Identification of Oyster Species Competing with Rock Oysters for Settlement Space

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FOREWORD

This is the first of a new series designed to inform fishermen of findings by the Fisheries Research Division which will be of help in fishing operations.

In the course of research work on the rock oyster in Northland Dr Dinamani has found in many areas a species of oyster, of no commercial value, which settles in very high density on the rock oyster spat collectors. As this species could interfere with the rock oyster catch and so lead to disappointment among rock oyster farmers, it is important that it should be distinguished at an early stage. This leaflet shows how the different species, including the recently introduced Japanese oyster, may be recognised.

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Identification of Oyster Species Competing with Rock Oysters for Settlement Space

Cultivation of rock oysters in Northland has reached a stage when seed collection has rightly assumed importance among oyster farmers. Several farmers are anxious to meet their own needs for seed and have begun to experiment with different types of cultch in likely "catching" areas, and at various tidal levels, during the summer breeding season of the rock oyster. As some farmers have already realised, seed collection poses many problems, not the least of which is interference from other animals that settle on spat collectors at the same time as the rock oyster spat.

Competition during Rock Oyster Spatting

Many oyster farmers are familiar with the golden or mushroom oyster *(Anomia walteri),* which normally settles on the upper flat surfaces of low-level spat collectors. The golden oyster is, of course, not a true oyster and is easily recognised and removed from collectors, since its attachment is only by a small calcified disc, the shell itself being wholly free.

The golden oyster occurs below the level of lower water of neaps, and its presence on spat sticks therefore usually indicates a depth that is near to mean low water of spring tides.

However, interference in many areas of Northland is from another species of oyster that is not easily recognised, since it resembles the rock oyster in its young stages. This oyster belongs to the *Ostrea* group of true oysters, to which the Bluff oyster also belongs. It is characterised by its flatter body and its habit of brooding the young inside the parent. In contrast, the rock oyster belongs to the *Crassostrea* group of oysters, which usually have deeper and longer shells and whose young develop wholly outside the parent.

Distinction Between Flat Oyster and Rock Oyster

The flat oyster in Northland occurs naturally on rocks and other hard surfaces along the shore at about the level of mean low water of springs. It also occurs on wooden stakes and supports in oyster farms, sometimes settling on tray nettings and, where trays are in sufficiently deep water, on the rock oysters themselves. The oyster has an extensive breeding period from December to April-May, which thus coincides with and overlaps the main breeding period of the rock oyster.

During the breeding season the flat oysters are "greysick" or "blacksick", and this appearance is caused by the many larvae within their bodies. Flat oyster larvae remain within the parent oyster until they are about 0.14 mm (1/175 in.) long (Fig. 1) and are then released. Sudden blooms of larvae occur periodically in the plankton throughout the breeding season.

The larvae remain in the plankton for about 2 weeks, leading a free-swimming life and growing to more than double their size on release. When they are just over 0.32 mm (1/75 in.) long they abandon their swimming phase and begin to settle down, preferring attachment to hard surfaces at levels below neaps; they are densest at about the level of extreme low water springs. In the summer of 1970-71 settlement plates placed 1 ft above chart datum (zero level of tides) usually showed about 300 spat on a plate 12 in. x 6 in. in size. (One of these plates 3 months after settlement is illustrated in Fig. 2.)

A week after settlement the spat of the flat oyster has grown to about 1 mm (1/25 in.). Its colour is

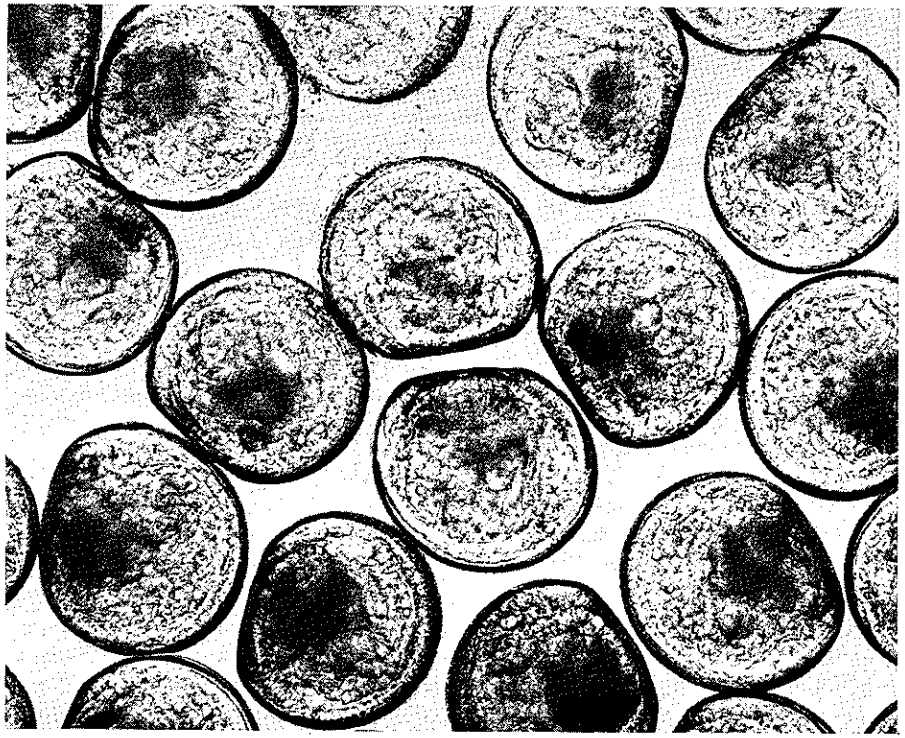

Fig. 1: Larvae of the flat oyster just before their release from the parent (a larva measures about 0.14 mm). A single oyster incubates up to 1 million of such larvae within its body.

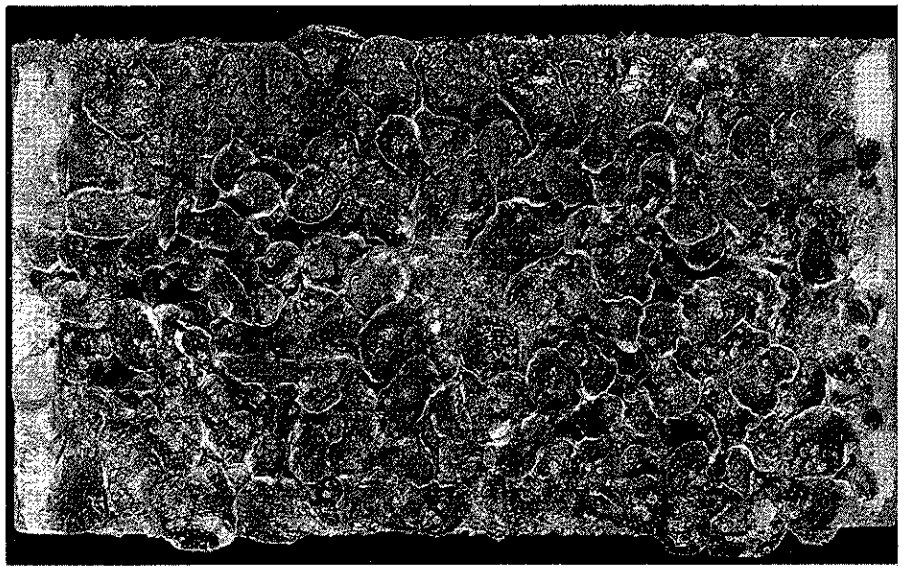

Fig. 2: An experimental Fibrolite plate, 12 in. x 6 in., showing flat oyster spat about 3 months old. The dense settlement illustrates the competition that this oyster creates for rock oyster spatting. The settlement took place in the Bay of Islands during the second week of January 1971 at low water springs.

usually between dark red and black, though some spat are lighter — cream or olive to grey. Many also have a yellow or black band running obliquely from the apex to the base of the shell. Some of the spat look very similar to rock oyster spat, having the same general shape and size, and the likeness is strong when the spat are also dark. The resemblance to the rock oyster persists even as the spat grows to a young oyster, more than 1 in. across and 3 to 4 months old.

Since the flat oyster settles in large numbers, farmers examining spat collectors during the breeding season may get the wrong impression that they have secured a heavy spatfall of rock oysters. Early recognition of flat oyster spat on the collectors is thus necessary to enable farmers to assess their seed production more accurately and perhaps avoid disappointment.

The main differences between the flat oyster and the rock oyster, evident in the spat, are shown in Fig. 3.

Colour

One of the points of distinction is colour: it is generally safe to treat all lighter coloured spat (usually shades of cream, yellow, and grey) as those of the flat oyster. Rock oyster spat are usually brownish purple when freshly settled, and their colour turns to dark purple as the spat grows larger. The spat normally have a spiny appearance because of tiny projections from the

shell surface. Darker spat of the flat oyster have a less spiny shell, but are difficult to distinguish from rock oyster spat. The only reliable way of confirming the difference is to open up a few specimens. One principal distinguishing character is in the shell itself: the inner side of the top shell valve of the flat oyster has a discoloured appearance, but that of the rock oyster is normally a solid white.

The other point of difference in the same shell valve is in the shape of the muscle scar, which is more elliptical in the flat oyster. (For comparisons see Fig. 3.) Major points of difference, in the soft parts of the animal, are best understood by studying Fig. 4 and examining specimens with a magnifying glass.

Physiological differences could also exist between the two species of oyster: for example, rock oyster spat on settlement plates transported to mid-tidal or higher levels survive exposure out of water at these levels, but those of the flat oyster are soon killed; young spat die more quickly. This difference between the two

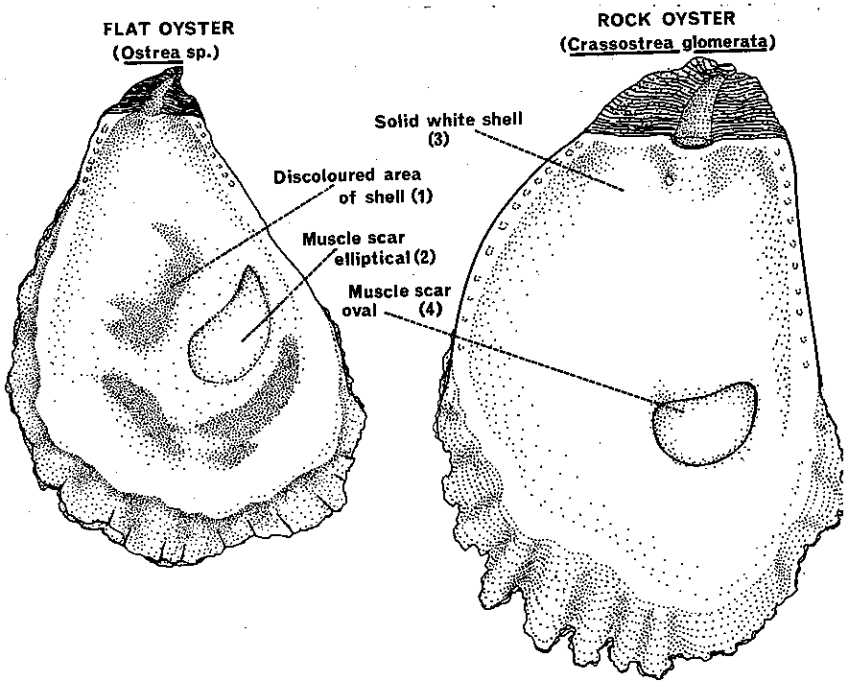

Fig. 3: The right valve of the shell (inner side) of the flat oyster compared with that of the rock oyster.

1. Discoloration is usually a dirty greenish grey; shell is thinner.
2. The scar is drawn to a point on the right.
3. Some shells have brownish blotches on the white surface.
4. Top edge of the scar is nearly straight.

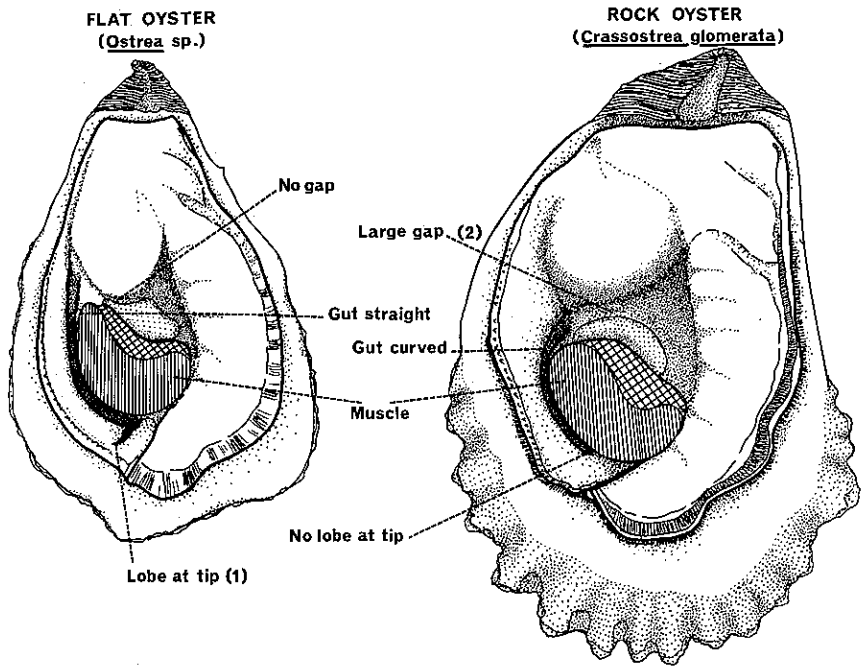

Fig. 4: A comparison of the flat oyster and the rock oyster. The right shell valve has been removed.

1. A small fold of skin is at the tip of the gut, called the anal fold.

2. The rock oyster has a gap between the muscle and the flesh which is a special exit passage from inside the oyster. This is not found in the flat oyster.

species of oyster may prove an easy way to test whether collectors have "caught" rock oyster spat. Transplantation of random samples of spat sticks to a higher level will reveal the identity of the oysters settled on the sticks.

Japanese Oyster

In January 1971 an occasional oyster that grew considerably larger than other oysters of the same batch was observed among the spat sticks in Mahurangi, usually one or two per standard bundle of Fibrolite sticks. This oyster was found to be the Japanese species (also called Pacific oyster, *Crassostrea gigas*), which belongs to the same genus or group as the rock oyster. The Japanese oyster has also been transported in spat sticks from Mahurangi to other parts of Northland and has been seen in Kaipara Harbour, the Bay of Islands, and Ohiwa Harbour. An exotic species of oyster has therefore been introduced into rock oyster growing areas.

The Japanese oyster grows large, up to 12 in., and in the first year may be 3 to 4 in. long. It therefore grows faster than the rock oyster and is a good edible oyster that forms the commercial fishery of

Japan, the Pacific coast of North America, and Tasmania, though it is generally less valuable than the rock oyster. Apart from its larger size and faster rate of growth, the Japanese oyster can be distinguished from the rock oyster on shell characters. In addition to those shown in Fig. 5 the rock oyster has a thick shell, with growth rings flat, whereas the Japanese oyster's shell is not as thick, and its growth rings are arranged concentrically and are produced as small blade-like projections (Fig. 6). Generally the outer colour of the rock oyster is a shade of grey and purple and there are no coloured bands on the shell; the shell of the Japanese oyster is a creamy white ground colour, with three broad, radiating purple bands in young oysters.

Many farmers will naturally want to know what significance the presence of a few Japanese oysters will have in the rock oyster fishery. In many areas where the Japanese oyster has been introduced for commercial purposes, such as in the United States of America, the oysters have failed to reproduce successfully for many years. In these areas, seed or adult oysters have had to be imported for the continuation of the fishery, because breeding

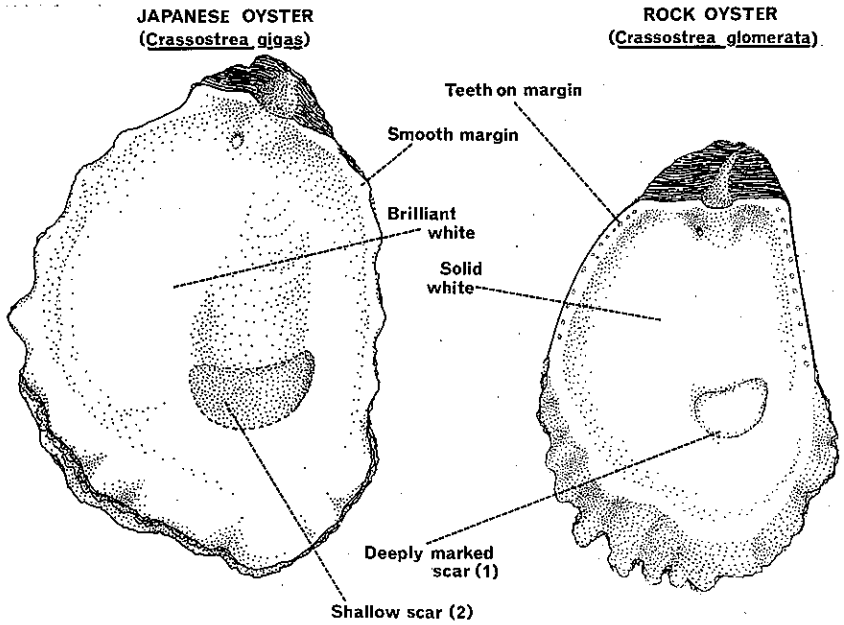

Fig. 5: Inner views of the right shell valve of the rock oyster and the Japanese oyster, showing the main differences.

1. Muscle scar is well marked and is usually pinkish cream.

2. Scar is not so deeply marked and is either whitish or dark purple.

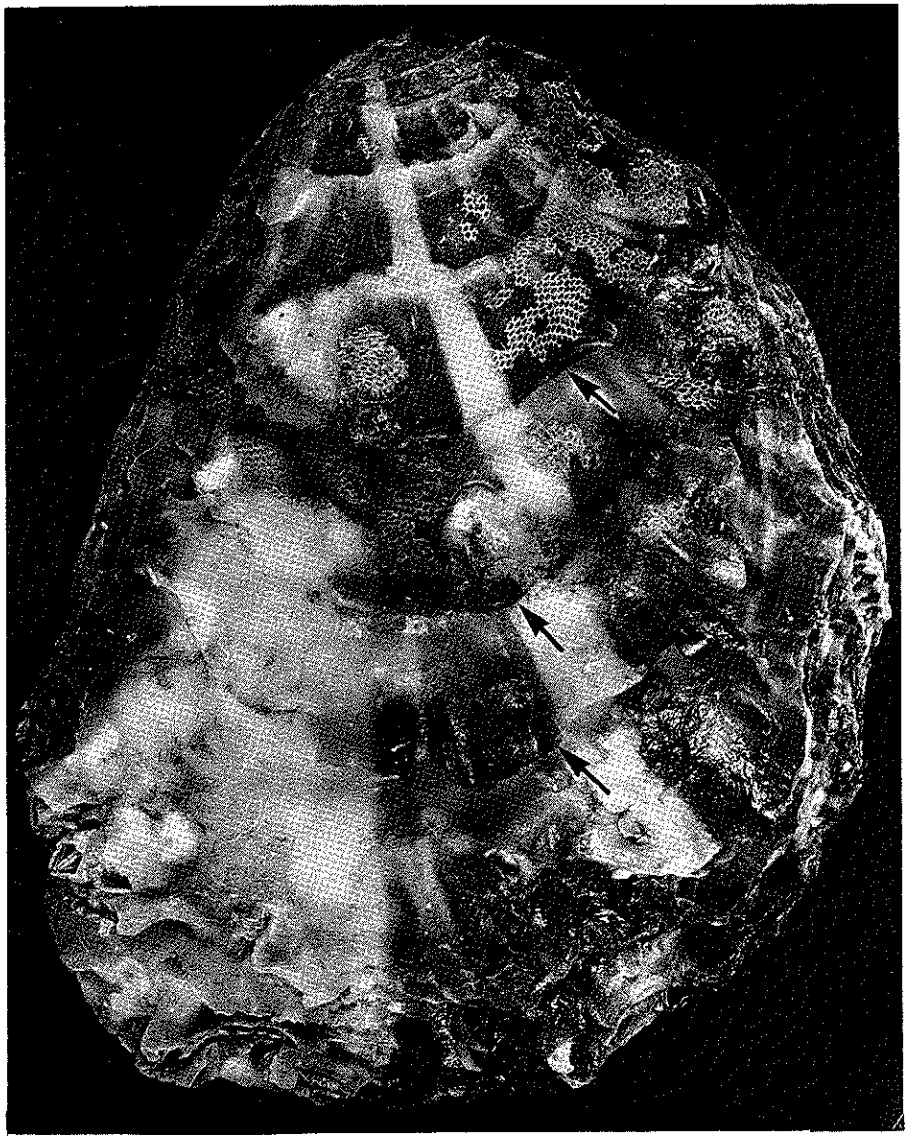

Fig. 6: A Japanese oyster, showing shell characters. The small blade-like projections are shown by arrows.

requirements for the imported species (such as right conditions for ripening, spawning, growth of larva, and settlement) have not been met in the new areas to give consistently successful settings for commercial purposes.

The significance of the effect of the oyster on the existing fishery in Northland is therefore difficult to predict at the moment. The few specimens in Mahurangi and other oyster farms in Northland are not sufficient to constitute a breeding stock; nor is it likely that they would reproduce successfully to compete with a well-established native species such as the rock oyster.