UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SCANNING ELECTRON MICROGRAPHS OF MODERN CHRYSOMONAD CYSTS FROM HAYPRESS MEADOWS, EL DORADO COUNTY, CALIFORNIA

by

David P. Adam

OPEN-FILE REPORT
80-1235

INTRODUCTION

This report is one of a series illustrating siliceous cysts from various localities. Although these cysts have been known for many years, they are so small that they cannot be observed in detail with optical microscopes. The recent development of the scanning electron microscope (SEM) has made possible much more detailed observations of the external features of these cysts, but as yet relatively few forms have been recorded in this way.

A major difficulty is taxonomic confusion. Many and perhaps all of these cysts are the resting stages of various algae of the phylum Chrysophyta; they will be referred to in the rest of this report as chrysomonad cysts, although other groups in addition to the Chrysomonadinae may be represented. Modern forms are found primarily in fresh water, and numerous authors have reported chrysomonad cysts from Holocene sediments (for example, see Nygaard, 1956). Older fossils have been recovered mostly from marine deposits, and are known as archaeomonads; whether the two groups are as distinct as this terminology suggests is not clear.

For an introduction to the literature on chrysomonad cysts and siliceous algal scales, the reader is referred to Adam and Mahood (1979a), a preliminary annotated bibliography on the subject.

The fossil archaeomonads have been described and named entirely on the basis of their cysts. This is not advisable with modern forms, because the cysts are the remains of one stage of the life cycle of algae that presumably already have legitimate taxonomic names. Proper cyst nomenclature therefore depends on establishing which cysts are produced by which algae. At the moment, we have only a very limited knowledge of the forms that exist, and almost no knowledge of the phycological pedigrees of the various forms.

The present work is directed towards expanding our knowledge of the various cyst forms and their geographic and environmental distributions. Taxonomic problems are ignored, and the various cyst forms are simply given numbers, which have been assigned arbitrarily. These numbers are consistent throughout all reports in this series, and are being used to tabulate where the various forms occur. (A list of the previous reports in this series is given in Appendix A). The approach used has been that of "splitting", as opposed to "lumping"; it may well be desirable to lump together many of the forms described here when more is known about them.

The SEM photographs are the most important part of this paper, and no attempt has been made to reduce them to words. Supporting data have been placed in the captions. Sample preparation techniques are generally the same as those used for preparing diatom samples; details may be found in Mahood and Adam (1979b).

The purpose of these initial reports is to provide primary documentation of the occurrence of particular cyst forms at particular localities, and to provide a means by which the SEM photographs of the cysts may be placed in a permanent depository. Counts of the relative abundance of the various forms and interpretations of their significance have not yet been attempted, but must await a more complete understanding of the range of cyst morphologies.

We have illustrated all of the distinctive cyst forms found in the sample, using the best available photographs. In some instances we have included more than one photograph of a given form, but we have not included all of the photographs we have taken.

Negatives of the plates for this report are on deposit at the USGS Photo Library, and prints can be obtained (at your expense) by writing to:

U. S. Geological Survey Library
Photo Library
Stop 914
Box 25406, Denver Federal Center
Denver, Colorado 80225

REGIONAL SETTING

The study area includes the crest region of the Sierra Nevada for about 10 km north of U. S. Highway 50 (fig. 1). The highest ground, the Crystal Range, is several km to the west of the drainage divide, and forms the western side of Desolation Valley. The drainage divide is rather poorly defined where it separates Desolation Valley from the Fallen Leaf Lake drainage to the east.

During the glacial stages of the Pleistocene, the maximum ice accumulation in this area was in Desolation Valley, just east and downwind of the Crystal Range. An ice sheet centered over Desolation Valley was continuous to the north with an ice sheet over Rockbound Valley; ice drainage from Desolation Valley was to the south into the American River and to the east into the Tahoe basin by way of Fallen Leaf Lake. On at least some occasions, ice also flowed into the Echo Lakes Valley (fig. 1), and there are also indications of northward ice flow from the Echo Lakes valley into the Fallen Leaf Lake drainage near Triangle Lake.

It is probable that the ridge crests between Desolation Valley, Echo Lakes valley, and the Fallen Leaf Lake valley have been ice free for considerably longer than the valleys themselves. The slopes above

Tamarack Lake are fresh bedrock for several hundred meters towards Haypress Meadows, but Haypress Meadows itself, as well as the ridge above it to the west, is much more deeply mantled with decomposed rock and soil. Further to the west, the eastern side of Desolation Valley is mantled by ground moraine that supports a forest of lodgepole and white pine, in contrast to the rest of the aptly-named valley.

SITE DESCRIPTION

At the lower (eastern) end of Haypress Meadows the mantle of unconsolidated debris that underlies the meadow pinches out, and ground water derived from the meadow area is forced to the surface. Several springs are in the area; the best known is next to the trail into Desolation Valley, and is a popular resting spot for hikers. About a hundred meters to the west of that spring, hidden from the trail, is another spring, which maintains sufficient flow to sustain a small perched *Sphagnum* bog. The chrysomonad cysts reported here are from the top of a core taken at the thickest part of that bog.

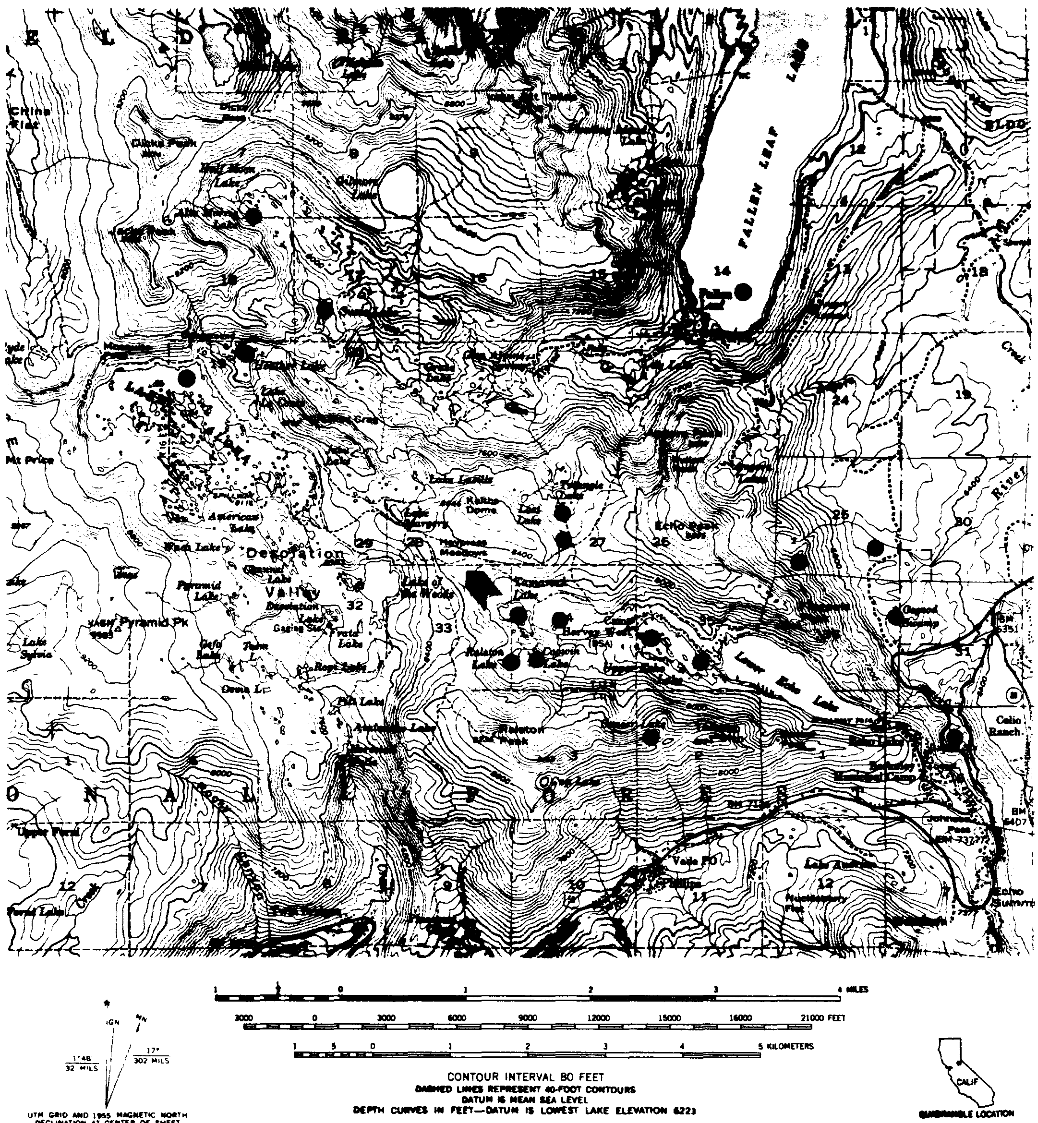


Figure 1.--Map showing the location of the Haypress Meadows site (arrow). Dots mark the locations of other sites where we have observed chrysomonad cysts. Map is reduced from part of the USGS Fallen Leaf Lake 15-minute quadrangle.

REFERENCES CITED

Adam, David P., and Mahood, Albert M., 1979b, A preliminary working bibliography on siliceous algal cysts and scales. U. S. Geological Survey Open-File Report No. 79-1215, 34 p.

Nygaard, Gunnar, 1956, Ancient and Recent flora of diatoms and Chrysophyceae in Lake Gribsø, *in* Berg, Kaj, and Petersen, I. C., eds., Studies on the Humic acid Lake Gribsø: Folia Limnologia Scandinavica, No. 8, p. 32-94, 12 plates.

Haypress Meadows Perched Bog, Plate A

scale bar = 5 micrometers

1 - Type 225

2 - Type 225

3 - Type 225

4 - Type 225(?)

5 - Type 225

6 - Type 225

7 - Type 225(?)

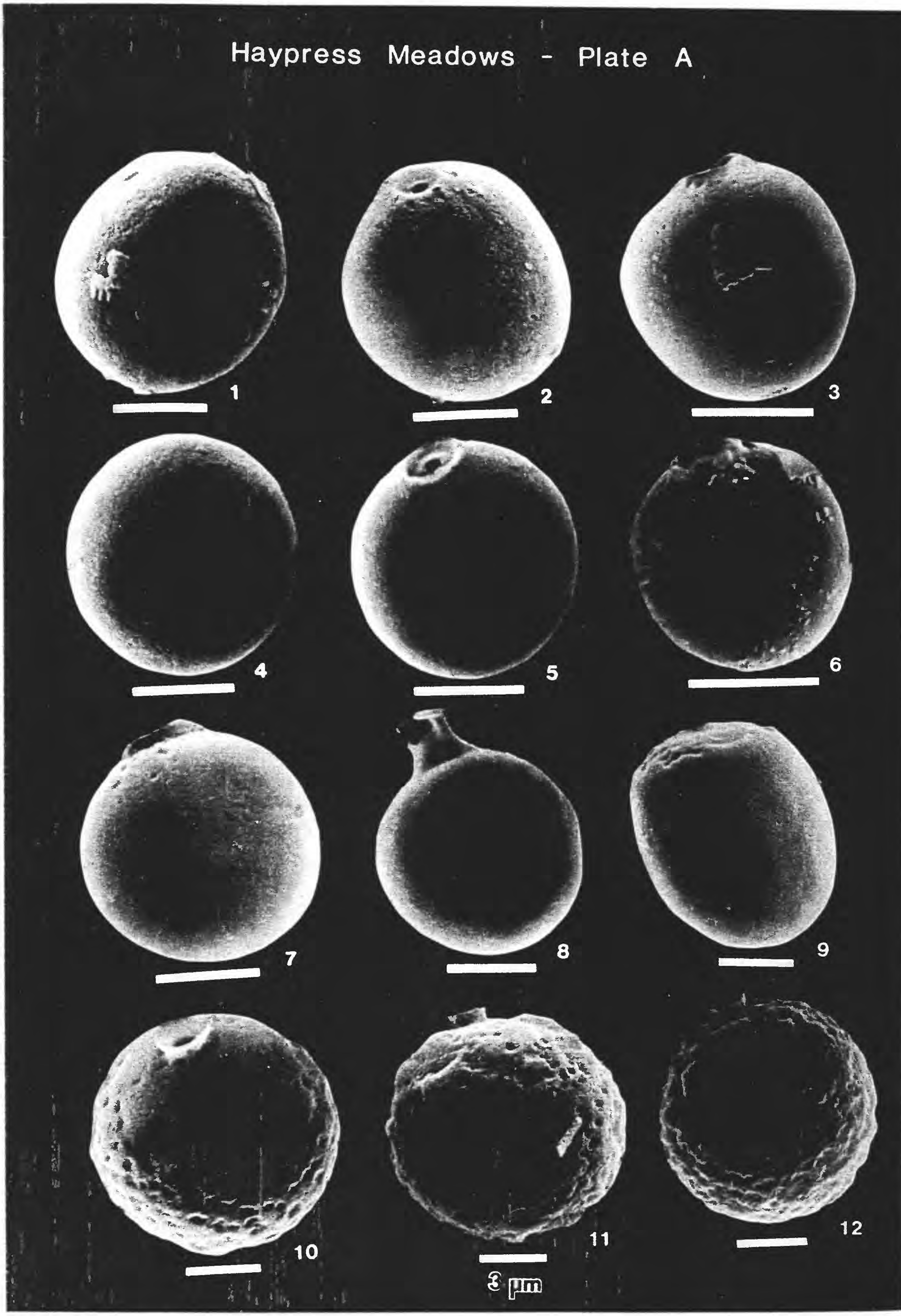
8 - Type 152

9 - Type 153

10 - Type 154

11 - Type 155

12 - Type 155


Haypress Meadows - Plate A
1
2
3
4
5
6
7
8
9
10
11
12
3 µm

Haypress Meadows Perched Bog, Plate B

scale bar = 3 micrometers

1 - Type 156

2 - Type 157

2 - Type 157

4 - Type 157(?)

5 - Type 158

6 - Type 159

7 - Type 160

8 - Type 160

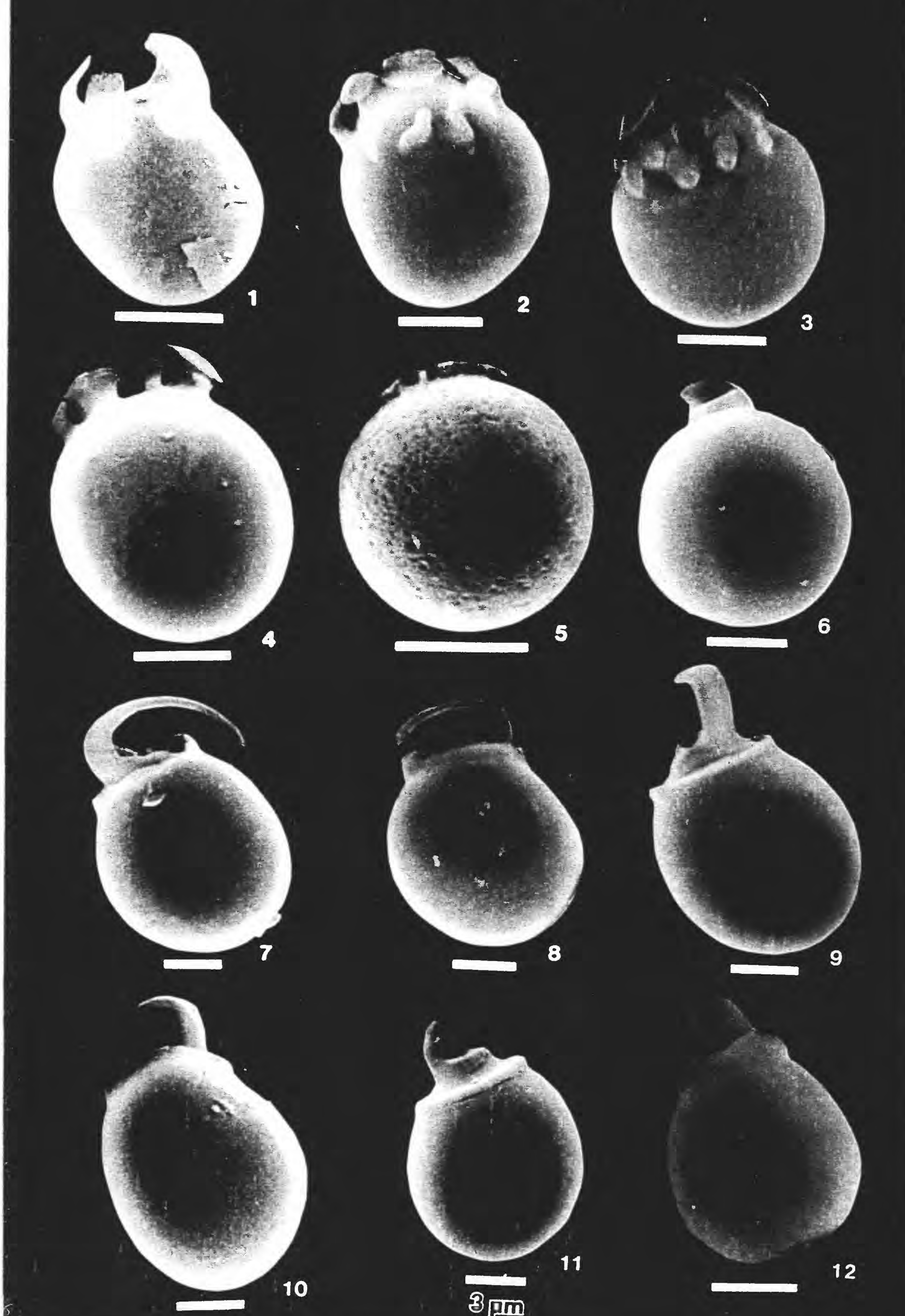
9 - Type 160

10 - Type 160

11 - Type 160

12 - Type 160

Haypress Meadows - Plate B



Haypress Meadows Perched Bog, Plate C

scale bar = 3 micrometers

1 - Type 161

2 - Type 161

3 - Type 161

4 - Type 161

5 - Type 161

6 - Type 165

7 - Type 165

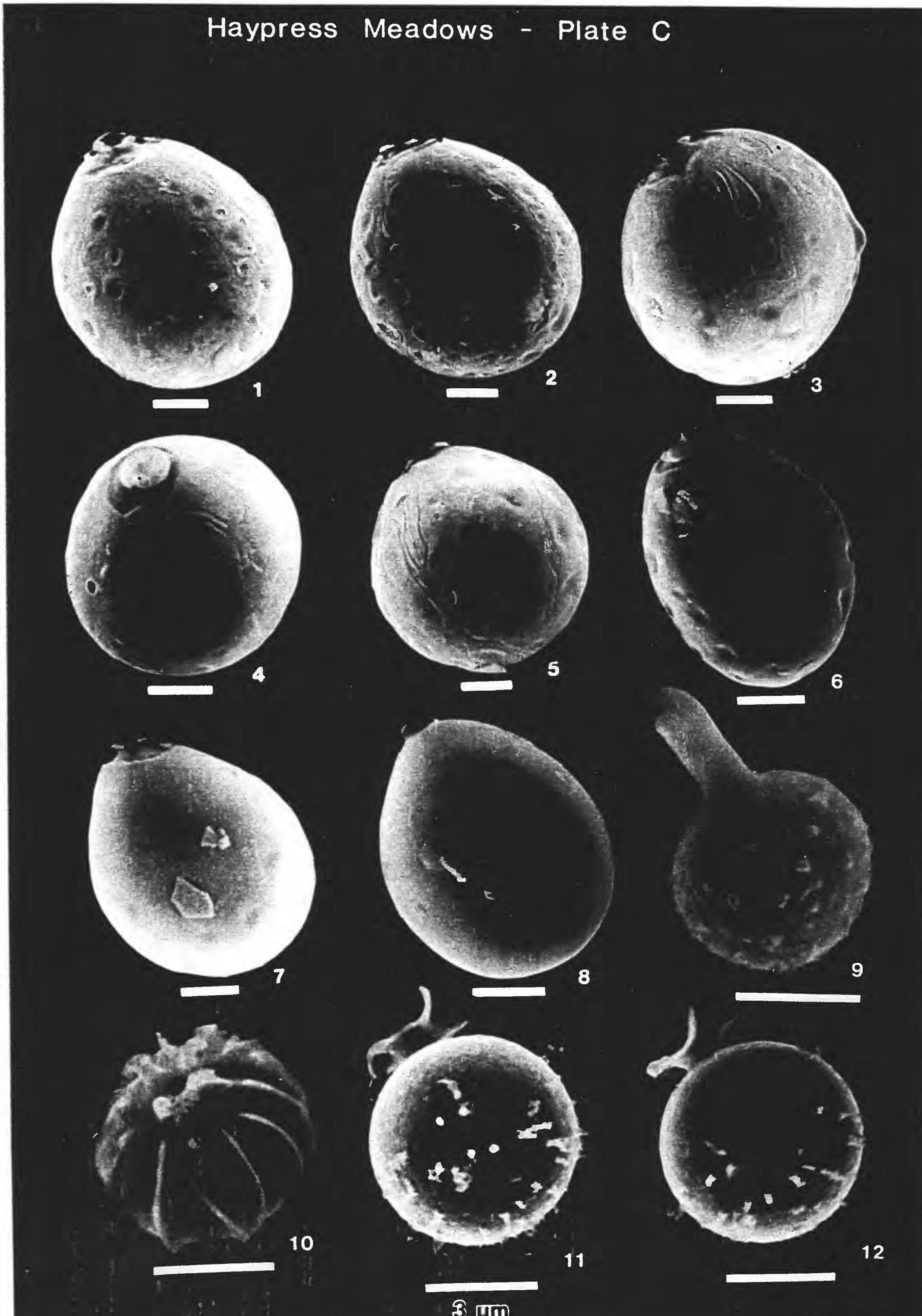
8 - Type 166

9 - Type 167

10 - Type 168

11 - Type 169

12 - Type 169


Haypress Meadows - Plate C
1
2
3
4
5
6
7
8
9
10
11
12
3 µm

APPENDIX A

PREVIOUS REPORTS IN THIS SERIES

Mahood, Albert D., and Adam, David P., 1979a, Late Pleistocene chrysomonad cysts from core 7, Clear Lake, Lake County, California: U. S. Geological Survey Open-file Report Number 79-971, 11 p., 4 plates. Defines types 1 through 44.

Adam, David P., and Mahood, Albert D., 1979a, A preliminary annotated bibliography on siliceous algal cysts and scales: U. S. Geological Survey Open-file Report Number 79-1215, 34 p.

Mahood, Albert D., and Adam, David P., 1979b, Techniques used for the cleaning, concentration, and observation of chrysomonad cysts from sediments: U. S. Geological Survey Open-file Report Number 79-1431, 5 p.

Adam, David P., and Mahood, Albert D., 1979b, Chrysomonad cysts from Upper Echo Lake, Eldorado County, California: U. S. Geological Survey Open-file Report Number 79-1461, 21 p. + 12 plates.

Adam, David P., and Mehringer, Peter J., Jr., 1980, Modern and Holocene chrysomonad cysts from Lost Trail Pass Bog, Montana: U. S. Geological Survey Open-file Report Number 80-797, 13 p. + 5 plates.

Adam, David P., and Mahood, Albert D., 1980, Modern chrysomonad cysts from Fallen Leaf Lake, Eldorado County, California: U. S. Geological Survey Open-file Report Number 80-798, 9 p. + 2 plates.

Adam, David P., and Mahood, Albert D., 1980, Modern chrysomonad cysts from Alta Morris Lake, Eldorado County, California: U. S. Geological Survey Open-file Report Number 80-822, 11 p. + 4 plates.

Adam, David P., and Mehringer, Peter J., Jr., 1980, Scanning electron micrographs of modern chrysomonad cysts from Castor Pond, Jemez Mountains, New Mexico: U. S. Geological Survey Open-File Report Number 80-1231, 18 p., including 5 plates.