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ARTICLE

Hydra vulgaris Pallas, 1766, (=*Hydra attenuata*) (Cnidaria; Hydrozoa) from the Los Padres Lagoon (Buenos Aires province, Argentina)

María Irene Deserti[1*] and Mauricio Oscar Zamponi[2]

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ABSTRACT: (*Hydra vulgaris* Pallas, 1766, (=*Hydra attenuata*) (Cnidaria; Hydrozoa) from the Los Padres Lagoon (Buenos Aires province, Argentina)). This paper reports the presence of *Hydra vulgaris* Pallas, 1766, from the Los Padres Lagoon (Buenos Aires province, 37º 56' S; 57º 45' W), and represents the first record of this species for Argentina. The study showed that morphological characters coincide with what has been reported by other authors, such as stenoteles 10-3 µm (15.48 ± 0.44; mean ± standard deviation) long and 6-20 µm (11.75 ± 0.82) in diameter, holotrichous isorhiza 9-14 µm (11.96 ± 0.56) long and 4-7 µm (5.45 ± 0.31) in diameter, atrichous isorhiza 5-13 µm (8.00 ± 0.87) long and 3-8 µm (4.80 ± 0.38) in diameter and the desmonemes 6-12 µm (8.24 ± 0.67) long and 4-8 µm (5.70 ± 0.43) in diameter. The colour of this species is brown; the column oscillates between 1.98-9.88 × 0.31-1.82 mm and their tentacles, ranging from 6 to 9, have a relative length of ~¾ the length of the column. This species is dioecious; young buds have five or six tentacles, with discontinuous growth.
Key words: cnidarians, hydrozoans, freshwater bodies.

RESUMO: (*Hydra vulgaris* Pallas, 1766, (= *Hydra attenuata*) (Cnidaria; Hydrozoa) da laguna Los Padres (Província de Buenos Aires, Argentina)). Este artigo trata da presença de *Hydra vulgaris* Pallas, 1766 na lagoa "Los Padres" (Província de Buenos Aires; 37º 56' S; 57º 45' W), representando o primeiro registro da espécie na Argentina. Os caracteres morfológicos são coincidentes com a descrição de outros autores, tais como os nematocistos estenotelos, entre 10-30 µm (15.48 ± 0.44; mèdia ± desvio padrão) de comprimento e 6-20 µm (11.75 ± 0.82) de diâmetro, os holótricos isoriza de 9-14 µm (11.96 ± 0.56) de comprimento e 4-7 µm (5.45 ± 0.31) de diâmetro, átricos isoriza de 5-13µm (8.00 ± 0.87) de comprimento e 3-8µm (4.80 ± 0.38) de diâmetro e os desmonemas de 6-12µm (8.24 ± 0.67) de comprimento e 4- µm (5.70 ± 0.43) de diâmetro. De cor marrom, a coluna oscila entre 1.98-9.88 mm de comprimento e 0.31-1.82 mm de diâmetro e seus tentáculos, em número de 6 a 9, têm aproximadamente um comprimento relativo de ¾ o comprimento da coluna. É dióica e apresenta cinco a seis tentáculos nos brotos jovens, os quais cresceram descontinuamente.
Palavras-chave: cnidários, hidrozoários, corpos da água doce.

INTRODUCTION

Cnidarians are mostly marine animals, but can be found in nearly all types of freshwater (i.e., streams, rivers, ponds and lakes), and occur mainly in mesotrophic to eutrophic habitats. The diversity of freshwater cnidarians is low. There are 40 species that are probably grouped in less than 15 genera (Jankowski *et al*. 2008). Hydras are freshwater cnidarians polyps. They can be found on all the continents except Antarctica, and they are also found on continental islands but are apparently absent from oceanic islands (Campbell 1999). Sometimes they can reach dense populations, which has been attributed to budding, morphological plasticity and regeneration capacity (Zamponi 1991). It is known that at high population densities, these organisms become significant predators of small invertebrates and, occasionally, tiny fish that they manage to immobilize and catch by means of their nematocysts (Dumont 1994, Elliott *et al*. 1997, Jankowski *et al*. 2005). The type and size of the prey potentially selected by hydras helps determine the structure of freshwater zooplanktonic communities (Schwartz *et al*. 1983).

Nearly 80 species of *Hydra* have been described; however, perhaps only 15 are really different (Jankowski *et al*. 2008). In South America, studies of these polyps began with Cordero (1939, 1941a, b), who developed a series of detailed descriptions of hydras from this region (such as *Chlorohydra viridissima* Pallas, 1766 from Brazil, Venezuela and Uruguay; *H. iheringi* from Brazil; and *H. attenuata thomseni* from Uruguay). Cordero considered all of these species as an "abundant component of the slight fauna" of lakes, pools and streams. Carvalho Wolle (1978) and Lang da Silveira *et al*. (1997) also mentioned *H. intermedia*, *C. viridissima* and *H. salmacidis* for Brazil. Studies of these polyps in Argentina are poor or absent, except for a paper by Dioni (1968), which reports *Hydra plagiodesmica* from the Salado River. The present study is a contribution to the diversity of freshwater cnidarians from Argentina, and is the first record of *Hydra vulgaris* Pallas, 1766, for this country.

1. Laboratorio de Biología de Cnidarios (LABIC), Facultad de Ciencias Exactas y Naturales, Departamento de Ciencias Marinas, Universidad Nacional de Mar del Plata. Funes 3250, (B 760 2AYL), Mar del Plata, Argentina.
2. CONICET, Laboratorio de Biología de Cnidarios (LABIC). Facultad de Ciencias Exactas y Naturales, Departamento de Ciencias Marinas, Universidad Nacional de Mar del Plata. Funes 3250, (B 760 2AYL), Mar del Plata, Argentina.
* Author for correspondence. E-mail: mdeserti@mdp.edu.ar

MATERIALS AND METHODS

Study area

The study was made at the Los Padres Lagoon Natural Reserve (37º 56' S; 57º 45' W), a wetland area in the Pampas Region of Argentina (Fig. 1). The lagoon has an area of 2.16 km^2 and a mean depth of 1.24 m (Pozzobon & Tell 1995). It is permanent and does not have thermal or chemical stratifications (Ringuelet *et al*. 1967, Ringuelet 1972).

Sampling design

A sample was taken on May 7 (2009) at 10:00 a.m. Twenty stems of *Schoenoplectus californicus* (Cyperaceae) were taken out of the lagoon and the first 20 cm of the submerged portion of each stem was collected. The sample was stored in a package that contained water from the site and was transported to the laboratory. At the same time the sample was made, the main limnological parameters (water temperature taken with a manual thermometer, 15°C), depth (37 cm) and transparency (10.6 ± 2.8 m taken with a disc of Secchi) were determined *in situ*. In addition, water samples were taken for the following analyses: dissolved oxygen (3.96 mg/L), total alkalinity (718.8 mg/L), turbidness (44.9 PTU) and pH (9). These analyses were made by the Chemistry Laboratory of Faculty Sciences from the State University of Mar del Plata following the recommendations of the American Public Health Association (APHA 1998).

Maintenance of sample and identification of hydras

The sample was placed in a circular aquarium that was 20 cm in diameter, with an aerator, to maintain the stems of the rushes (where the hydras adhere). Hydras were separated from the stems, using fine point tweezers, for later observation. Twice per week water was added from the Los Padres Lagoon. The sample was kept at 20º ± 3ºC with a photoperiod of 12 hours of light and 12 hours of dark for a week. During this week, and under these conditions, measurements of the extended hydras were made using a micrometer under a stereomicroscope.

Figure 1. Map of Los Padres Lagoon (37º 56' S; 57º 45' W).

From the 11 studied specimens, the following data was obtained: length (from oral to the aboral region); width, in the middle region, and form of the column; colour and form of the hypostome; number, length relative to body, colour and form of the tentacles; number, position, tentacle formation, number of tentacles, length and width of each bud.

Type, length, width and frequency of appearance of the nematocyst were obtained from squashed tissues of

Figure 2. A. *Hydra vulgaris* with buds. B. *Hydra vulgaris* with testes (t). C. *Hydra vulgaris* with embryotheca (e).

Table 1. Measurements of undischarged nematocysts types (Desmoneme, Stenotele, Atrichous and Holotrichous) from eleven specimens.

	Desmoneme		Stenotele		Atrichous		Holotrichous	
	Lenght- Diameter (min-max)		Lenght-Diameter (min-max)		Lenght-Diameter (min-max)		Lenght-Diameter (min-max)	
1	8-10	5-7	11-18	9-15	7-10	4-6	10-14	4-6
2	8-11	4-6	13-17	10-15	5-8	3-5	11-14	4-6
3	7-10	4-8	10-18	6-13	8-13	4-8	11-14	5-7
4	7-9	4-7	12-18	8-15	7-10	4-6	10-14	4-6
5	6-11	4-7	12-16	10-15	7-10	4-6	9-13	4-6
6	7-10	5-7	11-18	9-13	5-8	3-5	11-13	4-6
7	6-11	4-7	13-16	10-15	7-10	4-6	9-13	4-6
8	7-9	5-7	10-18	8-13	8-10	4-6	10-13	4-6
9	8-12	5-8	23-30	10-20	8-13	4-8	11-14	5-7
10	6-9	5-7	10-18	9-15	6-8	3-6	11-12	5-7
11	6-7	5-6	12-18	9-15	6-8	4-6	11-12	5-7
	(mean±SD)		(mean±SD)		(mean±SD)		(mean±SD)	
Length	8.24 ± 0.67		15.48 ± 0.44		8.00 ± 0.87		11.96 ± 0.56	
Diameter	5.70 ± 0.43		11.75 ± 0.82		4.80 ± 0.38		5.45 ± 0.31	

the column and tentacles. Nematocyst nomenclature follows Wang *et al*. (2009).

RESULTS

The hydras were brown, easily raised in the laboratory and their tentacles reached up to ¾ of the column. The column width was variable through out and had darker bulges in the gastric region, especially in fed polyps. The length of the column varied from 1.98 to 9.88 mm and the width from 0.31 to 1.82 mm. The hypostome was conic and brown in all individuals. The tentacles were moniliform and even in diameter when at rest. The specimens had six to nine tentacles (six tentacles in eight specimens, seven in two specimens and nine in one specimen).

Asexual reproduction

The time lapse between onset of development and the detachment of the buds varied. The length of each bud was 1.51 to 4.56 mm and the width was 0.13 to 0.78 mm. A single bud per polyp was the most common, but two (Fig. 2A) or more (e.g., four) were observed. When a hydra had more than one bud, the buds were at different developmental stages, and the younger bud had only primordial tentacles. The buds had a tendency to be darker with a slightly greater diameter than the column of the original polyp. Buds had six, seven or eight tentacles that were slightly discontinuous.

Sexual reproduction

The species is dioecious. From the 11 specimens, one had testes and two had embryotheca. The male one had three testes with the following measurements: 198, 277, and 296 µm in diameter and 295, 451 and 690 µm in length. At the stage observed the testes had a nipple. The testes are white coloured and are located above the gastric region. (Fig. 2B). Spermatozoa were seen moving in the nipple. Four pulses of sperm were seen moving through the nipple when the specimen was observed under the microscope.

The embryotheca occurs at the level of the budding region; they are round and have the same colour testes (Fig. 2C). One specimen had one embryotheca that was 633.6 µm in diameter and another one had an embryotheca that was 514.8 µm in diameter. This latter specimen also had a second, small embryotheca in development, which was above the first one, 295.3 µm in diameter and the same colour.

Nematocysts

The four characteristic nematocyst types of hydras were observed (Fig. 3); their measurements are in Table 1.

Desmonemes were the most abundant. They were present only in the tentacles, and were pyriform in shape and the filament was coiled one and a half times inside the capsule. These were followed (in abundance) by the stenoteles that were found in tentacles and in the column. Stenoteles were pear-shaped (eudipleural pyriform); the shaft occupied approximately 60% of the capsule and the filament was coiled against the wall, more or less occupying the lower half. When the stenoteles were everted, the capsules were smaller and the shafts displayed three thorns of equal size.

The atrichous isorhiza were less abundant, and were present only in the tentacles. They had a seed-like shape and displayed a very fine filament (vertically on itself) that occupied all of the interior part of the capsule.

The holotrichous isorhiza were the least abundant nematocyst. They were located in the column and displayed a form similar to a paramecium or sole of a shoe. The zone where the filament originated was fine; they always showed three or four heavy turns, generally of oblique disposition and a mass of fine filament that formed dense groups (like a ball of yarn) in the lower portion of the capsule.

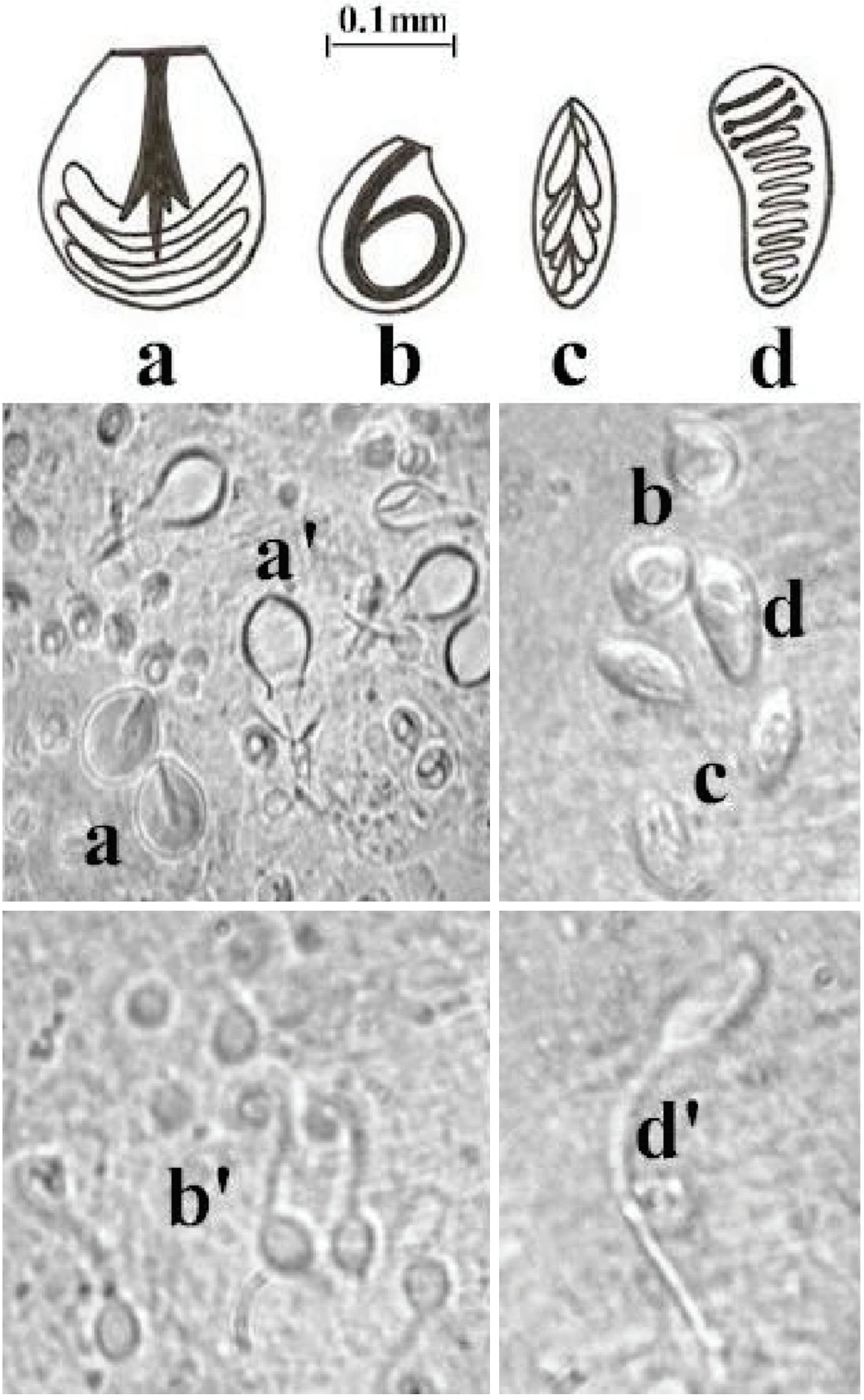

Figure 3. Nematocysts found in *Hydra vulgaris.* Line drawing of nematocysts and pictures of them showing the following: a, stenotele; a', discharged stenotele; b, desmoneme; b', discharged desmoneme; c, atrichous isorhiza; d, holotrichous isorhiza and d', discharged holotrichous isorhiza.

DISCUSSION

The group that comprises the brown hydras has been studied by Schulze (1917), Campbell (1982, 1989) and Holstein *et al*. (1990). However, the only taxonomic study of hydras for the inland waters of Argentina is by Dioni (1968), who described *Hydra plagiodesmica* (which is a green hydra) from the Salado River.

For South America, the species of non-green hydras that have been described are the following:

* *Hydra intermedia* Carvalho Wolle, 1978, from Brazil, dioecious over a two-year period of observation, has spines with flattened extremities in the embryotheca, is only 30 to 38.5µm long, the tentacles in the buds arise in slightly staggered sequence, and the desmoneme nematocysts are longer than the atrichous isorhiza.

* *Hydra salmacidis* Lang da Silveira, 1995, from Brazil, monoecious with testes with a nipple and round embryotheca with spines that range from 20 to 60µm in length, uniform column, tentacles up to three times the column length and holotrichous isorhiza nematocysts that are smaller or almost as long as the stenoteles.

* *Hydra attenuata* subsp. *thomseni* Cordero, 1939, from Uruguay, dioecious with testes with a nipple and round embryothecas with spines, uniform column and stenoteles in two sizes (like *H. attenuata* from Europe).

* *Hydra iheringi* Cordero, 1939, from Venezuela and Brazil, with short tentacles, a conic hypostome, cylindrical column with a small stalk close to the foot and holotrichous isorhiza with five transverse coils.

The hydra studied in the present paper is dioecious like *H. intermedia* and *H. attenuata* subsp *thomseni*, but differs from these because it has no spines on the embryotheca. In comparison with *H. iheringi*, these have short tentacles, a characteristic not found in the specimens studied in the present work; the same occurs with the number of transverse coils of the filament on their holotrichous isorhiza.

Therefore, the hydras of the present study belong to the *vulgaris* group *sensu* Campbell (1982, 1987 and 1989); they are brown hydras, their holotrichous isorhiza have three or four transverse coils and the young buds have five or six tentacles, with discontinuous growth.

The species *Hydra vulgaris* Pallas, 1766, is recorded for the first time for the inland waters of Argentina. It was found in a periphyton community localized along the coast of a lagoon. This community mainly acquires a singular ecological importance given the high primary productivity that it usually displays in shallow lentic water bodies with abundant coastal vegetation (Pieczynska 1970). The analysis of the taxonomic composition of this community type is frequently used to evaluate the trophic state and the degree and type of contamination of many aquatic ecosystems (Kettunen 1983, Sládecková *et al*. 1983).

As can be seen, the identification of species of *Hydra* is difficult and some authors like Anokhin *et al*. (1998), Campbell (1982, 1987, 1989 and 1999), Campbell and Holstein (1991), Forrest (1959, 1963) and Holstein *et al*. (1990) noted that the taxonomy of this genus is not well understood; and is further complicated by the complexity and similar morphology of species, such as those of the *vulgaris* group, which is very heterogeneous and has

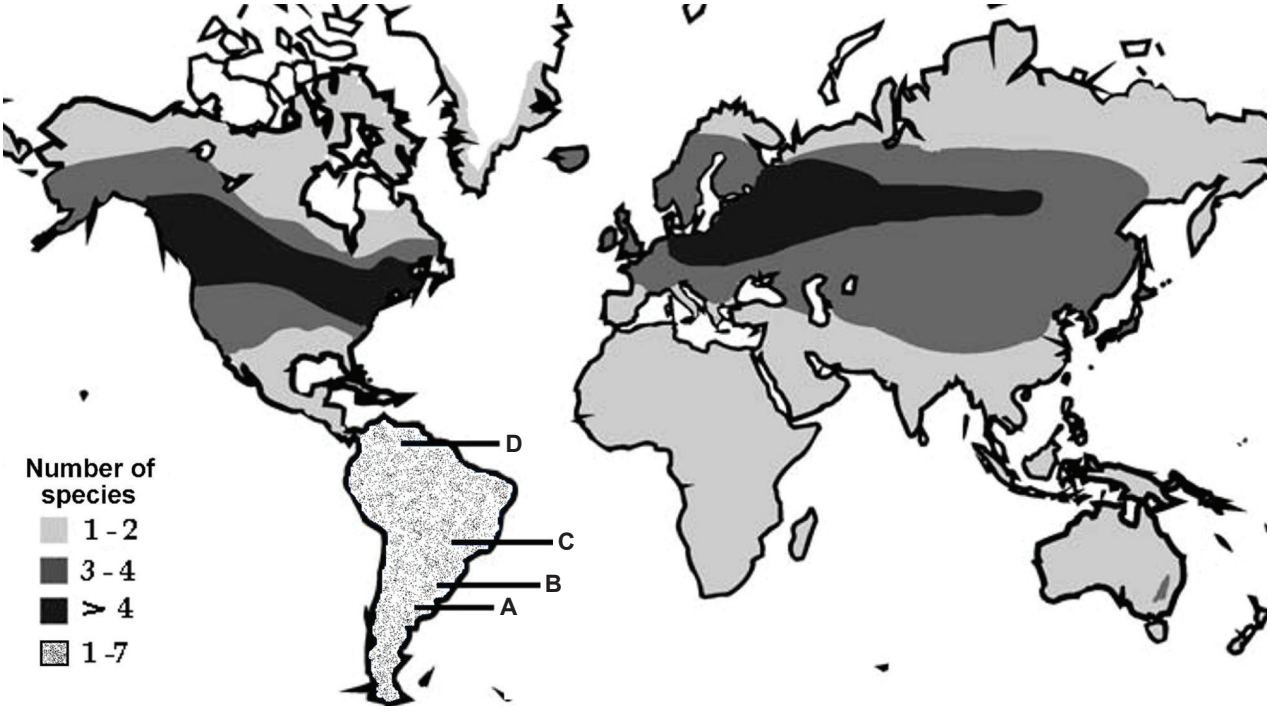

Figure 4. Modified map from Jankowski *et al*. (2008). **A.** *Hydra plagiodesmica* and *H. vulgaris*. **B.** *Chlorohydra viridissima* and *H. attenuata* subsp. *Thomseni*. **C.** *H. iheringi*, *C. viridissima*, *H. intermedia* and *H. salmacidis*. **D.** *C. viridissima*.

characteristics similar to three other groups.

Jankowski *et al*. (2008) provided a map with the number of species of hydras for South America but did not include the names of these species. Therefore, the authors of the present study modified this distribution map by updating the composition and diversity, as well as regional distribution (Fig. 4), which further clarifies the South American diversity reported by Jankowski *et al*. (2008).

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