# GIANT AGGLUTINATED FORAMINIFERIDS FROM FRANCISCAN TURBIDITES AT REDWOOD CREEK, NORTHWESTERN CALIFORNIA, WITH THE DESCRIPTION OF A NEW SPECIES OF *BATHYSIPHON*

*WILLIAM MILLER, III*
*DEPARTMENT OF GEOLOGY*
*HUMBOLDT STATE UNIVERSITY*
*ARCATA, CALIFORNIA*

The Franciscan Central Belt is a Late Mesozoic terrane composed of dislocated submarine fan deposits, splinters of oceanic crust and blocks of "exotic" lithologies (*e.g.* glaucophane schist) of uncertain origin, which are all tectonically mixed in a muddy melange matrix. The belt includes the bedrock units exposed in seacliffs and river valleys in northern coastal California (Aalto, 1976, 1982). Megascopic fossil remains in the flysch blocks are rare (Bailey *et al.*, 1964; Blake and Jones, 1974), with most of the reported occurrences of bivalves and ammonoids probably representing allochthonous faunal elements. As a result of a concentrated effort to find organic remains, Franciscan submarine fan deposits are now yielding a unique indigenous biota of locally diverse trace fossils associated with hollow, siliceous tubes (Miller, 1986a, b). The tubular fossils are best assigned to the foraminiferid genus *Bathysiphon*, considering their skeletal structure and overall morphology (a study of biologic affinities and paleoecology is in progress; Miller, in prep). The purpose of this report is to document the second occurrence of these unusual tubes in Central Belt turbidites, which includes a new species. Type material has been deposited in the U.S. National Museum of Natural History (USNM), Washington, D.C.

The fossils described and illustrated herein were collected in 1976 by a field party mapping the northeastern side of Redwood Creek valley (Fig. 1). All specimens came from dark gray argillite with interbedded sandstone within the "Incoherent Unit of Coyote Creek," a division of the Franciscan Complex shown on the geologic map the field group eventually produced (Harden *et al.*, 1982). This unit is Cenomanian in age, as indicated by the occurrence of the ammonoids *Desmoceras (Pseudouhligella) japonicum* and *Calycoceras* sp. The ammonoid finds excited local interest owing to the biostratigraphic potential, but the siliceous tubes were never studied. The specimens described here were stored in the paleontologic collections of Humboldt State University until Mr. Samuel Morrison, a member of the original mapping party, recently brought them to my attention. This is an important rediscovery not only because good chronostratigraphic control is available for the source rocks, but also because it supplements the existing information on abyssobenthic organisms that inhabited fine-grained ("distal") submarine fan substrata of the Franciscan Complex.

## Order FORAMINIFERIDA Eichwald, 1830
## Suborder TEXTULARIINA Delage and Hérouard, 1896
## Superfamily AMMODISCACEA Reuss, 1862

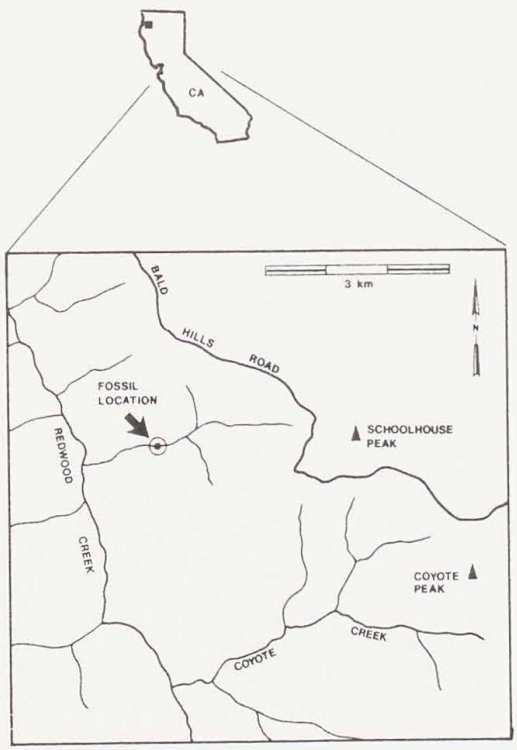


Figure 1. Locality map showing northeastern side of Redwood Creek valley and collecting site of *Bathysiphon cashmanae*.

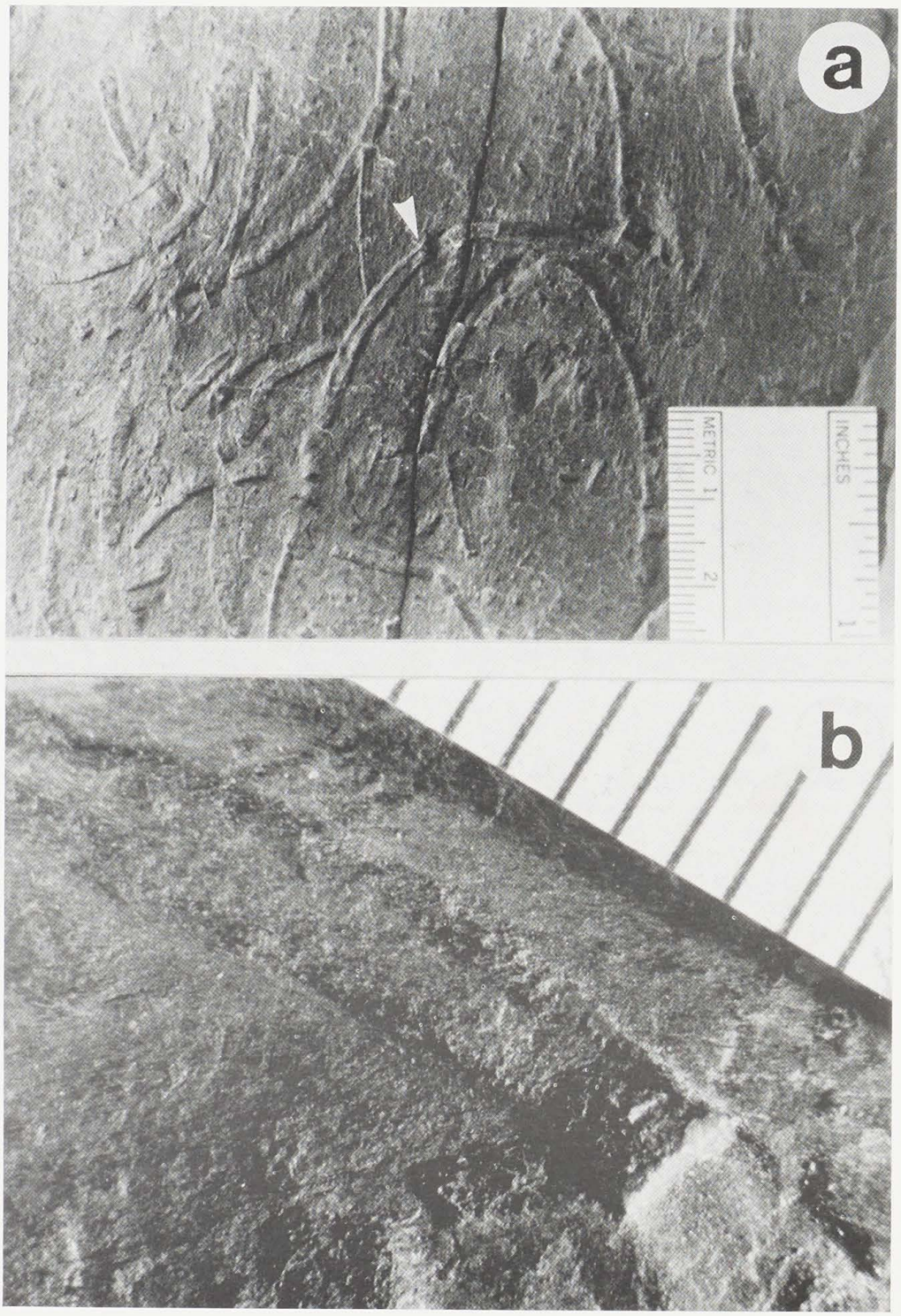


Figure 2. *a*, Argillite slab with 24 specimens of *Bathysiphon cashmanae* (syntypes: USNM 418012 through 418036); *b*, Close view of broken portion of large specimen indicated by arrow in *a* (scale in mm's).

Family ASTRORHIZIDAE Brady, 1881
Subfamily RHIZAMMININAE Rhumbler, 1895
Genus BATHYSIPHON M. Sars *in* G. O. Sars, 1872

BATHYSIPHON CASHMANAE
W. Miller, III, n. sp.
Figs. 2a, b; 3

*Description*: Test free, large, elongate, longitudinally tapered and slightly curved (in silhouette like the scaphopod *Dentalium*); cross-sections of adoral (mature) regions elliptical, but more circular in narrower adapical (immature) regions; wall is generally thicker than the width of the hollow internal cavity, with weakly developed surface striations that are discontinuous and oriented subparallel to long axis of the test; wall composed of apparently structureless, light gray, translucent, microcrystalline silica; test traversed by weak annular constrictions at irregular intervals and creased longitudinally by a furrow that is strongest in adoral regions of flattened specimens; both ends of test open.

*Dimensions*: Longest test (broken), 45 mm; maximum outer diameter observed, 2 mm; narrowest section through a tapered adapical region, 0.8 mm; arc (depth of bow of test, from inside of curved test to straight line connecting the ends, Fig. 3) of longest specimen, 7 mm.

*Syntypes*: Slab with about 24 broken tests and segments on one surface, USNM 418012 through 418036, inclusive.

*Discussion*: Specimens of *B. cashmanae* are similar to curved, tubular fossils that have been regarded by other workers as worm tubes (*i.e.*, *Terebellina* Ulrich, 1910; *Yokoia* Hatai and Noda, 1975). The biologic affinity of these tubes is in doubt, as are some assignments of tubular fossils to *Bathysiphon* in the absence of soft-parts (J. H. Lipps, *in litt.*, 1987). Certain features of the tests of *B. cashmanae* look worm-like, such as the curved, tapering shape, transverse constrictions, and the longitudinal furrow. Several other characteristics compare favorably with descriptions of modern *Bathysiphon* tests (see Cushman, 1910, p. 30-33; Loeblich and Tappan, 1964, p. C186; Gooday, 1983), including: 1) structural simplicity of the siliceous skeleton; 2) absence of a regular, well-developed surface ornamentation; 3) unbranched test open at both ends and lacking chambers; and 4) original flexibility of the test wall, suggested by the variable degree of development of the axial crease. Development (or accentuation) of transverse constrictions, longitudinal furrow, and to some degree the overall curvature of the test are probably partially dependent upon post-entombment deformation of an originally flexible skeleton (see Malecki, 1973). The large size (greater than 40 mm in length) of *B. cashmanae* is not incompatible with the size ranges of certain living species of *Bathysiphon* (*cf.*, Hatai and Saito, 1962); *B. filiformis* M. Sars, 1872, from the North Pacific Ocean, may attain a length of over 50 mm. Another Pacific species, *B. rufum* de Folin, 1886, may be conspicuously marked by transverse constrictions of the test and is slightly curved (Cushman, 1910). Based upon the characters of the test alone, *B. cashmanae* is most likely a giant agglutinated foraminiferid that inhabited the outer regions of a deep-sea fan.

The new species resembles the previously described Central Belt tube fossil, *B. aaltoi* Miller, 1986, in its large size and weak longitudinal striations on exterior surfaces of the best preserved tests. Both have thick walls composed of translucent, microcrystalline silica. *Bathysiphon cashmanae* differs in being sabre-shaped and smaller (recently discovered specimens of *B. aaltoi* from Point Saint George, Del Norte County, exceed 80 mm in length; Miller, in prep.).

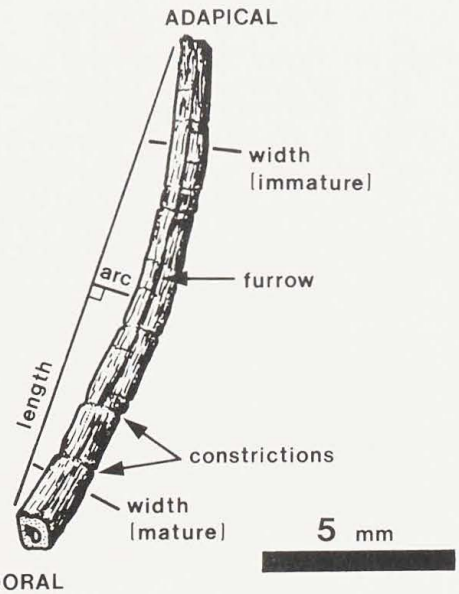


Figure 3. Reconstruction of *Bathysiphon cashmanae* showing terminology used in text to describe test morphology.

*Etymology*: This new foraminiferid is named in honor of Dr. Susan M. Cashman, Associate Professor of Geology at Humboldt State University and authority on the structural evolution of the Coast Ranges of northern California.

BATHYSIPHON AALTOI
W. Miller, III, 1986

*Discussion*: A few specimens of *B. aaltoi*, which was first recognized in Facies D turbidites at Point Saint George, Del Norte County, co-occur with *B. cashmanae* at Redwood Creek. However, the new species has not been found at Point Saint George. Largest segment observed was 22 mm in length and 2 mm in width.

I would like especially to thank Mr. Samuel Morrison for presenting the specimens. Ms. Corrine Sinnott drafted the locality map and Dr. Emily Vokes provided editorial corrections. I also thank Dr. Kenneth Aalto for numerous useful discussions on Franciscan geology, and Dr. Jere Lipps for advice as to how to approach the study of fossil representatives of *Bathysiphon*. Acknowledgment is made to the Donors of the Petroleum Research Fund, administered by the American Chemical Society, for support of this research.

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