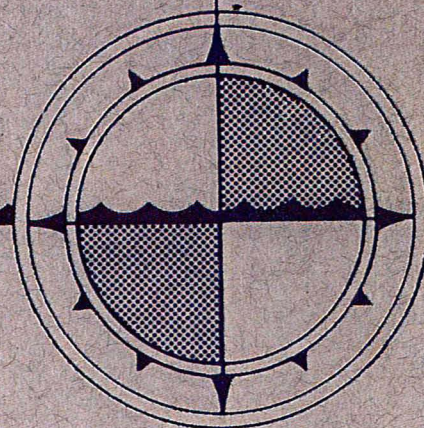


THE 'VANLENE' ACCIDENT

March 1972

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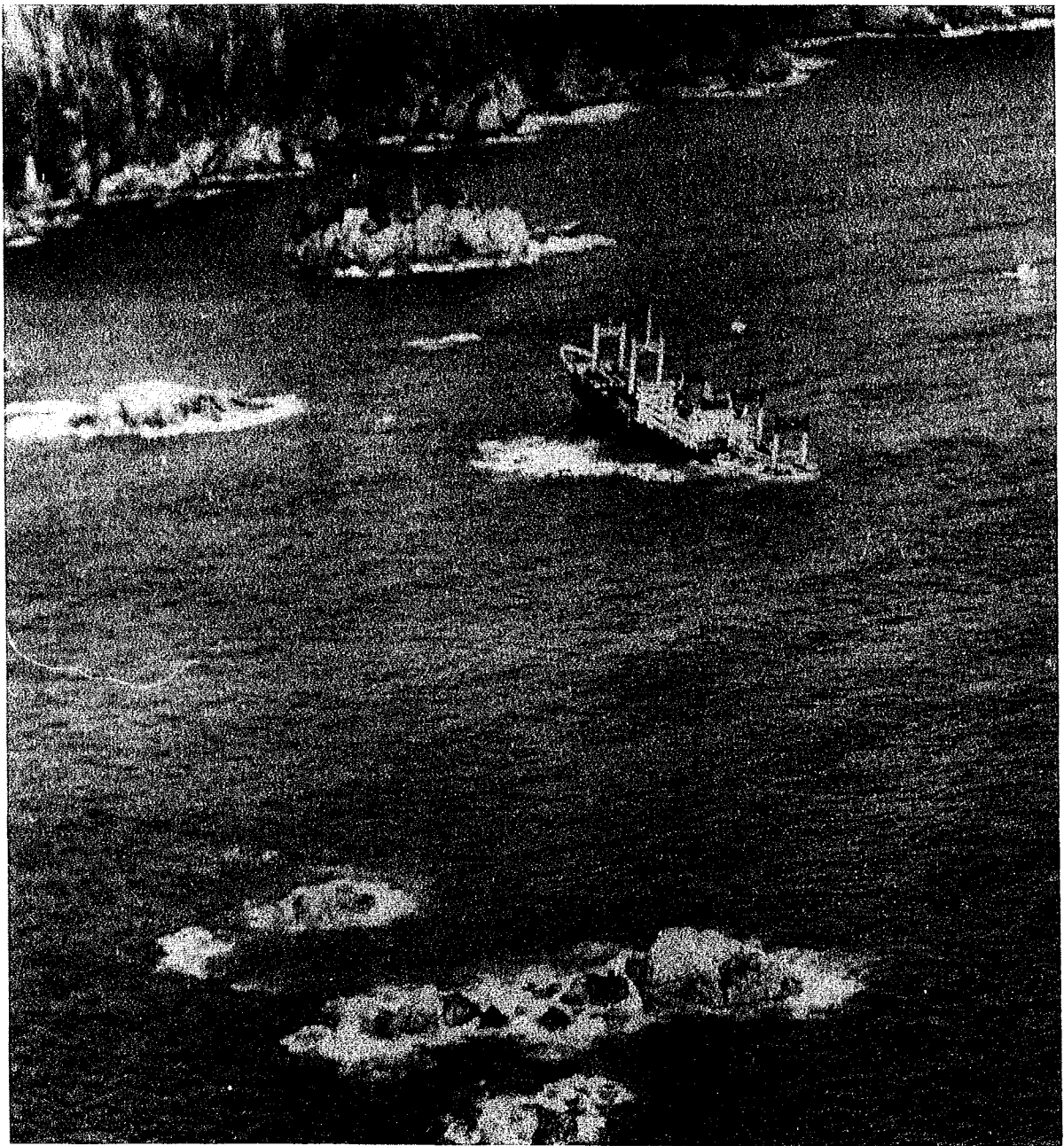
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m.v. "Vanlene" aground off
Austin Island, March 1972

(courtesy "The Victorian Weekly")

INTRODUCTION

On Tuesday evening, March 14, 1972, the 8500 ton m.v. "Vanlene" ran aground off Austin Island in Barkley Sound (fig. 1), a rugged and isolated inlet on the southwest coast of Vancouver Island and part of the new Pacific Rim National Park.

The Panamanian freighter en route from Japan to Vancouver with a cargo of 300 cars, was heading for the entrance of the Juan de Fuca Strait when she found herself on the rocks in Barkley Sound, 20 nautical miles off course. In a press interview shortly afterwards, the captain revealed that ever since her departure from Japan, the ship had been operating without any navigational aids except a magnetic compass.

Exposed to southerly seas, the 20 year old "Vanlene" was holed that same night and had to be abandoned when the engine room flooded. At the time of her grounding, there were 400 tons (2666 barrels or 112,000 U.S. gallons) Bunker "B" fuel left in her bunkers and some of this fuel started to spill when the double bottom ruptured amidships. A persistent southeasterly wind of 25 mph moved the slick among the islands and on Thursday morning, less than 36 hours after the grounding, patches of oil were reported⁽¹⁾ as far as Forbes Island (fig. 2). Several ships arrived at the scene during the following days to assist in salvaging the vessel and in containing the oil spill.

CHRONICLE

It soon became apparent that despite the efforts to contain the oil, a significant portion of the ship's fuel was escaping from the wreck and threatened Barkley Sound's ecology.

To examine the behaviour of the oil in the sea and to help assess the extent of beach contamination, the Marine Sciences Branch recalled C.S.S. "Vector" from her work area in the Strait of Georgia and despatched her to Barkley Sound on Friday, March 17th. The Biological Station of the Fisheries Research Board at Nanaimo was advised of the "Vector's" cruise and two marine biologists, Dr. D. Quayle (intertidal invertebrae) and Mr. D. Outram (herring spawning) joined the vessel in Victoria.

The "Vector" arrived in Mayne Bay early Saturday morning. At dawn, two boats were launched and began working their way south towards the wreck, examining shores for signs of oil pollution. The "Vector" moved to the wreck site for a brief meeting with Mr. Larry Slaght, the Vancouver Island Superintendent of M.O.T., who was conducting salvage and oil containment operations from C.C.G.S. "Camsell".

After the rendezvous with "Camsell", the "Vector" continued her reconnaissance in the general area northwest of the wreck site, taking sea water samples at locations where oil had been reported.

Shore reconnaissance with small boats continued until darkness and was resumed at daybreak Sunday morning, covering the western and northwestern outer islands of the Broken Group.

After a second meeting with Mr. Slaght on CNAV "St. Anthony" (the "Camsell" left the wreck site Saturday afternoon), the "Vector" departed from Barkley Sound and returned to Victoria, Sunday evening, March 19.

The weather had been rather inclement throughout the operation; the winds were southerly at 15 mph, gusting to 35 mph in rain squalls. A moderate swell with an on-shore wind made boat landings on the western shore of Barkley Sound (the shoreline southwest of Forbes Island) too hazardous. Since the "Camsell's" helicopters had earlier reported a slick off this shore, which is one of the main herring spawning grounds in Barkley Sound, arrangements were made with the Fisheries Protection Officer o/b the "Comox Post" to visit this area at a later date.

The "Vector" under Captain C.E. Macaulay was ideally suited for this emergency. Her experienced crew and rugged boats enabled us to cover a large area in a very short time. There were no breakdowns or delays.

DISCUSSION

On the basis of some broad assumptions, we estimated the amount of oil drifting in the general area on the 18th and 19th of March to be about 500 barrels (17,500 Imp. gallons), and on the beaches 150 barrels (5200 Imp. gallons), see fig. 2.

The "broad assumptions" were as follows:

- (1) The oil in the immediate vicinity (one square cable) of the wreck had an average thickness of 1mm, decreasing to 1/2mm in the channel north of Austin Island, over an area of 3 square cables. In laboratory experiments⁽²⁾ the final thickness of oil films on water has been found to vary between 15 and 150 microns. This thickness increases considerably when the water contains surface active agents (also produced by the spreading oil itself) and consequently has a lower surface tension. Moreover, the oil in the immediate vicinity of the "Vanlene" was often trapped by an onshore wind and could not spread freely. Therefore, a layer thickness of 1mm near the vessel and 0.5mm in the channel seemed a reasonable estimate.
- (2) The oil observed in the form of iridescent slicks had an average thickness of 2.5×10^{-5} cm over an area of about four square n.m. This assumption was derived from basic optical considerations: A thin film will create an interference pattern for a particular wave length of light about twice the thickness of the film. If visible light has a wave length of about 5×10^{-5} cm, we may expect to see colours when the thickness of the slick is about 2.5×10^{-5} cm (10^{-5} inches).
- (3) A total of 12 miles of beaches was covered with a one-foot wide band of oil at an average thickness of 1/2 cm. This estimate was derived from spot checks at various beaches (fig. 2). We concentrated our

attention on the more remote islands and beaches north and west of the wreck site. The site itself was being examined by a large group of Simon Fraser biology students operating from their Bamfield research station. This group was quoted by the press as having seen oil two feet thick in the area, a report which created apprehension among the public but which we were unable to confirm. We learned afterwards that it was based on observations of tidal pools on the eastern shore of Austin Island.⁽³⁾ Since we did not closely examine the immediate vicinity of the wreck, our total estimate may be somewhat conservative.

Beach contamination is even more difficult to assess than oil on the sea since a moving sand beach might cover the oil. The "Vanlene's" 'Bunker B' oil, which turned from black to brown upon emulsification, was particularly hard to spot on sandy and log-covered beaches. 'Bunker C' fuel ("Arrow", "Irving Whale") is black and much more conspicuous, as a comparison between photographs in the "Arrow" and "Irving Whale" reports^(4,5) and figures 6 and 7 of this report demonstrate. These photographs also show the almost negligible beach pollution caused by the "Vanlene" compared to that caused by the "Arrow" and "Irving Whale".

The "Vector" carried out a series of five oceanographic bottle casts to determine whether any oil had dispersed in the water column. One of the deficiencies of this procedure is that the bottles become contaminated by surface oil when lowered. We attempted to deal with this problem by lowering the bottles rapidly and agitating the bottles vigorously before sending the messengers down. To test the validity of this procedure, the first bottle went down to a depth well beyond the suspected maximum depth of contamination (about 40 meters). Had this deep sample contained any oil, the results of the analyses of the entire cast would obviously be doubtful.

The samples were inspected by the Biological Station at Nanaimo. No oil was found in any of the samples.

During our beach reconnaissance we counted six contaminated but otherwise quite mobile birds. Herds of seals did not show any sign of contamination. Preliminary inspection of various beaches by Dr. Quayle and Mr. Outram was reassuring. Barkley Sound is an important herring spawning ground with a peak spawning period around the middle of March.⁽⁶⁾ Mr. Outram and Dr. Quayle will report their findings in a separate paper. The area will be re-examined at regular intervals during the next six months.

No detergents or chemicals were used to disperse the oil. Peat moss was kept on hand but not used.

A harbour boom of logs was initially employed but proved ineffective. A much more sophisticated boom of synthetic material arrived on Saturday (fig. 4). The boom, an improved version of the Bennet boom dispatched to the "Irving Whale" in 1970⁽⁷⁾ was supposed to corral the leaking oil to a more protected location where it could be collected by slicklickers. Local windshifts made this arrangement impractical; the boom was never severely tested and there was not enough oil to prove the merits of a slicklicker.

It is a relatively little known fact that an oil barrier only works at a certain minimum water depth and maximum current. These conditions can be expressed by a dimensionless parameter, the Froude number F:

$$\text{We have } F = \frac{V}{\{(1-S.G.)gD\}^{\frac{1}{2}}}, \text{ where}$$

V = current in feet per second
 S.G. = specific gravity of the oil
 g = acceleration of gravity in
 ft/sec
 D = depth of channel in feet

Experiments at the hydraulic laboratory of the National Research Council at Ottawa⁽⁸⁾ showed that the oil is swept underneath the boom when F exceeds 0.4, no matter how deep the oil boom is, or even if the boom is inclined to the flow. For instance, in certain shallow locations near the "Vanlène", at depths less than ten feet, the oil would be swept underneath by a current of 1.5 knots (assuming that the oil's API gravity was 28, or its S.G. = 0.89).

*Note: This formula is an approximation of

$$F = \frac{V}{\left(\frac{\Delta\rho}{\rho}gD\right)^{\frac{1}{2}}}$$

where $\Delta\rho$ = oil-water density difference in slugs/ft³ and

ρ = density of the water in slugs/ft³.

RECOMMENDATIONS

Our method of collecting subsurface water samples to detect oil in particulate form was unsatisfactory. We must find a way to collect samples which are not contaminated by oil droplets nearer the sea surface. We were aware of this problem and, with the co-operation of a local paint manufacturer, tested oil-repellent coatings which would prevent the oil on or beneath the sea surface from sticking to the sampler. We have not yet found a satisfactory coating. We are still looking at other methods and hope to arrive at a better solution within the next few months.

Unfortunately, we did not have a Clarke Bumpus sampling net as was successfully used by F. Barber and W. Forrester after the grounding of the "Arrow"⁽⁹⁾. However, this sampler has some disadvantages in that it may also become contaminated on its way down to the required depth, even with its door closed. It does not take an in situ sample either and the minimum particle size is restricted by the mesh diameter.

Apart from improving our sampling method, we should look into a better laboratory procedure. Our Branch has no facilities for the determination of the oil particle size. The Biological Station at Nanaimo helped us out, but a more formal arrangement in future more serious emergencies is advisable. This remark may well apply to all other phases of the operation. A great deal of confusion still seems to exist regarding the responsibilities of various scientific and technical groups in the event of an oil spill. The number of vessels and the amount of equipment and manpower sent to the area by government agencies, private companies and volunteer groups were excessive. It was a good exercise for all of us, but a clearer definition of the responsibilities of these groups is needed to effectively cope with a future emergency.

It is also regrettable that our volunteer organizations have not yet been given much guidance and instruction.

CONCLUSION

On the 15th of February, 1923, the British freighter "Tuscan Prince" was wrecked at Austin Island in almost exactly the same position as that of the "Vanlene".⁽¹⁰⁾ The "Tuscan Prince" was en route from San Francisco to Seattle and her estimated position was well south of Cape Flattery, near the position originally given ^{by} to the "Vanlene's" captain in her distress call. Both ships were at least 40 miles north of their dead-reckoning positions.

They might have been caught in the Davidson current, a variable current, which, under certain conditions, flows north along the Washington coast.^(11,12) Combining with a southeast gale and an ebb tide from the Strait of Juan de Fuca, this current can create a considerable northwesterly set as was demonstrated by the disabled American steamer "Nika" during the same storm which grounded the "Tuscan Prince". The burning "Nika" drifted from Cape Flattery to the reefs of Barkley Sound at an average speed of 2 1/2 knots.

Although of minor impact to the ecology, these accidents underline the risk of a tanker route from Valdez to Cherry Point.

Assuming a producing rate of 1,200,000 bbls. per day through the Trans-Alaska Pipeline System, and a tanker size of 120,000 DWT, the Puget Sound demand would amount to 0.22 ships per day. In other words, one tanker loaded with 120,000 tons or 28 million gallons of crude Alaskan oil would enter the Juan de Fuca Strait every five days. Although these vessels would sail under American flag and consequently be maintained under rigid inspection, there will always be the possibility of an accident. Regardless of their established routes well out from the coast of Vancouver Island, they must somewhere enter the Juan de Fuca Strait and this area may be the most vulnerable part of the route, perhaps of the entire operation. An engine

breakdown off Cape Flattery in a northerly set such as experienced by the "Tuscan Prince" and several others could conceivably cause the ship to drift towards the shore near Carmanah Point in four hours, well before the arrival of tug boats or rescue vessels.

The "Vanlene", nearing the end of her voyage, had only 400 tons of fuel left in her bunkers. About 300 tons were spilled and in spite of a great deal of effort and modern equipment, none of the 300 tons spilled was either contained or salvaged.

The supertankers entering the Juan de Fuca Strait would not carry 400 tons, but 120,000 tons of oil.

When witnessing the frustration involved in attempting to control a few hundred tons of oil, one cannot help but have misgivings about the containment of a spilled cargo of a supertanker.

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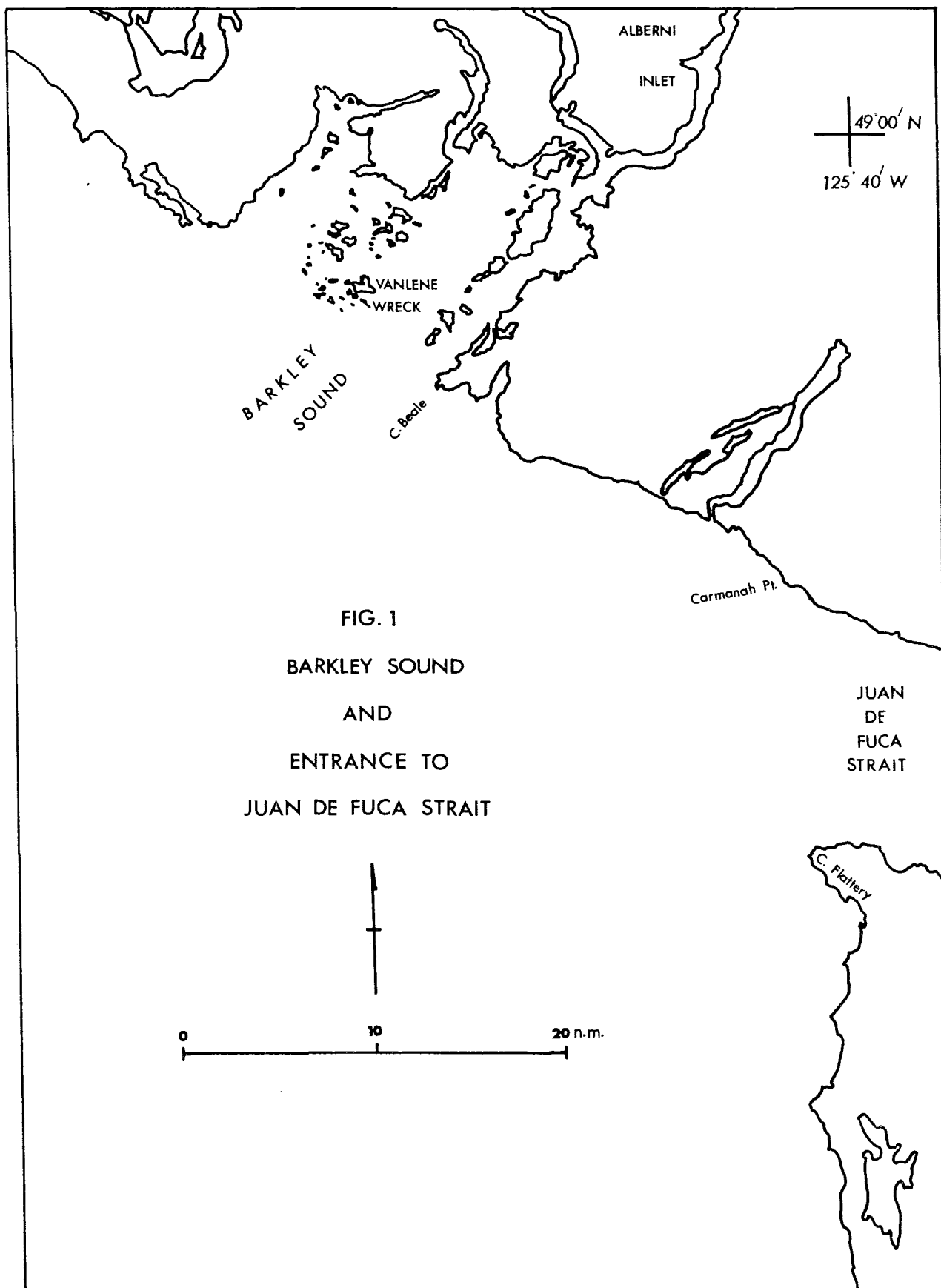
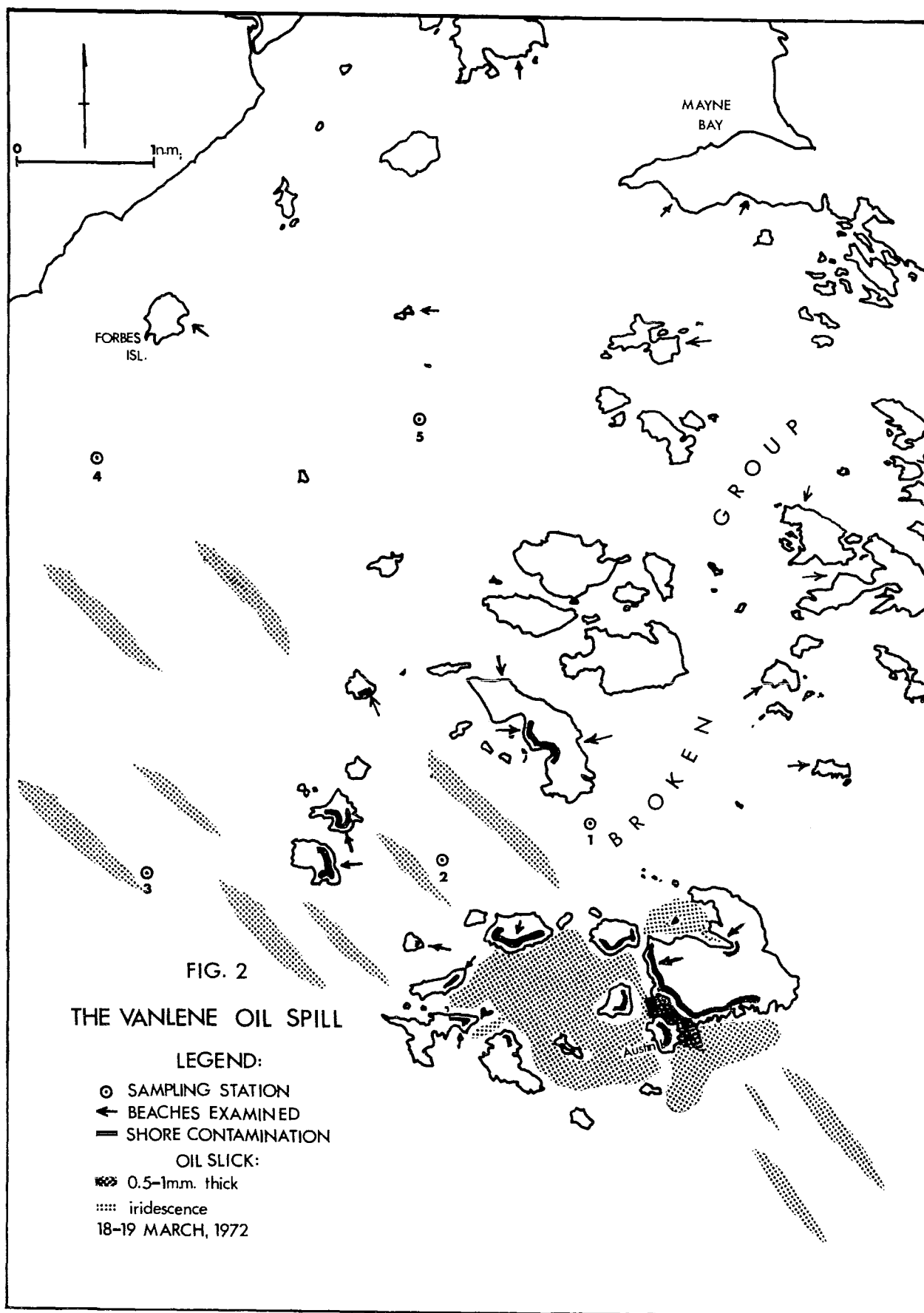


FIG. 1
BARKLEY SOUND
AND
ENTRANCE TO
JUAN DE FUCA STRAIT



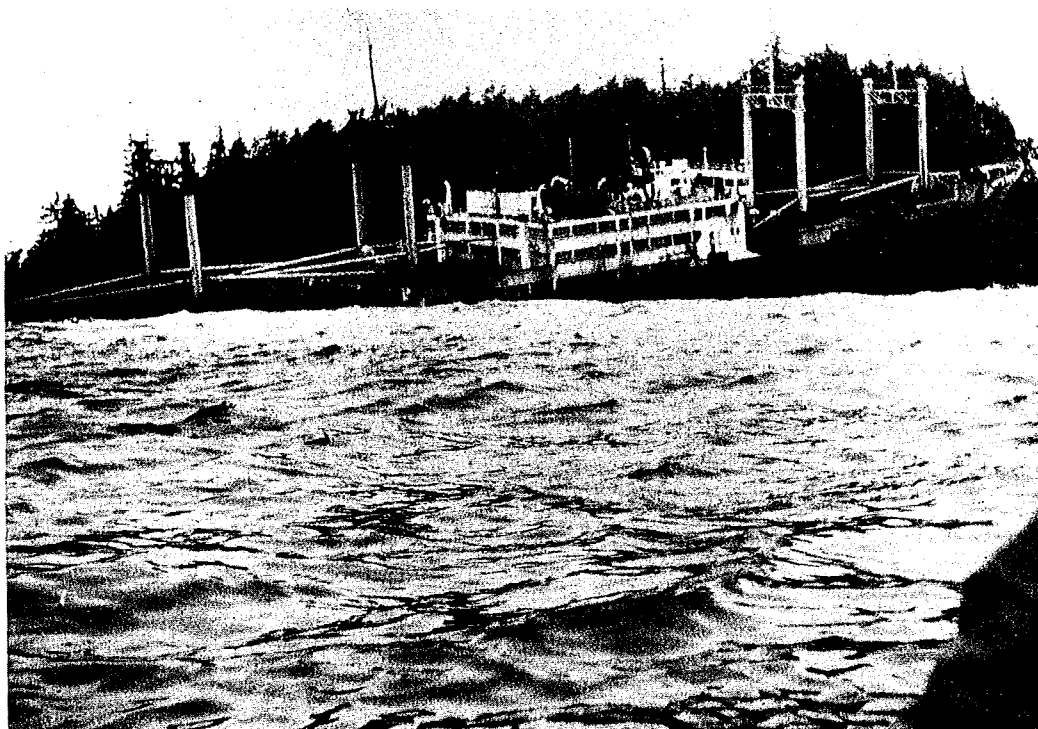


FIG. 3 THE "VANLENE", THREE DAYS
AFTER HER GROUNDING



FIG. 4 THE OIL SLICK