have not made haustorial connections with the host roots. The slowly developing seedlings remained alive for several weeks in the initial purine solutions. Seedlings stimulated by, and left in contact with, the natural stimulant solution did not develop enlarged cotyledons or undergo elongation of the shoot apex (*8*).

A. D. WORSHAM
Department of Field Crops, North Carolina State College, Raleigh
D. E. MORELAND
Agricultural Research Service, U.S. Department of Agriculture
G. C. KLINGMAN
Department of Field Crops, North Carolina State College

References and Notes

1. R. Brown and M. Edwards, *Ann. Botany* **8**, 131 (1944); C. Fuller. *Agr. J. Union S. Africa* **1**, 684 (1911); H. H. W. Pearson, *ibid.* **3**, 651 (1912); A. R. Saunders, *Union S. Africa Dept. Agr. Sci. Bull.* **128**, (1933); K. B. Vallance, *Ann. Botany* **14**, 347 (1950).
2. R. Brown *et al., Proc. Roy. Soc. (London)* **B136**, 1 (1949); ———, *Biochem. J.* **50**, 596 (1952); A. R. Lansdown, *Univ. of Cambridge Abstr. Diss.* (1953–54), p. 234; A. G. Long, *ibid.* (1952–53), p. 202; G. J. Tyler, *ibid.*, p. 213.
3. The kinetin used in this study was purchased from Nutritional Biochemicals Corp., Cleveland, O.
4. The other 6-substituted purines were generously supplied by Charles G. Skinner of the University of Texas, Austin, and by Parke, Davis and Co., Detroit, Mich.
5. C. G. Skinner and W. Shive, *Arch. Biochem. Biophys.* **65**, 567 (1956); *Plant Physiol.* **32**, 117 (1957).
6. F. M. Strong, *Topics in Microbial Chemistry* (Wiley, New York, 1958).
7. C. O. Miller, *Plant Physiol.* **31**, 318 (1956); *ibid.* **33**, 115 (1958).
8. These studies were cooperative investigations of the North Carolina Agricultural Experiment Station and the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture. This report is published with the approval of the North Carolina Agricultural Experiment Station as paper No. 1066.

30 July 1959

New Permian Insects Discovered in Kansas and Oklahoma

Abstract. The Midco insect bed of Oklahoma and a newly discovered insect bed above this were traced across Kay County, Okla., into Sumner County, Kan. As a result, a greater time span is available for study of insect evolution during the mid-continent Permian, and the exact stratigraphic correlation of the Wellington of Oklahoma and Kansas can now be demonstrated. Four insect orders have thus far been identified from the new insect bed: Protodonata, Odonata, Protoperlaria, and Ephemeroptera. Numerous new species and higher categories are included in the collections from the two insect beds.

In 1939 the famous Midco insect bed (Permian, Leonardian, Wellington formation) of Noble County, Okla., was discovered by G. O. Raasch (*1*) and subsequently explored by Raasch and F. M. Carpenter (*2*). Slightly northwest of a locality in southern Kay County where Raasch had previously reported no insects, Tasch, aided by his assistant, Bernard Shaffer, found insects in the Midco bed. In addition, some 8 ft above the Midco, a new insect bed was discovered (NW-SW, sec. 31, T 25 N, R 1 W).

The Midco insect bed and the new insect occurrence above it were both traced to northern Kay County (NE-NW and also SE-NE, sec. 23, T 28 N, R 28 W), where an excellently preserved insect fauna was found. At this locality algal beds occur respectively below and above the two insect beds. Equivalent algal beds were traced to Sumner County, Kan. (SE-SW, sec. 11, T 35 S, R 1 W). Insects were found associated with the upper algal bed.

This is the first stratigraphically related correlation of the Oklahoma and Kansas Wellington formation. As a result, dozens of fossil conchostracan beds that Tasch found in the Oklahoma Wellington can be related to those discovered in Kansas. This, in turn, provides the necessary stratigraphic basis for study of evolutionary changes in Permian conchostracans.

Previous work by Tasch in Kansas (*3*) established that there were two distinct insect beds: the well-known Carlton insect bed of Dunbar in Dickinson County and one below it in Marion, Harvey, and Sedgwick counties. The Midco insect bed and the newly discovered insect bed above it are stratigraphically above (that is, geologically younger than) the two insect beds of Kansas. Thus, four distinct insect beds are now known for the mid-continent Wellington formation.

Fossil Permian insects belonging to the following orders and families have been identified by Zimmerman, who is doing the insect systematics for this project.

Southern Kay County, Okla. Upper insect bed, 8 ft above the Midco: Protodonata; Odonata, Protozygoptera, Kennedyidae, *Kennedya* sp.; Protoperlaria, Lemmatophoridae.

Northern Kay County, Okla. Upper insect bed, 9.9 ft above the Midco: Ephemeroptera. Mideo: (extinct orders) Protodonata, Megasecoptera, Protelytroptera, Protoperlaria, Protorthoptera; (living orders) Ephemeroptera, Odonata, Blattaria, Corrodentia, Homoptera, Neuroptera, Mecoptera.

South Haven, Sumner County, Kan. Upper algal-insect bed, 9.3 ft above the Midco equivalent: Megasecoptera.

These findings are of unusual interest. Our knowledge of insect speciation and evolutionary trends during the American Permian had previously been limited to data from two beds: Midco and Carlton. Extension of the vertical range of Leonardian insects—above the Midco and below the Carlton—enlarges the geologic time span through which they may now be studied (*4*).

PAUL TASCH
Department of Geology, University of Wichita, Wichita, Kansas
JAMES R. ZIMMERMAN
Department of Biology, Indiana Central College, Indianapolis

References and Notes

1. G. O. Raasch, thesis, University of Wisconsin (1946).
2. F. M. Carpenter, *Proc. Am. Acad. Arts Sci.* **76**, 25 (1947).
3. P. Tasch, "Stratigraphic position of the Wellington conchostracan-bearing beds in Kansas," *Abstr. AAPG-SEPM Program, Dallas meeting* (1959), p. 60.
4. This research was supported by National Science Foundation grants Nos. G-7320 and G-4150.

31 August 1959

All-Female Strains of the Teleost Fishes of the Genus Poeciliopsis

Abstract. In addition to the viviparous fish *Mollienesia formosa*, two other species of poeciliids have recently been found to produce only female offspring. The young of these females, however, unlike those of *M. formosa*, inherit characteristics from any one of the several species of males used in experimental matings.

Self-perpetuating populations of unisexual vertebrates have been experimentally demonstrated only among the viviparous fishes of the New World family Poeciliidae—of which the guppy

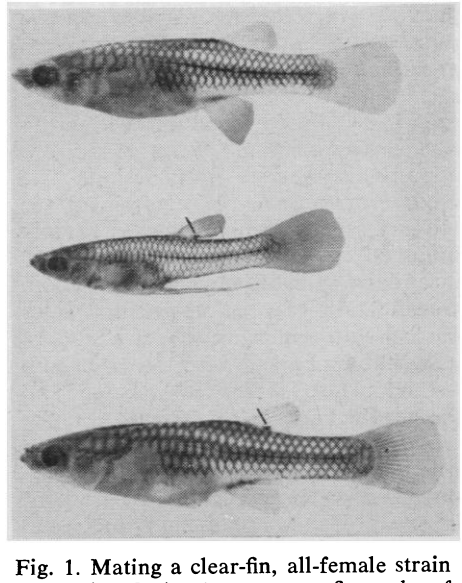

Fig. 1. Mating a clear-fin, all-female strain of species C (top) to a spot-fin male of species F (middle) results in spot-fin, all-female offspring (bottom); this demonstrates that, unlike the finding for *Mollienesia formosa*, characters of the male are transmitted to the all-female hybrids.