

## A new Charopidae from Chile and Argentina, *Stephacharopa calderaensis* n. gen. and n. sp., with remarks on the taxonomy of the genus *Stephadiscus* HYLTON SCOTT 1981

(Mollusca: Gastropoda Pulmonata)

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### Abstract

A new genus and new species of Charopidae, *Stephacharopa calderaensis*, is described based on specimens collected in the Atacama region, northern Chile. The new genus is clearly distinct from its congeneric genera due to its axial shell sculpture. The new genus also includes the species *Stephacharopa testalba* (HYLTON SCOTT 1970) n. comb. and *Stephacharopa distincta* (HYLTON SCOTT 1970) n. comb. The related genus *Stephadiscus* HYLTON SCOTT 1981 is herein redefined. Species thus included in genus *Stephadiscus* are *S. lyratus* (COUTHOUY in GOULD 1846), *S. rigophila* MABILLE 1886, *S. perversus* (HYLTON SCOTT 1969), *S. rumbolli* (HYLTON SCOTT 1973) and *S. stuardoi* MIQUEL & BARKER 2009, all of them with a distribution restricted to humid areas of southern South America.

**Key words:** Stylommatophora, Punctoidea, South America, *Stephadiscus*–*Stephanoda*, taxonomy.

### Introduction

Charopid snails are widely distributed in South America, especially in the humid neotropical areas, where they constitute an abundant but somewhat overlooked microfauna. Several speciose genera, from the southern part of South America have been described and recorded: *Amphidoxa* ALBERS 1850, *Stephanoda* ALBERS, 1860, *Radiodiscus* PISLBRY & FERRISS 1906, *Austrodiscus* PARODIZ 1957, *Lilloiconcha* WEYRAUCH 1965, *Zilchogyra* WEYRAUCH 1965, *Stephadiscus* HYLTON SCOTT 1981 and *Araucocharopa* MIQUEL & CÁDIZ LORCA, 2009 (STUARDO & VEGA 1985, MIQUEL et al. 2007, MIQUEL & CÁDIZ LORCA 2009). However, some of the micromolluscs described by PHILIPPI (1860), mainly from the areas near Valdivia,

southern Chile, are currently difficult to identify due to absence of type specimens and the brief, incomplete original descriptions. Many of these species have been considered incertae sedis by STUARDO & VEGA (1985). The objective of this work is, thus, to contribute on the knowledge of the terrestrial molluscan fauna, which is one of the least studied molluscan groups in Chile.

All the material used in the description of the new genus and species were collected by hand in the field and none was recovered with soft parts. Some shell specimens were measured under a stereoscope microscope and imaged by scanning electronic microscope in the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”.

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Used comparative material is listed in the appendix 1. The abbreviations used are:

FMNH	Field Museum of Natural History, Chicago, United States of America.
MACN-In	Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina.
MLP	Museo de La Plata, La Plata, Argentina.
MNHN	Muséum National d’Histoire Naturelle, Paris, France.

MNHNCL	Museo Nacional de Historia Natural, Santiago, Chile.
MUSM	Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru.
MZUC	Museo de Zoología, Universidad de Concepción, Concepción, Chile.
SMF	Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany.

## Systematics

### *Stephacharopa* n. gen.

**Diagnosis:** Shell small, orbicular of low spire, with sculpture different in morphology between protoconch and teleoconch, which can be distinguished even under low magnification; protoconch with smooth ribs, interspaces almost smooth or occupied by a few irregu-

lar and almost obsolete costulae; teleoconch with wide nodulose ribs and nodule costulae between them.

**Description:** Shell orbicular with low spire, moderately thick, of medium size for the family; suture deep; aperture descendent, almost circular; protoconch well differentiated from teleoconch by distinct sculpture; protoconch with thin smooth ribs, interspaces almost smooth or occupied by a few irregular and almost obsolete costulae; ribs fewer than 90; teleoconch sculptured with wide, marked ribs, and about ten axial costulae between them; umbilicus well developed and widely perspective; animal unknown.

**Type species:** *Stephacharopa calderaensis* n. sp.

**Distribution:** Chile and north western Argentinian Patagonia (Fig. 1).

**Stratigraphic distribution:** Holocene and Recent. Possibly Miocene.

**Etymology:** Conjunction between *Stephadiscus* HYLTON SCOTT 1981 and *Charopa* ALBERS 1860.

**Included species:** Besides the type species, species included now in the new genus are *Stephanoda distincta* HYLTON SCOTT 1970 and *Stephanoda testalba* HYLTON SCOTT 1970 (Fig. 9). Fossils specimens recently recorded from the Holocene of Chile, identified as *Stephadiscus* aff. *testalbus* and *Stephadiscus* sp. (MIQUEL & RAMÍREZ, 2011), which show similar conchological characteristics, could be included. Other older specimens from Argentina, from the Miocene of Santa Cruz (RODRÍGUEZ et al. 2012) and from the Eocene of Chubut (MIQUEL & BELLOSI 2007, 2010), could also be included in the new genus; however, not enough characters have been preserved clearly enough to warrant their inclusion now.

**Comparison with related genera:** The new genus can be easily distinguished from all other genera of Punctoidea living in South America due to its axial sculpture features. The related genera *Stephadiscus* and *Amphidoxa* differ from the new genus in having a very different sculpture between protoconch and teleoconch, with profuse and delicate radial ribs and costulae in the former (Figs 6–9) and in having a teleoconch

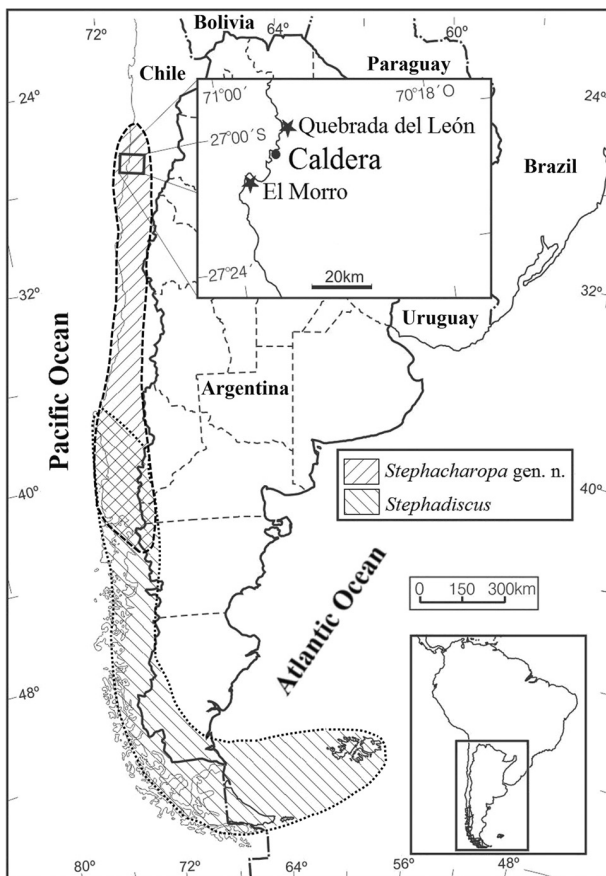
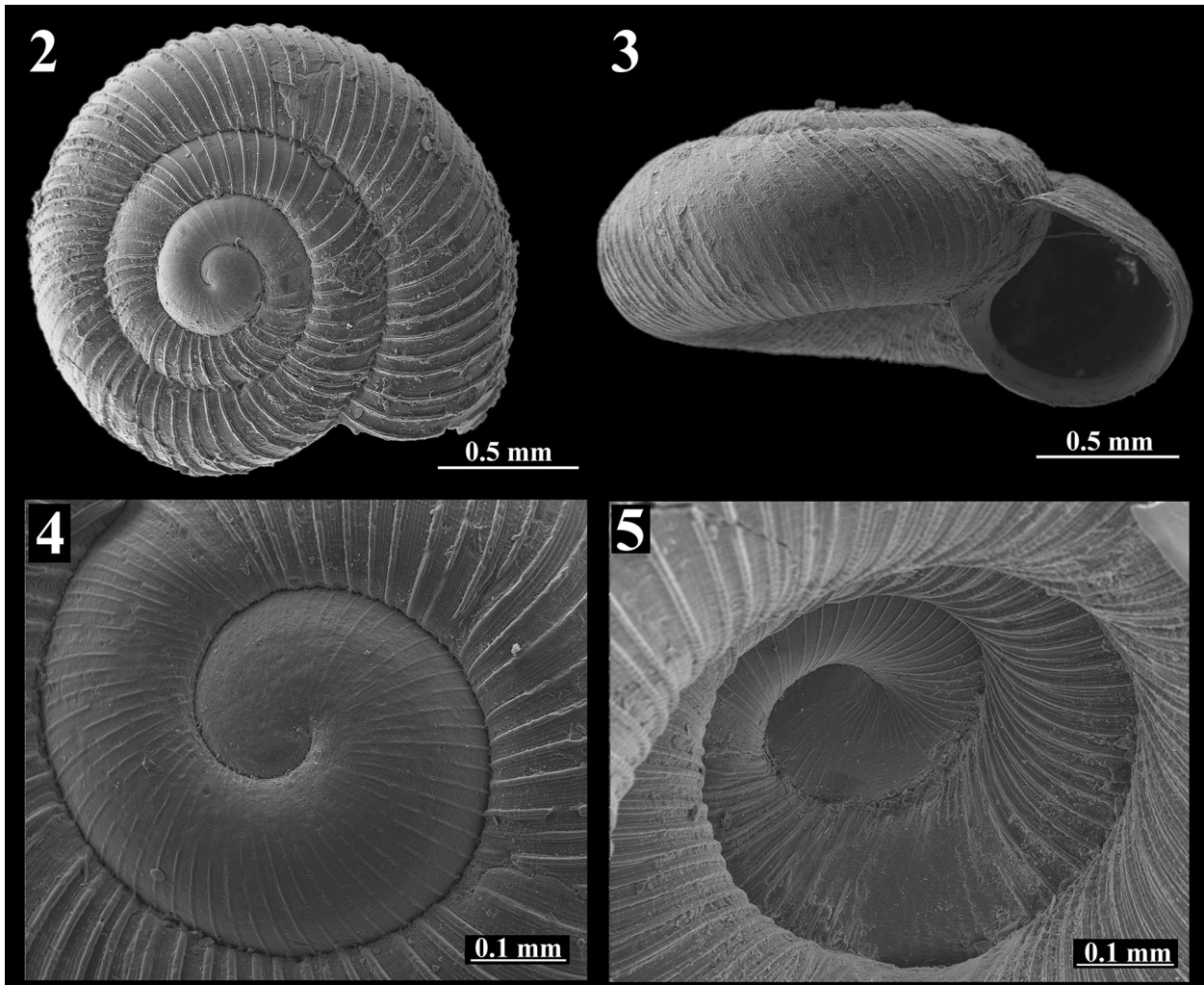


Figure 1: Distribution map of the genera *Stephacharopa* n. gen. and *Stephadiscus* HYLTON SCOTT 1981, and location map of *Stephacharopa calderaensis* n. sp.



Figures 2–5: Scanning electron micrographs of shells of *Stephacharopa calderaensis* n. gen. et n. sp. 2. Holotype. MNHNCL, apical view; 3. Paratype MACN-In 39023, frontal view; 4. Holotype. MNHNCL, protoconch detail; 5. Paratype MACN-In 39023, detail of umbilical area.

and protoconch with similar radial sculptures in the latter (Appendix 1).

*Stephacharopa calderaensis* n. sp.

Figs 2–5

**Diagnosis:** Shell orbicular, discoidal, of medium size for the family, with 4.5 whorls; protoconch of 1.75 whorls, with 40–60 delicate, thin, smooth ribs; teleoconch sculpture of ribs and nodulose costulae, last whorl with around 90–95 ribs, interspaces filled with about ten costulae; aperture circular, descendent; umbilicus well developed and widely perspective.

**Description:** Shell orbicular, discoidal, moderately thick, 2.10–3.00 mm width, with 4.5 convex whorls; widely umbilicate; spire low, with protoconch of 1.75 whorls, sculptured with 40–60 thin and smooth radial ribs, interspaces almost smooth; teleoconch of 2.75 whorls, sculptured with 90–95 prominent, wide, prosocline nodulose radial ribs, with interspaces filled by

about ten nodulose costulae, some of these small nodulae seem to be formed by the intersection of the radial ribs with fine spiral threads; suture deep; aperture circular, descendent, about 0.72 of shell height; lip relatively thick, columellar part slightly reflected over umbilicus; callus on body whorl distinct; umbilicus widely perspective, about 0.3 of shell diameter; shell microstructure consisting of well-developed columnar prisms oriented towards external surface, of 800 nm in length (BOLMARO, pers. comm., 2012); Animal unknown.

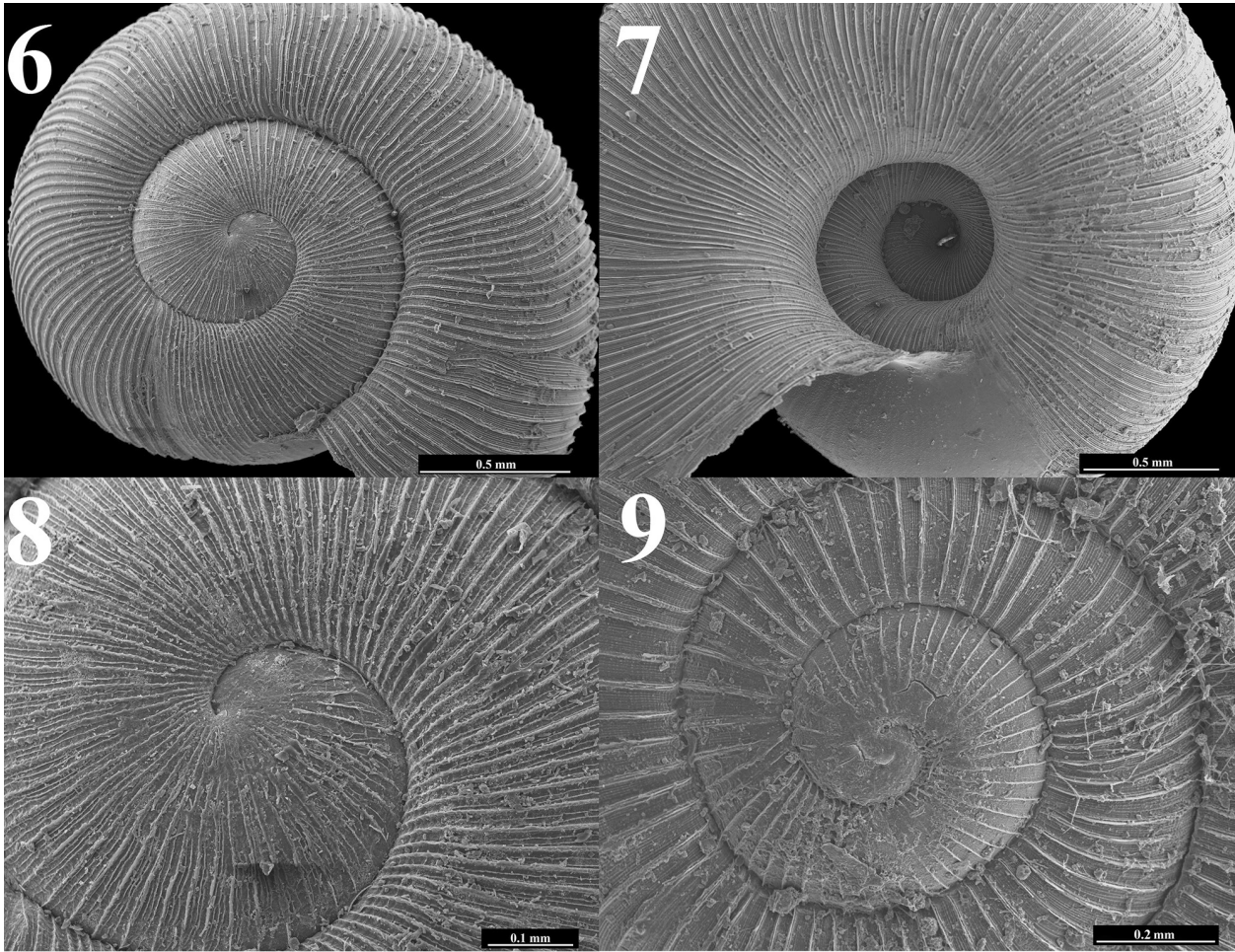
**Type locality:** Quebrada del León (26°57'S 70°44'W, 296 m), about 15 km NE of Caldera, Province of Copiapó, Region of Atacama, Chile.

**Distribution:** Region of Atacama, northern Chile.

**Eymology:** From Caldera, city closest to the type locality of the species.

**Type material:** Holotype: MNHNCL ... collected by J. F. Araya, 15/I/2012. Paratypes: MNHNCL ... MACN-In 39022. Quebrada del León, collected by J.F. Araya, 15/I/2012, 18 specimens; MACN-In 39023. NE Cerro El Morro (27°08'S 70°55'W, 165 m), south of Caldera, Copiapó, Atacama region, Chile, col-





Figs 6–9: Scanning electron micrographs of shells of species of Charopidae. — Figures 6–8: *Stephadiscus lyratus* (COUTHOUY in GOULD 1846). MACN-In 22525-1. 6. Apical view of teleoconch and protoconch; 7. View of umbilical area; 8. Detail of protoconch. — Fig. 9. *Stephacharopa testalba* (HYLTON SCOTT 1970). Apical view of protoconch.

lected by J.F. Araya, 24/III/2012, 25 specimens. MZUC 39606-39610 NE Cerro El Morro (27°08'S 70°55'W, 165 m), south of Caldera, Copiapó, Atacama region, Chile, collected by J. F. Araya, 24/III/2012, 5 specimens. SMF XXXXX/X, Quebrada del León, collected by J. F. Araya, 15/I/2012, 5 specimens.

**Remarks:** *Helix paupera* PHILIPPI 1860, also described from the Atacama region, northern Chile, may be conspecific with *S. calderaensis* n. sp. based on the original illustration (PHILIPPI 1860: 164, lám. VII, fig.

9). Unfortunately, the taxonomy of this species remains unresolved as the type material has not been located and conchological details, like the characteristic features of nepionic sculpture and details of teleoconch (which are diagnostic characters for the family), were not clearly described nor clearly illustrated in the original description. This was acknowledged in the last review of the Chilean terrestrial Gastropoda (STUARDO & VEGA 1985), where *H. paupera* was listed as *Incertae sedis*.

Table 1: Shell measurements (in mm) of *Stephacharopa calderaensis* n. sp.

	Size (width × height)	Whorls	Aperture (width × height)	Ribs (Protoconch/Teleoconch)
Holotype MNHNCL .....	2.10 × 1.05	4 +	0.65 × 0.65	60 / 90
Paratype MACN-In 39022	2.20 × 1.15	4.5	0.70 × 0.75	65 / 85
Paratype MACN-In 39022	2.10 × 1.10	3.75	0.70 × 0.65	62 / 80
Paratype MACN-In 39023	3.00 × 1.30	4.5	1.05 × 0.80	42 / 95
Paratype MACN-In 39023	2.75 × 1.30	4.25	1.05 × 0.65	—
Paratype MACN-In 39023	2.20 × 1.05	4	0.80 × 0.65	—
Paratype MACN-In 39023	2.20 × 1.05	—	0.80 × 0.55	—

Habitat: *Stephacharopa calderaensis* n. gen. and n. sp. was collected at two localities near Caldera, northern Chile, separated by at least 23 km. Both localities comprise low hills, separated from the adjacent Cordillera de la Costa by sand and gravel alluvial plains, deposited in the past by the river Copiapó (PASKOFF & MANRÍQUEZ 2003). At both localities the specimens were recovered from humus samples or buried in organic debris under cacti and roots of small bushes like *Adesmia* and *Heliotropium*. Associated with this habitat, numerous specimens of terrestrial Mollusca were recovered, including *Bostryx* aff. *pumilio* REHDER 1944, *Bostryx pupiformis* PHILIPPI 1845 and *Pupoides minimus* PHILIPPI 1845 at Quebrada del León, and *Plectostylus broderippi* SOWERBY 1832 at El Morro. The coast of Atacama, which encompasses the

type locality of *S. calderaensis* n. sp., is included in the phyto-geographical zone of the Atacama Desert (LUEBERT 2011). The areas around the city of Caldera are characterized by vegetation conditioned by the incidence of coastal fogs and low annual precipitations. The vegetation is dominated by cacti, mainly from the *Eulychnia* and *Copiapoa* genera and by annual herbs from genera like *Cristaria*, *Cistanthe*, *Tetragonia* and *Nolana*, which are distributed mainly in sandy areas. Flowering herbs *Alstroemeria*, *Leucocoryne* and *Oxalis* grow principally in sand among rocks. Noteworthy are the rains associated with the El Niño-Southern Oscillation (ENSO) phenomenon, which produce a huge blossoming of the vegetation in the coastal desert (CERECEDA et al. 2000), increasing significantly the biomass of the region.

### Discussion

Almost all the species of South American Charopidae are only known from their shell, which are highly diverse in form, ornamentation and size. The absence of anatomical descriptions for most of them (HYLTON SCOTT 1970) is a barrier to infra-family taxonomy.

The genus *Stephadiscus*, as defined by its author HYLTON SCOTT (1981), is characterized by having an exclusively radial nepionic sculpture and by having post-embryonic nodulose costulae. These characteristics allowed HYLTON SCOTT (1981) to further distinguish species belonging to *Stephanoda* (considered as having a smooth protoconch (HYLTON

SCOTT 1980), when it is, actually, reticulated (MIQUEL & CÁDIZ LORCA 2008)), from species of genus *Radiodiscus*, which have a radial protoconch sculpture, and from the genera *Lilloiconcha* and *Zilchogyra*, both of them with smooth protoconchs (MIQUEL & CÁDIZ LORCA 2009).

Our observations, however, indicate that the genus *Stephadiscus* in fact involves two very different structural models. *Stephadiscus lyratus* (COUTHOUY in GOULD 1846) (Figs 6–8), the type species of the genus, *Patula rigophila* MABILLE 1886 (a possible synonym of *S. lyratus*), *S. perversus* (HYLTON SCOTT 1969), *S. rumbolli*

Table 2: Comparative characteristics of species related to *Stephacharopa calderaensis* n. sp. Width and height measurements are in mm.

	Radial sculpture: Protoconch / Teleoconch	Whorls: Protoconch – Teleoconch	Average size (width × height)	H/W	O/W	Ribs on Protoconch	Ribs on last whorl
<i>Stephacharopa calderaensis</i> n. gen. and sp.*	Dissimilar	4.50: 1.75 + 2.75	2.4 × 1.1	0.47	0.33	40–60	90–95
<i>Stephacharopa distincta</i> n. comb. (Holotype)	Dissimilar	4.00: 2.0 + 2.0	2.1 × 1.3	0.62	0.30	70	150
<i>Stephacharopa testalba</i> n. comb. (MACN-In 21754-1)	Dissimilar	3.75: 1.75 + 2.0	2.6 × 1.3	0.51	0.25	50	80
“ <i>Stephadiscus</i> ” sp. aff. <i>Testalbus</i> (MACN-Pi 4918)	Dissimilar	3.75: 1.50 + 2.50	1.9 × 0.9	0.47	0.5	?80	80
“ <i>Stephadiscus</i> ” sp. (MACN-Pi 4917)	Dissimilar	3.75: 1.50 + 2.25	1.5 × 0.9	0.60	0.4	?70	95
<i>Stephadiscus lyratus</i> (MACN-In 22525-1)	Similar	4: 1.75 + 2.25	6.0 × 3.2	0.53	0.25–0.20	120	200
<i>Stephadiscus perversus</i> (MACN-In 36.121)	Similar	4.25: 2.0 + 2.25	2.1 × 1.2	0.57	0.65	110	120
<i>Stephadiscus rumbolli</i> (Holotype)	Similar	2.25: 1.75 + 0.5	3.2 × 1.7	0.53	0.40	140	50**
<i>Stephadiscus stuardoi</i> (Holotype)	Similar	4.25: 2.0 + 2.25	2.0 × 0.8	0.40	0.25	150	190

\* see Table 1. \*\* Juvenile



(HYLTON SCOTT 1973) and *S. stuardoi* MIQUEL & BARKER 2009 represent one model, which presents a protoconch and teleoconch similarly sculptured in their axial ribs, while the species *Stephacharopa distincta* (HYLTON SCOTT 1970) n. comb., *Stephacharopa testalba* (HYLTON SCOTT 1970) n. comb. and *Stephacharopa calderaensis* n. sp. represent a further model, where the characteristics of the protoconch and teleoconch differ substantially in the form and arrangement of the rib ornamentation.

*Stephadiscus lyratus*, *S. rigophila*, *S. perversus*, *S. rumbolli* and *S. stuardoi*, here treated as belonging to *Stephadiscus* s. str., possess plane-convex whorls, with a sculpture of nodulose ribs and costulae in the interspaces. In these species, the protoconch and teleoconch are of such great similarity that a transition between protoconch and teleoconch is barely distinguishable. Thus, the genus *Stephadiscus* is defined by the new diagnosis herein described: protoconch and teleoconch with the same ornamentation of thin, nodulose ribs, with about ten nodulose costulae in the interspaces between them. The transition between protoconch and teleoconch is slightly marked by a very tenuous scar or callus. The number of ribs on the protoconch and teleoconch is about 120 and 200, respectively. The apex is not prominent (Table 2). The type species, *S. lyratus*, is characterized by a nearly average size for the family, a low spire, a rather narrow umbilicus, and an expanded final whorl (HYLTON SCOTT 1970), as well as a oblique lamellar and globular microstructure of the shell, and crystals with 100–200 nm in length (BOLMARO, pers. comm., 2012).

*Stephacharopa testalba*, *S. distincta* and *S. calderaensis* n. sp. exhibit convex whorls, with a distinct difference in the sculpture of the protoconch and teleoconch, with thin, smooth radial ribs in the former and nodulose thick radial ribs in the latter. The interspaces between the ribs on the protoconch are filled with a few low, nodulose, irregular costulae (*Stephacharopa testalba* and *S. distincta*) or they are almost smooth (*S. calderaensis* n. sp.), whereas in the adult shell the interspaces are filled with about ten nodulose costulae. In these species the number of ribs on the protoconch is about 40–60 and on the teleoconch about 90–95. The apex is not prominent (Table 2). *Stephacharopa calderaensis* n. sp. differs from *S. testalba* as the latter has a larger shell with fewer whorls, a narrower umbilicus and, generally, fewer ribs on the adult shell. From *S. distincta*, the new species can

be distinguished by having fewer embryonic costulae and much fewer ribs in the adult shell (Table 2).

The microstructure of the embryonic and adult shells varies substantially among these Charopidae. Further research should involve a broader survey of species in the family in order to define and delimit the characteristics of crystallization in the protoconch and teleoconch in these charopid genera that may indicate phylogenetic relationships.

*Stephacharopa* n. gen. has been recorded in the continental region of Chile, from Atacama to Puerto Montt, and in Argentina near Bariloche. *Stephadiscus* on the other hand, has been recorded from Concepción, Chile to the southern tip of the American continent (Cabo de Hornos/Cape Horn) and Islas Malvinas (Falklands Islands) (Fig. 1).

All other species presently included in the genus *Stephadiscus* should require further critical study to determine their proper generic placement. These species include *Stephanoda celinae* HYLTON SCOTT 1969, *Stephanoda antarctica* HYLTON SCOTT 1973, *Stephadiscus striatus* HYLTON SCOTT 1981 (a possible introduced Punctidae in Venezuela, with two subspecies, *striatus* and *caribeus*) and *Stephadiscus madreiosensis* MIQUEL & RAMÍREZ 2011 (a possible Pristilomatidae from Peru).

An updated identification key to the South American genera of Punctoidea is given in appendix 2.

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## Appendix 1: Comparative material examined.

*Araucocharopa gallardoi* MIQUEL & CÁDIZ LORCA 2009: Holotype MNHNCL 6610. Reserva Costera Valdiviana, Valdivia, XIV Región, Chile, coll. F.J. Cádiz Lorca, 10/I/2006.

*Stephacharopa distincta* (HYLTON SCOTT 1970): Holotype MACN-In 27332. Woody area of river Foyel, Río Negro, coll. O. Kühnemann, 21/XI/1940, coll. C. Matteri; paratype (1) MACN-In 27.332-2. Woody area of river Foyel, Río Negro, coll. O. Kühnemann, 21/XI/1940, coll. C. Matteri; ? paratype (1). MLP 11.490. Foyel River, road to Bariloche. FMNH 308.199. Chile, Prov. Chiloé, Isla Chiloé, Chepu, coll. T. Cekalovic, 14/I/2002 [Tc-708]. 1 ex.

*Stephanoda antarctica* HYLTON SCOTT 1973: Holotype MACN-In 27820. Malvinas Islands / Falklands Islands, coll. M. Rumboll, 1971.

*Stephacharopa testalba* (HYLTON SCOTT 1970): Holotype MLP 10.511. Mascardi Lake area, coll. M. Birabén, 1942. MACN-In 35366. Lanín National Park, route 63, Neuquén, Argentina. Dry, open scrubland, coll. Barker-Miquel, 17/X/1996. 1 ex. MACN-In 21754-1, Llao Llao, Nahuel Huapi National Park. 1 ex. MACN-In 36103, Lanín National Park, route 63. Dry, open scrubland, coll. Barker-Miquel, 17/X/1996. 3 exs. MACN-In 36112, Hualpén Botanical Park, Concepción, Chile, coll. Barker-Miquel, 13/X/1996. 1 ex. Broadleaf gully forest, ad-

jaçant to lake. MACN-In 36113, Nahuel Huapi National Park, route 258, Gutiérrez, Lake. *Nothofagus* forest, coll. Barker-Miquel, 16/X/1996. 1 ex. MACN-In 36114, Futalaufquen Lake (Los Alerces National Park), coll. S.E. Miquel, 1994. 1 ex. MLP 10.509. Frías lagoon, coll. Pérez Moreau, 1940. 1 ex. MLP 10.511. Mascardi lake, Nahuel Huapi National Park, Río Negro. 1944. 2 exs. MLP 12.042-1. López bay, Nahuel Huapi, coll. Scott-Birabén, 1 ex. MLP 12.047. Llao-Llao peninsula, coll. Rapoport, 5/III/1959. 1 ex. MLP 12.048. Lacar lake, coll. Rapoport, 20/III/1959. 1 ex. MLP 12.053. National Park Lago Puelo, coll. Rapoport, 10/III/1959. 1 ex. FMNH 308.211. Chile, Prov. Concepción, camino a Camuncho, coll. T. Cekalovic, 2/XI/1986 [Tc-178]. 4 exs. FMNH 308.212. Chile, Prov. Concepción, Cerro Caracol, coll. T. Cekalovic, 17/VIII/1996 [482]. 1 ex. FMNH 308.230. Chile, Prov. Concepción, Estero Nonguen, coll. T. Cekalovic, 8/XII/1993 [Tc-371]. 7 exs. FMNH 312444 (ex 308.219). Chile, Prov. Concepción, Fundo El Manzano, coll. T. Cekalovic, 7/XII/1996. [Tc 507]. 1 ex.

*Stephanoda celinae* HYLTON SCOTT 1969: Holotype MACN-In 27275. Villa La Angostura, Nahuel Huapi National Park, Neuquén, coll. C. Matteri, XI/1968; paratypes (3): MACN-In 27275-2. Villa La Angostura, Nahuel Huapi National Park, Neuquén, coll. C. Matteri, XI/1968; ? paratypes MLP 11.488. Quetrihué Peninsula, Villa La Angostura, Nahuel Huapi National Park, Neuquén; ? paratypes MLP 11.489. Pucará, Villa La Angostura, Nahuel Huapi National Park, Neuquén. MACN-In 36075, Los Alerces National Park, Menéndez Lake, Port Sagrario, coll. M. Ramírez, 29/II/1996. 2 exs. MACN-In 36083, Nahuel Huapi National Park, route 258, Mascardi Lake. *Austrocedrus-Nothofagus* forest, coll. Barker-Miquel, 16/X/1996. 1 ex. FMNH 308.201. Chile, Prov. Chiloé, Isla Chiloé, Pudeto, coll. T. Cekalovic, 21/II/1989 [Tc-226]. 1 ex.

*Stephadiscus lyratus* (COUTHOUY in GOULD 1846): MACN-In 9997, Santa Inés Cape, Río Grande, Tierra del Fuego (54°07'S 67°06'W). 1 ex. MACN-In 12384, Las Minas River, Punta Arenas, Chile. 13 exs. MACN-In 12754, Landmark XIX, Río Grande, Argentina. 18 exs. MACN-In 21168, Ushuaia, Tierra del Fuego. Castellanos-Gómez, IV/1933. 5 exs. MACN-In 22173, Port San Juan, Isla de los Estados, coll. A. Carcelles, 1933-34. 21 exs. MACN-In 22525-1, Port Cook, Isla de los Estados, coll. Carcelles-Daguerre, 1935. 7 exs. MACN-In 27226, Lapataia, Tierra del Fuego, coll. M. Birabén. 22/II/65. 13 exs. MACN-In 27464, Año Nuevo Islands Group, coll. C. Matteri, X/1971. 1 ex. MACN-In 27815-1, 40 km at Río Gallegos, Santa Cruz, coll. C. Matteri-G. Hässel de Menéndez, 4/I/1976. 1 ex. MACN-In 29351-1, Hambre Valley, in front of Port Garibaldi, Tierra del Fuego, coll. C. Matteri, 7/XII/1969. 1 ex. MACN-In 30102, Ancón, Chile. Leg. C. Matteri, V/1977. 1 ex. MACN-In 31731, Near Balmaceda Mountain, Chile (51°24'S 73°05'W). 2

exs. MACN-In 31759, Port Bellavista, Última Esperanza, Magallanes, Chile (51°28'S 73°16'W). Leg. C. Matteri, 10/I/1977. 1 ex. MACN-In 33660, Route I, Río Grande, Tierra del Fuego. 1 ex. MACN-In 36084, Redonda Island, Beagle Channel, Argentina, coll. S.E. Miquel, XII/1999. 1 ex. MACN-In 36088, Victoria lagoon, Tierra del Fuego, coll. C. Matteri, 1985. 1 ex. MACN-In 36097, Futalaufquen lake, Chubut, coll. S.E. Miquel, 2 exs. MACN-In 36124, Cisnes river, Palena, Chile, coll. E. Maury, 8/XII/1986. 3 exs. MLP 4384-1, Vancouver bay, Isla de los Estados, coll. Ronderos-Bulla, 7/V/1971. 11 exs. MLP 56, Alexander bay, Isla de los Estados, coll. C. Matteri, XI/1971. 1 ex. MLP 67, Rubens Hotel, Chile, coll. Birabén-Scott, III/1948. 1 ex. MLP 5.310, Coast of lake Roca, Tierra del Fuego, coll. S. Gordillo, III/1991. 1 ex. MLP 10.482, Port Williams, Navarino island. Chile, coll. P. Kuschel, 21/XI/1957. 4 exs. MLP 10.481, Between Castillo and Campana hills. 2 exs. MLP 10.485, 40 km from Natales to Magallanes, Chile. 3 exs. MLP 10.486, Buen Suceso bay, Tierra del Fuego. 1971. 3 exs. MLP 10.487, Castillo hill, Chile. 2 exs. MLP 10.488, Douglas river, Navarino island, Chile, coll. T. Cekalovic, 25/VII/1951. 4 exs. MLP 10.489, Olivia mountain, Tierra del Fuego, coll. C. Matteri, 24/I/1974. 3 exs. MLP 10.491, Carbajal valley, coll. C. Matteri, 26/XI/1969. 1 ex. MLP 10.492, Picton island, Chile. 4 exs. MLP 10.494, Navarino island, Chile. 1956. 1 ex. MLP 10.495, Cami or Fagnano lake, Tierra del Fuego, coll. M. Birabén, 3/III/1959. 7 exs. MLP 10.496, Port Vancouver, Isla de los Estados. Leg. C. Matteri, XI/1967. 1 ex. MLP 10.498, Navarino island, Chile. 1 ex. MLP 10.499, Escondida lagoon, Tierra del Fuego, coll. C. Matteri, 9/XII/1969. 1 ex. MLP 10.500, Path to Cami or Fagnano lake, Lapataia, coll. C. Matteri, 11/I/1974. 8 exs. MLP 10.501, Ushuaia bay, Magallanes, Chile. Leg. C. Matteri. 1 ex. MLP 12.027, 30 km from Natales, Chile. 1 ex. MACN-In 22525-1, Taco 16; MACN-In 30204; MACN-In 36065.

*Stephadiscus madrediosensis* MIQUEL & RAMÍREZ 2011: Holotype MUSM 4238a; paratypes MUSM 4238b/4. Los Amigos Conservation Concession (LACC), Los Amigos Biological Station (CICRA) (12°34'07"S 70°05'57"W, 268 m: between Trail 14 (Cocha Lobo) and 11 (Bajío), between Trees 123 and 127, Manu province, Madre de Dios department, Peru, coll. R. Ramírez, 21-VI-2006.

*Stephanoda perversa* HYLTON SCOTT 1969: MACN-In 27329. Puerto Blest, Nahuel Huapi National Park, coll. E. H. Rapoport, 6/III/1959, 1 ex. MACN-In 36121. Nahuel Huapi National Park, Puerto Blest, coll. Barker-Miquel, Fuego, coll. D. Fernández, 8 exs. MLP 10.505. Vidal Gormaz island (51°50'S 74°41'W), Nahuel cove, Angelica bay, Última 18/X/1996. 2 exs. MLP 10.503, Puerto Blest, Río Negro, coll. Rapoport. 1 ex. (broken).

*Patula rigophila* MABILLE 1886: syntype (1) MNHN w/no. Around Orange Bay, Hardy Peninsula, Hoste Island, Patagonia, Chile; at 100 meters altitude.



*Stephanoda rumbolli* HYLTON SCOTT 1973: Holotype MLP 11.493; paratype (1). MLP 11.495. Area of Port San Carlos, Malvinas Islands (Falklands Islands); paratype (1). MLP 11.494. Río Gallegos, Güer Aike, Santa Cruz.

*Stephadiscus striatus striatus* HYLTON SCOTT 1981: paratype MLP 11487. Pocitos, Salta, Argentina, coll. M. Birabén, 20/III/1964.

*Stephadiscus striatus caribeus* HYLTON SCOTT 1981: syntype MACN-In 31.132. La Castellana, Venezuela, coll. E. Martínez Fontes, 20/XII/1960.

*Stephadiscus stuardoi* MIQUEL & BARKER 2009: Holotype MNHNCL 6655. Hualpén Botanical Park, Concepción, Chile, coll. Barker-Miquel, 13/X/1996. MACN-In 36.130. Hualpén Botanical Park, Concepción, Chile, coll. Barker-Miquel, 13/X/1996. 3 specs.

## Appendix 2: Synopsis for generic identification of extant and fossil South American Punctoidea (modified and actualized from MIQUEL & CÁDIZ LORCA 2008).

- A. Smooth teleoconch and protoconch
1. Shell nautiloid: *Flammulina* MARTENS 1873 (Recent, Patagonia)
  2. Shell subglobose: *Payenia* ROCHEBRUNE & MABILLE 1889 (Recent, Patagonia)
- B. Smooth teleoconch and spiral sculpture in the protoconch
- Glabrogryra* FONSECA & THOMÉ 1993 (possibly introduced, Patagonia)
- C. Smooth teleoconch and reticular sculpture in the protoconch
- Stephanoda* ALBERS 1860 ([?Eocene] Recent, Patagonia)
- D. Teleoconch with radial sculpture and protoconch with reticular sculpture
- Austrodiscus* PARODIZ 1954 (Recent, Patagonia [?Paleocene, Brazil])
- E. Teleoconch and protoconch with similar radial sculpture
- Amphidoxa* ALBERS 1850 (Recent, Patagonia, Juan Fernández Archipelago)
- F. Teleoconch and protoconch with dissimilar radial sculpture
1. Radial ribs delicate and very close together: *Stephadiscus* HYLTON SCOTT (Eocene, Patagonia)
  2. Radial ribs thick and widely separated: *Stephacharopa* n. gen. (Recent, Patagonia)
- G. Teleoconch with radial sculpture and smooth protoconch
1. Shell discoid, medium length, retractive ribs: *Zilchogyra* WEYRAUCH 1965 (Eocene, Argentina)
  2. Shell trochoid, very small, retractive ribs: *Colhuecomus* MIQUEL & BELLOSI 2010 (Eocene, Patagonia)
  3. Shell trochoid, medium length, straight ribs: *Lilloiconcha* WEYRAUCH 1965 (Eocene, Argentina)
  4. Shell planorboid, straight ribs: *Rotadiscus* PISLBRY 1926 (Eocene, Argentina)
- H. Teleoconch with radial sculpture and protoconch with spiral sculpture
- Paralaoma* IREDALE 1913 (Introduced, Argentina, Easter Island)
- I. Teleoconch with radial sculpture and protoconch with spiral sculpture and axial incisurae
- Radiodiscus* PISLBRY & FERISS 1906 ([?Cretaceous] Eocene, Argentina) and *Retidiscus* FONSECA & THOMÉ 1995 (Holocene, Argentina) (possibly a synonym of *Radiodiscus*)
- J. Teleoconch with radial sculpture and protoconch with segmented spiral costulae *Araucocharopa* MIQUEL & CÁDIZ LORCA 2008 (Recent, Patagonia)

