NOTES ON THE INTERTIDAL ECOLOGY OF TRIAL HARBOUR, TASMANIA.

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(With 3 plates)

ABSTRACT

A description is given on the zonation and general ecology of a reef on the exposed West Coast of Tasmania. The reef shows the unusual feature of a *Hormosira-Corallina* belt on an exposed coast. A white species of *Lithothamnion* which is considered to be characteristic of cold water conditions occurs there. The scarcity of littorines and barnacles is attributed to local factors.

1. INTRODUCTION

This paper is the eleventh of a series on the intertidal ecology of Tasmania and is the first to describe the major features of an intertidal region on the West Coast of Tasmania. This coastline is very rugged and is readily accessible at only four places. The most southerly accessible place, West Strahan, is a region of sandy beach and is thus outside the scope of this present series of papers. The north-westerly part of the coast is fairly readily accessible but is situated a considerable distance from Hobart. An attempt was made to examine the shore at Pieman Heads, a difficult place to reach, but bad weather defeated my object. The site of the present study, Trial Harbour, latitude 41° 59′ S. longitude 141° 10′ E., is accessible by motor track from Zeehan. Visits were made to the harbour in January, 1951, November, 1956, and February, 1957 and February, 1958. Trial Harbour is named for the brig "Trial" which used the "port" for the first time in 1881. During the mining boom the region became the site of the town of Remine and a jetty was erected. Little remains of either structure today. The place is well named since clouds of sandflies, mosquitos and frequent very rapid changes of weather make working there a real trial.

2. DESCRIPTION OF THE TRIAL HARBOUR AREA

Trial Harbour, latitude 41° 59′ S., consists of a reef extending a few chains out to sea in a north-westerly direction and some smaller reefs along the coast with boulder beaches. The roadstead is narrow.

To the north of Trial Harbour the coastline consists of rocky cliffs trending generally in a north-westerly direction. The cliffs are only feebly incised by watercourses and there are few boulder beaches. To the south of Trial Harbour there are three low rocky headlands interspaced by beaches. The beaches are composed of yellow quartzose rounded grit fragments forming a rather soft gritty sand. The hard packing of sand found on many ocean beaches is lacking here. There was evidence in November, 1956, of a very considerable removal by marine agencies of sand from one beach to the south of Trial Harbour. At one end of the beach a vertical bank seven feet in height had been cut in the grit, indicating that this quantity of substratum had been removed fairly recently. The sand scouring experienced by intertidal organisms must be intense.

To the south beyond the furthest of the headlands mentioned above, the shoreline continues for 15 miles to Macquarie Harbour as Ocean Beach, a sand surf beach penetrated near its northern end by the Little Henty River.

3. METHODS AND NOMENCLATURE

The area was examined during three periods, namely January, 1951, November, 1956 and February, 1957. During the first of these visits the weather encountered was so bad that little work beyond a preliminary survey could be undertaken, but better success was obtained on the later visits.

The collections were sorted and I am indebted to Mr. R. C. Kershaw and Miss Hope Macpherson for identifying the Mollusca and to Dr. Dora P. Henry for naming the Cirripedia. The algae were identified from University Herbarium material.

The nomenclature used is that of Stephenson and Stephenson (1949) and Guiler (1953).

The author of each species is only quoted in the text the first time that species appears.

4. PHYSICAL ENVIRONMENT

(a) Climatic factors.

(1) *Rainfall.*—The Trial Harbour area is shown by the Weather Bureau (1936) to be in an area of 50" to 60" annual precipitation. This rainfall is seasonal with more than 5" occurring each month during the period April to October, inclusive.

There is no meteorological station maintained at Trial Harbour or in its vicinity so there are no records of temperatures, relative humidity or other climatic data. However, the Meteorological Office (1947) shows the region as having a mean monthly temperature range from 20°C. to 6.6°C.

(b) Sea temperatures.

There are no sea temperatures available from Trial Harbour but the Meteorological Office show the West Coast of Tasmania as having a maximum monthly sea temperature in March of 18.8°C. and a minimum of 9.4° in September.

(c) Wind and Swell.

The prevailing wind at Trial Harbour is westerly to north-westerly with the latter being the sector of strongest winds. The winds reached Force 7 (Beaufort Scale) during 10% of the observations recorded by the Meteorological Office (1947). The swell is prevailing south-westerly to southerly with heavy swell occurring some 10% of the time and a moderate swell being the usual type of sea encountered. Days or no swell are rare. All of these records were compiled by ships off the coast and may not reflect conditions on the shore. For example, strong north to east, i.e. offshore winds deaden the effect of swell and reduce very materially the amount of wave action on the shore.

Briefly, to sum up the physical environment, Trial Harbour experiences a considerable range of temperatures, both air and sea, and has a heavy rainfall. Rough seas together with heavy to moderate swells are liable to occur at any time during the year and gales are frequent.

(d) Geology.

Waterhouse (1916) describes the geology of the area in detail. The coastline to the north of Trial Harbour consists of a red granite with some metamorphosed sedimentary rocks near the harbour. Similar metamorphic rocks exist to the south of the Harbour and form small headlands. The reef at Trial Harbour is composed of serpentine which when fresh, is a very dark blue but on the reef it is soft in texture and coloured a light greenish grey. Waterhouse considers that the freshest reef rocks are a light brown colour. The reef is penetrate by veins or aragonite and contains magnetite.

Wave action has worn the reef down to a very uniform level with a ridge at one point near the seaward edge. There are extensive deep gullies worn in the edges of the reef and at low tide the general reef surface has ponds which are usually fairly shallow (10 cms. approx. depth). The reef is entirely covered at high tide or during periods of rough seas.

In Tasmania, where much of the coastline consists of dolerite which does not form wave cut platforms of any extent, large reefs such as this are uncommon. The largest platforms I have seen are at South Cape Bay where the reef extends over 100 feet from the base of the cliffs.

Fresh water enters the harbour near the reef where the Serpentine Creek pours into the sea. Except at times of flood the volume of water carried by the Creek is not great but even then it is doubtful if it could have a profound effect on the fauna and flora because it enters the Harbour at a deep water channel which is always stirred up by wave action. Biologically, as shall be seen below, there is little evidence of the fresh water having any effects on the animals and plants. There are several other sources of fresh water ranging from seepages to creeks between Trial Harbour and the Cliff Mine, but as at Trial Harbour, they do not have any apparent effect on the fauna or flora of the shore. All these creeks carry brown button-grass water.

5. ECOLOGY OF THE REEF

The reef, as noted above, is remarkably uniform in the level nature of its surface and as a result, most of it falls in one characteristic faunal and floral belt. The exceptions to this are at the edges of the reef, whether exposed to the full effect of wave action or not, on some slightly elevated rocks at the wave sheltered end of the reef and on a small raised ridge at the seaward exposed end of the reef.

The zonation seen on the rocks at the sheltered end of the reef is—

Chamaesipho columna (Spengler)
Siphonaria diemenensis (Quoy and Gaim.);
Hormosira banksii (Turn.) Decaisne + *Corallina* sp.

There are no further belts below this level because the Infralitoral fringe and the lower parts of the Midiittoral are replaced by ponds. Most of the reef, however, falls into this mixed *Hormosira-Corallina* belt. In November the *Hormosira* plants were all small and obviously young growths. The November visit showed a very well developed belt below *Siphonaria* consisting of *Scytosiphon lomentarius* (Lyng.) J. Ag. and *Elachista* sp., together with *Colpomenia sinuosa* (Roth.) Derby & Sol. and a few *Ulva* plants. I do not include this algal belt as a permanent feature of the zonation as all these species are noted for the seasonal nature of their presence on the shore and in February they were absent.

(a) The *Chamaesipho* belt.

In sun shaded places the lower parts of the *Chamaesipho* belt have a population of *Galeolaria caespitosa* (Lam.). This worm never reaches the status of a belt forming species, but it is common in situations similar to that described above.

The *Chamaesipho* belt does not support a well developed fauna or flora. There are no lichens or algae at this level on the shore. The absence of lichens is undoubtedly due to the fact that the rocks do not reach sufficiently far above the inter-

tidal region for the Supralittoral lichens to appear. The absence, rather surprisingly, of the littorinid, *Littorina unifasciata* (Gray), can be attributed to the same cause. Most of the species encountered are cryptic in habit. One of the most interesting of these is the small mussel *Modiolus pulex* Lam. which is characteristically surrounded by sand which clings to the shell. These tiny mussels, approximately 2 mm. in length live in cracks in the rock and although very numerous, are most inconspicuous.

The other species found in the barnacle belt are the gastropods *Subninella undulata* (Solander), *Melanerita melanotragus* (Smith), *Lepsithais vinosa* (Lam.), *Fossarina* sp.? *legrandi* Petterd, *Siphonaria diemenensis* (Quoy and Gaim.), *Montfortula rugosa* (Quoy and Gaim.), the mussel *Modiolus pulex* Lam. and the chiton *Sypharochiton maugeanus* Iredale and May. All of these above species favour sun shaded places. *Montfortula rugosa* is scarce in this belt. It was surprising to find a young *Cellana solida* (Blainville) in this belt. *Notoacmea petterdi* (Ten.-Woods) and *Conacmea subundulata* (Angas) also are found in the *Chamaesipho* belt as well as *Siphonaria zonata*.

Chamaesipho belt occurs at the seaward edge of the platform where there is a ridge of rock elevated above the general shelf level. This belt is populated by *Notoacmaea mayi, Lepsithais vinosa, Littorina unifasciata, L. praetermissa*. Permanent ponds in this belt have a sandy mud bottom with *Subninella undulata, Dicathais textiliosa*, and the tectibranch *Pleurobranchus maculatus* (Quoy and Gaim.), Miss Nielson, who identified this species for me, assures me that the specimens do not fit Quoy and Gaimard's original figure but that they belong to the species usually considered as *P. maculatus*.

(b) **The *Siphonaria* belt.**

The dominant species is *S. diemenensis* together with the small sand surrounded mussel of the *Chamaesipho* belt, *Modiolus pulex. Ulva lactuca* and *Scytosiphon lomentarius* are common in restricted areas which have a small amount of water retained on them at low tide. However, these growths are seasonal, being absent from the reef in February. The lower part of the *Siphonaria* belt is characterized by a rich growth of *Scytosiphon* + *Ulva* + *Elachista* with *Colpomenia sinuosa*.

Ponds in this belt contain *Subninella undulata*, small plants of *Ecklonia radiata* (Ag.) J. Ag., a few *Corallina* sp., and a sparse population of *Enteromorpha* sp. on sun sheltered damp situations. A deep pond in this belt contained a large number of *Subninella, Gigartina* sp., a large orange *nudibranch, Dicathais baileyana, Colpomenia sinuosa, Ecklonia radiata, Corallina cuvieri, Tethya diploderma* (Schmidt), *Hymeniacidon perlevis* (Montagu). Below a large stone in the pond was a *Botryllus* sp., orange in colour, a deep plum coloured *Botrylloides*, a purple *Lithothamnion* and a bright orange-red calcareous *Bryozoan*.

Other species found on the rocks in this belt are the limpets *Notoacmea petterdi* (Ten.-Woods), *Conacmea subundulata* (Angas), a species of *Chiazacmea*, the pulmonate *Siphonaria tasmanica* (Ten.-Woods), the therid *Lepsithais vinosa* (Lam.) and the chiton *Sypharochiton maugeanus* Iredale and May. The latter species is especially common in clefts and in ponds.

(c) **The Hormosira-Corallina belt.**

Most of the reef falls into this belt which continues as far as the algal belt at the seaward edge of the reef. The continuity of the belt is broken by ponds, some of which are of considerable size but mostly of shallow depth, being less than one metre deep at low water.

The ponds contain a similar algal flora to that described above, namely *Ecklonia, Colpomenia* and *Corallina* with the addition of *Phyllospora comosa* (Labill.) Kutz., *Laurencia botryoides* (Turn.) Gail., *Codium fragile* (Sur.) Hariot, *Corallina pilulifera* Post & Rupr. An interesting feature of these ponds is the presence in them of small plants of *Macrocystis pyrifera* (L.) Ag. This species is usually found living in offshore beds and is not usually a species of the intertidal zone. However, although some of the small plants living in the ponds are never exposed to the air and so cannot be considered as intertidal in nature, other larger plants living in the big ponds are exposed for considerable periods at low water and so can be considered to be intertidal in nature (Plate I). *Hormosira banksii* occurs around the edges of all of the ponds. All of these algae are of equal ecological status with the exception of *Codium* which is scarce.

The fauna of the deeper ponds is poor. This is in large measure due to the absence of the stones on the bottom of the ponds to provide shelter for a cryptic or semi-cryptic fauna. There are several very large boulders which undoubtedly shelter some animals but they are too large or too solidly embedded to move. A further factor, probably the most important, which discourages the development of a large fauna is the nature of the bottom of the ponds. The bottom is of sand which is moved about considerably during gales and must move to some extent during the normal period of the day when the shore is covered by the sea. There is no infauna in the sand.

The starfish, *Patiriella calcar* (Lam.) is locally very common in ponds. In some places up to 100 individuals can be collected in an area of about one square metre. It is particularly numerous in places where there is some drift weed. This species is very variable in colour and the number of animals found each day also varies very considerably. On 6th November, 1956, there were many *Patiriella* in the ponds but on the following day the species was uncommon. Searching did not reveal the hiding places of the animals. By the 8th, the starfish had returned and there were plenty of them in the ponds.

Other species found in the deeper ponds are *Dicathias textiliosa* (Lam.) *Subninella undulata, Austrocochlea (Chlorodiloma) odontis* (Woods), *Cominella lineolata* (Lam.), *Aplysia tasmanica* (Ten.-Woods), *Notohaliotis ruber* (Leach), *Bembicium nanum* (Lam.), *Lepsithais vinosa, Montfortula rugosa* (Quoy & Gaim.), *Siphonaria tasmanica, S. diemenensis, Patellanax chapmani* (Ten.-Woods) and *Sypharochiton maugeanus*. Some of these species are of particular interest, particularly

Aplysia tasmanica. This species was very sporadic in occurrence and was represented by juvenile individuals which were attached by the posterior ends of their foot to *Laurencia* plants. One small plant harboured seven juvenile *Aplysia*. The fissurellid *Montfortula rugosa* was particularly numerous on the reef. In other parts of Tasmania this species is not very common.

The carnivorous gastropod, *Cominella lineolata*, was very numerous in the shallow ponds. *Cominella* always could be found by killing and crushing any other species of animal, whereupon *Cominella* would come out of hiding in the sand to feed on the dead animal. The individuals of *Cominella* live buried in the sand and rapidly make their way over the sand using the smell of the dead animal as a guide. Two varieties of *C. lineolata* were found—that with continuous lines around the shell and that with the lines broken.

The ponds towards the wave exposed end of the reef have the same flora except that *Laurencia botryoides* becomes more scarce. *Macrocystis pyrifera* becomes larger and the plants more numerous but a requirement for this species is a pool of several metres extent. *Lessonia corrugata* Lucas appears in these ponds.

Shallow ponds of less than 10 cms. depth in the *Hormosira-Corallina* belt do not usually support a varied algal flora. Generally speaking the only alga present is *Hormosira* though *Corallina* may or may not also be present. *Patiriella exigua* (Lam.) occurs sporadically throughout these ponds.

Those parts of the reefs which are not submerged support a poor fauna, consisting largely of the semi-cryptic species, *Sypharochiton maugeanus*, *Galeolaria caespitosa* and *Siphonaria diemenensis*.

The seaward part of the reef is exposed to heavy wave action and this factor becomes of greater importance in determining the zonal pattern. A small ridge near the edge of the reef is sufficiently elevated above the general level of the reef to show the zonation in an almost unbroken sequence from the *Chamaesipho* belt down to the Infralittoral fringe. The zonation is *Chamaesipho columna*, *Austromytilus rostratus* (Dunker), *Catophragmus polymerus* Darwin, mixed algal belt, *Lithophyllum hyperellum* Foslie, *Sarcophycus potatorum* (Labill.) Kutz.

This zonation is not necessarily present over all of the exposed edge of the reef. *Catophragmus* is rather patchy in distribution, preferring places where there are rounded fingers of the reef extending out to sea so that surf and broken water passes over the rock. Similarly, the mussels are patchy in distribution and are not found on the most exposed situations. The gullies extending into the reef show a reduction in the number and size of *Sarcophycus* plants in direct proportion to the distance from the edge of the reef and eventually *Sarcophycus* becomes absent and is replaced by *Phyllospora* as the dominant Infralittoral fringe alga. *Macrocystis* often occurs in these gullies. The mixed algal and *Lithophyllum* belts in November were richly populated by *Ulva lactuca*, and a mixed *Scytosiphon* belt was found on the shore above the Infralittoral fringe in places with submaximal exposure.

The barnacle belt at the seaward edge is populated by gastropods, but there are no other species of barnacles present in this belt. *Notoacmea mayi* (May), *Lepsithais vinosa* (Lam.), *Littorina unifasciata*, *L. praetermissa* (May), *Modiolus pulex* and *Patelloida latistrigata* (Angas), are the other species found in the barnacle belt.

The *Austromytilus* belt is populated by *Montfortula rugosa* (Quoy & Gaim.) and by chitons, *Sypharochiton maugeanus* (Iredale & May). A few *Catophragmus* are found at this level but they are all small in size. The anemone, *Actinia tenebrosa* (Farq.) is found in clefts in the mussel belt together with *Galeolaria*. These two species are not found living together. The patelliform gastropods *Patelloida latistrigata*, *Notoacmaea scabrilirata* and *Patellanax chapmani* are found in the *Austromytilus* belt.

The *Catophragmus* belt has the same limpet fauna as that given above for the *Austromytilus* belt but with the fissurellid *Montfortula rugosa* becoming very much more numerous.

One of the striking features of the mixed algal and the *Lithophyllum* belt is that there are no animals, other than small species such as amphipods, living on or inside the weeds. The poverty of fauna extends further down the shore and is to be seen in the *Sarcophycus* belt.

The *Lithophyllum* belt is populated by the limpet *Cellana solida*, a white encrusting *Lithothamnion*, *Laurencia botryoides*, *Ulva*, *Corallina* and a few *Scytosiphon* plants, the large chiton *Plaxiphora albida* (Blainville), a very few *Galeolaria caespitosa*, *Corallina lichenoides*, the *thaid Dicathais textiliosa* (Lam.), and *Patiriella calcar* (Lam.). *Corallina officinalis* may form a turf in some places in the *Lithophyllum* belt.

The *Sarcophycus* belt is the most obvious feature of the intertidal region but it is very poor in fauna and flora. The ascidian *Pyura stolonifera* (Heller) is found attached to the rocks around the holdfasts of the large alga and some clusters formed by *Modiolus pulex*. The latter species often has large numbers of *Kellia australis* (Lam.) around the byssus strands. *Poneroplax albida* is scarce and there are a few *Cellana solida*. *Iridaea sp. ? australasica* occurs between the plants and all of the rock which is not occupied by these species is encrusted by a pink *Lithothamnion sp.*, which is relieved by some black patches of *Isactis*. *Corallina pilulifera* and *Lithophyllum hyperellum* are also found in the *Sarcophycus* belt but are confined to the upper limit of the region. A large button shaped, dark green coloured alga, *Codium spongiosum* Harv., forms a prominent feature of this belt. This *Codium* species is scarce to rare on the shore but it forms such a vivid splash of green in the prevailing pink of *Lithothamnion* that a false impression of its numbers could easily be gained. Small limpets live in the upper part of the *Sarcophycus* belt, these being *Patelloida victoriana* (Singleton), *Patellanax peronii* (Blainville) and *P. squamifera* (Reeve) and the chiton *Poneroplax albida* (Blainville).

The sheltered north eastern side of the reef, although having *Sarcophycus* in the Infralittoral fringe, shows the decreased strength of the wave action in the belt found in the Midlittoral. The

Hormosira-Corallina belt extends to the edge of the reef and is replaced by a mixed algal belt with *Laurencia* often predominating and forming a turf. On the sheltered edge of the reef where there is broken water *Catophragmus* is more numerous than on the exposed side.

6. NOTES ON NEARBY AREAS

The rocky areas to the south of Trial Harbour are all situated in close proximity to sandy beaches and on account of the very heavy sand scouring experienced in these places there is often a poverty of life on the rocks. The " cut and fill " of sand in these beaches is very great, approximately seven feet of beach removal being noted in December, 1956. The rocks immediately beside the beaches are smooth and polished by the sand and there is no permanent animal or plant life on them with the exception of a few roving forms, such as *Littorina* or *Austrocochlea* living high on the shore, the latter being found in more sheltered places. The mussel *Austromytilus* is apparently least affected by wave action and sand action, being often found in sheets covering the rocks at a level about the lower Midlittoral. Other species which provide competition at this level for the mussels are absent but as the sand scouring diminishes these species put in an appearance, the last to do so being *Sarcophycus*. In some instances the rocky points to the South of Trial Harbour show a zonation of *Littorina, Chamaesipho, Brachyodontes* (perhaps with *Catophragmus*), *Sarcophycus*.

To the north of Trial Harbour, the coast stretches for some miles as cliffs interspaced with small boulder beaches. These, where it is possible to carry out examination, show a typical exposed coast zonation—namely, *Littorina L, Chthamalus, Chamaesipho, Catophragmus, Corallines* (including *Lithophyllum*) and finally *Sarcophycus*. In many places the small mussel is found forming a dense growth on the rocks at the bottom of the *Chamaesipho* belt, especially in places where the surface of the rock is uneven, e.g., at a place known locally as Ladder Hole.

Cellana solida and the anemone *Actinia tenebrosa* are both found on the wave sheltered side of boulders. *Galeolaria caespitosa* is also found on the wave sheltered side of rocks but it is most common in places which are sheltered from the full force of the waves where there is broken water. In these situations it forms encrustations not more than 2·5 cms. in thickness.

Other species found very commonly in this part of the coast are *Dicathais baileyana, Poneroplax albida, Lithophyllum hyperellum, Modiolus pulex,* and *Catophragmus polymerus.* The latter is very common in some, but not by any means all, places which suffer wave action plus surf. It is absent from many situations which appear suitable to it.

Ponds in this region support a fauna which is few in species but large in numbers. *Melanerita melanotragus* is one of the most common pond dwelling species. *Cominella lineolata, Austrocochlea obtusa constricta, Austrocochlea odontis* (Wood), *Bembicium nanum* (Lam.), *Sypharochiton maugeanus, Patiriella exigua* are all common together with the orange anemone *Anthothoe* sp. The ponds at highest levels on the shore frequently support a large *Hormosira* population. The edges of the ponds have a few *Cellana* living just out of the water.

One particularly noticeable feature of this part of the coast is the size of the holdfasts of *Sarcophycus,* one particularly large disc being over 30 cms. in width. In most places there are individuals of *Pyura stolonifera* scattered around the holdfasts of this alga.

7. DISCUSSION

The Trial Harbour area, although situated on a very exposed part of the coastline, does not exhibit features which can be considered to be typical of strong wave action. The absence of a well developed *Littorina* belt is one such feature. Other features are the absence of a well developed barnacle belt and the development of an *Hormosira-Corallina* association on the reef. However, these features can all be attributed to two local factors, namely the development of a reef extending for some distance off-shore and the absence of cliffs or rocks. This reef greatly reduces the wave action which is encountered at about high water level and this has had the effect of reducing the spray upon which the Littorines depend for their food and moisture. Further, the absence of any cliffs suitable for colonization by the species which habitually live on the upper part of the shore naturally results in the absence of these species.

The reef being at almost the same level from seaward edge to the land is colonized almost entirely by the species which are able to successfully live at that tidal level. On an exposed coast one might expect a mixed *Corallina-Patelloid* barnacle belt as at, for example Eaglehawk Neck (Guiler, 1952). However, the reef at Trial Harbour is of such an extent and apparently has reduced the wave action to such a degree that *Hormosira* is able to survive on the exposed coast, although *Hormosira* is normally a species of more sheltered habitat.

The presence of *Melanerita melanotragus* on the coast near Trial Harbour is of interest. This species was found at the Pieman Heads, some 40 miles further to the north but it is absent from the south coast at South Cape Bay (Guiler, 1954). *Melanerita* occurs very commonly along the north coast (Kershaw, 1956 and Guiler, Serventy & Willis, 1958) and it is also found at Freycinet Peninsula on the East coast. I did not record *Melanerita* at Eaglehawk Neck in 1952 but in February and April, 1957 I found several individuals on the sheltered side of Fossil Island at the Neck. The species can definitely be classified as rare at Eaglehawk. I did not find any specimens at Fortescue Bay, about seven miles further south, in December, 1956. It can be said that Eaglehawk Neck probably represents the southern limit of this species. The southern limit on the west coast must remain a matter for some speculation until examinations can be carried out in this inaccessible area.

One of the features of the south and west coasts is a prominent white *Lithothamnion* which lives characteristically in the Infralittoral fringe around the holdfasts of *Sarcophycus*. I have seen this species in Safety Cove near Port Arthur and Cribb (1954) records the species from Port Arthur. I have seen it at Fortescue Bay but it is not common at Eaglehawk Neck. It does not occur on the north coast or on the northern part of the East coast. It is very common on the south coast at South Cape Bay and also at Trial Harbour. It would appear that this *Lithothamnion* is indicative of cold conditions and does not penetrate far into Australian waters.

The absence of the southern Bull Kelp *Durvillea antarctica* (Cham.) Hariot is worthy of comment. Although much of the drift weed on the shore, particularly to the north of Trial Harbour, is *Durvillea* this material has been carried in the sea for a considerable time since large barnacles, *Lepas australis* Darwin, are found attached to the weed.

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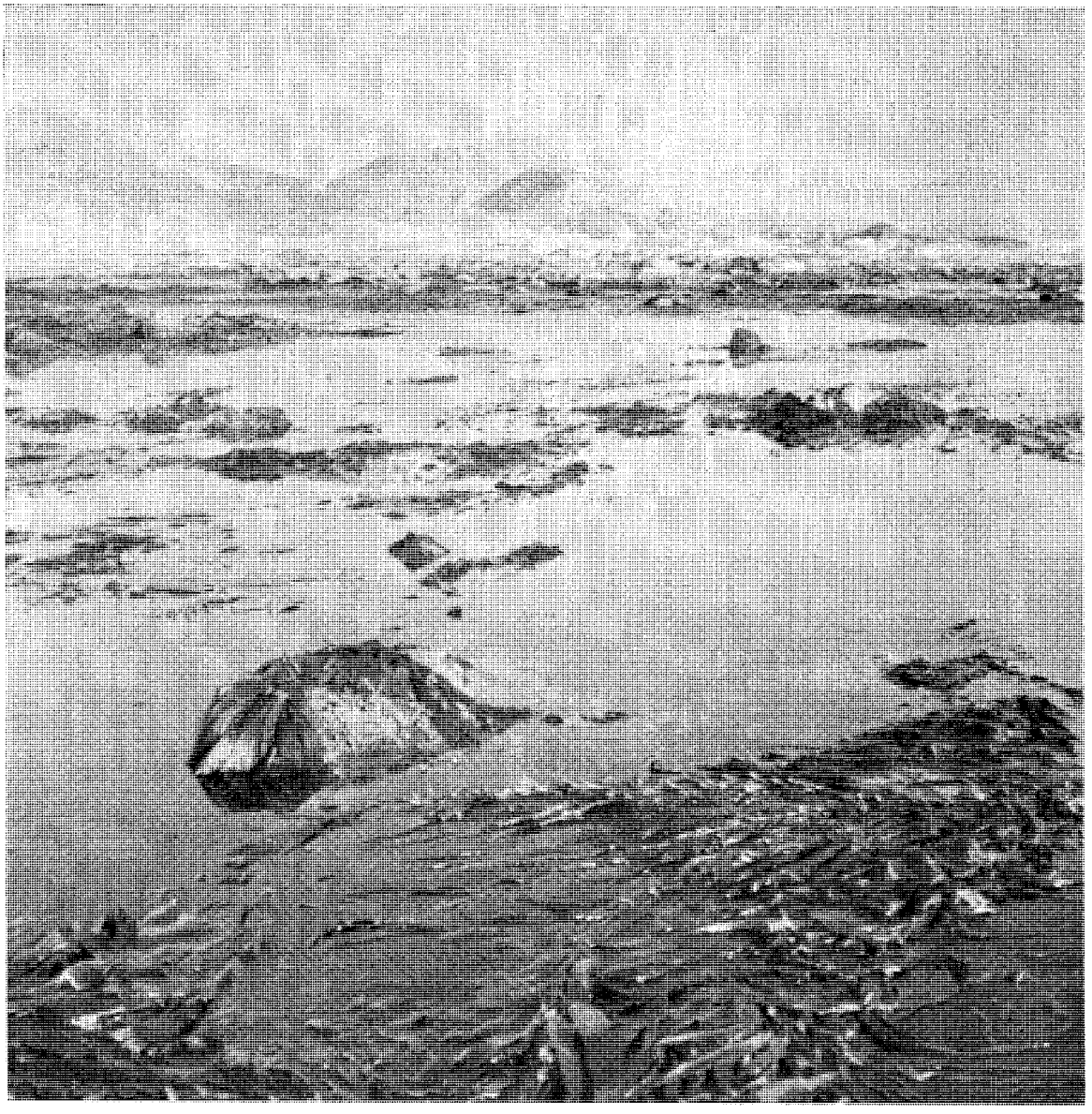

PLATE I.—The reef looking south. The channel in the foreground is occupied by *Macrocystis*. (Photo T. McMahon).

PLATE II.—*Sarcophycus* and the *Lithothamnion* belt at the seaward edge of the reef. (Photo T. McMahon).

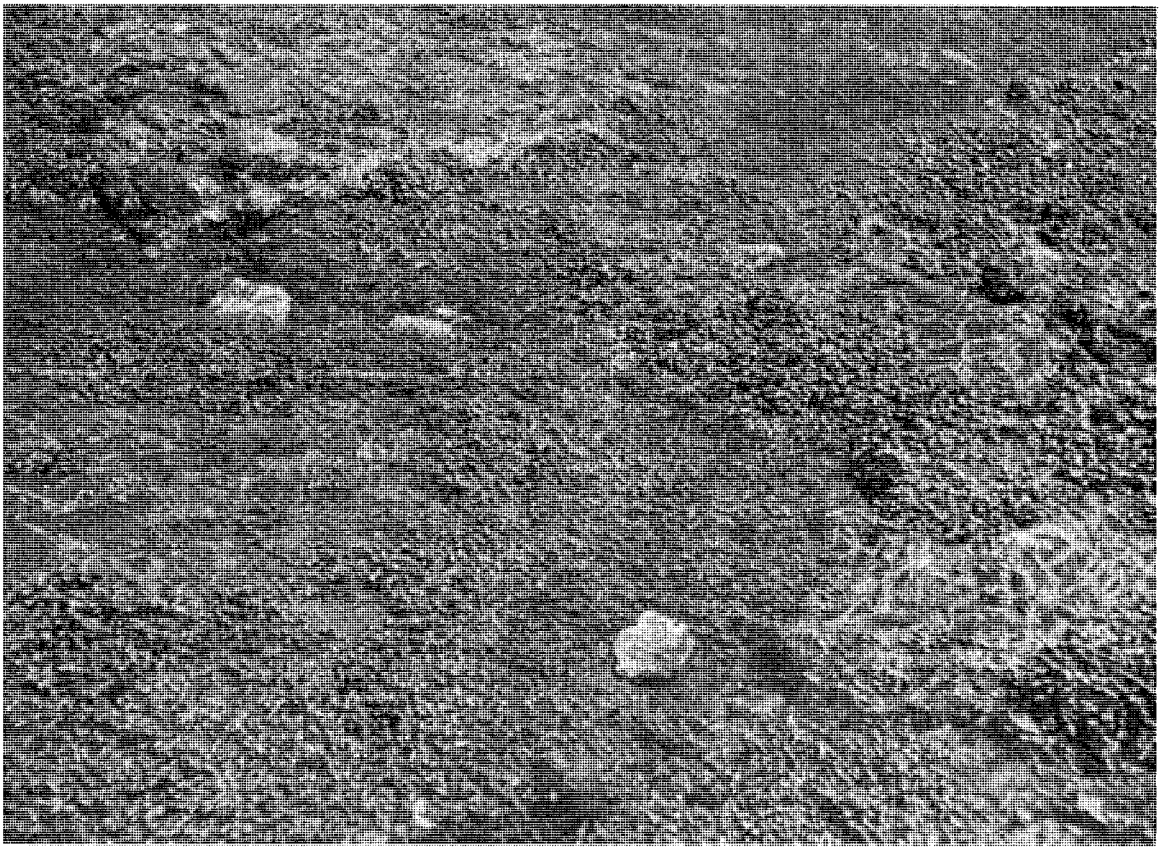

PLATE III.—*Hormosira* on the surface of the reef.