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NEJ/cin

21 April 1986

Dr R G Nairn
Auckland Committee on Racism & Discrimination
P O Box 47-155
AUCKLAND 1

Dear Dr Nairn

Please accept my apologies for the delay in responding to your letter of 25 February, and also for the delay in sending you a copy of the reports on the possible marketing of kina roe in Japan. A copy of this is enclosed.

You also asked me to supply you with copies of reports from the Ministry of Agriculture & Fisheries regarding the abundance or otherwise of the kina resource. As you correctly indicate there are no written reports of this kind, and the information which I discussed with you is that which was passed on to me verbally by officers of Fisheries Research Division and Fisheries Management Division in response to my questions about the extent of the resource.

I have taken from this verbal exchange that while there are areas of the country where it appears that kina is over-exploited (incidentally, not primarily for commercial reasons), there are other parts of New Zealand where the resource is in no way over-exploited. This particularly applies to many parts of the South Island and to the Chatham Islands.

Despite the National Hui, we do not yet appear to be any further along the track of determining how the rights of the Maori people in relation to kina can be equated with the rights of those who seek to commercially exploit them. As I have indicated to Acord and at the National Hui, there is considerable support and recognition by the fishing industry of the traditional rights of the Maori people to harvest seafood. However as has been also indicated, the Fishing Industry Board and the industry which it represents believes that where there is more than enough resource to sustain traditional interests, then such product, under wise management practices, must be considered as a target for commercial exploitation.

I again also express the view that there are more than enough shared concerns regarding the need for wise management, protection against pollution, etc, to warrant common action rather than opposition to each other's interests.

Yours sincerely
NZ FISHING INDUSTRY BOARD

N E JARMAN
General Manager

CONTENTS

FOREWORD

This report is an appraisal of the Japanese market for sea urchin roe, in particular the criteria determining the value of the product.

I am indebted to the Winston Churchill Memorial Trust for providing funds without which this research project would not have been possible, and to the New Zealand Fishing Industry Board for their financial and practical assistance.

I would also like to sincerely thank the staff of the New Zealand Embassy, Tokyo, and in particular Mr Eugene Bowen, Trade Commissioner, for all the advice provided and arrangements made.

I am also grateful to the companies both in New Zealand and in Japan who have lent their support to this research.

INTRODUCTION

This report outlines the catching, handling, processing and marketing channels of sea urchins in Japan, with a view to initiating an export industry in New Zealand.

The project originated from interest in the market being expressed by a number of New Zealand companies. Several attempts to process and ship sea urchin roe for Japan had been made in the past, but were not entirely successful. However, improvements in airfreight services and a strong need to develop alternatives to the inshore finfish fishery, under severe pressure, led to renewed interest in sea urchins, and a need was seen to understand the market more fully. It is hoped that this report will do this and provide the basis for consideration of how to develop this fishery.

I. SEA URCHIN DEFINITIONS AND BIOLOGY

A. New Zealand Species

The New Zealand sea urchin species to which this report refers is Evechinus chloroticus, of the Echinometridae family of the order of Camarodonta. The shell, or 'test', grows up to 145mm in diameter and is hemispherical, with a height more than half its horizontal diameter. The test and spines are dark green, with the spines sometimes tipped with white. (Mortensen 1943, McRae 1959, Fell 1953) Spine thickness and length varies (Dix, 1970).

Evechinus chloroticus is universally known as a sea urchin although it is also called sea egg or kina in New Zealand. It will be referred to throughout this report as sea urchin, kina, or uni, the generic Japanese term for sea urchin.

Sea urchins occur throughout New Zealand waters including the Kermadec Islands, the Snares and the Chatham Islands. They live in depths of down to 55 metres but mainly in shallow waters (down to 20 metres) (Dix, 1970).

While sea urchins are typically rocky-bottom dwellers, in some parts of New Zealand they may also be found on shelly sand, fine sand, mud and gravel bottoms and in masses of seaweed.

Sub-tidal adults usually live on the tops and sides of rocks or on flat bottoms, with little or no covering algae. Intertidal dwellers are more difficult to find, being hidden under ledges or at the bases of rocks, often well covered with algae (Dix, 1970).

Sea urchin populations vary widely in density even in small areas. They often occur in 'clumps', where individuals are touching or nearly touching one another, containing several thousand urchins. Clumps generally appear to comprise approximately equal sex ratios (Dix, 1970).

At the time of writing, no research had been carried out to establish the absolute size of the sea urchin population in New Zealand waters.

Several studies of the feeding habits of the sea urchins "indicate that although it may eat a wide variety of food, it is chiefly algivorous". During rough weather when drifting seaweed is abundant kina consume large quantities of weed, but during calm conditions they tend to browse material from rocks, including microscopic algae and rock-encrusting animals. Laboratory tests have shown them to consume almost anything (Dix, 1970). A widely held opinion among divers of paua (Haliotis iris) is that the paua and kina compete for food. Once a paua bed has been fully exploited and sea urchins move into the area, the paua never return.

Despite their prickly exterior, sea urchins have a number of predators. Those known to feed on sea urchins are blue cod (Parapercis colias), snapper (Chrysophrys auratus) and several species of mollusc and sea star. Some sources are of the opinion that rock lobster (Jasus edwardsii) also feed on sea urchins, although they by no means comprise a staple food. No doubt there are other predatory animals but

nothing is known of the pressure they exert on sea urchin populations (Dix, 1970) or the importance of the sea urchin in the food chain.

Although there is some disagreement on the subject, it is generally considered that the sexes of sea urchins are separate. The eggs and sperm are emitted into the water and fertilisation is by chance meeting of an egg cell with a sperm cell. Externally there is no way to distinguish between males and females. Even after removal of the gonad it is often not possible to tell a male from a female without microscopic examination of the gonad (Kramer & Nordin, 1977).

For marketing purposes sea urchin 'roe' really means sea urchin gonads and includes both male and female gonads (the eggs are microscopic), whereas the marketing of salmon roe, for example, involves the recovery of the actual roe or egg mass (Kramer & Nordin, 1977).

There exist five 'roes' per sea urchin.

Research at Kaikoura and Kaiteriteri (Dix, 1969) showed mean gonad indices of New Zealand sea urchins increased during the winter and spring to reach maximum values during the summer and then decreased to minimum values in autumn (see graph Fig 1). This seasonal variation is thought to generally apply throughout New Zealand.

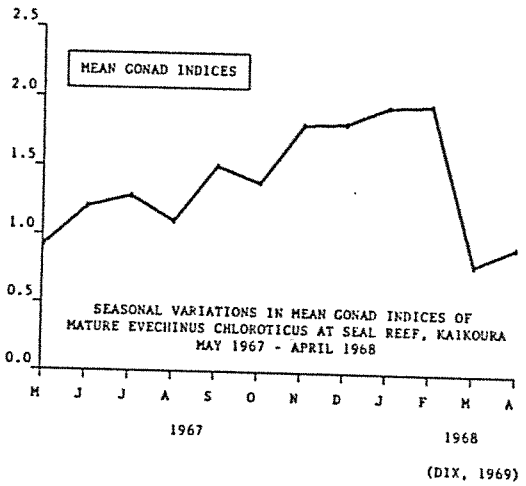

FIG 1

Differences in gonad indices occur between habitats and low indices have usually been correlated with habitats having smaller amounts of food. Observations in the Marlborough Sounds showed that kina in barren areas invariably had small gonads while those in nearby areas of luxuriant weed growth had large gonads. The effects of water temperature on sea urchin gonad sizes are uncertain (Dix, 1969).

Generally, gonad indices decrease with increasing urchin size, suggesting that kina become reproductively senile with age (Dix, 1969).

Overseas research on different species of sea urchin indicates that urchins mature sexually more rapidly where food is plentiful than where it is scarce, and that where food is scarce, animals may go through their main growing phase before diverting energy to gonad production i.e. they mature when older (Dix, 1969).

The ratio of gonad weight to green-weight varies due to the above factors between one and ten percent.

A very small proportion of roe is of suitable colour, shape and size (explained in Part II. G. page 14) for the Tokyo market. The proportion of suitable roe is likely to vary between habitats, but is thought to be in the region of 15 percent. This must be taken into account when carrying out feasibility studies of catching and processing in a given area. A problem exists in that markets or uses must be found for the remaining 85 percent of the extracted roe. It may be necessary to process in New Zealand or export second grade roe at marginal costed prices. Product forms are described below.

Kina have traditionally been a Maori fishery, and those interested in developing an export industry based on it should consider carefully its significance in any area to special interest groups.

II. CATCHING, HANDLING AND PROCESSING

A. Catching in New Zealand

Sea urchins are largely a by-catch of paua diving operations in the Marlborough Sounds, Chatham Islands and Stewart Island areas. However, in the Coromandel, Auckland, Northland and Gisborne areas, kina are the target species.

Current legislation requires commercial harvesting to be carried out by holders of hand-picking licences. A requirement of this licence is that all harvesting be done without the use of self-contained underwater breathing apparatus (Scuba), therefore permitting free diving only.

A launch is usually needed for transport to the catch area and is generally anchored while diving operations use dinghies to get closer to the beds of sea urchins. It is common practice for divers to collect kina in hand-held 'dive bags' and pass the catch to 'dinghy boys' whose job is to manoeuvre their dinghy using either oars or outboard so as to be close to the divers when they surface and empty the catch into the boat.

B. Catching in Japan

Several methods exist in Japan for harvesting uni, depending to some extent on the time of year and nature of the sea floor.

1. Diving

Free diving is apparently widespread in Japan and South Korea. Uni is the target fishery.

However, near Ishinomaki, in September (autumn) only, divers using helmets and pressurised air pumped from support vessels are employed to harvest uni at depths around 50 metres.

In northern Japan, Scuba is used for depths to 50m.

2. Mesh Trap

In Ishinomaki, on the Pacific coast of Honshu, north of Tokyo, a common capture method in depths of 10 metres or more is to lower a buoyed disc of steel mesh to the sea floor. The discs used are approximately 70cm in diameter and are baited with fresh bonito skeletons.

Uni apparently crawl onto the mesh within 24 hours and attach themselves to the bait with sufficient grip that traps may be lifted to the surface.

3. Rakes

In particularly clear water, rakes are used; notably around the Pacific coast of Honshu but probably in other areas as well.

Very calm, clear water is required for this operation. The rakes were said to have handles up to 20 metres in length and curled prongs. The

harvesting is carried out from aboard boats - the fishermen using glass viewing boxes from the surface to observe the operation.

4. Dredges

At Hakodate, southern Hokkaido, dredges are used for harvesting Bafun uni. There, Bafun uni live in water from knee-deep to 20 metres on a flat rock bottom. The dredges are towed behind motor boats and sonar equipment is used to avoid snags. The local Sea Urchin Fishermen's Co-operative manages the dredgable beds so that the region does not become over-exploited.

The dredging season is announced by the raising of a special flag on the waterfront directly ashore from the dredge beds.

C. Holding Period Between Catch and Processing

Several opinions were voiced on the subject of holding live uni prior to processing.

The Manager of the factory visited in Hakodate advised chilling immediately upon landing to -2°C, at which temperature the whole urchins could be held overnight. Temperature is raised to 0°C for a few hours immediately prior to processing. The uni are chilled in perforated plastic bins.

Another view expressed at that factory was that live uni could be kept alive at 0°C for 2-3 days.

However, some in the industry believe that sea urchins only remain alive for a few hours after harvesting and that even during this time, there is some loss of quality due to the stress being exerted on them (Harvey, 1981).

D. Processing to Raw Roe Stage

The factories visited used different methods of roe extraction. In Ishinomaki a sharp knife was employed to cut a hole in the base of the shell, approximately 4cm in diameter, through which the roe was removed, whereas in Hakodate the tests were split open using a sharp triangular-bladed tool or a reverse-pliers type of tool (see Figs 2 and 3 below).