Urechis novae-zealandiae (Dendy): A New Zealand Echiuroid

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[*Received by the Editor, April 24, 1957.*]

Abstract

Urechis novae-zealandiae (Dendy) which was recorded by Dendy in 1897, but never described apart from a few brief notes. is described and figured from some of Dendy's material supplemented by specimens from other parts of New Zealand. A lectotype is selected from Dendy's specimens The species is confined to New Zealand and distributional records range from Auckland to Stewart Island.

IN 1897, Dendy when reporting on a collection of marine animals washed up after a storm on Brighton Beach, near Christchurch, recorded a new species of Echiuroid, stating that he proposed to describe it later under the name *Echiurus novae-zealandiae*. However this description was never published, and apart from Dendy's brief notes there is no account of this species. Dendy's notes (1897, p. 323) are as follows: "This animal in life resembles an elongated cylindrical bag or bolster. It may be more than 8in long, with a thickness in the middle of about 1in when extended. When contracted it looks like a short thick sausage, becoming loose and baggy when badly preserved. The colour in life is dark purplish red, and the body cavity is filled with a dark red liquid resembling blood and containing numerous corpuscles. The skin is smooth. Anteriorly the body is produced into a very short proboscis, resembling a stand-up collar with a slit down the front. At the base of the collar, below the slit are two heavy hooks. A single ring of similar hooks surrounds the body at the hinder end, a short way in front of the terminal anus. The animal resembles a Japanese species, *Echiurus uncinatus*, which is used by the Japanese fishermen for bait, but it differs in its much larger size, its smooth integument and probably also in some details of its internal anatomy."

Dendy obtained eight specimens of this species. Three of these are now in the Canterbury Museum. In addition the Canterbury Museum collections include three immature specimens from 20 fathoms, off Banks Peninsula, and a large well preserved specimen with the locality Lyttelton on the label. The following description is based on the above specimens. Additional material in the collections of the Otago Museum, the Dominion Museum, the Auckland Museum, and the Zoology Department, Victoria University College, has also been examined.

The author wishes to thank the Directors of the Canterbury Museum, Christchurch, the Otago Museum, Dunedin, the Dominion Museum, Wellington, the Auckland Museum and Professor L. R. Richardson, Victoria University College, Wellington, for the loan of material.

The genus *Urechis* contains four species, *U. uncinatus* (Drache) from Japan, *U. chilensis* (Müller) from the Straits of Magellan, *U. caupo* Fisher and MacGinitie from California and *U. novae-zealandiae* (Dendy) from New Zealand, all with a very uniform outer facies. According to Fisher (1946) all signs point to *Urechis* being the last of a very ancient stock, one that may have flowered into many species during Paleozic times. It belongs, in his view, to the honourable company of *Lingula* and other living fossils.

Bock (1942) includes the genus *Urechis* with *Echiurus* in the family Echiuridae of the order Echiuroinea. Fisher (1946) erected a new order Xenopneusta to include the genus *Urechis*. Fisher's classification is followed in the present account.

PHYLUM ECHIUROIDEA

Class ECHIURIDAE

Order XENOPNEUSTA Fisher, 1946

No blood-vascular system, the coelomic fluid being heavily charged with large blood corpuscles containing haemoglobin or haemoglobin and haematin; intestine with the terminal portion in front of the cloaca enlarged, thin-walled, functioning as an organ of respiration in connection anus and cloaca.

Family URECHIDAE Fisher and MacGinitie, 1928

Differing from other Echiuroidea in the absence of a blood-vascular system, the corpuscles (red or brown in colour from haemoglobin or haemoglobin plus haematin) free in the coelomic fluid; distal portion of the midgut greatly enlarged and in connection with the cloaca serving as a respiratory apparatus; foregut very long, including a long gizzard between an anterior long crop and a posterior long stomach; proboscis reduced to a scoop-shaped upper lip.

Genus URECHIS Seitz

Urechis Seitz, 1907, p. 352 (type *Echiurus chilensis* Max Müller, 1852); Fisher and MacGinitie, 1928, p. 200; Fisher, 1946, p. 263.

Spiroctetor Skorihov, 1909, p. 77 (type *Echiurus uncinatus* von Drache).

Cylindrical or sausage-shaped echiuroids with the characters of the family. Body wall is very muscular, consisting of outer and inner circular layers and middle longitudinal layer, the latter the thickest; inner layer showing a fasciculate arrangement superficially. In the region of the posterior pair of nephridia is a zone of compound slimenet glands lodged in the verrucae of the skin. There are two or three pairs of nephridia, the basal nephrostomes of which have long spirally coiled ciliated lips for the collection of mature germ cells. Two anterior setae with a strong interbasal muscle; one ring of curved anal setae interrupted ventrally. Traversing the coelomic cavity in front of the anterior setae are paired dorsoventral muscles. The alimentary canal has a definite pattern of attachment to the body wall by muscular mesenteries, differing in minor details in the four species. The slender foregut is very extensive, consisting of pharynx, oesophagus, crop (subtended by a powerful muscular mesentery not attached to the body), a long gizzard and a stomach attached posteriorly by a strong mesentery. The greater part of the long midgut is accompanied by the siphon, which starts close to the distal end of the stomach. The ciliated groove of the midgut, which parallels the siphon, extends beyond it to a point where the gut is suddenly expanded into the inflatable respiratory portion. The true hindgut or cloacal cavity is separated from this respiratory portion of the midgut by a definite sphincter, consists of a thin-walled anterior portion, and a thicker walled terminal section with rugose mucosa. Very numerous frenula attach the cloaca to the body wall. Anal vesicles are voluminous sacs, always deflated, which open ventrally into the terminal portion of the cloaca. The glandular walls are externally rather cauliflower-like and the inner surface is intricately plicated. The scattered ciliated funnels are very tiny. The anus is eccentric to the circle of setae, being slightly nearer the ventral side.

URECHIS NOVAE-ZEALANDIAE (Dendy)

Echiurus novae-zealandiae Dendy, 1897, p. 32.

RECORDS: New Brighton Beach, washed ashore after a storm, A. Dendy, 25/8/97, 3 specimens (C.M.); Lyttelton, M. McLeod, 1 specimen (C.M.); off Banks Peninsula, 20 fathoms, E. W. Bennett, 1927, 3 specimens (C.M.); Port Howard, found

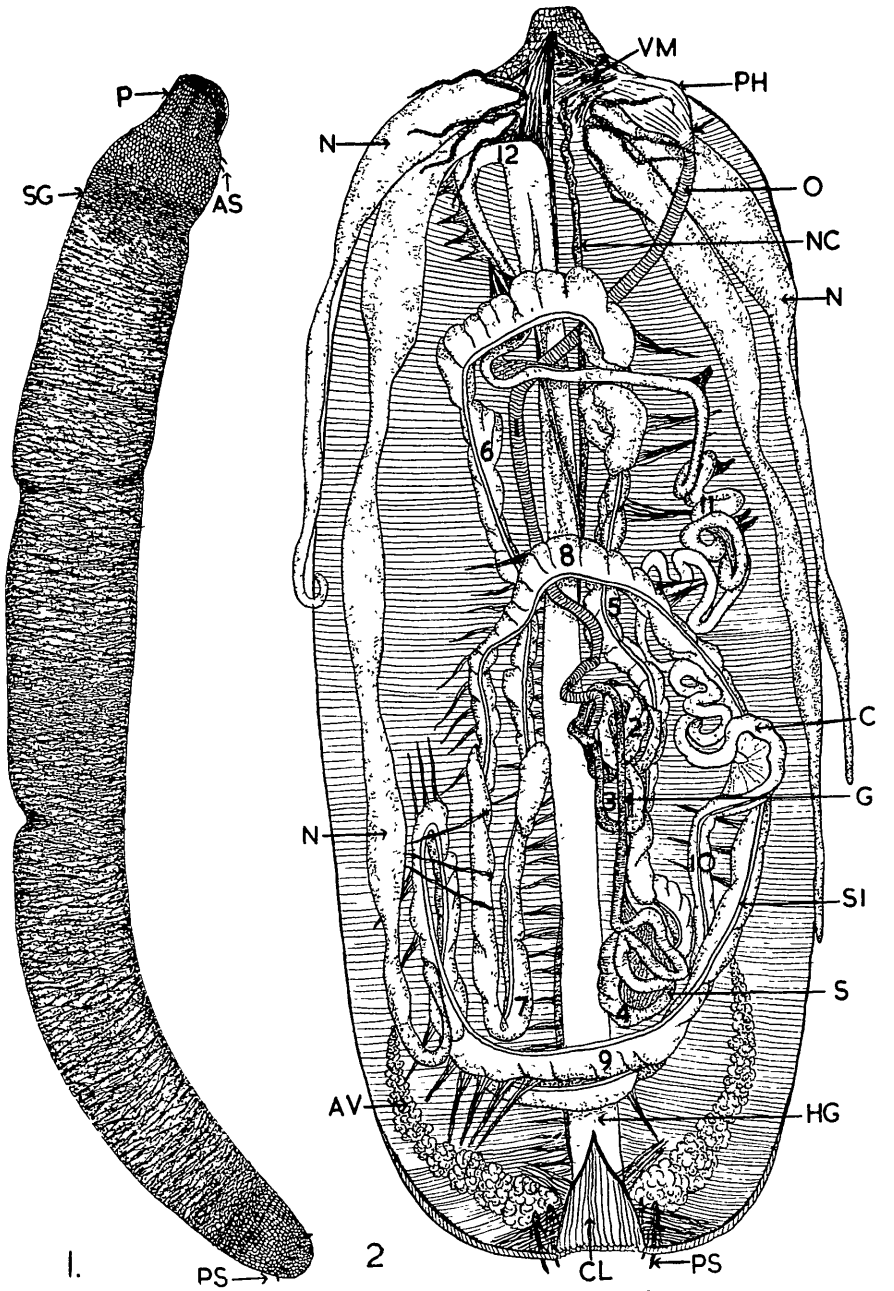

FIG 1 —Lateral view of a large specimen from Lyttelton, 230 mm long
FIG 2 —Dissection of a contracted specimen from above showing the long convoluted intestine The nephridia are greatly distended with sperm and the coelomic apertures are recognizable by the conspicuous coiled lips. The figures in sequence on the intestine are intended to aid in following the convolutions; 12 is at the junction of the midgut and its terminal specialized portion, the respiratory gut. The principal mesenteric bands which anchor the intestine are shown, but not lettered AS, anterior setae, AV, anal vesicles; C, crop, CL, cloaca; the posterior portion lined with heavy longitudinal ridges, G, gizzard; HG, respiratory gut; N, nephridium; NC, nerve cord; O, oesophagus; P, proboscis; PH, pharynx; PS, posterior or anal setae; S, stomach; SI, siphon or accessory intestine; SG, slime gland.

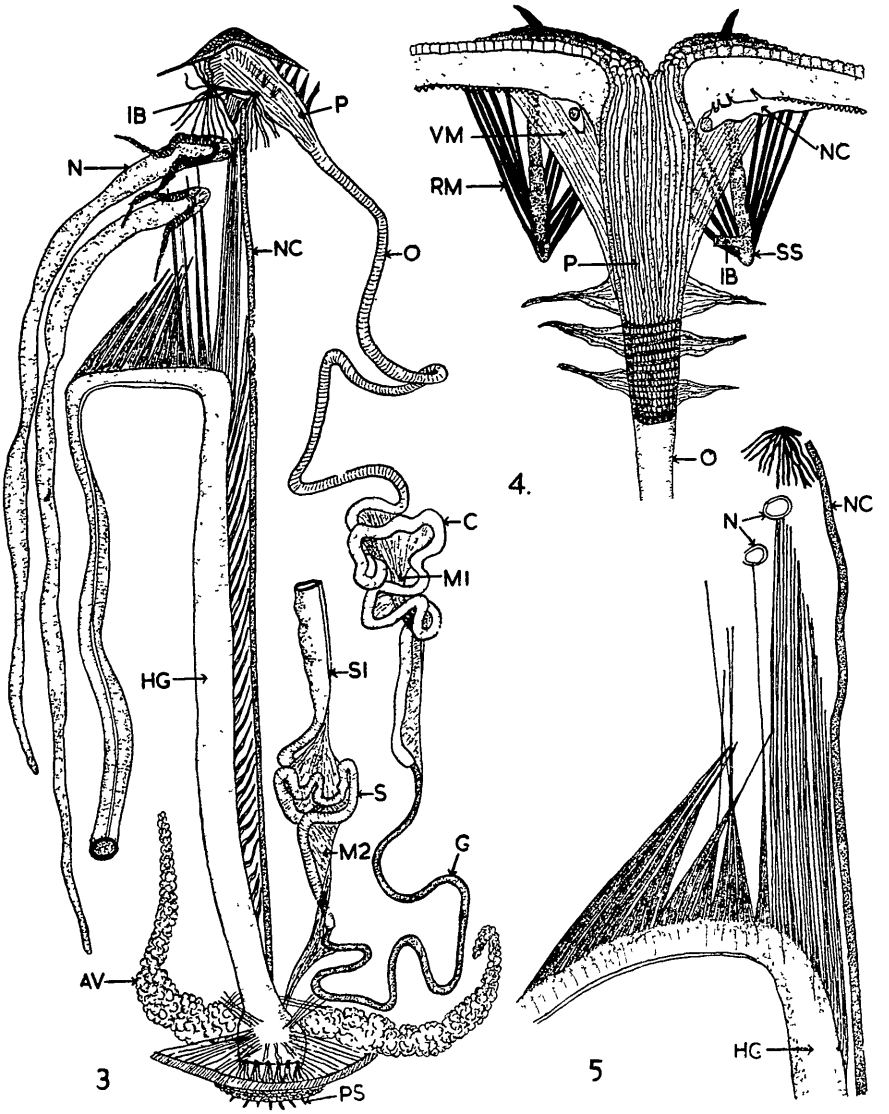

FIG. 3.—Dissection to show the generically characteristic parts of the alimentary canal, most of the "small intestine" having been removed. Attachment of the respiratory gut is always to the left of the nerve cord

FIG. 4.—Pharynx contracted and split open along its ventral side to show the straight longitudinal folds continuous with those of the proboscis. Posteriorly is shown the characteristic lining of the oesophagus

FIG. 5.—Anterior end of the respiratory gut showing the mode of attachment of the muscular mesenteries.

AV, anal vesicle; C, crop; G, gizzard, HG, hind gut, IB, cut interbasal muscle; M1, mesentery of the crop; M2, mesentery of the stomach; of anterior setae; N, nephridium; NC, nerve cord; O, oesophagus; P, pharynx; S, stomach; SI, commencement of the siphon; SS, setal sac; RM, radiating muscles of the anterior setae; VM, ventral mesentery of the pharynx.

washed ashore after a heavy southerly, G. Lawn, 17/2/47, 1 specimen (D.M.); Port Gore, 13/3/56, 1 specimen (D.M.); Auckland Harbour, A. W. B. Powell, 1 specimen from suction dredge in 3–4 fathoms (A.M.); Stewart Island from cod stomach, W. Traill, December, 1915, 1 specimen (O.M.); off Mokau River, from stomach of dogfish, 3 specimens (O.M.); south of Bluff, H. Suter, 1 specimen (O.M.); Cook Strait, from stomachs of dogfish trawled in approximately 40 fathoms, 8 specimens (V.U.C.).*

DIAGNOSIS. Differing from *U. chilensis* in the following particulars: anterior setae with a tapered, pointed tip; lining to the mouth cavity and pharynx thrown into continuous, prominent, longitudinal folds which do not become zig-zag, but at the beginning of the oesophagus pass abruptly to rugose transverse folds; siphon commencing 2–3 mm from the end of the stomach. Differing from *U. uncinatus*, which averages 70–80 mm, in attaining a much greater size. The proportions of the regions of the foregut show considerable differences from those found in the other species, the oesophagus and stomach being twice the length recorded by Fisher for *U. caupo*. The post siphonal intestine is also considerably longer than in *U. caupo*. Differing from *U. caupo* and *U. chilensis* in that the nephridia are reduced to two pairs with a single member of the third posterior pair sometimes present.

DESCRIPTION

Detailed accounts of the anatomy and histology of *U. chilensis* have been given by Seitz (1907) and Embleton (1900), and of the anatomy of *U. caupo* by Fisher (1946). The general morphology of these species resembles that of *U. novae-zealandiae*, but there are some important differences in detail.

U. novae-zealandiae (Fig. 1) is cylindrical, sausage-shaped, the relative length and diameter depending on the amount of contraction on preservation. Only one of the specimens available for study has been preserved in a relaxed condition. the others showing varying degrees of contraction. The posterior end is rounded, the anterior narrower, terminating in a short scoop-shaped proboscis In the contracted specimens this is folded into a tube, the inner surface of which is thrown into longitudinal folds continuous with those of the mouth. In one specimen 230 mm long the proboscis is 10 mm. The species approaches *U. caupo* and *U. chilensis* in size. Fisher and MacGinitie (1928) give the average size of *U. caupo* as 150–180 mm, although their largest specimen measured 545 mm when fully relaxed in anaesthesia and 375 mm when preserved. Wesenberg-Lund (1955) records specimens of *U. chilensis* from South America up to 255 mm long. The single well preserved extended specimen is 230 mm long and 28 mm across the broadest region of the body. One specimen from a dogfish stomach measured nearly 300 mm. The lengths of the other specimens from the vicinity of Banks Peninsula were 165 mm, 124 mm, 110 mm, 103 mm, 82 mm and 72 mm. The last three specimens were immature juveniles.

In the larger specimens the two anterior setae (Fig. 8) are situated 3–4 mm back of the groove leading into the mouth. They are 10 mm to 13 mm long, iridescent, bluish yellow, brownish at the tip The exerted portion is flattened, strongly curved and directed backwards. Internally they are enclosed in a setal sac (Fig. 4) projecting well into the body cavity and usually have a short substitute seta alongside. They are united by a strong interbasal muscle and numerous variable muscles radiate from their inner ends The anal setae (Figs. 6, 7) ten or eleven in number are cylindrical, tapering, terminating in a sharp curved tip. The dorsal setae are

* C M, Canterbury Museum; D M, Dominion Museum, O M, Otago Museum; V.U.C, Victoria University College.

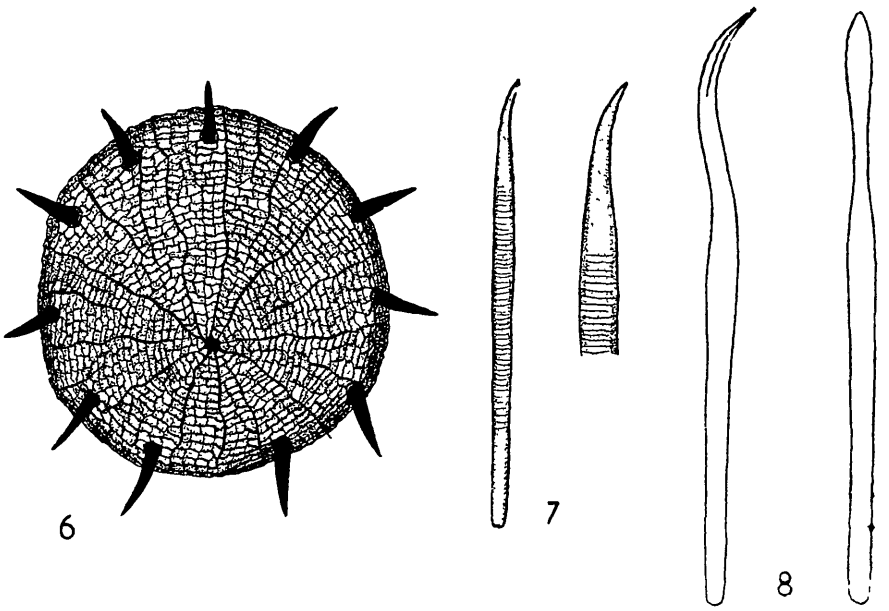

FIG. 6.—Posterior end of the body showing the eccentric anus and the circle of setae incomplete mid-ventrally.
FIG. 7.—Anal setae with an enlarged view of the tip.
FIG. 8.—Two views of the anterior setae.

longer than the ventral. As in *U. caupo* a midventral seta is absent, and the anus is eccentric to the circle of setae (centre of anus about 6 mm from the dorsal setae and 4 mm from the ventral).

The surface of the body is traversed by fine irregular channels giving a rugose appearance. This is more pronounced at the anterior and posterior ends. The anterior end to about 10 mm behind the anterior setae is deeply cut by channels into irregular rectangular or circular areas. This region passes abruptly into the region of the slime glands which is distinguished by rather fine close circular channels.

NEPHRIDA. Two of the three adult specimens examined from the type locality resemble *U. uncinatus* in having two pairs of nephridia. These vary in size according to the degree of distension with eggs or sperm. In one specimen 165 mm long the posterior nephridial tubes were 160 mm in length and up to 6 mm in diameter. The nephrostome is on the anterior side of the base of the tube and has long, grooved, spirally coiled lips. The nephridial tubes of the immature specimens were spherical with a cone shaped tip. One of the adult specimens had a third posterior nephridium on the right side, as has one of the juvenile specimens from Pegasus Bay, off Banks Peninsula. In another of these specimens one of the nephridia has a double nephrostome with two pairs of spiral lips. It appears that the primitive number of nephridia in the genus *Urechis* is three pairs. Fisher (1946) states that in *U. caupo* rarely one of the anterior pair of nephridia may be missing. *U. uncinatus* has two pairs of nephridia and in *U. novae-zealandiae* one or both members of the posterior pair are usually absent. Of 10 specimens dissected 8 had two pairs of nephridia and two had a third right posterior nephridium.

ALIMENTARY CANAL. The general arrangement of the alimentary tract is closely similar in all four species. The proportions of the different regions differ, although reliable comparisons are difficult owing to the contraction that occurs during preservation. In Fig. 3 the greater part of the siphonal and part of the post-siphonal

gut have been removed. It can be seen that the foregut is considerably longer than the body. In this specimen, which was 165 mm long, the pharynx is 15 mm long, the oesophagus 135 mm, the crop 90 mm, the gizzard 115 mm and the stomach 100 mm; total 455 mm. Fisher (1946) gives the following figures for a well expanded preserved specimen of *U. caupo,* 300 mm long; pharynx 30 mm, oesophagus 40 mm, crop 85 mm, gizzard 85 mm, stomach 50 mm; total 310 mm. Proportionately the foregut of *U. novae-zealandiae* is considerably longer, particularly the oesophagus and stomach portions.

As in *U. caupo* the pharyngeal lining is thrown into longitudinal folds (Fig. 4) which begin on the ventral side of the proboscis and run into the pharynx, decreasing in size. In the oesophagus these longitudinal ridges are deeply cross cut by narrow channels dividing them into rings of oblong verrucae which are visible externally. The oesophagus commences a few mm behind the last of the dorso-ventral mesenteries of the pharynx.

The crop is subtended by a strong mesentery not attached to the body wall. The gizzard is a slender threadlike tube with a conspicuous ringed appearance externally. The stomach has the mucosa thrown into transversely elongated compressed verrucae giving an irregularly ringed appearance externally. It ends abruptly at the beginning of the midgut. As in *U. caupo* the siphon commences 2–3 mm from the end of the stomach. In *U. chilensis,* according to Fisher (1946) the siphon commences 9 mm from the end of the stomach.

The course of the intestine is shown in Fig. 2. It can be seen that the siphonal part of the intestine is long and has three anterior and three posterior bends. Throughout its length it is attached by muscular mesenteries to the body wall.

The post-siphonal " small intestine " is about ⅕ the length of the pre-siphonal. In the specimen for which the measurements of the foregut were given above the post-siphonal intestine was 240 mm long. Proportionately this is considerably longer than that of *U. caupo.* It is anchored to the body wall by heavier mesenteries than those of the pre-siphonal portion.

The respiratory hindgut in all the specimens dissected except one of the juveniles is a straight, thick-walled, flattened tube. In this juvenile specimen it is a thin walled, semi-transparent, distended bladder indicating that it is capable of considerable dilation. It is firmly attached along its entire length to the left side of the nerve cord. The attachment of the anterior end of the respiratory hindgut is shown in Fig. 5. Fisher (1946) has figured the attachments of the other three species of *Urechis.* The method of attachment in *U. novae-zealandiae* more closely resembles that of *U. caupo* than of the other two species.

The cloaca is an elongated tube, deeply furrowed in its posterior half. The two large anal vesicles open into this posterior region. Their length in a specimen 165 mm long is about 40 mm.

LECTOTYPE. Canterbury Museum collection.

TYPE LOCALITY. Pegasus Bay, off Brighton Beach.

DISTRIBUTION. The species is apparently confined to New Zealand. Localities recorded in this paper range from Auckland to Stewart Island. It is probably widespread on suitable bottoms, but is seldom dredged owing to its deep burrowing habits.

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