The NMFS research vessel 'Delaware II' sails from Woods Hole, Mass., to assess shellfish resources south of New England. See cruise report page 9.

INTERIOR & COMMERCE TO CELEBRATE 100 YEARS OF FISHERY CONSERVATION

Secretary of the Interior Rogers C.B. Morton has announced that his department and the Department of Commerce will sponsor a conference on "Fish in Our Lives" in Washington, D.C., in December 1971 to commemorate the 100th anniversary of Federal fishery conservation efforts.

The conference is expected to attract fishery scientists, economists, sport-fishing interests, and nutritionists. The conference will deal with many aspects of fishery resources, including the growing menace of pollution.

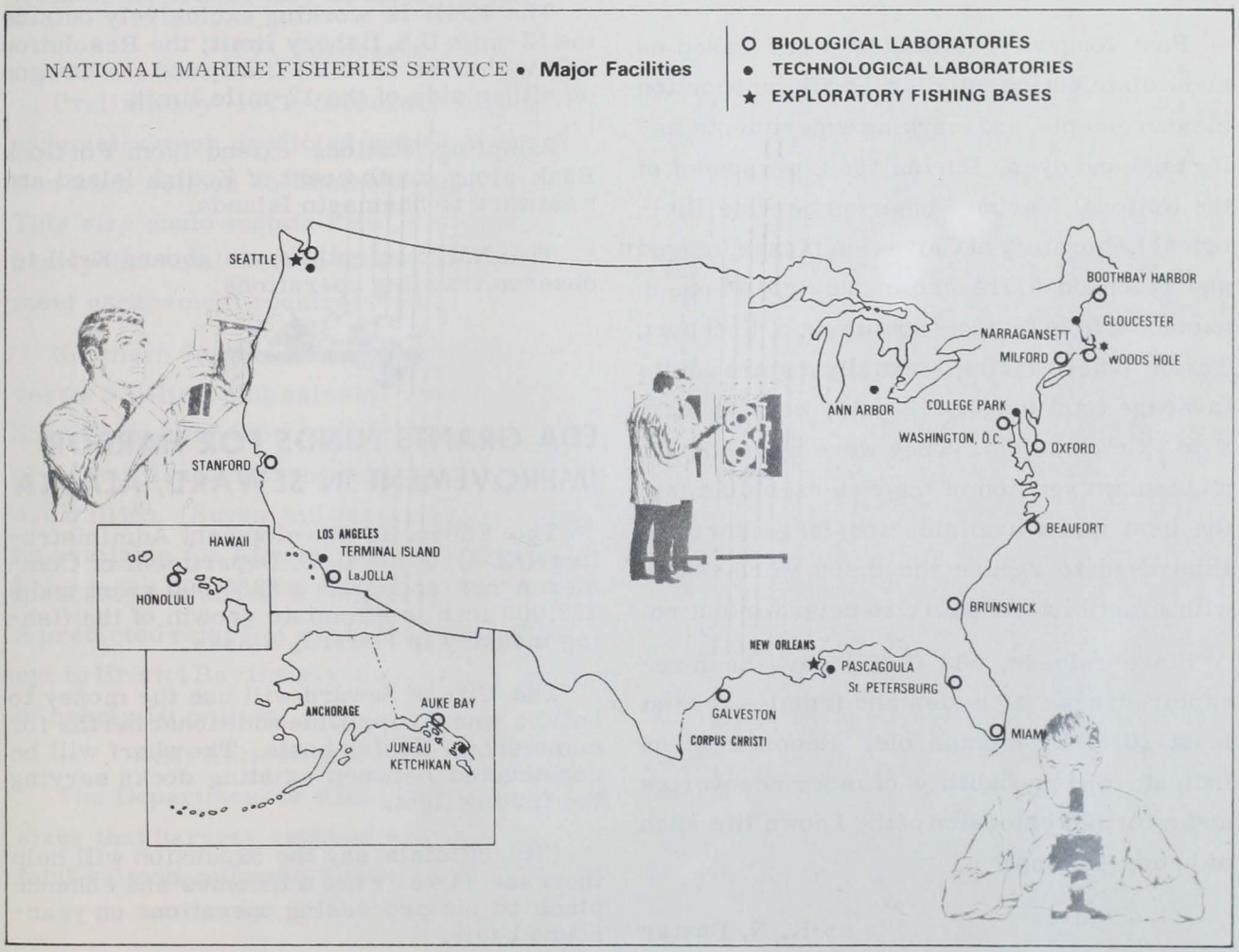
Secretary Morton said Federal fish hatcheries and laboratories will hold open house during the year.

Began in 1871

In 1871, Spencer Fullerton Baird was appointed first commissioner of fish and fisheries. President Grant signed an act "for the protection and preservation of the food fishes of the coasts of the United States." Since then, Federal fish conservation has been the responsibility of a succession of agencies--at present, Interior's Bureau of Sport Fisheries and Wildlife (BSFW) and Commerce's National Marine Fisheries Service (NMFS).

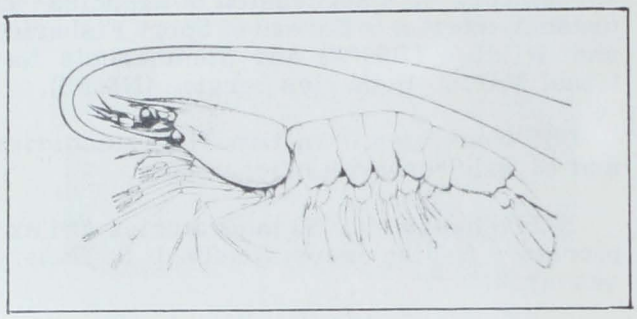
BSFW operates 100 national fish hatcheries and 16 fish-research laboratories.

NMFS has nearly 30 laboratories and exploratory fishing bases involved in fishery research.



BROWN SHRIMP LIVE LONGER THAN MANY BIOLOGISTS BELIEVE

It has been generally accepted among fishery biologists that the average life span of the more important penaeid shrimps is about 1 to $1\frac{1}{2}$ years. However, recent evidence suggests that they live considerably longer.



Past longevity estimates were based on size distribution studies, body proportion measurements, and marking experiments using tags and dyes. During 1969, personnel of the National Marine Fisheries Service Biological Laboratory at Galveston, Texas, tagged and released 6,514 brown shrimp, Penaeus azetecus, in 24 fathoms southwest of Freeport, Texas. These shrimp, sexually mature adults (average total length 169 mm), were at least 8 to 12 months old. They were marked with a cut-down version of the Petersen disc tag, the best mark available for large shrimp. Pins used to secure the discs were coated with an antibiotic mixture to retard infection.

Since release, 583 (8.9%) have been recaptured; several, males and females, are at least 20 to 27 months old. Recent returns indicate the probability of more recoveries and a further extension of the known life span of brown shrimp.

--K. N. Baxter

U.S. AND USSR STUDY SHRIMP IN GULF OF ALASKA

The abundance and distribution of northern shrimp over a large part of the Gulf of Alaska is being studied in a cooperative U.S.-USSR research project.

The project resulted from discussions between U.S. and Soviet scientists in Moscow, December 1970. Such meetings are provided for in U.S.-USSR agreements concerning North Pacific fisheries as opportunities to study the status of resources.

The Vessels & Areas

Three research vessels are participating: the Soviet 'Krill', the NMFS 'Oregon', and the 'Resolution' of the Alaska Department of Fish and Game.

The Krill is working exclusively outside the 12-mile U.S. fishery limit; the Resolution only within the 12-mile limit; and the Oregon on either side of the 12-mile limit.

Sampling stations extend from Portlock Bank along south coast of Kodiak Island and westward to Shumagin Islands.

Two NMFS scientists are aboard Krill to observe trawling operations.

EDA GRANTS FUNDS FOR HARBOR IMPROVEMENT IN SEWARD, ALASKA

The Economic Development Administration (EDA) of the U. S. Department of Commerce has approved a $288,000 grant and a $72,000 loan to stimulate growth of the fishing industry in Seward, Alaska.

The City of Seward will use the money to build a wharf to provide additional berths for commercial fishing boats. The wharf will be constructed between existing docks serving the fishing fleet.

City officials say the expansion will help increase fishermen incomes and enhance plans to put processing operations on year-round basis.

ALASKA'S SALMON FORECAST

Alaskan salmon harvests of slightly over 40 million fish of all species are projected for 1971 season, reports Melvin C. Seibel, Alaska's Commercial Fisheries Division. If this harvest is achieved, it would produce about 2.3 million cases of canned salmon--and 15-20 million pounds of fresh, frozen, and cured salmon products.

In 1970, about 66 million salmon were harvested. The lower projected harvest for 1971 reflects weakness in recent odd-year pink salmon runs to Southeastern Alaska and Kodiak, and an off-cycle year for Kvichak River system. The latter is the major contributor to Bristol Bay sockeye fishery.

1971 Forecasts

Preliminary 1971 forecasts indicate an especially weak predicted return of 4.3 million pink salmon to Southern Southeastern. This size could sustain little, if any, harvest; nearly the total return would be needed to meet escapement requirements.

Northern Southeastern has projected harvest of 5 million pink salmon. Prince William Sound has a brighter outlook: a total return of 6.2 million pinks, and harvest projection of 4.7 million. Seven million pink salmon will be available for harvest in Kodiak fishery if forecasted return of 8.3 million materializes. A predicted return of nearly 17 million sockeye to Bristol Bay fishery would yield harvest of nearly 10 million.

What Estimates Depend On

The Department of Fish and Game emphasizes that harvest estimates depend on 1971 total salmon returns being the size expected. Weaker returns may require more restriction of harvests to insure desired escapement goals. Larger-than-forecast returns may allow relaxation of regulations to insure maximum allowable harvest.

The forecasts result from extensive studies each year throughout state. Estimates of parent spawning populations and later abundances of young salmon gotten during past several years were analyzed for 1971 forecasts. In areas such as Prince William Sound, these techniques have been refined repeatedly. They now provide forecasts with sufficient accuracy for management and operational planning.

1970 Forecast

In 1970, the Department's first statewide salmon-harvest forecast (released in Nov. 1969) of 96 million proved too high; about 66 million salmon were harvested. Salmon returns considerably smaller than anticipated in 3 major Alaskan fisheries--Southcentral and Kodiak pink salmon, and Bristol Bay sockeye fisheries--accounted for roughly 90% of difference between projected and actual 1970 salmon harvest.

Total returns below forecast levels in these areas required additional restriction of harvest to insure achievement of adequate escapements. Widespread weaknesses in salmon runs throughout Alaska and British Columbia suggest possibility that below-average survival conditions existed in ocean-rearing areas.

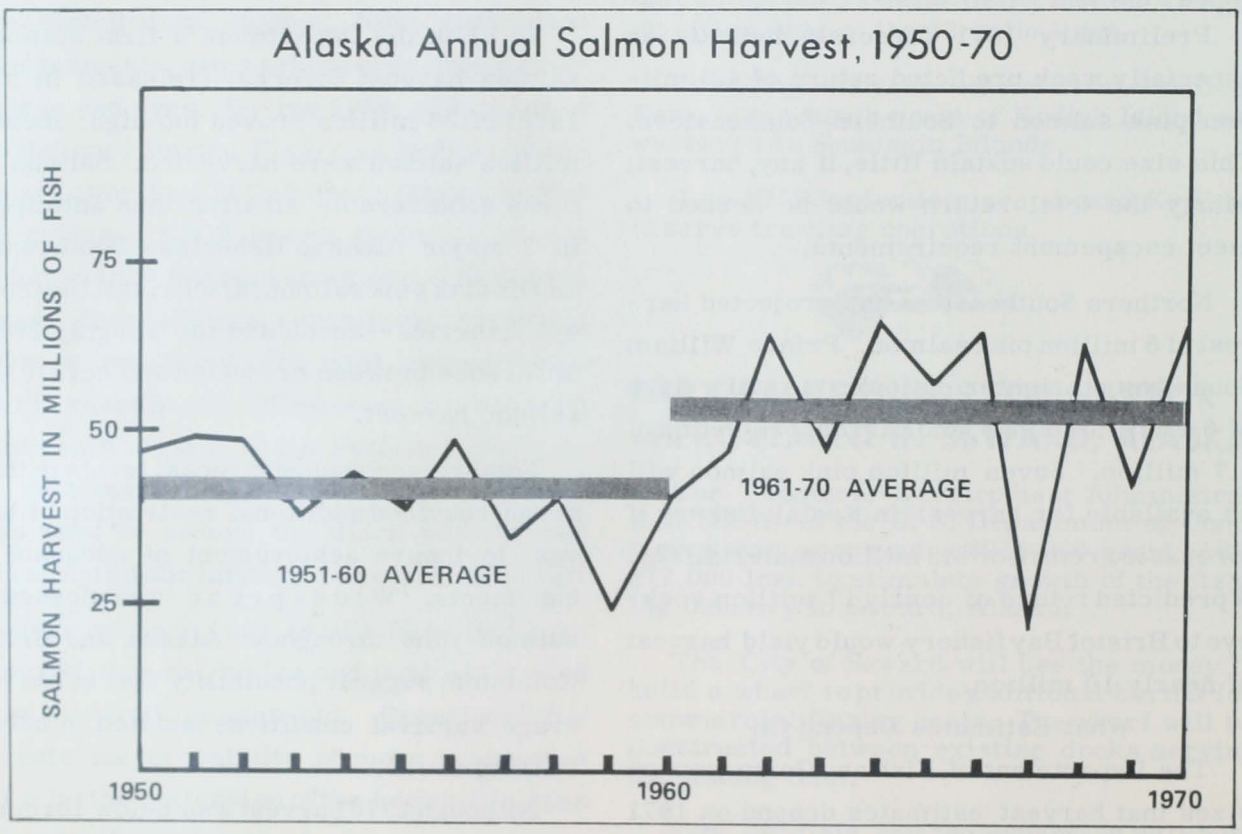
Although 1970 harvest was below forecast, the 66 million salmon produced 3.7 million

cases, and the largest harvest in more than 20 years. Major contributions included 10 million pink salmon from Southeastern, 12 million pinks from Kodiak, and 21 million sockeye from Bristol Bay.

State Optimistic

The Department is optimistic about the future of Alaska's salmon resources. This is not based on the size of a salmon harvest for any single year. Because salmon populations exhibit large natural fluctuations, it is necessary to base measures of population health on averages or trends. The graph below depicts annual commercial harvests of salmon in Alaska for 1951-70.

The two horizontal bars represent average annual harvest levels for the two 10-year periods--1951-60 and 1961-70. Average annual salmon harvests during the latter have exceeded by about 12 million fish the average of previous 10-year period. On a cumulative basis, this increase resulted in 120 million more salmon for Alaskan fisheries since 1961. If there are no natural catastrophes, or loss of salmon habitat from unwise development of other resources, Department biologists are confident that this higher level of production can be sustained and also increased. The Department emphasizes that achievement of maximum sustained harvest is primary goal of commercial fisheries management.



A Special Report on

FISH BLOCKS and STICKS and PORTIONS

Morris R. Bosin, Clemens B. Bribitzer,
Donald R. Whitaker
NMFS Division Current Economic Analysis

In 1970, supplies of blocks, sticks, and portions increased, but the rate of increase was not so great as in 1969. Imports of blocks were high in first-half 1970 but dropped sharply in second half as inventories were depleted in exporting countries.

The shortage of blocks, especially cod, caused prices for all blocks to rise; these reached record levels in December. As prices rose, U.S. inventories fell to 30.7 million pounds at the end of 1970.

Production of sticks and portions in 1970 increased 6% over 1969 but, in the fourth quarter, production was less than in 1969 period.

The higher prices of blocks forced a rise in prices of sticks and portions, which set records at the close of 1970. Concurrently, there was a decrease in disappearance of blocks, sticks, and portions in second-half 1970 compared to first half.

Two principal conditions will greatly influence the quantity of block imports and production and the sales of sticks and portions in 1971:

(1) the worldwide shortage of supplies of blocks, and

(2) the resultant high price levels.

GROUNDFISH

In 1970, supplies of groundfish fillets were 384 million pounds, 9% above 1969 and 18% above 1965-69 average. Landings of groundfish declined again in 1970--down 11% from 1969 to 92 million pounds (fillet weight). Imports continued to make greater inroads into U.S. markets. They increased 18% in 1970 to 245 million pounds and accounted for most of increase in supplies.

In the past 2 years, a discernible pattern of events has affected most groundfish species. In 1969, and especially 1970, prices in the economy became increasingly inflationary. Wholesale prices of groundfish fillets in the U.S. also rose, reflecting increasing costs of operation. High wholesale prices for fillets attracted heavier quantities of imported fillets--notably cod, flounders, and haddock. Imported products have been able to compete effectively with the domestic product because of lower production costs and because U.S. distributors considered imports a more stable source. An important reason for this stability was that supplies coming from several nations spread the risk of declining fisheries.

When a larger proportion of world fillet production was shipped to the U.S. in 1969 and 1970, a greater strain was placed on world

supplies. Greater fishing effort by exporting countries, along with rising costs, made these countries more dependent on high wholesale prices, such as those in the U.S.

Toward the end of 1970, wholesale prices began to level off as the economy cooled somewhat. The combination of scarcer supplies of some species (cod and haddock) and higher fillet prices, compared to other food items, accounted for a slowdown in consumption.

Although the demand for cod fillets has been bolstered by the burgeoning fish-and-chip outlets, scarce supplies and higher prices very possibly may cause buyers to resort to substitute species at lower prices. However, not all potential demand for cod fillets will be satisfied by substitutes, especially in institutional market.

In 1971, world supplies of cod fillets, and possibly pollock, may be diverted increasingly from the U.S. market. The United Kingdom and European Economic Community countries are likely prospects because of rising prices there.

The rise in wholesale prices of fillets in 1970 did not prevent consumption from reaching 333 million pounds, 9% above 1969. Cod-fillet consumption was constrained chiefly by supplies. Flounder and ocean-perch consumption may have been hurt in the latter part of 1970 by high prices.

Consumption of groundfish fillets is expected to be about 180 million pounds in first-half 1971; it was 181 million in first-half 1970. Flounder and ocean-perch consumption likely will rise, while consumption of cod, haddock, and pollock will fall.

World landings of cod are not expected to increase in 1971 and, possibly, may drop slightly in the next 2 years. A larger percentage of cod will be diverted to fillet production if--the potential demand for cod fillets in the U.S. generated by fish-and-chip franchises remains strong, and demand for sticks and portions levels off because of higher prices.

HALIBUT

Supplies of halibut decreased slightly in 1970 due to quota restrictions. Increased landings by U.S. vessels were offset by decreased imports.

Prices in 1970 were higher than in 1969, both wholesale and retail. Because of these higher prices, sales were a little low compared to previous years, and holdings at the end of 1970 were unusually high.

But a large increase in consumption in January 1971 ended fears of lower prices in 1971 because of decreased consumption and higher holdings in 1970. The outlook in 1971 is for firm prices and lower stocks.

WHITING

Supplies of whiting--headless and dressed--were 27 million pounds in 1970, 20% below 1969. Supplies have declined continuously for 5 years.

Consumption of whiting declined in 1970 following downward direction of available supplies. Consumption has also been down for

the last 2 years. With the prospect for low landings in 1970, processors paid high prices to fishermen to assure supply.

As a result of higher exvessel prices, wholesale prices rose. They began to attract substantial quantities of headless and dressed whiting from Argentina and South Africa. Prior to 1970, virtually all whiting were imported as blocks. Inventories of headless and dressed whiting began to build in summer 1970 as imports undersold domestic product.

To meet this competition, domestic processors began to lower wholesale prices, but exporters did likewise, and the price was still dropping in March 1971. Prospects in 1971 indicate that if wholesale prices continue to fall, imports will begin to shift back to blocks, especially because of the present U.S. shortage of blocks.

Consumption of headless and dressed whiting will probably continue to decline but, possibly, whiting in other forms--blocks and fillets--may take up some of slack.

SALMON

Salmon supplies were 2.2 million standard cases during first-half 1970, considerably lower than previous years. Canners and distributors made a concerted effort to reduce stocks during January through June to make room for anticipated record pack. Biologists had predicted a pack of 5.6 million standard cases, highest since 1941. The pack was larger than usual--3.9 million standard cases--but not a record. Salmon runs in Central and Southeastern Alaska fell below expectation.

Despite large pack, inventories were not excessive in second-half of 1970 and beginning of 1971. Prices for pink salmon were a little higher than 1969, reflecting relatively short stocks. Red salmon were plentiful, but prices remained firm.

The 1971 outlook is for a smaller salmon pack: 2.5 million standard cases, 36% below 1970, and 22% below most recent 5-year average. At beginning of 1971, inventories were not excessive. The industry is not unduly distressed about moving stocks in light of lower anticipated pack.

Prices should remain firm for red salmon and may even edge up for pinks. Consumption may rise slightly, primarily because of carryover from last year's large pack.

TUNA

Supplies of canned tuna increased substantially in 1970. Supplies were estimated at 505 million pounds, edible weight, 8% above 1969. U.S. tuna landings were a record 452 million pounds in 1970--also 8% above 1969. Imports totaled 313 million pounds, product weight, the 1969 level. Total production of canned tuna was 21.7 million standard cases in 1970--8.5% above 1969 pack.

Demand for canned tuna was strong during most of 1970; retail prices and per-capita consumption advanced. Exvessel and wholesale prices also increased sharply; albacore prices increased most rapidly.

In second-half 1970, and in early 1971, canned tuna was tested extensively for mercury. About 3.6% of U.S. domestic and imported

supplies was found to exceed the Food and Drug Administration's guideline of one-half part (.5) mercury per million parts of tuna. Tuna exceeding the guideline were withheld from sale or removed from market.

The outlook is for slightly higher prices and for recovering sales. It is possible that sales could be back to their long-run growth rate by midyear, if not sooner.

SARDINES

The domestic herring fishery continued to decline in 1970. Total supplies were 83 million pounds, 11% below 1969. U.S. landings decreased to 37 million pounds, about a third below 1969. The pack was below 20 million pounds for the first time in recent history of the fishery. Contributing to declining pack were low abundance, unpredictability of resource, and increasing use of imported sardines.

Imports of sardines increased slightly in 1970. But the category most competitive with U.S. pack--sardines in oil from Canada--more than doubled: 4.0 million pounds, compared with 1.9 million in 1969. Both wholesale and retail prices were up in 1970. Consumption was down, the decline mostly attributable to lower available supplies.

Prospects in 1971 are for a continued slight increase in imports, and a little lower consumption.

'DELAWARE II' ASSESSES SHELLFISH RESOURCES SOUTH OF NEW ENGLAND

The NMFS research vessel Delaware II defined and assessed resources along the continental slope south of New England from Dec. 18, 1970, through Feb. 26, 1971. The primary objectives of the 5-part cruise were:

1. To test and evaluate a system installed aboard the Delaware II for setting and hauling various pots in deep water.

2. Determine the species composition and distribution available to this fishing method during winter.

3. Gather biological information and samples of the catch; tag and release lobsters for migration studies; record and transmit hydrographic information.

4. Conduct test fishing with a variety of trapping devices (pots) along continental slope at 3 locations.

The scientists sampled at 3 primary locations off the Northeastern seaboard. Transects from about 100 to 600 fathoms were accomplished at Block, Hudson, and Baltimore Canyon (see map). All sampling was completed during January and February.

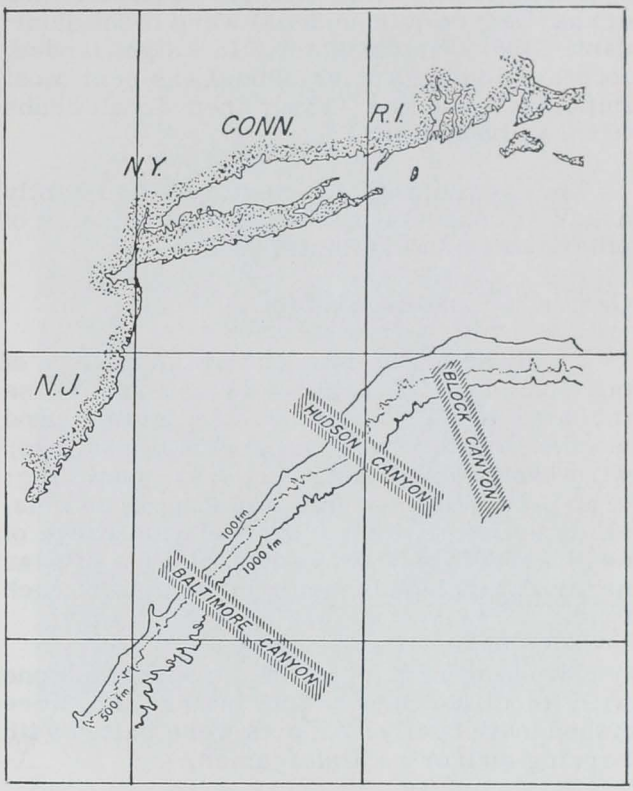


Fig. 1 - Areas of Operation.

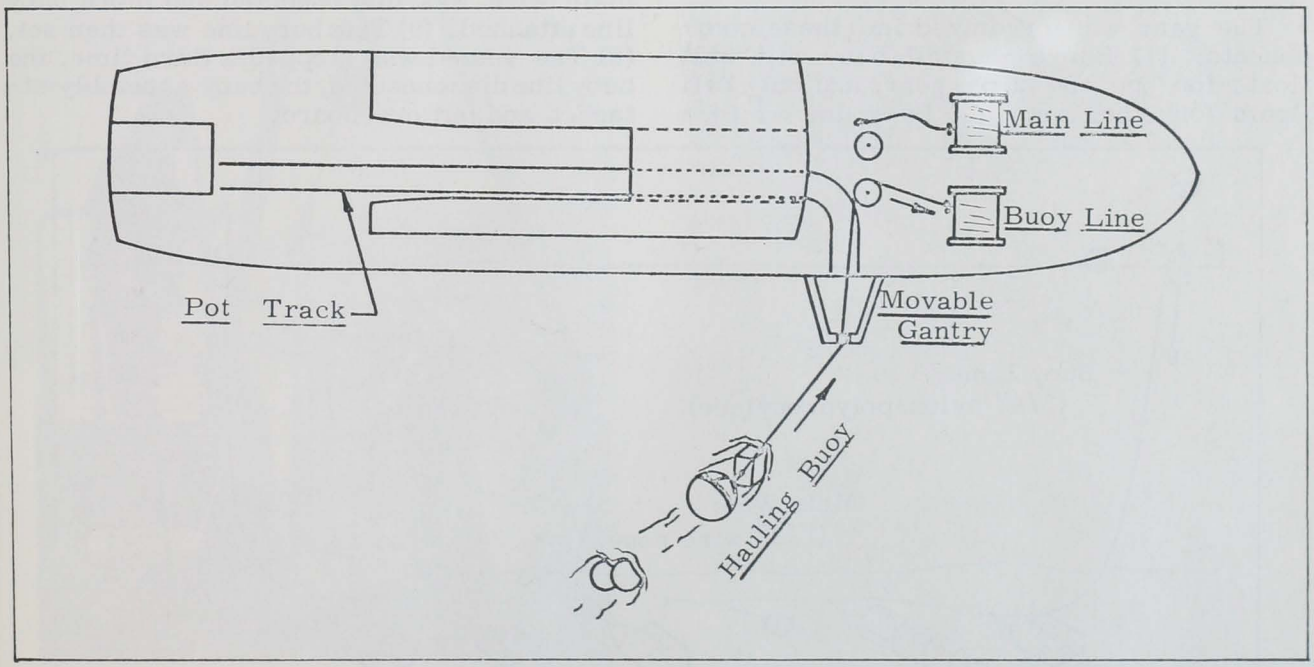


Fig. 2 - Delaware II's deck layout.

Three varieties of crustaceans comprised 92% of recorded catch of 20,103 pounds. Red crabs (Geryon quinquedens) were most abundant: 69% of total catch. In weight landed, lobster (Homarus americanus) was next most important species (13%); then Jonah crabs (Cancer borealis) 11%.

The remaining 7% were predominantly hakes (Urophycis sp.) and small amounts of other fishes and animals.

Gear and Handling System

To cover broadest spectrum, a variety of pot types were fished at most locations. These included steel, plastic-coated steel, and wooden lobster pots; cylindrical fish pots; wire-mesh shrimp pots, and west-coast king-crab pots. With exception of king-crab pots, all types were fished over a wide range of depths in sets of 10 to 50 pots. Strings of gear normally included one or more pots of each type.

Two king-crab pots, one standard and one with modified heads for taking fish, were fished individually. All pots were baited with herring and/or redfish frames.

Setting

The gear was organized into these components: (1) Buoys--a staff buoy with ball floats for one end of the gear, and only ball floats for other end. (2) Buoy line--$\frac{3}{4}$-inch polypropylene cored nylon braided rope. (3) Main line--$\frac{1}{2}$-inch galvanized wire rope. (4) Pots--lobster, shrimp, and fish traps.

The staff buoy was attached by 5 fathoms of polypropylene rope to a pair of inflatable ball floats. The buoy line, secured to this assembly, was divided into 50-fathom lengths to allow easy adjustment for many operational depths. The main wire was divided into 10-fathom lengths to permit changing number of pots fished on each set.

The sequence of operations during setting was: (1) Pots to be fished were baited and arranged in order in an open-ended skid-rack. (2) The vessel began steaming slowly along a predetermined track for setting the pots. (3) The buoy line was shackled to staff buoy and ball float assembly. (4) The staff buoy & ball float assembly was pushed out the stern ramp, followed by buoy line. (5) When enough buoy line had been set, the vessel was stopped. The buoy line was stopped off, disconnected, and the end of main wire was attached. (6) Then the main wire was set while steaming. A pot was attached to each 10-fathom length with a snap hook slipped over running line. The hook would snub against eye splice in each length of wire; the pot would be pulled overboard. (7) Again the vessel was stopped. The main wire was disconnected and more buoy line attached. (8) This buoy line was then set. (9) The vessel was stopped a third time, the buoy line disconnected, the buoy assembly attached and put overboard.

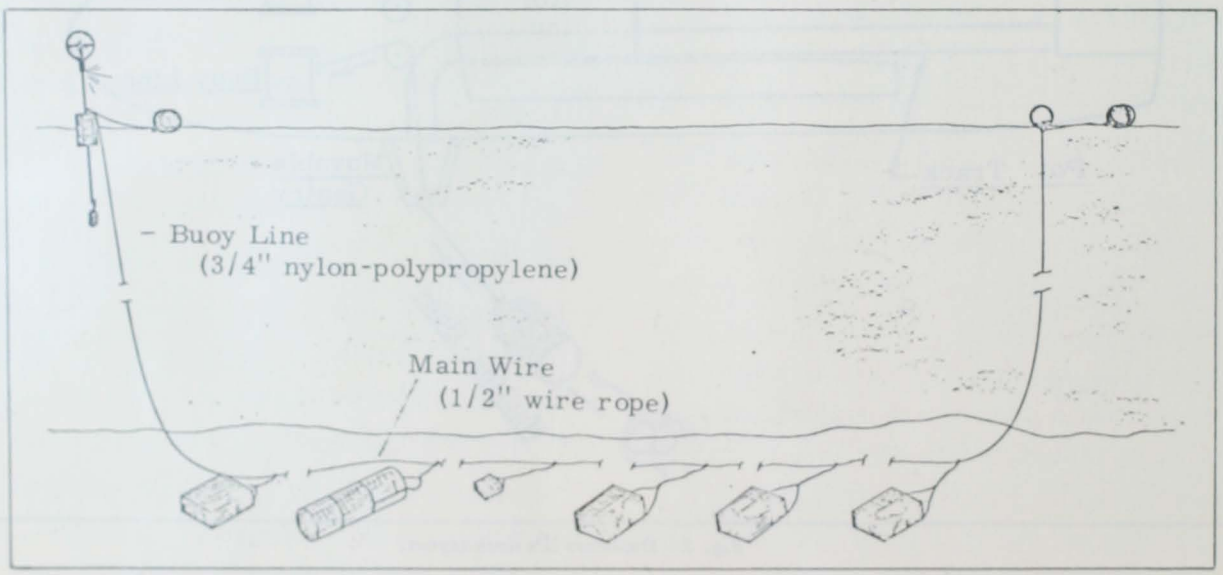


Fig. 3 - Schematic view showing arrangement of typical set. "Standard" sets usually consisted of a total of 20 pots, including 3 types lobster, shrimp, and fish pots.

Hauling

Hauling involved additional gear not used in setting. An opening in starboard bulwarks was used to bring pots aboard. A hydraulically powered movable gantry was mounted over opening. Two deck mounted fairlead blocks, one for buoy line and one for main line, provided leads to winch drums. A tensiometer was installed on one to provide an accurate gauge of load on buoy line. The rate of haul, therefore, could be adjusted to prevent excessive line tension.

The sequence of operations during haul back were: (1) The vessel approached buoy parallel with direction of set. (2) A grapnel was thrown over a floating line between staff buoy and ball floats. (3) A messenger line from starboard winch drum was passed through block at top of haulback gantry. (4) The buoy assembly was detached, hauled aboard, and carried aft for next set. (5) At same time, messenger line and buoy line were connected and hauling started. (6) When the buoy line was aboard, a messenger line from port winch drum was connected to main wire. (7) Buoy line was disconnected and hauling main wire with pots attached was started.

Fig. 4 - Lobster pot coming aboard Delaware II. Note moveable gantry and track (at bottom).

Fig. 5 - Stern area showing pots ready for launching off track. Note fairlead and buoy line.

(8) As hauling continued, the pots were brought to gantry hanging block. The gantry was brought inboard and pots were dropped on deck by action of gantry's arc of travel. (9) The pots were detached manually and skidded down racks for emptying, rebaiting, and storage in preparation for next set. (10) Then hauling was switched back to original winch drum for retrieval of buoy line at other end of string of gear.

Buoys

Two types of buoys were used: a lighted radar reflecting staff buoy, and inflatable ball floats.

The staff buoy was equipped with an aluminum radar reflector encased in a protective polyurethane foam sphere. Flotation was provided by a rectangular piece of styrofoam. Weight at bottom holds staff buoy upright.

The inflatable ball floats are about 20 inches in diameter. They are used with staff buoy to facilitate retrieval of gear (see Fig. 3).

Coverage and Results

Sixty-one sets were made ranging from 85 to 823 fathoms. Due to weather and other operational factors, the time each individual set was on bottom varied; the average soaking time was 21 hours.

The scientists sampled at three locations along continental shelf at Block, Hudson, and Baltimore Canyons. When possible, "standard sets" of 20 pot strings of gear were fished one or more times within each 100-fathom interval between 100 and 800 fathoms. Each set included lobster, shrimp, and fish pots. At some locations, standard sets were supplemented by sets using only lobster or king-crab pots.

Fig. 6 - Large lobster weighing about 20 pounds. Average weight of lobsters was over 3 pounds.

During cruise, 23,607 hours of pot-effort were completed. This was 1,000 individual pot-days of effort. Of this total, over 83% was by lobster pots; the remainder fish pots (8%), shrimp pots (7%), and king-crab pots (1%). Geographically, effort was divided equally among the 3 canyons.

The total catch was over 20,000 pounds, most of this crustaceans. Small amounts of fish also were caught.

Red Crabs

The red crab was 69% of total catch. This is particularly significant because the greatest concentrations of red crab were in relatively deep water, over 250 fathoms, and received somewhat less coverage than shoaler depths. In areas sampled, the most dense concentration of red crabs was at 400-fathom depth contour near Hudson Canyon. Here, lobster pots averaged 122 pounds of red crab per pot-day; a single king-crab pot caught 714 pounds in an 18-hour set.

Good concentrations of red crabs also were found at Block and Baltimore Canyon sampling sites. The red crabs averaged about 1.2 pounds each and were found from 166 to 823 fathoms. There were consistently high concentrations between 250 and 500 fathoms.

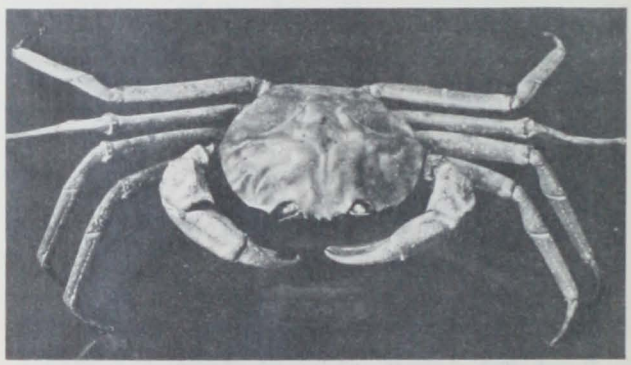


Fig. 7 - Red crab (Geryon quinquedens), the most abundant species caught. Occasionally reach over 2 lbs.
(Photos: W. F. Rathjen, NMFS, Woods Hole)

Table 1 - Fishing Effort by Canyon

AREA	No. Sets	Pot Hours Fished: Lobster	Shrimp	Fish	King Crab	Total	Percent
Block C.	18	5,975	661	785	96	7,517	31.8
Hudson C.	26	6,612	324	415	163	7,514	31.8
Baltimore C.	17	7,068	721	787	None	8,576	36.3
Totals	61	19,655	1,706	1,987	259	23,607	

Lobster

In weight, lobster catches were about 13% of total. They were caught at the three areas sampled from 85 to 300 fathoms. The best concentrations were between 150 and 200 fathoms at Baltimore and Hudson Canyons; there, lobster pots averaged about 6 pounds per pot during 24-hour periods.

Catch rates at shoaler and deeper depths were much less. Comparing the 3 areas sampled, the Baltimore Canyon provided the best catches. More than 800 lobsters averaging over 3 pounds were taken during cruise; of these, 326 were tagged and released for migration studies, the remainder preserved for research on stock identity.

Jonah Crabs

Jonah Crabs, which are similar to inshore rock crabs, were surprisingly abundant in observed catches. They were most plentiful in sets at less than 150 fathoms but were caught down to over 200 fathoms.

The best indications accounted for average catches of about 8 pounds per pot-day from lobster pots.

The observed depth ranges for the 3 predominant species of crustacea were:

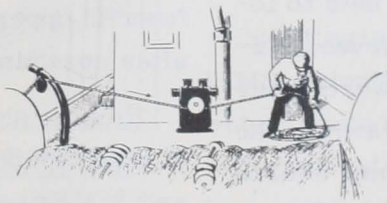
Table 2 - Depth Range of Crustacea

	Red Crabs		Lobsters		Jonah Crabs		Depth Fished	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	Fathoms							
Block C.	175	654	85	273	85	210	85	785
Hudson C.	185	823	151	300	98	212	98	823
Baltimore C.	166	583	89	293	89	200	89	583
Entire Cruise	166	823	85	300	85	212	85	823

Fish

Catches of fish with the gear used were uniformly light. Red and white hake (Urophycis sp.) were the most common species in depths less than 500 fathoms. Beyond 500 fathoms, frequent catches of deep-water sharks and blue hake (Antimora rostrata) were made.

For more information, contact Keith A. Smith, Base Director, NMFS, EF&GRB, Woods Hole, Massachusetts 02543.



VIMS STUDIES HERRING SPAWNING SITES & NURSERIES

Scientists of the Virginia Institute of Marine Science determined recently which areas of 4 major river systems serve as spawning and nursery grounds for river herring and shad. The largest is the Potomac River with 45,000 acres of mainstream and 16,000 acres in 40 creeks from both Virginia and Maryland.

The James River system ranks second with 41,000 total acres; 8,300 of these make up 104 major primary and secondary streams.

The Rappahannock River is third with 16,000 acres, including 1,860 in 56 tributaries.

The York-Pamunkey-Mattaponi river system is fourth with 11,000 acres, including 900 acres in 38 streams. Only the two major branches of the York River system serve as nurseries because the York proper is too salty.

How They Sampled

Sampling was done monthly at 5-mile intervals from mouth of each river to fall line to locate nursery areas. A 4-man field crew used gill nets, seines, and fyke nets to capture adult fish. It used plankton nets to locate the eggs and newly hatched larvae. Extensive collections of juveniles were made with surface and midwater Cobb trawls. The crew worked from onset of spawning season in the spring until juveniles left in fall; it sampled a single river system each year.

Determining Spawning Areas

If ripe adults were caught, the site was assumed to serve as spawning area. The same assumption was made where eggs or larvae were taken in plankton nets. At least two visits, and frequently more, were needed to confirm whether a tributary or site in mainstream served as spawning area.

River herring and shad spawning areas extend upstream from point where fresh and salt water meet. The study indicates that most river herring spawn in the freshwater reaches of tributaries and, to a lesser extent, in tidal freshwater portion of mainstream. Above the zone in each river where fresh water first meets salt water, nearly all streams could be listed as "probable" or "confirmed" spawning sites. However, extensive industrial and domestic pollution in James and Potomac rivers has made some spawning waters unsuitable.

American & Hickory Shad

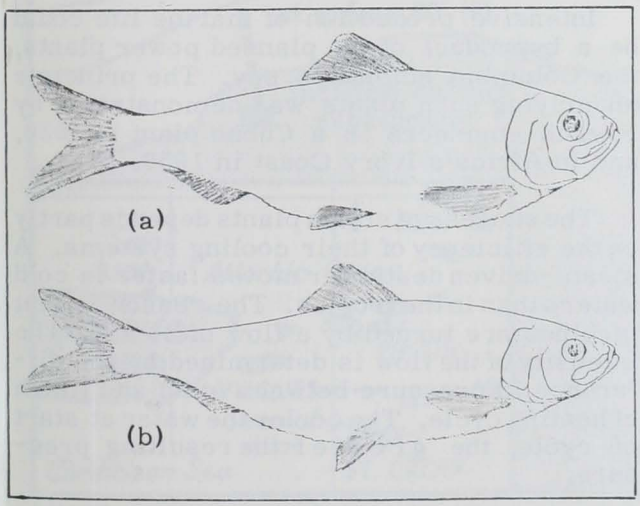
American shad prefer spawning on shallow-water flats of mainstream's tidal freshwater section. Most running-ripe spawners were captured on this area of the river. Shad also apparently spawn in tributary streams because shad larvae and young juveniles were found in upper reaches of tributaries shortly after spawning period.

Hickory shad also were found in running-ripe and spent condition in tributary streams and mainstream. These shad appear to run as far up mainstream as possible to spawn below first insurmountable barrier they meet. Hickory shad in spawning condition were taken below dam on Rappahannock River at Fredericksburg, at Walkers Dam on Chickahominy River, and below first dam at Richmond on

James River. Spawning hickory shad and river herring were captured in several tributary streams of these rivers.

Alewife & Shads

Alewife, hickory shad, and American shad enter Chesapeake Bay about same time in early spring. Blueback herring come later. Alewives have been reported in York-Pamunkey-Mattaponi river system in December and January. But earliest capture of alewives during VIMS study was in early February in James River system; surface-water temperature was 41°F. Alewives were found in spawning condition in tributary streams until mid-May. The height of spawning occurred during latter part of April, when surface-water temperatures ranged from 61° to 73° F.



Fishermen recognize alewife (a) and blueback (b) as two distinct kinds of river herring, but use several different names for them. Alewife is the deep bodied, big-eyed, greenbacked fish that runs early; blueback is the slender, small eyed, bluebacked fish that runs later.

Hickory Shad

The VIMS crews recorded earliest capture of hickory shad in York River system in late March; surface-water temperature was 50° F. These fish were found on spawning grounds with partially spent gonads until late May, when surface-water temperature was 73° F. Not enough were taken to determine peak spawning period.

American Shad & Blueback Herring

American shad enter Chesapeake Bay in March; height of spawning migration is in April. The earliest capture of ripe shad was in late March in Pamunkey River, when surface-water temperature was 50° F. Shad were found in spawning areas until late May, when water temperature was 67° F.

Blueback herring usually do not appear in the rivers until April; they remain until late May and early June. Most blueback spawning occurs in May when water temperature ranges from 64° F. to 75° F.

Males More Numerous

In all 4 species, the males generally are more numerous than females throughout spawning season; they also appear in the rivers earlier and stay later.

Starting in 1953, and continuing for 4 years, VIMS scientists investigated the effect of water temperatures on shad catches. They reported that almost no shad were caught below a water temperature of 40° F. Between 40° and 45° F, a few were caught. Largest catches were made in 45° to 59° F. At higher water temperatures, catches taper off but, even at 70° to 74° F, more shad were caught than at 39° F or less.

L.I. SHELLFISH THRIVE IN WEST INDIES EXPERIMENT

Oysters and clams shipped from Long Island Sound are being raised in St. Croix in the subtropical Virgin Islands in a bold effort to make use of what some have called the world's most important resource--the deep, cold, nutrient-rich water found in some parts of the world oceans. This was reported by Walter Sullivan in The New York Times on March 28.

The shellfish arrived in December 1970. Since then, their growth rate has been "absolutely fantastic," according to Dr. Arthur Chu, City University of New York, who is "mothering" the first crop.

I. Aquaculture

A larger plan, of which the shellfish experiment is one part, seeks to: explore the oceans' cold, deep layers for large-scale food production by "aquaculture"; generate power without pollution; extract moisture from trade winds to supply arid islands.

Antarctic Bottom Water

The Antarctic bottom water is the raw material for the plan. It originates in Antarctica's ice-clogged seas. It sinks beneath warmer waters of Atlantic, Pacific, and Indian Oceans. It inches northward until it crosses into Northern Hemisphere.

On its long voyage, the water gathers phosphates and nitrates from decayed marine life. It becomes remarkably fertile. And, where it surfaces--off Peru and West Africa, for example--oceanic life blooms.

Trying To Top Nature

The Virgin Islands experiment aims to stimulate and increase the upwelling phenomenon to propagate shellfish. The "longer-term prospect" is for use of the water's low temperature as a source of power and fresh water.

Three-quarters of the world's ocean water is colder than 50° F, state R. D. Gerard and Dr. A. O. Roels, Columbia University's Lamont-Doherty Geological Observatory. Much of it is just a few degrees above freezing. Because of its potential uses, they add, "it is obvious" that such waters are the planet's "most abundant resource."

St. Croix Experiment

A pipe has been laid from St. Croix's shore down to about 2,500 feet a mile off shore. Cold, nutrient-rich water is pumped into pools on shore. Cultures of one species of diatom, a microscopic form of algae, are put into the pools. The diatoms multiply until the water turns brown. Then they are passed through tanks with trays of oysters and clams.

The deep water is 50 times richer in phosphates and nitrates than surface water. The diatoms thrive--and so do the shellfish that eat them.

When the seed oysters and clams arrived in Dec. 1970, they were barely visible. They have been growing so fast that the scientists are looking forward to a summer feast.

In northern waters, oysters need 4 or 5 years to mature because they hibernate in winter and their diet is less rich.

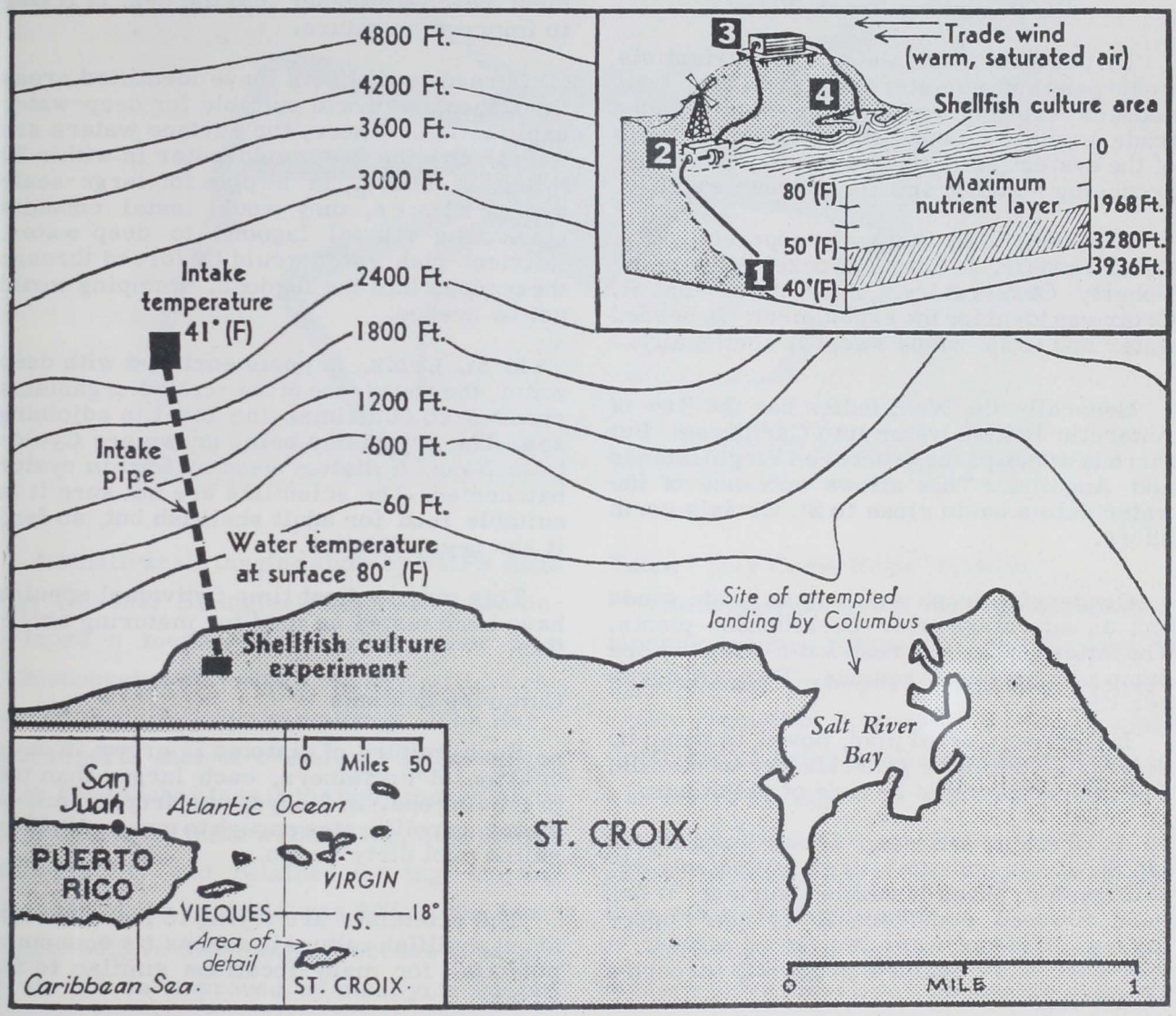
II. Power Plants

Intensive production of marine life could be a byproduct of the planned power plants, the Columbia scientists say. The principle underlying such plants was demonstrated by French engineers in a Cuban plant in 1930, and in Africa's Ivory Coast in 1950.

The success of steam plants depends partly on the efficiency of their cooling systems. A steam-driven destroyer moves faster in cold waters than in the tropics. The reason is that turbines are turned by a flow of steam. The intensity of the flow is determined by the difference in pressure between start and finish of heating cycle. The cooler the water at start of cycle, the greater the resulting pressure.

The St. Croix system would be special. By using Antarctic bottom water, it would operate at a very low-starting pressure--and, as a result, at a very low temperature.

Air pressure on a mountain is lower than at sea level, so water there boils more readily. If pressure is low enough, water will boil at temperature of tropical sea water--about 80° F.



Cold, nutrient-rich water is pumped from ocean depths off St. Croix as a means to mass produce sea food, as depicted above. Inset diagram, upper right, shows related plan for extracting fresh water from the moist trade winds. Cold water, drawn from deep, nutrient layer (1) by windmill pump (2) is used in cooling condensers (3) that collect water from damp air. The oceanic cooling water is then fed into lagoon (4) where marine life is cultivated. Columbia University is conducting the experiments.

(The New York Times, March 26, 1971)

In the proposed St. Croix power plants, a temperature and pressure difference sufficient to drive turbines would be created by using the heat in warm surface waters. The cooling agent would be bottom water at about 50°.

III. Producing Fresh Water

To produce fresh water, the scientists would pass bottom water through hill-top condensers exposed to warm, moisture-laden trade winds. As wind strikes cold surfaces of the system, its moisture would condense--producing a steady trickle of fresh water.

A scheme like this was proposed by Mr. Gerard and Dr. J. Lamar Worzel of Lamont-Doherty Observatory. They noted that St. Croix was ideal for the experiment: it needed water and trade winds swept it continually.

Generally, the West Indies bar the flow of Antarctic bottom water into Caribbean. But there is a deep passage between Virgin Islands and Anguilla. This allows entrance of the water into a basin close to St. Croix's north shore.

Condensing fresh water from trade winds has an advantage over desalination plants. The latter extracting fresh water from the sea dump a highly saline residue. This endangers sea life.

In Gerard-Worzel plan, power to pump up deep water would be generated by windmills. The operation would be free of pollutants.

At present, the water drawn from depths off St. Croix pass through a pipe only $3\frac{1}{2}$" in diameter. When it reaches surface, it has been warmed considerably by sea's upper layers. If deep water is used as coolant, it will have to be pumped up quickly through a larger pipe.

Excelling Nature

The natural upwelling off Peru, which is responsible for rich fisheries, does not bring up the very deep water richest in nutrients, according to Gerard. The St. Croix experiment, reaching deeper into the sea, is trying to improve on nature.

Gerard and Roels have identified areas throughout the world suitable for deep-water exploitation. There, the surface waters are warm, and the deep, cold water is within 20 miles of shore. In a plan for large-scale aquaculture, they would instal conduits connecting coastal lagoons to deep water. Nutrient-rich water would be forced through these pipes into the lagoons. Pumping would not be needed.

In St. Croix, in pools enriched with deep water, the abundance of one-celled organisms reaches 10,000 times the level in adjoining sea. The organisms being grown are Cyclotella Nana, a diatom used as food in oyster hatcheries. The scientists are not sure it is suitable food for adult shellfish but, so far, it has been effective.

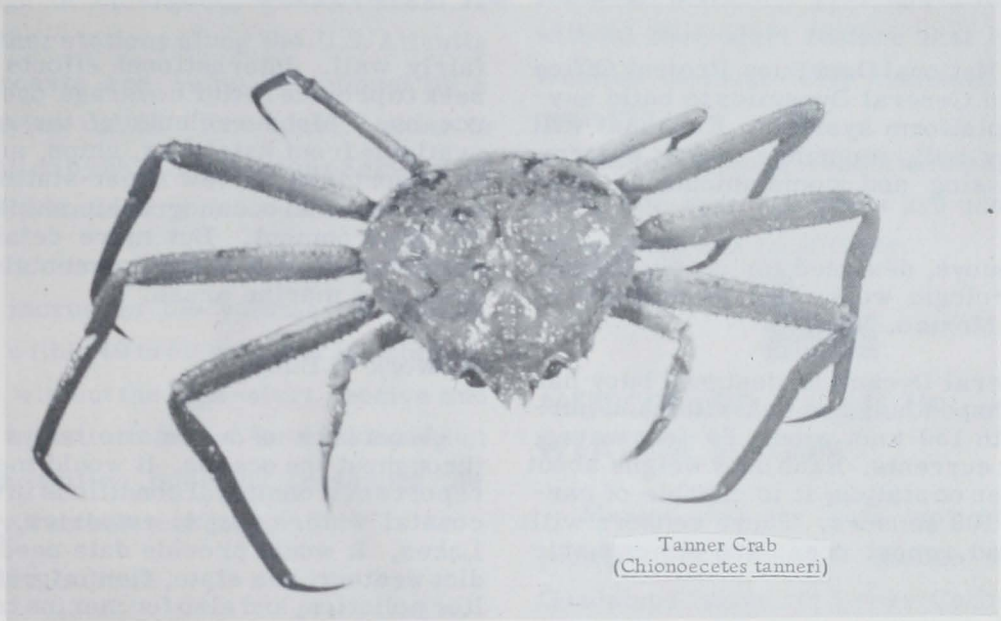
This may be first time individual species have been tested as food for maturing shellfish.

Culturing Diatoms

Each culture of diatoms is grown in succession of containers, each larger than the preceding one. In 8 days, one dropper full of diatoms proliferates enough to make a 12,000-gallon pool dirty brown.

The scientists are trying to learn enough about shellfish culture to assess its economic potential for many locations similar to St. Croix.

TANNER CRAB TAGGED SUCCESSFULLY FOR FIRST TIME



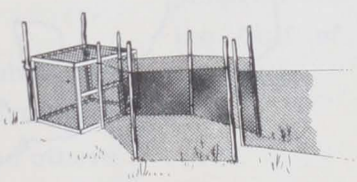
Tanner Crab
(Chionoecetes tanneri)

A small-scale tagging study by NMFS Auke Bay (Alaska) Biological Laboratory has developed a method for tagging tanner crab (Chionoecetes sp.) with a tag that will be retained through ecdysis (molting). John Karinen reports that of 9 male C. bairdi tagged with Floy anchor tags in the body musculature proximal to the third walking leg, 30% molted successfully and retained the tag; molting success of the controls was 90%. The biologists believe that molting success of tagged crab can be improved by modifying the tag and the insertion method.

Tanner May Come Home To Molt

The tagging program also has shown that tanner crab may return to a "home" area to molt and mate each year. SCUBA divers recently recovered a tagged male tanner crab in 30 feet of water at the Laboratory dock. It was one of 10 tagged in March 1970 and released at the same location. Tanner crab gather here each year to molt or mate and then return to deep water.

More tagging of tanner crab is underway to learn more about local movements and behavior.



ENVIRONMENTAL DATA BUOYS WILL BE TESTED IN GULF OF MEXICO

NOAA's National Data Buoy Project Office has selected General Dynamics to build several ocean platform systems. Each unit will have a buoy hull, moorings, power system, data-processing and communications systems.

These buoys, designed for oceanographic and meteorologic work, will be deployed in the Gulf of Mexico.

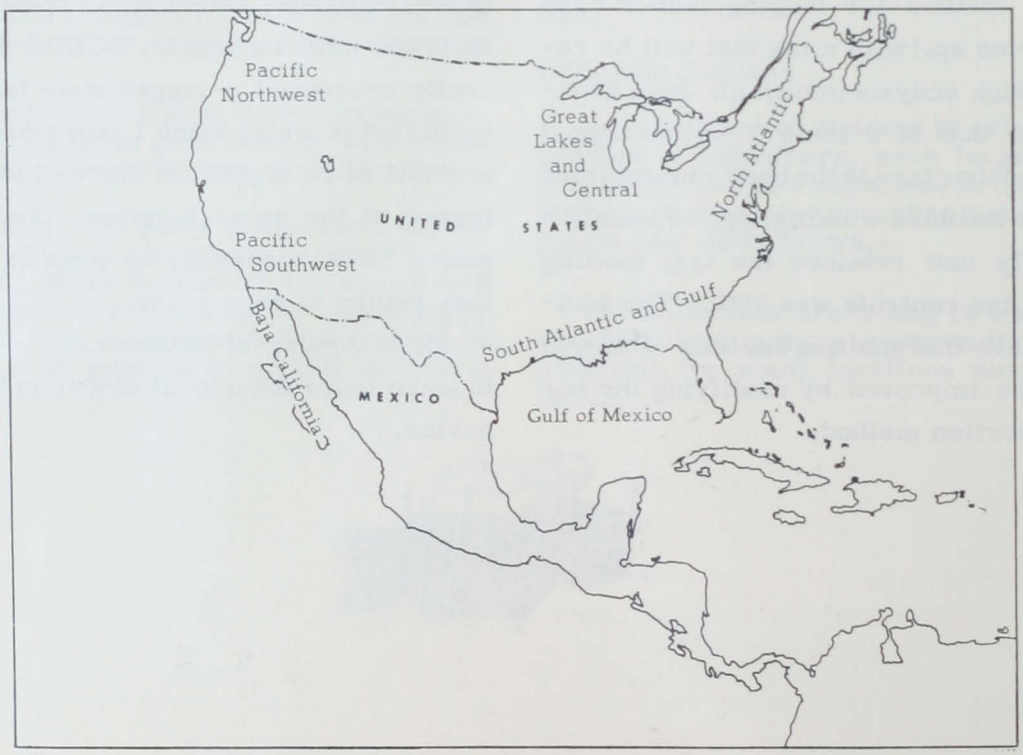
The General Dynamics-designed buoy has a discus-shaped hull and can withstand hurricanes with 150-knot winds, 60-foot waves, and 10-knot currents. Each buoy weighs about 100 tons when on station; it is capable of carrying over 100 sensors. These sensors will measure and report ocean and atmospheric conditions.

Long Needed

The buoys will fill the data gap in maritime areas. Inhabited regions are observed fairly well. International efforts currently seek to provide better coverage over land and oceans. "Measurements of the oceans are available from satellites, ships, and aircraft of opportunity, a few ocean station vessels, and occasional oceanographic ships sampling the environment. But more detailed information is needed on environmental conditions over vast marine areas."

Network of Buoys

A network of automatic buoys is needed throughout the oceans. It would measure and report environmental conditions in the oceans, coastal waters, bays, estuaries, and Great Lakes. It would provide data needed to predict weather, sea state, fish migration, monitor pollution, and also for marine transportation and other ocean-oriented industries. The World Weather Watch and the Integrated Global Ocean Station System programs may have someday a network of marine buoys and automatic land stations.



WARNINGS OF BAD WEATHER STRENGTHENED BY NEW DEVICE

Warnings of emergency weather from 12 radio weather stations along the U.S. Atlantic and Gulf coasts are being heightened by a special device called "tone-alert," which is being installed by NOAA's Weather Service on its UHF-FM stations.

The device transmits a signal that automatically increases the volume on special receivers within 40 to 50 miles of the station. Receivers without the tone-alert receive and broadcast a distinct 3-to-5-second tone just before the station operator transmits the emergency weather message.

When Device Is Used

The device is used immediately before special warnings of severe weather: tornadoes, hurricanes, winter storms, high winds, severe thunderstorms. These warnings are sent to hospitals, schools, civil disaster agencies, newspapers, TV and radio stations--and to those with radio receivers containing "weather band" at 162.550 or 163.275 megacycles.

U.S. Network Planned

In time, each UHF-FM weather radio stations of the Weather Service's nationwide network will have the alert device. The stations are part of NOAA's Natural Disaster Warning System.

The 24-hour-a-day stations transmit continuous weather forecasts and observations to farmers, sportsmen, boaters, and others needing reliable information. The regular flow of weather information is interrupted by hazardous-weather warnings.

Cost of Receivers

Equipment to receive the tone-alert is priced from about $150 upward. Receivers without tone-alert feature that can pick up Weather Service UHF transmissions start near $20.

The reception of transmissions, especially when low-cost receivers are used, depends on location and sensitivity.

MEXICO AND U.S. SET UP WEATHER STATION

Mexico and the U.S. have established a jointly funded weather station on Mexico's Guadalupe Island off Lower California. It is expected to improve warnings of storms threatening both countries.

The station makes upper-air observations to fill a need for atmospheric data from an ocean area that generates severe weather.

Upper-Air Reports

The upper-air reports made at Guadalupe Island are transmitted to the National Meteorological Center in Suitland, Md., by Mexican personnel who make observations twice a day. The reports are expected to offer valuable clues to the high-level steering currents that propel moist air inland from the Pacific and the Gulf of Mexico. ('Commerce Today', Mar. 8.)

ELECTRICAL SYSTEM WILL HELP DETECT MARINE POLLUTION

A system that will aid in detecting and controlling marine pollution has been devised and tested successfully by Texas A & M Sea Grant oceanographers. It is an electrical logging system that measures relatively quickly and cheaply the upper soft seabottom sediments. NOAA's National Sea Grant Program is supporting continued development and adaptation to computer techniques.

In-Place Gravity Probe

A main feature of the electrical system is an in-place gravity probe with electrodes in the nose. This is dropped into the soft bottom sediments. As it is withdrawn, it measures the electrical resistances of the sediments.

The oceanographers also have developed a device for obtaining the same measurements from cores. Also, they are showing how the electrical properties measured by either technique are related to some "chemical, physical, sedimentological, and engineering properties of the sediments."

Pollution detection is one of NOAA's responsibilities in monitoring the marine environment. Detection is vital to adequate pollution control. Bottom sediments are affected directly by changes in the kinds of particulate matter in the sea. Electrical logging techniques can record these changes.

Information obtained through logging also can benefit ocean engineering, mining, pipeline surveys, and basic research into bottom sediments.

System's Advantages

The oceanographers state that on-site measurement of electrical resistivities of sediments is a relatively quick and inexpensive way to determine some properties. Before, these could be measured only on shipboard, or in the lab, through subbottom samples gotten by the more painstaking technique of coring. Electrical logs will supplement, not replace, coring and reduce number of cores needed.

1969-70 Tests

Tests with probes 12 to 25 feet long were made in 1969 and 1970 south of Galveston, Texas, in northern terminal of Alaminos Canyon. In one series, electrical profiles were obtained in about 90 minutes of recording on the sea floor. Recovery of 30 cores from these stations would have taken about two weeks; analysis of their porosity and density would have taken months more.

Present Work

The oceanographers are building a new in-place device. With it, measurements will be made while probe is at the bottom. The device will end irregularities in pull-out caused by movement of the ship--and so increase accuracy appreciably.

NAVY SCIENTISTS DIVE AND WORK UNDER ARCTIC ICE COVER

Four oceanographers of the U.S. Naval Oceanographic Office (NOO) recently dived and worked under the Arctic ice mass less than 500 miles from the North Pole. NOO says the dives may be "the first extensive day-to-day operation ever conducted this far north."

The dives were made during a 10-day period in the 24-hour darkness of the Arctic night through a hole cut in 15 feet of sea ice adjacent to Fletcher's Ice Island. This is a floating 28-square-mile glacier. Since 1952, it has served as the site of an Arctic research laboratory for U.S.

The waters underlying the ice ranged in thickness from 15 to 60 feet. They were a constant 28.9 degrees Fahrenheit. Outside temperatures ranged from 20 to 39 degrees below zero. The first dive lasted 25 minutes; the longest was one hour, 55 minutes. The scientists reported that cold hands "were the principal factor limiting dive duration."

Their Purpose

The scientists were working to establish techniques for making scientific observations, especially measuring and profiling the underside of the ice cover. They photographed the ice with still and motion-picture cameras. They profiled a part of the underwater ice mass by direct measurement with tapes, measuring rods, and a recording slate.

"We were particularly interested in measuring and recording on film the juncture of Fletcher's Island with the adjacent sea ice," they said.

Value of Work

Oceanographers-divers can only provide information on a small part of undersea ice at any one time, NOO states, as opposed to wide-ranging surface techniques, such as aerial photography. But divers' data will be useful in relating "the bottom side with the top. If we know this general relationship, we can then infer what the bottom side looks like from our surface observations." A complete picture of ice structure will help NOO oceanographers predict movement of sea ice for the benefit of shipping in the Arctic and the Antarctic.

NOO's oceanographers provided much initial data that helped to insure a safe voyage for the 'Manhattan'. The world's largest oil tanker-icebreaker successfully navigated the icebound Northwest Passage in fall 1969.

OCEANOGRAPHERS HUNT EARTH'S OLDEST CRUST IN SOUTH PACIFIC

NOAA oceanographers aboard the 'Surveyor' are making a 6800-mile trip in April-May from American Samoa to South America seeking what may be the oldest part of the earth's crust in this area.

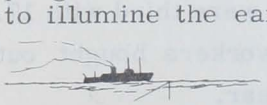
The Seattle-based vessel, operated by NOAA's National Ocean Survey, conducted a hydrographic survey of the approaches to Pago Pago Harbor in American Samoa before beginning the $3\frac{1}{2}$-week oceanographic expedition.

A Giant Chasm

Barrett H. Erickson, the project's chief scientist, said: "Although the undersea structural features in this part of the South Pacific are now poorly known, it seems that the oldest oceanic crust in this area may lie just east of the southern Tonga Trench." This great chasm in the seabed descends more than 6 miles below the sea surface; it extends south of the Samoan Islands toward New Zealand.

Erickson added: "A study of the geophysical characteristics of the oceanic crust between the Tonga Trench and the East Pacific Rise should provide evidence on the age and history of the oceanic crust in this area." The East Pacific Rise is a mile-high underwater mountain range lying in water almost 2 miles deep It parallels the northwest coast of South America.

The Surveyor expedition is part of NOAA's long-range program to investigate the sea bottom and to illumine the earth's history.



RECREATIONAL BOATING IS EXPANDING RAPIDLY

In 1970, recreational boating in the U.S. involved an estimated 44,070,000 persons who spent about $3,440,000,000. So reports the National Association of Engine and Boat Manufacturers.

The pastime has grown greatly. The industry estimates there were 8,814,000 recreational boats in the U.S. in 1970; 4,864,074 were registered by states and the Coast Guard. The boats ranged from plush sailing craft and sleek motor jobs to rowboats, prams, and dinghies.

Housing Them

The boatmen were from 5,900 marinas, boatyards, and yacht clubs. They hauled their craft to the water aboard 3,700,000 homemade and factory-produced boat trailers.

Industry's Growth

There were an estimated 3,510,000 recreational boats in 1950; in 1970, 8,814,000. Total expenditure jumped from $680,000,000 to nearly $3.5 billion.

Outboard Motors

An estimated 7,215,000 outboard motors were being used in 1970.

The skilled worker is the heaviest buyer of outboard motors: 24.5% of them. The professional was second with 17.6%. Clerical and sales people were third with 17.2%. Only 2% of factory workers bought outboard motors during the year.

The New York City area led in outboard motor use with 316,000. The average length of motor boats purchased in one 12-month period is listed as 15.4 feet; the greatest number (43%) run from 14.7 to 16.6 feet.

TELL COAST GUARD WHEN HELP NO LONGER NEEDED, CAPTAINS URGED

Fishing vessels calling for emergency aid should notify Coast Guard immediately when assistance is no longer needed, the Search and Rescue Branch of the First Coast Guard District has urgently requested. The Fishing Vessel Safety Division of the National Marine Fisheries Service joins in this appeal.

Over 300 commercial fishing vessels from Maine, Massachusetts, and Rhode Island ports are aided each year by Coast Guard cutters, aircraft, and bases located from Eastport to Block Island. While most Coast Guard missions are completed safely, some vessels solve their own difficulties while help is on the way. These vessels continue their trips without notifying the Coast Guard.

A Wild-Goose Chase

This happened recently when a Gloucester (Mass.) trawler called for Coast Guard assistance while disabled in the Gulf of Maine. Coast Guard search and rescue units raced to assist the stricken craft. When they arrived at the reported location, there was no trace of the vessel. A long search of the area ended when the vessel was reported safely tied up in Gloucester harbor.

OKLAHOMA SCIENTISTS SEEK ANTIBACTERIAL AGENTS IN CORAL

NOAA has awarded a $161,800 Sea Grant to inland Oklahoma University for marine pharmacology work. Chemists under Dr. Alfred Weinheimer will isolate and try to produce useful compounds that demonstrate antibacterial, or similar effects, from coral and other marine invertebrates.

The Oklahoma marine-chemistry program is more than 15 years old. It has studied the extractable organic chemical content of several abundant coral-reef invertebrates from the Caribbean and other waters. The scientists have observed that many extracts demonstrate antibacterial activities of possible benefit to man. Recent experiments showed a high degree of antitumor and antileukemia action among certain compounds.

Practical Production Methods Sought

With the NOAA Sea Grant, the researchers hope to develop practical methods for producing useful compounds in quantity. They will give special attention to those aspects showing potential as anticancer agents.

The Oklahoma researchers collect tropical and subtropical invertebrates several times each year, mainly in the Caribbean. They have studied corals, sponges, and other materials.

The program is part of NOAA's Sea Grant effort in marine pharmaceuticals. In December 1970, NOAA awarded a Sea Grant to Osborn Laboratories of Marine Sciences of the New York Zoological Society to extract and test antibacterial agents from sponges.

SEA GRANTS FOR COASTAL-ZONE PLANNING, RESEARCH & TRAINING

NOAA has awarded $207,500 worth of Sea Grants for coastal-zone planning, for research, and for training:

1) $139,200, in 2-year project, to Nassau-Suffolk Regional Planning Board, Hauppauge, New York, to develop methods for planning the best use of coastal-zone marine resources. The project "will identify, classify, and analyze problems confronting decision makers dealing with marine resources."

2) A $50,000 Sea Grant to Lamont-Doherty Geological Observatory of Columbia University to continue its artificial upwelling project in the Virgin Islands. (See p. 16.)

The major emphasis during the next year will be on "food from the sea". This involves the growth of plankton and selected commercially valuable organisms.

3) The University of New Hampshire, Durham, was awarded $18,300 to give engineering students experience in the parts and systems used in ocean-oriented projects.

Students will continue to work on such projects as underwater life-support systems, shallow-water coring, and underwater tools. Each project is conducted by a team of students under one or more faculty members. In the project's first two years, 52 undergraduate and 17 engineering faculty members participated.

The 3 institutions will match at least half the NOAA Sea Grant with non-Federal funds.

LAMPRICIDE STUDY

A chemical used in Lake Michigan and Lake Superior to control sea lamprey--TFM--will be studied systematically for the first time by pharmacologists of the Medical College of Wisconsin, Milwaukee. NOAA has awarded it a $26,500 Sea Grant to study the metabolism and pharmacology of 3-trifluoromethyl-4-nitrophenol.

TFM is a selective lampricidal agent that has been effective in destroying the sea lamprey during its early development. Two or 3 parts of TFM in a million parts of water are lethal to sea lamprey larvae, while not affecting most other fish and aquatic species.

TFM's Achievement

Since TFM's introduction, the population of lake trout and white fish has increased substantially. The lamprey had nearly wiped out these fishes.

However, very little is known of how TFM works and what happens to it after it has done its job. No definitive studies have been made of TFM's pharmacology, metabolic fate in fish and mammals, and its possible environmental effects.

That is what the Medical College of Wisconsin will do.

STUDY CIGUATERA POISONING

Ciguatera poisoning, a tropical malady of humans and fish, will be investigated under a NOAA Sea Grant to the Caribbean Research Institute, College of the Virgin Islands, St. Thomas. Tropical islanders around the world fear the malady.

Dr. Robert W. Brody will seek to determine patterns of infection and food-chain relationships, and conduct laboratory analysis of the poison.

A Ciguatera Case Repository will be set up to gather clinical and pathological data from human cases.

Serious Problem

Ciguatera fish poisoning is a serious public health problem in the northern Leeward-Virgin Islands area. It slows the growth of the fishing industry so much that local fisheries provide only about 50% of the fish protein eaten.

The malady, apparently concentrated in tropical islands, has little effect on continental areas. It has been studied in the Pacific since World War II. There it is linked to a shallow-water food chain. The Caribbean scientists will be in close communication with University of Hawaii researchers.

Published Reports

About 4,500 persons in the world have had the illness since it was first identified; 542 deaths have been recorded. It affects the gastrointestinal and nervous systems. It usually develops 3 to 5 hours after an infected fish has been eaten.

FAO will cooperate with Sea Grant project. Its fishing vessel 'Alcyon' will provide fish samples and other data. NOAA's NMFS laboratory at Seattle, Wash., will also participate. It will provide chemical services in extracting and purifying the toxin.

Information Program

Medical reporting of ciguatera poisoning in the Virgin Islands is presently spotty. Individuals who become affected apparently seldom seek medical help. To obtain better data on symptoms and on suspect fish, the Sea Grant scientists plan to conduct an information program in the Virgin Islands. This will include TV and a brochure similar to one used in Japan and the U.S. trust territories to encourage people to report to medical authorities when they suspect that they have ciguatera poisoning.

TEXAS LAB TO PRESCRIBE MEDICINE FOR FISH IN MARICULTURE

Texas A&M University opened its new Aquatic Animal Medicine Laboratory January 11. The university says its College of Veterinary Medicine is the only one in the U.S. that has a medical-care program for marine animals.

"What we hope to do is be able to produce a cheaper and better seafood product," says Dr. George W. Klontz, associate professor of veterinary medicine, who is in charge of the lab.

Need for Mariculture

Ocean fishing is largely a hunter-type operation, Dr. Klontz adds. The ocean is being drained of its resources, and industry must devise more effective ways to produce food from the sea.

In mariculture, propagation in captivity of marine life, ocean water can be directed into ponds and the "livestock" cultivated.

"An example is a two-acre pond," Dr. Klontz notes. "You run sea water in one end, through the pond, and out the other end back to the sea. You stock the pond with fish, feed them and harvest them."

Disease Is Major Problem

A major problem so far with mariculture is contraction of disease.

"Of all animals presently being hatched in captivity, 25 to 50 percent don't get to the market because of disease," he says. "In some cases it runs even higher, but that's a good estimate."

Also, 30 cents of every dollar spent in mariculture enterprises goes to disease control.

12 Species For Lab

When the laboratory is stocked, Dr. Klontz says, 12 species of fish will be available for study and experimentation. Two species, albino catfish and Gulf topminnows, already are swimming nervously in 4 separate tanks.

He says the albinos were used because of their genetic homegeneity for measuring responses to viruses and bacteria; the topminnows for measuring a large spectrum of responses.

"These are our lab animals," he notes. "When commercial propagation of fishes becomes a reality, we hope to be ready to help when the diseases occur."

Lab Supports Sea Grants

The new laboratory will support the work of 4 Sea Grant projects in marine fisheries. The studies focus on bacteria and viral diseases of marine fish and shellfish, parasitic relationships, and histopathological studies of inflammation in fish.

Cooperative work with the Texas Parks and Wildlife Department also will be conducted.

Dr. Klontz points out that the university has the only vet college in the U.S. offering formal instruction in aquatic animals medicine at the preprofessional and graduate levels.

AT&T MAKES PROGRESS IN PROTECTING SUBMARINE CABLES

A 12-year effort by American Telephone and Telegraph Company's Long Lines Department to prevent fishermen from snapping submarine cables between U.S. and Europe is beginning to pay off. This is reported by New England Marine Resources Program.

The breaks are caused by snarling of gear in the cables. When these occur, hundreds of voices are silenced; repairs cost hundreds of thousands of dollars.

To ease problem, AT&T has: appealed to the fishing industry; offered free charts and brochures pinpointing the cables; offered to pay fishermen for nets and fouled gear that have to be cut away to avoid damage to a snagged underseas cable; maintained a North Atlantic patrol to warn trawlers away from cable routes; developed equipment and techniques that enable company to bury cable two feet under ocean floor, safe from commercial fishing tackle or natural disasters.

70 Cable Failures

In the past 15 years, there were 70 cable failures on the 4 transatlantic telephone cables; 54 were on this side of Atlantic. Two were caused by icebergs, the remainder by trawlers or scallopers. AT&T feels that elimination of breaks caused by fishing is key to preventing cable failures. AT&T says it can no longer depend on selecting routes to avoid fishing grounds because fishing areas have extended considerably in the past 12 years and have overrun new cables. Routes that were free of trawling when cables were placed are now vulnerable.

TATS 1-5

The first transoceanic telephone cable system, TAT-1, was put into service in 1956. Since then, 4 more have been placed along ocean floor. When TATS 1 through 4 were in planning stage, prime importance was given to routes outside fishing grounds. TAT-1 was charted north of Grand Banks in Newfoundland, where fishing mainly for cod was heavy. A change in fishing methods and consumer tastes in the late 1950s drew trawlers farther north, where cables were located. Soviet fleets with refrigerated trawlers began to process ocean perch, a highly perishable catch formerly ignored by fishermen. Eventually, trawlers from 13 other nations began fishing near the cable routes.

A Break In 1959

"The first break in service occurred in February, 1959, when a Russian trawler accidentally snagged TAT-1," AT&T stated. Its air patrols began that month to augment ship patrols designed to warn trawler captains when they are too near a cable. Two ships patrol Cabot Strait and the North Atlantic trawling area; they are ready to repair a snapped cable. The air patrols drop leaflets printed in 6 languages warning captains of their closeness to submarine cables. Cooperation has been good.

'Shoes' Kick Cables

It isn't the trawling nets themselves that cause the cable breaks. The 'culprit' is the large oak and metal "shoes," called otter

boards, which scrape along ocean bottom holding open the great nets. If otter board scoops up cable instead of riding over it, the cable is likely to be snapped.

In 1965, Woods Hole Oceanographic Institution, Cape Cod, Mass., discovered a rich scallop bed off New Jersey through which a cable had been placed. New England and Canadian fishermen converged on the area. Cable breaks became numerous, mostly from scallop dredges being dragged repeatedly across bottom. In one instance, 7 miles of cable had to be replaced and, in one period, repairs cost over $350,000.

Going Underground

This was when AT&T was trying to convince fishermen to weld a small metal addition to their dredges between the shoe and the dragging frame. This would allow gear to slide up and over a cable instead of hooking onto it. This did not eliminate problem, so AT&T solved it by burying sections of new cables near this area in 1966. It was the first underground cable along an ocean bottom.

Working cable into the ocean floor is always preceded by an oceanographic survey. A Bell-designed, 7,000-pound survey vehicle with communications and measuring instruments collects underwater information. Towed by a cable ship, this vehicle has a weighted steel wheel to cut through the soil.

Cooperation With Fishermen

AT&T is asking fishermen to help where cable lines lie exposed on ocean floors, and where it is impossible or impractical to bury the cable. Its charts are highly detailed and show exact cable positions. AT&T points out that snagging cables can also be costly to fishermen. Fishermen have lost fishing time and up to $8,000. The company is willing to replace snarled nets. It has done so 12 times at a cost of about $2,000 each time.

AT&T emphasizes danger fishermen expose themselves to when they cut cables to free meshed gear. Telephone cables carry up to 5,000 volts of electricity, considerably higher than telegraph cables.

Successful Burial

The successful burying of cable has increased reliability of international communications. It has reduced AT&T patrol and repair costs from fishing damage or natural events--undersea landslides, icebergs, currents, surf action, and rough ocean-bottom conditions. Shorter cable routes are possible because commercial fishing locations do not have to be circumvented.

CALIFORNIA'S GIANT KELP

In 1968, the California Legislature directed the Department of Fish and Game to prepare "a comprehensive master inventory and preliminary master plan for utilization of all ocean fish resources from existing scientific information. . . ."

The deadline was the 5th legislative day of the 1971 Regular Session. The department has prepared "California's Living Marine Resources And Their Utilization," a 148-page work. "It concerns itself primarily with the living marine resources that enhance the wealth of this State and provide for recreational benefits for the people. It does consider some of the effects of man's activities in coastal areas of California as well as some problems confronting the State's fishing industries."

The following is reprinted from the California publication:

History of the Harvest

Marine plants have been used in many parts of the world for hundreds of years as a food supplement for humans and animals. The giant kelp, Macrocystis, has been harvested commercially and processed in California since 1910. Except for a few innovations to reduce spillage and speed up the cutting and loading process, kelp still is harvested as it was over 50 years ago.

Kelp contains carbohydrates, minerals, vitamins, and algin or alginic acid. During World War I, potash, acetone, and iodine were the chief products recovered from kelp. Kelp meal, used as an animal food supplement, and algin, used in many modern products, are the most important items today.

Algin, a colloidal substance extracted from kelp, has the unique property of absorbing large quantities of water. This property makes it important in preparing commercial ice cream since it prevents water from forming coarse ice crystals. Algin also has suspending, stabilizing, emulsifying, gel-producing, film-forming, and colloid-forming properties which render it valuable in other processes. It is used in pharmaceuticals to suspend drugs and antibiotics such as penicillin. Algin is important in the preparation of adhesives for containers, coatings for welding rods, and to hold fiberglass mats together. The textile industry uses it for thickening and stabilizing dyes. At present, there are more than 200 uses for algin.

The annual California kelp harvest has varied from a high of 395,000 wet tons in 1918 to a low of 260 tons in 1931, but averaged 129,000 wet tons during the 10-year period (1960-1969). No adverse influence on the rich fauna associated with kelp beds can be attributed to harvesting as currently practiced.

Kelp beds are numbered and designated beds may be leased for a 20-year period. Commercial kelp harvesters may lease two-thirds of the kelp beds in California; however,

the remaining one-third is not leased and may be harvested by any company. These are called open beds. Commercial harvesters bid for the privilege of exclusive use of leased beds. A single entrepreneur may not lease more than a total of 25 square miles or 50 percent of the total kelp areas, whichever is greater. Every harvester must purchase an annual license and pay a royalty per ton of wet kelp harvested. Over or under harvesting a leased bed constitutes a violation of the lease agreement, and a fine and loss of the exclusive lease can occur.

Giant kelp is harvested by specially built barges. These vary in size and some are capable of carrying up to 300 tons of wet kelp. Kelp is cut to a maximum depth of 4 feet (by regulation) below the water's surface and is transferred by a conveyor belt into the open hold of the barge. It then is transported to a processing plant where it is transformed to a salable product.

Status of Biological Knowledge

Giant kelp ranges from Sitka, Alaska, southward to Pt. Abreojos, Baja California; nevertheless, kelp harvesting has been centered in southern California. Kelp grows in water from just outside the surf to depths of 100 feet. The plant has a root-like structure called a holdfast which clings to a hard rock or shale substrate.

Giant kelp is a perennial, living and sending up new stalks called stipes for a period of 5 to 10 years. These stipes reach the surface to form a canopy, and live for about 6 months. There is a constant succession of new stipes growing to the surface to replace dead and dying ones, and a single holdfast may have more than 100 stipes. A young plant takes about 1 year to become established. Under favorable conditions, a young plant will double in size every 3 weeks. Growth and reproduction are limited by the available light (water clarity and depth), temperature, amount of available rocky substrate, nutrients present, number of grazers in area (opaleye, sea urchins, abalone, and other gastropods), disease (black rot), storms, and by heated water discharges and sewage outflows in the area.

Growth is primarily from the terminal tips of the stipes. Nutrients are taken from the surrounding water in the presence of sunlight during the process of photosynthesis. Rapid growth may follow an increase in the amount of plant food present in the water. During periods of optimum conditions, which consist of clear, cool waters, below 66° F, enriched with nutrients upwelled to the surface, giant kelp stipes have been observed to grow from 12 to 24 inches in a single day. When water temperatures reach 66° F, growth is arrested and sloughing occurs.

Giant kelp has a fascinating reproductive system. There are two different forms in the life cycle of the species. The sporophytes (the large plants making up the kelp beds) liberate billions of spores which give rise to microscopic plants known as gametophytes. The male and female gametophytes in turn give rise to sporophytes. The reproductive tissue of the sporophyte is located in specialized blades at the base of the plant. While individual plants fruit at specific times during the year, within any one kelp bed reproduction occurs throughout the year.

Grazers, such as sea urchins, may have a tremendous impact on kelp beds when ecological conditions permit their populations to reach large numbers. Environmental conditions created by sewage outfalls in southern California have led to the establishment of large urchin populations in certain areas. Urchins not only destroy the existing kelp, but keep young plants from becoming established. Once the kelp is gone, the urchins are able to survive by living off the sewage discharge nutrients. Research indicates an urchin also may absorb up to 50 percent of its minimum daily nutrient requirements from the surrounding water. In this manner, large urchin populations continue to exist in areas that formerly contained kelp beds.

Kelp beds can be restored. Sea urchin populations can be controlled by man. The kelp bed at Point Loma, near San Diego, has been restored almost to the same size it was 20 years ago. In addition to physically or chemically killing the sea urchins, several other techniques have been developed to assist in kelp restoration. Juvenile plants have been cultured in the laboratory and planted at suitable sites. Adult plants have been transplanted. Work is underway to develop mass culture techniques. Spore production and dispersal rates have been studied, and light requirements of the microscopic stages of kelp are being investigated. Efforts continue to upgrade water conditions along the coast.

One side effect of disappearing kelp beds is the loss of fish habitat. Areas that once sustained considerable sport and partyboat fishing pressures now provide very little support to these fisheries. Unfortunately, loss of kelp beds has been the largest in areas where fishing pressures are the greatest. In these same areas, the need for high aesthetic values in the inshore marine environment is possibly the greatest in California because of their proximity to large metropolitian areas.

Status of Population

California kelp beds have decreased in size since the early 1900's when they covered approximately 100 square miles. Today they cover less than 75 square miles. There are 74 designated kelp beds along the California coastline. These cover 53.86 square miles south of Point Conception, including the offshore islands, and 15.5 square miles between Point Conception and Point Montara. In the last 10 years, some of the major kelp beds of southern California have all but disappeared due to temperature changes, sewage discharges, and kelp grazers. Kelp habitat improvement projects, initiated in 1963 by industry and the academic society, have restored the Point Loma kelp bed near San Diego to a point where it again can sustain a commercial harvest. Increased numbers of heated water discharges could pose a threat to the kelp resources of California in the future unless special effort is made to keep the warm effluent away from kelp beds.