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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References and Notes

1. J. C. N. Westwood, I. A. Macpherson, D. H. J. Titmuss, *Brit. J. Exptl. Pathol.* 38, 138 (1957).
2. F. W. Sheffield and G. M. Churcher, *ibid.* 38, 155 (1957).
3. R. M. Drew, *Science* 126, 747 (1957).
4. F. J. McCarthy and A. A. Tytell, *Federation Proc.* 17, 525 (1958).
5. W. B. Dunham and F. M. Ewing, *Proc. Soc. Exptl. Biol. Med.* 95, 637 (1957).
6. J. F. Morgan, H. S. Morton, R. C. Parker, *ibid.* 73, 1 (1950).
7. J. E. Salk, J. S. Youngner, E. N. Ward, *Am. J. Hyg.* 60, 214 (1954).
8. M. M. Mayer, H. J. Rapp, B. Roizman, S. W. Klein, K. M. Cowan, D. Lukens, C. E. Schwerdt, F. L. Schaffer, J. Charney, *J. Immunol.* 78, 435 (1957).
9. J. L. Melnick and K. Habel, *Federation Proc.* 17, 526 (1958).
10. L. L. Coriell, M. G. Tall, H. Gaskill, *Science* 128, 198 (1958).
11. A. A. Tytell, personal communications.
12. The assistance of Mary E. Wick is gratefully acknowledged.

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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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References and Notes

1. C. M. Richards, *Physiol. Zool.* 31, 138 (1958).
2. This work was supported in part by a National Science Foundation grant (NSF G-5542).

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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