43.

AUSTRALIAN MARINE SCIENCE BULLETIN

No. 43

July 1973

50c.

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AUSTRALIAN MARINE SCIENCES ASSOCIATION

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EDITORIAL

With this issue the Bulletin ends its third phase and enters a fourth. Roger Braddock is taking over as Editor and will introduce some changes in policy. May I wish Roger every success, and appeal to members to help him on his way with contributions of material. I would like to thank members for their tolerance and assistance over the last four years.

Reprinted in this issue is an article by E.R.A. De Zylva on training for the fishing industry, sent in by a member. In view of the current atmosphere of change and the proposed restructuring of tertiary curricula, this article is well worth considering.

B. Newell

THE AUSTRALIAN MARINE SCIENCES ASSOCIATION

President:
Dr. A. J. Gilmour
Fisheries & Wildlife Department
Melbourne

Hon. Secretary:
Mrs. Patricia Dixon
School of Zoology
University of New South Wales

Hon. Treasurer:
Dr. D. J. G. Griffin
The Australian Museum
Sydney

POLICY STATEMENT

OBJECTIVES

The objectives of the Association are:

To promote, develop and assist in the study of all branches of Marine Science in Australia.

To provide for the exchange of information and ideas between those concerned with marine science.

To represent marine scientists as a body in approaches to, and negotiations with, Government and other authorities.

ACHIEVING THE OBJECTIVES:

1. National Council for Marine Science

Australia, the island continent, is bounded by three of the world's great oceans which contain one of the world's greatest natural wonders, and it has a special interest for those areas of science relating to the marine environment.

Some 75% of the population is concentrated on the coast. The increasingly rapid development of aquatic recreation, the development of significant commercial fisheries, the production of off-shore oil and gas, increasing coastal urbanisation and other pressures on the environment make it imperative that marine research activities should be carried out in a well co-ordinated framework developed at a national level by practising marine scientists.

It is the belief of the Association that the best method of achieving this objective is to create a National Council for Marine Science which can:

Cause funds to be made available from Government and private sources in a co-ordinated manner for research and development in the marine sciences.

Report to the Government and to the people of Australia on the best use of those funds.

Such co-ordination is a prerequisite to the alleviation of the existing fragmentation of the administration and direction of research effort. It will provide a continuing means of review of national policy and a central avenue through which proposals of national importance may be rigorously evaluated.

2. Regional Centres of Excellence

The present fragmented nature of marine research in Australia has been unable to make significant contributions to our understanding of the coastal zone and the seas surrounding the continent. The development of excellence in a particular discipline in one geographic location on our coast will not be conducive to the teaching of marine sciences throughout the country nor, more importantly in the immediate future, to the increase in our knowledge of our overall marine environment.

The development of regional centres employing reasonable numbers of scientists in some of the major disciplines will provide the basis for a much better long-term understanding of our coastal and marine environments and resources. Such centres should be developed on sufficiently large sites to provide foci for a variety of disciplines from universities and other institutions, with a consequent sharing of facilities such as libraries, wharfs and aquarium systems. The possibility of interaction with important industrial establishments should not be overlooked. Such multi-institutional centres will help to alleviate the problems of low utilisation of expensive research facilities, including vessels, with respect to a particular discipline. Adequate travel funds are essential for interchange of scientists and field visits over such a vast area as Australia and its continental shelf.

3. Vehicle for the Development of Inter-disciplinary Studies

The Association was established deliberately as a multi-disciplinary body, and as such it sets out to encourage the interaction between many disciplines. It is the belief of the Association that such a ferment of creative abilities is the key to the future understanding of such complex ecosystems and physical processes as are represented in the coastal and marine environments. This will be achieved by means of publications, meetings, symposia and other such methods as may be considered appropriate.

4. Development of Neglected Areas of Research

A number of areas of research in the marine environment are currently neglected. The further development of our understanding of waves and tides, and the movement of large water masses in the surrounding oceans is important. Such information is necessary for planning beach erosion, coastal engineering projects generally, oil-rig operations, to understand the influence of the oceans on commercially important species of fish and their food, and in terms of the interpretation of the problems of pollution in the sea.

Developments in our coastal regions at the moment are often sadly hampered by an inadequate understanding of the physical and chemical conditions in many areas. Such information is basic to the problems of the establishment of harbours, the provision of outfalls into the ocean, and the establishment of oil exploration and production facilities, to quote a few examples.

Inadequate knowledge exists of the taxonomy and life histories of many of even the most common species of marine organisms. A knowledge of our living resources, in terms of commercial and recreational fishing pressures on the stocks that are known to exist, and also with respect to the long-term chronic effects of pollution on those stocks and their food species, is sadly lacking. The development of regional centres of excellence in the context of the three major oceans in which Australia is placed, will make it possible to establish multi-disciplinary environmental studies, to support fundamental research in marine physics, chemistry, geology and ecology, and to provide the training for young Australians as well as specialists from many of our neighbouring countries.

June, 1973

AUSTRALIAN MARINE SCIENCES ASSOCIATION

STATEMENT OF RECEIPTS & PAYMENTS FOR PERIOD 1st DECEMBER 1972 to 30th APRIL 1973

RECEIPTS		$
Cash at Bank 30.11.1972		316.74
Subscriptions		336.43
Bulletin subscriptions		214.50
Sales of publications		
Handbook 1	63.00	
Handbook 2	200.09	
Careers Pamphlets	21.80	284.89
Postage		8.73
Donations		201.20
Miscellaneous		19.62
Bank interest		3.00
		$1385.11

PAYMENTS	$
Bulletin Postage & Addressograph Charges	45.50
Bulletin Printing	301.60
Bulletin Covers	155.20
Postage	6.49
Secretarial Assistance	10.20
Zerox copying	2.70
Repayment of loan — R.C. Sprigg	840.00
Balance 30.4.1972	23.32
	$1385.11
Investments — St. George Perm. Bldg. Soc.	$397.02

(D.J.G. Griffin)
Hon. Treasurer,
7 May, 1973

NEW MEMBERS

Dr. A. Phillip,
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NEW TOWN TAS. 7008

Mr. J.R. Bradbury,
Division of Sea Fisheries,
Dept. of Agriculture,
Crayfish Point,
TAROONA TAS. 7006

DELETIONS:

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Curator of Museum Display,
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G.P.O. Box 1164M,
HOBART TAS. 7001

Mr. D.R. Walter,
Science Aids/Aust. Pty. Ltd.,
12 Dequetteville Tce.,
KENT TOWN S.A. 5067

The Secretary,
Geosurveys of Australia Pty. Ltd.,
G.P.O. Box 1479L,
ADELAIDE S.A. 5001

PUBLICATIONS RECEIVED

N.S.W. State Fisheries, 211 Kent Street Sydney. Cruise reports of F.R.V. "Kapala". Four of these have been received. All deal with deep trawling (ca. 250 fathoms) off the N.S.W. coast between Sydney and Norah Head.

Details are given of the gear used and its performance, and the catches made.

Tests are being carried out with C.S.I.R.O. (Food Research) on the palatability of royal red prawns.

LOCAL NEWS

Much activity in Melbourne these days with the arrival of several new appointees to the Westernport programme.

John Harris, ex-Texas A & M and Brian Robinson ex-Belfast/Melbourne have started in the Marine Chemistry Unit.

Des Connell from Queensland P.I. Department has taken on the Marine Co-ordinator job.

Graham Arnott has moved across from the University to full time at Flinders Street as zooplankton ecologist.

Dave Negilski has arrived to take up the vertebrate physiology studies in Westernport whilst Noel Coleman is looking after the invertebrate (mainly bi-valve) physiology.

Mohammed Ahsanulla, from London, is to conduct the thermal studies.

Division of Fisheries and Oceanography at Cronulla has been re-organised into four groupings, viz. Crustacea, Pelagic fisheries, Eco-systems and Water Movements and Properties. Dave Tranter is to head Eco-systems and Bruce Hamon the W.M. & P. group.

No staff structure has been decided for the two fishery groups.

The Division played host to some 60 physical oceanographers on June 18th and 19th at an informal seminar and symposium. Details from R.H. Austin.

Andrew Herón is back from sabbatical leave with all the latest ideas on ecology.

Canberra CAE staff and students have been visiting as part of their planning for courses orientated towards environmental science.

KNOW YOUR COUNCILLORS

Dr. Des. Griffin

I am 33½. Born in Wellington, New Zealand, completed my M.Sc. at Victoria University of Wellington in 1962, my Ph.D at the University of Tasmania in 1966.

From 1965 to 1966 I was a Lecturer in Zoology at the University of Tasmania. I joined the Australian Museum in 1966 and from 1968 have been Curator of the Department of Marine Invertebrates (Crustaceans and Coelenterates). Was appointed a Research Scientist in 1969.

In 1970 I was a visiting Post Doctoral Research Fellow at the Smithsonian Institution. In June 1972 I was appointed a Senior Research Scientist and in November 1972, Assistant Director. I have been Editor of the Museum Records and Memoirs since April 1971.

I have research interests in the taxonomy and biology of Decapod Crustacea and in ecology and social behaviour of animals. I have been a Councillor of the Association from 1966 to 1967 and Honorary Treasurer from 1968 until the present time.

Joseph Thomas Baker, M.Sc., Ph.D., F.R.A.C.I., F.C.S., M.A.C.S.

Age, 40 years.

Present Appointment, Associate Professor of Chemistry, James Cook University of North Queensland.

Future Appointment: As from January 1, 1974, Director, Roche Research Institute of Marine Parmacology, Dee Why, N.S.W.

Field of Interest. Organic compounds from marine fauna and flora.

General Information — Four years research on essential oils from Australian Eucalypts.

13 years involvement in investigations on precursors to purple dyes from Australian Gastropod Molluscs, and also in scent gland constituents from North Queensland *hemiptera*. Has worked in Marine Stations in Hawaii, California, Costa Rica, Puerto Rico, North Carolina, Bermuda, Naples and Tokyo on grants from the Royal Society, Society of Sigma-XI, Carnegie Corporation of New York, and the National Science Foundation.

Was first Academic appointed to the University College of Townsville, (now James Cook University of North Queensland).

Married with four children — two boys and two girls.

Currently a member of the University Council and several of its Committees.

Immediate past Chairman, N.Q. section of the Royal Australian Chemical Institute.

Interested, apart from Chemistry, in conservation of marine environment and on aspects of marine farming species.

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A. W. W. A.

April 30 - May 4, 1974, Melbourne

PRELIMINARY PROGRAMME

Tuesday, April 30th, 1974

2.00 p.m. Registration — continuous to 10 p.m.
8.00 p.m. OPENING CEREMONY & RECEPTION

Wednesday, May 1st, 1974

TOPIC: RE-USE OF TREATED WATER

9.00 a.m. KEYNOTE ADDRESS: Prof. Eckenfelder.
11.00 a.m. Three papers covering re-use of treated water for Irrigation, Industrial and Domestic purposes.
12.30 p.m. LUNCH.

TOPIC: CARE OF NATURAL WATERS

1.45 p.m. Three papers reporting on recent research in this field.
3.45 p.m. S.E. Asian Invitation Lecture.
EVENING FREE.

Thursday, May 2nd, 1974

7.45 a.m. BREAKFAST WORKSHOP
9.00 a.m. FORUM — Topical subject.

TOPIC: TREATMENT OF TRADE WASTES

11.00 a.m. Three papers detailing case histories from Industry.
12.30 p.m. LUNCH

TOPIC: SLUDGE TREATMENT AND DISPOSAL

1.45 p.m. Three papers presenting separate experiences in the solution to this problem
OR
Concurrent Scientific Session
3.45 p.m. A.W.W.A. General Meeting
EVENING: CONVENTION DINNER

Friday, May 3rd, 1974

TOPIC: TERTIARY TREATMENT AND NUTRIENT REMOVAL

9.00 a.m. Three papers covering recent Australian experience in this area.
11.00 a.m. Two papers describing recent advances in equipment for this purpose.
12.00 noon CONFERENCE REVIEW.
12.30 p.m. LUNCH
AFTERNOON: TECHNICAL INSPECTIONS
EVENING: SOCIAL ENTERTAINMENT

Saturday, May 4th, 1974

A Choice of Technical and Sight-seeing Tours.

Enquiries to Hon. Secretary, A.W.W.A. Convention, 277 William Street, Melbourne, 3000.

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Reprinted from NEW ZEALAND SCIENCE REVIEW

GRADUATES FOR THE FISHING INDUSTRY

E.R.A. de Zylva
Hillary College, Otara, Auckland

Today man exploits the food resources of the sea much as he exploited the food resources of the land before modern agriculture became established. On the sea, he is still essentially a hunter. Man's experience with agriculture suggests that the participation of institutions of higher education in awakening the interest of students in the prospects, practices and potentialities of the sea will assist materially the advancement of marine aquaculture to a position of importance in the production of animal and plant protein.

In the United States, where a super-abundance of food is now produced off the land, the agricultural industry utilizes the direct services of only 6% of the total population, leaving 94% of available manpower to engage in other economic pursuits. Figures taken from the 1971 *N.Z. Official Yearbook* show that, in 1966, a total of 126,000 persons were engaged in all farm occupations, representing under 4.7% of the population at that time.

It is doubtful whether the highly efficient agriculture which is the backbone of this country's economic growth would exist today if it were not for the facilities for, and emphasis on, agricultural education and research, supported by extension services in the field. Starting at pre-school level, many children in this country are in contact with the farming environment, and throughout their school years, and in varied holiday occupations, many of them develop an abiding interest in farming of one form or another as a future vocation. In the school science curriculum there is a background of instruction in the energy relationships of land plants and animals, and the School Certificate examination syllabus provides for many courses of instruction, including general agriculture, dairying, animal husbandry, horticulture, engineering shop-work, technical drawing and woodwork, all of which develop skills and interests which lead young people into tertiary education as farmers or laboratory technicians and field workers, or as graduates in agriculture, agricultural science, veterinary services, land valuation, horticulture, dairying and sheep farming, or provide the industry with manpower to meet expansion, diversification and replacement needs. It is with the needs of graduates for the fishing industry that this article is primarily concerned.

The world is now experiencing an effort parallel to that which it has already developed for agriculture in its endeavour to focus attention on the development of the resources of the sea. There has barely been a beginning in the development of technologies which will provide the means to farm the rich marine pastures of the world, which extend over 70% of its surface and have a third dimension of depth.

The United States President's Science Advisory Committee Panel on the World Food Supply reported in the last decade that the world food problem was not a future threat. It was here now, and must be solved within the next two decades. If it was solved during this time it would be manageable for the years thereafter. Otherwise 1985 would be the beginning of the famine years. The world population was increasing at the rate of 3% per annum which was likely to rise to 4% per annum by the turn of the century. World food production from the

land was, however, increasing at only about 2.7% annually, although improved new rice and wheat varieties held great promise, and although the production from the world's expanding fisheries was doubling about every 10 years.

R.A. Young, Acting President of the Oregon State University Marine Science Centre, in his opening address to the Conference on Marine Aquaculture, emphasized that new technologies must be developed to utilize more effectively the world's natural resources which would involve advancements in all of the agricultural and fisheries sciences and technologies as well as their efficient application.

The sea may become a major element in the production of an adequate supply of high value animal protein for this and future generations. Already many natural stocks of food fish and shell fish are showing signs of depletion. Although other natural stocks remain unused, their number is diminishing each year. On a world-wide basis little attention has been given to the development of aquaculture. Japan has advanced to the stage of harvesting in excess of 70 million pounds of oysters, 75 million pounds of yellowtail and 20 million pounds of chum salmon each year, all of which are products of aquaculture. The Japanese have achieved a 400% increase in the landings of some varieties of fish by rearing the fry in hatcheries until they have passed through the most vulnerable stages, and then having them released in the fishing grounds through the co-operation of the fishermen. The Japanese are actively exploring new technologies on the culture of other sea life such as prawns, and are continuing to improve methods of growing traditional products such as oysters and seaweed. On an experimental basis, oyster farms have shown increased yields from 600 lb of oyster meat per acre per year to as much as 50,000 lb.

The potential for expansion of production from fisheries was highlighted by Gordon Eddie of the White Fish Authority in the 1971 James Clayton Lecture to the Institution of Mechanical Engineers. Speaking on the expansion of the fisheries, he said that, although fisheries were still a minor source of food compared with agriculture, they contributed some 12% of the animal protein consumed. The fisheries are the only source of high grade protein whose production has been steadily rising faster than the world population for the last 20 years. This may be because of the slower development of fisheries in relation to other food industries, as a result of the mis-match between the large range of scientific and technical expertise that needs to be deployed in the industry, and the relatively unsophisticated organization and structure of much of the world's fishing industries.

New Zealand lies strategically in the centre of the least exploited region of the world's fisheries. Information that Russian and Japanese factory fleets are concentrating a great deal of attention on the waters around New Zealand, and that a fleet of nine Japanese trawlers is able to transship as much as 40,000 tons of fish annually, the present total production of the New Zealand fishing operation, through "mother" ships to the Japanese market should not come as a surprise.

The Japanese fishing industry is well supported in its development and expansion of capture, farming and processing operations by its educational system. Apart from general fishery education in high schools and in special fisheries high schools, and night classes, it provides specialist training in all types of fishing, gear and processing technology, in addition to the scientific disciplines of fisheries biology, oceanography, hydrology and related disciplines in its many universities and research stations.

It appears obvious that, with its limited university resources at the present time, New Zealand cannot produce the wide range of graduates needed to keep a marine-based industry developing. Even if such facilities were to be developed, there is a tendency among undergraduates to select their courses at random, based more on individual interest at the time than on preparation for a planned career. Of the small number of general biology graduates produced by universities, the majority appear to go overseas, many never to return.

Dr. Gordon Hewitt of Victoria University, speaking at the 1971 N.Z. Marine Sciences Society Conference, said that there were 80 New Zealand graduates, not all biologists, however, at the University of British Columbia. On the other hand, many overseas trained biologists have come to New Zealand and some of these remain in the country. Dr. Hewitt believed that the employment situation overseas for biologists showed that the slow-up in Government spending was affecting research in the United Kingdom, U.S.A., and Canada, but that there was no corresponding reduction in the number of graduates they were producing. More graduates were staying on to complete a Ph.D., but even at this level there were biologists who were out of work. This situation could affect New Zealand too, but if there is a rational development of the fisheries in this country, more research would be necessary in many fields of study. Yet there is no guarantee that the specialists required could be or are being trained here. Production of graduates will have to be tailored to the future needs of both our academic and industrial sectors.

There is a great deal of planning taking place in New Zealand, directed towards the use of national resources. Dr. Alan Kirton, in his presidential address to the New Zealand Association of Scientists in 1971, considered that the most important of these resources was people. The escalating costs of training people were making the production of a surplus of graduates in any field a luxury which the country cannot afford. The recent survey of scientific manpower published in *Science Review* has indicated a possible surplus of graduates in some disciplines and shortages in others, and an overall shortage of trained technicians over the next few years. There is need for a greater integration of science into business and industry if this country is to meet the challenge of greater productivity required by current and proposed development programmes.

The Fisheries Committee Report to the National Development Conference in May 1969 stated that the universities in N.Z. were not geared to train students in fisheries biology or fisheries technology. In view of the world wide demand for trained scientists for fisheries research, N.Z. needs to train fishery scientists and to retain them in the face of a world demand. Technological training for fisheries researchers was not provided and facilities for this training were necessary, and the report stated that the urgent requirement for experienced professional staff to cope with the increasing need for management techniques of the exploited fisheries and to achieve their full continuing utilization called for early action.

The Committee found that the whole effort in fisheries research was restricted because of lack of qualified staff, limited accommodation, and poor research vessel facilities. Research was required for the development of farming of fish and shell fish. Studies on growth rates, stocking rates, breeding seasons, hybridization, food requirements, site and water requirements were essential to produce the information that would make farming ventures not only possible but economically viable. Exploratory fishing was

InterOcean

WATER QUALITY MONITORING

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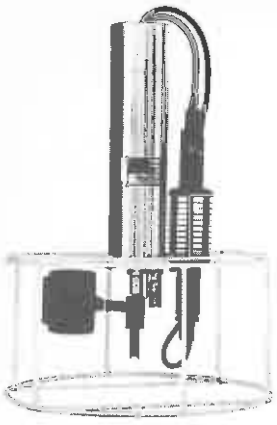
Brisbane: NORIAN INSTRUMENTS SERVICE COMPANY. 80 Merivale Str., Sth. Brisbane, 4101. Phone: 44-6726

IN SITU ENVIRONMENTAL MONITOR Model 590



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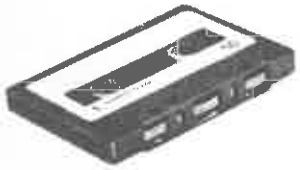
The Model 590 is designed to be deployed in a stationary installation for the purpose of monitoring and recording the basic chemical water quality parameters. The environmental sensors, electronics, and system packaging have been designed and constructed to provide the ultimate in reliability and long-term stability. Standard operating time is 30 days.

Data is recorded on casette type magnetic tape using standard ASC II code to facilitate data recovery. Recorded data may be played back into an ASR 33 or 35 teletypewriter to produce a hard copy print-out and digital paper punch tape or into a computer facility.



WATER QUALITY SURVEYING SYSTEM C/S/T/D/Do/pH/Tr Model 500

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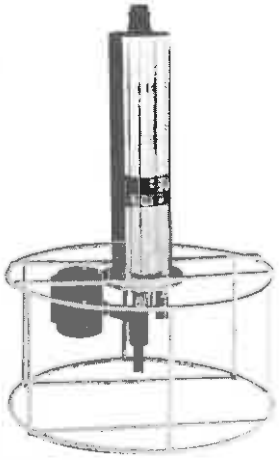
This system operates effectively in coastal and estuarine waters, the deep ocean, and in many industrial applications. Any combination of the in situ sensors may be used. The high precision readout consists of a digital display with automated data interrogation and identification; compatible with analog recorders, punch paper tape, digital printers and digital magnetic tape recorders. Real-time panel meter readout of the data is also provided with outputs for a graphic profile of salinity and temperature as a function of depth. Salinity is automatically computed within the probe by an advanced electronic temperature/conductivity compensating circuit which permits it to operate over an extremely wide range of salinity. Temperature to 0.02°C, Salinity to 0.02 ppt.

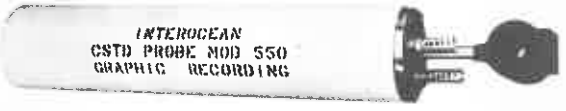
OCEANOGRAPHIC TELEMETERING SYSTEM C/S/T/D Model 660



The Model 660 system has been developed to obtain Salinity, Conductivity and Temperature profiles to depths of up to 6000 meters with a high degree of precision and reliability. Temperature time constant of 60m sec and instrument precision of 0.01% are standard.

The Model 660 Probe contains the sensors, signal processing electronics and fm multiplex converter. The shielded cable which supports the probe requires only a single conductor, which supplies dc voltage to the probe and transmits the multiplexed fm data to the on deck equipment.

The shipboard equipment separates the multiplexed data and converts it to analog dc signals. These signals are used to drive the Model 500R Analog Profile Recorder to present the data in graphic form. In addition the dc analogs may be fed into the InterOcean Model 514A Digital Data System where the values are digited, displayed in digital form, and recorded on either digital paper punch tape or digital magnetic tape.



SELF CONTAINED GRAPHIC RECORDING PROFILER Model 550

The Model 550 is a completely self-contained, internal graphic recording, sensor system. The user may select any four of the following parameters as a function of depth; Conductivity, Salinity, Temperature, Dissolved Oxygen, pH and Turbidity. Two parameters may be recorded as a function of depth while the Probe is descending and automatically switch to record two other parameters while ascending.

The system is easily portable, can be operated by one man and does not require electrical cable or shipboard electronics. It is ideally suited for small boat operation. Some of the outstanding features include a temperature time constant of 60m sec., 0.15% resolution, and a ready to use graphic data presentation.

ANALOG PROFILE RECORDER
Model 500R

A two pen, XYY' recorder to simultaneously plot cartesian coordinate graphs of two separate variables as a function of time or another variable.

The Model 500R is commonly used to plot Salinity and Temperature (vertical axis) versus Depth (horizontal axis). Alternatively, other parameters may be plugged into the three input channels. Some channels may be time shared, such as dissolved oxygen and pH.

Resolution of the recorder is greatly improved by using the special zero suppression circuit which is supplied when the Model 500R is purchased with an InterOcean Sensor System. Typically, resolution for Salinity is 0.025 ppt, and Temperature is 0.025°C. Linearity 0.1% full scale.

MULTIPOINT STRIP CHART RECORDER
Model 500MP-24

The Model 500MP-24 is an analog strip chart recorder with a capacity for up to 24 separate channels of input data. The recorder automatically scans the input channels and records each value. The scan rate is easily programmed and may be changed as required. Data points are numbered and color coded to provide for an easily read data record. Linearity 0.1% full scale.

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APPLICATIONS

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4. Underwater reconnaissance
5. Offshore oil wellhead marking and locating
6. Acoustic telemetry
7. Wellhead blowout-preventer valve controls
8. Subsurface buoy release
9. Object relocation

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required to develop resources, such as the pelagic fisheries, as the cost of searching for new grounds or of employing specialized types of equipment were inhibiting the diversification of fishing operations. Gear technology was required to assist the development of fishing techniques and their adaptation to local conditions, and a wide range of food technological studies was necessary to ensure that the maximum use was made of the fish harvest in accordance with the highest standards of food hygiene.

A study of trends in the fishing industry overseas indicates that prices obtainable for fish are held down by the competition from other food products, while costs of catching continue to increase. This means that the industry must introduce improved technology and aim at better standards of handling to maintain the level of quality as high as possible.

In many overseas fishing industries, the entire distant water catch is being frozen at sea. This has involved greater mechanization of gutting, handling, washing and grading in order to economize on manpower. Gordon Eddie told the U.K. Institute of Food Science and Technology that, in view of the shortage of skilled personnel, much more attention should be given to the education of fishing skippers in such subjects as oceanography, biology, fishing methods, and food technology.

In this country little technological information is available on the temperature of fish when it comes on deck, the time taken to bring its temperature down to that of melting ice, and the temperature in the fish hold at various stages and under various intake levels in relation to the temperature of the water. A study of the effect on fish of current stowage practices in fish holds, both in relation to the reduction in weight upon and damage to tissue resulting from stowage of fish to too great a depth in the bins, and under different icing techniques, has yet to be done. The effect on quality of the stowage of different varieties of fish between time of capture and time of sale or processing for sale, have not yet been determined for the different varieties of fish.

The development of fish farming requires a great deal of study as a prelude to training in the use of gear and equipment, care of the catch and the supervision of processing, and merchants and processers will need training in local institutes where fish technology should be taught at university, and possibly secondary school level in the schools near to the main ports. There would be need for food technologists in the board rooms of the industry. Though the long-term object of fish farming is to produce some of the dearer and less prolific varieties in order that they can become more plentiful and less costly, the introduction of farming techniques as a positive measure of conservation in marine fisheries should not be overlooked.

Acclimatization societies have been making a big thing of the danger to trout fishing in this country as a result of an increase in trout disease which they fear will be a concomitant of farming. Experience with the farming industry overseas is sufficient evidence that a successful trout farming industry can be carried out alongside the improvement of trout fishing resources in inland waters with considerable benefit to the angler. Raymond Simon of the Oregon Co-operative Fishery Unit at the Oregon State University and Dr. Lauren Donaldson of the College of Fisheries, University of Washington, have shown that a study of genetics and the application of selective breeding are important adjuncts to the development of improved strains of salmon and trout.

Dr. Donaldson has conducted a long-term programme of selective breeding of rainbow trout since 1932. When the programme was initiated, the trout reached maturity in their fourth year at an average weight of 680 grams (1½lb) and produced 400 to 500 eggs at their first spawning. After 36 years of selection, the males of the select stock reach maturity in their first year and the females in their second year. The average length of 2-year-old spawners had increased to 60.4 cm (23½ in.), the average egg production being 9,259 eggs, with one female producing 18,144 eggs. The fish continue to grow and increase in fecundity in the third year. The difference between this select stock and wild fish shows in that the 2-year-old wild fish have reached a length of about 6½ in.

At the 1970 Annual Congress of the British Veterinary Association, Ian Richardson, Research Secretary of the White Fish Authority, started his talk on marine fish cultivation with an appeal to veterinarians for their help and advice. He stated that, without a contribution similar to that which they had made to animal husbandry on farms and in poultry houses, an industry based on farming marine fish would not develop. He stressed the certainty that marine fish and shell fish farming would develop into an industry of considerable size in the U.K., which would create an increasing demand for the services of fish veterinarians. The White Fish Authority had spent about £400,000 on its feasibility study over the past seven years on marine farming, and results to date warranted an increased allocation of funds.

The need for trained veterinarians goes beyond the diagnosis and treatment of fish disease. It extends to the recognition and enforcement of standards of quality of fish and fish products, as these standards are becoming increasingly important in domestic and export markets. Veterinarians will provide the nucleus of lecturers and instructors in farming and in quality control for training programmes of the future, and quality controllers for fish for export, on the same lines as the Department of Agriculture now operates in the meat export industry.

Fishing is becoming more specialized with the introduction of electronic devices to assist in capture operations and in navigation. Fish are now being hunted not only with sonar and echo sounder but also with temperature gauges and salinometers. A study of the behaviour of fishes increases the use which is being made of technology in the location of fish in fishable concentrations.

On board there is the improved technology to ensure that the maximum proportion of the quality of fish is retained between time of capture and time of delivery to the market. Gear technologists are engaged in the development of improved equipment for use both on vessels and in the sea in the ceaseless hunt for fish. Researchers are endeavouring to establish the size and location of fish populations of commercial importance and to determine maximum sustainable yields. Marine farming is endeavouring to increase production from enclosed waters by introduction of improved strains of fish and by the use of anadromous types which will return to their spawning rivers after two or three years' growth in the ocean.

Technologists are required for guiding the handling and processing of fish for domestic markets and for export, to ensure that standards of quality are observed in fish unloaded from vessels and at all stages of processing. They will also be required to certify suitability for export in keeping with the requirements of overseas markets.

Research effort needs to be concentrated on selection and breeding of suitable types of fish for farming, on their nutrition, and on disease control, if marine farming is to realize its full potential. Suitable zoning schemes must be developed to protect the natural resources from pollution, to ensure that adequate areas of inshore water are re-

served for the development of farms. This calls for ecological and hydrological studies to ensure the selection of suitable areas and the perpetuation of unpolluted conditions in these selected areas. Fish geneticists and fish veterinarians will be needed to develop fish as farming stock and to maintain them in healthy production. More of these trained specialists will be required to form the training team in universities and for extension work in the field in these new technologies.

In 1970 the New Zealand harvest from the seas amounted to 40,000 tons. The NDC target for 1978, based on a production of 5 kg per hectare (1.3 tons per square mile), is some 70,000 tons. It is not inconceivable that the actual yield potential may be two or three times this quantity. The pelagic fisheries should raise this yield by at least 100% when they come into fuller exploitation. To this figure should be added the potential from farms. New Zealand production could be at the level of several hundred thousand tons per annum in a few years, and this volume of fish will involve the services of a large team of specialized personnel.

Will New Zealand prepare now to produce graduates in these specialized fields for its developing fishing industry? How long can we, dare we, postpone action?

ANNUAL CONFERENCE PROVISIONAL PROGRAMME

Saturday, 11th August, 9.00 - 10.45 a.m.

Kennedy, G. "Some Aspects of Planktonic Populations in a Tropical Estuary."

Kowarsky, J. "Movement patterns of the Cobbler in the Swan Estuary in Relation to Seasonal Changes in Environment."

Harper, S. and Smith, P. "The Ecology of Lakes Macquarie and Tuggerah."

11.15 - 1.00 p.m.

Taylor, D. "Marine Geology, Fly River Estuary, Papua."

Ducke , S. "Zoophytes."

Brown, G. "Management of the Environment."

concurrently with

Cresswell, G. "Current Measurements on Continental Shelves."

Major, G. "Zinc in the Marine Environment."

Saenger, P. "Bromophenols in the Red Algae and Seawater."

2.00 - 3.45 p.m.

Shark Bay Symposium:

Johnson, D. "Sedimentation of the Gascoyne River Delta."

Hagan, G.M. "Carbonate Sedimentology, Hamelin Pool Basin."

Logan, B. "Evolution of the Shark Bay Environment."

Penn, J. "Penaeid Prawns and their Relationship to the Environment in Shark Bay."

Lenanton, R. "Scale Fisheries of Shark Bay, W.A."

Sunday, 12th August 9.00 - 10.45 a.m.

Kenny, R. "Temperature Desiccation Factors in the Ecology of Tropical Intertidal Gastropods."

Wake, L. "Advances in Fouling Prevention."

Morgan, G. "Population Estimation of Marine Decapods."

R. Lenaton, Convener.

ELECTION OF COUNCILLORS

The following nominations for positions on the A.M.S.A. Council have been received:

POSITION	NOMINEES
PRESIDENT	ALISTAIR JOHN GILMOUR B.Sc., Ph.D. Officer in Charge, Marine Pollution Studies, Fisheries and Wild life Dept., Melbourne.
HON. TREASURER	D.J.G. GRIFFIN, Ph.D. Assistant Director, Australian Museum, Sydney.
HON. SECRETARY	PATRICIA I. DIXON, B.Sc., Dip. Ed. Senior Tutor, School of Zoology University of N.S.W.
ASSISTANT SECRETARY	PATRICIA A. HUTCHINGS Ph.D. Assistant Curator of Marine Invertebrates, Australian Museum, Sydney
COUNCILLOR	GRAHAM A. BROWN M.Sc. (Geology) Consultant, P.A. Management Consultants P/L., Sydney.
	LEON C. COLLETT B.A., B.Sc. Biologist, N.S.W. State Fisheries, Sydney.
	BRIAN NEWELL, B.Sc. M.Sc. Oceanographer, C.S.I.R.O. Cronulla
	BRIAN JOHN NOYE, B.Sc., Ph.D. A.U.A., Dip. Ed. Senior Lecturer Applied Mathematics Department, University of Adelaide.
	JEANETTE E. WATSON, Dip. App. Chem. Dip. App. Geo. Environmental Consultant.
	SCORESBY SHEPHERD, LL.B., B.A. Senior Fisheries Officer, Department of Fisheries, Adelaide.

Since insufficient nominations to fill all vacancies have been received, Councillors to fill the remaining vacancies shall be nominated and elected at the A.G.M. in August. (Rule 815 of the Constitution).

PROPOSAL TO ESTABLISH A NEW CATEGORY OF MEMBERSHIP

The Association has now sponsored two handbooks, the latest of which involved an expenditure of $3,500. In order to finance the printing, a loan was kindly made available by Mr. R. Sprigg, a Past President, and this loan has been almost repaid. Sales of this handbook have been rather slow and as a consequence the drain on funds has put the Association in an embarassing financial situation.

An appeal for funds was made to Esso Australia and to the Broken Hill Pty. Ltd. Both firms have been kind enough to present the Association with cheques for $200 which have resolved the immediate problem.

However, your Council has some firm proposals for a much more active participation in the affairs of marine science in Australia. These cannot be developed until a more consistent level of finance is available from year to year than can be the case at present. For example, Bulletin subscriptions are not meeting the cost of production and apart from a conference, that must pay for itself, the Association has few other activities of benefit to members.

Many professionel bodies and societies have class of membership called "Sustaining Member" which permits companies and other institutions interested in the relevant fields to make substantial annual grants. This allows recognition of the support given and allows a continuity of activity by the recipient from year to year. The proposers of this motion, acting on behalf of your Council, which gave its unanimous support, therefore ask that members should support the proposed amendments to the constitution.

It is proposed that the following clause be inserted in section 3, Membership.

(v) Sustaining Member: A sustaining member shall be persons who, organisation or institutions which, are engaged in or sponsor marine research.

and renumber items (V) and (VI) accordingly.

It is proposed that the following clause be inserted in section 6. Subscriptions.

(iii) The Council shall fix, subject to review by the next General Meeting, a minimum subscription rate for Sustaining Members.

and renumber item (iii) accordingly.

Proposer: A.J. Gilmour, President
Seconder: D.J. Griffin, Treasurer

APPLICATION FOR MEMBERSHIP

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I have published research in .....

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..... Journals

Date ....

Signature of Applicant .....

Proposed by .....

Seconded by .....

— both being members of A.M.S.A. who to the best of their knowledge, verify that the applicant is eligible for membership under A.M.S.A. Constitution.

* Delete that which is not applicable.

OBJECTS OF A.M.S.A.

To promote liaison between scattered centres and workers in the many disciplines of marine sciences in all States, through a quarterly Newsletter, through meetings and conferences or any other means and to promote co-operation between them. Membership is open to scientists or corporate bodies engaged in marine research or to students of marine science approved by the Council of the Association. A.M.S.A. aims to improve the public's 'image' of marine scientists and to forward their interests generally.

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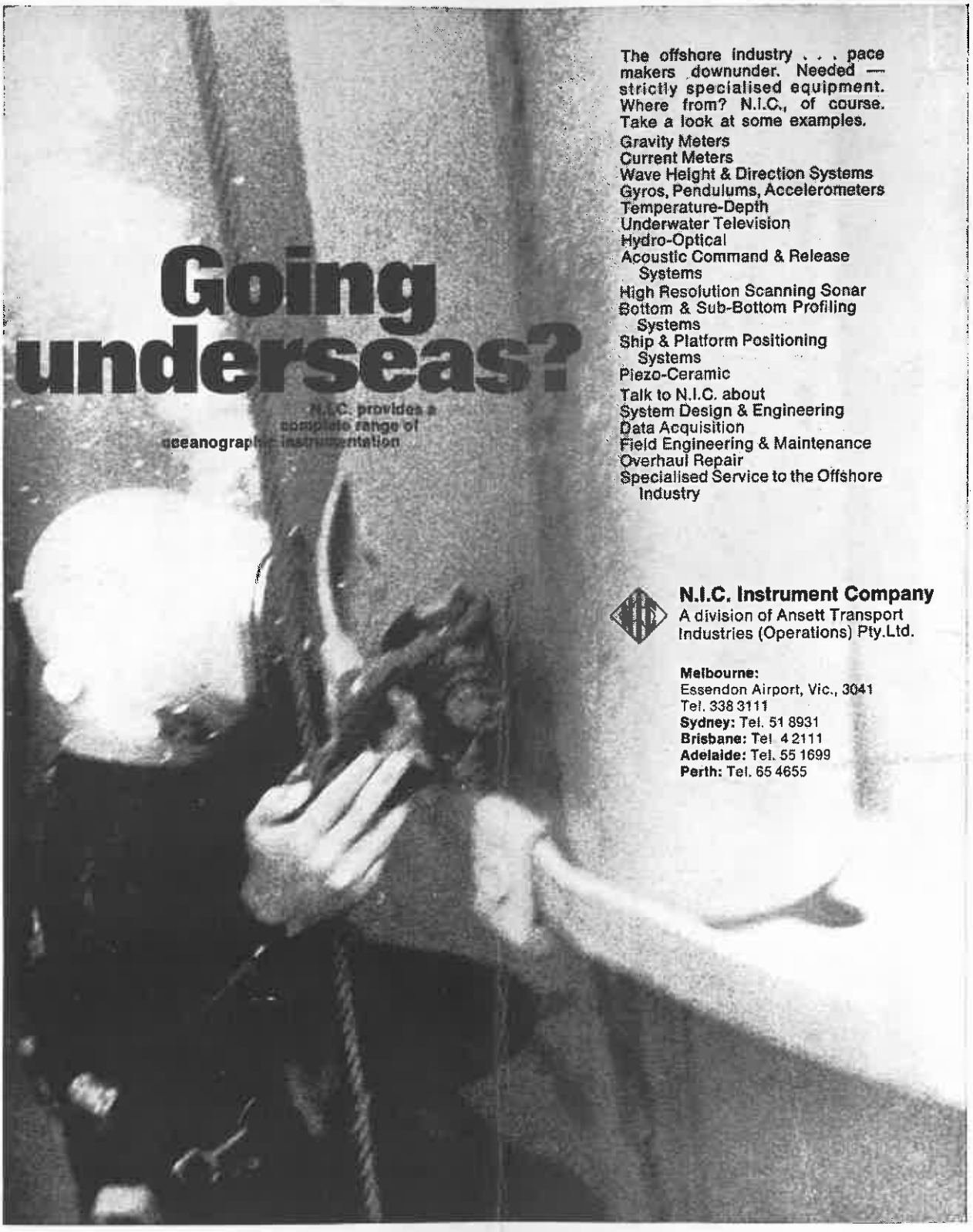
THE "JET-BOAT". A prop-less craft for shallow water work. *Photos by R.H. Austin*



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