tained for 15 passages and is stable for this period. There is little doubt, therefore, that in the present study the derived line cell originates from the primary tissue used (*12*).

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Failure of Survival of Slowly Growing Members of a Population

Abstract. Water in which tadpoles or fish have grown inhibits growth of others of their own kind. Larger animals may completely suppress the growth of smaller ones and may eventually kill them by this water-borne inhibition. Under natural conditions of overproduction only the more rapidly growing would be expected to survive.

Work with various fish and tadpoles has indicated that each species as it grows releases growth-inhibiting products which act in feedback fashion. The inhibitory products, in the case of tadpoles, may be removed from the culture water by heating, freezing and thawing, centrifugation, filtration, or sonication (*1*).

The effect of larger animals on smaller ones is such that, for example, one *Rana pipiens* tadpole growing rapidly in 6 lit. of water with 3 lit. replaced daily will completely inhibit the growth of smaller *R. pipens* tadpoles.

Water from growing tadpoles inhibits the growth of smaller tadpoles. If food is withheld from large tadpoles their culture water is not inhibitory to smaller tadpoles. It seems that products of growth collect in the aqueous medium and tend to limit growth. The effect is more marked when the products come from larger tadpoles and are used on smaller ones.

Similar relationships have been observed with young, growing fish. A pair of White Cloud mountain fish, *Tanichthys albonubes,* produce many more fertile eggs in a 15-lit. aquarium than can grow to 1-cm size. No matter how many hatch, even as many as 200, never more than 20 reach 1-cm size. Shortly after feeding begins, differences in size appear. The larger fish continue to grow; the smaller ones stop eating and die in spite of an abundance of food.

There is nothing inherently wrong with the smaller fish. They can grow if they are removed to other aquaria, and all may live if the groups are smaller than 20. They can also grow in the original aquarium if their larger siblings are removed.

A more striking demonstration that products, rather than a deficiency of food, limit survival was obtained with another fish, *Barbus tetrazona.* This fish has larger eggs and can use as its first food small soil nematodes and granules of yolk from hard-boiled eggs. A slight excess of food was present at all times. From a spawning of over 200 never did more than 15 survive to 1-cm size in a 15-lit. aquarium. The survivors were always the most rapid early growers. The number of survivors to 1-cm size was increased to 174 by replacing one-half of the water two, three, and toward the end of the experiment, four times a day.

In view of the fact that the production of fish was increased more than tenfold by frequent water changes, it might seem strange that one large tadpole could completely inhibit smaller ones when water was changed frequently. This is not due to a difference between tadpoles and fish. The growth of a group of tadpoles all of the same size is also greatly increased by water changes. The important thing is that when larger and smaller animals are together, the inhibitory effect of the larger is so great that it is effective even when half of the water is replaced daily. This is true for both tadpoles and fish.

Under natural conditions of overproduction more organisms begin development than can survive. From the above results it is suspected that any genome which led to a decrease in growth rate would be a death warrant. A new genome that favored growth might spread rapidly, for its bearers would inhibit their more slowly growing relatives without being inhibited by them. This may be a relationship favoring rather rapid evolutionary advances in aquatic organisms (*2*).

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Neopilina (Vema) ewingi, a Second Living Species of the Paleozoic Class Monoplacophora

Abstract. In December 1958 the Lamont Geological Observatory research vessel "Vema" dredged four specimens of Monoplacophora from the Peru-Chile Trench off northern Peru. This is the second discovery of living representatives of this class of Mollusca which was thought, until 1957, to have become extinct in the Devonian. The specimens are considered to represent a new subgenus and species: *Neopilina (Vema) ewingi,* and the discovery suggests that more relict types may exist alive in the deep sea off Central and South America.

On 6 and 7 December 1958, members of the scientific staff aboard the research vessel "Vema" dredged four fresh monoplacophoran mollusks from two localities in the north end of the Peru-Chile Trench off Peru (stations 150 and 151). These specimens are considered to represent a new subgenus and species of the Cambrian-Devonian class Monoplacophora. As such they differ in several significant respects from *Neopilina (Neopilina) galatheae* Lemche, 1957 (*1, 2*), the other living species of this class trawled by the Danish ship "Galathea" off Costa Rica in 1952.

The localities at which the specimens were dredged are: station 150, lat. 7°35′S, long. 81°24′W, in 3183 to 3192 fathoms (corrected); and station 151, lat. 7°30′S, long. 81°25′W, in 3195 to 3201 fathoms (corrected). These localities are over 1300 miles south-southeast of, and 1200 fathoms deeper than, the Galathea station 716 (lat. 9°23′N., long. 89°32′W.) in 1963 fathoms (corrected) and are separated from that locality by the Cocos Rise.

Although analyses of ecological and geological data are still incomplete, in view of the wide interest in this class and its importance to paleoecology, molluscan evolution, and interphylum relationships (*3*), it seems advisable to publish this preliminary report (*4, 5*).

The specimens were collected by us, J. Lamar Worzel, chief scientist, Thomas G. Dow, of Lamont Geological Observatory, and Juan J. Rivero, a visiting

Table 1. Measurements of the types.

Length (mm)	Width (mm)	Height (mm)	Apex to anterior margin (mm)
Holotype, station 150			
15.5	14.0	5.0	3.0
Paratype, station 151			
12.5	10.7	4.5	2.0
9.2	7.6	2.9	1.5
Paratype, station 150			
4.9	3.7	1.5	0.8

scientist from the University of Puerto Rico (*6*).

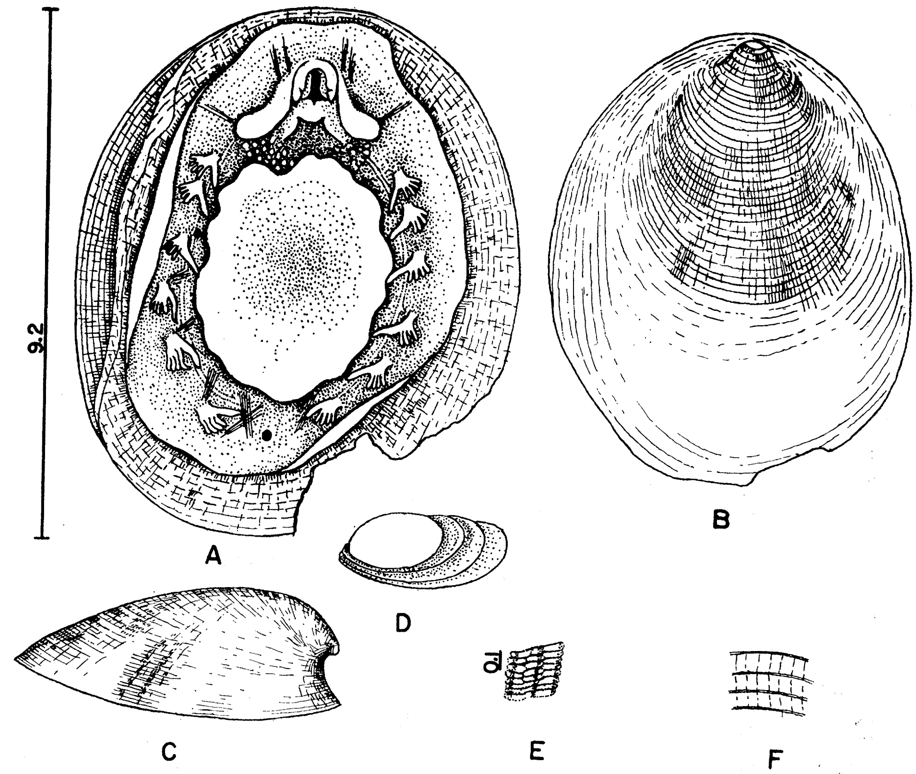

Fig. 1. *Neopilina* (*Vema*) *ewingi,* new species. *A,* Ventral view of paratype; *B,* dorsal view of another paratype; *C,* lateral view of paratype, (specimen *A*); *D,* apical portion of shell of paratype; *E, F,* striations on shell of paratype. Scale in millimeters. [R. J. Menzies]

Genus *Neopilina* Lemche, 1957 (*1*). Type species: *Neopilina galatheae* Lemche, 1957, by monotypy. Subgenus *Vema,* new subgenus. Type species: *Neopilina* (*Vema*) *ewingi,* new species.

The subgenus has the characters of its type species. The shell and animal are similar, in a general way, to those of *Neopilina* (*Neopilina*) *galatheae,* but there are prominent differences, as follows. Six pairs of gills are present in subgenus *Vema,* while only five pairs occur in subgenus *Neopilina.* The postoral tentacles are approximately half again as numerous in *Vema* as illustrated for *Neopilina.* The periostracum is all but invisible in *Vema* but is prominent in *Neopilina,* in the latter being blackish near the apex and changing to light brown near the margin. In addition, the shell in *Neopilina* is much thicker than in *Vema,* the radial lines are more irregular and fewer, and the whole sculpture is much coarser.

The taxonomic value of characters in the Monoplacophora is quite uncertain at the present time because so few specimens are known. Because the animal has not yet been sectioned and studied in detail, it is considered only as representing a new subgenus. The subgenus is named for the research vessel.

Neopilina (*Vema*) *ewingi,* new species (Fig. 1). Shell patelliform, ovate, thin, semitransparent, and pale yellowish white. Apex prominent, anterocentral, pointed, and curved ventrally. Aperture ovate, somewhat longer than wide, and with smooth margins. Shell sculpture consists of many fine, concentric, raised threads which are best developed near the apex, and a large number of poorly defined, low, radial riblets. In addition there are numerous (about 300 in the holotype) fine, concentric lines between the concentric threads, and a great many (about 700 in the holotype) fine, radial lines which together with the concentric lines delimit a vast number of rectangular prismatic units. In the holotype, the shell (unsectioned) appears to be constructed principally of these units with the addition of a very thin, lustrous layer on the inner surface and a pale yellowish, diaphanous, transparent periostracum, clearly visible only where it projects beyond small irregularities in the apertural margin.

The animal is similar in a general way to *Neopilina galatheae*—that is, it has a large, flat, subcircular foot surrounded by the mantle which bears the gills; an anterior mouth and associated appendages; and a posterior anus. Gills are arranged in two rows of six, one row on each side of the foot, and each bearing about five (specimen illustrated) to seven lamellae (holotype). The two palp-like appendages adjacent and lateral to the mouth are more elongate and lanceolate than in *N. galatheae,* and the postoral tentacles are much more numerous.

The holotype is from "Vema" cruise 15, station 150, about 140 mi west of Chicama, Peru, in 3183 to 3192 fathoms and is No. 220849 in the Museum of Comparative Zoology, Harvard University. A paratype from the same locality is on loan at the U.S. National Museum. The other paratypes are at Lamont Geological Observatory. Measurements of the types are given in Table 1.

All the specimens were dead upon arrival on deck. At that time the whole ventral surface, especially the foot and gills, was obscured by a thick layer of mucus. This indicates that the animal indeed does secrete a mucous film to aid in locomotion, as suggested to us by K. G. Wingstrand from his study of the anatomy of *N. galatheae.* It was also noted that only minor contraction occurred upon fixation and preservation and that the appendages were not significantly different in shape from their appearance in the figures drawn from preserved material. Before fixation the membranous portion of the foot was bluish with a diffuse, pinkish central area; the cephalic region was pale orange tan; and the muscular border of the foot, the gills, and the mantle were all pale yellowish tan.

The species is named in honor of Maurice Ewing, director of Lamont Geological Observatory, who has done more than any other American scientist to encourage modern deep-sea biological research and whose indefatigable efforts resulted in the "Vema" cruise 15 and the discovery of this species.

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4. This report is contribution No. 341, Lamont Geological Observatory, and Marine Biology contribution No. 37.
5. A report on the ecological and geological observations and on additional details of anatomy is in preparation.
6. W. J. Clench, D. R. Crofts, Maurice Ewing, Henning Lemche, R. D. Turner, K. G. Wingstrand, and J. Lamar Worzel have participated in helpful discussions or correspondence with us. The laboratory research was supported by a gift (RK-57076) from the Rockefeller Foundation for research in marine biology. The collections made aboard ship were made possible by contract with the Office of Naval Research and the Bureau of Ships, U.S. Navy, and by a grant from the National Science Foundation. We sincerely appreciate this aid.

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