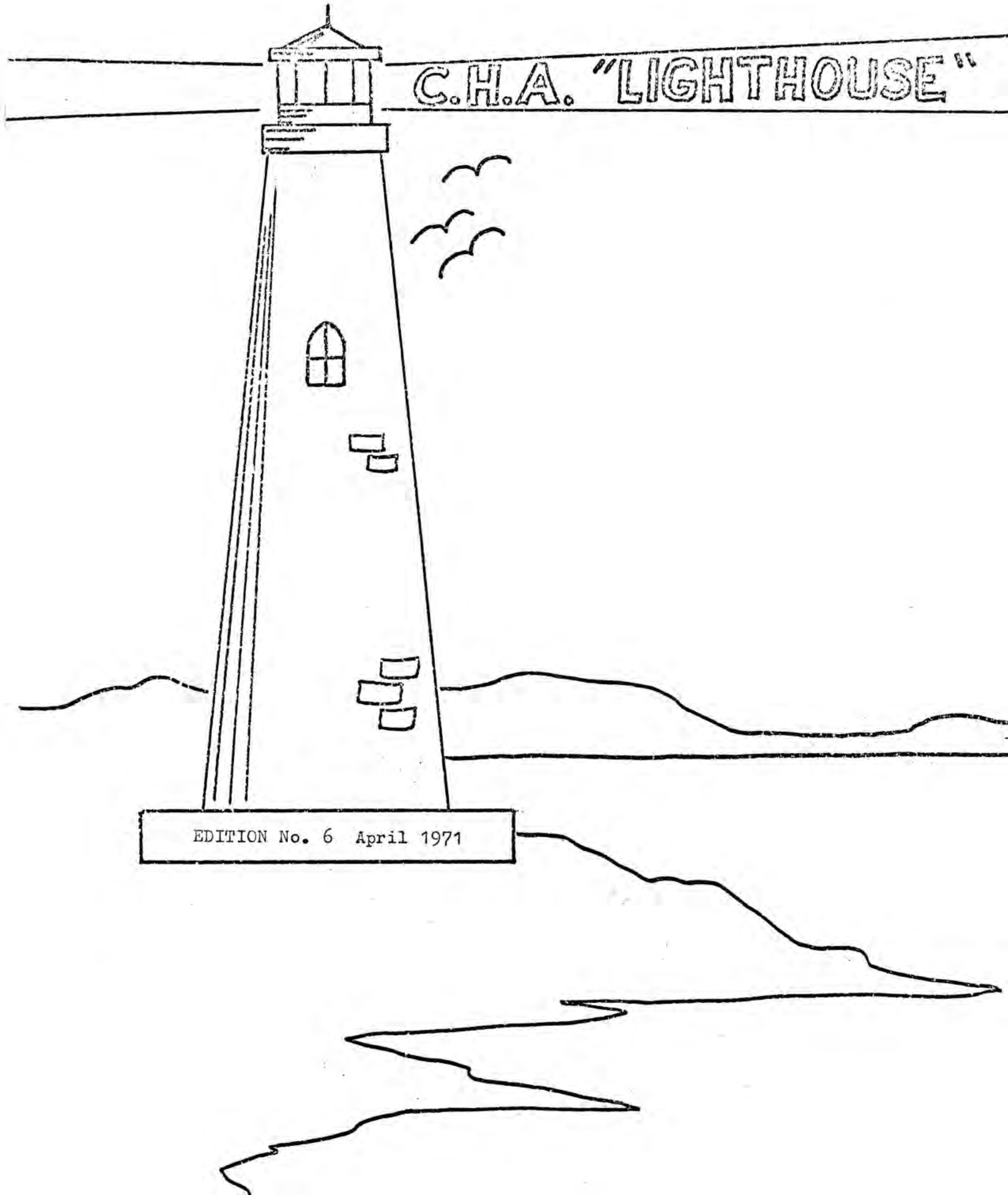

C.H.A. "LIGHTHOUSE"
EDITION No. 6 April 1971

FORWARD

The CHA 'Lighthouse' is finally on its feet. All three branches have contributed articles to this edition; in fact, so many articles were received that there are a few left over for the next issue.

The editors are pleased to announce that a twenty-five dollar award will be given to the author of the best paper appearing in "Lighthouse" in 1971. This award is limited to papers not previously published. It is our hope that many of the younger hydrographers will "try out" their papers in "LIGHTHOUSE".

Letters to the editor commenting on this edition of "LIGHTHOUSE" will be gratefully received.

The editors would like to thank the members of CHA for their favourable response to our plea for help.

LETTER TO THE EDITOR

Dartmouth, N.S.,
Saturday 6 March.

Dear George,

My belated congratulations for "Lighthouse"! It was a lot of hard work (I hope you enjoyed at least part of it) but it was well worth it, and I hope you will keep it up. Of course whether you can do this or not depends on contributors, and for my part I'll try to see there is a regular contribution from the navigation group.

I agree with the trend of yesterday's discussion -- that there should be more technical articles -- but I think there must also be humour, poetry, and general interest, just as the "Canadian Surveyor" has its yellow pages.

I enclose a copy of the British Navy survey branch newsletter, not because I think it is very good (it isn't) but for general interest and in case it might be worth occasionally exchanging articles with it. I hope you don't mind my telling them about the "Lighthouse" (copy of letter enclosed). One feature of "Hambone" that might be worth copying is the brief reports from survey parties, saying who went where and describing interesting incidents and novel techniques.

I think my talk on "Radio Waves" is probably too long for "Lighthouse". Unless you particularly want it all, I suggest you send it back to me, and I'll guarantee to have a shorter article on Satnav, along the lines of the dinner-hour talk I gave at CCIW, in you hands by 31 March.

Cheers for your efforts!

Mike Eaton

Lower St. Lawrence Survey, 1971

The 1971 Lower St. Lawrence Survey will embrace the waters of the St. Lawrence River between Murray Bay and Quebec City.

Seven launches, comprising three 25 ft. Bertram hulls, two 20 ft. Botved hulls, and two 26 ft. displacement hulls, will be equipped to collect survey data from minifix, hydrodist, and RPS positioning systems. Edo 9040 sounders, Ross Surveyor recorders, and Kelvin Hughes 26A units will be employed to determine the bottom profile of the river.

The minifix chain will be used as a positioning device for survey data displayed at a 1:25,000 scale. The chain will be calibrated using a hydrodist theodolite range-bearing procedure. A track recorder will continuously monitor the pattern. All slaves will be powered from 50 Watt Telan propane generators. Both digital and mechanical receivers will be used in the launches. A helicopter will be equipped with a retractable antenna and receiver in order to expedite calibration and data collection.

The hydrodist chains will be employed on a range-bearing basis to allow precision coverage of areas surveydd at 1:10,000, and critical areas at a 1:25,000 scale. A digital appendage, under development at C-Tech, will be evaluated and used as convenient.A student ashore operating the remote hydrodist unit and a T_1A theodolite, plus a hydrographer in the launch, entail the technical committment to this type of sounding.

The RPS system will be used both in a range-range, and range-bearing mode. Its inception into this type of survey will provide valuable experience in respect of future utility.

Two Bertram launches plus two Botved launches will be equipped with gasoline propulsion systems to effect quick transportation. One Bertram has undergone extensive modifications in order to parallel a configuration in use on the west coast. A Volvo diesel unit, coupled to a V-drive shaft assembly, should allow speeds up to 20 knots. This launch will be equipped electronically with both Edo and Ross sounder systems capable of recording in metric or imperial values, plus an automatic data logger as per HAAPS system, to collect XYZ information. Minifix and RPS inputs will be adapted.

Water level reductions will be ascertained from differential zone predictions based on tidal curves monitored at Riviere-du-Loup and St. Jean Port Joli. The Tides and Water Levels Section in Ottawa will daily publish listings covering a span of 70 river miles, divided into 40 zones. Listings give the time of every .5 foot change in water level for each zone. In order to verify, and supplement the above system, Ottboro pressure gauges will be established at convenient points along the survey area.

A PDP-8 computed and Calcomp drum plotter will be established at the base camp to process data logger tape. A TWX teletype will establish continuous communications with the Development Section at Central Region.

Technical staff will include eight (8) hydrographers, six (6) students, plus two (2) electronic technicians.

Data for field sheets produced in 1971 will be collected and displayed in a metric format.

The purpose of the survey is to upgrade and expand on present survey data of the St. Lawrence River. In addition, the application and evaluation of new techniques and equipment will assume a paramount committment.

Bruce Wright
Marine Sciences Branch
Central Region
Burlington, Ontario

Great Lakes Systems and Thousand Islands

The survey of the Thousand Islands from Kingston to Brockville is a continuation of the small craft charting program of Central Region.

The Thousand Islands extend from Kingston to Brockville through some of the most picturesque country in eastern Canada and the U.S.A.

This season the Thousand Islands survey party will be concentrating on the area adjacent to Gananoque, heart of the Thousand Islands. The survey will be confined to waters on the Canadian side of the border and will be carried out at a scale of 1:10,000. Approaches to Gananoque will be surveyed at a scale of 1:5000.

R.D. Courtnage

INTERNATIONAL GREAT LAKES LEVELS BOARD.

Several years ago The International Joint Commission set up the International Great Lakes Levels Board to study the Regulation of Great Lakes Levels. In turn the I.G.L.L.B. working committee set up a number of Sub-committees which were assigned specific tasks.

The Shore Property Sub-committee was given the responsibility to investigate and study the effects of fluctuating water levels related to shore property interests.

Task forces were set up for each of the Canadian shores of the Great Lakes and the investigation was broken down into 8 objectives:-

1. Erosion and Inundation
2. Recreation
3. Marine Structures
4. Wild life
5. Fisheries
6. Water intakes and Sewer Outfalls
7. Ice Effects
8. Projections

The first phase of the study consisted of obtaining data that had already been collected by various other agencies, institutions and government departments.

The second phase involved a thorough survey of the entire shoreline of the Great Lakes and connecting waterways, including the St. Lawrence River as far as Trois Riviere P.Q.

The Task Forces collected basic data which included complete inventory of present shoreline development, land use, physical characteristics of the shoreline, shore materials, physical data on all major marine structures, erosion measurement, off-shore profiles and wind and wave statistics. The data collected in the field investigation has been summarised and transferred to a set of comprehensive plans for use in the evaluation of the multifold effects of fluctuating water levels on the shore property interests.

The methodologies for evaluating the eight objectives and the analyses of the collected data necessarily involved some theoretical approaches, statistical hydrologic data pertaining to the frequency and duration of lake levels, unit cost of construction of typical shore protection measures etc. These were used in the evaluation of the proposed Regulation Plans in order to determine the potential annual average benefit or loss to shore property interests from regulation.

Final reports are presently being prepared by the various sub-committees for the I.J.C.

The field activities of the Task Forces of the Shore Property Sub-committee have been discontinued as of March 31, 1971.

Agreement has now been reached whereby Central Region, M.S.B., will become custodian of the Shore Property Sub-committee records. These records will be in our possession by mid-April, 1971 and plans are being made to update them on a continuous basis.

Initially, the Lake Huron Shore Property documents will be updated during 1971, by integrating this work with our Revisory Survey of the same area. Information required for revisions to our charts is, in many instances, compatable with that required to update the I.G.L.L.B. documents.

R. Marshall

Lake of the Woods Survey for 1971

On May 10, Lake-of-the-Woods Survey party will depart from Burlington to head for the town of Morson, Ontario. After three (3) days and about 1250 miles of monotonous driving, we will arrive at 'Cadieux's Camp'.

Morson is a very small town consisting of Dalseg's General Store and Morson Public School along with about seven (7) houses.

Morson is located near the border of Ontario, Manitoba and Minnesota, 90 miles northwest of Fort Francis (population 10,000) and 45 miles from Rainy River (pop. 1900).

Lake-of-the-Woods Survey will be under the direction of Ed Thompson who will be the acting officer-in-charge.

Assisting Ed will be a hydrographic staff made up of Messrs. P. Richards, A. Velmers, R. Rehbein and J. Vosburgh. J. Vosburgh will be on duty with us until July 4. Peter Richards is scheduled to head a sub-party located on Oak Island (30 miles northwest of Morson) for a couple of months, to work on plot 11.

The Morson camp, better known as "Cadieux's Camp", consists of five (5) trailers and one (1) dining trailer, all of which are placed in a row and face 20' high sawdust piles and complemented by an open sewage lagoon on our back steps.

This survey party is outfitted with three (3) and possibly four (4) botveds; one steel hull boat (23' twin OMC outdrives), two whalers and one aluminum boat. These boats will be serviced from a 'floating workshop'. Monty Robinson is our gas engineer and quartermaster and is in charge of the CSL GOOSE.

The total number of people at 'Cadieux's Camp' will be about 22 - made up of 6 hydrographers, 11 crewmen, a 4 summer students and 1 electronics technician.

Sometime at the end of May, we will be doing some control work for CCIW at Rawson Lake. Mr. B.C. Kenney, physical limnology section of CCIW is carrying out an experiment with radar tracking of drogues in this small lake. We will be using a jet-ranger helicopter to travel to Rawson Lake, since this area is almost inaccessible by road.

For the duration of the summer, we will be sextant sounding and examining shoals on plots 8, 9 and 10, and possibly some work on plot 11.

OTTAWA RIVER, 1971

Next month the Ottawa River party, under the command of Ab Rogers, will once more pack their drop bows, crow quills, and lead lines and venture forth into the field. From a base at Pembroke this party will survey the last remaining gap in the Ottawa River coverage between Lake Nipissing and Montreal.

This is a 50 mile stretch of river stretching from Rolphton (where G. Wade left off in 1969) to 5 miles below Pembroke (where A. Rogers last left it in 1968).

With the exception of a 1:10,000 section at Petawawa, the whole area will be surveyed at a scale of 1:20,000. Four shoreline plots of this area have already been prepared by Topographical Survey. Sounding lines will be controlled by Hydrodist, sextant, or photos, depending on the area. Suspicious areas will be investigated with a transit sonar. Wharves will be sounded with the northshore subtense method.

To do the job the party will use two old Masons (wooden), one Botved and three Boston Whalers. The Masons will be equipped with Edo 9040's, the Botved will have a K.H. 36F, and the whalers will use Raytheon sounders. Late in August the party expects to use the services of the helicopter to search for any uncharted, submerged cribs that may exist in the river (a legacy of the logging industry).

Aside from the black flies, mosquitoes, high water and fast current, theparty should have little difficulty in closing the Ottawa's gap by next fall.

If the boats don't break
And the funds aren't pinched,
From Montreal to Mattawa
The Green Belt will be cinched.

J.V. Crowley

NAVIGATION GROUP FORMED AT BEDFORD INSTITUTE

"An old captain once told me to take a cast of the lead at 4 a.m. We were bound from Hull from the Baltic. He came on deck before breakfast and on showing him the arming of the lead, which consisted of sand and small pebbles, I was surprised to see him take a small pebble and put it in his mouth. He tried to break it with his teeth. I was very curious and asked him why he did so. H told me that the small pebbles were called Yorkshire beans, and if you could break them you were toward the westward of the Dogger Bank; if you could not, you were toward the eastward."

From the diary of a 19th century seaman and quoted by K.O. Emery in the Scientific American issue on 'The Ocean', September, 1969.

Having found the Yorkshire bean system limited, the Bedford Institute has recently set up a 'Navigation Group' to solve problems in position-finding. It comes under the regional hydrographer, and has the job of doing "mission-oriented research and development in navigation" for all disciplines working at sea.

At present this group consists of Mike Eaton as acting head. He will shortly gain an acting assistant and a student assistant.

The group's immediate interests are in the range-range variety of Loran-C, which will probably on 'Baffin' this May; in following the B.I. Metrology section's development of underwater acoustic navigation; and in getting a feel for the error caused by sea-ice on the wave-path of 12F Decca.

Reports of the Navigation Group's activities will appear regularly in 'Lighthouse'.

M. EATON

ITEMS OF INTEREST

Bob Moulton, now on the Polar Continental Shelf Project, became the father of 'Carey Robert' who weighed in at 6 lb. 12 oz. Congratulations, 'Ratso'!

Mike Casey returned to Central Region Hydrographic staff after spending a year in Europe.

Ken Daechsel returned from a very interesting and enjoyable visit to England, France, Spain, and Morocco.

It seems that Joe McCarthy won't be needing his driver's license this summer as he will be aboard CSS Hudson.

Would you believe that Jack Wilson made seventy-five dollars the first day with his mining stock?

Ted Waugh has transferred from Central Region Hydrography to Inland Waters Branch at Guelph, Ontario. Best of luck , Ted, in your new duties.

"THAT'S GOOD, RAJ,
IT'S RIGHT ON THE CENTRE!"

When we arrived in Dartmouth March 1, 1971 to
attend the Hydrographic Conference, the weather
was pleasant, clear sunny skies, no wind.
But as the time to depart grew near, the weather
turned nasty, cold biting wind, snow, overcast skies.

The following grew from this:

The silent sea sucks at the shore
Tides and ebbs forever more
A strip of seaweed gently floats
Kissing bows of passing boats

A silhouetted figure stands
And contemplates upon the sand
Crabs and starfish bask and swoon
In the first light of the moon.

A calm grey sea soon comes to life
Seagulls sleep amid the strife
The hollow chimney heralding
What the east wind next will bring

....

The vicious sea drums on the rocks
Ships are shaking at the docks
Rattling windows howling wind.
Tranquil dreams come to an end.

G.D. Macdonald

THE RELUCTANT HYDROGRAPHER

The time has been long overdue for the Canadian Hydrographic Service at large to be made aware of what went on during the so-called Training Course. What is it that so transmutes those gentle, clean shaven and appealingly courteous young men of the technical schools who wander in in unsuspecting innocence through our portals and in a few short months become the repulsively hairy, shaggy bearded, pipe smoking sex oriented boozers that the Public Service in general and the office staff of the C.H.S. in particular see when they are confronted with the Field Hydrographer in captivity? The printing presses were set up for a special article in the C.H.A. Lighthouse to carry an exposé of the disgustingly vile initiation ceremonies presumed to take place under the guise of our training programme, and to this end a spy was painstakingly planted in the traing course. But first, to help prepare this unfortunate individual (who was a condemned murderer, but after a little gentle persuasion and inducement finally volunteered to undertake this assignment) an in depth survey of our field hydrographers was carried out. Under this closer investigation, however, the horrible truth was discovered.

Of all our present day field hydrographers, no less than 92.7% were found to be total abstainers, 64.3% have quit smoking and 22.5% have sworn off "pot" and "grass" since joining the Outfit (as they so charmingly refer to the Canadian Hydrographic Service) and 71.9% are happily married with nary a thought of extramarital activities. Another 19.3% are bachelors of whom two, when severely interrogated by our survey team, responded: "Sex? But I'm not married yet..."

From whence, then, cometh that mental picture of the delightfully repulsive hairy bearded pipe smoking sex oriented boozer? I'm glad you asked that question. Everyone was puzzled for a while, then the light dawned.

This may seem like a digression, but you've heard, nae doot, of the mean, tight-fisted. miserly Scottish men? Aye, I thought ye had. Well now. Think back a moment. Who was it told you the last three Stingy Scot stories? Quite right. Two of them were Scottish, and the third guy had a Scottish aunt, you'll recall. Actually, truth be known, the Scots are an awfully softhearted bunch and were forever givng away their most prized possessions to the first foreigner who asked, and these poor people were feeling quite a need for some protection, when they stumbled on the perfect answer. And the whole world is quite

continued.........

convinced that the stingy Scot is the very last man to touch for a small loan. Brilliant idea, you'll be thinking.

Ah, yes. You asked about our Field Hydrographer. That pipe smoking, over sexed, bearded boozer we observe returning from the Elisyan Field surrounded by that delicious aura of radiant manhood and beery good health. Yes indeed, joyous sight is it not? And you have perhaps noticed that restless feeling that seems to pass through our office population towards the end of September, starting as a gentle breeze rustling in the leaves of the upper twigs, then gaining strength with the smaller branches swaying softly, till around mid October whole limbs, nay, the entire trunks no less, are in restless movement. And the last day or two of the field season, the new hairdo and neat close fitting low necked costumes that suddenly blossom out with such daringly high hemlines on our secretaries? Ah, yes. Lovely visions spring to the mind. Now need I remind you of that day last October (and the year before) when your secretary - remember how lovely she was that day? - unaccountably found that she had to keep opening and closing the window, then adjusting the curtains from time to time lest the strong sunlight affects the ink in your pen? A picture leaps unbidden to the mind's eye of the moment when she suddenly dropped with a crash the milkjug she was using to water the window boxes and dashed off to fetch you a thied cup of coffee. That coffee, come to think of it, never did arrive, for she had to stay downstairs to help file away the field notes and sounding rolls the Field Hydrographers had with them.

You know, it is really quite surprising the number of people who appear out of the woodwork to help the returning Field Hydrographers put their field notes in order, isn't it? Can't think what they have that the rest of us don't have, and most of them are such scruffy chaps too. Unwashed, reeking of tobacco, and with their beards smelling so strongly of drink that even their tales of adventure and stories of friendly natives don't quite hide the smell.

I can't think what all these girls see in them, really I can't.

J. Weller

MINAMATA AND MERCURY

In stock crime movies, members of the ruling syndicate invariably outfit an upstart competitor with cement "shoes", escort him out to sea, and gleefully throw him overboard. This cinematic cliche is another testimony to man's ageless belief in the ocean as the perfect disposal unit. We have been tossing, shoveling, squirting, leaking, spilling, sinking, draining and dumping unwanted things into the ocean for centuries.

This carefree disposal, today nears floodtide proportions. An industrial society's most prominent product is wastes, wastes that grow in volume, variety, and toxicity, and continually and more persistently threaten to engulf us in gross ugliness and alarming pestilence. As a solution to an ever increasing accumulation of wastes, the ocean is not only considered a handy dump, but an economical one, fully capable of diluting, neutralizing, and absorbing the flood of solid and liquid wastes to which it is subjected.

Minamata Bay is a rugged niche in the coast of Kyushu, a Japanese main island. A sweet abundance of fish and shellfish support the Bay's eleven fishing villages. Just inland lies Minamata City, where a large chemical plant employs many of the city's residents.

In 1953, 18 years ago, a mystifying nerve disease made its appearance at Kyushu. People of varying age, sex, and physical well being were struck by the disease which left its victims helpless cripples in the throes of violent nervous disorders. Senses which no longer responded, limbs which suddenly collapsed, uncontrollable twitching, and rapid deterioration of mental ballast and cognizance, were well catalogued reactions of victims. The disease became known as "Minamata disease", and between 1953 and 1960, one hundred and five cases were reported.

Doctors were baffled by its cause, much less its cure. Medical teams from the United States diligently examined victims. Encephalitis, toxic metals, and thiamine deficiency were all considered as possible causes, but all were ultimately rejected. Researchers were reduced to isolating living habits common to the victims of Minamata disease. Most lived in fishing villages rather than the city. Many had cats as pets, cats that were often afflicted with the same disorientation that seized their masters. Strangely, these cats, unbalanced in direction, would suicidally plunge into the sea.

The cats and their masters had one thing in common. Both consumed seafood caught daily in the bay. Sample Minamata Bay shellfish were analysed for toxic content. Although quite healthy in their own right, the shellfish were found to contain high concentration of mercury. When these shellfish were fed to laboratory cats, the cats swiftly developed nervous disorders akin to Minamata disease.

Mercury's toxicity derives from its ability to penetrate the blood-brain barrier, and disrupt the central nervous system. Where the Minamata shellfish were picking up their mercury temporarily perplexed investigators. Then it was noted that the large chemical plant at Minamata City had increased its production of vinyl chloride, used in phonograph records and plastics. After being processed, the vinyl chloride was washed to rid it of impurities, including residues of the catalyst, which contained mercuric chloride. The washing process left the plant with volumes of impure water, and the answer to the problem, typically enough, was to dump it into the bay.

Thus ended the mystery of Minamata disease and, incidentally, the fishing industry; and the exposure to the world of a new concern -- mercury contamination.

It has been fourteen years since the causes of Minamata disease became apparent, yet only in the last three years has mercury pollution of our waters been brought to the public attention.

B. Wright

Hydrodist MRB 2

Hydrodist in the Range bearing mode was used on the "William J. Stewart" during the 1970 field season. This report is intended to indicate the advantages and disadvantages experienced using Hydrodist in the range bearing mode on a typical survey in this region.

Two complete sets were supplied to the "Stewart" for the season but for a variety of reasons both sets were seldom in use at the same time.

Prior to the start of the season a two week course on Hydrodist was given to the personnel who were to be primarily engaged in its use. At the conclusion of the course everyone concerned was satisfied that they were qualified to operate the equipment as part of a 3 man team. During the course the various arguments, pro and con, were discussed.

One of the "Stewarts" projects for the 1970 season was to complete the field sheet numbered 3338 L Triple Islands to Dundas Island which had been started in 1968. In 1968 conventional methods were used i.e. 2 Hydrographers using simultaneous horizontal sextant angles. In 1970 Hydrodist was employed using 3 Hydrographers, 1 ashore and 2 in the launch.

While fully realizing that statistics can be made to prove anything, and fully recognizing the errors and inadequacies of this method I have drawn up a list of comparative sounding figures for 1968 sextant sounding and 1970 Hydrodist sounding.

Bearing in mind the fact that the area is similar, the weather conditions similar, control is established and the Hydrographers were equally well qualified in their respective methods, this list includes dates on which sounding took place in both 1968 and 1970.

Date	Conventional 1968	Hydrodist 1970
June 5th	30.0 Miles.	29.8 Miles
6th	17.9	25.9
7th	19.3	13.8
8th	49.0	6.6
16th	37.3	17.2
17th	53.7	19.9
19th	10.0	7.5
29th	26.2	10.6
30th	18.0	2.5
July 2nd	22.0	4.4
4th	6.0	8.2
5th	24.8	10.3
7th	2.5	5.3
8th	1.0	4.8
13th	4.0	9.3
15th	20.5	13.8
16th	29.0	16.0 (Total for 2 launches this day)
Totals	371.2 (2 Hydrographers)	205.9 (3 Hydrographers)

Other factors to consider are that in sextant sounding a plot is up-dated with every fix and at the end of the day every fix is readily transferred to the collector sheet. With Hydrodist sounding, the fixes are not required for course information and are not easily plotted on the launch. Therefore, considerable time is spent in the evening plotting up the days work before scaling etc. can take place.

Again, this comparison is not intended as proof one way or another, for or against, sextant or Hydrodist sounding.

In theory the Hydrodist is based on sound principles, unfortunately, in practise the promise shown was not realized. The system's unreliability is one of the many causes of concern, time and time again hours were lost because of unexplainable failures in the equipment, for instance inability to receive a trackable signal for no apparent reason. Later examination of the equipment revealing no apparent faults.

Reception at distances beyond 2000 metres, is critically dependent on smooth seas and suitable elevation of the shore station (not always obtainable). If the required elevation is obtained it often means a long difficult climb with the required equipment causing further delays. On a good day an hour must be given over to the landing of the shore party and another hour for retrieving the party not to mention lunch time arrangements. This reduces the working day to 75% before a fix is obtained.

This repeated landing and retrieving exposes the party and equipment to the associated risks every day, on one occasion this year the dory overturned casting the men and equipment into the sea.

The inflexibility of the Hydrodist operating procedure was noted. To go Hydrodist sounding a plan is prepared and both the shore party and the launch party have a copy of the proposed sounding lines to be run. If for some reason this plan cannot be adhered to i.e. landing not possible, then a new plan must be drawn up for a different set up. Of course several plans can be drawn up and taken into the field but this does not make the system any more flexible.

Operator fatigue is another factor, with good conditions it is tiring tracking the spot all day, on the other hand the operator's morale is considerably lowered trying to maintain a satisfactory signal throughout the line. Good radio communications are essential in Hydrodist operation. This was another area in which we had considerable problems, loss of radio contact at a vital moment can be infuriating and also cause one to repeat that particular sounding line. The radios we were supplied with (Motorola P.T. 300) were not suitable, the range was inadequate. The substitutes we used are on the same frequency as used by an American trucking company and we were frequently unable to contact each other because of their traffic.

The power supply, standard 12V batteries, also let us down on numerous occasions, partly because no batteries were provided with the equipment and partly because when batteries were acquired they would run down during the day. This latter fault is either due to improper charging of batteries or it is another unexplained failure of the Hydrodist equipment under field conditions.

One of the arguements for Hydrodist is the fact that considerably less control points are needed before Hydrodist sounding can commence. This was quite apparent when we were able to start sounding having only recovered 2 stations. However, a considerable amount of secondary control is required for photograph control. A point to bear in mind is that the lack of control was really felt towards the end of the survey when we were required to examine shoals by sextants.

The system is single user and as the "Stewart" carries four launches, no reduction in the amount of control required is possible. The other launches need the stations for sextant fixing.

Less interlines were required due to the well controlled sounding lines and the interlines that were required were very easily obtained, this was more noticeable in areas where strong currents prevailed.

Towards the end of the season, in much better conditions than we had experienced all season, we were able to phase out one of the hydrographers in the launch. This was only possible at short range where the signal was quite strong, but it proved that when functioning properly the system can be operated by 2 hydrographers.

Throughout the season we attempted to do shoal examinations by the fixed star method using hydrodist; while we were able to fix the star in the field a considerable amount of time was spent in the evening, in overtime hours, plotting all the data collected on the shoals.

From the experiences outlined here I would conclude that Hydrodist can be an aid to a field party and used in selected situations. It is not, however, a major tool, and surveys can not be planned around Hydrodist as they can around other radio aids.

A. D. O'Connor
Pacific Region
1970

C.S.S. "BAFFIN" Survey

Beaufort Sea

1970

T. B. Smith

R. Macnab

BAFFIN IN BEAUFORT SEA, 1970

An abrupt shoaling of a small area of the ocean floor in the Beaufort Sea was first noticed in 1969 by the hydrographers aboard the C.C.G.S. John A. Macdonald. At that time, the ship was escorting the icebreaking tanker S. S. "Manhattan" through the Canadian Arctic enroute to Prudhoe Bay, Alaska, and was following the tanker by about 1 km.

The shoal manifested itself by a rapid rise of the sea bottom from 49 meters to 23 meters over a horizontal distance of 200 meters, followed immediately by an equally rapid drop back to 49 meters. On the return voyage from Prudhoe Bay, both ships skirted the shoal by passing to the north of its position, and no attempt was made to relocate the feature.

Because of a lack of detailed bathymetric information in the Western Arctic, as typefied by this incident, and in response to the requirement for modern charting brought about by the increased activity of oil companies, the Canadian Hydrographic Service pooled resources from its three regions and embarked on an extensive mapping program in the Beaufort Sea and adjacent regions.

The Pacific Region, which has operational control for this area, supplied the ship CSS "Parizeau" and was given the task of a systematic survey of Mackenzie Bay including the beach approaches.

The Central Region provided personnel for the hydrographic component of the Polar Continental Shelf Project, and was assigned the task of charting Franklin Bay using an SRN-6 hovercraft. Central Region also assisted in staffing CSS "Parizeau and CSS "Baffin". The latter ship is a major hydrographic charting vessel with its home port at the Atlantic Oceanographic Laboratory of the Bedford Institute, in Dartmouth, Nova Scotia.

The Polar Continental Shelf Project provided a long range electronic positioning system, Decca 6f Lambda operating in the hyperbolic mode. In addition they had a logistic and communication base at Tuktoyaktuk.

The CSS "Hudson" also operating from the Atlantic Oceanographic Laboratory of Bedford Institute, spent four weeks in the Beaufort Sea as part of the Hudson '70 Expedition. The "Hudson's" primary arctic program was concerned with geological and geophysical exploration and research. The CSS "Richardson", Pacific Region, supported Hudson as well as working on her own oceanographic program involving current measurements, bottom sampling and seismic observations in Mackenzie Bay.

CSS "Baffin" was placed under the operational control of the Pacific Region. The survey staff on Baffin consisted of 5 hydrographers, 1 geophysicist, 1 geologist, and 3 technicians from the Atlantic Region, and 2 hydrographers from Central Region.

The Baffin, with her greater offshore capabilities, was charged specifically with a detailed study of the shoal found by "John A. Macdonald" and the bathymetry of the surrounding area. Questions on the nature and extent of this topographic anomaly were of interest to geologists who were working in the Arctic and of vital importance to the mariner.

The survey area covered approximately 5,000 square kilometers and was situated near the edge of the continental shelf, about 120 kilometers northwest of Atkinson Point, N.W.T. (Figure 1, Insert Map).

Using Decca Lambda (i.e., low ambiguity Decca) for control, bathymetry was obtained over 9,828 kilometers of parallel sounding tracks spaced ½ km apart on the average. Simultaneous gravity and magnetic measurements were made over 3,960 and 7,400 kilometers, respectively, at an average line spacing of 1 km. Bathymetry and gravity were recorded and processed digitally on board for plotting, while the total magnetic field measurements, uncorrected for diurnal variations, were simply recorded and monitored. Numerous bottom samples were collected over the area as well.

Unexpectedly, the bathymetric observations revealed a large number of underwater mounds dotting an otherwise smooth floor (Figure 1). In size and shape, each bore a superficial resemblance to the shoal found by Macdonald in 1969. (Figure 2). As far as could be inferred from detailed launch examinations, they were generally irregular and asymmetric in form, with one side steeper than the other (Figure 3). The base diameters averaged 400 metres, and the elevations, from base to peak, 30 metres. In most cases, a shallow (2-3 m) moat or depression surrounded the base of the feature.

A total of 78 mounds were located in the survey area, with least depths ranging from 15_4 metres to over 45 metres. Their distribution appears to be random. Several were grouped in clusters, others were paired, and the remainder were scattered singly within the 70-meter isobath.

During the same period, similar features were discovered outside the detailed survey area by other vessels engaged in hydrographic or scientific activities: The Canadian Scientific Ships PARIZEAU and HUDSON, the latter using side-scan sonar, identified seven on the east side of the Mackenzie Canyon (at 69° 55'N, 137° 10'W). CSS HUDSON also obtained a seismic reflection profile over another located at 70° 15'N, 131° 12'W, immediately to the east of CSS BAFFIN's work area. These observations indicate that more shoals may exist on the unmapped portions of the continental shelf of the Beaufort Sea. The implications with respect to deep-draft shipping in the Western Arctic are obvious; e.g., the shoal with the least depth 15_4 metres was located less than 1 mile north of "Manhattan's" track in 1969. At the time of her passage, "Manhattan" was drawing 15_8 metres. It is interesting to speculate on the results had the tanker's track been a little to the north in 1969.

No detectable correlations were apparent between these small-scale topographic features and the geophysical observations. The magnetic field,measured to a precision of 1 gamma, displayed no evidence of shallow sub-bottom structure, save for a possible outcrop in the northeast corner of the survey area. As expected, the gravity field was dominated by the shelf edge anomaly, and the shipboard system, measuring to a precision of 1 milligal, gave no indication of perturbations associated with the seafloor mounds.

The Gravity and Magnetic results will be incorporated into the Natural Resource Chart Series.

Figure 1

Distribution and least depths of the underwater mounds mapped in 1970 by hydrographers aboard CSS BAFFIN. The region shown in this diagram does not represent the full survey area. The shoal located near 70° 40'N, 132° 15'W is thought to be the one traversed by the MANHATTAN and the JOHN A. MACDONALD in 1969. The box at 70° 40'N, 132° 35'W contains the two shallowest features located, and is shown magnified in Figure 3.

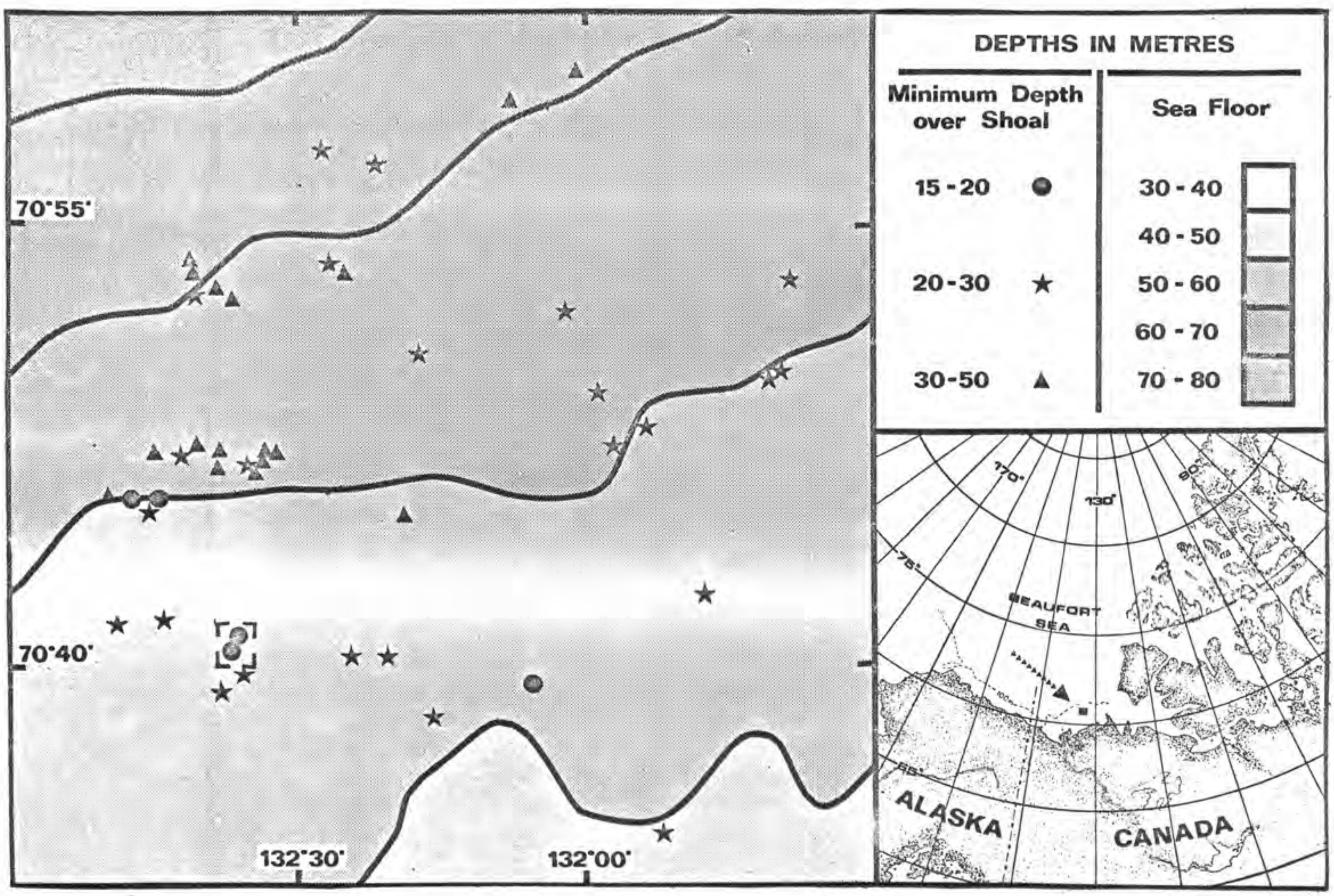


Figure 2

Echo-sounder record obtained over an underwater mound in the Beaufort Sea. The sounder used was a Kelvin-Hughes, Model 62B. The needle-sharp appearance is due to vertical exaggeration (38x). The shallow moat surrounding the mound is evident in this profile view.

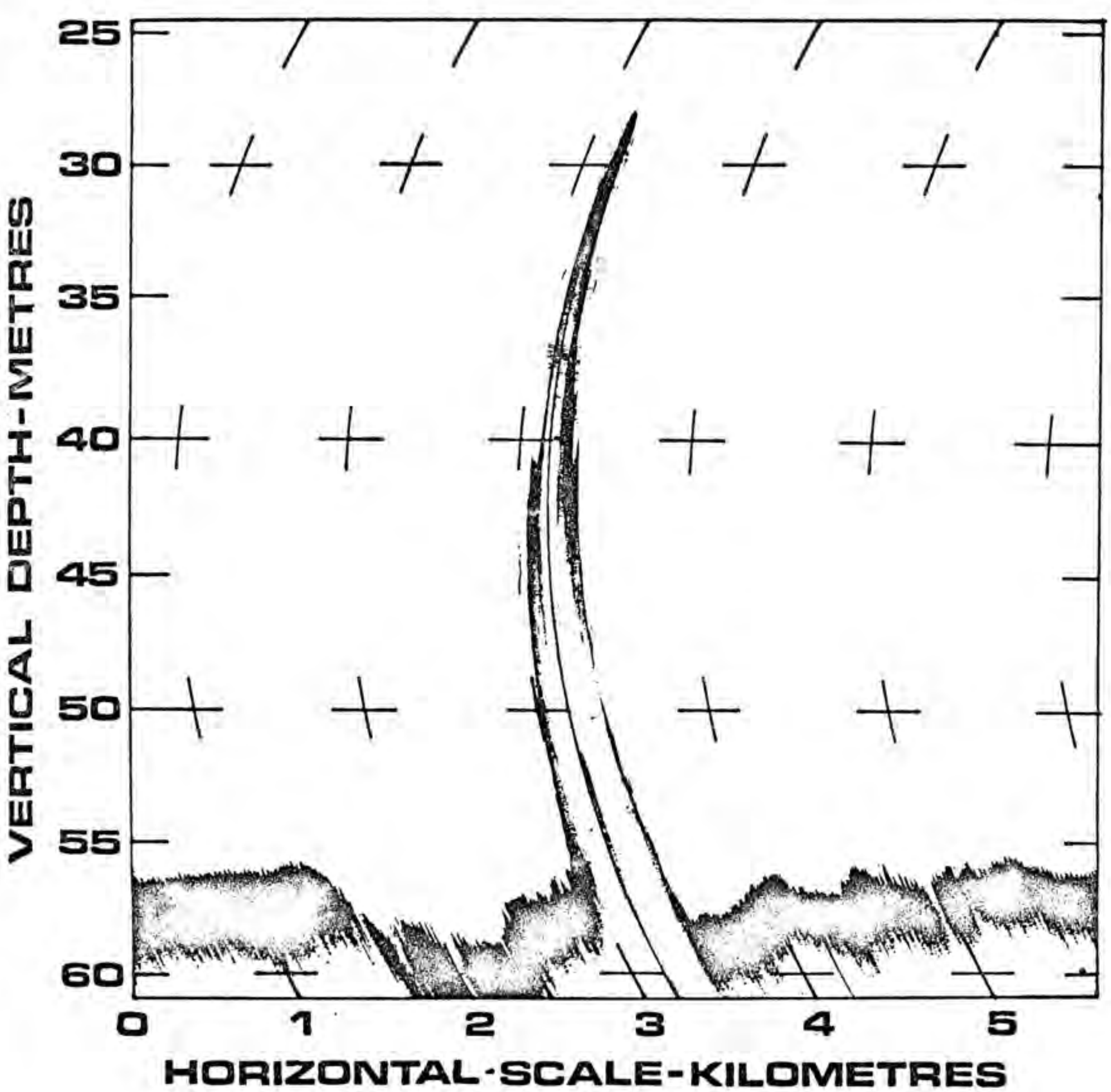
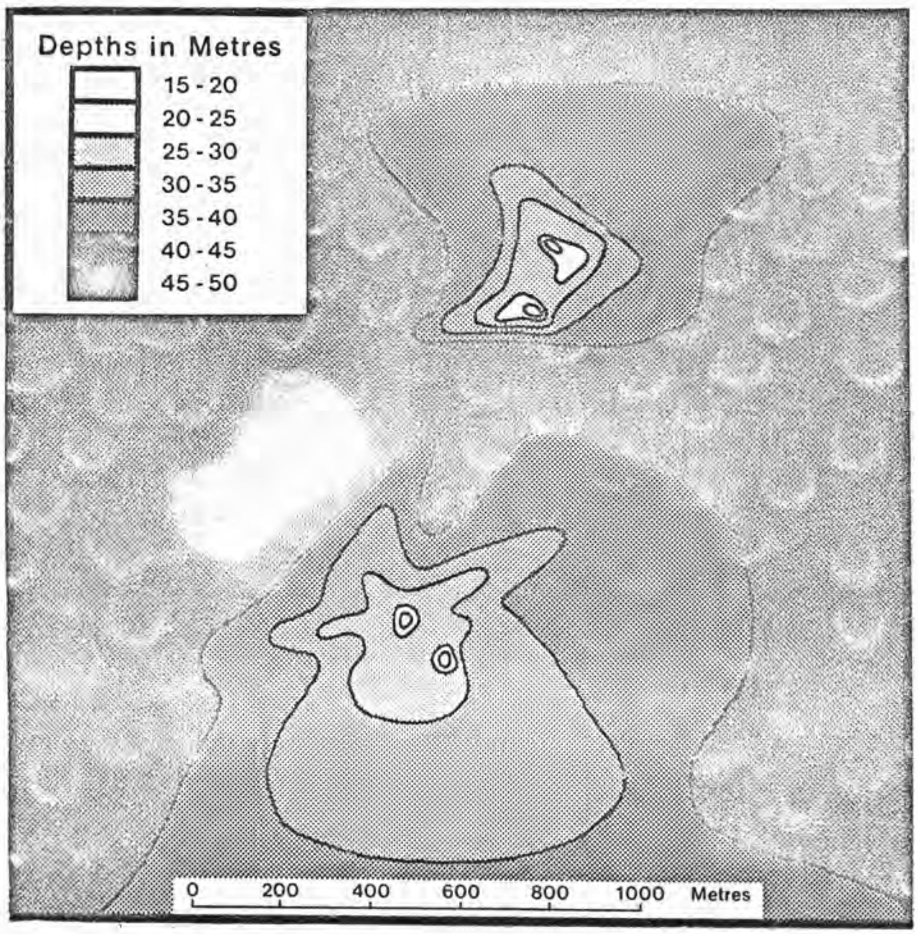


Figure 3

Detailed bathymetry of the two shoals at 70° 40'N, 132° 35'W, as derived from ship and launch soundings. Depths to the peaks have been confirmed with lead-line soundings. The irregular forms are typical of the mounds examined in this area. The contour interval permits no indication of the shallow depression surrounding these features.



CONVERSION TO THE METRIC SYSTEM

In the printed proceedings of the British Parliament for May 24, 1965, the president of the Board of Trade is quoted as follows in reply to a question by a member of the House of Commons: "The Government are impressed with the case which has been put to them by the representatives of industry for the wider use in British industry of the metric system of weights and measures. Countries using that system now take more than one-half of our exports; and the total proportion of world trade conducted in terms of metric units will no doubt continue to increase. Against that background the Government condider it desirable that British industries on a broadening front should adopt metric units, sector by sector, until that system can become in time the primary system of weights and measures for the country as a whole."

Thus the nation that developed the "imperial" system of weights and measures-the system of inches, ounzes and quarts familiar throughout the English-speaking world-announced its decision to abandon the system in favour of the decimal scheme first officially launched by France in 1790 and spread widely through Europe by Napoleon. The trend toward "metrication" is such that the U.S. may soon be the only major nation still using the imperial system.

The folklore of measurement is entrancing. In the Anglo-Saxon measurements that underlie the imperial system, the inch was the knuckle of the thumb. The cubit was the distance from the elbow to the end of the middle finger;stated another way, it was six palms, the palm being the width of four fingers. The foot was not what one might think: it was originally four palms or 16 fingers, but since there is much variation in the size of human fingers and human feet, the foot was standardized 1,000 years ago as 36 barleycorns "taken from the middle of the ear". (Barley also measured weight and volume; a bushel was 50 pounds or 8 imperial gallons.) A yard was the distance from the tip of King Edgar's nose to the tip of the middle finger of his outstretched arm. A fathom was said to be the length of a Viking's embrace. An acre was the amount of land that could be plowed in a day by a yoke of oxen. The amount could vary depending on whether the soil was heavy or light. In those days, the larger unit was the hide; it too was a variable measurement, being based on the amount of land a yoke of oxen could plow in a year. This amount, which averaged about 120 acres, was deemed enough to support a family.

In medieval Germany the length of the rute (rod, pole or perch) was established by a random sample of 16 men coming out of church: they stood toe-to-heel, and the overall length was accepted as the standard. The Roman legionaries strode out the mile; their mille was 1,000 paces or about 1,618 yards. A pace, however, is a variable unit, and so the mile has varied: the British and American mile was standardized at 1,760 yards, but in a number of European countries, the mile ranges from less than a British-American mile to six such miles.

Throughout the centuries measurements proliferated in regions, countries and localities and persisted long after their original significance and utility had been forgotten. As a result, there were problems not only in fitting but also in making sure of honest measure and in avoiding confusion born of misunderstanding. Statutes and therefore standards had to be imposed. William the Conqueror regularized measurements of area. His son, Henry I, applied penal sanctions to weights and measures and also legalized King Edgar's arm length as "our yard of Winchester." The Magna Carta spelled out weights and measures for wine, ale, corn and cloth. The framework was thus established for the units of the imperial system.

In 1790, the French National Assembly appointed a committee to explore the possibilities of a rational system of measurement. The committee's proposals for a new unit of length, the meter, and a new unit of weight, the kilogram, were enacted into law in France a few years later. The meter was defined as one ten-millionth of a quadrant of the earth's meridian as carefully measured over the fraction of the quadrant lying between Dunkirk in France and a point near Barcelona. The unit of weight or mass was established as the kilogram, which was defined as the mass of a cubic decimeter (.1 meter) of water at the temperature of its maximum density; this volume was to be called a liter.

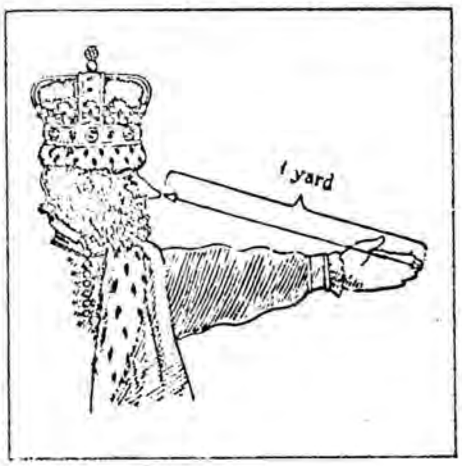
Difficulties in reproducing or comparing metric standards from country to country led France to call in 1870 an international convention to work out a unified metric system. These efforts led to the signing of the Treaty of the Meter in Paris in 1875. The treaty established an International Bureau of Weights and Measures, which would be custodian of the standards, and a General Conference of Weights and Measures, which would meet periodically to adopt new definitions as the need arose.

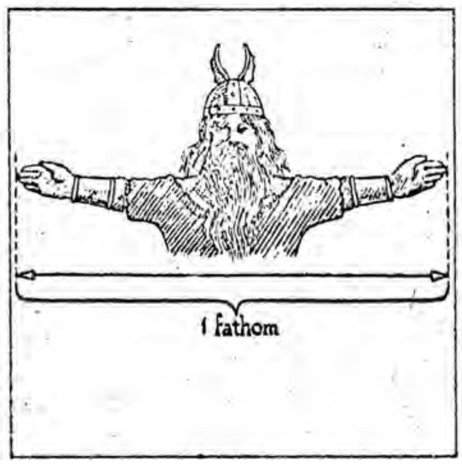
In 1960, the General Conference redefined the meter as "equal in length to 1,650,763.73 wavelengths in vacuum corresponding to the transition between certain levels of the krypton-86 atom." In 1889, the kilogram was defined as the mass of a particular platinum-iridium cylinder. The unit of time, the second, is described as "the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom."

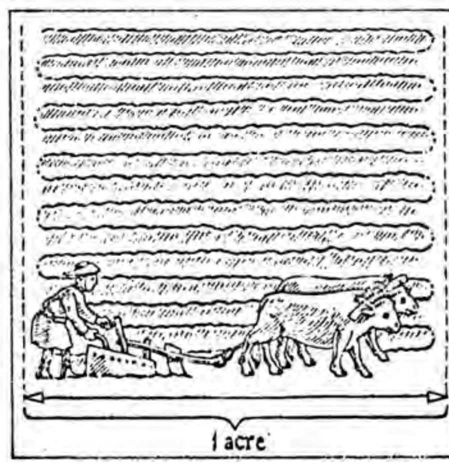
The unit of temperature is the degree Celsius or Kelvin. In 1954, the General Conference defined it as 1/273.16th of the thermodynamic temperature of the triple point of water (.01 degree C.).

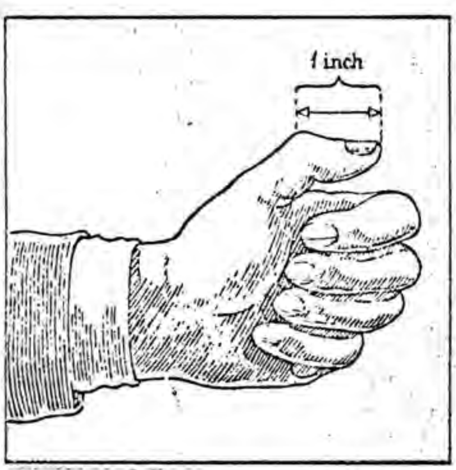
The basic electrical unit, the ampere, has been defined since 1948 as "that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible curcular cross section and placed one meter apart in a vacuum, would produce between those conductors a force equal to 2×10^{-7} newton per meter of length."

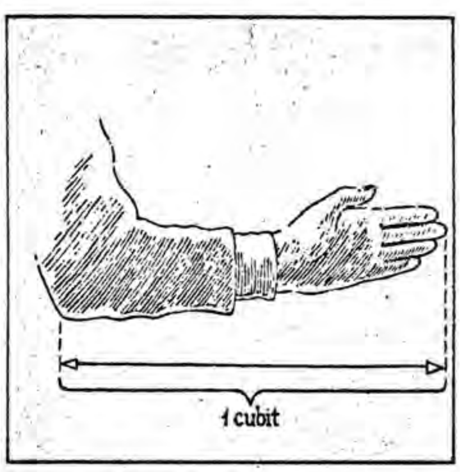
The candela was adopted in 1948. It is defined as the luminous intensity in the perpendicular direction of a surface of 1/600,000th of a square meter of a black body at a temperature of freezing platinum under a pressure of 101,325 newtons per square meter.

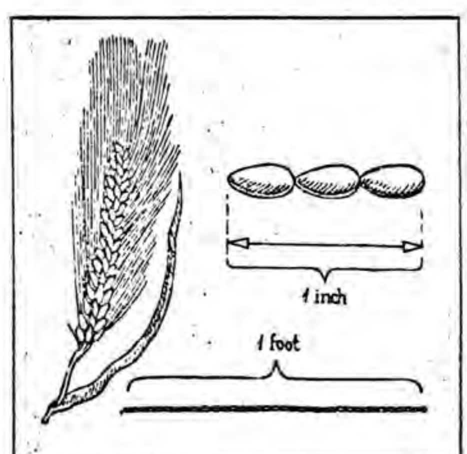












LENGTH

KILOMETER	(km)	=	.621371 MILE
METER	(m)	=	1.09361 YARDS
MILLIMETER	(mm)	=	.0393701 INCH
MICROMETER	(μm)	=	39.3701 MICROINCHES

AREA

SQUARE KILOMETER	(km^2)	=	247.105 ACRES
SQUARE METER	(m^2)	=	1.19599 SQUARE YARDS
SQUARE MILLIMETER	(mm^2)	=	.00155000 SQUARE INCH

VOLUME

CUBIC METER	(m^3)	=	1.30795 CUBIC YARDS
CUBIC DECIMETER	(dm^3)	=	.0353147 CUBIC FOOT
CUBIC CENTIMETER	(cm^3)	=	.0610237 CUBIC INCH
LITER	(l)	=	.2642 GALLON (U.S.)

VELOCITY

KILOMETER PER HOUR	(km/h)	=	.621371 MILE PER HOUR
METER PER SECOND	(m/s)	=	3.28084 FEET PER SECOND

ACCELERATION

METER PER SECOND PER SECOND	(m/s^2)	=	3.28084 FEET PER SECOND PER SECOND

MASS

KILOGRAM	(kg)	=	2.20462 POUNDS
GRAM	(g)	=	.0352740 OUNCE

DENSITY

KILOGRAM PER CUBIC METER	(kg/m^3)	=	.0624280 POUND PER CUBIC FOOT

FORCE

NEWTON	(N)	=	.224809 POUND-FORCE

TORQUE

NEWTON METER	(Nm)	=	.737562 POUND-FORCE FOOT

PRESSURE, STRESS

NEWTON PER SQUARE METER	(N/m^2)	=	.000145038 POUND-FORCE PER SQUARE INCH

VISCOSITY (DYNAMIC)

NEWTON SECOND PER SQUARE METER	(Ns/m^2)	=	.0208854 POUND-FORCE SECOND PER SQUARE FOOT

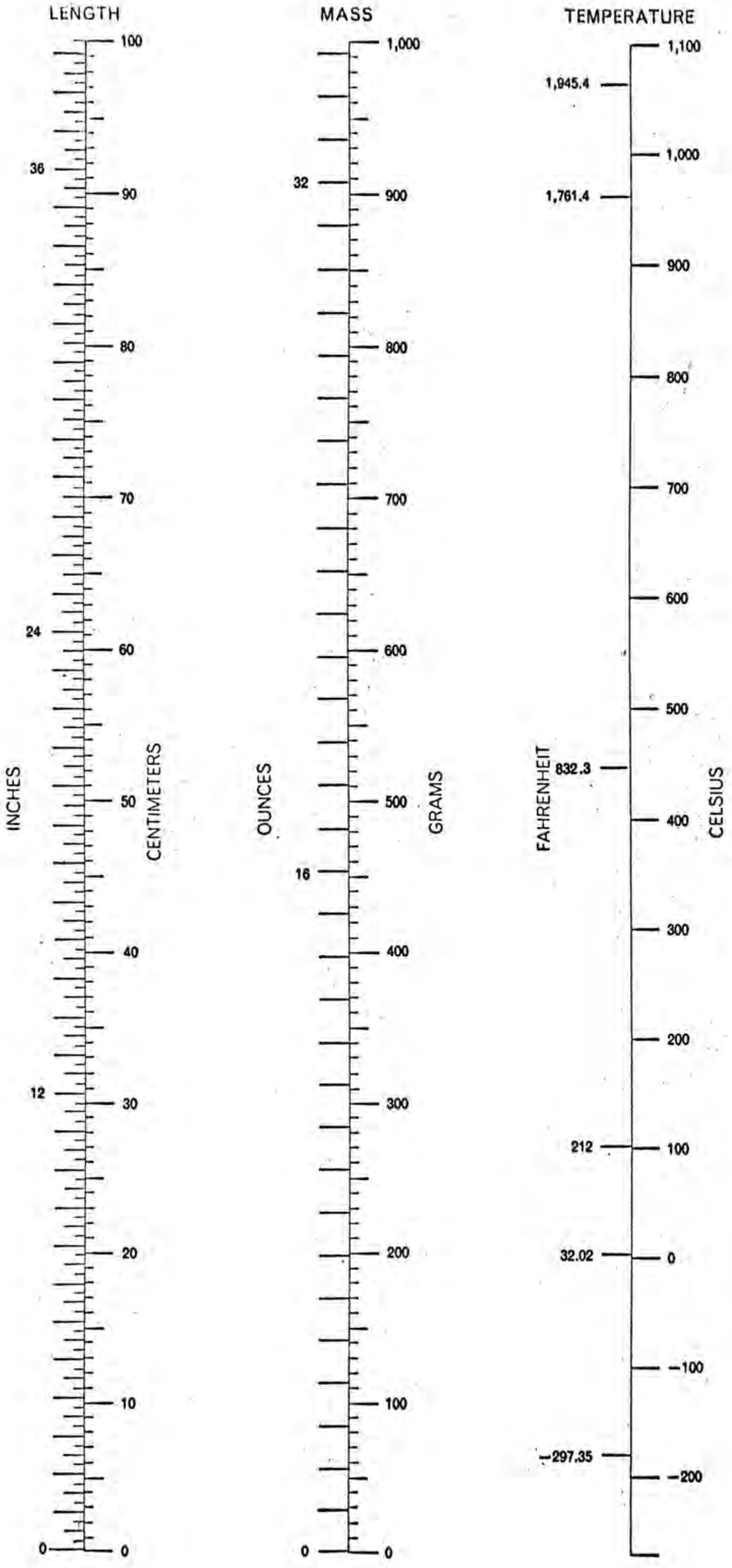
VISCOSITY (KINEMATIC)

SQUARE METER PER SECOND	(m^2/s)	=	10.7639 SQUARE FEET PER SECOND

ENERGY

JOULE	(J)	=	.737562 FOOT POUND-FORCE
KILOJOULE	(kJ)	=	.277778 WATT-HOUR

Key Conversions of common metric units to units of the imperial system are shown on the basis of data published by the National Physical Laboratory of the Ministry of Technology in Great Britain. The term "pound-force" appearing under such headings as "Force" and "Pressure" is employed in this scheme in place of such somewhat different concepts as foot-pounds and pounds per square inch.



Basic units of the metric and imperial systems are compared, with metric units on the right and imperial units on the left. The reference points shown on the Farenheit scale are, reading from the bottom, the boiling point of oxygen, the triple point of water, the boiling point of water, the boiling point of sulphur, the freezing point of silver and the freezing point of gold.

PREFIX	SYMBOL	POWER		EXAMPLE
tera	T	$10^{12} =$	1,000,000,000,000	
giga	G	$10^{9} =$	1,000,000,000	gigahertz (GHz)
mega	M	$10^{6} =$	1,000,000	megawatt (MW)
kilo	k	$10^{3} =$	1,000	kilometer (km)
hecto	h	$10^{2} =$	100	
deca	da	$10^{1} =$	10	
deci	d	$10^{-1} =$	.1	
centi	c	$10^{-2} =$	.01	
milli	m	$10^{-3} =$	.001	milligram (mg)
micro	μ	$10^{-6} =$	.000001	microsecond (μs)
nano	n	$10^{-9} =$	.000000001	nanometer (nm)
pico	p	$10^{-12} =$	.000000000001	picofarad (pf)
femto	f	$10^{-15} =$	.000000000000001	
atto	a	$10^{-18} =$	.000000000000000001	

Multiplying prefixes for use with the basic units of the metric system were approved by the General Conference on Weights and Measures, which promotes the use of the metric system and acts as a centre for international cooperation.

Subject matter taken from the July, 1970, edition of SCIENTIFIC AMERICAN and rewritten for inclusion in THE LIGHTHOUSE by R. D. COURTNAGE.

CONSTRUCTION OF VELOCITY SCALES
FOR MS 26B ECHO SOUNDERS ON CONVERSION TO THE METRIC SYSTEM

This year the Hydrographic Service of the Atlantic Region will collect bathymetry in metres. For this purpose the K.H. MS 26B sounders are being converted to read depths in metres. No mechanical changes to the sounders are involved as the conversion kit consists only of a Recorder Front Plate and a Scale, both graduated in metres.

The actual velocity of sound in water must be known to read true depth. As the velocity varies in different layers of the water mass, the true depth is difficult to determine.

The standard K.H. metric scale is drawn for an assumed sound velocity of 1500 metres/second, giving 1.60° rotation per metre. A velocity of 1463 metres/second (4800 feet/second) gives 1.64° rotation per metre and is the standard used for the basic scale of the fathoms/feet version of the sounder. In order to determine the true depth from the echo sounder graph, a series of scales are constructed to depict various velocities. The correct scale for a given velocity should then be selected by comparison with the "Bar Check".

As the basic metric scale reads from 0-40 metres (131.234 ft) it is longer than the 0-120 foot scale and the chord must be drawn from zero and extended beyond the point on the arc where it makes an angle of 60° at the centre of rotation. At a velocity of 1500 m/s the chord will cut the arc at 37.5 metres. There are 225 metres on the Front Plate. 360/225 = 1.60° rotation per metre. 1.60 x 37.5 = 60°. The arc is drawn with a 5 inch radius which is the distance from the centre of rotation to the stylus.

The interval from zero on the chord to any division on the scale must be calculated along the chord and perpendiculars erected to the arc.

The intervals along the chord are calculated by the following formula, derived with the assistance of Dr. C. D. Maunsell.

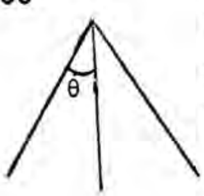
$$X_n = r\,\{0.5 + \mathrm{Sin}(2400^\circ\ n/v - 30^\circ)\}$$

where

X_n = Distance from zero of scale to division for n metres
n = Number of metres required for any specific division
r = Radius from centre of rotation to stylus
v = Velocity of sound (metres/second)

The stylus rotates at 200 r.p.m. or 3 1/3 r.p.s. In 1 second it has rotated through 1200°. If the depth were 1500 metres and the velocity 1500 m/s the stylus would rotate through 2400° by the time the echo is received.

$\theta = -30^\circ$



The centre of rotation of the stylus is at the middle of the paper. When the recorder is on its shallowest scale, neglecting the transducer depth adjustment, the transmission mark (zero depth) lies near one edge. The line joining the centre of rotation to the transmission mark then makes an angle of $\theta = -30^\circ$ with a line parallel to the paper motion.

For divisions to the left of centre of the scale or until angle θ becomes zero, the Sin quantity in the formula is negative. As θ increases from zero the Sin quantity is positive.

$$\left.\begin{array}{l} n = 0 \\ X_n = 0 \end{array}\right\}\ \text{when}\ \ \theta = -30^\circ$$

Example:

Required the length from zero along the chord for the 5 metre division with a radius of 5 inches and velocity of 1500 m/s.

$$X_n = r\{0.5 + \text{Sin}(2400° \ n/v - 30°)\}$$

$$= 5\{0.5 + \text{Sin}(2400° \times 5/1500 - 30°)\}$$

$$= 0.625 \text{ inches for 5 metres}$$

Similarly for 40 metres

$$X_n = 5(0.5 + 0.559) = 5.295 \text{ inches.}$$

To produce the necessary scales for different velocities we drew each one with an expanded radius of 25 inches with divisions at half metre spacings, then photographically reduced them to the actual scale length for 40 metres.

To facilitate drafting the expanded scales, the computations were obtained in Gerber Counts by PDP-8 computer, a paper tape produced and the points plotted by the Gerber Flatbed Plotter. A point 25 inches from zero was incorporated in the computations and this point and zero were used to find the centre of the circle and draw the arc. The perpendiculars were erected by plotting two sets of the points, one directly above the other and separated by about 12 inches. The perpendiculars could then be drawn by setting a straight edge along the equivalent divisions on the two sets.

We had originally hoped to put divisions every 2 decimeters but it appeared they would be too crowded. Also when the sounder is switched to low speed where the basic scale reads from 0-240 metres each division would be 1.2 metres and awkward to scale.

We are producing scales for thirteen different velocities varying the interval from 1425 to 1514 metres/second.

J. G. Shreenan

OCEAN STATION "P" WEATHERSHIP OCEANOGRAPHY

PROGRAM REVIEW DECEMBER 1970

OVERALL GOALS:

Weathership Oceanography

A. To accumulate and interprete a climatological record of oceanographic (physical, chemical and biological) quantities from an open ocean station. Such a record is necessary to an understanding of normal conditions and normal variability in the ocean, which in turn is required for such purposes as recognizing abnormal variations or planning other ocean monitoring programs. Interpretation by this group is aimed at discovering what the normal variations are and attempting to relate them to various processes, such as air-sea interaction. In addition to data collected for use and publication by this group itself samples and data are collected for various purposes for outside agencies such as the Environmental Research Group at the Pacific Biological Station in Nanaimo and the Radiocarbon Laboratory at Scripps Institution of Oceanography.

B. To monitor variations in circulation in the Alaska gyre by means of oceanographic observations along Line "P", which runs from Swiftsure Bank to Station "P". Since Station "P" is more or less in the centre of the Alaska gyre Line "P" crosses most of the northward flow.

C. To do various special experiments designed to aid the interpretation of the climatological data. Examples of this would be higher frequency observations with the BT or STD, moored buoy current measurements and special air-sea interaction experiments.

"Richardson" Work: (D. Healey)

A. To examine oceanography of Western Canadian Arctic including water properties, current measurements, seismic survey and geological samples.

ACTIVITIES IN 1970:

Weathership Observations

A. Climatology

1. Bottle stations at Station "P": Basic schedule is weekly bottle casts to 4200 m on alternate patrols, continuing series begun in 1956. Samples were also taken

on 6 out of the 9 patrols in 1970. Unfortunately two of the patrols missed were consecutive.

Water samples are taken from these casts for salinity, dissolved oxygen, nutrients (Phospate, Nitrate and Silicate: some casts only), Alkalinity (some casts only). Some of these analyses are performed on board.

2. Bathythermograph observations at Station "P": Every 3 hours to coincide with surface meterological observations. (Encoded and transmitted to CANMARPAC and FNWF in Monterey.) These are continuing the series begun in 1954 and are taken by the ship's personnel on every patrol.

3. STD observations at Station "P": One 300m and one 1500m cast each week. On cruises without oceanographic technicians these observations are carried out by ship's personnel. In the case of STD malfunction bottle stations are performed instead on cruises with technicians. The 1500m cast is encoded for transmission to CANMARPAC.

4. Surface salinity samples are taken daily at 0000 GMT by ship's personnel on all cruises.

5. Surface nitrate samples are taken on alternate days at 0000 GMT by ship's personnel on all cruises.

6. Daily 150m vertical plankton hauls (taken by ship's personnel when technician not aboard) for Environmental Research Group, Pacific Biological Station, Nanaimo.

7. 1200m vertical plankton hauls twice during each cruise (taken by ship's personnel when technician not aboard) for E.R.G., Nanaimo.

8. Horizontal plankton haul for 10 minutes on three consecutive nights three times each cruise (by ship's personnel when technician not aboard) for E.R.G., Nanaimo.

9. Weekly surface measurement of photosynthesis and plant pigment for E.R.G., Nanaimo.

10. VanDorn bottle cast every second week for plant pigment, C^{14} and nitrate samples, for E.R.G., Nanaimo.

11. Air samples are taken weekly for CO_2 analysis on all cruises (taken by ship's personnel when technician not aboard).

12. Surface sample (200 liter) from sea water loop for $C^{14}O_2$ analysis twice during cruise, with sample for total CO_2 analysis at same time.

13. Surface sample for alkalinity observations every 3 days.

14. Deeper samples for $C^{14}O_2$ analysis (200 liter) occasionally.

15. Rainwater and surface samples are collected for the Radio-carbon Lab at Scripps Institution of Oceanography.

16. Birds are counted on every watch and a log is kept of mammal sightings, both by ship's personnel.

B. Line "P"

1. Bathythermograph (or XBT) casts are made at every 40th minute of longitude en route to and from Station "P" by ship's personnel.

2. Surface salinity samples are taken every 40th minute of longitude en route to and from Station "P" by ship's personnel.

3. STD casts to 1500 meters (or the bottom if shallower) at 12 positions between Swiftsure Bank and Station "P". Two of these casts are extended to the bottom (2400 and 3500m respectively) with bottle casts. Completion of these stations is dependent upon the weather and there being sufficient spare time in the ship's schedule. Generally the incoming ship is obligated to do only those stations not occupied by the outward bound vessel (if both carry oceanographic technicians). Because of the weather and the low priority of this work as compared with arriving in port early the record is modest. In 1970 there were 8 round trip transects on which oceanographers were present going at least one way: 3 of these were completed, 2 stations were missed on 2 of these, 4 stations missed on 1, 7 stations missed on 1 and 11 missed on the last. Improving the sampling density on Line "P" is one of the main reasons for wishing to man all patrols with oceanographic technicians.

4. Surface nitrate samples are collected at each Line "P" station for E.R.G., Nanaimo.

C. Special Experiments

1. In co-operation with the Institute of Oceanography at the University of British Columbia an air-sea interaction experiment was carried out during the 15 May - July 2 patrol of the CCGS Vancouver. Aimed at studying the statistics of the wind field and thermocline and mixed layer response to winds this work involved continuous recording of winds using a fast response anemometer and frequent sampling with the STD and XBT's.

2. In co-operation with the Institute of Oceanography at the University of British Columbia and the North Atlantic Treaty Organization current measurements using a moored buoy and recording current meters were made during the 26 June - 13 August patrol of the CCGS Quadra.

Weathership Group

The most visible product of the shore-based activities was the continuation of the data report series, which is now up to date to the beginning of 1970. The move to Victoria and absence of D. Healey in the Arctic resulted in an interruption of the flow of reports. However, it is expected that the results of the cruises in the first 9 months of 1970 will be in press in early 1971.

Dave Healey and Curt Collins are also working up the results of a series of comparisons of STD and bottle casts, while De Jong and Collins produced a report describing a system for on-line digitizing of Expendible Bathythermograph data with a shipboard computer.

Arctic Work on C.S.S. "Richardson"

D. Healey was on board the C.S.S. "Richardson" in the Beaufort Sea area from July 9 until September 5. With the assistance of personnel from Bedford Institute and the Department of Geophysics at U.B.C. programs of bottom sampling, measurement of water temperature and salinity, current measurements (both while anchored and by following free floating current followers) and seismic and side-scan sonar observations were carried out. This work was considerably hampered by the inadequate facilities available on the ship (e.g. no. 110V electrical power and no dry lab space) and particularly by the restrictions on working time imposed by the rule of no overtime except on weekends.

A preliminary cruise report has been submitted to MSB headquarters and a more detailed description of the scientific results is now in preparation.

TABLE 11

Sea and Field Time, Man Weeks

Activity	Time	Men Involved
Weathership	82	8
Arctic	9	1
Total	91	9

We hope that the next edition of "Lighthouse" will be available in mid-July. Members of all field parties and rotational staff are urged to submit articles for this issue.

It will be mid-field season and many activities will be taking place. Everyone will be exceptionally busy and there should be no dearth of noteworthy and newsworthy items which would help to make the summer issue of this publication one of the best yet.

Rotational Central Region hydrographers, Bill Silvey and Ray Chapeskie will be attending to the editing of that issue. Please send your contributions to either one of them at

Canadian Hydrographic Service,
Marine Sciences,
Canada Centre for Inland Waters,
Box 5050,
BURLINGTON, Ontario.