DISCUSSION

DROUGHT AND THE FUNGOUS FLORA OF COLORADO

DURING the years from 1930 to 1934, severe drought prevailed throughout the whole country, and the mountainous region of Colorado presented no exception. During these dry years, the fungous flora of this region was sparse. Fungi could be found only along the banks of streams and in a few other scattered moist locations. Many fruiting bodies of the woody perennial fungi had died by the end of the second year of drought. A few xerophytic species, however, persisted throughout the dry years. Mushrooms, boletes, coral fungi, cup fungi and others were conspicuously absent in locations where in moist years they abounded.

These five consecutive dry years were followed in 1935 by a dry winter, but from April to September of that year an abundance of moisture fell and the average rainfall throughout these months was in excess of normal. In view of the dry winter, however, the yearly average in some cases showed a slight deficiency of moisture.[1] With the return of an adequately moist growing season in 1935 one might expect a return of the abundant fungous flora which so marks the mountainous region of Colorado during moist years. This, however, was not the case. The fungous flora was more abundant than in any of the preceding dry years, but markedly less abundant than in any year preceding the drought that received a normal amount of moisture.

A few of the observations made during the summer of 1935 might be mentioned. Near Kingston Peak, elevation 11,000 feet, it was noted by the author and his wife that certain kinds of boletes and agarics could be found growing on the ground only around the edge of thick conical clumps of Engelmann spruce. These species of boletes and agarics are not known to be parasitic on the roots of evergreens; nor were they known to produce fruiting bodies in this location during the drought period. The conical clumps of Engelmann spruce conduct run-off water as would a tepee, with the result that the soil around the edge of these clumps is always more moist than elsewhere. It is thought that during the years of drought the scanty rainfall, when concentrated in this manner, was sufficient to at least keep the perennial mycelia alive. On the advent of more favorable conditions of moisture in 1935, fruiting bodies were developed. During years of normal moisture, these particular fungi are found in locations other than that explained above. Furthermore, it was noted that agarics and boletes were found growing more abundantly on the ground under brush piles and fallen trees than in open locations. It is likely that this forest debris may have been instrumental in keeping the perennial mycelia alive throughout the drought by conserving the moisture. Also, during the years of average precipitation, the fruiting bodies of wood-destroying fungi make their appearance at certain times of the season; thus they are classified as spring, summer and autumn fruiting. During the season of 1935, many of these fruiting bodies appeared from one to three months late. It is thought that either the perennial mycelia in the logs were so depauperated from the prolonged dry period that a longer time than usual was required for formation of fruits, or the mycelia were killed and the fruiting bodies developed from new infections initiated from spores that were carried from the few widely scattered fruiting bodies that endured the dry period due to their favorable location with relation to moisture.

In conclusion, during the dry years many or most of the fungi died and only those situated in favorably moist situations lived. It is thought that the return of the abundant fungous flora of the mountainous region of Colorado will depend upon the occurrence of several or perhaps many seasons of abundant precipitation in succession, and that during these moist seasons "reseeding" from the widely scattered areas where a few plants flourished during the five dry summers will take place.

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[1] U. S. Department of Agriculture, Weather Bureau, *Climatological Data*, Colorado Section 40 (13): 1935.

THE FRESH-WATER MEDUSA IN LOUISIANA

AN appearance of the gonosomes of *Craspedacusta* has recently been observed at Monroe, La., by Mrs. J. W. Granberry and Mr. P. H. Murdaugh, who have supplied the authors with valuable information of the occurrence and with a quantity of preserved material. The medusae were found in an old open city reservoir on Wood Street, a concrete tank about fourteen feet deep with an accumulation of sand and clay on the bottom, connected with the city mains and also receiving some contribution of seepage. A previous appearance of the jellyfish in numbers is believed to have taken place in 1932 or 1933. In June, 1935, a quantity of medusae was again observed and a sample of six specimens preserved. Later in June the reservoir was drained, refilled and stocked with sunfish; nevertheless, by August of the same year gonosomes were again present in large numbers, and over four hundred were preserved. Two individuals of the June sample and 103 of the August lot, sent to the Bingham Oceanographic Laboratory for examination, yield the following information:

The June specimens are respectively 8.1 and 6.6 mm

in bell diameter; the August ones range from 7 to 13 mm, bell heights being between one half and three fifths the diameter. All specimens are sexually mature males. In one individual of the August sample the gastrovascular cavity contains a bolus of algal filaments, apparently partially digested, in which is entangled detritus and numerous fragments of copepods; in each of two others there is a small partly digested dipterous pupa. Such a diet does not seem to have been previously recorded for the gonosome, according to the monograph by Dejdar[1] (p. 687).

The irregularity of tentacular arrangement suggested by Dejdar (p. 622) is difficult to discover in the present material, in which these organs are arranged in seven quite complete cycles, fully distinguished in size in the smaller specimens, although somewhat obscured beyond the fifth series in larger ones. An incomplete eighth cycle, increasing in extent with increase in size of the individual, is present. The folds in the nettle-ring of the bell-margin are regularly disposed at the bases of the larger tentacles, of the first through fourth classes in the smaller, the first through fifth in the larger medusae. There are modally three lithocysts between each of these puckerings of the rim; and in conformity with the addition of such folds at base of tentacles of the fifth class in large individuals, there are approximately twice as many lithocysts per quadrant (48) in these as in the smaller ones. Dejdar's conclusion as to the universal peduncculation of the lithocyst concretions in *Craspedacusta* is evidently correct, but with reference to his synonymization of most of the named forms, it is worth noting that the present seems to agree with other American material in displaying a much less conspicuously elongate attachment than that described in medusae from other regions of the world.

If the reported reappearance of the medusoid population subsequent to its removal by drainage of the reservoir at Monroe is correctly interpreted, and if the medusae were not carried into the pool with the water-supply, it may be inferred that the gonosomes, replenished by a hydroid stock which survived the drainage, reached sexual maturity and a diameter of 13 mm within two months after liberation, a growth rate comparable with that found by Dejdar (p. 687–688) in aquarium-reared medusae. Also, if the maleness of the two available individuals of the June sample be assumed to have characterized the entire population at that time, it may be inferred that homogeneity in sexual nature of the gonosomes was maintained in successive liberations from the trophosomes, in the face of some modification of the environment. Dejdar (p. 688) very properly suggests that the quite usual sexual uniformity of local populations of *Craspedacusta* requires the assumption of a "getrenntgeschlechtliche Polypengeneration"; nevertheless, the alternative possibility that the prime affect of sexual nature in *Craspedacusta* is environmental seems worth consideration.

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[1] *Zeits. f. Morph. Ökol. Tiere,* 28: 595–691, 1934.

A MARINE TENEMENT

SANIBEL ISLAND, in Lee County, Florida, lies three miles off the mainland coast at the mouth of the Caloosahatchee River, and has its long axis generally directed S.E. and N.W. This position affords a southerly exposure to some twelve miles of open beach on the Gulf of Mexico. The immediate locality is exceedingly rich in genera and species of molluscan fauna and also in numbers and unusual variety of other forms of marine invertebrate life.

Drift rows of incalculable numbers of living *Atrina* (*Pinna*), principally *A. rigida* Dillwyn, were stranded on the beaches by the wind-blown tides of early March, 1936. Normally *Atrina* lives in moderate depths of water, buried in the sea-bottom, and attached by a byssus to some point of support with only an inch or less of the free, rounded edge of the bivalve shell exposed to the invasion of inquilines of various other tribes.

These "pen-shells" must have been washed from their beds, quite likely in the hurricane of September, 1935, and must have lain for the succeeding five months in some depression of the sea-bottom between outlying sandbars, not far off shore and at no great depth. This seems evident from the character of the creatures which have adopted these shells for their tenements and made use of the entire extent of their rough outer surfaces.

When the "pen-shell" is buried vertically in sand or mud, as it normally lives, the surfaces of the shell are protected from contact with the larvae of other mollusks, and of worms, crustaceans, ascidians, zooids, etc., which are free-swimming in early life, and also from creeping forms of other invertebrate creatures which seek a firm and stable attachment for themselves or their egg-cases.

These *Atrinas* were covered over from top to bottom with an extraneous medley of living marine animals; principally species which live in shallow water and within the littoral region. Some of them were covered with this adventitious growth on one side only, suggesting that they had lain for some time undisturbed upon the bottom of the sea.

One *Atrina* picked up at random yielded the animals listed in the following inventory: