Before the expedition sets out at least one member should visit the makers, or their agents, in order to learn the working and correct maintenance of the engines. Many useful practical hints will be picked up in this way. The literature supplied with the engines should be studied and will save much time otherwise wasted on trial and error. Minor faults are most likely to develop in the early stages of the engine's life, so that all running-in should be completed before leaving. This will also give initial experience in handling both engines and boats.

CANADIAN FISHERIES RESEARCH VESSEL *CALANUS*

[Based on notes in *Arctic. Journal of the Arctic Institute of North America*, Vol. 2, No. 1, 1949, p. 56–57 and *Arctic Circular*, Vol. 1, No. 5, 1948, p. 53–54.]

During the first season's field work of the Ungava Bay Fisheries Expedition, 1947–49,[1] the need was apparent for a vessel of special design and robust construction, specially equipped for marine biological investigations. The Fisheries Research Board of Canada therefore decided to go forward with the design and construction of a research vessel for use in arctic waters. Messrs German and Milne of Montreal were given the task of producing a suitable design, in co-operation with M. J. Dunbar of McGill University, who was in charge of investigations in Ungava Bay, and E. Rigby of the Atlantic Biological Station of St Andrews, New Brunswick. The Industrial Shipping Company at Mahone Bay, Nova Scotia, undertook the work of construction, and the vessel, known as the *Calanus*,[2] was designed, drawn, and built between January and August 1948.[3]

The *Calanus* is a ketch designed to be drawn up on shore during the winter, and is suitable both for deep-sea and inshore work. Details are:

Length, 49½ ft.
Beam, 15 ft.
Draught, 6½ ft.
Gross tonnage, 30.
Displacement tonnage, 43.
Engine, Diesel 77 h.p.
Auxiliary, Lister Diesel 3 kW.
Sail area (staysail, mainsail, and mizzen), 668 sq.ft.
Cruising speed (under power alone), 7 knots.

The ribs, combings, gunwale, wheel-house, ice sheathing and planking (above the water-line) are built of oak; below the water-line 2-inch yellow birch planking is used. The decks are of white pine.

Internally the vessel is divided into the following compartments: forecastle,

[1] For a report on this expedition see p. 92.

[2] The generic name of the most important member of the Copepod plankton of the North Atlantic.

[3] It is interesting to record in this connection that a motor fishing vessel, also named *Calanus*, was acquired by the Scottish Marine Biological Association in October 1947, for work at the Marine Station at Millport on the Isle of Cumbrae. Strongly constructed of wood, she is larger than the Canadian *Calanus* and is of a type built according to Admiralty specifications during the war: length 75 ft. 7 in.; beam 19 ft. 4 in.; draught 10 ft. 11 in.; gross tonnage, 77; engine, Blackstone Diesel 160 h.p.; auxiliary, Lister Diesel 12 h.p.; accommodation for eleven.

with accommodation for an Eskimo crew of four; laboratory and two-berth cabin; cargo-room; engine-room; galley and toilet, and saloon. Heating is by hot-water radiators, lighting by electricity. There is accommodation for a total complement of eight.

The equipment includes a fully equipped laboratory; an echo-sounder with 75- and 300-fathom scales; a radiophone; a two-drum engine-driven winch, with 275 fathoms of wire on each drum, running through fair leads to gallows-frames for otter and beam trawling; and two hydrographic winches with 500 and 1000 m. of wire respectively.

THE SNOWMOBILE

[Summarized from notes in *Motor*, Vol. 94, 19 January 1949, p. 695, and *Arctic Circular*, Vol. 1, No. 4, 1948, p. 41.]

In 1926 an experimental half-tracked vehicle, steered by skis and propelled by caterpillar tracks, was designed and built by J. A. Bombardier to operate on snow-bound roads in northern Canada. The vehicle, known as the Snowmobile, was later produced in large numbers for doctors and commercial firms, and between 1939 and 1945 was used extensively by the armed forces.

The power unit of the civilian Snowmobile is a 115 Chrysler T120 engine, located at the rear, driving the bogie axle through a standard Chrysler gear-box. The rear axle carries two large sprockets to drive the caterpillar tracks, which on each side run over four wheels fitted with 450 by 16-in. tyres. The forward end of the vehicle is mounted on skis, 12 in. wide by 60 in. long, by means of which it is steered. Spring action on the steering skis is achieved by means of two vertical shock absorbers, short lengths of chain being fastened from these to a rocker arm on the skis. The same type of springing action is used for body suspension, except that the shock absorbers are installed horizontally. To ensure that no part of the mechanism can become clogged by snow, the bottom is planked, and the braking system, which operates on the propeller shaft, and the brake and clutch operating rods are installed between the bottom planking and the floor-boards. This has the advantage that all repairs can be effected from inside the body by lifting the floor-boards or by opening the doors of the engine compartment and working on the engine in the engine-room.

Body weight is kept to a minimum: plywood is used throughout, and the overall weight is 3400 lb. The full load consists of twelve passengers or 2000 lb. of goods. Snow pressure over the 5000 sq.in. of bearing surface is less than $\frac{3}{4}$ lb. per sq.in. Internal heating is provided by circulating water from the engine radiator directly through heating radiators inside the body. Each heating radiator is fitted with a control valve, so that internal temperature can be adjusted. When the radiators are shut off, water circulates through the engine-cooling system in the normal way.

Since 1945, the military Snowmobile has been developed largely as a result of lessons learnt during Exercise "Musk-Ox" in 1946. The Penguin Mark I then in use proved itself capable of traversing either frozen or thawing terrain, but