

## DOC Medal and NOAA Award Winners Announced

The U.S. Department of Commerce (DOC) presented its top awards, the Gold and Silver Medals, to outstanding employees in ceremonies late last year at the Department's 37th annual honors awards program. Commerce Secretary Malcolm Baldrige thanked the medalists for their hard work and acknowledged "the hundreds and thousands of others in the department who show a similar dedication."

NOAA employees earning the Gold Medal were Donald W. Beran, Office of Oceanic and Atmospheric Research; Clyde C. Goad, National Ocean Service; and Samuel G. H. Philander, Environmental Research Laboratories, for his studies on the El Niño-Southern Oscillation phenomenon.

### NMFS Medal Winners

Several NMFS employees were presented with the Department's Silver Medal, the second highest honorary award, for meritorious contributions of unusual value to the department or the nation. Jointly receiving the Silver Medal for outstanding achievement in preparing and editing a major publication on the early life history of fishes were H. Geoffrey Moser, William J. Richards, Michael P. Fahay, and Arthur W. Kendall, Jr. Their book, "Ontogeny and Systematics of Fishes," has been heralded by scientists as an important literary accomplishment in the area of the early life history of fishes. It includes 83 chapters on the development, classification, and natural relationships among various marine and freshwater fishes written by 74 scientists from 10 foreign countries.

The publication also provides information on current techniques being used to identify and culture eggs and larvae as well as on the study of fish in their juvenile stages for recruiting and assessing fish stocks. Moser is with the NMFS Southwest Fisheries Center in La Jolla,

Calif.; Richards is with the Southeast Fisheries Center in Miami, Fla.; Fahay is with the Northeast Fisheries Center in Woods Hole, Mass.; and Kendall is with the Northwest and Alaska Fisheries Center in Seattle, Wash.

Carmen Blondin, of Fort Washington, Md., was also awarded the agency's Silver Medal for directing international negotiating teams representing the United States in protecting marine mammals, including endangered species, for the National Marine Fisheries Service. Thanks to his efforts, the United States has reached separate agreements with Canada and other foreign countries to jointly manage and restore the salmon resources in the Atlantic and Pacific Oceans. Moreover, he helped negotiate an accord with Canada and Japan to limit the bluefin tuna quota in the western Atlantic to increase the fish supply. Blondin was also cited for his efforts in administering Federal law protecting fishery resources within the U.S. 200-mile conservation zone and promoting projects to aid the U.S. fishing industry.

Under his direction, the NMFS effectively implemented the American Fisheries Promotion Act of 1980 requiring foreign nations to promote the development of the U.S. fishing industry in return for allocations of U.S. fishery resources. His agreements have also helped increase joint venture purchases and improve export markets for U.S. fish processors. Blondin, Deputy Assistant Administrator for Fisheries Resource Management, has been employed by the NMFS since 1978, and also received the Silver Medal in 1982.

### NOAA Awards

Harvey Hutchings and Robert Pearce of NOAA's National Marine Fisheries Service (NMFS) received NOAA's highest award late last year. Hutchings was cited for improving the management of

ocean salmon fisheries off the U.S. West Coast, and Pearce was cited for his contribution to preserving the fishery resources along the Columbia River and its tributaries.

Hutchings was presented the NOAA award for his key role in coordinating a west coast data system among the NMFS and three state fishery agencies and using it to develop a regional management plan for Pacific salmon fisheries. He established a regional plan allowing more flexibility and quicker implementation of regulations before and during fishing seasons to meet changing fishery conditions, resulting in reduced cost and better management.

In addition, Hutchings coordinated a data system among fishery agencies in Washington, Oregon, and California where statistics on salmon catches were compiled, sent by computer to the Pacific Marine Fisheries Commission and published monthly for use in developing coastwide fishing patterns. Since 1978, changes in fishing seasons and boundaries, gear requirements, quotas, and bag limits had often been delayed because the necessary information on salmon harvests was not always available. Hutchings, of Woodinville, Wash., is Chief of the Fishery Management Division in the NMFS Northwest Regional Office, Seattle, Wash., and has been employed with the Fisheries Service since 1964.

Pearce, a hydraulic engineer also with the NMFS Northwest Regional Office, but who is located in Portland, Oreg., was presented the NOAA award for designing devices that protect the salmon and steelhead supply at several hydroelectric plants along the Columbia and Snake Rivers and in the Yakima River basin.

Each year the fish migrate upstream to spawn and later the juveniles move back downstream to the Pacific Ocean. Many, however, were drawn into irrigation canals and power dams and were harmed or lost. The devices allow the fish to circumvent these structures. Because of his effort, the harvestable supply of salmon and steelhead has been preserved in the Upper Columbia basin. Pearce, who lives in Portland, joined the Fisheries Service in 1973.

## U.S. 1985 Fish Landings Slightly Down, Consumption Up

U.S. fishermen landed 6.3 billion pounds of fish and shellfish last year, valued at more than \$2.3 billion, the National Oceanic and Atmospheric Administration (NOAA) has announced. Landings fell slightly from the 1984 total of 6.4 billion pounds worth just over \$2.4 billion, according to the Commerce Department agency.

Harvests by American fishermen who landed their catches at ports outside the 50 states or sold their fish at sea in joint venture operations increased almost 600 million pounds to 2.4 billion pounds, valued at \$277 million. Despite this 32 percent catch increase, the value of the fish decreased by \$11 million in value compared with 1984.

Most of the non-joint-venture catches consisted of tuna landed at canneries in Puerto Rico. Of the 6.3 billion pounds landed last year, 3.3 billion pounds was edible fish and shellfish, unchanged from 1984. Flounder and tuna harvests fell during the period, but were generally offset by strong showings of clams, Alaska pollock, shrimp, and Pacific salmon. The remaining 3 billion pounds—a drop of 5 percent from 1984—consisted of fish used for industrial purposes, mostly menhaden. The record year was 1980, when U.S. landings totalled 6.5 billion pounds.

### Record Consumption

Americans ate a record amount of seafood in 1985 for the second consecutive year, however, NOAA's National Marine Fisheries Service (NMFS) reported. Altogether they consumed 14.5 pounds apiece, nearly 1 pound over the 1984 mark of 13.7. Since the end of World War II, the agency said, Americans have steadily increased their fish and shellfish consumption from slightly under 10 pounds annually to the current rate. Recreational fishermen put

another 3-4 pounds of fish on the average American's plate each year.

The trend, says the NMFS, reflects several changes in the U.S. seafood market: Increased availability and variety of fish at restaurants and supermarkets; higher consumer income; cheaper fish imports; and more fitness-conscious people, some of whom consider fish healthier than red meat.

Table 1.—Middle Atlantic fish landings by state, 1984-85.

State	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Virginia	606	84	723	77
New Jersey	112	68	107	61
Maryland	91	55	92	47
New York	38	40	39	38
Delaware	3	2	5	2
Pennsylvania	<0.5	<0.5	<0.5	<0.5
Total	850	249	966	225

Table 2.—Middle Atlantic fish landings major port, 1984-85<sup>1</sup>.

Port and state	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Cape May-Wildwood, N.J.	52	28	30	18
Hampton Roads area, Va.	33	30	24	25
Atlantic City, N.J.	29	14	22	12
Ocean City, Md.	24	11	18	7
Point Pleasant, N.J.	13	6	17	6
Chincoteague, Va.	9	5	12	7
Cape Charles-Oyster, Va.	10	4	11	5
Hampton Bays, N.Y.	8	5	9	6
Montauk, N.Y.	11	10	8	9
Greenport, N.Y.	5	6	<5	<3

<sup>1</sup>Owing to the Federal Privacy Act, landings at major ports are not included if there are less than three processors at those ports (i.e., Reedville, Va.).

Other factors include changing cultural and demographic aspects of American life. Growing numbers of working women help to account for the increase in meals—frequently seafood—eaten away from home. The figures reflect the consumption of edible meat, rather than the weight of the whole fish, the NMFS added.

### FCZ Catch Record

U.S. fishermen last year harvested a record 3.2 billion pounds, or 59 percent of the combined foreign domestic catch, within the 200-mile U.S. Fishery Conservation Zone (FCZ), the NMFS reports. While the U.S. harvest increased 9 percent, foreign countries took only 2.6 billion pounds, 14 percent less than in 1984 and 21 percent below the average for the preceding 5 years.

In the years following establishment of the FCZ in 1977, U.S. fishermen were harvesting only about one-third of the total catch there, according to NMFS

Table 3.—Middle Atlantic landings of major species, 1984-85.

Species	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Hard blue crabs	98	28	93	28
Surf clams	62	31	63	33
Ocean quahogs	36	11	47	14
Summer flounder (fluke)	19	12	14	13
Silver hake (whiting)	13	3	14	3
Squids	18	4	11	3
Am. oysters	14	32	8	16
Weakfish (gray sea trout)	4	3	6	3
Sea scallops	6	32	5	32
Scup	8	4	5	3

Table 4.—New England fish landings by state, 1984-85.

State	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Maine	179.1	107.6	174.2	101.0
New Hampshire	11.9	8.4	8.4	5.6
Massachusetts	375.5	233.5	295.8	235.2
Rhode Island	120.0	70.4	103.8	69.9
Connecticut	7.8	13.5	6.7	11.9
Total	694.3	433.4	588.9	423.6

figures. Joint venture harvests by Americans, who sell their catch at sea to foreign processing vessels, showed a large increase in 1985. Last year U.S. fishermen sold a record 2 billion pounds of fish, worth \$104.3 million, to foreign vessels. That was a 37 percent increase over 1984 joint venture sales of 1.5 billion pounds, worth \$79 million.

Alaskan waters supplied most of the foreign-caught fish—about 92 percent. Waters off California, Oregon, and Washington contributed slightly more than 4 percent, with the remainder coming from the North Atlantic. Alaska pollock accounted for 73 percent of the foreign catch, Pacific flounder 13 percent, Pacific cod 5 percent, and other fish and shellfish the balance. Japan continued to be the leading foreign harvester, catching 1.8 billion pounds (mostly pollock), or 69 percent of the total foreign catch. South Korea, with

498 million pounds (19 percent of the catch), was second.

### Middle Atlantic Harvests Up, New England Down

Preliminary figures for 1985 commercial fish landings in the Mid-Atlantic states of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia were 966 million pounds, valued at 225 million dollars. These 1985 figures are up 116 million pounds and down 24 million dollars from the 1984 figures, according to Allen E. Peterson, Jr., Director of the NMFS Northeast Fisheries Center. Mid-Atlantic landings (in millions of pounds and dollars) by state for 1984 and 1985 are given in Table 1, landings by port are in Table 2, and Table 3 lists landings by species.

Preliminary figures for commercial landings of New England fish during 1985 were 588.9 million pounds, valued at 423.6 million dollars. These 1985 figures are down 105.4 million pounds and 9.8 million dollars from the 1984 figures, Peterson reported. New England landings (in millions of pounds and dollars) by state, major port, and species are given in Tables 4-6.

Table 5.—New England fish landings by major port, 1984-85.

Port	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Rockland, Me.	42.9	9.4	57.8	11.2
Portland, Me.	37.0	14.5	35.9	17.2
Glouc., Mass.	179.1	37.1	115.6	37.1
Boston, Mass.	20.2	11.2	19.2	12.0
N. Bedford, Mass.	99.5	107.7	90.6	103.2
Newport, R.I.	20.8	15.7	16.8	13.7
Pt. Judith, R.I.	69.9	27.3	56.8	28.0

Table 6.—New England fish landings by major species, 1984-85.

Species	Landings			
	1984		1985	
	Million pounds	Million dollars	Million pounds	Million dollars
Atlantic cod	95.8	35.6	77.4	33.9
Haddock	26.0	18.4	14.4	13.5
Pollock	39.5	6.4	42.3	6.9
Yellowtail flounder	36.2	26.4	23.6	19.6
Redfish (oc. perch)	12.2	3.5	9.7	3.2
Silver hake (whiting)	33.0	4.2	31.0	5.4
Butterfish	24.0	6.4	7.7	2.6
Atl. herring	73.7	3.7	57.0	3.0
Squids	12.9	3.2	15.0	4.2
Sea scallops	11.1	62.5	10.2	50.1
Am. lobster	41.5	107.0	42.3	106.0

### Shrimp '85: Prices Down, Consumption Up

The U.S. market for shrimp reached a third successive record in 1985 (Table 1), as measured by apparent consumption, and according to preliminary statistics. The overall average price of shrimp was lower in 1985 than in 1984, but prices of smaller shrimp trended upward from the third quarter onward.

Through November 1985, landings of shrimp in South Atlantic and Gulf ports totaled 172 million pounds (heads-off) versus 162 million pounds a year earlier, an advance of 6 percent. Despite the adverse effects of a cold (1984-85) winter on white shrimp in South Atlantic waters, an exceptional crop of brown shrimp boosted harvests later in the year, and the 11-month grand total for all species of shrimp rose 35 percent to 15 million pounds. Eleven-month land-

ings in Gulf ports totaled 157 million pounds in 1985, higher than in 1984, but short of the 1981 record. However, landings in Louisiana and Mississippi did surpass the comparable 1981 level in the first 11 months of 1985.

U.S. imports of shrimp totaled 328 million pounds (product weight) in January-November 1985 versus 311 million pounds a year earlier, an increase of 5 percent. Increases occurred in all major categories: Raw headless, up 5.9 million pounds; peeled raw, up 2.1 million pounds; peeled other, up 4.8 million pounds; and canned, up 3.7 million pounds. Imports from Mexico, the leading supplier, were down significantly. Imports from Ecuador were limited by availability of postlarval shrimp for shrimp farms. The largest increases in imports were for Brazil, Thailand, Taiwan, Norway (the leading supplier of coldwater shrimp), and China. Holdings of frozen shrimp in cold storage at the end of November 1985 were relatively normal at 73 million pounds (heads-off basis), though they were a relatively low 61 million pounds at the beginning of 1985.

The U.S. market could have totaled roughly 610 million pounds (heads-off basis) in 1985, nearly 3 percent higher than in 1984. The market has been growing for 6 years, an unusually long expansion as market declines generally occur about every 3 years. Several factors have contributed to the market's

Table 1.—U.S. supply and use of fresh and frozen shrimp Jan.-Nov. 1984-85 (million pounds, heads off).

Component	1984	1985
Beginning inventory	71	62
Landings		
Gulf	151	157
South Atlantic	11	15
Total	162	172
Imports	354	374
Total supply	587	607
Exports	19	21
Canned pack (Gulf only)	11	6
Ending inventory	70	73 <sup>1</sup>
Apparent consumption	487	506

<sup>1</sup>Preliminary data subject to revision; data may not add to total shown because of rounding.

growth in the 1980's, including prices, a strong dollar, sharply lower supplies of king crab, increased consumer interest in seafoods, and a generally rising economy, despite two recessions and lingering problems in some sectors of the economy. So far, sharp growth in supplies of surimi-based foods, now mostly imitation crab products and mostly imported, appear to have had limited, indirect effects on the U.S. shrimp market.

Not all sectors of the industry have gained in proportion to market growth in the 1980's. Most of the market growth has been in less processed forms of shrimp, in accord with changing consumer preferences. Thus, processed output tonnage has not grown in proportion to the total market. The number of U.S. canneries and output of canned shrimp have declined sharply, but consumption has increased with imports. Shrimp fishermen have faced continuing financial problems and business failures in the 1980's, with sharply higher insurance costs and falling shrimp prices adding to their problems in 1984-85.

Prices of shrimp were mixed in 1985. Wholesale prices of all sizes of shell-on, frozen Gulf brown shrimp in New York averaged lower, and the largest four sizes closed lower, but 31/35 and smaller shrimp closed higher. At \$4.60 a pound in December 1985, the 31/35 shrimp were nearly \$1/pound higher than in December 1984. Other increases were smaller. On the other hand, the under-15 shrimp were nearly \$1.00 lower at \$6.75/pound in December 1985. During 1982-84, the under-15 and 16/20 shrimp had shown greater price strength than other sizes.

Growth in the U.S. shrimp market may be limited in 1986 for several reasons. Concerted efforts by several governments to weaken the dollar began in fall 1985, and one result may be to dampen U.S. imports of shrimp and stimulate buying by other countries. Also, Ecuadorian shrimp culture output may not grow much until 1987, though other suppliers of farm-raised shrimp are entering the market. Many observers believe that shrimp farming will soon become the primary means of increas-

ing world supplies.

Whether from farms or traditional fisheries it appears that additions to world supplies grew fast enough to accommodate sharp growth in U.S. imports and push most prices down during 1982-85. Japanese imports began growing again in 1984, and advanced 8.6 percent from a year earlier through October 1985. U.S. landings of shrimp could be lower than the relatively high level of 1985. Finally, growth in the U.S. economy may be roughly the same as in 1985, and unlikely to greatly stimulate demand for shrimp. Therefore, the market is likely to grow during 1986, but some factors may limit that growth. (Source: John Vondruska, NMFS Southeast Regional Office, St. Petersburg, Fla.)

### ***The Blue Crab Market, 1984-85***

U.S. landings of hard blue crabs, *Callinectes sapidus*, in 1985 were an estimated 185 million pounds, which was 17 million pounds (8.4 percent) below the record of 1984, and 6 percent below the 1981-84 average. Despite lower supplies in 1985, ex-vessel prices received by fishermen were close to what they were in 1984. New York wholesale prices of jumbo-lump and lump-flake blue crab meat and live blue crabs also averaged close to what they did in 1984. Lump meat, however, averaged 16 percent higher.

From a longer term point of view, the rapid expansion in landings in 1977-81 and the sustained high level of 1981-85 help explain both the decline in real prices from 1976 to 1980 and the limited rise from 1980 to 1985. Landings in 1976 of 115 million pounds represented the most recent low point in the cyclical harvests of blue crabs, while landings during 1981-85 averaged 194 million pounds, and represented an unusually long and high plateau. The real average price (in 1984 dollars) received by processors for blue crab meat was \$7.02 a pound in 1976, \$5.30 in 1980, and \$5.52 in 1984, while the real average price received by fishermen for blue crabs was \$0.35/pound in 1976, \$0.25 in 1980,

and \$0.28 in 1984. Besides the growth in landings since 1976, other factors have affected real prices of blue crab in the past 10 years, including possible competition from other crab products, and two recessions (early 1980 and late 1981 through 1982).

The king, *Paralithodes* sp.; dungeness, *Cancer magister*; and snow crab, *Chionoecetes* sp., fisheries have also been the source of significant amounts of U.S. processed crab meat. Production of king crab meat even exceeded that of blue crab meat in 1965-68 and in 1980 (estimated).

Measured in pounds consumed, blue crab has been America's leading crab for 5 years in a row, as it had been in most previous years, and crabmeat is the major processed product of the blue crab. These two factors account for the fact that blue crab has been the leading source of U.S. processed crab meat in most years and accounted for 26 million pounds out of an estimated total of 36 million pounds in 1984.

The U.S. market for crab products has undergone radical changes in the 1980's. Several factors are involved, albeit in different ways, depending on the crab and type of product. One major factor has been the rising landings of blue crab during a period of declining landings for king, snow, and dungeness crabs. Also, surimi-based imitation crab meat has become important at the lower-priced end of the market, and has increased the size of the total (natural and imitation) crab market to twice what it would be with natural crab products alone. Whether imitation crab complements natural crab products, or competes with them, or both, is clearly related to the product form and marketing strategies pursued. Source: John Vondruska, NMFS Southeast Regional Office, St. Petersburg, Fla.

### **The U.S. Market for Processed Shrimp**

While the U.S. market for shrimp has been expanding in the 1980's, processed shrimp output is smaller now than 10 years ago. Apparent consumption of all shrimp reached an estimated 591 million

pounds (heads off) in 1984, a record level, roughly 150-200 million pounds ahead of 10 years ago.

While processed shrimp accounted for about half the market in 1983, it was 80 percent of the market in the early 1970's. Comparing processor output now and 10 years ago, we see that 1) breaded shrimp is lower, 2) raw headless shrimp is fluctuating, 3) peeled raw shrimp is growing, 4) peeled cooked shrimp is declining, and 5) canned shrimp is declining in the Pacific and Gulf regions.

The National Seafood Consumption Survey of 1981 has consumer usage, purchase, and attitudinal data that may be useful in developing marketing strategies for shrimp and other seafood products. There is a trend toward more healthy diets, and seafood has more health benefits than are widely recognized and promoted.

However, an aggressive seafood marketing strategy must also deal with consumer attitudes about price and value,

preparation, lack of familiarity, and product safety and quality. One recent study suggests that a key to successful seafood advertising is to concentrate on changing the consumer's own perceptions from being a nonconsumer of seafood to a consumer of seafood. This approach may be easier than changing consumers' perceptions, beliefs, or attitudes about seafoods.

Looking to the future—to the year 2000—firms that have heretofore based their seafood market position mostly on products using natural shrimp may benefit from possible moderating influences on shrimp raw material prices because of expanding shrimp mariculture. On the other hand, there will likely be an increasingly severe competitive challenge from "imitation" (analog or fabricated) products that use significant percentages of surimi as raw material (now about \$0.80/pound in Japan). Source: John Vondruska, NMFS Southeast Regional Office, St. Petersburg, Fla.

## **NE Cod, Haddock Supplies to Grow**

Large numbers of young of two major New England seafood species, haddock, *Melanogrammus aeglefinus*, and Atlantic cod, *Gadus morhua*, are appearing on Georges Bank, the NMFS Northeast Fisheries Center (NEFC) reported early this year. These young haddock and cod were spawned the previous spring on the Bank, the Northeast's richest fishing ground, and comprise the 1985 "year class" of each species.

Allen E. Peterson, Jr., NEFC Director, noted that "in recent years the commercial catch of haddock and cod has decreased and the retail price, especially of haddock, has correspondingly increased." He feels that "these 1985-year-class fish ultimately will boost commercial catches and could moderate retail prices."

If the New England Fishery Management Council, which manages the Georges Bank fisheries, places—as expected—a 17- or 19-inch size limit on haddock and cod, then the 1985 year classes of Georges Bank haddock and cod will not grow enough to attain a legal size until late 1987 or early 1988. Peterson is concerned, however, that "haddock and cod from the 1985 year classes will nonetheless begin showing up in fishermen's nets later this year occasionally at 9 inches and consistently at 12 inches, well under the Council's proposed size limits." All undersized fish would have to be discarded at sea.

Peterson notes that "many discarded fish would die as a result of being caught and thus fail to reach a legal or 'landable' size. This potential loss to the legal-size population of haddock and cod could dampen any improvement in landings for fishermen and in retail prices for consumers." He added that "the cooperation of fishermen in adhering to the Council's fishing regulations—all designed to reduce the mortality of undersized fish—and in avoiding fishing among concentrations of undersized fish, could be the key to restoring the Northeast's haddock and cod fisheries."

NEFC scientists first detected the strong 1985 year classes of these species

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## **Magnetite Makes Magnetic Sense to Yellowfin Tuna**

Fishery scientists with the University of Hawaii and NOAA's National Marine Fisheries Service have found that yellowfin tuna, *Thunnus albacares*, sense magnetic forces on the ocean floor which may guide them in their migrations across the eastern Pacific Ocean. The researchers have found that the tunas contain as many as 10 million magnetic crystals of the black iron mineral magnetite in their skullbones and may use it to navigate during migration. The scientists believe that the fish use the magnetite like a compass, determining both their location and the direction to take in relation to the seafloor's magnetic field.

At mid-oceanic ridges, molten rock wells up through the seafloor and leaves mineral deposits that become magnetized and align themselves with the Earth's magnetic north pole. However, because the magnetic field changes over time, older minerals are aligned with the magnetic south, creating "magnetic avenues" in both directions. Scientists believe that the yellowfin tunas use their

magnetite as a map to detect these avenues and measure their angle from the North Pole and the Equator while migrating.

Researchers know from tagging data that the yellowfin tuna migrates as many as 3,800 miles from the Fiji Islands toward Central America. Combining this data with information detailing the ocean floor's magnetic features enables scientists to predict where these tropical fish migrate.

"This information is a major step in allowing us to distinguish among the various stocks of tuna in the Pacific and determine if there are similarities in their migratory behavior," said Richard Brill, fishery biologist at the NMFS Honolulu laboratory. Also, the study will cover skipjack tuna, *Euthynnus pelamis*, and kawakawa, *E. affinis*, and will try to determine the minimal change that the fish can detect in the Earth's magnetic field. About 221 million pounds of yellowfin tuna, valued at more than \$110 million, were landed in the United States in 1984.

on Georges Bank during an August research vessel cruise to the Bank to test juvenile fish sampling gear and methods. Center scientists later indexed the strength of these year classes based on the October portion of the Center's annual autumn survey of fish distribution and abundance on the continental shelf from Nova Scotia to North Carolina. This series of autumn surveys, begun in 1963, is the only method for forecasting year-class strength well before the young fish have grown large enough to begin showing up in fishermen's nets.

### Recent Catches

The 1984 catch of Georges Bank haddock by American fishermen—19 million pounds—was the same as the 1983 catch, but down from a 1981 catch of 42 million pounds and a 1982 catch of 28 million pounds. Fishermen received about \$13 million for their 1984 catches of haddock from Georges Bank. Based on preliminary data, the 1985 American catch of Georges Bank haddock was expected to drop by 50 percent to a little over 9 million pounds.

The 1984 catch of Georges Bank cod by American fishermen—73 million pounds—was down from the record 1980 catch of 88 million pounds and the 1983 catch of 81 million pounds. Fishermen received more than \$27 million for their 1984 catches of cod from Georges Bank. Based on preliminary data, the 1985 American catch of Georges Bank cod was expected to be the lowest in 7 years at about 63 million pounds.

### Size of Increase

For haddock, the Center's survey yielded the third highest number of young fish (i.e., those hatched within the year) since the surveys began in 1963. Only the numbers of young fish from the 1963 and 1975 year classes were higher.

When fish from the huge 1963 year class of Georges Bank haddock reached a catchable or "recruited" size in 1965, they fueled the foreign overfishing of Georges Bank from which the haddock population has never fully recovered. When the 1975 year class haddock re-

cruited to the fishery in 1977 (just as the U.S. 200-mile limit took effect), it aided the resurgence of the New England fishing industry.

Peterson noted that "although the size of the 1985 year class of Georges Bank haddock is far below the size of the 1963 year class, it appears to be between the size of the 1975 and 1978 year classes—the only two year classes to contribute significant numbers of fish to the Georges Bank haddock fishery in the past two decades."

In actual numbers, the 1975 year class of Georges Bank haddock produced 83 million 2-year-old fish (the age at which haddock begin to recruit to the fishery); the 1978 year class produced 62 million. The 1985 year class production should be between these two values.

For cod, the Center's survey yielded the second highest number of young fish since the surveys began. Only the number of young fish in 1975 exceeded the number in 1985. Based on the survey values, the 1985 year class should rejuvenate the sagging cod catch by late 1987 or early 1988.

### Managing the Increase

The New England Fishery Management Council, created by the Magnuson Fishery Conservation and Management Act to manage the fisheries resources of Georges Bank, Gulf of Maine, and Southern New England, is developing a new management plan for haddock, cod, and other demersal finfish. The new plan, to be called the Northeast Multispecies Fishery Management Plan, would control fishing by setting closed seasons and areas, gear restrictions, and size limits.

For haddock and cod, the plan would set a 17-inch size limit the first year of the plan, then a 19-inch limit the second year. Although the plan's gear restrictions are designed to reduce the catch of undersized fish, many haddock and cod of the 1985 year class would still be vulnerable to being caught before they attain legal size.

Peterson concluded that "it will be difficult for the Council's managers to control the catch of undersized fish without the cooperation of fishermen. Such cooperation is essential, though,

because those haddock and cod which do survive beyond the future 19-inch legal size limit—a size at which most have also matured—will form the bulk of the spawning stocks that will in turn produce much of the future supply of haddock and cod. For haddock in particular, the spawning stock in recent years has been so low that the probability of producing a strong year class has also been very low."

### NOAA Satellite Data Helps Many Fishermen

Fishermen used to spend a great deal of valuable time searching along the Gulf Stream for the warm, spiraling currents and the swordfish, sharks, and tunas that inhabit them. But in recent months, many fishermen have been using the National Oceanic and Atmospheric Administration's oceanographic analysis charts, radically cutting time and fuel costs and finding fish.

A survey of 130 commercial and sport fishermen by NOAA's New Jersey Sea Grant Extension Service found that 83 percent of the anglers credited the charts for locating better fishing areas. And, 73 percent said they saved time at an annual savings of about \$2.25 million in fuel costs.

The charts, using timely information provided on such ocean features as spiralling eddies and sea-surface temperature changes, are derived from the Commerce Department agency's polar-orbiting satellites, transmitted to receiving stations at Wallops Island, Va., and Redwood City, Calif. From there they are relayed to NOAA's National Environmental, Satellite, Data, and Information Service (NESDIS) in Washington, D.C.

These pictures then go the NMFS Narragansett Laboratory in Narragansett, R.I., where they are compared with the sea-surface temperature maps, updated with data on warm core eddies, and distributed to fishermen. On the U.S. west coast, images are sent and ocean charts prepared and distributed by NOAA's Ocean Service Center in Seattle and National Weather Service offices in Redwood City, Calif., and Anchorage, Alaska.

The charts have been so popular that oceanographers at the Narragansett Laboratory and the University of Rhode Island are developing maps with better details of the continental shelf waters off southern New England where more anglers fish. More information is available from Jay Tebeau at (202) 634-7281 or (301) 774-7427.

### **Upturn Foreseen in New England Scallop Fishery**

Large numbers of young Atlantic sea scallops, *Placopecten magellanicus*, are appearing off the U.S. east coast, the National Marine Fisheries Service's (NMFS) Northeast Fisheries Center, Woods Hole, Mass., reported early this year. These young scallops, spawned in 1982 and comprising the 1982 "year class" of sea scallops, will grow enough to attain legal size later this year or in early 1987. Allen E. Peterson, Jr., Director of the Northeast Fisheries Center (NEFC), feels "the 1982 year class could reverse the current 17-year decline in the Northeast's sea scallop fishery."

#### **Management**

The Northeast's sea scallop fishery is managed by the New England Fishery Management Council in conjunction with the Mid-Atlantic Fishery Management Council as part of their responsibilities under the Magnuson Fishery Conservation and Management Act. On 1 April 1986, the NMFS was to implement new regulations developed by the Councils which will require scallops to be a "minimum" size before they can be sold. Earlier scallops only needed to be an "average" size before sale.

Under the average-size regulations, strong year classes of sea scallops—such as the huge 1979 year class in the Great South Channel area of Georges Bank—have been quickly harvested at small sizes and then "mixed" with larger scallops from other sites to achieve the regulated average. This mixing technique crops strong year classes before the scallops grow to a spawning size and lessens the ability of scallop stocks to naturally replenish themselves. The new

minimum-size regulations should result in fishermen landing mostly adult-sized scallops and should significantly improve the chances for these new adults to spawn at least once.

#### **Right Timing**

Peterson feels that "the timing of the new scallop regulations is excellent from a conservation standpoint. When the strong 1982 year class, particularly in the Mid-Atlantic, becomes vulnerable ('recruited') to the fishery later this year or in early 1987, fishermen will be dissuaded from fishing those scallop beds composed of juvenile scallops."

"Increased survival of these 1982 year class scallops until they have both attained a legal size and had a chance to spawn, could fulfill the New England and Mid-Atlantic Councils' objective of restoring long-term vitality to the Northeast's sea scallop industry."

#### **Recent Catches**

American catches from the east coast's three major sea scallop stocks—Mid-Atlantic, Georges Bank, and Gulf of Maine—peaked in 1978 at 32 million pounds of scallop meat. The catch has declined each year since. Based on preliminary data, the 1985 American catch was expected to be about 15 million pounds, the lowest since 1975. The 1985 catch was expected to be worth about \$75 million in dockside or "ex-vessel" prices to fishermen, a \$20 million decline from 1984.

#### **Size of Increase**

Evidence of the strong 1982 year class of sea scallops comes from the Center's annual summer survey of scallop distribution and abundance on the Northeast continental shelf. The analysis of the 1985 summer survey data showed a marked increase in the abundance indexes of small, precommercial-sized scallops from the 1982 year class in both the Mid-Atlantic and on Georges Bank.

In the Mid-Atlantic, the survey abundance index of small scallops in the New York Bight area was the highest since surveys began in 1975; in the Delmarva area it was the third highest since surveys began. On the U.S. portion of Georges Bank, the survey abundance in-

dex of small scallops in the Great South Channel area was the fourth highest since surveys began, and was triple the 1984 value. The small scallop index for the southeastern part of Georges Bank was the third highest since surveys began, and was double the 1984 value.

### **Hagfish Create Problems for Deepwater Lobstering**

Using a NOAA-chartered research submersible, the Harbor Branch Foundation's *Johnson-Sea-Link*, the NMFS Northeast Fisheries Center (NEFC) has confirmed its suspicions that the Atlantic hagfish, *Myxine glutinosa*, can be a major problem in the deepwater lobster fishery. During four dives last summer at Jordan Basin (central Gulf of Maine), NEFC scientists observed hagfish—primitive eel-like creatures closely related to sea lampreys—consuming up to 90 percent of the bait (usually redfish or Atlantic herring "racks") within 24 hours from commercially fished lobster traps. Amphipods, crabs, and shrimps also came into the traps to finish off the bait. Excellent videotapes and photographs now document this hagfish activity.

This bait loss from deepwater traps either creates a major problem or raises a serious question. On the one hand, it creates a major problem if the presence of bait in the traps is essential for attracting lobsters. A typical deepwater lobsterman will set about 1,000 traps, filling them with about \$1,000 worth of bait, and hauling them every week. If hagfish are consuming 90 percent of the bait soon after the trap is set, then current baiting practices are very inefficient.

On the other hand, it raises a serious question if the traps are effectively fishing more than 85 percent of the time (i.e., 6 out of 7 days) with little or no bait. In fact, earlier underwater observations by NEFC scientists, as well as fishing experiences by some Long Island offshore lobstermen, suggest that deepwater lobsters are attracted to traps not because of the bait, but because of the shelter they can provide on an otherwise featureless bottom.