FISHERIES INSTRUMENTATION LABORATORY OFFERS BIOLOGISTS NEW RESEARCH "TOOLS"

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A new and unique unit, the Fisheries Instrumentation Laboratory of the U. S. Bureau of Commercial Fisheries, has been established in Seattle, Wash., to assist fishery workers in making the most effective use of modern instrumentation and other physical science devices for their research problems.

Just completing its second year of operation, the Fisheries Instrumentation Laboratory is the only one of its kind which combines the talents of a team of biologists, engineers, electronic scientists, and instrument makers into a single unified group. By working together in the laboratory and in the field, biologists and

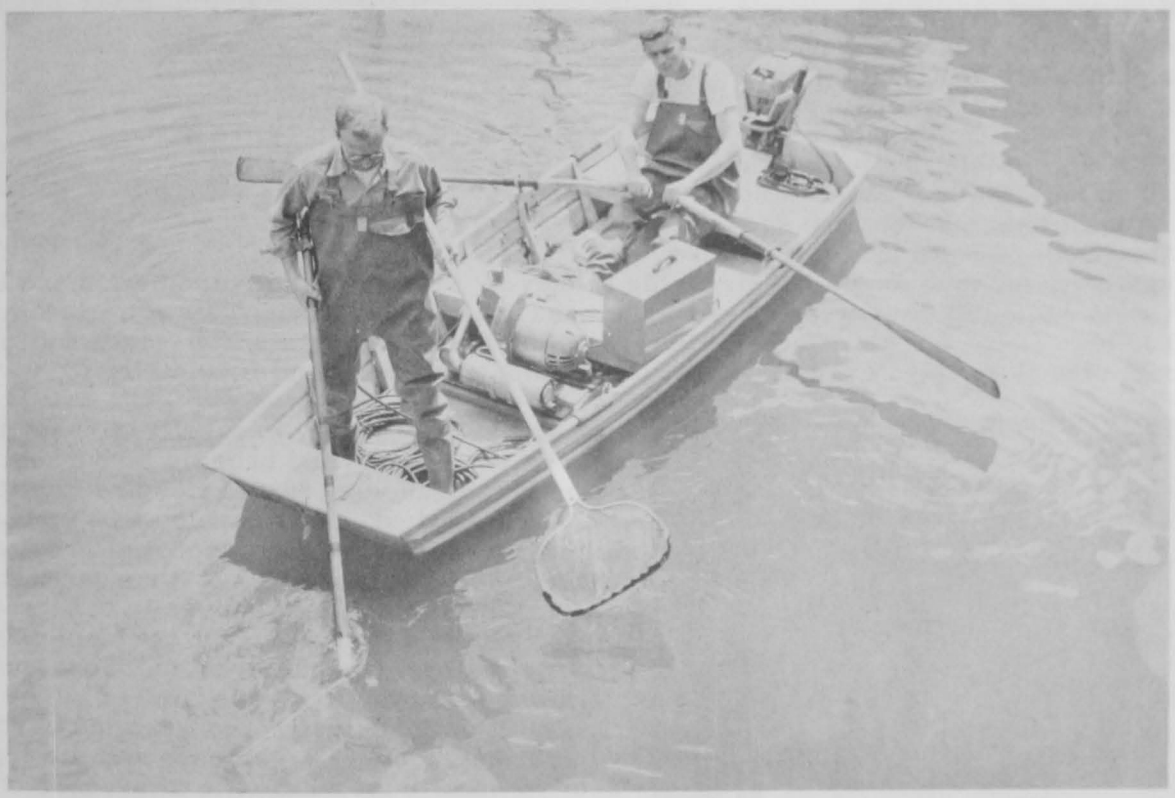

Fig. 1 - Electronic fishing with d. c. pulses provides improved sampling method in rivers and streams.

engineers are obtaining an understanding of each other's problems. This is materially increasing their combined effectiveness. As a result, new techniques, instruments, tools, and materials constantly being developed by the rapidly progressing physical sciences, are quickly adapted and utilized to the fullest extent in fishery research.

Services of the staff of the Fisheries Instrumentation Laboratory are available to all personnel of state, Federal, and private agencies who are contributing towards the advancement of fishery research and management.

The constantly increasing and damaging intrusion of modern civilization on one of our most valuable natural resources--fish and shellfish--has imposed a heavy

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burden on fishery scientists engaged in the conservation of this important protein source and recreational outlet. In many areas, increasing demands for water by industry, residential areas, irrigation, and hydroelectric installations have seriously depleted or altered the supply of available water for fish propagation and recreational purposes. In other areas, increased fishing pressure, pollution, silting, and a variety of changing environmental factors have seriously interfered with efforts to maintain commercial and sport fishing catches.

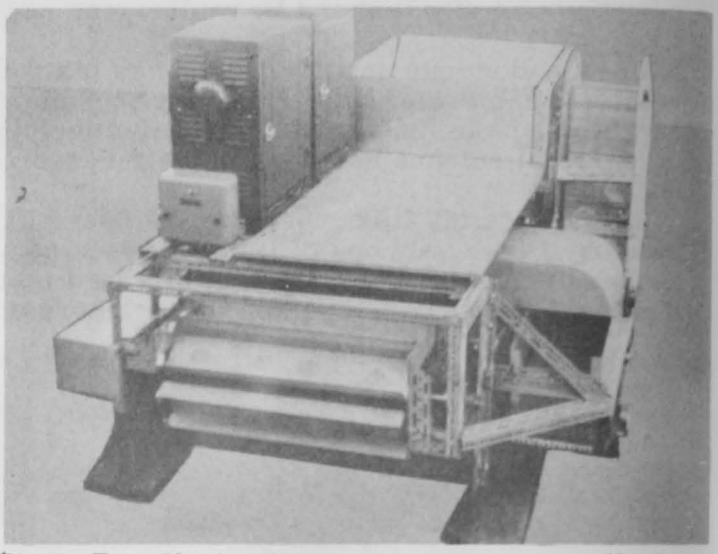

Fig. 2 - Tagged herring ejector examines up to two tons of herring a minute and removes individual fish containing a special internal tag.

Overcoming these problems requires considerable expenditures of time, money, and manpower. Modern fishery workers are turning more and more to the powerful tools of physical instrumentation for data gathering and processing techniques.

The effective use of modern instrumentation has shown that substantial savings in time and money may be realized. Some investigations have saved considerable money by installing instrumentation and better data-handling facilities; others have used their saved manpower to work toward other aspects of their projects. Many have been able to accomplish tasks which would otherwise have been beyond their means, physically and financially.

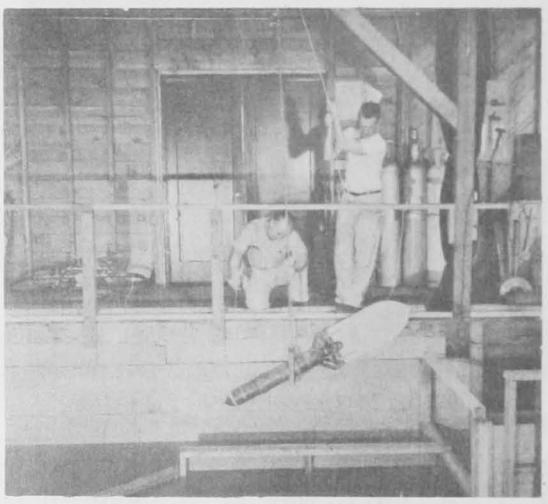

Fig. 3 - Improved model of current recorder provides permanent and accurate 90-day record of water speed and compass heading.

Caused in part by necessity, fishery research work is spread broadly throughout the country, and in very few places are facilities available to workers to develop new instruments or repair old ones except at great expense. A few universities and research units have allowed biologists access to their shop facilities. But even then, the problem of selecting the best materials or the most appropriate mechanism has been limited by the difficulty of communication between the biologist without engineering experience and the engineer or machinist with little awareness of the environmental problems of fishery biology.

Such a situation has long existed in the design of instruments for biological research, and has often led to many awkward and semi-satisfactory devices, cleverly conceived but inefficient in operation. Many satisfactory instruments are available, and need only to be brought to light.

The need for a unit with an understanding of the environmental problems of fishery biology and a knowledge of the proper technical assessment of contemplated instruments or systems of instruments is plainly evident.

The present staff of the recently-organized Fisheries Instrumentation Laboratory includes personnel trained and experienced in biology, physics, technical writing,

instrument making, and electronics. Gradual acquisition of precision tools and instruments has enabled this organization to undertake problems of considerable variety and extent.

Most of the present group were recruited from the staff of the Pacific Salmon Investigations, where the use of electronic instrumentation was most intensive within the Service. Several Bureau employees were instrumental in making the services of this unit available on a non-profit basis not only to the research biologists of the Bureau, but to fishery workers throughout the country.

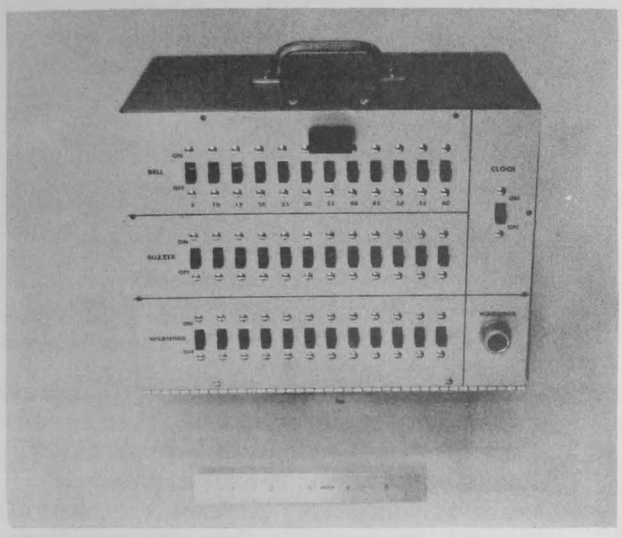

Fig. 4 - Battery-powered intervalometer provides bell buzzer and light indication for precise timing of fish-counting sample intervals.

It must be emphasized that the present state of development of the instrumentation industry is such that a foolproof machine can be made, but it will cost many times what it would be worth to the biologist. The biologist usually wants a satisfactory instrument at an absolute minimum of cost. Conventional design usually is too expensive, and even after considerable ingenuity is exercised a compromise between cost and performance is usually required.

As a result the Fisheries Instrumentation Laboratory attempts to provide better and less complicated instruments at a lower cost, and to provide information on availability of commercial devices and materials for more efficient use of research funds.

Work requests are necessary for only about one-tenth of the problems, since the Laboratory is usually able to suggest available commercial equipment or services, simplify the problem in other ways, or accomplish the task in a very short time. The extensive files of commercially-available instruments, and the expanding stock of instruments for loan may solve a difficult problem.

Several examples of modern instrumentation applied to fishery research are:

The manner in which an electronic fishing device is used to obtain population data in streams and rivers where nets and other means of collection are difficult if not impossible to use is illustrated in figure 1. Pulsating direct current applied between the hand-held positive electrode and the metal hull of the skiff tend to attract and momentarily stun the fish in the vicinity of the positive electrode. The fish are not harmed by this experience, and are easily captured by dip nets.

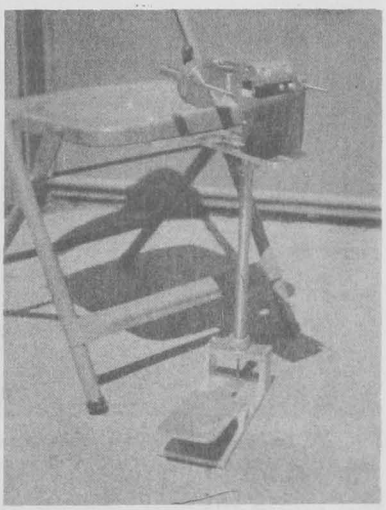

Fig. 5 - Treadle-operated tag injector inserts special metal tag in body cavity of Alaskan herring.

An automatic high-speed tagged herring ejector is shown in figure 2. This fantastic machine will recover individual internally-tagged herring from a rapidly moving conveyor belt of the type used in a typical Alaska herring processing plant. The new device does not slow or otherwise interfere with the high-speed processing of the commercial product.

An improved self-contained current recorder being lowered into the water to measure the speed and direction of water flow is shown in figure 3. By means of photographic film exposed at precisely regular intervals, a permanent and accurate record of water speed and compass heading is recorded for a period of 90 days without attention.

A battery-powered intervalometer for selecting any combination of five-minute periods per hour, with bell or buzzer signals (fig. 4). A warning buzzer-and-light sequence is available 30 seconds before the timing bell or buzzer.

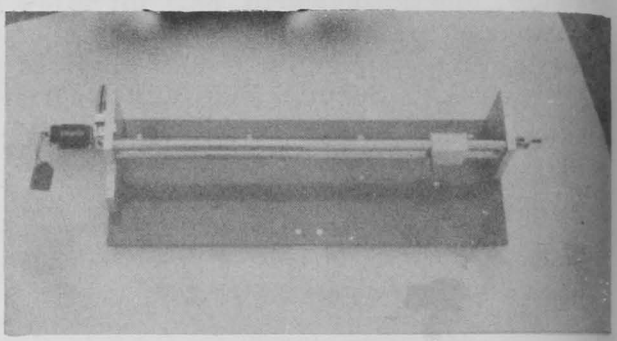

Fig. 6 - Fish-measuring instrument reads directly in millimeters lengths to $\frac{1}{2}$ meter.

A mechanical treadle-operated tag injector which was designed to rapidly insert a small plastic-coated metal tag into the body cavity of herring (fig. 5).

A mechanical half-meter measuring device which reads directly in millimeters the various lengths required by fishery biologists is shown in figure 6. The versatility of the instrument is greater than its apparent simplicity would seem to indicate. An adapter is available which records this and auxiliary identifying data on either punch cards or teletype tape.

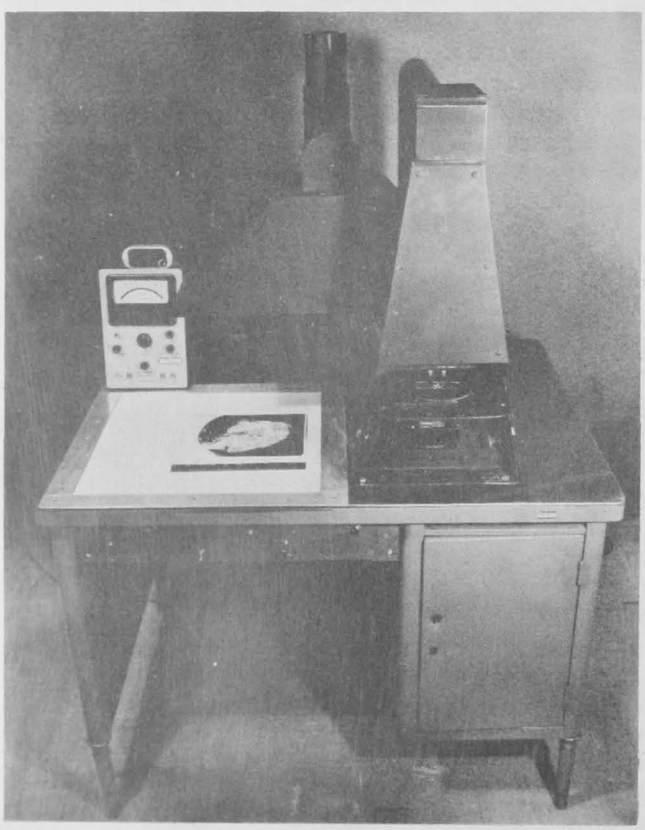

Fig. 7 - Electro-optic scale reader accurately, rapidly, and semi-automatically provides data on individual salmon scales.

A combination optical and electronic device for the purpose of accurate, rapid, and semi-automatic salmon-scale reading (fig. 7). Although still in the development stage, the new instrument shows tremendous promise.

A strong light is projected through one of a number of scale impressions on a transparent acetate sheet. A prism and mirror system allows the scale image to be magnified and presented on a smooth white tabletop. The entire scale image is in focus at one time at a magnification of 50 diameters. A narrow slit cut in the surface of the table permits light to fall on a sensitive photomultiplier tube mounted on a movable carriage underneath the table. As the photomultiplier scans the thin line along a scale radius, it detects and amplifies the variations in light intensity representing the scale circuli, which are presented as pips on a strip-chart recorder. The new technique greatly simplifies the counting and measurement of circuli and annuli. Future plans call for presentation of the data on punch cards, which will materially increase the speed of the present operation.

A Gulf II plankton sampler which was built in modified form by the Laboratory is shown in figure 8. The sampler is towed at 10 knots, collecting plankton and recording the sampled volume.

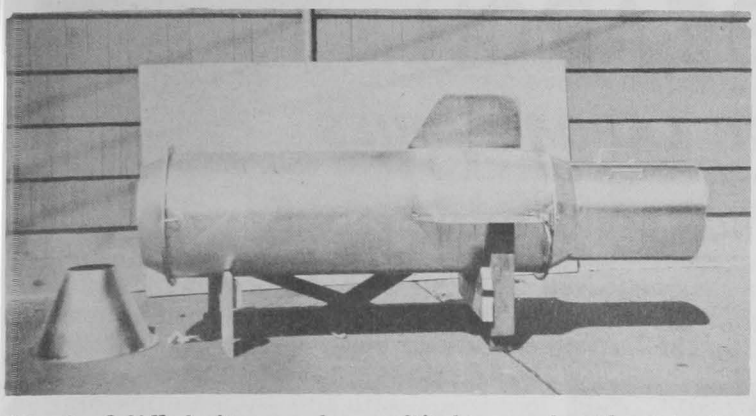

Fig. 8 - Gulf II plankton sampler, modified to comply with needs of Alaska Region, Bureau of Commercial Fisheries.

A portable crab measuring instrument which reads directly in hundredths of inches, from $\frac{1}{2}$ to 8 inches, is shown in figure 9.

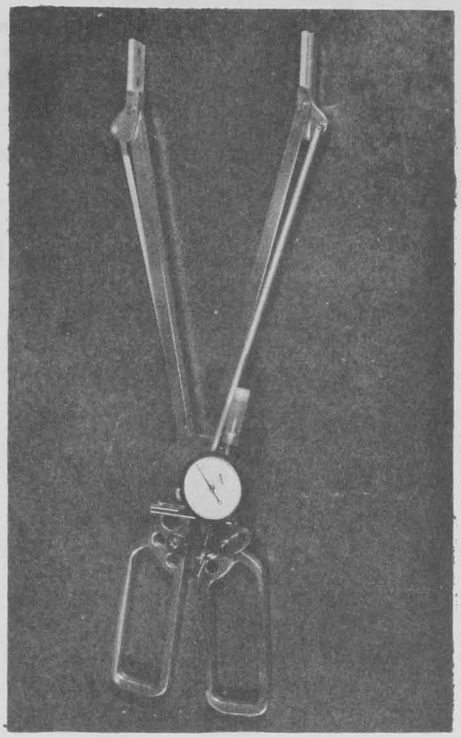

Fig. 9 - Portable crab-measuring instrument, accurate to one-hundredth of an inch.

Among fishery agencies which have used the services of the Fisheries Instrumentation Laboratory are the Bureau of Sport Fisheries and Wildlife, the University of Miami, Cornell University, the Canadian Department of Fisheries, and the International Pacific Salmon Fisheries Commission. In addition to correspondence with the 49 states, the Laboratory has received and answered letters concerning instrumentation problems from at least a dozen foreign countries. The wide utilization of this facility and of the instruments developed by it demonstrates the need for instrumentation know-how in the fisheries field, and the advantages alert fishery workers can realize from the services of the Fisheries Instrumentation Laboratory.

SINGAPORE'S SHRIMP PONDS PROFITABLE

The Singapore Ministry of Commerce and Industry in its 1956 Report says that its brackish-water shrimp ponds (which cover 14 acres) since their construction in 1954 yielded 24,032 pounds of prawns and fish, which was sold for about US$6,400. The cost ($4,200) of building the embankments, sluice gates, and huts was fully recovered in less than two years.