

## Extension of the genus *Pseudopeas* (*Dysopeas*) (Gastropoda: Subulinidae) from Venezuela to Nicaragua

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**ABSTRACT.** The study of Nicaraguan land snails is fragmentary. Recent sampling produced specimens of an undetermined species of *Pseudopeas* Putzeys, 1899. This genus was segregated from *Opeas* Albers, 1850 by reason of its prominent rib sculpture and later re-described by Pilsbry (1906) for the characteristic spiral sculpture of its nepionic whorls. Baker (1927) named a new subgenus *Dysopeas* for species where the spiral sculpture covers the entire shell, not only the nepionic whorls. The Nicaragua specimens show nepionic and body sculptures that precisely match descriptions and illustrations given by Pilsbry and Baker for the complex *Pseudopeas/Dysopeas*. Since 1999, a total of 160 specimens have been collected from El Castillo on Río San Juan, Isletas de Granada and the Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense (URACCAN) in Bluefields. Similitude with some sculpture traits and protoconch development with species of *Spiraxidae*, *Subulinidae* or *Lamellaxis* might cause confusion in the determination of *Pseudopeas*. Besides the critical protoconch sculpture and profile, additional discriminatory differences from these look-alikes are dimensions, sculpture pattern and crystalline structure.

**Key words:** *Subulinidae*, *Pseudopeas*, *Dysopeas*, genus extension, Nicaragua.

**RESUMEN.** El estudio de moluscos continentales de Nicaragua es fragmentario. En el muestreo reciente se han colectado numerosos especímenes de una especie indeterminada del género *Pseudopeas* Putzeys, 1899. Este es un género segregado de *Opeas* Albers, 1850 debido a su escultura de cóstulas prominentes y posteriormente fue descrito de nuevo por Pilsbry (1906) dando prominencia a la escultura espiral característica de sus vueltas nepiónicas. Baker (1927) nombró un nuevo subgénero para ejemplares en los que las espirales de la protoconcha se extienden también por las restantes vueltas. Los especímenes de Nicaragua muestran perfil, escultura en la protoconcha y en las vueltas ulteriores que se ajustan exactamente a las descripciones e ilustraciones de Pilsbry y Baker para el conjunto *Pseudopeas/Dysopeas*. Desde el año 1999 se han colectado un total de 160 especímenes de este grupo en tres localidades: El Castillo de Río San Juan, las Isletas de Granada y el recinto de la universidad URACCAN de Bluefields, indicando una extensión bien establecida del género en el sur de Nicaragua. Su similitud con algunos rasgos de la estructura y desarrollo de la protoconcha con especies de *Spiraxis*, *Subulinidae* o *Lamellaxis* pueden causar confusión en la determinación de *Pseudopeas*. Además de la característica escultura nepiónica, también son criterios de diferencia de género la escultura del cuerpo de la concha, su perfil, longitud y la estructura cristalina.

**Palabras clave:** *Subulinidae*, *Pseudopeas*, *Dysopeas*, extensión de género, Nicaragua.

The study of Nicaraguan land snails is fragmentary. Since the year 1992 some 160 specimens of a small *Opeas*-like gastropod have been collected in Nicaragua that correspond to Baker's description of genus *Pseudopeas* (*Dysopeas*) with spirals extended to all whorls. The first site was at El Castillo on the San Juan River in Southern Nicaragua, among volcanic building blocks, dislodged from the castle ramparts (López, 1992). A second location was at the Isletas, a group of islands in Cocibolca (Nicaragua) Lake near the town of Granada and a third

on the Campus of the URACCAN university by the town of Bluefields on the Caribbean coast (Table 1).

Collecting was done in humid surroundings, close to bodies of water among gravel and sandy soil, under stones or wood debris (López 1992; López & Pérez 1996, 1998; López, & Urcuyo, 2009). Surrounding soil was gathered in bags for later observation under a stereoscope (NIKON, SMZ-10A) to detect minute specimens and accompanying fauna. Live specimens were placed in 70%

TABLE 1  
Collection sites in Nicaragua

LOC.	DEPARTM.	UTM (16P)		LOT	ELEV (m)	spms	LONG (mm)
		X (E)	Y(N)				
Ken's Island, Isletas	Granada	619850.73	1311604.44	92:02	30	30	2-3
Castillo, type locality.	Río San Juan	784140.62	1219364.61	92:25	59	24	2-8
El Coyol, Isletas, Lago de Nicaragua	Granada	618365.11	1312267.50	06:05	30	32	2-5
URACCAN Univ. campus, Bluefields (17P)	RAAS	198255.48	1331703.97	96:13	23	8	4-5

alcohol and soiled specimens cleansed in ultrasonic bath (MEDELCO, INC. MODEL MD5-115).

Lots recorded in ACCESS tables are numbered by two digits separated by a colon, the first digit for the year and the second for the order of sequence in that year. Thus, 92:02 is the second lot found in 1992. Each entry also contains the number and dimensions of specimens, location coordinates and date, as well as other details.

UCA Mollusk Collection (UCACM) contains 10 lots of *Dysopeas* sp. for a total of 160 specimens (Table 1).

- Two voucher spms sent to LACM.
- Previous mention: *Pseudopeas* sp. Two specimens, Isleta de Ken, Isletas de Granada (Pérez 1999).

**Accompanying fauna at type locality:** *Lamellaxis micra*, *L. gracilis*, *Leptinaria lamellata*, *L. guatemalensis*, *Cecilioides consobrinus*, *Bulimulus corneus*, *Succinea hyalina*, *S. recisa*, *Miradiscops opal*, *Thysanophora crinita*.

According to Pilsbry (1906) the presence of the characteristic spiral protoconch sculpture sufficiently determines his genus *Pseudopeas*. Baker's additional condition (1927) that the protoconch spiral sculpture extends over the remaining whorls also sufficiently determines his subgenus (*P.*) *Dysopeas*. The difference between the two is not a different protoconch sculpture, but only that in *Dysopeas* the characteristic spirals extend beyond the initial whorl onto the body whorls. And the reason why this protoconch spiral sculpture is necessary and sufficient for determination of the complex *Pseudopeas/Dysopeas* is simply that no other known genus has it. Pilsbry himself (1906) mentions that although on some specimens of *Paropeas*, like *P. achatinaceum*, there are two or three very weak protoconch spirals, they are actually only folds between whorls and not sculpture as in *Pseudopeas* (Naggs, 1994).

It has been objected that to date no previous mention has been made of the complex *Pseudopeas/Dysopeas*

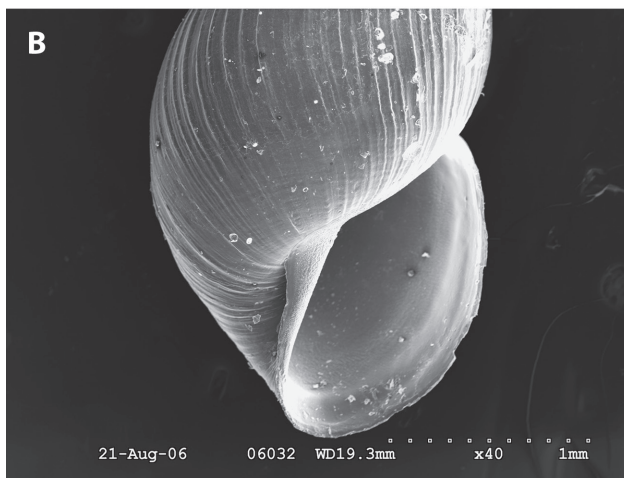
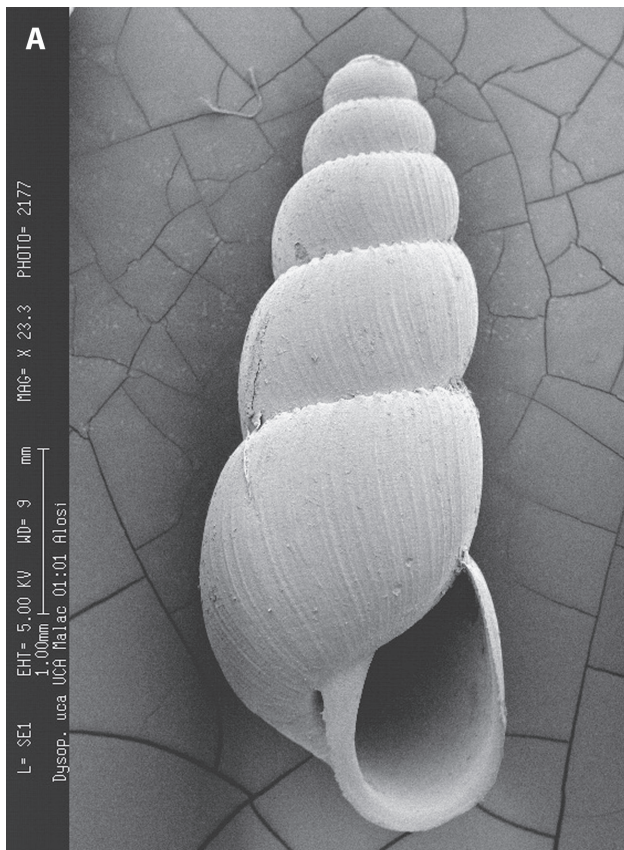
in Mesoamerica. This would seem to be a good reason in favor of a recent genus extension, as here reported. However the extension might not be so recent if one fails to observe the characteristic nepionic sculpture. A revision of private and public collections may well reveal specimens of *Pseudopeas* mislabeled *Opeas*, *Subulina*, *Spiraxis*, or *Lamellaxis*.

The nepionic sculpture of the *Pseudopeas viviparum* Miller protoconch is described by its author (1879) as of one whorl "minutely decussate", and by Pilsbry (1906) as one and a half whorls with very delicate, close, striate spirals. Pilsbry adds (1906) that *Pseudopeas* has a protoconch of some two whorls "spirally striate" and figures *P. saxatile* (Morelet, 1885) from West Africa (Fig. 2A) with typical apical sculpture of *Pseudopeas*, spiral and granulate. Although Pilsbry does not mention the granulation, it is clearly shown in his figure.

Baker (1927) figures *Dysopeas translucidum* protoconch (Fig. 2B) and describes it as globose, of 2 to 2.5 convex whorls separated by a deep suture with a sculpture of very weak growth lines some 35 in number near the beginning of the second whorl.

Altogether, the descriptions and illustrations by Miller (1879), Putzeys (1899), Pilsbry (1906; Fig. 1A, 2A) & Baker (1927; Fig. 1B, 2B) accurately match the protoconch and shell sculpture and profile of the Nicaraguan specimens in the genus *Pseudopeas*.

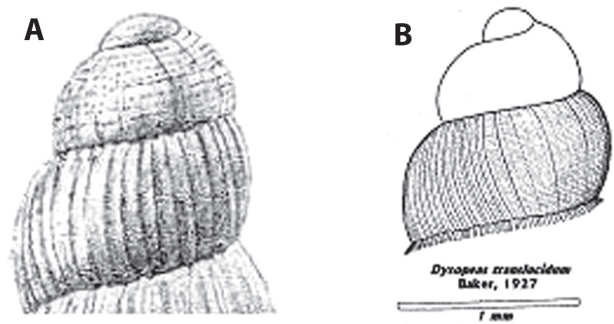
*Pseudopeas* shares some sculpture traits and protoconch development with Spiraxidae like *Micromena* Baker 1939, *Rectaxis* Baker 1926 and even with *Lamellaxis gracilis*, which might cause confusion. In Pilsbry's opinion the spirally striated protoconch firmly determines the genus *Pseudopeas*, without need of further criteria such as dissection or radula study, described as 13-1-13 by Baker (1927). Additional reasons like dimensions, body sculpture pattern, profile and crystalline structure further distinguish the complex *Pseudopeas/Dysopeas* from these look-alikes, such as *Spiraxis funibus* (Fig. 3B) and *S. alvaradoi*, both described from Guatemala by Goodrich & van der Schalie (1937), which are common and widely



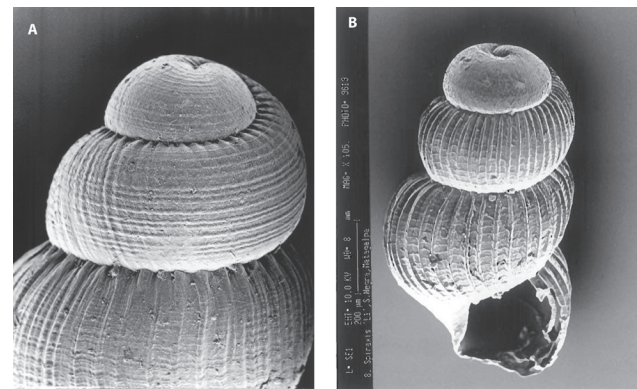
**Fig. 1A.** (*Pseudopeas*) *Dysopeas* genus type. El Castillo (Alosi SEM 9607). **Fig. 1B.** Same specimen, aperture & body whorl; weak spiral sculpture (Alosi SEM 2180).

spread in Nicaragua. Other similar Spiraxidae in the subgenus *Rectaxis* Baker and *Micromena* (Baker, 1939) are also present in various localities.

One general difference between these small Spiraxidae and *Pseudopeas* is size, with *Micromena* barely reaching 3 mm and other Spiraxidae attaining 5 to 6 mm maximum

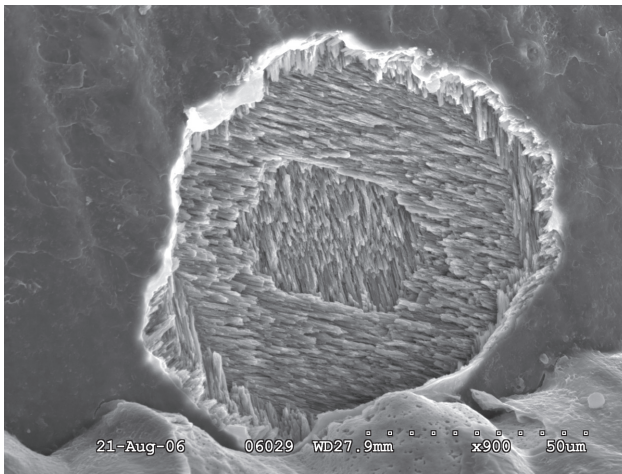


**Fig. 2A.** *Ps. saxatile* Pilsbry, 1906, protoconch (Africa) **Fig. 2B.** *D. translucidum*, protoconch; (Baker, lam. 23).



**Fig. 3A.** *Pseudopeas* genus, Castillo. **Fig. 3B.** *Spiraxis funibus*, Matagalpa, 3.14 x 2.7 mm.

length, whereas *Pseudopeas* grow to 8 mm. Another difference is that Spiraxidae protoconch spirals are dissected by the diagonal ribs into individual chevron-shaped segments, very characteristic of these species (Fig. 3B). In *Pseudopeas* the spirals are continuous, though slightly raised at intersections with ribs (Fig. 3A), thin and weak in Spiraxidae, but thick, sturdy, porcelain-like in *Pseudopeas* and other Subulinidae. Crystal structure seen in small punctures or corroded areas of *Dysopeas* specimens reveals it is formed by three successive layers of orthorhombic interlaced crystals (Fig. 4) which determine the tough aragonite material of the shell (Callil & Mansur 2005), in contrast with the weaker structure of Spiraxidae and Subulinidae. But as mentioned, the most important and definitive discriminating trait is the characteristic nepionic sculpture, (Fig. 2A, 2B), which is totally absent in Spiraxidae (Fig. 3B), *Lamellaxis*, *Opeas* and all other recognized genera. Independently of protoconch sculpture presence or absence, its profile also discriminates the genus. In *Pseudopeas*, it is dome-like, whereas in *Spiraxis* it is bulbous.



**Fig. 4.** (X 900) Aragonite crystal structure.

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