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Gobiesox lanceolatus, a new species of clingfish (Teleostei: Gobiesocidae) from Los Frailes submarine canyon, Gulf of California, Mexico

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Abstract

Gobiesox lanceolatus is described from a single specimen collected from 300 meters depth in the Los Frailes submarine canyon in the southwestern Gulf of California. The "Canyon Clingfish" is unique within *Gobiesox* in having a lanceolate caudal fin, with the central rays longer than those above and below them. It is also distinguished by 14 dorsal-fin rays (first tiny and unsegmented), 11 anal-fin rays, 28 pectoral-fin rays, anus slightly closer to anal-fin origin than to posterior margin of pelvic disc, and dorsal-fin origin in front of vertical from anus. It is most similar to *Gobiesox eugrammus*, known from Isla Guadelupe, the coast of outer Baja California and southern California. This is the deepest record for a species of *Gobiesox* and only four other species of clingfishes are known from greater depths.

Key words: deep water, depth records, *Soucoupe* diving saucer

Introduction

Clingfishes of the genus *Gobiesox* are well-known inhabitants of rocky intertidal and shallow subtidal reef areas of the western Atlantic and eastern Pacific oceans, with a few species occupying freshwaters of the region (Briggs 1955). They are generally not known to occur at great depths, but the fishes of deep reefs, especially small, cryptobenthic groups such as clingfishes, remain poorly surveyed in this and other regions. We herein describe a new species of *Gobiesox* based on a single specimen from 300 meters depth in a submarine canyon, fortuitously collected in 1965 by geologists aboard the *Soucoupe* submersible (Shepard & Dill 1966).

Materials and methods

Measurements made with dial calipers generally follow those of Briggs (1955), with the addition of predorsal, preanal and preanus lengths which are the shortest distances between the tip of the upper lip and the dorsal-fin origin, anal-fin origin, and anus, respectively. Cephalic sensory pore terminology follows Shiogaki & Dotsu (1983). Museum abbreviation: SIO, Marine Vertebrate Collection, Scripps Institution of Oceanography, La Jolla.

Gobiesox lanceolatus, new species

"Canyon Clingfish"
Figures 1–3

Holotype. SIO 65-34, male, 39.8 mm SL, Gulf of California, Los Frailes submarine canyon, just south of Punta Los Frailes, Baja California Sur, Mexico; approximately 23°22.3'N, 109°25.0'W, 300 meters depth, 6 February 1965, Earl Murray and Raymond Kientzy aboard the *Soucoupe* diving saucer.

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Diagnosis. A member of the genus *Gobiesox* distinguished from all congeners by the presence of a lanceolate caudal fin and the following combination of characters: 14 dorsal-fin rays; 11 anal-fin rays; 28 pectoral-fin rays; anus slightly closer to anal-fin origin than to posterior margin of pelvic disc; dorsal-fin origin in front of vertical from anus.

Description. General body shape as in figures 1–3. Head large, broad, strongly dorsoventrally depressed. Body moderately dorsoventrally depressed anteriorly; becoming increasing laterally compressed posteriorly. Body deepest near dorsal-fin origin. Eye small, positioned in upper half of head; center of eye much closer to tip of snout than to posterior margin of operculum. Snout short. Anterior nostril with a tapering tube and small fleshy flap (tube and flap 1.2 mm long). Posterior nostril surrounded by low fleshy rim; situated close to base of anterior nostril and adjacent to orbital margin. Gill membranes united and free from isthmus.

FIGURE 1. Photograph (above) and radiograph (below) of *Gobiesox lanceolatus,* SIO 65-34, holotype, 39.8 mm SL, in dorsal view.

Mouth terminal, posterior tip of upper jaw reaching vertical through anterior margin of orbit when mouth closed. Upper lip fleshy, widest anteriorly, separated from snout by shallow groove. Lower lip thin, smooth (no lobes evident). Upper jaw with 22–24 unicuspid teeth in outer row on each side; central teeth slightly incisiviform, grading to conical laterally; a few low, rounded teeth posterior to central portion of outer row. Lower jaw with 17–18 unicuspid teeth in outer row on each side; anterior six teeth incisiviform, all others conical; 3–4 small conical teeth posterior to central portion of outer row. Upper and lower pharyngeal tooth plates with well-developed

conical teeth. Cephalic lateral-line system with 2 pores in nasal canal; 2 pores in postorbital canal; 3 pores in lachrymal canal; 3 pores in preopercular canal; and 3 pores in mandibular canal.

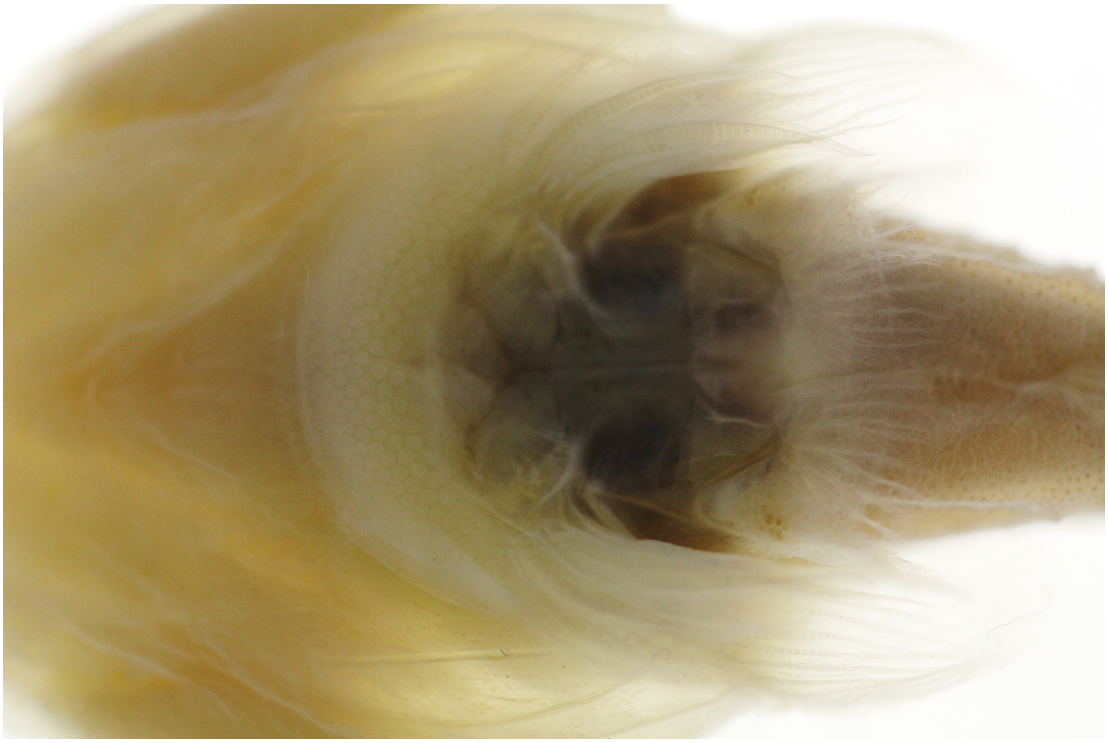

FIGURE 2. Adhesive disc of *Gobiesox lanceolatus,* SIO 65-34, holotype, 39.8 mm SL.

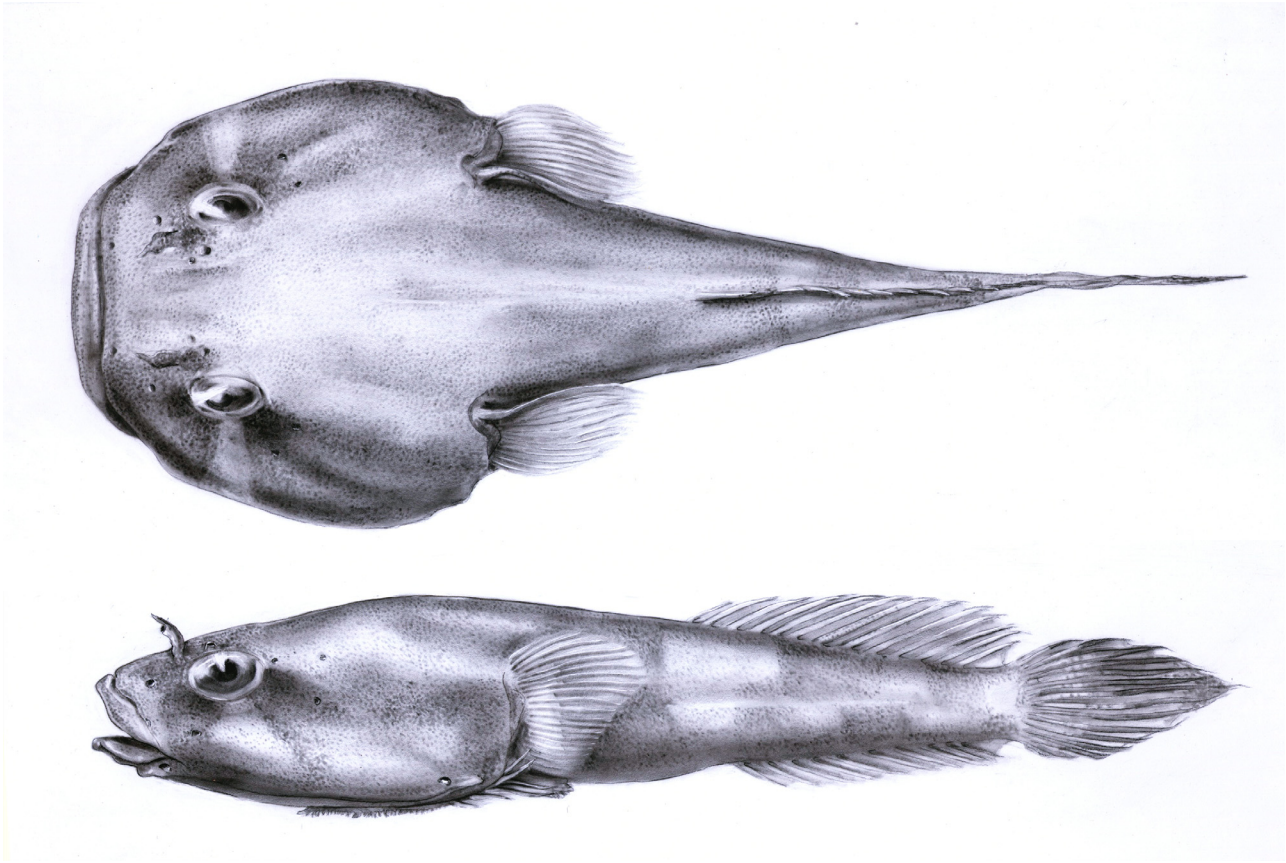

FIGURE 3. Drawings of *Gobiesox lanceolatus* SIO 65-34, holotype, 39.8 mm SL, in dorsal (above) and lateral (below) view (artist unknown).

Dorsal-fin rays 14, first element minute. Caudal fin with 16 segmented rays plus 3 upper and 3 lower unsegmented rays. Principal caudal-fin rays 6 upper and 6 lower; procurrent rays 5 upper and 5 lower. Caudal fin with nonautogenous upper and lower hypural plates; epural and parhypural not observed. Pectoral-fin rays 28. Pelvic-fin rays I, 4. All fin rays, excluding anteriormost dorsal- and anal-fin rays, unbranched and segmented. Anteriormost dorsal- and anal-fin rays singular, unbranched and unsegmented elements.

Precaudal vertebrae 13; caudal vertebrae 16; total vertebrae 29. First dorsal-fin pterygiophore inserted between neural spines of vertebrae 10 and 11. First anal-fin pterygiophore inserted between hemal spines of vertebrae 14 and 15. Ribs 12, associated with vertebrae 3–14.

Adhesive disc large, singular (Fig. 2); anterior margin slightly crenulate; posterior margin smooth. 7–8 transverse rows of circular papillae across width of disc region A. 7–8 transverse rows of papillae across width of disc region B. Anterolateral margin of disc region C with two widely separated clusters of 7–10 papillae.

Skin associated with last pelvic-fin ray attached to base of pectoral fin opposite 6th lowermost pectoral-fin ray. No pectoral-fin ray tips free. Fleshy pad on lateral surface of pectoral base not clearly evident due to flacid skin; line drawing made sometime after capture (Fig. 3) shows a weak pad extending to level of 7th pectoral-fin ray from top of fin.

Caudal fin lanceolate, central rays longer than those above and below. Dorsal-fin origin anterior to a vertical from anus and well anterior of a vertical through anal-fin origin. Last dorsal- and anal-fin rays connected to body by a well-developed membrane. Two large, fleshy skin folds along left and right sides of abdomen, extending from level of pectoral-fin base to past anus. Two large (6.3 mm long by 2.0 mm wide), fleshy swellings (apparent epaxial musculature) on dorsal side of head just above opercle. Skin on head and body flacid.

Measurements of the holotype in mm: standard length (SL) 39.8; total length 49.6; head length (to posterior gill membrane) 19.0; head length (to upper insertion of gill membrane) 18.0; body depth (at dorsal-fin origin) 6.4; predorsal length 23.9; preanal length 29.0; preanus length (to anterior margin of anus) 24.5; posterior margin of pelvic disc to anus 4.2; anus to anal-fin origin 3.0; caudal peduncle length 3.8; caudal peduncle depth 3.6; pelvic disc length 12.0; maximum width of pelvic disc 12.7; head depth at orbit 6.6; head width at orbit 14.1; maximum head width 17.6; bony interorbital width 5.0; snout length 5.4; eye diameter (pigmented eye) 2.5.

Coloration (after 40 years in preservative). Dorsal surface of head, pectoral-fin base, and lateral aspect of body covered with well-spaced small melanophores. Ventral side of head and abdomen immaculate. Upper pectoral-fin rays with few melanophores, none on lower rays. Pelvic fin and disc immaculate. Dorsal fin with scattered melanophores, increasing in density posteriorly. Anal fin similar, with scattered melanophores, increasing in density posteriorly. Central caudal-fin rays and intervening membranes densely covered with melanophores, especially prominent on elongate central rays, with relatively few melanophores on dorsalmost and ventralmost rays.

Coloration based on a drawing made after capture and initial preservation (Fig. 3): melanophores more prominent, with some concentrated in ill-defined dark bars, anterior and posterior to orbit, with an intervening lighter area under orbit. Three broad, ill-defined dark bars on lateral aspect of body with intervening lighter areas. Pigment on fins relatively uniform.

Etymology. *lanceolatus*, spearlike, from *lancea*, a short spear, in reference to the lanceolate caudal fin - the single most distinctive (and unique) feature of the species. We suggest the common name of "Canyon Clingfish" in reference to the type locality of this species.

Distribution. Known only from the holotype collected at 300 meters depth from Los Frailes submarine canyon in the southwestern Gulf of California (Fig. 4). The specimen was collected from the canyon floor, described as having fine sediment with a few large rocks and cobbles. The holotype was attached to a small cobble collected by the submersible *Soucoupe* (Fig. 5) as a geological sample. Two dive tracks of the *Soucoupe* on the day of collection of the holotype are shown in Figure 6 (Fig. 61 from Shepard and Dill, 1966). The precise collecting locality was not recorded but likely was near the 300 m contour where the canyon begins to widen.

Comparisons. *Gobiesox lanceolatus* resembles *Gobiesox eugrammus* Briggs, 1955 and *G. meandricus* (Girard, 1858), both from the northeastern Pacific, in having the central margin of the upper lip smooth, without lobes, a relatively long dorsal fin with more than 11 rays, the anus slightly closer to the anal-fin origin than to the posterior margin of pelvic disc, the dorsal-fin origin in front of or just above a vertical from the anus, an incomplete pectoral pad (not extending to the upper margin of the gill opening), and unicuspid teeth in the lower jaw. The Canyon Clingfish is most similar to the *G. eugrammus*, originally described from Isla Guadelupe, but also recorded from the outer coast of Baja California and southern California (Briggs 1965; Greenfield & Wiley 1968), in that the

posterior nostril is situated posteriorly directly above the anterior margin of the orbit. The new species differs from *G. eugrammus* in several features including the shape of the caudal fin (lanceolate versus rounded in *G. eugrammus*), number of pectoral-fin rays (28 vs. 21–24), eye diameter (7.6 in head length versus 3.7–4.9 in *G. eugrammus*), and apparently in coloration (spots and bars present in *G. eugrammus*).

FIGURE 4. Map of the Gulf of California indicating the approximate location of Bahia Los Frailes, shown in the inset. Courtesy of Google Earth.

Comments. The holotype of *G. lanceolatus*, collected from a rock recovered from the bottom at 300 meters depth, is the deepest known occurrence for a species of *Gobiesox* and approaches the deepest record for any species of clingfish. Only four species of clingfishes have been recorded from greater depths (Table 1). The deepest known specimen of *Protogobiesox asymmetricus* Fricke, Chen & Chen, 2016 was collected from 400-560 m depth off Papua New Guinea, *Alabes bathys* Hutchins, 2006 from western Tasmania is known from depths of 160 to 348 m (Hutchins, 2006), *Gymnoscyphus ascitus* Böhlke & Robins, 1970 from the western Atlantic is known from depths of 231 to 318 m (Conway & Prestridge, 2011), and *Kopua nuimata* Hardy, 1984, from New Zealand is known from six specimens collected at depths between 160 and 337 m (Hardy, 1984). The deepest reported record for another species of the genus *Gobiesox* is 140 m for *Gobiesox meandricus* (Girard, 1858) based on unpublished records of the Canada Department of Fisheries and Oceans (Love, 2011; Love, pers. comm.), a species surprisingly known also from the intertidal (Johnson, 1970). *Gobiesox eugrammus* Briggs, 1955, the species most similar to *G. lanceolatus*, is known also from relatively deep water including the type locality of 82 m (40–45 fathoms) at Isla Guadelupe (Briggs, 1955). Twenty-one of the 167 currently recognized species of clingfishes have been collected from depths greater than 50 meters (Table 1). It is probable that other clingfishes occur at great depths, but given the difficulty of collecting cryptobenthic fishes from beyond normal diving depths, especially clingfishes that are well known for tightly adhering to hard substrates, their collection is largely fortuitous.

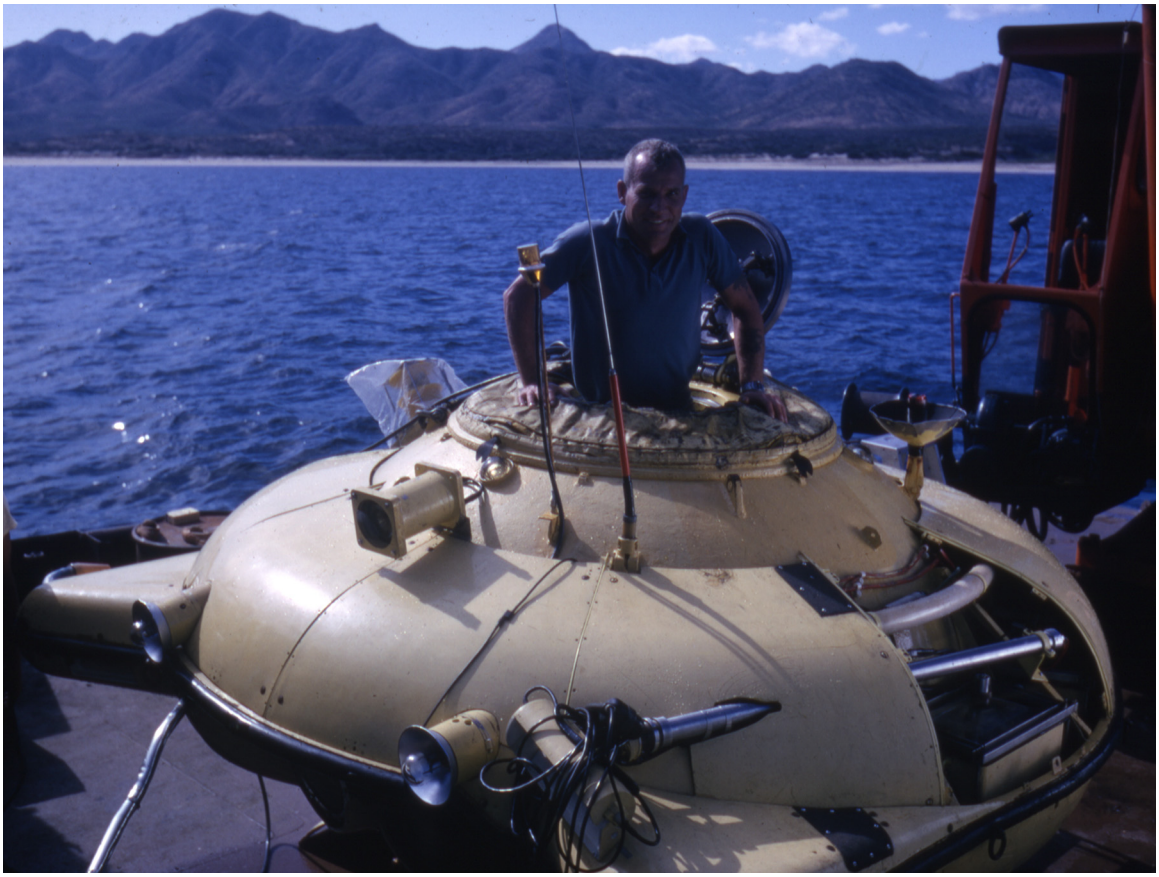

FIGURE 5. Diving saucer *Soucoupe* at Bahia Los Frailes, Baja California Sur, Mexico, 1965. Courtesy of SIO Archives.

TABLE 1. List of clingfish species known from depths of over 50 meters, sorted by maximum depth of capture.

Species	Depth (m)	Distribution	Reference
Protogobiesox asymmetricus	400-560	Papua New Guinea	Fricke, Chen & Chen, 2016
Alabes bathys	160–348	Tasmania	Hutchins, 2006
Kopua nuimata	160–337	New Zealand	Hardy, 1984
Gymnoscyphus ascitus	231–318	western Atlantic	Conway & Prestridge, 2011
Gobiesox lanceolatus	300	Gulf of California	present study
Derilissus kremnobates	146–265	Caribbean	Fraser, 1970
Kopua japonica	225–228	East China Sea	Moore, Hutchins & Okamoto, 2012
Diplecogaster megalops	220	South Africa	Fricke, Wirtz & Brito, 2016
Diplecogaster pectoralis	183	Canary Islands	Fricke, Wirtz & Brito, 2016
Diplecogaster ctenocrypta	165	Canary Islands	Fricke, Wirtz & Brito, 2016
Modicus tangaroa	20–149	New Zealand	Hardy, 1983
Gobiesox meandricus	0–140	northeastern Pacific	Love, 2011
Kopua kuiteri	92–110	New South Wales	Hutchins 1991
Modicus minimus	to 90	New Zealand	Hardy, 1983
Gobiesox eugrammus	9–82	northeastern Pacific	Briggs, 1955
Derilissus lombardii	84	Bahamas	Sparks & Gruber, 2012
Lepadichthys akiko	to 70	Indonesia	Allen & Erdman, 2012
Derilissus altifrons	68–69	Caribbean: Dominica	Smith-Vaniz, 1971
Derilissus vittiger	to 68	Venezuela	Fraser, 1970
Alabes obtusirostris	28–65	Australia & Tasmania	Hutchins & Morrison, 2004
Derilissus nanus	31–51	Bahamas	Briggs, 1969

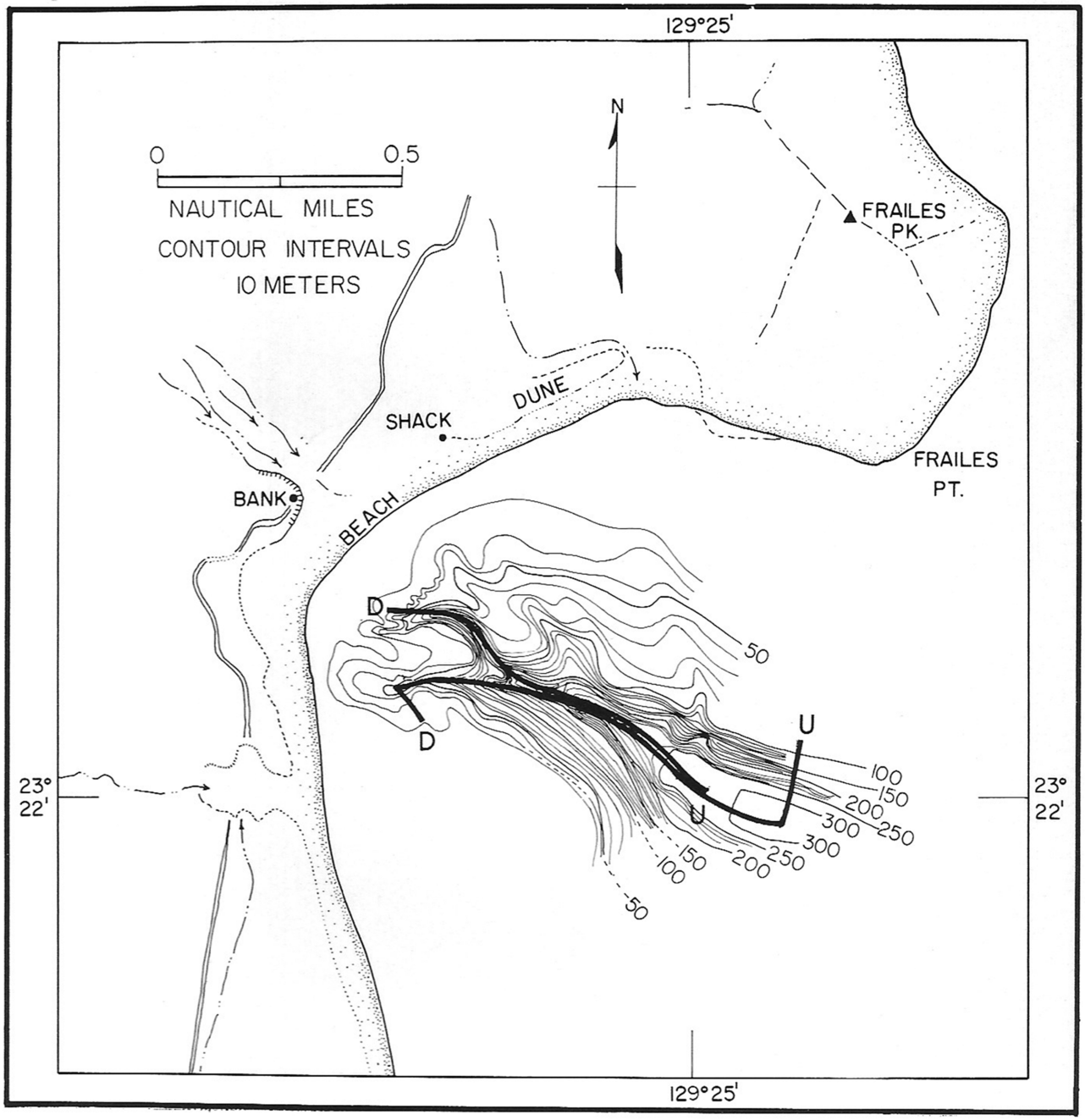

FIGURE 6. Dive tracks (dark lines) of the submersible *Soucoupe* in Los Frailes Canyon during which the holotype of the Canyon Clingfish was collected near the 300 m depth contour (D = position of descent; U = position of ascent; Fig. 61 from Shepard & Dill 1966).

Comparative material examined. *Gobiesox eugrammus*. USA: California, La Jolla, SIO 67-209 1(43.5 mm SL), SIO 75-428 1(58). MEXICO: Punta Banda: SIO 68-287, 15(20.5-49); Isla Guadelupe: SIO 63-167, 1(43), SIO 71-108, 3(37-40); Isla San Benito: SIO 71-113, 2(28-35), SIO 90-74 1(23.5). *Gobiesox meandricus*. USA: California, Piedras Blancas: SIO 80-20, 4(54-65); San Simeon: SIO 674-151, 22(27-72); San Miguel Island: SIO 54-190, 1(83.5).

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