

NOTE

The spread of the North American *Aphis lugentis* Williams (Hemiptera: Aphididae) to Africa and South America

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*Aphis lugentis* Williams 1911 (Hemiptera: Aphididae) is a dark grey to black aphid with black legs and antennae, closely-related to similarly-colored species such as the Nearctic *A. senecionis* Williams 1911 and the Palearctic *A. calliasteris* Hille Ris Lambers 1947, *A. haroi* Nieto Nafria 1974, and *A. jacobaeae* Schrank 1801. All five aphids can be found on species of *Senecio* (Asteraceae), with some also colonizing plant hosts in other asteraceous genera (e.g., *Acrisione*, *Erigeron*, *Jacobaea*). *Aphis lugentis* was first described from Nebraska in the American Midwest and has been recorded since then from all major regions of the country except the Northeast; it also is present in Canada and Mexico (Smith and Parron 1978, Lund University Biological Museum 2018). The species was nominally described from *Senecio lugens* Richardson (Williams 1911) which is not actually present in Nebraska (USDA, NRCS 2018). The actual type host is probably either *Packera cana* (Hook.) W.A. Weber & Å. Löve (Williams 1891) or *Senecio integerrimus* Nuttall (Cook 1984). Today, *A. lugentis* is known to colonize several *Senecio*, *Erigeron*, and *Packera* species, and can be found on all vegetative parts of its host, including the roots (Blackman and Eastop 2006). *Aphis lugentis* was first found outside its native range in southern France in 2001 (Coeur d'acier et al. 2014, Martinez et al. 2014).

In 2015, JO identified aphids collected on *Senecio* spp. in Argentina as

*Aphis lugentis* (identification key in Blackman and Eastop 2018). The morphology of the specimens did not quite match that in the species descriptions (Gillette and Palmer 1932, Palmer 1952, Cook 1984), however, and doubts resurfaced when MA and JMNN examined similar specimens collected in Tunisia that same year. To verify our identifications, DNA was extracted and the DNA barcode (Hebert et al. 2004) sequenced from seven Argentinian and Tunisian collections following standard non-destructive protocols (Favret 2005, Favret and Miller 2011). These specimens are deposited in the University of Montreal Ouellet-Robert Entomological Collection (molecular vouchers QMOR43656-62 and additional specimens QMOR43663-9). Other specimens are located at the Universidad de León, the Université de Sousse, and the private collection of Jaime Ortego (JO).

All of the barcode sequences from our samples matched those available on GenBank and the Barcode of Life Data System (Ratnasingham and Hebert 2007, Benson et al. 2012) by 99.5% or higher, a value considered well within the scope of intra-specific variation in aphids (Footitt et al. 2008). All of the reference barcodes are based on authoritatively identified specimens (Table 1): GenBank accession numbers EU701443, EU701444, KC897576, KC897577, KC897578, KF638963, KF638964, KF638965, KR030717, KR045153 (Footitt et al. 2008, Coeur d'acier et al.

Table 1. Reference barcodes (Canada, USA, France) and newly collected material. Specimens from Tunisia collected by MA, from Argentina and Peru by JO, and from Chile by JO, JMNN, and Milagros-Pilar Mier.

Locality	Date	Host	GenBank Accession
<b>CANADA</b>			
Silver Star Provincial Park: British Columbia	1998-08-13	<i>Senecio triangularis</i> Hooker	EU701443
Glacier National Park: British Columbia	2010-07-14		KR030717
<b>USA</b>			
Skyway: Colorado	1999-07-10	<i>Senecio serra</i> Hooker	KR045153
Buck Creek Serpentine Barren: North Carolina	2002-05-20	<i>Packera plattensis</i> (Nutt.) W.A. Weber & A.L.öve	KC897578
<i>Idem.</i>	2002-05-30	<i>P. plattensis</i>	EU701444
<b>FRANCE</b>			
Aude	2001-05-22		KF638963
<i>Idem.</i>	2001-05-30		KF638964
Banyuls-sur-Mer	2008-05-22	<i>Packera</i> sp.	KC897576-7, KF638965
<b>TUNISIA</b>			
Limaguess (oasis)	2015-03-02	<i>Senecio gallicus</i> Chaix	
IRA Kébili (greenhouse)	2015-03-18	<i>S. gallicus</i>	
Bazma (oasis)	2015-03-26	<i>S. gallicus</i>	
Zaafrane (oasis)	2015-03-26	<i>S. gallicus</i>	
IRA Kébili (greenhouse)	2016-03-15	<i>S. gallicus</i>	MK226153
Douz (greenhouse)	2016-03-16	<i>S. gallicus</i>	MK226152
Gabès (littoral coast)	2016-03-24	<i>S. gallicus</i>	MK226154
Bazma (oasis orchard)	2016-05-16	<i>S. gallicus</i>	MK226155
<b>ARGENTINA</b>			
Malargüe: Cabañas Arco Iris (Mendoza)	2014-10-14	(found in swimming pool)	
Malargüe: La Bandera, Malargüe (Mendoza)	2015-01-22	(yellow pan trap)	
Tafí del Valle (Tucumán)	2015-03-05	<i>Senecio</i> sp.	
Godoy Cruz (Mendoza)	2015-11-10	<i>S. subulatus</i> Don ex Hook. & Arn.	
Sarmiento, Pedernal (San Juan)	2015-11-18	<i>S. subulatus</i>	
<i>Idem.</i>	2015-11-18	<i>Senecio</i> sp.	
Malargüe: La Colorada (Mendoza)	2015-12-17	<i>S. subumbellatus</i> Phil.	
Tupungato (Mendoza)	2016-09-29	<i>S. flaginoides</i> DC	
<i>Idem.</i>	2016-09-29	<i>S. subulatus</i>	
Ischigualasto, Valle Fértil (San Juan)	2016-11-03	<i>S. subulatus</i>	MK226156
<i>Idem.</i>	2016-11-03	<i>S. leucostachyus</i> Baker	MK226157

Table 1. Continued.

Locality	Date	Host	GenBank Accession
Felipe Varela, Talampaya (La Rioja)	2016-11-09	<i>Senecio</i> sp.	
Malargüe: La Colorada (Mendoza)	2016-11-24	<i>S. subumbellatus</i>	MK226158
<i>Idem.</i>	2016-11-24	<i>S. gilliesii</i> Hook. & Am.	
Tumbaya: Cuesta de Lipán (Jujuy)	2017-03-11	(incidental)	
<i>Idem.</i>	2017-03-11	<i>Senecio</i> sp.	
<i>Idem.</i>	2017-11-24	<i>Senecio</i> sp.	
Cavihauc: Cascada Escondida (Neuquén)	2017-04-15	<i>S. subumbellatus</i>	
Susques (Jujuy)	2017-11-25	<i>Senecio</i> sp.	
San Antonio de los Cobres (Salta)	2017-11-25	<i>Senecio</i> sp.	
Ciudad Villa de Merlo: Junín (San Luis)	2018-07-09	<i>Euryops chysanthemoides</i> (DC.) B.Nord.	
<b>CHILE</b>			
Entre Lagos (Región X, de los Lagos; prov. Osorno)	2016-02-03	<i>Acrisione denticulata</i> (Hook. & Am.) B.Nord.	
Volcán Osorno (Región X, de los Lagos; prov. Llanquihue)	2016-02-14	<i>Senecio</i> sp.	
<b>PERU</b>			
Aymaraes, Apurímac	2018-06-02	<i>Senecio</i> sp.	
Lucanas, Ayacucho	2018-06-03	<i>Senecio</i> sp.	



Fig. 1. Colony of *Aphis lugentis* on *Senecio* sp. in La-Salvetât-sur-Agout, France, 2016-08-23. Photo courtesy of A. Cœur d'acier.

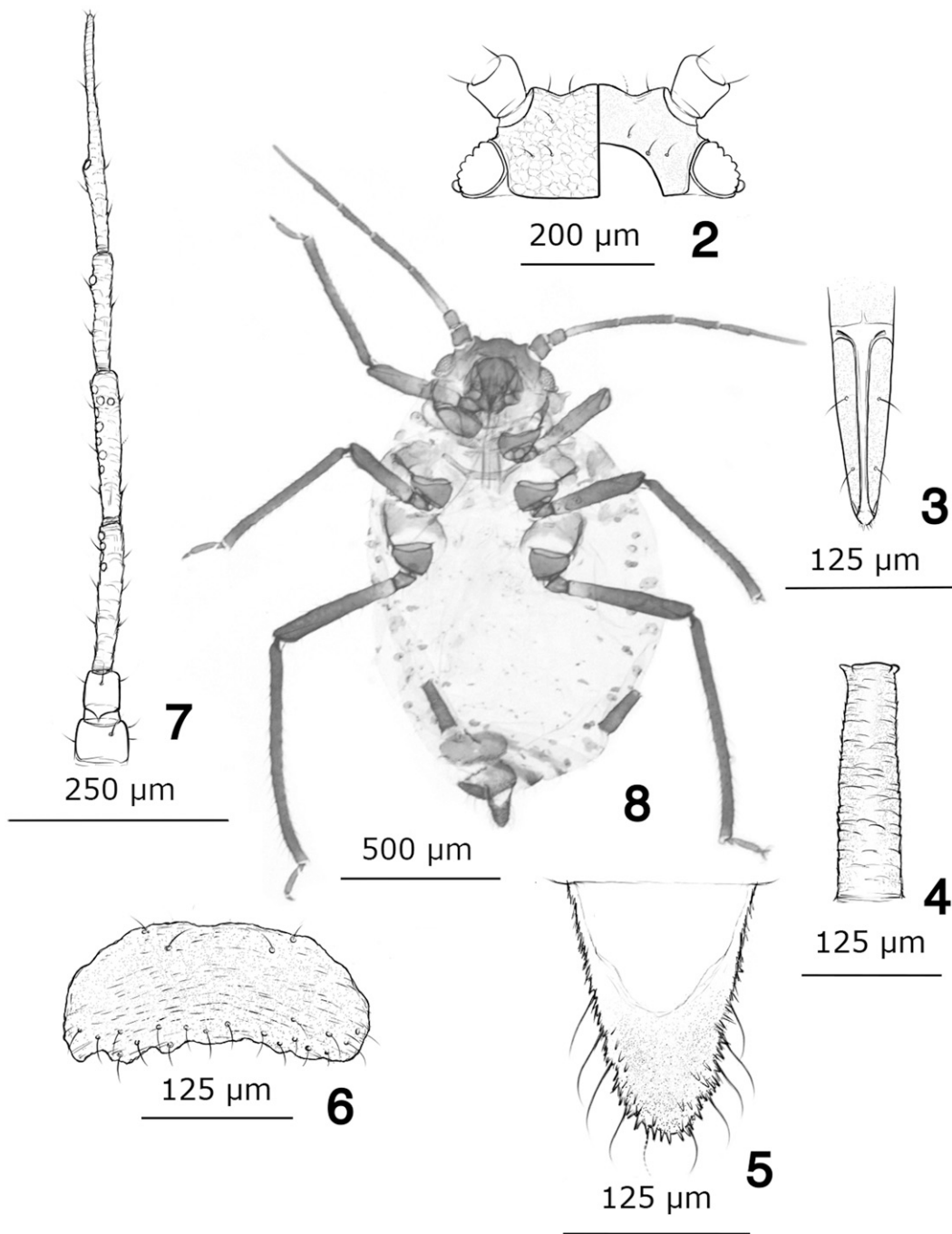
2014, Lagos et al. 2014, Gwiazdowski et al. 2015).

Collecting expeditions across Argentina in 2000, 2002, 2006 and 2009 by JO, JMNN, and Milagros-Pilar Mier found various aphids on *Senecio*, but no *Aphis lugentis*. The first capture of this species in South America was in West-central Argentina, in 2014, of many winged individuals in a swimming pool (Table 1). Additional searching found no other specimens on host plants. In early 2015, samples were collected in northern Argentina on *Senecio*, and by the end of that same year, *Aphis lugentis* was being found in multiple locations across the country except the farthest south.

Especially near Malargüe, we have witnessed the displacement by *Aphis lugentis* of other *Senecio*-feeding species such as the South-American natives *A. senecionicooides* Blanchard 1944, *A. papillosa* Mier Durante et al. 2003, and *A. malalhuina* Mier Durante et al. 2003.

*Aphis lugentis* can form dense colonies and is often tended by ants (Fig. 1). The species is either highly variable or one of several members of a complex needing further study (Cook 1984, Blackman and Eastop 2006, 2018, Andrew Jensen, personal communication). Based on our current knowledge (Cook 1984, Blackman and Eastop 2018, personal observations), along with its association with asteraceous hosts, especially *Senecio* species, *A. lugentis* apterae are characterized by: 1) the presence of relatively large marginal tubercles on the prothorax and abdominal segments 1 and 7; 2) mostly homogeneously dark appendages, with only the basal portions of the femora and the third antennomere pale (Fig. 8); 3) the frequent presence of sensoria on the third and especially the fourth antennomeres (Fig. 7); 4) the siphunculus as long as or longer than the ultimate rostral segments (Figs. 3–4); 5) the longest setae on the third antennomere short, 13–25  $\mu\text{m}$  (Fig. 7); 6) the entire dorsum, including the head, covered in polygonal reticulation (Fig. 2); 7) a parallel-sided to tongue-shaped cauda typically bearing 10 or more setae (Fig. 5); 6) a ratio of the antennal processus terminalis to the base of the sixth antennomere of 1.6–2.1 (Fig. 7); 7) two accessory setae on the ultimate rostral segments (Fig. 3); 8) the anterior portion of the genital plate usually with 4 (2–6) setae (Fig. 6).

Already present in its native North America and introduced to Europe, namely France, we here report the presence of



Figs. 2–8. Photomicrograph and line drawings of *Aphis lugentis*. 2, Head (left half dorsal, right half ventral). 3, Ultimate rostral segments. 4, Siphunculus. 5, Cauda. 6, Genital plate. 7, Antenna. 8, Whole specimen (QMOR43660).

*Aphis lugentis* on two additional continents, South America and Africa, namely in Argentina, Chile, Peru, and Tunisia. It is unknown how the aphid has expanded its native geographic range, but it may be due to the horticultural value of and trade in some *Senecio* species. Given the almost global distribution of the aphid's hosts, it likely will continue to spread. Indeed, a recent Argentinian record is on *Euryops chysanthemoides* (DC.) B.Nord., a South African endemic, so the capacity is high for *A. lugentis* to establish in this latter country and elsewhere if accidentally introduced.

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#### LITERATURE CITED

- Benson, D. A., M. Cavanaugh, K. Clark, I. Karsch-Mizrachi, D. J. Lipman, J. Ostell, and E. W. Sayers. 2012. GenBank. *Nucleic Acids Research* 41: D36–D42.
- Blackman, R. L., and V. F. Eastop. 2006. *Aphids on the World's Herbaceous Plants and Shrubs*. John Wiley & Sons, Chichester, England.
- Blackman, R. L., and V. F. Eastop. 2018. *Aphids on the World's Plants*. (<http://www.aphidsonworldsplants.info/>).
- Blanchard, E. E. 1944. Descripciones y anotaciones de afidoideos argentinos. *Acta Zoologica Lilloana* 2: 15–62.
- Coeur d'acier, A., A. Cruaud, E. Artige, G. Genson, A.-L. Clamens, E. Pierre, S. Hudaverdian, J.-C. Simon, E. Jousselin, and J.-Y. Rasplus. 2014. DNA barcoding and the associated PhylAphidB@se website for the identification of European aphids (Insecta: Hemiptera: Aphididae). *PLoS ONE* 9: e97620.
- Cook, E. F. 1984. *Aphis* (Homoptera: Aphididae) recorded from Compositae in North America, with a key to the species East of the Rocky Mountains and comments on synonymy and redescriptions of some little known forms. *Annals of the Entomological Society of America* 77: 442–449.
- Favret, C. 2005. A new non-destructive DNA extraction and specimen clearing technique for aphids (Hemiptera). *Proceedings of the Entomological Society of Washington* 107: 469–470.
- Favret, C., and G. L. Miller. 2011. The neotype of the cotton aphid (Hemiptera: Aphididae: *Aphis gossypii* Glover 1877). *Proceedings of the Entomological Society of Washington* 113: 119–126.
- Footitt, R. G., H. E. L. Maw, C. D. von Dohlen, and P. D. N. Hebert. 2008. Species identification of aphids (Insecta: Hemiptera: Aphididae) through DNA barcodes. *Molecular Ecology Resources* 8: 1189–1201.
- Gillette, C. P., and M. A. Palmer. 1932. The Aphidae of Colorado. Part II. *Annals of the Entomological Society of America* 25: 369–496.
- Gwiazdowski, R. A., R. G. Footitt, H. E. L. Maw, and P. D. N. Hebert. 2015. The Hemiptera (Insecta) of Canada: Constructing a reference library of DNA barcodes. *PLoS ONE* 10: e0125635.
- Hebert, P. D. N., M. Y. Stoeckle, T. S. Zemlak, and C. M. Francis. 2004. Identification of birds through DNA barcodes. *PLoS Biology* 2: e312.
- Hille Ris Lambers, D. 1947. Neue Blattläuse aus der Schweiz (Homopt. Aphidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 20: 323–331.
- Lagos, D. M., D. J. Voegtlin, A. Coeur d'acier, and R. Giordano. 2014. *Aphis* (Hemiptera: Aphididae) species groups found in the

- Midwestern United States and their contribution to the phylogenetic knowledge of the genus. *Insect Science* 21: 374–391.
- Lund University Biological Museum. 2018. Specimen of *Aphis lugentis*, determined by Jaroslav Holman, collected in Mexico, D.F., Ajusco, altitude 2500 m, 6 August 1981, on *Senecio stoechadiformis* DC, by Jaroslav Holman and Rebeca Peña Martínez.
- Martínez, M., J.-F. Germain, and J.-C. Streito. 2014. Insectes ravageurs invasifs: le point sur les espèces introduites. *Phytoma* 677: 18–22.
- Mier Durante, M. P., J. M. Nieto Nafría, and J. Ortego. 2003. Aphidini (Hemiptera: Aphididae) living on *Senecio* (Asteraceae), with descriptions of a new genus and three new species. *The Canadian Entomologist* 135: 187–212.
- Nieto Nafría, J. M. 1974. Aphidinea de la Cordillera Central y provincia de Salamanca. Madrid Instituto Nacional de Investigaciones Agrarias, Madrid.
- Palmer, M. A. 1952. Aphids of the Rocky Mountain region. The Thomas Say Foundation.
- Ratnasingham, S., and P. D. N. Hebert. 2007. BOLD: The Barcode of Life Data System (<http://www.barcodinglife.org>). *Molecular Ecology Notes* 7: 355–364.
- Schrank, F. von P. 1801. Blattlaus. Fauna Boica. Durchgedachte Geschichten der in Baiern einheimischen und zahmen Thiere 2: 102–140.
- Smith, C. F., and C. S. Parron. 1978. An annotated list of Aphididae (Homoptera) of North America. North Carolina Agricultural Experiment Station Technical Bulletin 255: 1–428.
- USDA, NRCS. 2018. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Team, Greensboro, NC.
- Williams, T. A. 1891. Host-plant list of North American Aphididae. University of Nebraska Department of Entomology Special Bulletin 1: 1–28.
- Williams, T. A. 1911. The Aphididae of Nebraska. University Studies of the University of Nebraska 10 [1910]: 85–175.
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