

Long legged pycnogonids have been observed to walk about in a somewhat unstable manner, and their high ratio of surface to volume makes it easy for currents to move them about. On at least one occasion deep sea pycnogonids of this genus were observed floating near the bottom during a bathyscaphe dive (T. MONOD, 1954,

Bathyscaphes, p. 167). It would appear that the dispersal of pycnogonids is probably easier than that of shelled gastropods, and it is obvious that in this example at least the pycnogonid is a potential means for dispersion beyond the immediate site of egg deposition of at least one species of Antarctic mollusk.

Ten New Species of Typhinae

(Gastropoda: Muricidae)

BY

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(Plates 8 to 11; 3 Textfigures)

IN THE TWENTY YEARS since a review of the Typhinae was published (KEEN, 1944), much new information has accumulated. Authors have described a number of species that modify or add to the distributional picture then drawn up, and the study of fresh specimens and better material has indicated the need of another revision. Because, however, of a prospect for first-hand study of type material in certain European collections, this is being postponed for the time being. To put on record the undescribed forms presently before us seems desirable, in the hope that this stimulus will bring to light other unrecorded information collectors may have that would be useful in our projected review of the entire subfamily.

New interpretations of typhine morphology have been expressed by FLEMING (1962) and VELLA (1961). We shall reserve a more extended discussion of these for the proposed revisional work. VELLA, for example, would consider that most of the new species described herein have 4.2 "growth-steps" or varices per whorl, for as there is an offset of each varix below the one on the whorl preceding, it usually requires two complete turns for a varix to fall immediately below an earlier one. We

continue, however, in the interest of simplicity, to describe such shells as having 4 varices per whorl, aware that the precise number may be any fraction between 4.0 and 4.9.

Typhis (Typhina) imperialis KEEN & CAMPBELL,
spec. nov.

(Plate 8, figures 1 to 4)

Shell of moderate size, biconic, spire somewhat elevated; teleoconch of five whorls; protoconch of two whorls; nucleus small, flattened, in a central position, gradually expanding, with rounded whorls; varices four per whorl, a single spine at the shoulder curves dorsally and medially, remaining free from the preceding whorl; outer lip narrow and foliated with four or five crenulations between the shoulder and the anterior canal; varices thin, convex; shoulders acute, with a suture between the tip of the tube and the succeeding varix; suture distinct, moderately deep; tubes stout, arising about midway between varices, directed dorsally, with a decided ad-apical curve (see Table 1 for tube angles); aperture oval, with produced peristome flaring at margin to form

a secondary varix; siphonal fasciole with remnants of earlier canals; umbilical region not deeply grooved or perforate; anterior canal long, widened, closed, with slight bend to right and a noticeable fin-like spur on the labial side.

Type Material: Holotype at present is in the Akibumi Teramachi collection, Kyoto, Japan. The paratype is in the Stanford Univ. Paleo. Type Coll. no. 9727. Exact replicas of the holotype have been prepared in natural color out of acrylic plastic. One is on deposit in the Stanford Univ. Paleo. Type Coll. no. 9728. As others are prepared they will be distributed to the major repositories.

Type Locality: Holotype and paratype were trawled off Tosa, Japan in approximately 200 m. Lat. 33° 20' N; Long. 133° 40' E.

Age: Recent.

Dimensions: Height 16.5 mm, maximum diameter 10.2 mm (holotype).

Height 16.2 mm, maximum diameter 9.8 mm (paratype).

Remarks: This deep-water species has a close affinity to the Australian species *Typhis* (*Typhina*) *yatesi* CROSSE & FISCHER, 1865 but is distinguished by a different angle of exit of the tubes, more convex body whorl, with a decidedly contracted base, and narrower anterior canal.

Among the Japanese typhine fauna *Typhis imperialis* spec. nov. belongs in a compact group that includes *T. (Typhina) montfortii* A. ADAMS, 1863¹; *T. (Typhina) tosaensis* AZUMA, 1960 represented by a single specimen, the holotype, that was trawled in excess of 200 m off Tosa, Japan (this species is also the type species for

Monstrotypis); and *T. (Typhina) teramachii* spec. nov. trawled off Kii, Japan in more than 100 m and also known from only the holotype.

The similarities and differences can be summarized best in the form of a table that includes only the more obvious points.

The protoconchs of all five species have the same general form - an eccentric nucleus followed by 1¼ to 1½ smooth, round, gradually expanding whorls.

Tube angles on a number of species have been measured and compared and it was found that there is rather wide variation between species belonging to the same group, but within a given species minimal variation in the angle of tube exit was noted. At the present time it is considered that these angles have limited systematic value primarily on a specific level. One example of the value of the angle of tube exit is the subgenus *Indotyphis* KEEN, 1944 in which the last tube is bent ventrally and soldered to the succeeding varix. For the sake of comparison, two of the tube angles are tabulated (Table 1) for each of the five species. These are more easily measured from photographs than using the actual shell because one is then working with a flat surface and the shell picture can be enlarged, increasing the accuracy of the measurement. For the "vertical angle" the shell is oriented with the aperture facing left, and the angle is measured between the long axis of the tube near the point of exit and the edge of plane that transects the shell at mid-aperture level (this is at a right angle to the shell's spiral axis). To determine the "dorsal angle" the shell is viewed from the "top," that is, the apex; the angle is measured between the long axis of the tube near the point of exit and a line drawn across, parallel with the edge of the aperture. The relationship between the tube and aperture remains constant.

Table 1

Species	Shell shape	Tube angles ¹		Varices (excl. shoulder spine)	Varical shoulder spine	Anterior canal
		Vertical	Dorsal			
<i>Typhis imperialis</i> spec. nov.	Biconic	24°	84°	4 crenulations	Fluted; curved dorsally	Widened, a fluted spine present
<i>T. montfortii</i> A. ADAMS, 1863	Narrowly biconic	61°	47°	4 crenulations	Almost closed; vertical	Long, narrow, smooth
<i>T. teramachii</i> spec. nov.	Fusiform	33°	77°	8 crenulations	Closed; recurved ventrally	Long, narrow, smooth
<i>T. tosaensis</i> AZUMA, 1960	Markedly fusiform	ca. 60°	ca. 30°	4 recurved spines	Long, narrow closed, recurved	Long, narrow, a closed spine present
<i>T. yatesi</i> CROSSE & FISCHER, 1865	Biconic	25°	80°	4-5 crenulations	Partially closed, recurved ventrally	Widened, a fluted spine present

¹ see text

It becomes evident for reliability that tubes measured in a series of shells of the same or different species must be at the same relative stage of development. Ideally this means the last tube in adult shells of the same relative size or age and number of whorls. This was the case for the measurements in Table 1.

Typhis (Typhina) teramachii KEEN & CAMPBELL,
spec. nov.

(Plate 8, figures 9 to 11)

Shell of moderate size, elongate; spire markedly elevated; teleoconch of five whorls; protoconch of $1\frac{3}{4}$ whorls, sub-cylindrical, gradually expanding, forming rounded whorls; nucleus eccentric and smooth; varices four per whorl, with a single spine at the shoulder which is trough-shaped, closed and recurved; varices thin, convex, and free from preceding whorl; lip narrow and foliated with eight forward curving crenulations; shoulder high on spire whorls, acute; periphery moderately contracted to form deep suture; carina between tip of tube and succeeding varix small; tubes long, slender, with a slight bend toward base, steeply inclined toward apex and obliquely to the rear, origin about midway between varices but exit closer to preceding varix (see Table 1 for tube angles); aperture oval, with a produced peristome that expands at margin, forming a secondary varix; siphonal fasciole with remnants of previous anterior canals; anterior canal very long, narrow, closed throughout, with a slight dorsal curve.

Type Material: Holotype at present is in the Akibumi Teramachi collection, Kyoto, Japan. Exact replicas of the holotype have been prepared in white acrylic plastic and one is on deposit in the Stanford Univ. Paleo. Type Coll., no. 9729. As others are prepared they will be distributed among several major institutions.

Type Locality: Trawled off Kii, Japan in more than 100 m. Holotype only specimen known. Lat. $33^{\circ} 48' N$; Long. $134^{\circ} 53' E$.

Age: Recent.

Dimensions: Height 20.7 mm, maximum diameter 8.3 mm (holotype).

Remarks: *Typhis teramachii* spec. nov. has all the features of *Typhina* in a narrowed interpretation based on *T. (Typhina) belcheri* BRODERIP, 1833. It differs from that species by being considerably more fusiform, with different tube morphology. Overall sculpture is that of *T. (Typhina) montfortii* A. ADAMS, 1863, a more biconic Recent Japanese species with tubes directed decidedly more apically and radially (see Table 1). A species similar in shape and laxness of coiling is the Recent Japanese form *T. (Typhina) tosaensis* AZUMA, 1960, but this species has four prominent spines on the outer lip, one of which is at the shoulder, and a long, narrow, curving spur on the anterior canal.

It is likely that *Typhina* originated in the Australian area, the oldest record being *Typhis (Typhina) maccoyi* TENISON-WOODS, 1876² (see Plate 8, figure 8) from the Janjukian (Oligocene), it is not surprising to find a similar loosely-coiled, elongate form in the Australian Tertiary, *T. (Typhina) disjunctus* TATE, 1888 (see Plate 8, figure 12) from the Balcombian (lower Miocene).

We take pleasure in naming this species in honor of Mr. Akibumi Teramachi, a well known Japanese collector who has been responsible for the discovery of many new and rare Japanese shells and has been very generous in sharing material.

Typhis (Typhisopsis) clarki KEEN & CAMPBELL,
spec. nov.

(Plate 9, figures 15, 19 and 23)

Shell of medium size, light brown to creamy white, lighter on the parts of the lip varix face above and below the apertural opening; teleoconch whorls five or more; apex not well preserved on any specimens in the type lot

² Some authors prefer to retain this species in *Typhis s. s.* because of the nature of the varical spines, but since it has features of both groups we have chosen to place it in *Typhina*, recognizing that it may represent a transition stage.

Explanation of Plate 8

Figure 1: *Typhis (Typhina) imperialis* KEEN & CAMPBELL, spec. nov. Ventral view of holotype. $\times 2.7$.

Figure 2: Lateral view; Figure 3: Apical view. Figure 4: Paratype S U P T C no. 9727 $\times 2.75$.

Figure 5: *Typhis (Typhina) montfortii* A. ADAMS, 1863. (off Kii, Japan, 60 m). Ventral view. $\times 2.6$.

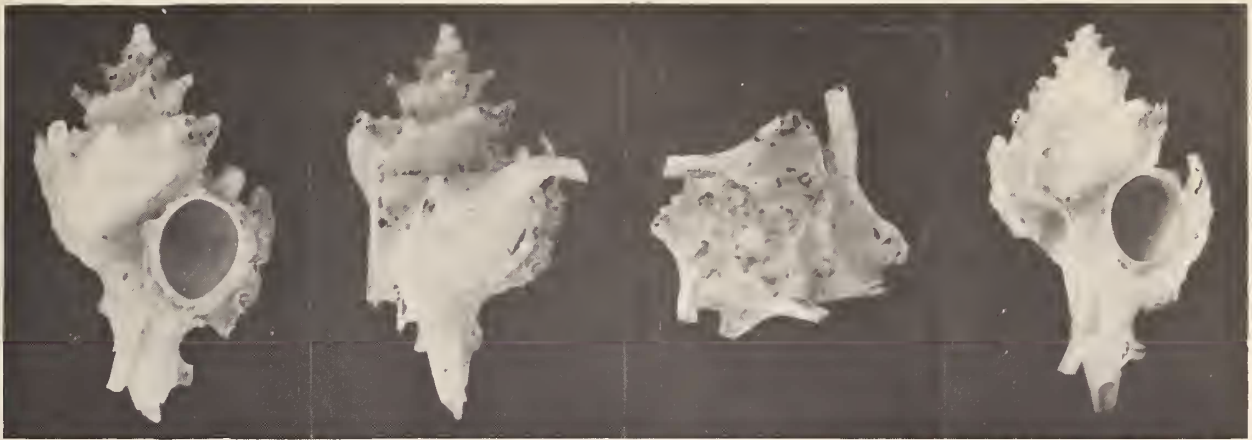
Figure 6: Lateral view. Figure 7: Apical view.

Figure 8: *Typhis (Typhina) maccoyi* TENISON-WOODS, 1876. (Manyung Rocks, Victoria, Australia; Oligocene?)
Ventral view. $\times 2.0$.

Figure 9: *Typhis (Typhina) teramachii* KEEN & CAMPBELL, spec. nov. Ventral view of holotype $\times 2.2$.

Figure 10: Lateral view. Figure 11: Apical view.

Figure 12: *Typhis (Typhina) disjuncta* TATE, 1888. Ventral view. (Balcombe River, Australia; lower Miocene). $\times 3$.

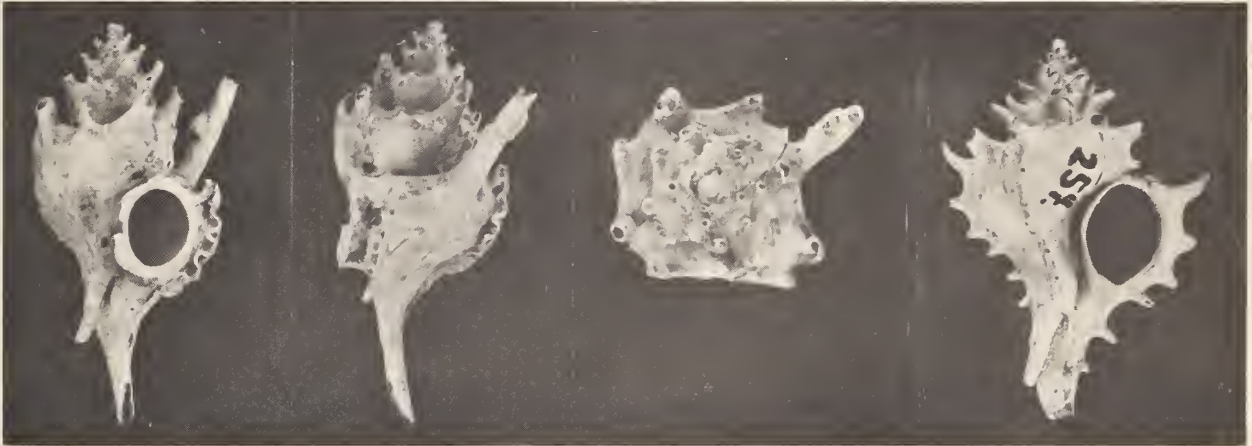


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but apparently of $1\frac{1}{2}$ smooth turns; varices 4 per whorl; spiral sculpture weak but showing as festooning along the outer part of the lip varix; suture irregular, whorls excavated above the periphery to form a concave platform behind each remnant of a previous varix; tubes brown, long, slender, each tube soldered to the downward-sloping remnant of a previous varix-top or callus pad; anterior canal sealed, ending in a brown tube that is open at its tip.

Type Material: Stanford Univ. Paleo. Type Coll. no. 9724 (holotype), 9725 (paratype); California Academy of Sciences; United States National Museum.

Type Locality: Venado Island, Panama Bay; intertidally, at a — 3.0 tide. Collected by Walter D. Clark, March 1946. Lat. $8^{\circ} 55' N$; Long. $79^{\circ} 32' W$.

Age: Recent.

Dimensions: Holotype, height 20 mm, diameter 12 mm. Five paratypes ranging in size from height 24 mm, diameter 12 mm in the largest to height 16 mm, diameter 8 mm in the smallest, an immature specimen.

Additional Material: Two specimens from the Panama Bay area are in the collection of E. W. Ulrich; another is in the collection of John Q. and Rose Burch; one is in the Stanford University collection, a beach shell taken by Dr. James Zetek. A juvenile specimen collected at Mazatlán, Mexico, by James McLean in 1962 seems referable to this species because of its brown tubes.

Remarks: The quadrate profile of this shell has led to the identification of it as *Typhis quadratus* HINDS, 1843, in collections. Study of available evidence on the type material of *T. quadratus* convinces us that this is not a good species, that it must fall as a synonym of *T. coronatus* BRODERIP, 1833, representing only a stage of growth. *Typhis coronatus* is the type of the subgenus *Typhisopsis* which, like *Talityphis*, has very wide varices and has the tube forming immediately after the completion of a varix. In *Typhisopsis* the tube actually lies against the upper part or callus pad of the varix (see textfigure 1 for illustration of this term), and the varix remnant serves as a buttress for the base of the tube. The anterior canal area is wider in *Typhisopsis* than in *Talityphis*. Although *T. clarki* in some respects resembles certain species of *Talityphis*, it shares with *T. coronatus* the attachment of the tube to the preceding varix-remnant and the wide anterior canal. The part of the varix above the aperture (the callus pad) slopes downward at a steeper angle than in *T. coronatus*, and the spines on the varix shoulders are less recurved. The brown coloration of the tubes and the brown anterior tip to the canal are distinctive of *T. (T.) clarki*; so also is the lack of spiral sculpture.

The specific name is chosen in recognition of the work done by Mr. Walter D. Clark of Palatka, Florida, who,

during the years of World War II, was stationed in Panama. Because of his collecting zeal and his generosity, a number of collections are the richer.

Typhis (Talityphis) precursor KEEN & CAMPBELL,
spec. nov.

(Plate 9, figures 14, 18, 21 and 22)

Shell large, exceptionally sturdy, with massive tubes and ridge-like varices; teleoconch whorls 5, spire relatively high; varices and tubes 4 per whorl; pad above aperture a little narrower than the outer lip portion of the varix; sculpture almost entirely axial, with weak spiral lines showing only on the face of the outer lip varix, which is festooned slightly by about 6 spiral lines; aperture relatively large, its margin free and entire, standing upward as an oval rim; anterior canal completely sealed along the apertural face, open at end.

Type Material: Univ. Calif. Dept. Paleo. Type Coll. no. 15083 (holotype); paratypes, nos. 15084-15088. One hypotype (? or paratype) in the collection of Dr. Axel A. Olsson.

Type Locality: Univ. Calif. loc. S-8012, on the South American coast 6 km west of Puerto Colombia, Dept. Atlántico, Colombia. Collected by Max Steineke for Standard Oil Company. (Holotype and 3 paratypes). Lat. $11^{\circ} 03' N$; Long. $75^{\circ} 00' W$.

Other Localities: Univ. Calif. loc. S-8068, 500 m west of Puerto Colombia, Dept. Atlántico, Colombia. Max Steineke, collector. (Two specimens, regarded as paratypes because of the proximity of the collecting locality to the locality of the holotype). One specimen from "Near Puerto Colombia," collected by Dr. A. A. Olsson should probably also be regarded as a paratype rather than a hypotype, as it is evidently from the same outcrop section.

Age: Horizon - Las Perdices shales, upper Oligocene.

Dimensions (in millimeters):

	length	width
Holotype	47.5	27.8
Paratype I	41	27
Paratype II	40	25
Paratype III	37	23
Paratype IV	42	29 (loc. S-8068)
Paratype V	40.5	21 (loc. S-8068)
Hypotype	49	32

Discussion: In form, this is nearest to *Typhis (Talityphis) pterinus* GARDNER, 1936, which has a similarly high spire. However, *T. precursor* averages more than twice as large, for the type of *T. pterinus* is only 20 mm in length. Spiral sculpture is fairly strong in *T. pterinus*, and the

varices are not so ridge-like and massive. The stratigraphic horizon from which the type lot of *T. precursor* came, Las Perdices shale, is generally accepted as correlative with the Aquitanian Stage of Europe; whether this is upper Oligocene or lower Miocene in age is, however, a matter of debate among stratigraphers. Whatever the decision, this new species extends the known range of *Talityphis* downward in time from the previous occurrences in the lower to middle Miocene Round Mountain silt (Temblor formation) of California and the middle Miocene Shoal River formation (Alum Bluff group) of Florida. At the time the specimens were first noted as new by one of us (KEEN, in 1943), the available evidence seemed to suggest an even greater age; therefore, description was postponed until Dr. J. Wyatt Durham, who was then working in Colombia, could make a field study of the area. His report (letter dated December 20, 1943) cleared the way for description, but difficulties of publication during the World War II years and a busy schedule since has made further postponement easy. Dr. Durham's survey showed that the slightly consolidated, fine-grained gray Las Perdices shales outcrop along the coast west of Puerto Colombia for 7 to 8 kilometers, overlain unconformably by beds of unquestioned middle Miocene age (the *Turritella altilira* horizon). Not far away there is a thick section of lower Miocene deposits between these shales and the *Turritella* beds, which would seem to imply that not only is the correlation of the Las Perdices with the Aquitanian Stage the more plausible but that the age is more likely upper Oligocene than lower Miocene. At least this is the conclusion we draw from the data supplied by Dr. Durham. We are grateful to him for the detailed analysis he made of the stratigraphy of the area, even though the use of the information has been so long delayed.

The occurrence of a massive shell as the initial stock in a line is unusual in the history of most molluscan

groups, for the trend normally is from rather unspecialized forms toward greater size or more elaboration. Here there is smoothness and solidity, and the direction taken by the *Talityphis* stock as it radiated northward, eastward, and northwestward during Miocene time was toward smaller, thinner shells, with a proportionately shorter spire and wider lip varix. The diamond shape of *T. precursor* persists in *T. pterinus* but is replaced by a more triangular outline in *T. lampada* KEEN, 1943 from the California Miocene and *T. alatus* SOWERBY, 1850 from the middle Miocene of the West Indies. In all of the species of *Talityphis*, the anterior canal and pillar area seems to be narrower and more tapering than in the closely related group, *T. (Typhisopsis)*.

The specific name is from the Latin noun *praecursor*, forerunner.

Siphonochelus (Siphonochelus) nipponensis

KEEN & CAMPBELL, spec. nov.

(Plate 10, figures 25 and 29)

Shell small, fusiform; color light tan; protoconch light brown, glassy, two convex whorls with a high keel on latest portion, nucleus central; teleoconch of $4\frac{1}{2}$ whorls with an elevated spire; shoulder narrow, sloping, moderately channeled between whorls; varices four per whorl, of rounded oblique folds raised slightly above shoulder extending back to engulf preceding tubes; tubes markedly flattened in a spiral fashion, directed almost vertically and only slightly dorsally; tubes preceded by broad rounded intervarical folds that in turn are preceded by a sulcus containing apertural scars; varices strongly convex, contracting sharply at base; sculpture other than growth lines lacking; aperture oval, with produced lip; anterior canal long, narrow, closed, and bent to the right. Type Material: Holotype at present is in the Akibumi Teramachi collection, Kyoto, Japan. The paratype is in

Explanation of Plate 9

Figure 13: *Typhis (Talityphis) latipennis* DALL, 1919 (off Guaymas, Sonora, Mexico, 50 m; compare with *T. precursor*). Ventral view. $\times 1.3$.

Figure 14: *Typhis (Talityphis) precursor* KEEN & CAMPBELL, spec. nov. Ventral view of holotype. UCDPCTC no. 15083. $\times 1.27$.

Figure 15: *Typhis (Typhisopsis) clarki* KEEN & CAMPBELL, spec. nov. Ventral view, holotype SUPTC 9724. $\times 2.25$

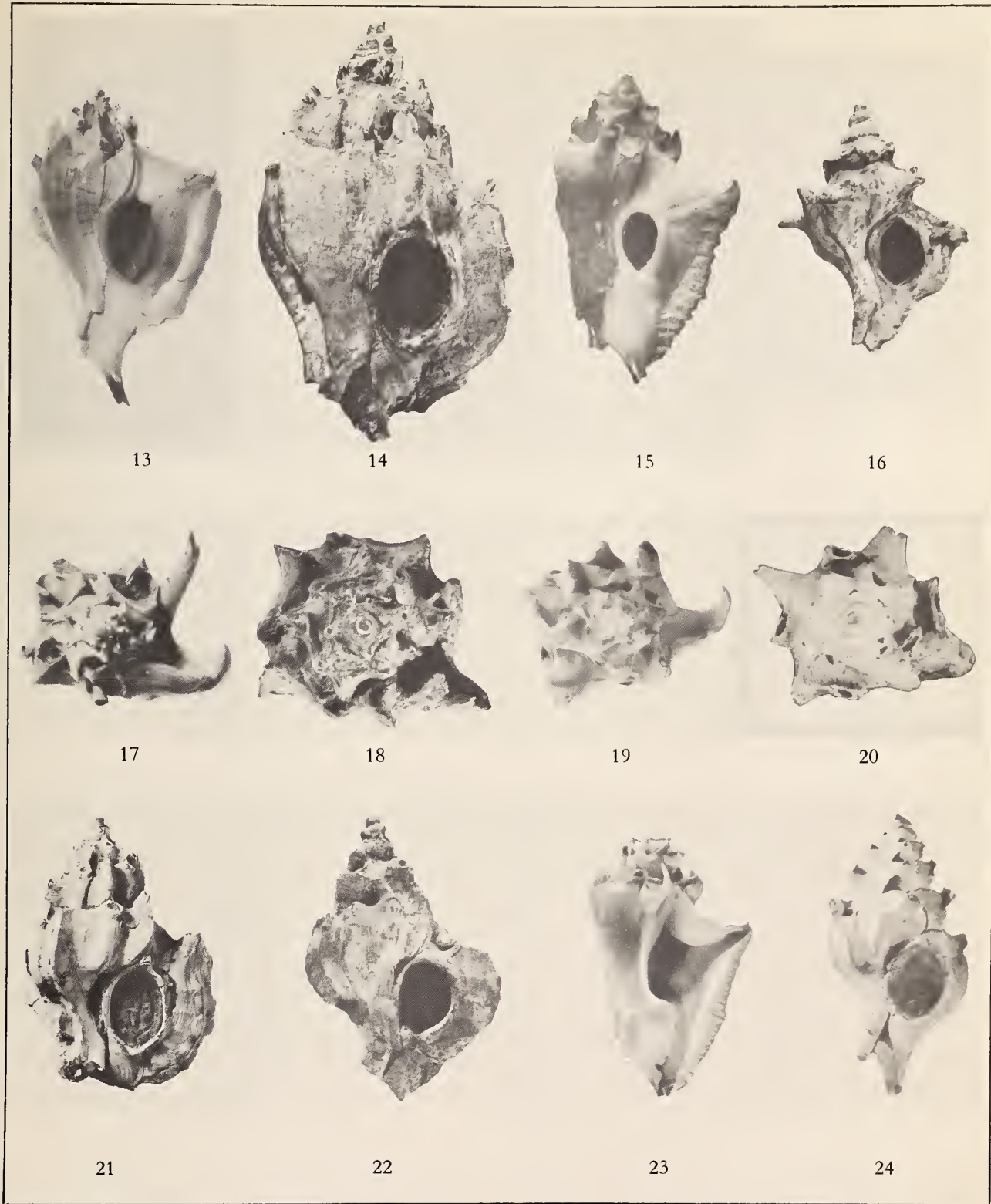
Figure 16: *Laevityphis (Laevityphis) schencki* KEEN & CAMPBELL, spec. nov. Ventral view, holotype. SUPTC no. 9723. $\times 1.9$.

Figures 17 to 20: Apical views of the same shells as shown in top row. Same magnifications throughout.

Figures 21 and 22: Ventral views of hypotype and paratype IV, respectively, of *T. precursor*. $\times 0.8$ and 1.0 , resp.

Figure 23: Ventral view of paratype 9725 of *T. clarki*, showing the formation of the varical spine. $\times 2.1$.

Figure 24: *Siphonochelus (Siphonochelus) arcuatus* (HINDS, 1843). (Off Cape Point, South Africa, 695-869 m; So. Afr. Mus. No. A4946) $\times 2.3$.



the Stanford Univ. Paleo. Type coll. no. 9730. Exact replicas of the holotype have been prepared in natural color out of acrylic plastic. One is on deposit in the Stanford Univ. Paleo. Type Coll. no. 9731. As others are prepared they will be distributed among several major institutions.

Type Locality: Trawled off Tosa, Japan in excess of 200 m, both specimens. Lat. 33° 20' N; Long. 133° 40' E.
Age: Recent.

Dimensions: Height 10.8 mm, maximum diameter 5.1 mm (holotype).

Height 6.9 mm, maximum diameter 3.2 mm (paratype).

Remarks: This species most closely resembles the Italian Pliocene form *Siphonochelus fistulosus* (BROCCHI, 1814), (see Plate 10, figures 26 and 30), but in *S. nipponensis* spec. nov. the spirally flattened tubes are not nearly so wide and arched. The protoconch of the latter consists of 1½ whorls of which the latest portion is definitely keeled. In contrast, *S. fistulosus* has a gradually expanding conical protoconch made up of four rounded whorls.

Siphonochelus nipponensis is the second member of the genus to be added to the Japanese fauna, the first being *S. japonicus* (A. ADAMS, 1863)³.

It has only been recently (KEEN, 1944) that *Siphonochelus japonicus* has been recognized as a separate and distinct species from *S. arcuatus* (HINDS, 1843; see Plate 9, figure 24). The confusion was initiated by G. B. SOWERBY II (1874) when he listed *S. japonicus* as a synonym for *S. arcuatus* and added Japan to the Cape of Good Hope locality for the geographic range. Based on dredged material Dr. Habe established the authenticity of *S. japonicus* and Mr. Teramachi kindly gave us three specimens that had been trawled in 60 m off Sagami, Japan. The shell, glossy brown with spiral dark brown bands at the suture, periphery and base, has a flattened protoconch of one whorl or slightly less. Through the courtesy of Dr. K. H. Barnard we were able to examine and photograph three specimens of *S. arcuatus* trawled off South Africa. The varices are more sharply edged, the surface texture chalky and the protoconch has a globose nucleus with 1½ subsequent whorls.

We are indebted to Mr. Teramachi for supplying the only two known specimens of this new Japanese typhine.

Siphonochelus (Siphonochelus) erythrostigma

KEEN & CAMPBELL, spec. nov.

(Plate 10, figures 27, 31 and 35)

Shell small, fusiform, solid, color white with a small reddish brown dot at the base of each varix; anterior

³ This species possibly should be assigned to the subgenus *Lyrotypis*, as it has five varices per whorl (see Plate 10, figures 28 and 32).

canal and prior canal remnants stained reddish brown; protoconch white, glassy, two convex whorls with a keeled paracentral nucleus followed by 4½ subsequent whorls; peripheral angle high; shoulder narrow, deeply channelled between whorls; varices four per whorl, each a rounded fold which extends above shoulder to join preceding varix and curves back to envelop preceding tube; tubes flattened, directed almost vertically and inclined only slightly dorsally, each with a suture on the anterior surface which is carried down on face of succeeding varix; varices strongly convex, contracted at base, with prominent spiral sculpture of six raised cords; intervarical area smooth, lacking secondary varical folds; aperture oval; anterior canal elongate, narrow, closed throughout; operculum of imbricated laminae, horn color, nucleus apical.

Type Material: Holotype is on deposit in the Stanford Univ. Paleo. Type Coll. no. 9732.

Type Locality: The holotype was collected in the Moreton Bay area off Brisbane, Queensland, Australia by Mr. Wicks, a prawn fisherman. Lat. 27° 20' S; Long. 153° 15' E.

Age: Recent.

Dimensions: Height 13.9 mm, maximum diameter 7.0 mm (holotype).

Discussion: The genus *Siphonochelus* is well represented in the Australasian typhine fauna, with three Recent species and two from the Tertiary, the oldest being *S. evaricosus* (TATE, 1888) from the Lower Miocene (Balcambian), Australia. The largest concentration of species is in the Tertiary of Europe, with the earliest species *S. parisiensis* (D'ORBIGNY, 1850) dating back to the Middle Eocene.

Recent intensive trawling and collecting around the Moreton Bay area of Queensland, Australia have produced a number of new species of mollusks among which was found the specimen of *Siphonochelus erythrostigma* spec. nov. Several differences set it apart from the other Recent species of *Siphonochelus*. The protoconch has a keeled eccentric nucleus and the whorls lack the intervarical folds or ridges seen so commonly in *Siphonochelus* and *Laevityphis*. The most remarkable feature is the six raised spiral cords that sculpture the varices only. This brings to mind a species from the Upper Eocene of Italy, *S. hortensis* (OPPENHEIM, 1900), which likewise has six raised spiral cords, but these cords are continuous across the varices and interspaces.

We are grateful to Mr. Oswald Rippingale for the referral of this unusual specimen of *Typhis*. We also acknowledge the courtesy of Mr. Anthony D'Attilio for forwarding the specimen to us and for lending pertinent *Typhis* material.

The specific name is from the Greek *erythros*, red, and *stigma* (a noun, neuter gender), spot or mark, referring to the distinctive red dots at the bases of the varices.

Laevityphis (Laevityphis) ludbrookae

KEEN & CAMPBELL, nom. nov. for *Typhis tripterus* TATE

(Plate 10, figures 33, 34 and 36)

1888 *Typhis tripterus* TATE. Roy. Soc. South Australia Trans. and Proc. and Report, 10: 93, pl. 3, fig. 14 (not *Typhis tripterus* GRATELOUP, 1833).

1944 *Pterotyphis (Semityphis) "tripterus"* [TATE].

KEEN, A. M. Journ. Paleo., 18 (1): 61, 67.

1961 "*?Semityphis sp. = Typhis tripterus* TATE." VELLA, PAUL. Palaeontology, 4 (3): 380.

Shell of moderate size, biconic, elongate; spire markedly elevated; protoconch of $2\frac{1}{2}$ rapidly expanding, convex whorls followed by $3\frac{1}{4}$ subsequent whorls in holotype, five in hypotype I; varices averaging 3.6 per whorl in holotype, 3.4 per whorl in hypotype I, each a broadly rounded fold angled sharply at the shoulder and somewhat less at the base; tubes about midway between varices, directed radially, slightly dorsally, and only a few degrees apically; immediately anterior to tubes and within the intervarical space are secondary folds; just preceding these secondary folds are sulci with apertural scars; sutures rather deeply impressed; aperture oval; anterior canal wide, elongate, reinforced by remnants of previous canals, closed throughout, bent to right.

Type Material: Holotype and Paratype in the Tate Type collection at the University of Adelaide, Australia. Holotype on tablet labeled Adelaide University Geology Department No. T 453B; paratype on tablet A. U. G. D. No. T 453A. A topotype on loan from Dr. N. H. Ludbrook, Adelaide, has been studied; two hypotypes are in the Stanford Univ. Paleo Type Coll. no. 9733 and 9734.

Type Locality: According to Dr. M. F. Glaessner (*in litt.* 9 March, 1964), Tate failed to record exact localities and mounted specimens from different places together. Tate's locality was recorded as "Adelaide Bore, S. A. clayey green sand." The specimen on loan from Dr. Ludbrook perhaps pinpoints this locality more accurately. This shell was recovered from the "62 to 63 foot level" of Adelaide Childrens Hospital Bore 5. Lat. $34^{\circ} 56' S$; Long. $139^{\circ} 24' E$.

Other Localities: Hypotype I came from "Bed I. J. R. I.", Victoria, Australia, collected by F. Singleton. Dr. Glaessner (*ibid.*) commented that this locality is unidentifiable. The hypotype II, also collected by Singleton, came from Cape Otway, Victoria, Australia.

Table 2
Dimensions

	Height	Maximum diameter	Average number of varices per whorl*
Holotype A. U. G. D. No. T 453B	9.0 mm	5.0 mm	3.6
Paratype A. U. G. D. No. T 453A	12.0 mm	6.3 mm	4.2
Topotype (incomplete)	7.0 mm	4.2 mm	4.3
Hypotype SUPTC 9733	15.4 mm	11.1 mm	3.4
Hypotype II SUPTC 9734 (anterior canal broken)	11.0 mm	6.5 mm	4.3

* The total number of tubes or varices per shell is divided by the number of post-nuclear whorls.

Explanation of Plate 10

Figure 25: *Siphonochelus (Siphonochelus) nipponensis* KEEN & CAMPBELL, spec. nov. Ventral view of holotype. $\times 4$.

Figure 26: *Siphonochelus (Siphonochelus) fistulosus* (BROGHI, 1814). (Astian, Castel Arquato, Italy; Pliocene; ex Prof. Fr. Sacco). Ventral view. $\times 3.2$.

Figure 27: *Siphonochelus (Siphonochelus) erythrostigma* KEEN & CAMPBELL, spec. nov. Ventral view of holotype, SUPTC no. 9732. $\times 3.4$.

Figure 28: *Siphonochelus (Lyrotyphis) japonicus* (A. ADAMS, 1863). (Off Sagami, Japan; 60 m). Ventral view. $\times 5$.

Figures 29 to 32: Apical views of the same shells as shown in top row. Same magnifications throughout.

Figure 33: *Laevityphis (Laevityphis) ludbrookae* KEEN & CAMPBELL, spec. nov. Ventral view of hypotype SUPTC no. 9733. $\times 3.0$.

Figure 34: Apical view of shell shown in Figure 33.

Figure 35: Lateral view of shell shown in Figure 27.

Figure 36: Dorsal view of shell shown in Figure 33.

