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**THE SPECIES OF MACROCYSTIS
WITH SPECIAL REFERENCE TO THOSE
ON SOUTHERN AUSTRALIAN COASTS**

BY

H. B. S. WOMERSLEY

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INTRODUCTION

DURING RECENT years ecological surveys of the coast of Victoria by Bennett and Pope (1953)¹ and of parts of South Australia by the writer have shown that *Macrocystis* is a distinctive alga of the upper sublittoral zone of much of the Victorian coast and of the eastern part of the South Australian coast. *Macrocystis* is also plentiful around Tasmania, especially on the east and southeast coasts, where extensive deepwater beds occur. Here, investigations of its growth rate, extent, and possible economic use are being made by officers of the Commonwealth Scientific and Industrial Research Organisation.

An examination of collections from southern Australia and Tasmania showed that, on the basis of holdfast characters, two species were present and not one as has been generally thought. This study of the Australian *Macrocystis* was begun at the University of Adelaide and continued at the University of California at Berkeley, where abundant herbarium material is available from almost the whole world range of its distribution. *Macrocystis* collections have been examined also in the following herbaria: in the United States in the Chicago Natural History Museum, the Farlow Herbarium, and the New York Botanic Garden; in England in the Royal Botanic Gardens, Kew, and the British Museum (Natural History); in Europe in the Botanical Museum in Lund, the Riksmuseet in Stockholm, the Botanical Museum in Copenhagen, the Rijksherbarium in Leiden, and the Laboratoire de Cryptogamie in Paris.

The type specimen of *Fucus pyriferus* Linnaeus has been seen in the Linnaean Collection, London, and the type specimens of *Macrocystis angustifolia* Bory and *M. integrifolia* Bory in the Paris Natural History Museum.

Besides knowing the Australian species in the field, I have studied the two North American species on the California coast, and have had the benefit of the field knowledge of Professor George F. Papenfuss of the South African plant, and of Dr. Robert F. Scagel of *Macrocystis* in British Columbia, Canada.

Part of this study, carried out at the University of California and elsewhere in the United States, was made possible by a grant from the Carnegie Corporation of New York, to whom acknowledgment is made. Grateful acknowledgment is made to Professor Papenfuss and to Dr. Scagel for reading the manuscript critically, and to the former for use of the algal herbarium and library facilities of the Department of Botany, University of California.

¹The *Macrocystis* on Victorian coasts is here incorrectly given as *M. integrifolia*, instead of *M. angustifolia*.

The map opposite page 113 is based on Goode Base Map No. 101M by Henry M. Leppard (copyright by the University of Chicago). It is used by permission of the University of Chicago Press.

RECORDED DISTRIBUTION OF MACROCYSTIS IN AUSTRALIA

The earliest record of *Macrocystis* from Australia is that of Bory (1826a, p. 10) who described *M. angustifolius* from a specimen collected by de la Billardiere in "Nouvelle-Hollande." Bory (1828, p. 93) later changed this name to *M. angustifrons* and figured the plant (1826b, pl. 8). The frond in this figure is very like those of plants from Robe in South Australia, but not the holdfast. However, Bory states that he received the holdfast from Lamouroux, with "mers australes" as the locality. This specimen could not be located in the Paris Museum, but in the Riksmuseet, Stockholm, there is a specimen with a good holdfast and a label "Laminaria pyrifera angustifolia (Lamouroux) Mers australes." The following passage, possibly in Bory's handwriting, is added, "Il est douteux que les racines données comme on le voit sur l'autorité de Lamouroux comme celles de l'*angustifrons* soient les siennes. Nous les croyons celles du *communis*. Quand à l'habitat il doit être Valparaiso venant probablement du capitaine Tomasi." As the collection place of the holdfast is so very vague, and Bory himself stated the holdfast may be that of another species, it seems best to disregard completely the holdfast in Bory's figure of *M. angustifrons*. The holdfast of the Riksmuseet specimen is characteristic of *M. pyrifera* as understood in this paper.

Since this first record, most subsequent authors have referred all Australian specimens to *Macrocystis pyrifera*, usually recognizing only this one species within the genus. Harvey (1862, pl. 202) recorded *M. pyrifera* from "east of Cape Northumberland, and in Tasmania," and Lucas (1909, p. 17; 1936, p. 95) reported it from the south and southeast coasts of Australia and Tasmania. May (1939, p. 198) records it from as far north as Bondi in New South Wales, and it may also occur on Lord Howe Island (Lucas, 1935, p. 213). Probably the New South Wales records are of drift plants, since Dakin, Bennett, and Pope (1948) did not record *Macrocystis* during their ecological survey of this coast, and Bennett and Pope (personal communication) found it only as far east as Walkerville (west of Wilson's Promontory) in Victoria.

Macrocystis probably occurs in suitable localities westward along the Victorian coast from Walkerville. It was recorded from Port Phillip by Wilson (1892, p. 161), and Pope and Bennett (1953, p. 136) found it in most exposed localities which they studied recently. The westerly distribution probably ends at Robe in South Australia, where it grows from just below low-water level to 20 feet (or more?) in depth. Fragments of plants, however, have been collected from the drift at Encounter Bay, Pennington Bay on Kangaroo Island, and at Stansbury and Port Vincent on Yorke Peninsula. Since the prevailing current along southern Australia is from west to east, these drift plants may have originated from smaller outlying patches near these localities, or they may have traveled long distances from subantarctic localities in the current of subantarctic origin which flows along southern Australia. *Macrocystis* is known to travel such great distances in the west-wind drift of the subantarctic regions (Hooker, 1847, p. 461)

that little importance can be given to drift plants in the geographical distribution of the genus.

Macrocyttis appears to be widely distributed around Tasmania. Harvey (1860, p. 289) records *M. pyrifer* as occurring "all around the coast." Mr. Alan Cribb (personal communication) states that *Macrocyttis* forms extensive beds on the east and southeast coasts, and probably occurs around most of Tasmania, though it may be rare or absent on parts of the north coast.

Thus the known distribution of *Macrocyttis* in Australia is around Tasmania and from Walkerville in Victoria to Robe in South Australia, in suitable habitats, whereas drift plants and possibly outlying patches may occur farther east and west.

Specimens occur in the Australian herbaria (those in Adelaide, Melbourne, and Sydney have been examined) from within this range, but with few exceptions are inadequate for specific determination, and will not be cited here.

WORLD DISTRIBUTION OF MACROCYTTIS

The main distribution of *Macrocyttis* (Setchell, 1932, p. 446, pl. 48) is circum-subantarctic from about 60°S to 40°S latitude. It is particularly plentiful around most subantarctic islands and the southern tip of South America, and extends up the west coast of South America almost to the equator (Howe, 1914). In South Africa (Papenfuss, 1942, p. 21) *Macrocyttis* is limited to the southwest part of the Cape Province, extending from the Olifant's River in the north to Cape Point in the south. Dassen Island, however, may be the northernmost locality for attached plants. The distribution of *Macrocyttis* in Australia has been discussed above; in New Zealand it occurs in suitable localities in the South Island and near Wellington in the North Island (Moore, 1941, p. 23).

In the northern hemisphere, *Macrocyttis* is known only from the west coast of America, from about Magdalena Bay on the coast of Baja California northward to near Sitka in Alaska.

The distribution of the individual species of *Macrocyttis*, as recognized in this paper, is given later with the taxonomic descriptions, and is shown on the accompanying map.

TYPE LOCALITY OF THE TYPE SPECIES

The type of *Macrocyttis* is *Fucus pyriferus* Linnaeus (1771, p. 311), which was described from material collected by Koenig in "oceanus Aethiopicus" during a voyage from Europe to India. Setchell (1932, p. 454) believed this locality to be "somewhere among the Antarctic Islands (Kerguelen, Crozets, etc.)," but Papenfuss (1940, p. 7) has pointed out that the name "Oceanus Aethiopicus" applies on old maps to the Atlantic Ocean off Africa, from the coast of Guinea southward. Although several old atlases (such as Heylyn's *Cosmographie*, fourth book, 1656) give the Aethiopian Ocean in the general region of the Gulf of Guinea, Banke's *Universal Geography* (1818, map opposite p. 100) refers to the "Ethiopic or South Atlantic Ocean." Hooker (1847, p. 463) interpreted the type material as from "the seas of the Cape of Good Hope."

In considering the place of origin of the type material of *Fucus pyriferus*,