Les Cahiers de droit

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Volume 10, numéro 3, 1969

URI : https://id.erudit.org/iderudit/1004659ar
DOI : https://doi.org/10.7202/1004659ar

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Éditeur(s)

Faculté de droit de l'Université Laval

ISSN

0007-974X (imprimé)
1918-8218 (numérique)

Découvrir la revue

Citer cet article

Pharand, D. (1969). The Legal Status of Ice Shelves and Ice Islands in the Arctic. *Les Cahiers de droit*, *10*(3), 461–475. https://doi.org/10.7202/1004659ar

The Legal Status of Ice Shelves and Ice Islands in the Arctic

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The recent discovery of huge deposits of oil on the north slope of Alaska has forced man to imagine new ways of exploiting and transporting this precious commodity. Ice islands, once grounded in shallow waters, could become natural platforms for the installation of drilling rigs ; these ice islands might also be used as moorings for tankers while taking on oil cargo by pipeline. Numerous ice islands have been located in the Arctic, and they appear to originate from ice shelves off the north coast of Ellesmere Island bordering on the Arctic Ocean. Should this ocean be used eventually to transport oil to Europe, [1] it will be important to know if the ice shelves affect the determination of territorial waters. [2] The purpose of this brief study is to inquire into the legal status of ice shelves and ice islands, as they present themselves in the Arctic.

I – Ice shelves

The legal status of ice shelves in international law has never been determined but there appears to be a consensus among interested states that they ought to be considered as land. Such would seem to be the

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1 For a study by this writer of the possibility of navigation in the Arctic, see "Freedom of the Seas in the Arctic Ocean", (1969) 19 *University of Toronto Law Journal*, 210 at 219–226.

2 Canada has not yet issued geographical coordinates to determine the baselines of its territorial waters in the Arctic, but it will presumably do so after it has issued lists for the east and west coasts. So far, the government has issued only one list, covering the coast of Labrador and the east coast of Newfoundland (see P.C. 1967–2025, dated 26 October 1967). Lists of coordinates for the east and west coasts of Canada are presently under preparation (see statement by the Honourable Jack DAVIS, Minister of Fisheries, in : *Débats de la Chambre des Communes*, 13 May 1969, vol. 113, n° 148, at 8622).

intent of Article VI of the Antarctic Treaty of 1959, which specifies that the treaty applies "to the area south of 60 degrees South Latitude, including all ice shelves" ; in other words, the treaty covers not only *terra firma* but *glacies firma*. These huge ice-tongues are partly afloat, but their thickness and quasi-permanency render them much more like land than water. As pointed out by Ivor Richardson with respect to the Ross Ice Shelf within the New Zealand sector, "for the purposes of navigation, it makes no difference if a permanent barrier is composed of frozen water or land" [3] : one is as effective a barrier to navigation as the other. The permanency of the Ross Ice Shelf as a barrier to navigation is certainly quite evident when one considers that its thickness is said to vary from 500 to 1,500 feet [4] and that it is land-locked in an immense bay between Victoria Land and Marie Byrd Land. The 1959 Treaty, however, did not limit its assimilation of the shelf ice to land to the case of the Ross Ice Shelf ; it applies to all ice shelves in the Antarctic, and some of them in the other sectors are far from being as large, as thick and permanent as the Ross Shelf. Indeed, some of the ice shelves are only semi-permanent, in the sense that seaward sections break off and float away to form ice islands. A similar phenomenon occurs in the Arctic, although to a much more limited extent. A brief investigation into the physical characteristics of the Arctic ice shelves must be carried out before attempting to determine the legal consequences.

1. Description of ice shelves

On 14 August 1946, when the U.S. Air Force spotted by radar a huge ice mass, very much thicker that the surrounding ice floes and having an area of some 200 square miles, it had found a fragment of an ice shelf. [5] When two more were found in 1950, the search for their place of origin was intensified. As a result of a study of RCAF trimetrogon photographs, some "twenty-eight ice islands, varying in size from a mile to 7 or 8 miles across were found, as well as a considerable number of smaller fragments". [6] Historical research also showed that early

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[3] Ivor RICHARDSON, "New Zealand's Claims in the Antarctic", (February 1957), 33 *New Zealand Law Journal* 40.

[4] *Ibidem.*

[5] Major L. S. KOENIG, "Discovery of Ice Islands on U.S.A.F. Flights over the Arctic Ocean", in : L. S. KOENIG et al., "Arctic Ice Islands, (1952) 5 *ARCTIC* 68–75. This same ice island was seen again in October 1965 and it had maintained its original triangular shape, with an area of about 125 km2 ; see D. LINDSAY, "Ice Islands", (April 1966), 20 *ICE* at 8.

[6] Sqn. Ldr. K. R. GREENWAY, "Additional Information from Flights and Air Photographs in the Canadian Arctic", in : L. S. KOENIG, *supra*, note 5, 75 at 78.

explorers had described large ice floes, which were possibly fragments of ice shelves. Peary had probably found the place of origin of those islands when he spoke about a "peculiar ice-foot" and of a "glacial fringe" [7] located north of Ellesmere Island.

Dr. Hattersley-Smith was probably the first to trace scientifically the origin of the ice islands of the Arctic Ocean to the ice shelves of northern Ellesmere Island. The conclusion he arrived at in 1952, which has been confirmed since, was quite clear : "It is the periodic breaking-off of large areas of this shelf which has formed the ice islands at present drifting in the Arctic Ocean and channels of the Canadian Archipelago". [8] Ice shelves are known to have existed off the north-east coast of Greenland and possibly off Spitzbergen, and there is ice shelf at the present time between the islands of Severnaya Zemlya. [9] However, it seems that the only important ice shelves left in the Arctic to-day are located off the coast of Ellesmere Island. The northern part of this large island resembles Greenland and the Antarctic continent, in that it is partly covered with glaciers projecting ice lobes far deep into the fiords ; these glaciers are partly responsible for the formation of the landward part of the ice shelves. As for the seaward projection, it is the result of an accumulation of snow on sea ice over a long period of years. Dr. Hattersley-Smith describes the formation of the shelf ice north of Ellesmere Island as follows :

> "In the inner parts of the fiords, where the ice appears to be very thick, the main glaciers and their tributary glaciers seem to have been the chief sources of supply ; in the outer parts of the fiords and along the coast between the fiords the shelf ice seems to have grown mainly through the accumulation of snow on sea ice." [10]

Ice shelves are, therefore, the product of land as well as sea ; each contributes a separate part which eventually forms such a perfect union that it is impossible, in most cases, to find the demarcation line between the sea ice and the glacier. Ice shelves front much of the fiords of Ellesmere Island. The landward part of the shelves is of considerable thickness, as indicated by some of the ice islands like T-3, which was

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7 Moira DUNBAR, "Historical references to Ice Islands", in : L. S. KOENIG, *supra*, note 5, 83 at 92.

8 HATTERSLEY-SMITH, "Comments on the Origin of the Ice Islands", in : L. S. KOENIG, *supra*, note 5, 95 at 102.

9 G. HATTERSLEY-SMITH, "The Ellesmere Ice Shelf and the Ice Islands", (1957) n°. 9 *The Canadian Geographer*, 65 at 67.

10 G. HATTERSLEY-SMITH, *supra*, note 8, at 99.

described as being 190 feet thick : [11] the outer part of the ice shelves is about 100 to 150 feet thick. [12]

Until 1962, there were four major ice shelves north of Ellesmere Island (Map N°. 1). [13] The *Milne Ice Shelf* covers the entire fiord and projects about two miles beyond the mouth of Milne Fiord, which is approximately 10 miles wide. Although the other three ice-shelves under review have suffered considerable breaking-up in recent years, the Milne Ice Shelf has remained intact. [14] Part of its resistance seems to come from the fact that it is the only one welded to a main glacier tongue which appears to be aground. The *Ayles Ice Shelf* covered two-thirds of Ayles Fiord until about 1966, and extended about two miles beyond the mouth of the fiord. In April 1966, it was noticed that "only scattered ice islands and slivers of ice shelf" remained, [15] and a 1967 report indicated that the ice shelf had completely disintegrated. [16] The *M'Clintock Ice Shelf* covered the full entrance of the fiord and extended three miles beyond until about 1966 also. An aerial survey of April 1966 showed that "only scattered disoriented fragments of ice shelf (or small islands)" were left ; [17] by 1967, this ice shelf had also completely disintegrated. [18] The *Ward Hunt Ice Shelf*, projecting north of Disraeli Fiord, is by far the largest of the four main ice shelves. Until 1962 it measured some 45 miles in length and extended an average of 10 miles seaward beyond the main coastline. Dr. Hattersley-Smith described the ice shelf in the following terms : "West of the Markham Bay re-entrant, the ice shelf has maintained, as for west as Cape Discovery, an unbroken band averaging about 16 km. in width from the outer coast and extending far up Disraeli Fiord". [19]

Between August 1961 and April 1962, extensive fragmentation of the Ward Hunt Ice Shelf occurred ; it was estimated that about 596

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11 Max C. BREWER, "Drifting Stations in the Arctic Ocean", in : (1963) *Proceedings of the Arctic Basin Symposium*, 305.

12 G. KONECNY et al., "Studies on Ice Movements on the Ward Hunt Ice Shelf by means of Triangulation-Trilateration", (1966) 19 *ARCTIC* 337.

13 Reproduced from G. HATTERSLEY-SMITH, "The Ward Hunt Ice Shelf : Recent Changes of the Ice Front", (1963) 4 *Journal of Glaciology*, at 416.

14 G. HATTERSLEY-SMITH, "Note on ice shelves off the north coast of Ellesmere Island", (1965-66) vol. XVII, n°. 1, *The Arctic Circular*, 13-14.

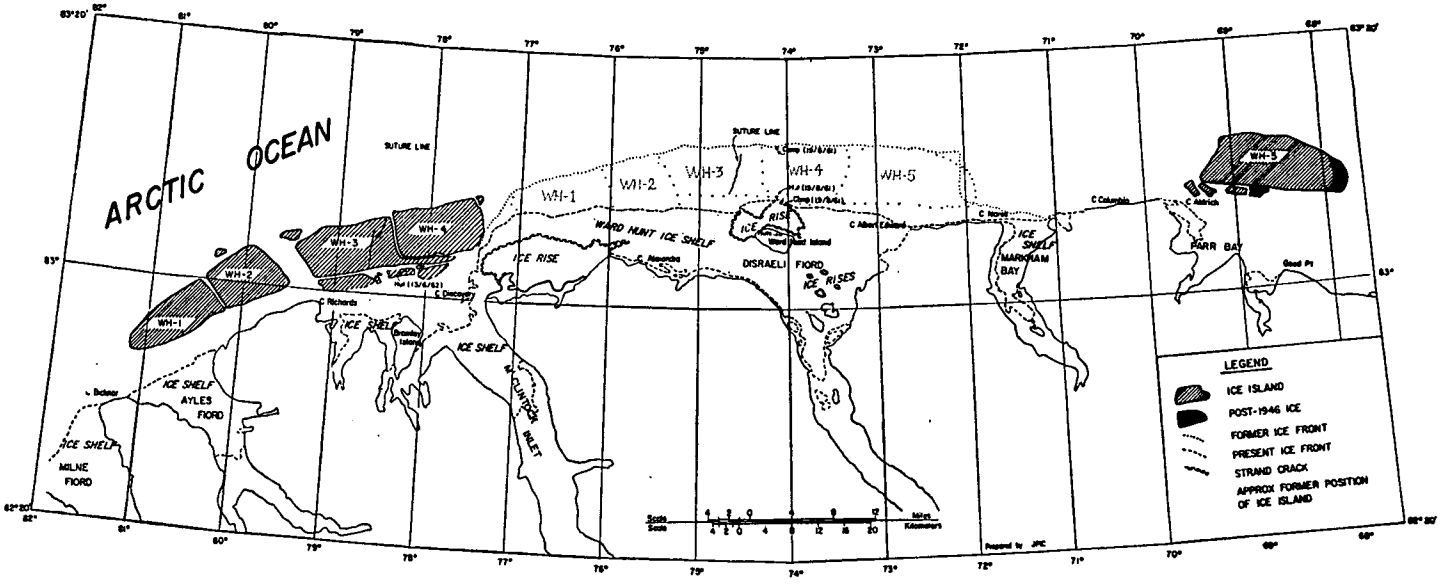
15 *Ibidem*, at 13.

16 See G. HATTERSLEY-SMITH, "Report", in : (April 1967) 23 *ICE*, at 9.

17 G. HATTERSLEY-SMITH, *supra*, note 14, at 13.

18 See HATTERSLEY-SMITH, *supra*, note 16.

19 G. HATTERSLEY-SMITH, "Ice Conditions off the North Coast of Ellesmere Island", *Report n°. Misc. G-8*, at 10 Defence Research Board, Canada, 1962.



Map of Ward Hunt Ice Shelf and vicinity to show calving of shelf, and position of new ice islands on 13 June 1962

MAJOR ICE SHELVES OFF ELLESMERE ISLAND

Reproduced from the Journal of Glaciology, vol. 4, n°. 34, at 416 (1963)

MAP N° 1

km. 2 of ice shelf was calved during that period. [20] Five large ice islands were born during the calving, as well as a number of smaller ones (Map N°. 1) ; four of the islands proceeded together westwards preserving their original position, and are following the general direction of the clockwise movement of the current around Beaufort Sea. [21] The fifth island proceeded east and eventually entered Robeson Shannel between Greenland and Ellesmere Island. [22] Radar reflectors were placed on this fifth island (WH 5) so as to be able to follow its drift and thus provide further data on the currents involved. [23] The ice island was subsequently traced into Baffin Bay where it eventually broke up. [24] The Ward Hunt Ice Shelf has been under close observation since the fragmentation of 1961-1962, but there has been no further calving apparently, and the ice movement has been very slight ; indeed, the special observations obtained between 1964 and 1965 suggest that "the ice shelf is in a stagnant condition". [25] Its front now extends only slightly north of Ward Hunt Island, located at the entrance of Disraeli Fiord.

2. Legal aspect of ice shelves

It appears from the foregoing inquiry that only four major ice shelves are known to have existed in recent times in the Arctic, and all of them were located along the coastline of Ellesmere Island. Two of these ice shelves, Ayles and M'Clintock, which extended about two or three miles beyond their respective fiords, have completely disintegrated since 1967 ; they have, therefore, ceased to pose any legal problem for the measurement of territorial waters. The two remaining ice shelves are Milne and Ward Hunt. The Milne Ice Shelf extends an average of about two miles beyond the entrance of the fiord, the closing line of which is about 10 miles ; this means that, if the ice shelf is assimilated to land, the edge of it ought to serve as the baseline for the measurement of Canada's territorial waters. The Ward Hunt Ice Shelf still extends an average of about four miles beyond the entrance of Disraeli fiord ; However, because of the presence of Ward Hunt Island at the outer

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[20] G. HATTERSLEY-SMITH, "The Ward Hunt Ice Shelf : Recent changes of the Ice Front", *supra*, note 13, at 418.

[21] See D. LINDSAY, "Sea Ice Reconnaissance", in F. MÜLLER, "Glacier Research", (1967) 20 *Canadian Geographic Bulletin*, 188-189. See also D. LINDSAY et al., "Ice Islands, 1967", (1968) 21 *ARCTIC*, 193–106.

[22] See D. C. NUTT and L. K. COACHMAN, "A note on ice island WH-5", (1963) 16 *ARCTIC* 204–206.

[23] See G. HATTERSLEY-SMITH, *supra*, note 13, at 423.

[24] See D. C. NUTT, "The drift of the ice island WH-5", (1966) 19 *ARCTIC* 244–262.

[25] C. KONECNY et al, *supra*, note 12, at 342.

edge of the shelf at the entrance of the fiord, the baseline for measuring territorial waters coincides roughly with the edge of the ice shelf, projecting only a mile or two beyond the baseline. [26]

It follows therefore that ice shelves in the Arctic cause little difficulty in the measurement of territorial waters. In view of considerable disintegration of the Ward Hunt Ice Shelf and the complete disintegration of neighbouring ones, it is suggested that it would be somewhat unrealistic for Canada to assimilate the remaining ice shelves to land in the measurement of its territorial belt north of Ellesmere Island. Unlike the Antarctic continent, there is no active inland ice sheet or glacier on Ellesmere Island pushing ice shelves forward. [27] Thus there is little chance of the remaining ice shelves eventually regaining their former seaward position and affecting the location of baselines.

II – Ice islands

As stated by Professor Bishop, "the question may be asked whether large floating 'ice islands' in the Arctic may be subject to territorial sovereignty when expeditions remain in occupation of them for considerable periods". [28] In dealing with this problem, a distinction could be made between two types of ice islands : the 'ice islands' properly so-called, which are huge fragments detached from ice shelves off Ellesmere Island, and the 'ice floes' which are large pieces of sea ice contituting the ice pack. Although the first presents more sturdiness as an embarcation, both types can be occupied and used for essentially the same purposes, and may be treated together. Being capable of occupation, can these ice islands be considered as floating pieces of territory ? Or are they perhaps more of the nature of ships ? Or do they possibly constitute a special phenomenon of nature not yet capable of legal qualification ? A closer look at their physical characteristics and at the kind of use and occupation to which they may be subjected may help in determining the legal status they should be given. What follows is a representative sampling of the ice islands which have been used thus far as floating research stations by the United States and the Soviet Union.

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[26] For the sake of completeness, it should be mentioned at this point that ice shelves around Severnaya Zemlya and possible remnants off North Greenland likewise are too small to affect the measurement of territorial waters.

[27] This is the phenomenon which has been observed at Halley Bay, a British survey station operating in the Antarctic since 1956. See Sir Vivian FUCHS, "Life Cycle of a Polar Station", (1967) *The Geographical Magazine*, 460–467.

[28] Wm. W. BISHOP, *International Law Cases and Materials*, Boston, Little Brown & Co., 1962, at 355, note 15.

1. Description and occupation of ice islands

(1) T-3 or Fletcher's Ice Island (U.S.)

This fragment of one of the Ellesmere Island ice shelves is the largest and sturdiest ice island to have been occupied in the Arctic Ocean. It was originally described as measuring 31 miles in circumference and 5 miles across in the narrowest part ; [29] ten years later it was described as "four by nine miles and approximately 190 feet thick" ; [30] and at the end of 1967, T-3 was reported to be "about 6 miles long and 3 miles wide". [31] It was continuously occupied by the Americans until May 1954, and reoccupied periodically until October 1961, a year and half after it had become grounded in about 130 feet of water, some 88 miles northwest of Barrow, Alaska. In 1962, heavy storms caused a major portion of T-3 to refloat and it was then reoccupied, this time by the U.S. Navy ; research stations have been operating on the ice island since then, and will probably continue to do so for a long time to come. So long as T-3 remains in the Pacific Gyral north of Alaska and Canada, it serves as an excellent research platform for geophysicists, biologists, meteorologists and other scientists ; highly classified research is also reportedly pursued on T-3 by the Electronics Defense Research Laboratory. [32] Life for the personnel on this ice island presents no great problem since it can be supplied by aircraft. The only major difficulty for the future of the island is the possibility of it being caught by the transpolar drift whenever it gets close to the North Pole ; this was the fate of another ice island, Arlis II.

(2) ARLIS II (U.S.)

This 70-foot-thick ice island was unusual in that it presented certain characteristics of land ; Leonard Le Shack of the Office of Naval Research gives the following description :

> "This 3.5 by 1.5 ice island with its piles of rocks and boulders looks, even to the most discerning observer, remarkably like a snow-covered land mass. Its gently rolling topography, similar to a snow-covered meadow, differs markedly from the surrounding characteristic pack ice, whose perfectly flat surfaces alternate with thin, jumbled, blocky, broken ice. From 'dunes' of glacial debris, the ARLIS II ice slopes gently, like a seashore, until it reaches the pack ice 'ocean'." [33]

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29 See A. P. CRARY et al., "Preliminary Report on Scientific Work on 'Fletcher's Ice Island', T-3", (1952) 5 *ARCTIC*, 212-213.

30 Max C. BREWER, *supra*, note 11.

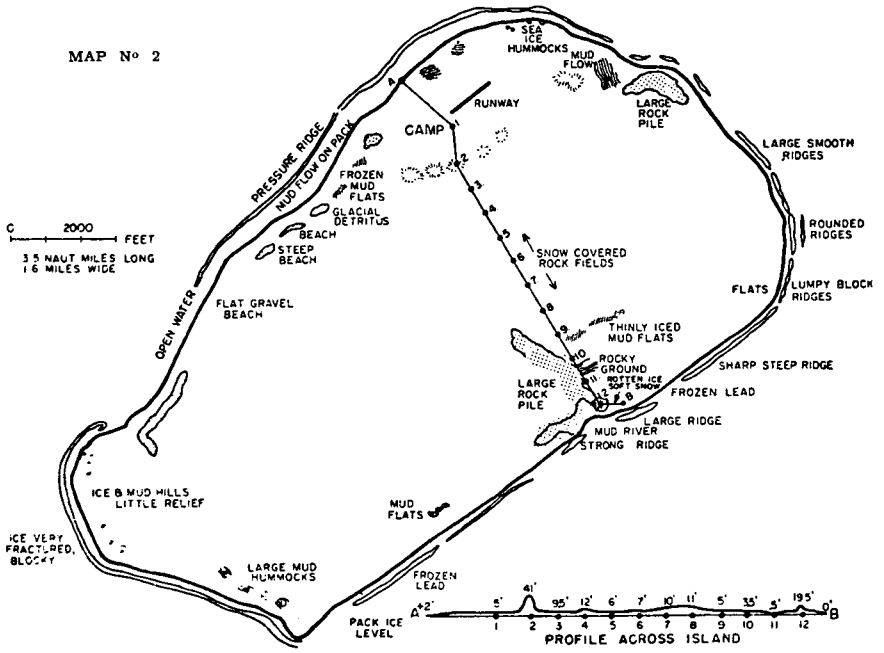
31 *The Polar Times*, at 13, December 1967.

32 *Ibidem*, at 12.

33 Leonard A. LE SHACK, USNR, "Arlis II : New Arctic Drift Stations", (Sept. 1961) *Naval Research reviews*, 12.

A sketch of the island prepared by the same author confirms the visual impression of land rather than ice (Map N°. 2) ; [34] he suggests, as did others, that this peculiar phenomenon might be the 'land' which Cook and other explorers are said to have seen in the Beaufort and Lincoln Seas during the early part of the century.

The United States took possession of this ice island immediately upon locating it north of Alaska at 73°10'N., and 156°05'W., in May 1961, and occupied it continuously for four years. Unlike T-3, Arlis II failed to follow the Pacific Gyral around the Beaufort Sea ; it was



SKETCH OF ICE ISLAND ARLIS II

Reproduced from Naval Research Reviews, at 16 (Sept. 1961)

caught in the transpolar current after nearly reaching the Pole, and proceeded east in the Greenland Sea. It was evacuated in May 1965 at 66°43'N. and 27°01'W., in the Denmark Strait between Greenland and Iceland. In spite of its land-like appearance, it was definitely only a large piece of ice shelf ; it disintegrated in the warm waters of the Atlantic and dumped its rocks onto the ocean floor.

34 *Ibidem*, 16.

(3) Other U.S. Ice Stations

The other five drift stations occupied by the Americans were ordinary ice floes (not ice islands) and, consequently, were considerably less secure and permanent. *Alpha* and *Charlie* were occupied for 17 and 9 months respectively but had to be evacuated because of gradual breaking-up of the ice, particularly at the end of the airstrips. [35] *Arlis I* was a small 8-foot-thick ice floe and was occupied for only 6 months ; it was abandoned because it had drifted too far west. [36] Ice stations *Arlis III and IV* were planned for temporary occupation and were evacuated as planned after about 3 months, when the specific studies envisaged had been carried out. [37] Although only two of these five ice floes were abandoned because of breaking-up of the ice, it seems that all of them developed the usual pressure ridges, tension cracks and leads of open water.

(4) North Pole 6 (USSR)

North Pole 6 was organized on an ice island which, like the American T-3, is believed to have originated from ice shelves off northern Ellesmere Island. [38] . It measured 13.8 by 8.3 kilometers [39] and was deep enough [40] never to develop fractures during its three and a half years of continuous occupation. [41] The ice island was located north of the Chukchi Sea at 74°24'N. and 177°06'W. when first occupied in April 1956 ; it difted right across the Arctic Ocean, following the transpolar current, and was abandoned as it entered the Greenland Sea. Life on the island posed no major problem, and its temporary inhabitants were once entertained by visiting artists from Moscow. [42]

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35 See Max C. BREWER, *supra*, note 11, at.306 ; also Louis O. QUAM, "Arctic Basin Research", (Oct. 1966) *Naval Research reviews*, 1 at 6-7.

36 See Louis O. QUAM, *ibidem*, at 10.

37 *Ibidem*, at 10-11.

38 See V. F. BURKANOV, "Floating ice islands in the Central Arctic", noted in : (1965) 12 *Arctic Bibliography* at 136, n°· 70459 and V. D. DIBNER, « Floating ice islands and the glaciers which originated them », also in 12 *Arctic Bibliography* at 211, n°· 71014.

39 See K. A. SYCHEV, "On a drifting ice island", noted in (1965) 12 *Arctic Bibliography*, at 875, n°· 76053.

40 Its thinest edge seemed to measure from about 5 up to 12 meters, since meltwater was combatted in summer by boring holes in the ice which varied from 4.8 to 12.1 meters in depth. See V. S. ANTONOV, "At the last stage", noted in : (1965) 12 *Arctic Bibliography* at 55-56, n°· 69821.

41 See P. A. GORDIENKO, "Scientific Observations from, and the Nature of Drift of the 'North Pole' Stations", in : *Problems of the Arctic and Antarctic N°· 11*, ed. by N. A. OSTENSO, at b-5, (1966).

42 See V. M. DRIATSKII, "The International Geophysical Year in the Central Arctic", noted in (1965) 12 *Arctic Bibliography*, at 224-225, n°· 71109.

(5) North Pole 7 (USSR)

North Pole 7 was established on an ice floe in April 1957 and was occupied for two years ; the station was set up at 82°06'N., 164°11'W., north of the Chukchi Sea. It drifted north and eventually east into the transpolar current, where it was abandoned at 85°14'N., 33°03'W., in April 1959, heading toward Greenland. By this time the ice floe had become too short for aircraft landings. In April 1961, North Pole 7 was spotted by a plane of the Royal Canadian Air Force off the east coast of Baffin Island ; it is believed that the floe drifted into Robeson Channel between Ellesmere Island and Greenland, and proceeded south into Baffin Bay. [43] Three weather buildings were still on the floe but the sun had melted about 14 feet of ice ; one of the buildings had settled to the point where a diesel generator, left inside and insulating the ice beneath, had gone through the roof. [44] Obviously the surface melting of the ice does pose problems to personnel on ice floes.

(6) Other Soviet Ice Stations

Soviet scientists have occupied only one ice island properly so-called. NP6, all the others being ordinary ice floes. In their various occupations they have, therefore, experienced the numerous and various difficulties which are associated with life on floating ice ; the data collected by the Soviet stations establish beyond any doubt that living on an ice floe can hardly be compared to living on land. In reviewing the accomplishments of the first ten ice stations, Gordienko points out that ice fracturing and hummocking constitute definite hazards to life ; part of his description of the gradual breaking-up of the ice floes is reproduced below :

> "Ice fracture, compression, and hummocking are hazards to life on the polar pack. Every polar explorer knows from personal accounts and log books the difficulties that members of the drift expeditions encounter. (Table 2 gives a full list of all fracturing and pressure ridging to which the 'North Pole' stations were subjected). The ice pack broke up and hummocked more that 450 times around 'North Pole' stations ; 95 of these cases occurred within the station camp. Not one station escaped the onslaught of the elements, no matter in what region they drifted. Fifty-seven times the break-up and pressuring of ice forced the occupants to shift their camps to new sites on more stable ice floes." [45]

It appears obvious that the main reason for the moving of camps by Soviet scientists has been the danger to life ; the danger resulted mainly

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[43] See Moira DUNBAR, "The drift of North Pole 7 after its abandonment", (1962) 6 *Canadian Geographer*, 129–142.

[44] *The Polar Times*, at 13, December 1961.

[45] P. A. GORDIENKO, *supra*, note 41, at b-5. The table referred to in the passage cited is reproduced herein.

TABLE I. LARGE ICE FRACTURES AND COMPRESSIONS OBSERVED DURING DRIFTS OF THE "NORTH POLE" STATIONS IN THE VICINITY OF THE CAMPS AND AT THE SCIENTIFIC INSTALLATIONS

Station and Years of Drift	*Phenomena Observed Outside the Camp*		*Fractures and Hummocking Within the Camp*		*Total Number of Phenomena During Drift Period*	*Comments*
	Fractures, Channels, Ice Thinning	*Compression, Hummocking*	*Fractures*	*Hummocking*		
"North Pole-1" 1937/38	6	?	4	?	10?	Camp was re-established 4 times
"North Pole-2" 1950/51	1	2	2	10	15	Camp was re-established 5 times
"North Pole-3" 1954/55	2	20	2	15	39	Camp was re-established 4 times
"North Pole-4" 1954/55	13	16	—	—	23	Camp was re-established 1 time
"North Pole-4" 1955/56	10	11	—	—	21	Camp was re-established 1 time
"North Pole-4" 1956/57	34	29	—	—	63	Camp was re-established 2 times
"North Pole-5" 1955/56	total of 90 occurrences		total of 11 occurrences		101	Camp was re-established 4 times
"North Pole-5" 1956	5	7	2	2	16	Camp was re-established 4 times
"North Pole-6" 1956/59	up to 15/IX 1959 when the station was abandoned no fracturing occurred within the ice island					——
"North Pole-7" 1957/58	8	8	—	—	16	——
"North Pole-7" 1958/59	3	6	4	2	15	Camp was re-established 4 times
"North Pole-8" 1959/60	17	13	4	4	38	Camp was re-established 4 times
"North Pole-8" 1960/61	9	12	—	—	21	——
"North Pole-8" 1961/62	6	8	12	11	37	Camp was re-established 14 times
"North Pole-9" 1960/61	19	4	8	2	33	Camp was re-established 10 times On 28 March camp was threatened with destruction and the party was evacuated.
Total of 14 annual drift cycles *	Outside the camp ice fracturing, hummocking and compressions were observed 353 times.		Within the camp ice fracturing, hummocking and compressions were observed 95 times.		448	The camp and its installations were re-established 57 times.

* Excluding the drift of station "North Pole-6".

Reproduced from Problems of the Arctic and Antartic No. 11, ed. by N. A. Ostenso, at b-6 (1966)

from ice conditions at the camp site or from the condition of the airstrip used for supplies. In so far as the evacuation of the ice stations themselves are concerned, the main reason seems to have been to avoid being caught by the outflow current leading to the Greenland Sea.

2. Legal appraisal of ice islands

Keeping the above description in mind, the main question to examine is whether an ice island should be assimilated to land or to a ship. To consider ice islands as floating pieces of territory would present an element of logic, since they are but fragments of ice shelves which may be legally assimilated to land. If that is so, all ice islands in the Arctic might have to be considered as coming under Canadian sovereignty, since they all seem to have originated from Ellesmere Island which is part of Canadian territory. Or does an ice shelf fragment become a *res nullius* once detached and subject to territorial acquisition by the first occupant ? If so, does the new territorial sovereignty continue as long as the ice island is occupied, regardless of the drift path which it follows ? Extending this kind of logic soon reveals that it is somewhat unrealistic to continue considering ice shelf fragments as land after they have become movable and have drifted away from their place of origin on to the high seas. The same reasoning applies, *a fortiori,* to ordinary ice floes which are not of territorial origin. Ice islands do not have the qualities of permanency and stability which are basic characteristics of any piece of territory. Even if an ice island could somehow be anchored in the Arctic Ocean or grounded in a shallow sea, [46] the consequences of considering it as territory of the occupying state would be inacceptable in international law ; such action would be contrary to the Convention on the High Seas which provides that "[t]he high seas being open to all nations, no state may validly purport to subject any part of them to its sovereignty". (Art. 2). Two of the 1958 Conventions on the Law of the Sea make it quite clear that an island must be land before it can be legally considered as an island, with its own territorial waters. Article 10 of the Convention on the Territorial Sea specifies that "an

[46] Ice island T-3 became grounded in May 1960 in about 130 feet of water northwest of Barrow. See Max C. BREWER, *supra*, note 11. It has also been reported that "two huge 'ice islands' had grounded themselves in 90 feet of water just 20 to 30 miles north of the Prudhoe Bay area". (See Max B. SKELTON, "Ice Islands May Become Moorings", (February 20, 1969) *The Ann Arbor News*, at 3). Plans are now being made to increase their weight so much that they will remain grounded and serve as moorings and drilling platforms. (See Clair BALFOUR, "Ice Islands studied as drilling platforms" (May 13, 1969) *The Globe and Mail*, at B-14).

island is a naturally-formed area of land". [47] The qualification "naturally-formed", which was not in the draft of the International Law Commission, adds an important element to the legal definition of an island ; it also indicates clearly that States consider as vital the basic principles of freedom of the seas and territorial integrity. The same concern is reflected in Article 5 of the Convention on the Continental Shelf, which provides that the various devices constructed by states to explore and exploit the continental shelf "do not passess the status of islands" (Para. 4). Under these treaty limitations, it is even impossible to consider as islands the artificial coral-type 'islands' constructed in the Persian Gulf in order to drill for oil ; *a fortiori*, such limitations eliminate the possibility of assimilating ice islands to land capable of territorial sovereignty.

But, if ice islands cannot be assimilated to land, can they perhaps be regarded as ships ? Ice islands are indeed used very much like research ships to study the ocean floor, the currents, the winds, etc. As far back as 1932, Gidel asked himself the question : "Les îles flottantes sont-elles des navires ?" [48] Having retained the ability to navigate as the essential criterion of a floating apparatus qualifying as a ship, he answers the question in the negative. However, he does go on to say that, if a floating island is equipped with propellers activated by motors, it may be assimilated to a ship since it is then able to navigate in the traditional sense. [49] Gidel was not discussing the ice-type of floating islands, but it is submitted that the same reasoning is substantially applicable. In other words, it is conceivable that modern technology might enable man to control the movements of an ice island in such a way that it is actually being navigated. Cmdr. Paul Frazier of the United States Navy, referring to ice islands, affirms without hesitation : "These are nothing more than floating 'ships of ice' which must be supplied by air support". [50] Up to now these ice stations have been devoted to peaceful uses and may be assimilated to merchant vessels, but, in time of war, they could become warships ; quoting again from Cmdr. Frazier, "with additional slight modification these same scientific platforms could become effective 'aircraft carriers' or 'advance bases' for defense in the event of global war". [51] Gordon Smith, discussing Canada's claim in the Arctic in 1966, also prefers to compare ice islands to ships rather than

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[47] This article was adopted by a vote of 37 to 6, with 14 abstentions. See WHITEMAN, (1965) 4 *Digest of International Law*, at 295.
[48] G. GIDEL, *Le Droit International Public de la Haute Mer*, t. I at 66 (1932).
[49] *Ibidem*, at 68.
[50] (1958) Proceedings of the *Amer. Soc. of Int. Law* 165.
[51] *Ibidem*.

to land, but he believes that the analogy "soon breaks down because the movements of an ice island, up till the present time at least, cannot be controlled as those of a ship can be". [52] Charles Hubert of France made a case recently for the necessity of defining the legal status of artificial islands, saying that it was a new mode of occupation of the sea, and traditional maritime law was no longer adequate to cope with this new situation. [53] The same may be said of natural ice islands ; they constitute a new way of navigating and possibly occupying the sea. The suggestion is that ice islands ought to be considered as ships when occupied and appropriated. Such ice islands would be classified as public or private ships in the same way as ordinary ships are, depending mainly on whether or not they are engaged in the performance of public acts. They could be subject to the 1958 Convention on the High Seas, in so far as its provisions relating to ships may be made applicable. The same criterion of applicability could be followed for the relevant principles of customary law. Of course, if the use of ice islands should become extensive enough, it would be advisable for interested states to agree on a special convention governing such use. Having regard to the uses already being made and those contemplated, one can ask if such a convention should not be passed in a near future. Perhaps such a special convention between Arctic states could include also legal principles which would govern the exploration and use of the sea-bed of the Arctic Ocean and peripheral seas. Considering that the two super powers happen to be close neighbours in the Arctic, an agreement of this kind might be quite meaningful for the promotion of international cooperation and the maintenance of peace. The legal principles to be formulated could usefully draw upon the recent decision of the International Court of Justice, in a case relating to the sea-bed of the North Sea and involving Germany, Denmark and the Netherlands. [54]

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[52] G. W. SMITH, "Sovereignty in the North : The Canadian Aspect of an International Problem", in : *The Arctic Frontier*, ed. by R. St. J. MACDONALD, Toronto, University of Toronto Press, 1966, at 249.

[53] Charles HUBERT, "Les îles artificielles", (avril-juin 1967) 71 *R.G.D.I.P.* 342–368.

[54] The Court stated that, in negotiating an agreement delimiting the continental shelf of the North Sea, the Parties should take into account at least three factors : (1) "the general configuration of the coasts" ; (2) "the physical and geological structure, and the natural resources" ; (3) "a reasonable degree of proportionality, which a delimitation carried out in accordance with equitable principles ought to bring about between the extent of the continental shelf areas appertaining to the coastal State and the length of its coast measured in the general direction of the coastline". See *North Sea Continental Shelf Cases*, 20 February 1969, reproduced in : *International Legal Materials*, (March 1969), vol. VIII, n°. 2, 340–434 at 384. There is quite an extensive continental shelf in the Arctic, and this question is being investigated by the writer as part of a general study on the Arctic regions.