvarco	25-Jan-00	498
	<i>Adesmia</i>		Salta	Quebrada de Escoipe	05-Nov-06	1136
	<i>Ailanthus altissima</i>		Mendoza	Dorrego	15-Mar-10	1712
	<i>Astragalus</i>		Jujuy	Iturbe	07-Nov-06	1174 (JX624086)
	<i>Astragalus</i>		Jujuy	Yavi	27-May-03	970 (JX624099)
	<i>Astragalus</i>		Mendoza	Malargüe	22-Oct-96	211
	<i>Astragalus pehuenchis</i>		Mendoza	Malargüe	15-Nov-96	217
	<i>Atriplex lampa</i>		Mendoza	San Carlos	17-Nov-94	65
	<i>Baccharis spartioides</i>		San Juan	Calingasta	6-Nov-96	1708
	<i>Bougainvillea spinosa</i>		Mendoza	Malargüe: Cueva del Tigre	16-Nov-96	218
	<i>Bougainvillea spinosa</i>		Mendoza	San Carlos	17-Nov-94	66
	<i>Bulnesia retama</i>		Catamarca	Los Algarrobos	03-Nov-06	1111
	<i>Bulnesia retama</i>		Mendoza	Monumento Canota	30-Nov-02	760
	<i>Bulnesia retama</i>		San Juan	Barreal	23-Nov-02	721 (JX624104)

TABLE 1. (CONTINUED) LIST OF THE STUDIED ARGENTINEAN SAMPLES. GENBANK ACCESSION NUMBERS ARE GIVEN IN PARENTHESES BELOW VOUCHER IDENTITIES (ARG- PLUS NUMBER) IN THE UNIVERSITY OF LEON ZOOLOGICAL COLLECTION.

APHID SPECIES	HOST PLANT	PLANT FAMILY	PROVINCE	LOCALITY	DATE	ARG-
<i>Cassia aphylla</i>		Fabaceae	Mendoza	Lavalle: La Josefa	25-Nov-04	1029 (JX624091)
<i>Cassia aphylla</i>			Mendoza	Malargüe: Agua Nueva	16-Nov-96	219
<i>Cassia aphylla</i>			Río Negro	Fortín Castro	10-Dec-09	1506
<i>Cassia aphylla</i>			Río Negro	San Antonio (25 km SO ruta 3)	09-Dec-09	1465 (HQ971360)
<i>Cassia aphylla</i>		Chenopodiaceae	Río Negro	Santuario Virgen Misionera	10-Dec-09	1497
<i>Chenopodium</i>			Mendoza	Malargüe: Agua Botada	03-Mar-97	1011
<i>Condalia microphylla</i>			Mendoza	Malargüe: Agua Nueva	23-Dec-96	1031
<i>Condalia microphylla</i>			Mendoza	San Carlos	07-Nov-96	216 (JX624095)
<i>Condalia microphylla</i>		Asteraceae	Río Negro	Fortín Castro	10-Dec-09	1507
<i>Condalia microphylla</i>			San Luis	Tilisrao	19-Jan-97	1080
<i>Condalia microphylla</i>			Mendoza	General Alvear	02-Nov-97	1710
<i>Gazania elegans</i>			La Rioja	Los Tambillos	26-Nov-02	742 (JX624097)
<i>Geoffroea</i>		Fabaceae	Mendoza	Luján de Cuyo	21-Nov-02	674 (JX624092)
<i>Geoffroea</i>			Córdoba	Villa Dolores	10-Nov-06	1231
<i>Geoffroea decorticans</i>			La Rioja	Fiambalá	03-Nov-06	1104
<i>Geoffroea decorticans</i>			Mendoza	Los Árboles	21-Nov-02	708 (JX624090)
<i>Geoffroea decorticans</i>			Mendoza	San Rafael	17-Nov-95	103
<i>Geoffroea decorticans</i>			Mendoza	Tupungato: Cruz Negra	21-Nov-02	712
<i>Geoffroea decorticans</i>			Río Negro	Chelforó	11-Dec-09	1525
<i>Geoffroea decorticans</i>			Río Negro	Cubanea	10-Dec-09	1496
<i>Geoffroea decorticans</i>			Salta	Cafayate	04-Nov-06	1131
<i>Geoffroea decorticans</i>			Salta	La Candelaria	09-Nov-06	1212
<i>Geoffroea decorticans</i>			Salta	Zanjón de Oyuela	09-Dec-09	1550
<i>Geoffroea decorticans</i>			San Luis	Tilisrao	19-Jan-97	228
<i>Geoffroea decorticans</i>			Tucumán	Quilmes	04-Nov-06	1129
<i>Geoffroea decorticans</i>			Tucumán	Simoca	10-Nov-06	1222
<i>Geoffroea decorticans</i>			Mendoza	La Carrera	21-Nov-02	866
<i>Hibiscus</i>			Mendoza	Guaymallén	19-Feb-04	979 (JX624098)
<i>Hoffmanseggia</i>		Fabaceae	Mendoza	San Rafael: Cuesta Ternereros	16-Oct-96	1006
<i>Hoffmanseggia</i>			Mendoza	El Chocón	09-Dec-04	1041 (JX624101)
<i>Hoffmanseggia</i>			Neuquen		09-Dec-09	1476
<i>Hoffmanseggia</i>			Río Negro	Nuevo León	09-Dec-09	1464
<i>Hoffmanseggia</i>			Río Negro	San Antonio (25 km SO ruta 3)	09-Dec-09	1501 (HQ971361)
<i>Hoffmanseggia</i>			Río Negro	Santuario Virgen Misionera	10-Dec-09	1158
<i>Hoffmanseggia falcaria</i>			Jujuy	Purmamarca	07-Nov-06	

TABLE 1. (CONTINUED) LIST OF THE STUDIED ARGENTINEAN SAMPLES. GENBANK ACCESSION NUMBERS ARE GIVEN IN PARENTHESES BELOW VOUCHER IDENTITIES (ARG- PLUS NUMBER) IN THE UNIVERSITY OF LEON ZOOLOGICAL COLLECTION.

APHID SPECIES	HOST PLANT	PLANT FAMILY	PROVINCE	LOCALITY	DATE	ARG-
<i>Hoffmanseggia falcaria</i>			Mendoza	Malargüe	25-Nov-95	104
<i>Hoffmanseggia falcaria</i>			Mendoza	Malargüe	07-Dec-96	220
<i>Hoffmanseggia falcaria</i>			Mendoza	Malargüe	02-Jan-97	225
<i>Hoffmanseggia falcaria</i>			Mendoza	San Rafael: Cuesta Terneros	30-Oct-96	212
<i>Kochia</i>		Chenopodiaceae	Río Negro	Coronel Juan José Gómez	11-Dec-09	1559
<i>Kochia</i>			Río Negro	General Enrique Godoy	11-Dec-09	1528
<i>Kochia scoporia</i>			Mendoza	Maipú	17-Mar-02	922
<i>Kochia scoporia</i>			Mendoza	Maipú	19-Jan-03	931 (JX624089)
<i>Kochia scoporia</i>			Mendoza	Malargüe	17-Dec-96	223
<i>Larrea divaricata</i>		Zygophyllaceae	Mendoza	Malargüe: Agua Nueva	23-Dec-96	224
<i>Malva sylvestris</i>		Malvaceae	Mendoza	General Alvear	02-Nov-97	1012
<i>Medicago sativa</i>		Fabaceae	Mendoza	Malargüe	06-Feb-96	129
<i>Medicago sativa</i>			Neuquen	Cutral-Co	12-Dec-09	1572 (HQ971366)
<i>Melilotus</i>		Fabaceae	Neuquen	La Rinconada	23-Jan-00	467
<i>Melilotus alba</i>			Mendoza	Chachingo	18-Nov-02	642
<i>Melilotus alba</i>			Mendoza	Maipú	18-Nov-02	640
<i>Melilotus alba</i>			Neuquen	La Lipela	13-Dec-09	1642
<i>Phaseolus vulgaris</i>		Fabaceae	Río Negro	Pomona	10-Dec-09	1510
<i>Prosopidastrum globosum</i>		Fabaceae	Mendoza	Dorrego	11-Nov-09	1711
<i>Prosopidastrum globosum</i>		Fabaceae	Mendoza	San Rafael: Cuesta Terneros	12-Dec-96	222
<i>Proustia cuneifolia</i>		Asteraceae	Mendoza	Monumento Canota	30-Nov-02	764
<i>Robinia pseudoacacia</i>		Fabaceae	Buenos Aires	Carmen de Patagones	10-Dec-09	1481
<i>Robinia pseudoacacia</i>			Catamarca	Belén	04-Nov-06	1114
<i>Robinia pseudoacacia</i>			Córdoba	Huerta Grande	30-Oct-96	1709
<i>Robinia pseudoacacia</i>			Mendoza	General Alvear	20-May-96	151
<i>Robinia pseudoacacia</i>			Mendoza	La Carrera (Mendoza)	21-Nov-02	699
<i>Robinia pseudoacacia</i>			Mendoza	Malargüe	03-Mar-94	84
<i>Robinia pseudoacacia</i>			Neuquen	Andacollo	25-Jan-00	483
<i>Robinia pseudoacacia</i>			Neuquen	Cutral-Co	12-Dec-09	1574
<i>Robinia pseudoacacia</i>			Río Negro	Choele-choel	11-Dec-09	1518
<i>Robinia pseudoacacia</i>			Salta	Cachi	05-Nov-06	1143
<i>Rosa</i>		Rosaceae	Catamarca	Belén	04-Nov-06	1115
<i>Salsola kali</i>		Salsolaceae	Mendoza	Santa Rosa	10-May-07	1704 (JX624105)
<i>Sphaeralcea miniata</i>		Malvaceae	La Pampa	Chical-Co	07-Feb-03	936 (JX624093)
<i>Sphaeralcea miniata</i>			La Pampa	Santa Rosa	04-Feb-03	940

TABLE 1. (CONTINUED) LIST OF THE STUDIED ARGENTINEAN SAMPLES. GENBANK ACCESSION NUMBERS ARE GIVEN IN PARENTHESES BELOW VOUCHER IDENTITIES (ARG- PLUS NUMBER) IN THE UNIVERSITY OF LEON ZOOLOGICAL COLLECTION.

APHID SPECIES	HOST PLANT	PLANT FAMILY	PROVINCE	LOCALITY	DATE	ARG-
<i>Sphaeralcea miniata</i>			Mendoza	Malargüe	28-Feb-94	83
<i>Sphaeralcea miniata</i>			Mendoza	Malargüe: Las Chacras	20-Jan-94	82
<i>Sphaeralcea miniata</i>			Mendoza	Monumento Canota	30-Nov-02	762 (JX624096)
<i>Tamarix</i>		Tamaricaceae	Mendoza	Malargüe: Agua Nueva	06-Nov-97	1014
<i>Tricomaria usillo</i>		Malpighiaceae	La Rioja	Villa Unión	26-Nov-02	741 (JX624106)
<i>Tricomaria usillo</i>			Mendoza	Lavalle: La Josefa	25-Nov-04	1028 (JX624102)
<i>Tricomaria usillo</i>			Neuquen	Neuquen	12-Dec-09	1564
<i>Trifolium repens</i>		Fabaceae	Río Negro	Choele-choel	11-Dec-09	1517
<i>Wisteria sinensis</i>		Fabaceae	Mendoza	Maipú	09-Nov-03	973 (JX624094)
Cactaceae			Mendoza	Uspallata	16-Nov-01	916
Fabaceae			Neuquen	Junin de los Andes: Atreuco	23-Jan-00	450
Malvaceae			Mendoza	Monumento Canota	30-Nov-02	759 (JX624100)
unknown fern			Mendoza	Godoy Cruz	26-Dec-03	974
unknown flowering plant			Jujuy	San Salvador: P.B. Los Perales	08-Nov-06	1194 (JX624087)
vagrant			Jujuy	San Salvador: P.B. Los Perales	08-Nov-06	1198

and a part in 95% ethanol for molecular work. Methods for slide mounting of specimens and morphometric measurements were those normally used in the taxonomic study of aphids.

DNA sequences for the 5' end of the cytochrome oxidase subunit 1 (COI) gene (DNA barcode region) were obtained through the facilities of the Biodiversity Institute of Ontario using techniques described in deWaard et al. (2008). Sequence data are available on GenBank under the accession numbers given in Table 1 and in Fig. 1. Reference sequences (GenBank accession numbers given in Fig. 1) for samples from various geographic regions are taken from Footitt et al. (2008), Komazaki et al. (2010), Valenzuela et al. (2007), and additional sequences released with this study (GenBank accession numbers JX438172 to JX438176). Between-sequence dis-

tances were calculated using the Kimura two-parameter model and the resultant matrix summarized in a neighbor-joining tree (Fig. 1). DNA sequences for the tRNAleucine/cytochrome oxidase subunit II genes (COII) were obtained using methods of DNA extraction, gene amplification, and sequencing as described in von Dohlen & Teulon (2003). In addition to Argentinean samples, 2 *A. craccivora* samples from USA and Spain were sequenced in this study: 99EM0214, from *Medicago sativa* L. (Fabaceae), Colorado, 1999, and LE2904, from *Cytisus scoparius* (L.) Link (Fabaceae), Spain, León, San Martín del Agostedo, 11 Sep 2004 (GenBank accessions JX624107 and JX624108). Reference sequences from other geographic regions were downloaded from GenBank (accession numbers in Fig. 2.). Between-sequence distances were calculated using the Tamura-Nei

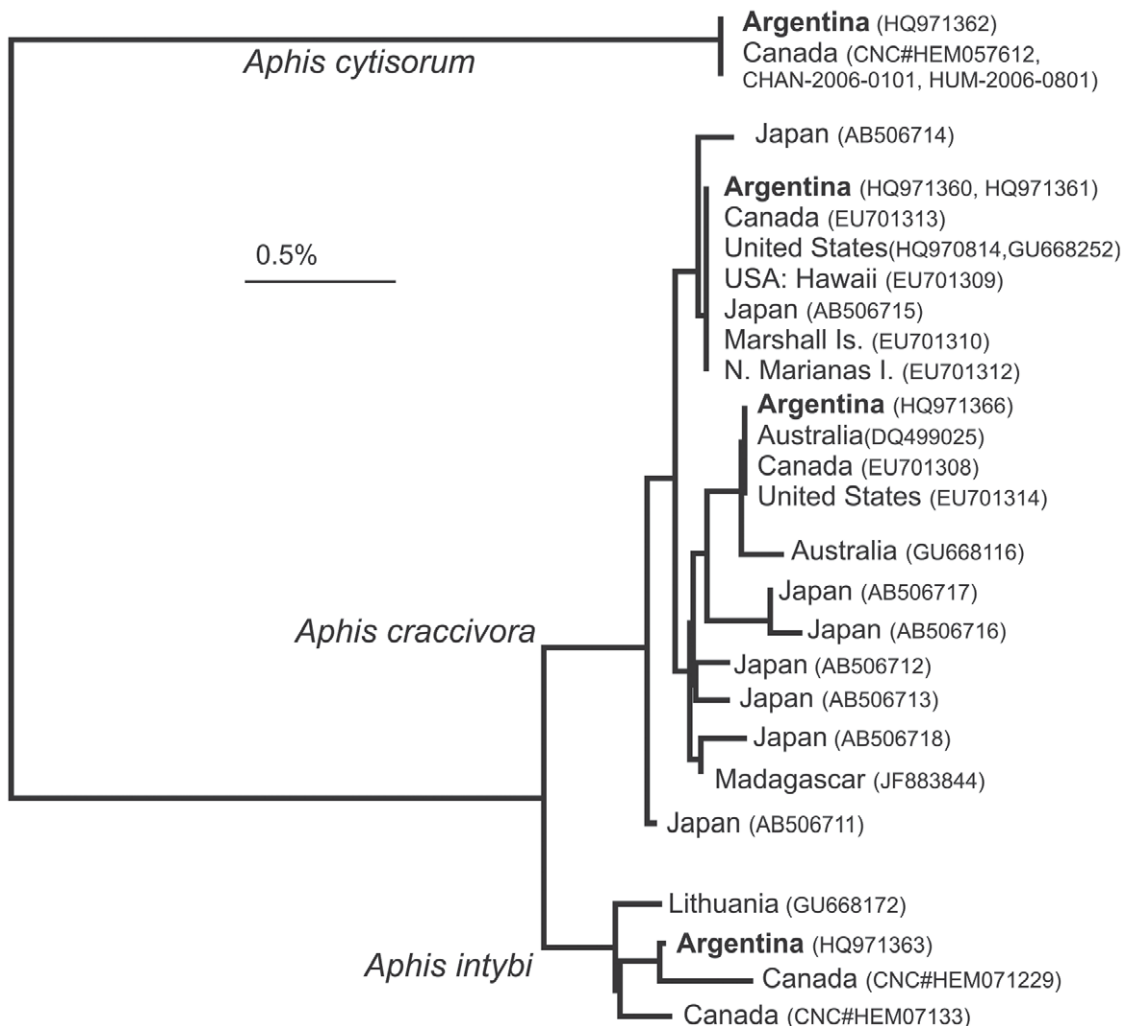


Fig. 1. Neighbor-joining tree of COI pairwise distances estimated under the Kimura two-parameter model of substitution. GenBank Accession numbers are indicated in parentheses.

model of evolution, as the best fit model determined by ModelTest (Posada & Crandall 1998); the resultant matrix was summarized in a neighbor-joining tree with Geneious Pro software (Drummond et al. 2011) (Fig. 2).

RESULTS AND DISCUSSION

Aphis intybi Koch, 1855

This species closely resembles *Aphis craccivora* Koch, but can be differentiated by: (1) when alive the specimens are covered with a whitish waxy powder, (2) the shape of the cauda, which is more triangular than digitiform, (3) some small differences in measurements (see below), and (4) the males are apterous.

According to Blackman & Eastop (2006), 2 metric characteristics differentiate the apterous viviparae in *A. intybi* from *A. craccivora*: (first

“terminal filament/base of antennal segment VI”, 2.4-3.8 in *A. intybi* and 1.7-2.7 in *A. craccivora*, and (second) “apical rostral segment / base of antennal segment VI” 1.25-1.75 times in *A. intybi* and 0.85-1.20 in *A. craccivora*.

However, based on data (including photographs) provided by García Prieto & Nieto Nafria (2005) for both species, and on the measurements of specimens from Argentina, the values for *Aphis craccivora* are (first) 1.2-3.4 times and (second) 0.8-1.3 (exceptionally 1.5) times. Thus, the first of the 2 characters is of little use.

According to our data, identification can also be based on “ultimate rostral segment/second segment of hind tarsus”, 1.1-1.5 times in *A. intybi* and 0.7-1.3 times in *Aphis craccivora*.

Analysis of COI barcodes demonstrates that the Argentinean sample is similar to material identified as *A. intybi* from Lithuania and Canada. The COI sequence clusters corresponding to

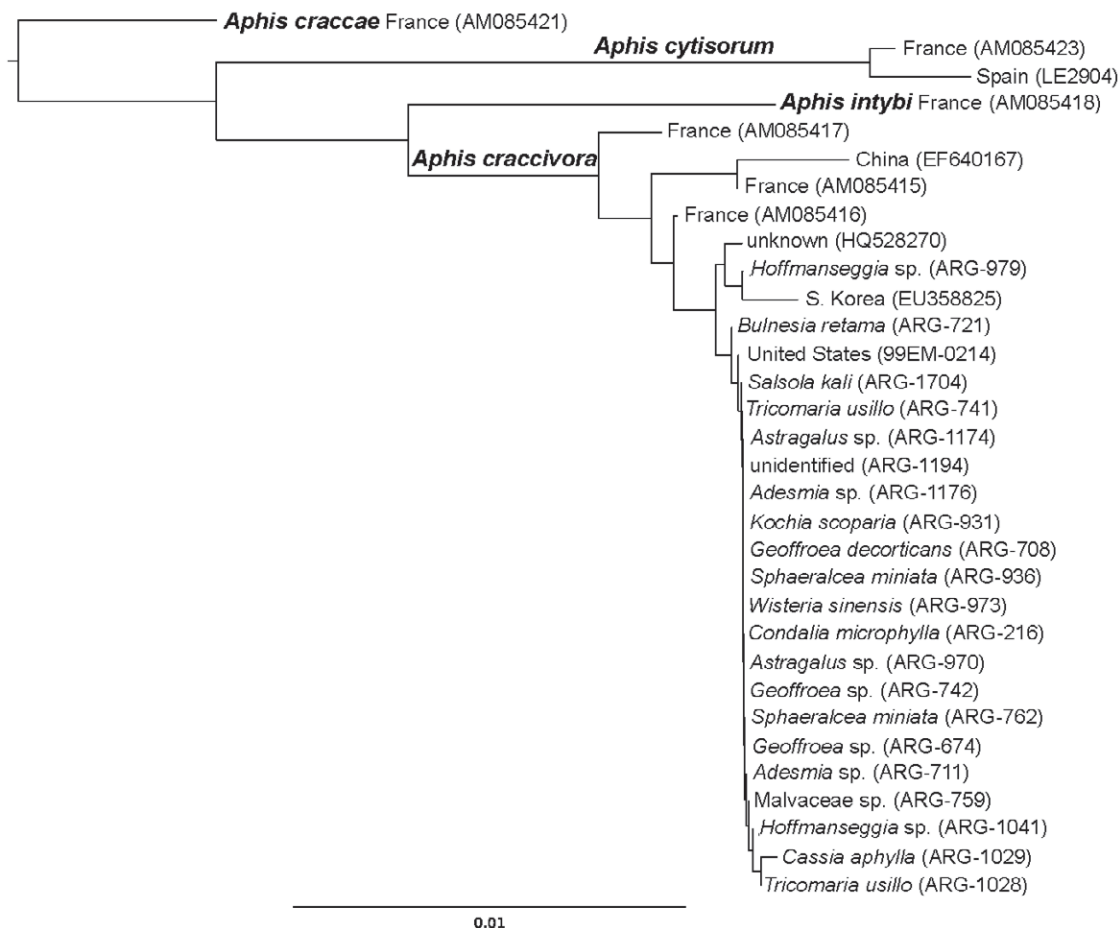


Fig. 2. Neighbor-joining tree of COII pairwise distances estimated under the TrN model of substitution. Accession numbers are indicated for sequences retrieved from GenBank, either unpublished or from published studies (Coeur d'acier et al. 2007; Kim & Lee 2008).

A. intybi and *A. craccivora* are defined by 4 fixed differences but the minimum between-species K2P distance between the groups is small (0.77%) compared to the maximum within-species divergence of 0.61%, (Fig. 1). Despite the small magnitude of the interspecific distance relative to intraspecific variation, the concordance of these clusters with the morphological differences indicated above supports the recognition of *A. intybi* as a distinct entity.

While COII sequences were collected primarily to quantify genetic variation within *A. craccivora*, these data also demonstrate that *A. intybi* is well differentiated from all samples of *A. craccivora*, which form a distinct cluster. The minimum distance of *A. intybi* to *A. craccivora* is 1.43%, while the maximum distance within *A. craccivora* is 0.81%. Although our COII data do not measure within-species variation for *A. intybi*, the genetic distance of the single *A. intybi* representative to *A. craccivora* samples supports the distinction of the 2 species, consistent with COI data and morphology.

The specimens were collected in 5 localities in the provinces of Río Negro, Neuquén and Mendoza, on the usual host plant, *Cichorium intybus* L. (Asteraceae), which is adventive in Argentina (see Table 1).

Aphis cytisorum Hartig, 1841

The first record of *A. cytisorum* in Argentina (and also in South America), and the only one so far, on *Tipuana tipu* Lillo (Fabaceae) in the province of Buenos Aires, was made by Nieto Nafraía et al. (1994), with a correction by Ortego (1998). This species was also recorded from Santa Fe province on *Spartium junceum* L. (Fabaceae) by Ortego et al. (2002). The presence of the aphid

species in Argentina is confirmed on 2 of its usual host plants in Europe: *Cytisus scoparius* (L.) Link (Fabaceae) and *Spartium junceum*, which are adventive in Argentina.

The collection localities are situated in the provinces of Mendoza, Río Negro, Neuquén and Santa Cruz, which would indicate that the species occurs throughout the country.

The qualitative and quantitative characteristics of the collected specimens are within the limits known for the species (Blackman & Eastop 2006, and García Prieto & Nieto Nafraía 2005). The COI sequence for the Argentinean sample is identical to sequences obtained from samples from Canada.

Aphis craccivora Koch, 1854

Aphis craccivora is subcosmopolitan and one of the polyphagous species in the genus, and its most important characteristics vary considerably, as Mehrparvar et al. (2012) have also shown.

Some of the measurements corresponding to some of the studied specimens are not within the known limits for the species (Blackman & Eastop 2006; García Prieto & Nieto Nafraía 2005) (Table 2). However, the identification of clone-mates of these specimens as *A. craccivora* was confirmed by molecular analysis (Figs. 1 and 2). Our results address certain comments by Mehrparvar et al. (2012), because they analyzed samples from 4 plant genera (*Astragalus*, *Atriplex*, *Chenopodium* and *Robinia*) of a total of 6, which are also present in our study: “The results presented here for the morphological structure of *A. craccivora* provide the framework to investigate the genetic and biological differences among these entities so that we could be able to exactly evaluate their taxonomic situation”.

TABLE 2. MINIMUM AND MAXIMUM LIMITS OF THE QUANTITATIVE CHARACTERS IN APHIS CRACCIVORA.

QUANTITATIVE CHARACTER	PREVIOUS LIMITS	NEW LIMITS
Antenna / Body (times)	0.50-0.80	0.42-...
Antennal segment VI: terminal processus / base (times)	1.3-3.4	1.2-...
Ultimate rostral segment (mm)	0.10-0.13	...-0.14
Ultimate rostral segment / Antennal segment VI base (times)	0.8-1.4	...-1.5
Ultimate rostral segment / Second segment of hind tarsus (times)	0.7-1.2	...-1.3
Siphunculus (mm)	0.22-0.46	0.19-...
Siphunculus / its diameter at the middle (times)	3.0-8.3	2.3-...
Siphunculus / Cauda (times)	1.2-2.4	1.0-...
Cauda / its basal width (times)	1.3-1.8	1.2-...
Setae on cauda (number)	4-10	3-12
Longest seta on Antennal segment III (µm)	8-19	...-23
Longest seta on Antennal segment III / Subarticular diameter of the segment (times)	0.2-0.8	...-1.3
Ventral setae on hind trochanter / Trochanter-femoral suture (times)	0.3-0.5	...-0.9
Longest marginal setae on abdominal segments II-IV (µm)	8-15	15-33
Longest dorsal setae on abdominal segment VIII (µm)	10-23	...-45

Aphis craccivora is here mentioned for first time, according to Blackman & Eastop (2006), on species of *Baccharis* (Asteraceae), *Bulnesia* (Zygophyllaceae), *Condalia* (Rhamnaceae), *Gazania* (Asteraceae), *Hoffmanseggia* (Fabaceae), *Larrea* (Zygophyllaceae), *Prosopidastrum* (Fabaceae), *Proustia* (Asteraceae) and *Tricomaria* (Malpighiaceae), and on species of another 21 genera of several plant families in Argentina (Table 1). While the specimens recorded on *Condalia microphylla* were identified with some uncertainty by Nieto Nafria et al. (2008) as *Aphis conflicti* Nieto Nafria, Ortego & Mier Durante, 2008, COII sequences here confirm these specimens as *A. craccivora* (Fig. 2). COII sequences further illustrate the high genetic similarity among Argentinean populations, which nevertheless exploit a broad taxonomic range of host plants.

Aphis craccivora is recorded for the first time in the provinces of Chubut, San Juan, Neuquen, Rio Negro and Salta, and is now known in 17 of the 23 provinces forming the Republic of Argentina.

ACKNOWLEDGMENTS

The authors acknowledge Prof. R. Rakauskas, Vilnius University, for the Lithuanian sample of *Aphis intybi*. Dr. Lee Humble (Canadian Forest Service, Victoria, British Columbia, Canada) provided specimens of *Aphis cytisorum* and Ms. Claude Pilon (Repentigny, Quebec, Canada) provided specimens of *A. intybi*. We thank Mr. E. Maw for the preparation of Fig. 1. C. D. von Dohlen's research was supported by the Utah Agricultural Experiment Station, approved as journal paper #8461. M. P. Mier Durante and J. Ortego's research was supported by grants (LE45/02, LE034A05 and LE036A08) of the Regional Government of Castilla y Leon, Spain.

REFERENCES CITED

- BLACKMAN, R. L., AND EASTOP, V. F. 2006. Aphids on the World's Herbaceous Plants and Shrubs (Volume 1 Host Lists and Keys; Volume 2, The aphids). J. Wiley & Sons. Chichester, UK. 8+ 1439 pp.
- COEUR D'ACIER, A., JOUSSELIN, E., MARTIN, J. F., AND RASPULUS, J. Y. 2007. Phylogeny of the genus *Aphis* Linnaeus, 1758 (Homoptera: Aphididae) inferred from mitochondrial DNA sequences. Mol. Phylo. Evol. 42: 598-611.
- DEWAARD, J. R., IVANOVA, N. V., HAJIBABAEI, M., AND HERBERT, P. D. N. 2008. Assembling DNA barcodes: analytical protocols In C. C. Martin [ed.], Environmental Genomics, Methods in Molecular Biology, Vol. 410: 275-293. Humana Press, Totowa, NJ.
- DRUMMOND, A. J., ASHTON, B., BUXTON, S., CHEUNG, M., COOPER, A., DURAN, C. FIELD, M., HELED, J., KEARSE, M., MARKOWITZ, S., MOIR, R., STONES-HAVAS, S., STUR-ROCK, S., THIERER, T., AND WILSON, A. 2011. Geneious v5.4. Available from <http://www.geneious.com/>.
- FOOTITT, R. G., MAW, H. E. L., VON DOHLEN, C. D., AND HERBERT, P. D. N. 2008. Species identification of aphids (Insecta: Hemiptera: Aphididae) through DNA barcodes. Mol. Ecol. Resources 8: 1189-1201.
- GARCÍA PRIETO, F., AND NIETO NAFRÍA, J. M. 2005. Genus *Aphis*. In J. M. Nieto Nafria, M. P. Mier Durante, F. García Prieto, and N. Pérez Hidalgo, Hemiptera Aphididae III In M. A. Ramos et al. [eds.], Fauna Ibérica, Vol. 28: 30-173. Museo Nacional de Ciencias Naturales (CSIC). Madrid.
- KIM, H., AND LEE, S. 2008. A molecular phylogeny of the tribe Aphidini (Insecta: Hemiptera: Aphididae) based on the mitochondrial tRNA/COII, 12S/16S and the nuclear EF1 α genes. Syst. Entomol. 33: 711-721.
- KOMAZAKI, S., SHIGEHARA, T., AND TODA, S. 2010. Diversity of Japanese *Aphis gossypii* and comparison with other *Aphis* species based on the mitochondrial cytochrome oxidase I sequence. Ann. Entomol. Soc. America 103: 916-924.
- MEHRPARVAR, M., MADJIZADEH, S. M., MAHDAVI ARAB, N., ESMAELBEYGI, M., AND EBRAHIMPOUR, E. 2012. Morphometric discrimination of black legume aphid *Aphis craccivora* Koch (Hemiptera: Aphididae), populations associated with different host plants. North-Western J. Zool. 8(1): 172-180.
- MIER DURANTE, M. P., ORTEGO, J., PÉREZ HIDALGO, N., AND NIETO NAFRÍA, J. M. 2011. Three aphid species (Hemiptera: Aphididae) recorded for first time from South America. Florida Entomol. 94(4): 839-842.
- NIETO NAFRÍA, J. M., DELFINO, M. A., AND MIER DURANTE, M. P. 1994. La afidofauna de la Argentina, su conocimiento en 1992. Universidad de León, León. 235 pp.
- NIETO NAFRÍA, J. M., ORTEGO, J., AND MIER DURANTE, M. P. 2008. The South American species of *Aphis* (Hemiptera: Aphididae: Aphidina) living on Rhamnaceae and Loranthaceae, with description of a new species. Proc. Entomol. Soc. Washington 110(2): 481-492.
- ORTEGO, J. 1998. Pulgones de la Patagonia Argentina con la descripción de *Aphis intrusa* sp. n. (Homoptera: Aphididae). Rev. Fac. Agron., La Plata 102(1) [1997]: 59-80.
- ORTEGO, J., PARAVANO, A. S., AND IMWINKELRIED, J. M. 2002. Actualización de los registros afidológicos (Homoptera: Aphidoidea) de la provincia de Santa Fe, Argentina. Rev. FAVE – Cienc. Agr. 1(1): 47-55.
- POSADA, D., AND CRANDALL, K. A. 1998. Modeltest: testing the model of DNA substitution. Bioinformatics 14: 817-818.
- STOETZEL, M., AND RUSSELL, L. M. 1991. *Aphis intybi*, a pest of chicory intercepted at United States ports of entry (Homoptera: Aphididae). Entomol. Gener. 16: 147-155.
- VALENZUELA, I., HOFFMANN, A. A., MALIPATIL, M. B., RIDLAND, P. M., AND WEEKS, A. R. 2007. Identification of aphids using a rapid PCR-RFLP method based on the cytochrome oxidase subunit I gene. Australian J. Entomol. 46: 305-312.
- VON DOHLEN, C. D., AND TEULON, D. A. J. 2003. Phylogeny and historical biogeography of New Zealand indigenous Aphidini aphids (Hemiptera, Aphididae): An hypothesis. Ann. Entomol. Soc. America 96: 107-116.