

# Management of Sledge-dogs and Journeys with Them during the First Wintering (Feb. 1957–Feb. 1958), the Japanese Antarctic Research Expedition.

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## 第1次越冬隊のそり犬の管理と犬ぞり旅行

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### 要 旨

(1) 第1次越冬隊に使用させていただいた犬ぞりは、その準備と訓練に多大の努力を払って下さった加納一郎氏、北海道大学の犬飼哲夫教授、芳賀良一講師など、北大極地研究グループの人達に負う処が極めて大であった。厚く御礼申し上げます。

(2) 南極や北極で、外国隊の使用した犬はすべてハスキー種(又はその同属)であるが、日本隊は、1910~12年の白瀬隊の時もそうであった様に、今回も樺太犬を使用した。

(3) 越冬した樺太犬は、越冬初期に19頭(内雌1頭)であったが、越冬中に3頭をなくし、8頭の仔犬が生まれたので、その末期には24頭(雌1頭、仔犬8頭を含む)であった。この内、15頭の雄成犬が、第2次越冬隊を待ったまま昭和基地に残った。

(4) IIの項では、昭和基地の犬小屋、犬の食糧(第1表)、犬の体重変化(第2表)、仔犬の出生及び8月に行なった訓練(第3表)について書いた。

(5) IIIの項では、始めにそりその他の用具に

ついてふれ、続いて、パグ島並びにその南の上陸地点への偵察行(8月28日~9月4日)、ボツヌーテン行(10月16日~11月11日)及びオラフ行(11月25日~12月10日)の3つの旅行をあげ、それぞれ第4表、第5表、第6表にその概要を記した。

(6) 犬ぞり旅行を、数字で説明する一つの試みとして、

$$Wt = \frac{4rtfgaWdN}{V} \quad (\text{荷重の法則})$$

なる式を仮定し、3つの旅行について、その分析を行なった。第7表、第8表、第9表に示す通りである。

(7) 15頭の犬達が、オングル島に残らざるを得なかったのは、実現はしなかった第2次越冬隊を送り込む事に最大の努力がはらわれ、犬達は新しい隊の来るのを待っていたのである事実を明記した。

(8) 最後に犬達の冥福を心から祈って、この拙い報告書を彼等の霊に捧げる。

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## I. Introduction

Whether or not dogs should be used for the expedition (the Japanese Antarctic Research Expedition 1956-57) raised animated discussion among the members con-

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cerned, and toward the end of January 1956 they finally decided to make practical preparation for dogs. This great task was undertaken by the members of Polar Research Group of Hokkaido University in Hokkaido (the northernmost of the four Japanese islands) centering around Professor Dr. Tetsuo INUKAI, Mr. Ryoichi HAGA, and Mr. Ichiro KANO.

They had worked on the problem for about ten months until the departure of our ice-breaker, m. s. Soya, on the 8th of November in 1956. Though it was a very short period, their efforts were worthy of praise and we owe them much in the use of dogs during our wintering in Antarctica. A report<sup>1)</sup> has already been published on the preparation and training of sledge-dogs they had done in Hokkaido, and to avoid repetition, we take up here only a special article to describe the *Karafuto-ken* (so-called Saghalien dog).

Japan sent her small-scaled expedition headed by Nobu\* SHIRASE to Ross Sea, in the years from 1910 to 1912 and our expedition was the only second attempt since that time (excluding the whaling vessels). So, we have never had sufficient experiences and data on dog-transportation. However, in snowy regions of Japan such as Hokkaido or Karafuto\*\* (Saghalien), dog-teams have been used for various kinds of work since the old days, and especially among the natives of Karafuto, they have been used most frequently. The dogs are called *Karafuto-ken* (Saghalien dogs), distinguishing them from *Huskies*, but they are both sledge dogs resembling each other closely.

SHIRASE's expedition<sup>2)</sup> party had used the *Karafuto-ken*, but this fact has not been known generally. The *Karafuto-ken* were also employed by our expedition, and the following description is naturally about them.

The dogs were transported by the m. s. Soya, on which a simple dog-steerage with two small room coolers was equipped for them, but they were usually kept on a chain on the helicopter deck. After 70 days' voyage passing through the equator, they landed safely on the fast ice of the Antarctic. The dog-teams carried out the first reconnaissance (Jan. 24-27, '57) for the Ongul Island. Later, two weak male dogs and a poor female pup wounded by a fall in the hatch were sent back to Japan aboard on the Soya, and the other 18 male dogs and the only one female pup were left to enter their wintering-life at the Antarctic.

The wintering party consisted of eleven members, and the writers of this paper were the only two persons who had some experience in dog-sledging among them. But one year's wintering gave considerable experience in the technique of dog-sledging not only to us two but also to several members of the party such as E. NISHIBORI, the leader, and some other members.

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\* His first name Nobu is sometimes written Choku by mistake.

\*\* Karafuto is not Japanese territory at present.

## II. Kennel management at Syowa Base and training of the dog team

**II. 1. Dog-hut and tethering line** It was at the beginning of April 1957 when a simple dog-hut and tethering line were completed at Syowa Base ( $69^{\circ}00'22''\text{S}$ ,  $39^{\circ}35'24''\text{E}$ ). The dog-hut has a passageway in the middle of it and individual kennels on both sides faced each other. On the roof of the kennels, crates are furnished to provide for storage of supplies and equipment. The hut is roofed with sheet-zinc, and when it is buried by snow in winter, it looks just like a tunnel. One of the entrances opens to a door of our living hut, and at the other a curtain of canvas is hung as a door.

The tethering line is made of a wire rope (some 70 meters in length, 90 m/m in diameter), both of the ends are fixed to the rocks and wire clips fitted at about every three meters of the rope to tie the chains (about 1 meter long) of the dogs by means of "Karabiner" (see Figs. 1 and 2).

The temperatures at Syowa Base did not drop so low as to injure the health of the dogs during our wintering. The lowest temperature measured<sup>3)</sup> was only  $-36.0^{\circ}\text{C}$ . As the wind blew bitterly carrying a large quantity of snow which we called a blizzard, it offered warm coverlets for the dogs. We had, therefore, never used the whole dog-hut at one time for all dogs. The dog-hut was utilized only for sick dogs and as the breeding bed of a female dog, *Shiro*, but any way, it was very convenient for us, for we were able to use it as our work-shop to do many things.

**II. 2. Feeding and care** What was fed to the dogs during one year's wintering is shown in Table 1.

The food called Dog pemmican was only rarely given to dogs at Syowa Base



Fig. 1. The tethering-line of sledge-dogs at Syowa Base (Sept. 10, '57).

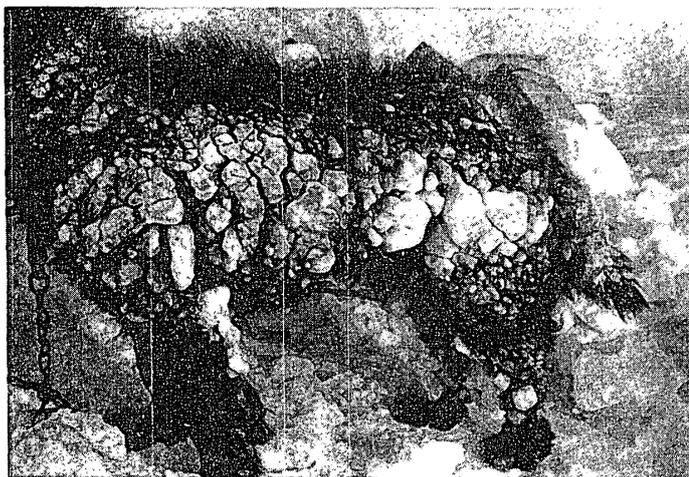


Fig. 2. In hard winter, the dogs with long hair, sometimes, have been suffered from the armon-like ice, but not in case of short hairs (Sept. 16, '57).

Table 1. Food of sledge-dogs during the wintering.

Kinds of food		Weight par day (g)	Consumption (day)	Notes
Transported from Japan	Dog pemmican	500 (2380 cal)	70	10 days at the Base, 60 days in journey.
	Dog food	1500	10	Used many on board, a little at the Base.
	Dog meal	500	80	
	Dried cod	700 (5~6 cods)	60	
	Dried herring	irregular	some	
	Restover food			
Got at the spot	Seal meat	1,500~3,000	140	26 seals were treated during the year.
	Penguin flesh	irregular	a little	
	Skua flesh			

as a test, as it was prepared for traveling rations for them (see Fig. 3). It was a mixture of dried whale meat (42% in weight), fat (27%), wheat flour (20%), fish meal (10%), codliver oil (0.5%) and salt (0.5%), pressed into the size of a biscuit and baked, containing 40% protein and 33% fatty substances. It was designed that each pound and a half (equals 3,560 cal) of them was wrapped in a vinyl sack, corresponding to food for a dog per day, but this amount was cut down in order to decrease the loading of sledge in the latest journey along the Prince Olav Coast when it was not so cold.

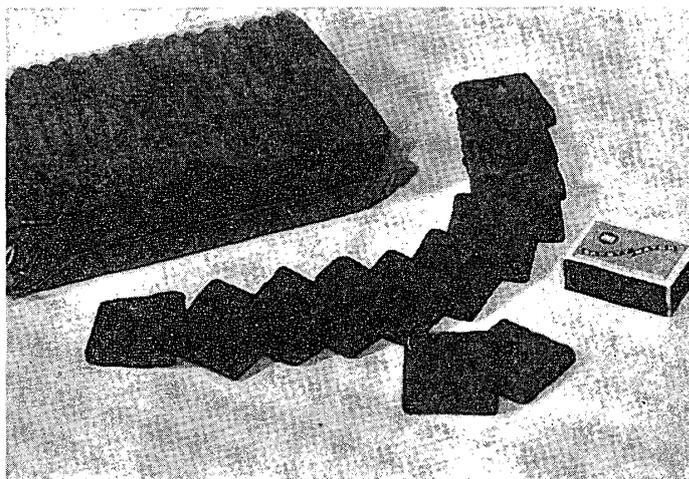


Fig. 3. Dog pemmican. Each pound and a half of them are wrapped by a vinyl sack.



Fig. 4. Weighing of dog (Apr. 17, '57).

Dog food so called was made of horse meat and corn. It was canned, containing 3 pounds each that was the ration of one day for a dog. Dog meal had the similar contents to dog food, being dried and powdered. It was given at the Base, after soaking it in warm water. Dried cod was

so completely desicated that it kept in good condition through the whole period, while dried herring got mildewed in transit by ship. So the latter was reserved for emergency food at the Base. The greater part of the dog food fed at the Base was furnished by seal meat, but we used other food as mentioned above when we were out of stock during the hard winter (June to August) when the seals never appeared on sea ice in the neighborhood of our Base.

The dogs were usually fed once per day at the end of work, but, at a certain time in Syowa Base, once every three days with a treble quantity of food with not so welcome results.

The dogs were kept tied to the tethering line all the year round (even through the hard winter). At the beginning of the wintering, they were set free for a while as a test, but we came to the conclusion that tethering the dogs was the best way. In summer when the snow decreased, it became necessary to give the dogs water individually, so we removed the tethering line on the sea ice at the end of the wintering to save to give water to so many dogs separately every day.

We, sometimes, weighed the dogs especially before and after their journeys (see Fig. 4). Table 2 shows the data:

As our dogs were collected in a short time, they were by no means all excellent typical *Karafuto-ken*. It should be considered that they were just average *Karafuto-ken*, being selected at random.

Their average weight was 31.5 kg at the lowest, but it increased to 38.9 kg at the end of the wintering. The data of three journeys gave the fact that their weight decreased during their journey.

In our wintering, we lost three dogs either from sickness and by some accident. On August 15 *Beck* died of kidney trouble, on September 4 *Kuma* (*Hippu*) seemed to have lost his way and never came back again, and on December 11 *Tetsu* died of old age.

**II. 3. Breeding** Since we left Japan we had had a plan that we would get pups, and breed them during our wintering for the purpose to use them as sledge-dogs during the wintering of the following year and the year after next. For this purpose, the female dog (born Sept. 10, '56) wintered with the other eighteen grown up male dogs. The female dog, *Shiro*, experienced her first heating period in March 1957. However, the hard winter was approaching, and if she had been bred, pups would have been bothered by the coldest weather at their young period. So she was not allowed to mate. Her second heating period came in August and she (her father is *Riki*, one of the best dogs of our team) had *Tetsu*, *Kuro*, *Shiro* (male), and *Jiro* as her stud-dogs. She bred 10 pups on the 24th of October. Eight pups (3 males and 5 females) out of them grew up well.

**II. 4. Commands** According to the custom in *Karafuto* and *Hokkaido*, we commanded our dogs by words as follows:

Table 2. Weight of sledge dogs during the wintering (kg).

No.	Name of dogs	Age	Feb. 1 1957	Apr. 17	May 20	June 14	July 15	Aug. 1	Aug. 16	Sept. 6	Sept. 24	Oct. 14	Nov. 11	Nov. 24	Dec. 11	Jan. 20 1958
1	<i>Riki</i>	6.5	32.8	31.0	31.8	31.8	30.5	32.5	32.7	31.6	32.2	*35.0	*31.4	*33.5	*31.2	38.0
2	<i>Tetsu</i>	6.5	32.0	28.5	27.5	32.0	29.5	30.7	31.0	31.5	29.2	*31.0	*26.0	27.7	—	—
3	<i>Aka</i>	5.5	29.8	29.2	29.2	28.5	28.0	29.5	29.0	31.0	31.3	*33.1	*28.5	*33.4	*30.7	33.5
4	<i>Derry</i>	5.5	31.0	30.2	30.0	31.8	31.0	34.0	34.5	30.0	31.2	31.5	37.5	36.9	35.8	37.5
5	<i>Kuma (Furen)</i>	5.0	32.6	30.0	30.0	30.0	28.0	35.1	32.7	31.3	32.0	*33.0	*30.2	*36.0	*32.8	37.8
6	<i>Pess</i>	4.5	37.3	30.5	33.5	34.7	32.8	36.6	37.0	35.0	34.9	*38.5	*31.5	*36.0	*35.0	41.0
7	<i>Beck</i>	4.0	36.0	31.8	28.0	29.8	31.8	31.0	—	—	—	—	—	—	—	—
8	<i>Kuro</i>	4.0	34.1	33.3	33.8	34.2	33.5	35.7	33.5	34.0	36.2	*36.2	*31.3	*37.2	*33.0	40.0
9	<i>Kuma (Hippu)</i>	3.5	35.5	33.8	34.5	34.3	38.0	45.0	41.8	—	—	—	—	—	—	—
10	<i>Kuma (Monbetsu)</i>	3.5	35.8	31.8	32.0	32.6	31.8	37.2	37.9	35.0	34.9	*37.8	*30.6	*38.8	*34.0	44.9
11	<i>Jack</i>	3.5	28.8	27.0	26.7	29.3	25.9	27.0	30.0	29.9	31.4	*33.1	*29.0	*32.1	*30.3	37.1
12	<i>Pochi</i>	3.0	33.9	31.5	31.0	32.7	30.0	33.0	32.0	31.8	31.3	*33.0	*29.5	*35.3	*34.7	39.0
13	<i>Goro</i>	2.5	39.5	40.2	44.2	40.0	38.6	46.0	45.2	42.0	41.8	*47.2	*39.5	40.6	39.2	42.8
14	<i>Anko</i>	2.5	32.3	30.8	31.8	32.5	32.5	35.1	35.2	34.2	33.1	*36.1	*32.0	*34.7	*32.0	37.0
15	<i>Moku</i>	2.5	32.5	30.0	31.5	31.0	33.6	35.7	37.0	35.1	37.0	*37.7	*33.1	*38.9	*34.0	43.0
16	<i>Shiro</i>	2.5	31.0	31.2	31.0	34.1	35.5	35.8	34.3	31.5	33.2	*34.9	*31.5	*35.9	*32.8	36.0
17	<i>Taro</i>	1.5	32.0	30.0	31.3	31.2	31.0	33.7	34.0	32.4	35.0	*37.3	*33.0	*37.5	*34.0	38.0
18	<i>Jiro</i>	1.5	33.0	32.2	31.7	32.5	32.5	38.0	36.1	34.0	35.8	*35.0	*30.0	*35.5	*34.0	38.5
	mean	3.5	33.3	31.5	31.6	32.4	31.9	35.1	35.1	33.1	33.9	35.7	31.5	36.2	33.6	38.9
19	♀, <i>Shiro</i>	0.5	22.3	27.2	31.4	33.8	31.8	32.5	33.8	35.2	34.0	39.6	34.5	35.0	34.1	32.5
	Notes	Begin- ning of the winter- ing	On sea ice near by Soya				No training. 50% increase of food	<i>Beck</i> died at the night of Aug. 15	<i>Hippu</i> ran away soon after the journey to Padda			Just before the journey to Botnnuten	Soon after the journey to Olav	Just before the journey to Olav	Soon after the journey to Olav	<i>Tetsu</i> died on Dec. 11. ♀ <i>Shiro</i> got pups on Oct. 24
												35.9	31.0	36.4	32.9	
												Mean of dogs joined in the journey, marked by *				

“Tô” or “Tow”, for starting and go straight.

“Kai”, for a right turn.

“Choi”, for a left turn.

“Brái” or “Broo” (with trembling of the tongue), for stopping.

**II. 5. Training** After parting from the Soya, we had such busy days that we could not have the dogs' training. But we wanted to have them trained before the hard winter came. So two members, the authors of this paper, took charge of the dogs' training through May to the beginning of June, leaving their other jobs aside.

We made them run about on the sea-ice near our Base for a short period around noon time when the sun is lightest of a day. The total distance they ran during this time was about 250 kilometers. The chief purposes of the training were as follows:

- (a) To promote the trainers technique and studies.
- (b) To train leader dogs.
- (c) To train to keep the dog-team waiting for us and not to move when we command them stopping to do something.
- (d) To organize the most efficient order of the team.

At the end of the training period, we succeeded in getting a considerably well-trained dog-team, but we had bidden farewell to the sun at the same time. We saw the last sun on the 31st of May, and we were never able to see it again.

On July 13, the sun appeared in the sky again. From then, the day-time was

Table 3. Dog sledging in August 1957.

	Round Ongul Is.	Visiting near small Is's in order	To and from Rumpa Is.	Yutre Hovdeholmen→Langhovde		
				Syowa Base →Yutre Is.	Yutre Is. →Langhovde	Langhovde →the Base
Date	'57 Aug. 2	Aug. 8	Aug. 9	Aug. 12	Aug. 15	
Weather	fine	fine	fine	cloudy mistily	a.m. fine	p.m. fine
Ⓐ Members	S. N. T. T. T. K.	T. K. M. S. B. T. K.	T. T., T. K. T. S <sub>1</sub> , N. M. B. T. K.	S. N., T. K. T. S <sub>2</sub> , B. T. K.	S. N., T. K. T. S <sub>2</sub> , B. T. K.	T. K., B. T. K.
Ⓑ Number of dogs	11	15	15	15	14	14
Ⓒ Loading (kg)	305	310	485	550	510	240
Ⓓ Distance(km)	18.1	34.7	42.0	29.2	12.5	25.6
Ⓔ Time required (hour)	2.5	5.5	7.0	5.5	2.5	3.0

Notes: Ⓐ Each initial shows the following members:

S. N. = Seiki NAKANO

N. M. = Nozomi MURAKOSHI

T. T. = Tatsuo TATSUMI

T. S<sub>1</sub> = Toshio SAKUMA

T. K. = Toru KIKUCHI

T. S<sub>2</sub> = Tomio SAEKI

M. S. = Masanori SUNADA

B. T. K. = Taiichi KITAMURA

Ⓑ These dogs trail one sledge.

Ⓒ “Loading” includes the weight of rided drivers and sledge, harness, etc.

Ⓓ “Distance” was measured by the sledge meter.

Ⓔ “Time required” includes also the time which are necessary to drive the team, e.g. to rest and to take lunch etc. and never the other time, e.g. to survey.

getting longer day by day, but the temperature dropped little by little. But it was not too cold for dog training, so we began it gradually. The training this time was different from that of May. The purpose of this time was to be ready for the forthcoming journey, practically running about around Ongul Island, looking for penguins, and surveying geology, sea ice and so on. The places we went and other data are given in Table 3.

On August 2 we encircled Ongul Island, and on the 8th we went about to the small islands, which we temporarily named "A" Island, "B" Island, and "C" Island. There, we made a survey of their geology and looked for penguins. Next day we advanced as far as "Rumpa" Island, and we really had a 42 kilometer-running on one day.

On August 12, the dog-team (KIKUCHI and KITAMURA and 15 dogs) left Syowa



Fig. 5. A magnetic compass for a aircraft was utilized. The installing-stand, made of duralumin (partly, of brass), was designed to be usable, also, for a stage of astronomical-compass.

Base to perform its duty of seeing off two members NAKANO and SAEKI as far as "Yutre Hovdeholmen" Island, as they were to study the ecology of penguins (however, they were not yet there). It was the first stopping out trip with tent after the hard winter. The party encountered a sudden blizzard on the "Yutre Hovdeholmen" Island on the same day, but, on this occasion, we were able to get some experience, such as,

moving depending only on a magnetic compass (see Fig. 5), or pitching a tent even on hard sea-ice, in a raging blizzard using ice-pitons.

Being compelled to stay at the place on the 13th and 14th, we left for Langhovde on the 15th. Leaving NAKANO and SAEKI there, the dog-team returned Syowa Base in the evening of the same day. On the way back, we tried to make our sledge run with sail, and we could have a successful result. Sledging with sail is very good when the wind is in a good condition (see Fig. 6).

Later, we went on some journeys which will be described after, and during the journeys or the period we were waiting for the Soya coming, we, several times, organized dog-teams to put them practical use for carrying daily needed ice from the icebergs, or to survey ice condition, and to train them.

### III. Journeys

#### III. 1. Sledging equipment Before writing about the journeys, some explanation

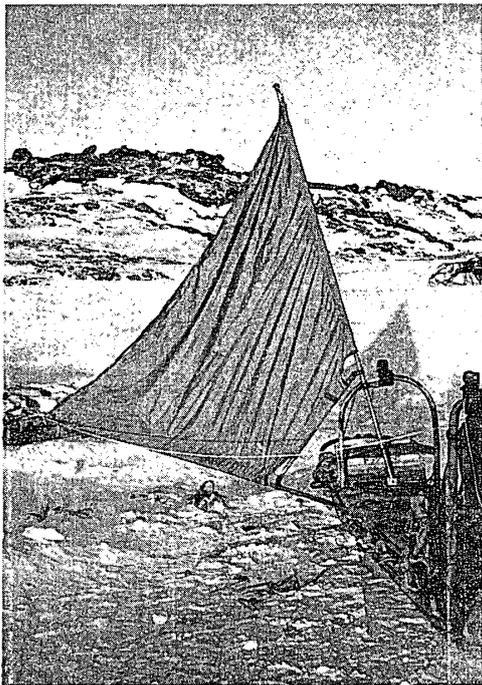


Fig. 6. The sail of dog sledge, which was made of duralumin pipe, nylon sheet and nylon rope, have a main pole, not stood vertical for the sake of getting a wide range of vision in front. It weighs only 4.8 kg altogether. The sledge in this figure is of rattan. There are two magnetic compasses in rear of sledge and in head respectively.



Fig. 7. The rear of sledge (of hickory) and the hoetype brake (of stainless steel). The "Valflon" (poly-tetra-fluoro-ethylene) is glued at the tail of runner.

has already been made by T. INUKAI and R. HAGA<sup>1)</sup>, only the necessary facts will be given here.

III. 1. 1. SLEDGES: The sledge of our team measures 402 cm×65 cm×28 cm, the runner 9 cm wide, with a half-moon bumper in front, and a hoelike brake (of stainless steel) (see Fig. 7) and a handle stand (bar) in the rear. The sole of the runner is shod with 0.8 mm thick "Valflon" (poly-tetra-fluoro-ethylene, made in Japan), or with 1 mm thick hardened-celluloid. The whole weight comes to 64 kg in the heavy sledge (hickory is largely used), and 60 kg in the light one (using mainly ash or oak). We also had a rattan sledge of the same size (but with hickory runner) for special lightness and to get more flexibility. The weight is 47 kg. These sledges are planned and manufactured, in order that each of them is fit for a team of 10~15 dogs, carrying a maximum load of 500 kg.

The result obtained proved that rattan, as material for a sledge, is very noteworthy. Also, we found that "Valflon" shod at the sole of the runner slides extremely well but liable to rip off, while celluloid—not sliding so well as "Valflon"—stays rather firmly attached. As regards brakes, there is no necessity to make a heavy and costly, stainless steel one, unless it is intended for hard winter use.

III. 1. 2. TOW-LINE AND HARNESS: The hitching system which our team used

of the equipments used there should be described. However, a detailed report

may be described as Alternate-double-tandem-hitch (see Fig. 8), with dogs being lined up on both sides of one center trace, same as in the ordinary Double-



Fig. 8. Alternate-double-tandem-hitch (Karafuto-system). The distance view is Syowa Base at Ongul Island (Aug. 8, '57).

tandem-hitch, but with the difference, in our system, that each dog, instead of being arranged in pairs right and left, is placed on a sub-rope (called Tomo-zuna in Japan), branching alternately from the center trace like tree branches. A lead dog comes first in the center keeping some distance—about a little less than one meter—from the second, that comes on the right (or left) side of the center trace. After

that the third gets his position on the left (or right) drawing back a half-body-length distance from the second, and so on, all dogs come alternately right and left separating by the same distance.

In comparing this system with the ordinary Double-tandem-hitch, in which dogs are arranged in pairs, we may say that ours has its advantages and disadvantages. Which is better is not ascertained yet. However, we adopted this system, for they are accustomed to what they had used in their native land since the old days.

At the end of the wintering, we not only tried Tandem-hitch which we had used, but also tried Fan-hitch which we had seldom tried before.

As to harness, we also employed what has been long in use in old Karafuto and Hokkaido, and which is suitable for the above-mentioned Alternate-double-tandem-hitch (we called this recently Karafuto system). At a glance, it appears simple, but, nevertheless, is a contraption of profound utility: viz., there is a belt of leather, comparatively wide, placed at the dog's breast (front of the fore limbs, under the neck), engirdling from behind. And, on the back of the dog, there is a metal ring to gather the straps coming from both sides. From this point a slender leather girth encircles the dog's trunk (the part just behind the fore limbs). Both the front and back belts have an adjustable buckle fitted to suit any dog's physique, and for convenience in putting on and taking off.

III. 1. 3. OTHER EQUIPMENTS: A special sledge-meter (see Fig. 9) was prepared by utilizing a bicycle wheel with solid rubber tire. It felt a bit too heavy, which, however, accounted in our opinion for the resulting accuracy of distance recorded thereby.

For camping purpose, we had made provision in Japan for a special tethering-

line of fine wire rope. But actually, this was not used, as we let the dogs rest hitched as they were to the center trace joining to the sledge. However, two or three dogs among them were found so stubbornly inured to gnawing at the Manila rope, or else began soon to fight one another, that finally we decided to separate them from the others while camping, and made them pass the night, chained severally to the rear of the sledge.

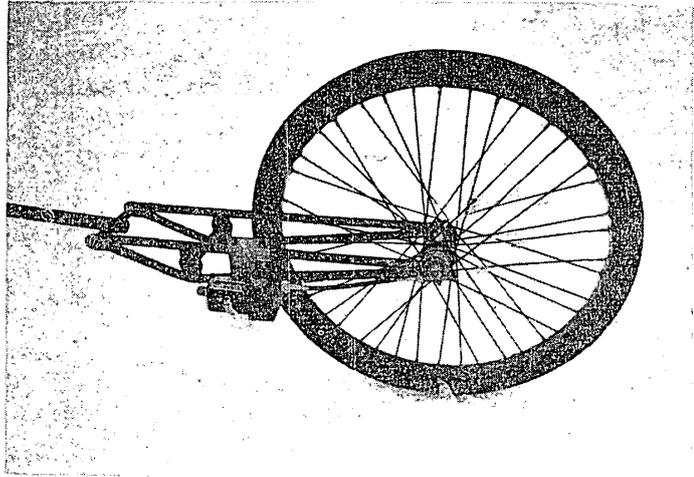


Fig. 9. Sledge-meter.

For a camp site, we usually selected the shade of an iceberg—a spot where there was

much snowdrift. An oak pole, one meter long by five centimeters thick, was driven in the hardened snow with a geological hammer. Dogs were hitched to this oak pole, of which three or four are sufficient for one team (15 dogs). For camping on ice, however, mountaineering ice-pitons were used by us.

In order to make an easy, quick, and perfect lashing of loads onto the sledge possible, large canvas bags were prepared. The shape of these bags, which were made of comparatively thin canvas, were rectangular, and their bottoms were of the same dimensions as the load-bed of the sledge. The sides were one meter high, and only one of them had a one meter wide piece of cloth attached, to serve as covering for the load. This canvas bag itself weighs a mere 4 kg.

**III. 2. Journey to Padda Island** It was on August 28, 1957, that we despatched a reconnaissance party to the head of the Lützow-Holm Bay in preparation of our coming spring journey to Botnnuten. It consisted of four members: Dr. E. NISHIBORI (leader of the wintering party), Dr. T. TATSUMI (geologist), T. KIKUCHI (geologist), and T. KITAMURA (geophysicist), and a team of 15 dogs. Eight days were spent in the coldest season of the year. Throughout the journey, the temperature recorded was as low as  $-34^{\circ}\text{C}$ .

In the center (east of the Padda Island) of the Lützow-Holm Bay, an immense number of old icebergs lie ranging one after another, shutting out a course on the sea-ice. These icebergs appear to be continuously distributed to the south, further towards the interior, that is, as far as the glacial tongue at the head of the bay. No proper course could be made there. On the northern side, it was witnessed by the party on the return journey that there were numerous cracks of sea-ice. From then on to the spring, therefore, no course on sea-ice at that side seemed to be available. The only alternative, consequently, was to climb over the iceberg ranges—apparently the best course left. Fortunately, there was heavy snow in this neighborhood. More-

Table 4. Data of the reconnaissance for Padda and the landing place.

Date	Weather	Time	Temp. (°C)	Actions, circumstances, and others	Distance (km)									
					The day	Total								
1 Aug. 28 1957	fine	08.45	-26	Started from Syowa Base	}	7.7								
		09.50		At the south corner of Teöya										
		10.00		Between the "E" Island and "Rumpa" (lunch)										
		11.30												
		12.00												
		13.00		At the north corner of "Rumpa"				20.9						
		13.05												
		15.50		Camp 1, deep snow, dogs tired				29.4						
		16.10												
		24.00												
		29.4												
2 Aug. 29	fine	08.35	-24	Started from Camp 1	}	15.1								
		11.35		Lunch, on sea ice										
		12.00		"Table ice-berg No. 1"										
		13.19												
		13.25												
		15.45		"Table ice-berg No. 2"				30.5						
		15.50												
		16.00		Camp 2, beside a crack				31.0						
										60.4				
		3 Aug. 30		fine				06.00	-31	Got up	}	3.7		
08.35	Started from Camp 2													
09.25	Top of the 1st "Dome ice-berg"													
11.00	Top of the 4th "Dome ice-berg" (lunch)													
12.00														
13.00														
13.05	Top of the 8th "Dome ice-berg"		13.8											
15.46														
	Camp 3, tired		23.7											
						84.1								
4 Aug. 31	fine	05.50	-31	Got up	}	8.5								
		08.25		Started from Camp 3										
		10.00		North bay of Padda										
		10.55		"Austpynten" (East cape) of Padda										
		11.20		Crack named "Haru-no-ogawa" (lunch)										
		12.00												
		13.20												
				Camp 4				17.7						
										101.8				
		5 Sept. 1		fine				08.05	-28	Started from Camp 4	}	13.4		
	Landing place													
11.00	Turn back point on the continent (lunch)													
11.45														
12.40														
13.10	Geological survey at the outcrop		22.2											
15.15														
	Camp 5 (same point as Camp 4)		33.7											
						135.5								
6 Sept. 2	fine windy		06.00		-31	Got up	}	35.2						
		08.45	Started from Camp 5											
			Round the north of Padda											
		16.40	Camp 6											
		7 Sept. 3	fine	09.05		-31			Started from Camp 6		}	13.5		
				11.50					Lunch					
				12.00										
				16.00										
									Camp 7					32.4
8 Sept. 4	cloudy			08.30	-18		Started from Camp 7	}	8.7					
				10.22			Found the trace of Camp 1							
				12.00			Lunch, near "Rumpa"							
				12.30										
		14.40												
		15.00	"B" Island	25.3										
		15.50												
			Met the snow car	27.4										
							230.5							
			Came back to Syowa Base	38.3										
		241.4												

over, all the icebergs have smooth sides, so that dog-sledges and snow-cars can have comparative freedom of climbing up and down the icebergs. We called them "Enkyu-hyozan-gun" (group of dome icebergs). They are being constantly pushed on, even in hard winter, by the continental glacial tongue behind. On both sides of them, many large cracks are formed, and we named them "Haru-no-ogawa" (brook of spring).

We landed for the first time (Aug. 31, '57) on Padda Island, and were able to investigate it. On the opposite beach of Padda Island, we discovered an ideal landing place which, by the way, we had previously presumed suitable, after studying an aerial photo of the landscape. Here we decided to establish our base camp intended for the coming Botnnuten journey.

An outline of this journey is given in Table 4.

**III. 3. Journey to Botnnuten** Encouraged by the results of our reconnaissance of Padda Island as well as the landing place, and our confidence in the course to take increasing, we now applied ourselves to the task of realizing the Botnnuten journey. First of all, we had to transport the required commodities (food and fuel) to the landing point. On September 27, 1957, a "dépot" party of two snow-cars started. During the six days that it lasted, a lowest temperature of  $-35^{\circ}\text{C}$  was reached. On the whole, however, this was a warmer trip than the former journey with dogs.

After returning from this "dépot" trip, we made ready to set out on our main journey to Botnnuten using snow-cars, when, unfortunately, the engine warmer (pre-heater) was found out of order. Now, it was absolutely necessary for starting the engine or for repairing engine troubles. And it became clear that to carry out a long dated journey by snow-car was simply unimaginable without a engine warmer.

Therefore, it was decided to use canines again, and Dr. NISHIBORI gave the word finally: "Go to Botnnuten with the dogs".

A party of three—Dr. S. NAKANO (surgeon) as leader, and T. KIKUCHI (geologist) and T. KITAMURA (geophysicist), in charge of 15 dogs—set out from Syowa Base. It was October 16, 1957.

The 27 days which followed is but a little journey compared with those large-scale explorations promoted by foreign nations. To us, however, this is the essence, the culmination of all and great efforts rendered by everybody concerned in the enterprise. An honor, as it were, to carry up the last one of the topmost stones of a pyramid which has been accumulated by our collaborators, and, naturally, a realization of our dream! The 15 dogs we took with us, worked hard, in fact, more than we had expected of them, bringing to fruition our many labors in training them for the journey. As we daily watched and followed them, our heart warmed up to the unsharing canine efforts.

The "Enkyu-hyozan-gun" (group of dome icebergs), which blocks the course on this side of the Padda Island, is a collection of big, old, decrepit icebergs, all

of which are about 50 meters high, and mostly one kilometer in diameter. Because they are contiguously distributed over the area, we have to climb up and down the icebergs, and are not allowed to make a detour. So we rode across this group of icebergs. Our loads were great; but the dogs all endured well.

On October 21, 1957, starting from our "dépot" at the landing place, we set foot on the continent and proceeded towards the south, and more south. There were no big crevasses on the course. But we had to march in the teeth of strong winds which brought on snows that hurt our faces. It was hard to walk looking forward. Frostbite left its mark on the face. As for the dogs, they were not better than ourselves. It probably made it difficult for them to steer straight ahead against the wind, seeing them prone to go in the wrong direction.

In this way, on the afternoon of October 25, 1957, the three-man party and the 15 dogs reached the foot of Botnnuten. At that point, the altitude is approximately 1,000 meters above the sea-level, the temperature was in the neighborhood of  $-20^{\circ}\text{C}$ , and, as usual, snowdrifting was severe. The next morning, October 26, the mercury read  $-26^{\circ}\text{C}$  with a strong wind blowing at 15m/s. Usually, this wind has a tendency to subside in the afternoon, so we tide over it by keeping ourselves in the tent while it lasts. In the afternoon, we got on the unloaded sledge and made a round trip to Botnnuten. This mountain mass, having a circumference of 4~5 km, is not so big. However, it is cut on all sides by glaciers, so that there is no likelihood of its being climbed easily. It is what we call a "nunatak".

We named temporarily the several peaks of this mountain mass, viz., "To-hô" (east peak), "Shu-hô" (main peak), and "Sei-hô" (west peak). And a small peak located on their western side got the name of "Inu-yama" (dog mountain) in recognition of our dogs' contribution to the journey.

The prospective routes determined through reconnaissance as possibly climbable are:—

1. To ascend along the west ridge of Botnnuten from the pass running between "Inu-yama" and "Sei-hô", which we temporarily called "Inuyama-tôge" (pass of dog mountain).
2. The gully which is found on the southern side of Botnnuten, between "Shu-hô" and "Sei-hô".
3. And, on the northern side, the gully located between "To-hô" and "Shu-hô".

Other than these three mentioned above, there is apparently no route elsewhere that promises an easy climb.

Towards the evening of that day, at 16:40, the three men, leaving the dogs at the camp, started on Route 1 to attack the top. The party climbed, step by step, up the hard ice, as far as "Inuyama-tôge" (see Fig. 10). Shortly after making the pass, the three men did Anseilen. The real climbing was about to begin along the west ridge.

Table 5. Data of the journey to Botnnuten.

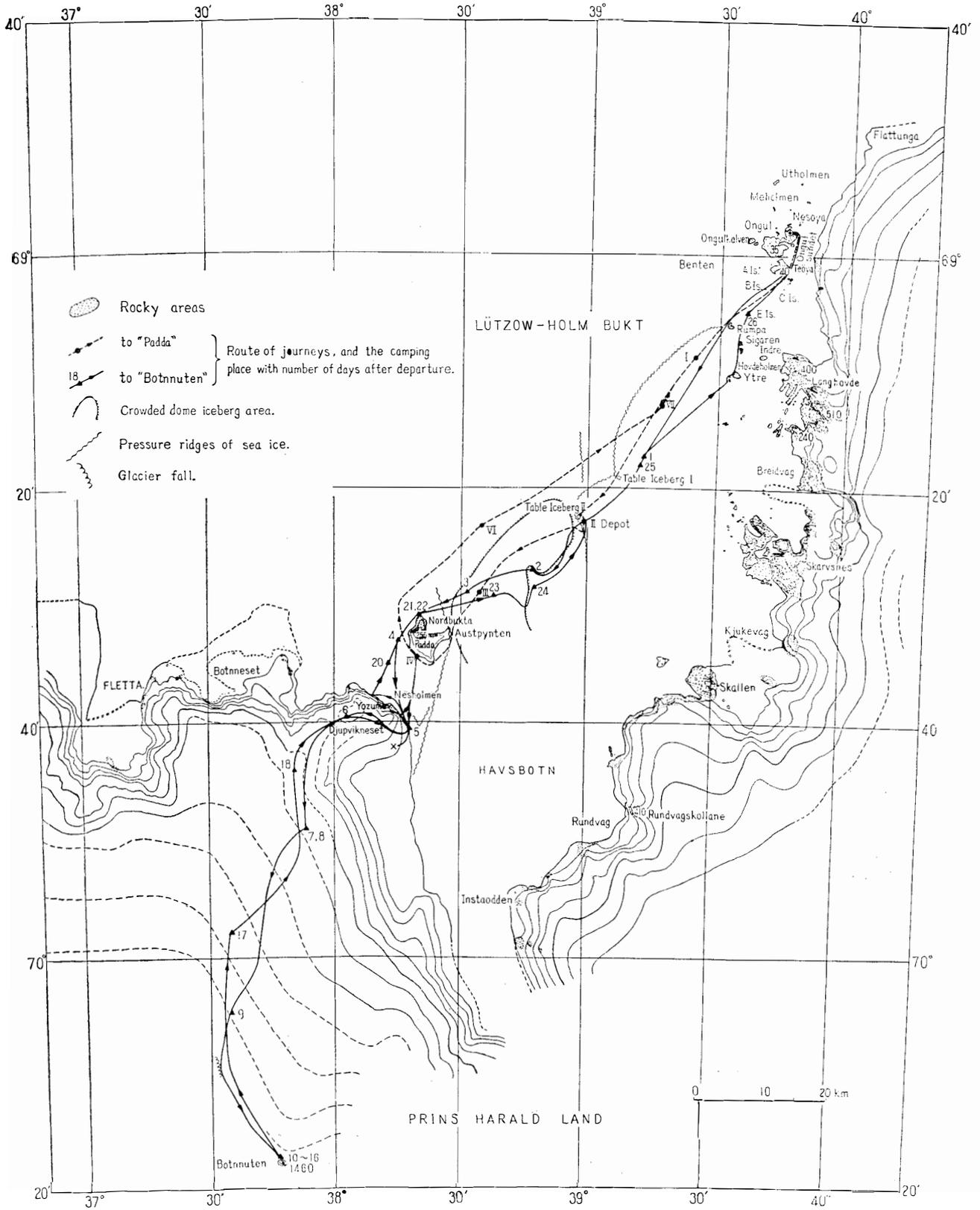
Date	Time	Weather	Height (m)	Temp. (°C)	Direction of wind	Velocity of wind (m/s)	Action, circumstances, and others	Distance (km)		
								The day	Total	
1 1957	Oct. 16	06.00	mistful	6	-19		At Syowa Base before starting Support party (TATSUMI, OTSUKA, SAEKI) started with a snow-car NAKANO, KIKUCHI, KITAMURA and 15 dogs started from the Base At the south corner of Teōya At the north corner of "B" Island At the north corner of "Rumpa" Lunch Set up Camp 1 At Camp 1 "			
		06.20	"							
		08.10	high cloud o.c.							
		08.50	(o.c.=over cast)	0					7.4	
		09.28	"	"					12.7	
		10.20	"	"					20.2	
		10.30	low cloud o.c.	"	-23	NE		5		
		11.27	} fine	"	-13	"		3		
		11.50		"					28.1	
		15.58	"	"	-14				47.0	
19.30	"	"	-23							
21.50	"	"	-27				47.0			
2	Oct. 17	03.05	"	"	-30		"			
		07.40	"	"	-19		Started from Camp 1	9.7		
		08.50	"	"	-19		Near the "Table ice-berg No. 1"			
		09.15	} "	"			"Dépot" near the "Table ice-berg No. 2"	11.6		
		10.20		"			Got 250 kg transported by snow car			
		11.50	} "	"	-13	calm	At the east corner of the "1st dome ice-berg" (lunch)	15.4		
		12.30		"	-13		Set up Camp 2 } deep snow	22.9		
		16.28	"	"	-13		At Camp 2			
20.15	"	"	-19			69.9				
3	Oct. 18	06.00	middle cloud o.c.	"	-19	S	5	"		
		08.00	"	"				Started from Camp 2		
		11.55	} "	20	-11			On the "Dome ice-berg" (lunch)	6.0	
		12.30		"						
		16.16	"	"	-12			Set up Camp 3	12.5	
20.30	"	"	-19			At Camp 3	82.4			
4	Oct. 19	06.00	fine	"	-19	SE	5	"		
		08.00	"	"				Started from Camp 3		
		09.00	"	"	-18	S	5	On the "Dome ice-berg"		
		11.30	} "	0	-12	S	3	At the crack of sea ice, named "Haru-no-ogawa" (lunch)	6.5	
		12.20		"						
		14.40	} "	"	"	S S E	3	At the north corner of Padda	10.9	
		16.00		"						
		17.20	"	"	-14			Set up Camp 4	16.7	
21.00	"	"	-19	calm		At Camp 4	99.1			

Date	Time	Weather	Height (m)	Temp. (°C)	Direc- tion of wind	Velocity of wind (m/s)	Action, circumstances, and others	Distance (km)			
								The day	Total		
5	Oct. 20	06.00	0		S	5	At Camp 4	10.3	114.1		
		07.45	"				Started from Camp 4				
		09.00	"	"	-13	S E	10			On sea ice, south-west of Padda	
		11.40	}	"	-11	S S E	10			On sea ice (lunch)	
		12.20		"							
		13.15	"	"						Set up Camp 5, at the landing point	
		20.10	"	"	-19					At Camp 5	15.0
24.00	"	"	"		15	"					
6	Oct. 21	06.00	"	-22			"	5.0	146.4		
		08.45	"	-16		calm	Started from Camp 5				
		11.20	}	300						On the continental ice (lunch)	
		12.00		clear							
		15.20	fine	440						Set up Camp 6	12.0
		19.00	"	"	-21	S	5			At Camp 6	
23.00	"	"	-17	S	10	"					
7	Oct. 22	07.40	"	-16	S	8	"	8.2	126.4		
		08.55	}	"						Started from Camp 6	
		11.40		500	-14	S	8			On the continental ice (lunch)	
		12.20	"								
		15.40	"	550	-14	S	7			Set up Camp 7	20.3
19.00	"	"	-16	S	8	At Camp 7					
8	Oct. 23	06.30	"	-20	S	20	Solar eclipse } no movement	Camp 7=Camp 8			
		07.00			S	20					
		07.40			}	fine					
		12.40				snow drifting					
		17.30			clear	"				-16	S
		"	"	S	2						
9	Oct. 24	04.30	550	-22	S	20	At Camp 8	19.4	180.8		
		06.30	"		S	25	Started from Camp 8				
		10.30	}	800	-18	S	20			Lunch in tent, avoiding the drifting snow	
		13.15		"							
		15.30	fine	950	-18	S	20				
		16.40	"	1,000	-20	S	5			Set up Camp 9 Could see Botn. in distance	34.4
		18.30	"	"	-23		calm			At Camp 9	
		20.00	"	"	-27	"	"			"	

10	Oct. 25	06.00	snow drifting	1,000	-27	S	15	At Camp 9	7.5 26.1	206.9
		08.30	"	"	-24			"		
		09.35	"	"				Started from Camp 9		
		11.15	} fine	1,050	-18	S	10	At the foot of a glacier fall, named "Kushi (comb)"		
		11.30		"						
		16.30	"	1,100	-18	S E	5	Set up Camp 10, at the north foot of Botnnuten		
20.00	"	"	-21	S E	10	At Camp 10				
11	Oct. 26	06.00	snow drifting	"	-26	S	15	"	7.1	214.0
		12.30	"	"	-19	S	10	"		
		14.00	high cloud o.c.	"				} round Botnnuten with Came back to the camp } dogs		
		15.45	"	"						
		16.40	"	"	-20	S	2	Started from Camp 10, on foot to attack the top		
		18.20	"	1,320				} Return back from a over-hang just under the top of west peak		
19.50	"	1,100				Came back to Camp 10=11				
12	Oct. 27	08.30	snow drifting	"	-20	S S E	15	At Camp 11	We did not use sledge dogs.	
		12.00	high cloud o.c.	"	-15	S	10	"		
		14.10	"	"				} Started from Camp 11, on foot to attack the top At the top of the " West peak "		
		15.50	"	"						
		16.05	}	1,480		NE	5	At the top of the " Main peak "		
		16.35								
17.35	"	1,300				} At the top of the " Dog mountain " Came back to Camp 11=12				
19.00	"	1,100								
13	Oct. 28	08.00	snow drifting	"	-18	S E	10	At Camp 12		
		12.00	"	"	-16	S E	10	"		
		16.15	middle cloud o.c.	"				} Started from Camp 12, to survey the geology Came back to Camp 12=13		
		18.00	"	"						
19.00	"	"	-15	S E	5	At Camp 13				
14	Oct. 29	07.00	high cloud o.c.	"	-20	S E	5	"		
		10.00	"	"	-17			} Astronomical observation and mensuration of Botnnuten when it was somewhat fine		
		12.10	"	"	-15					
		15.30	"	"	-16	S E	3			
		21.10	"	"	-18	S E	5	At Camp 13=14		
15	Oct. 30	08.20	snow drifting	"	-18	S E	5	At Camp 14		
		10.30	"	"	-16			"		
		14.30	low cloud o.c.	"				} Started from Camp 14, to survey the geology Came back to Camp 14=15		
		17.30	"	"						
		21.00	"	"	-17	calm				

Date	Time	Weather	Height (m)	Temp. (°C)	Direction of wind	Velocity of wind (m/s)	Action, circumstances, and others	Distance (km)		
								The day	Total	
16	Oct. 31	08.45	mistful	1,100	-16	S S E	5	At Camp 15 " " " " Started from Camp 15 } Climbed "Dog Came back to Camp 15=16 } mountain" At Camp 16	We did not use sledge dogs.	
		11.40	"	"	-12					
		14.00	"	"	-14					
		16.30	high cloud o.c.	"	-15					
		17.15	"	"						
		18.55	"	"						
		20.40	"	"	-16					
17	Nov. 1	07.00	snow drifting, snow	"	-17	S S E	8	" Started from Camp 16 At the front of the glacier fall, named "Kushi (comb)" (lunch) Set up Camp 17 At Camp 17	18.0 35.0	249.0
		18.40	snow	"	-17	E	8			
		12.10	} snow drifting }	1,050	-16	S E	5			
		13.05		850	-12	"	"			
		17.00	snow	"	-19	S	2			
		20.00	fine	"	-19	S	2			
18	Nov. 2	07.15	snow drifting	"	-19	S	8	Started from Camp 16 Near the trace of Camp 7=8 (lunch) Set up Camp 18	25.0 35.0	284.0
		11.10	} fine	550	-12	S	2			
		12.35		"	-13	S	2			
		16.30	"	"	-13	S	2			
19	Nov. 3	05.30	high cloud o.c.	"	-16	S	3	At Camp 18 Started from Camp 18 At the trace of Camp 6 (lunch) Set up Camp 19, at the trace of Camp 5 At Camp 19	10.5 22.5	306.5
		07.30	} low cloud o.c.	440	-10	S	5			
		11.30		0	-7	S	1			
		13.05		"	-10	S	5			
		17.40		"	"	-10	S			
		21.45	"	"	-10	S	5			
20	Nov. 4	07.30	fine, snow drifting	"	-12	S	5	" Started from Camp 19 } geologic survey on the way Set up Camp 20 At Camp 20	15.0	321.5
		14.45	fine	"						
		18.40	"	"						
		21.15	"	"	-18	calm				
21	Nov. 5	03.30	fine, snow drifting	"	-12	S	10	" " Started from Camp 20 Set up Camp 21, at the north corner of Padda At Camp 21	11.8	333.3
		08.20	fine	"	-12	S	8			
		10.20	"	"						
		12.40	"	"	-9	S	8			
		20.45	"	"	-9	S	8			
22	Nov. 6	10.30	clear	"	-6	S	10	" At the top of Padda At Camp 21=22		
		13.00	"	280	-6	S	15			
		22.35	"	0	-7	S	8			

23	Nov. 7	08.30	clear	0	- 6	S S E	8	" Started from Camp 22 At the crack of sea ice, named "Haru-no-ogawa" } Acrossed the "Haru-no-ogawa" (lunch) Set up Camp 23 } deep snow	4.4	349.3	
		10.35	"	"	"	E S E	2		5.5		
		12.00	"	"	"				16.0		
		12.40	"	"	"						
		13.30	"	"	"						
		17.10	"	30	- 7	calm					
24	Nov. 8	08.20	"	"	-11	W S W	3	At Camp 23 Started from Camp 23 On the "Dome ice-berg" (lunch) } Set up Camp 24, at the south east foot of the "Dome ice-berg" At Camp 24	10.0	359.3	
		09.00	"	"	"						
		12.00	"	"	"	- 8	E S E		1		
		12.40	"	"	"						
		17.00	high cloud o.c.	0	-10	NE	3				
		20.00	mistful			NE	1				
25	Nov. 9	07.00	"	"	-12	calm	" Started from Camp 24 Lunch, on sea ice } "Dépot" near the "Table ice-berg No. 2", got the food of us and dogs Set up Camp 25	14.0	384.3		
		09.20	"	"	"					25.0	
		12.20	"	"	"	- 6		NE		2	
		12.40	"	"	"						
		14.15	high cloud o.c.	"	-14	NE		1			
		15.20	fine	"							
		17.50		"							
26	Nov. 10	07.00	mistful	"		N N E	5	At Camp 25 Started from Camp 25 } At the north corner of "Yutre" Is. (lunch), survey- ing Set up Camp 26, at "E" Is.	33.0	417.3	
		08.50	"	"	"						
		13.05	snow	"	-10	NE	8				
		15.30	"	"	-10	NE	3				
		16.50	low cloud o.c.	"							
27	Nov. 11	07.00	"	"	- 7	calm	At Camp 26 Started from Camp 26 Came back to Syowa Base	18.0	435.3		
		10.00	"	"	"	NE		1			
		12.15	"	"	"						



Map 1 Route map to Botnnuten. Observational values of Syowa Base (69°00' 29" S, 39°35' 10" E, by the J.A.R.E. 1956~'57) and of Botnnuten (70° 25' 00S, 37° 55'1 by KITAMURA) have been gotten, but this map was taken after the H.E. HANSEN's (1;250,000).

But, after some two hours climbing, at 18:20, we, unfortunately, found ourselves below a large overhang. It is a real overhang about three meters high.

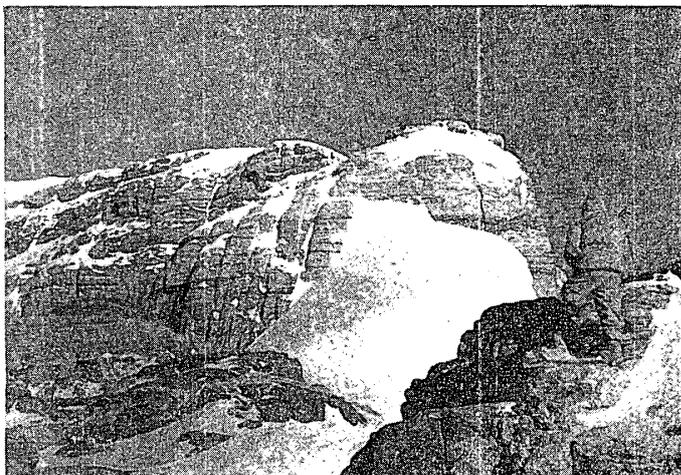


Fig. 10. The west side of "Botnnuten", viewed from the "Inuyama-toge" (pass of dog mountain), and the back figure of leader NAKANO (Nov. 26, '57).

"Let's quit", voiced our leader NAKANO, making his decision.

The next day, October 27, it is also windy through the morning. We put on Steigeisen and left the camp at 14:10. Following Route 2 we arrived at the gully on the southern side of Botnnuten. The mercury registered  $-20^{\circ}\text{C}$ . And at 16:05, the three of us topped together the mountain (1,500m approx. above sea-level).

While at the top of Botnnuten, we made various investigations. And, on the 27th day after departure, we returned to Syowa Base.

The journey's outline is shown on Table 5.

To add: The situation of Botnnuten is  $70^{\circ}23.0'S$ ,  $37^{\circ}55.1'E$ , according to KITAMURA's observations which was performed using a Wild-T<sub>2</sub> for sextant and a "Omega" deck-watch, can be employed at the same time for a stopwatch, and the tables (of which degree of precision is within one tenth minute) in "Manual of Celestial Navigation" by Arthur A. AGOTON. The figures slightly differ from those given in the Norwegian map (by H. E. HANSEN).

**III. 4. Journey along the western half of the Prince Olav Coast** Upon our return from Botnnuten, we set about making preparation for our next venture on the schedule—that of trying to go as far northeastward as possible along the Prince Olav Coast.

The party was made up of three members, NISHIBORI, KIKUCHI, and KITAMURA, and our Botnnuten dog-team, minus two (*Goro* and *Tetsu*), of 13 dogs.

This journey covered 16 days (Nov. 25~Dec. 10, 1957), and the temperature throughout was much higher than at the time of our preceding ones. The sea-ice commenced to loosen. Cracks appeared at every place. Puddles were already forming. The thermometer read a low of  $-8^{\circ}\text{C}$ , and, during the daytime, stood at near  $0^{\circ}\text{C}$ . The sunlight is so strong that the surfaces of snow and sea-ice melt by its radiant heat. And then, when night falls (though the sun almost never sets), they begin to freeze again.

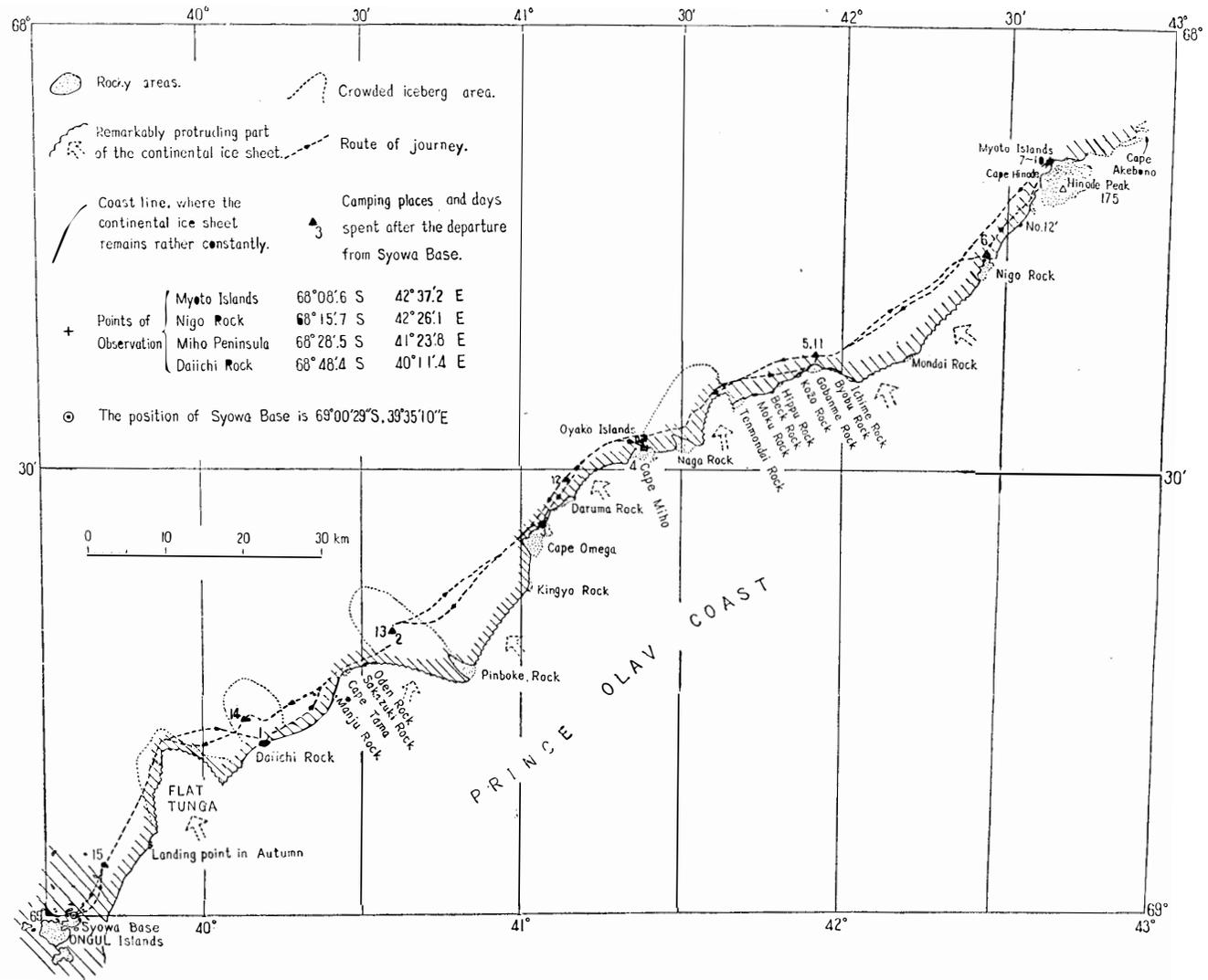
In these circumstances, the course we made was strewn with plenty of snow-ices formed like granulated sugar. This was very bad for our dogs, whose soles of paws were damaged.

Table 6. Data of journey to Prince Olav Coast.

Date	Time	Weather	Temp. (°C)	Direction of wind	Velocity of wind (m/s)	Action, circumstances, and others	Distance (km)		
							The day	Total	
1	Nov. 25 1957	09.20	clear	- 5	ENE	10	Started from Syowa Base	17.7	43.0
		11.45	"	0	NE	5	West corner of "Flattunga" (lunch)		
		12.15	"	- 1	ENE	3	On sea ice		
		15.10	"	- 1		1	Set up Camp 1		
2	Nov. 26	06.00	fine	- 7	ENE	10	At Camp 1	3.0	70.1
		08.45	"				Started from Camp 1		
		09.15	"	- 4	ENE	8	Sought for the fallen magnetic compass, found it		
		10.15	"	- 4	ENE	5	On sea ice (lunch)		
		11.45	"	- 4	ENE	5	On sea ice (lunch)		
		12.25	"	- 4	ENE	5	On sea ice (lunch)		
		12.55	middle cloud o.c.	- 2	ENE	3	Geologic survey at "Tama-misaki"		
		14.50	low cloud o.c.	- 2	ENE	1	Set up Camp 2		
16.40	fine			calm	At Camp 2				
3	Nov. 27	07.00	clear	- 6	calm		"	12.2	93.1
		09.30	"				Started from Camp 2		
		11.45	"	- 3	ENE	8	On sea ice, (lunch)		
		13.00	"	- 1	ENE	5	Geologic survey at "Omega-misaki"		
		14.30	"	- 1	ENE	5	Geologic survey at "Omega-misaki"		
		16.30	"				Set up Camp 3, geologic survey after supper		
4	Nov. 28	07.00	"	- 5	ENE	10	At Camp 3	18.4	111.5
		09.30	"				Repair the pillar of sledge at the front of Camp 3		
		12.20	"				Started from there after lunch		
		15.55	"	+ 1		calm	Set up Camp 4, geologic survey		
5	Nov. 29	08.00	"	- 3	ENE	3	At Camp 4	14.8	140.6
		08.40	"				Started from Camp 4		
		11.25	"	- 2	NNE	1	On sea ice (lunch)		
		12.30	"	- 2	NNE	1	On sea ice (lunch)		
		15.30	"	- 2	NNE	1	On sea ice (lunch)		
		17.00	"	- 2	NNE	1	On sea ice (lunch)		
17.23	"	- 3			3	Geologic survey at "Gobanme-iwa"	29.1	140.6	
22.40	"	- 7	SE	5	Set up Camp 5 At Camp 5				

6	Nov. 30	08.50	//	- 3	ENE	3	Started from Camp 5	9.3 29.6	170.2
		12.20	//	- 1	NE	1	On sea ice (lunch)		
		13.00 17.35	fine	- 3	calm		Set up Camp 6		
7	Dec. 1	09.00	high cloud o.c.	- 3	NE	8	At Camp 6	13.3 15.2	185.4
		11.15	fine				Started from Camp 6		
		13.55 14.15 14.35	// //	- 2	NE	10	At the south corner of "Hinode-misaki" Set up Camp 7, at "Miyoto-jima"		
8	Dec. 2	06.00	//	- 4	ENE	15	At Camp 7	0	185.4
		09.00	middle cloud o.c.	+ 1	ENE	20	//		
		14.00	low cloud o.c.	+ 1	ENE	15	//		
		21.15	//				At Camp 7=8 } Computation and mapping		
9	Dec. 3	08.45	//	- 1	ENE	10	At Camp 8	0	185.4
		17.30	//	0	NE	5	// } Geologic survey		
10	Dec. 4	10.00	//		NE	3	//	0	185.4
11	Dec. 5	04.00	fine		NE	8	At Camp 8=9=10	15.8 28.2 45.1	230.5
		05.30	//	- 4	NE	10	//		
		05.50	//				Started from Camp 10		
		07.40	//				At the trace of Camp 6		
		09.25	//	- 2	ENE	10	On sea ice (lunch)		
		09.55 13.00	// //	- 1	ENE	10	Set up Camp 11, at the trace of Camp 5		
12	Dec. 6	03.30	clear	- 7	calm		Started from Camp 11	21.0 36.5	267.0
		07.05	//				On sea ice (lunch)		
		08.25	//				Set up Camp 12		
		12.30	//						
13	Dec. 7	02.40	//	- 4	ENE	3	Started from Camp 12	16.6 29.4	296.4
		06.15	//				On sea ice (lunch)		
		07.55	//				Set up Camp 13 at the trace of Camp 2		
		10.50	//				At Camp 13		
		12.00	//	+ 4	calm				

Date	Time	Weather	Temp. (°C)	Direction of wind	Velocity of wind (m/s)	Action, circumstances, and others	Distance (km)		
							The day	Total	
14	Dec. 8	02.20	- 5		calm	Started from Camp 13 On sea ice (lunch) Set up Camp 14 At Camp 14	Sole of pows were wounded.	13.8	320.5
		05.45							
		07.35	}}						
		10.05	clear						
		11.00	}}						
15	Dec. 9	01.50	- 4	N E E	3	Started from Camp 14 On sea ice (lunch) Set up Camp 15 At Camp 15		11.8	348.9
		05.00							
		06.00	}}						
		10.00	}}						
		13.20	}}						
16	Dec. 10	08.20				Started from Camp 15 Came back to Syowa Base		435.3	
		09.50							



Map 2 Route map to Prince Olav Coast. Place names used in this map are not yet authorized. They were only tentatively used during our journey.

Last January, when we started for the first time from the Soya on our reconnaissance journey to the Ongul Island, we had the experience of hurting cruelly the soles of dog's paws. And this time, too, our dogs marched forward as best they could, stamping their bloody paw-prints on the snow. Unable to bear any longer to see the dog's suffer, leader NISHIBORI was bent upon shoeing our canine friends. For this purpose, our own socks were utilized, and our gloves were commandeered. The dogs, however, did not take to the idea, and each time we shod them, as they often tried to pull off their shoes. Not daunted at all, NISHIBORI, patience itself, repeated the act over and over again, until the dogs finally learned that it was better than without the shoes on. They no longer tried to take them off.

Our course ran on the sea-ice out of Ongul Island, in a northeastern direction, along the Prince Olav Coast.

We touched at the outcrops of rock, which are frequently met with on the margin of continent, and made various investigations as we proceeded on our journey. When we covered a distance of 185 km on December 1, 1957, we arrived at a large outcrop, whose area is about as large as that of the Ongul Island.<sup>4)</sup> This outcrop offers quite flat ground, a site suitable for a Base, should we in future ever con-



Fig. 11. The "Hinodemisaki" (Cape sunrise) at Prince Olav Coast, the outcrop of rock, as wide as Ongul Island, the north-easternmost point, to which we have been able to reach (Dec. 3, '57).

template establishing one, other than on the Ongul Island. We named it "Hinodemisaki" (Cape sunrise). To the two tiny islands that we found at the tip of the cape, the name of "Miyoto jima" (Couple islands) was given (see Fig. 11). An astronomical observation we made, on the top of the southern island of the two, indicated its position as  $68^{\circ}08.6'S$ ,  $42^{\circ}37.2'E$ . The method of observation used here is the same as has been already reported in the section about Botnnuten.

For the subsequent three days, we investigated the "Hinodemisaki". Our return journey was made over the same route to our Syowa Base.

The outline of this journey is shown in Table 6.

#### IV. Law of loading

##### —An Analysis of the journeys with dogs—

Expeditions at the polar regions depended solely on dog-teams before, but of late aircrafts and snow cars have come to be increasingly used on all sides, and for all purposes. Besides, more attention is being paid to the scientific end of such explo-

rations, with the result that expeditions nowadays are planned for on a much larger scale than they used to be. Consequently, not everyone of the party, particularly, (and this is not to be ignored), of the principal members can be expected to possess a good knowledge of or experienced in, dog transportation. On such an expedition, when a journey with dogs is programed as part movement of it, it is possible that the members concerned sometimes even lack a minimum necessary knowledge (of course, of dogs).

Of particular importance is the matter of weight of freight to be loaded upon the sledge at the time of departure. In this respect, scientific-minded leaders are often too eager about research and observation to obey the loading capacity of a sledge, while, on the other hand, dog-team drivers are hard in reducing it to avoid an overloading.

In view of this, it will certainly be a welcome news for dog-teams if some law or standard could be found with which the leaders are ruled content.

Further, in reading accounts and reports of other journeys undertaken by other parties, it is desired that more scientific analysis would have been given than was the case in the past, so as to enable one to compare with clarity the actions and movements taken by them on a journey with those of his own party. Such analysis would be helpful, no doubt very advantageous.

It is considered necessary to find out, through such analysis, a possible formula, in order to benefit future journeys with dogs. Also, a facility will be taken to compare the usefulness of dogs in the future with that of other mechanical means of conveyance.

Basing ourselves on a hypothetical law derived from the training of dogs and journeys we made during the one wintering year, we have tried to analyze here three, comparatively speaking, major journeys of ours.

First of all, the hypothetical law, as under, is given to make matters simple:

$$Wt = \frac{4rtfgaWdN}{V} \dots\dots\dots \text{“LL”}$$

Let us assume this formula as “Law of loading” (“LL” for short).

To give a brief explanation of the individual letters used in this “LL”:

“Wt”—means total weight (kg) of what the dogs have to draw: viz., the sledge with all its paraphernalia, such as harness, rope, etc., plus weight of the load to be put on, and further, including weight of the operating driver (with, of course, his clothes on). It is the sum total of all, in obtaining which detailed and precise calculations have to be worked nut, because the whole thing is a rather delicate affair.

“V”—is velocity (km/h). To get this, the distance (shown by “D”) (km) covered by a team in a day is divided by the hours (shown by “H”) (hour) that it required. Namely, “V”=“D/H”. “D” is read from the sledgometer. In “H” is included the time spent for rest and for lunch, etc., that sledging

reasonably demands, but from which is excluded such time as is taken for surveys, observations, camping, and so on—things that are apart from sledging (itself). In other words, “H” represents all the time (hours) taken by a sledge from the moment it starts from a camp in the morning until the time it sets up another camp in the evening, minus the time spent for special purposes irrelevant to and other than actually required by sledging.

“Wd”—means value of dogs’ weights. The average weight of dogs, while (at a specific point) on a journey, is ascertained by proportional allotment from the figures obtained immediately before departure and those available immediately upon their return.

“N”—represents the number of dogs constituting a team. Under the present “LL”, however, team ranging from several up to about 15 dogs are applicable. A team composed of more, or less, than the above figures will be subject to other specific functions. Moreover, “Wd × N” may indicate the aggregate total weight of the individual dogs.

So far, these data can be easily indicated by figures that are comparatively correct. However, “LL” is not perfect with these alone, for various functions, as shown hereunder by small letters, are necessary.

“r”—means functions of soles of sledge-runner, which are assumed as follows:

Fluoro-ethylene	1.3
Celluloid	1.2
Hickory	1.0
Iron	0.7

“t”—concerns the function of temperature, and is treated as follows:

Above—20°C	1.0
Below—20°C	0.8

“f”—stands for vitality of dogs. Conversely, the functions of the degree of fatigue of dogs prescribed under specific conditions, as shown below:

Action for morning hours only, or for only 2~4 hours	1.2
Action for 7~9 hours (for one day)	1.0
Inclined to be slightly fatigued	0.9
Out of a day’s task, only when that for the afternoon is considered	0.8

“g”—means function relative to ground condition. This plays a most important part among the five functions, being considered in the following way:

Very good	1.9
Good	1.6
Pretty good	1.3
Ordinary	1.0
Pretty bad	0.7





analysis of the journey to Botnnuten.

10	11	17	18	19	20	21	23	24	25	25	26	27
25	26	Nov. 1	2	3	4	5	7	8	9 before dépot	9 after dépot	10	11
94	—	36	25	14	26	15	15	8	0	15	8	0
90.0	90.0	85.0	85.0	85.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
4.0	—	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
6.0	6.0	6.0	6.0	6.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
1.2	1.2	1.2	1.2	1.2	—	—	—	—	—	—	—	—
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
110	106	105	105	105	108	108	108	108	108	108	108	108
13.5	—	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
3.1	—	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1.4	—	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
3.6	—	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
1.9	—	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
2.0	—	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1.6	1.6	1.6	1.6	1.6	—	—	—	—	—	—	—	—
15.0	—	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
9.0	—	4.0	3.0	2.0	10.0	9.0	8.0	7.0	6.0	6.0	5.0	4.0
3.4	—	3.4	3.4	3.4	—	—	—	—	—	—	—	—
1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
—	—	—	—	—	—	—	2.4	2.4	2.4	2.4	2.4	2.4
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
72	19	67	66	65	68	67	69	68	67	66	65	64
60	—	60	60	60	60	60	60	60	60	60	60	60
44	—	16	12	8	50	40	30	20	10	25	15	5
—	—	70	70	70	70	70	70	70	70	70	70	70
150	225	225	150	120	225	225	30	30	75	225	225	225
530	350	579	488	442	617	585	283	364	390	569	551	532
35	35	33	33	33	33	32	32	32	31	31	31	31
15	15	15	15	15	15	15	15	15	15	15	15	15
26.1	1.7	35.0	35.0	22.5	15.0	11.8	16.0	10.0	14.0	11.0	33.0	18.0
7.0	1.0	8.3	9.3	10.2	3.0	2.3	6.5	8.0	5.0	2.5	4.5	2.3
3.7	7.1	4.2	3.8	2.2	5.0	5.1	2.5	1.3	2.8	4.4	7.3	7.8
1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.0	1.2	1.0	1.0	1.0	1.2	1.2	1.0	1.0	1.1	0.9	1.2	1.2
0.8	0.9	1.0	0.8	0.4	1.1	1.1	0.4	0.2	0.5	1.2	1.3	1.4
1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.1	1.1

Table 9. Loading (kg) and "LL" analysis of the journey to Olav.

		1	2	3	4	5	6	7	11	12	13	14	15	16
		Nov. 25	26	27	28	29	30	Dec. 1	5	6	7	8	9	10
Dog pemmican		90.0	82.5	82.5	75.0	67.5	60.0	60.0	45.0	37.0	30.0	30.0	20.3	10.5
For dog team	shedge & accesories	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
	canvas bag	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	4 cudgeles	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0	4.5	3.0	3.0	3.0
	10 ice-pitons	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	hammer	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
	others	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	sum	111	111	111	111	111	111	111	111	111	111	109	109	109
Common equip- ments	nylon tent	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
	pegs of the tent	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	zeltsack	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	3 rubber mats	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	bellows of the mat	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	scoop	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
	Wild-T <sub>2</sub>	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
	tripod of T <sub>2</sub>	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	medical set	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	cooking tools	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
	kerosene	15.0	14.0	10.0	12.0	11.0	10.0	9.5	6.0	5.0	4.0	3.0	2.5	1.5
	sign sheet for air- craft	3.4	3.4	3.4	3.4	3.4	3.4	3.4	—	—	—	—	—	—
	binocular	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	gun	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	2 skis	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
	2 ice-axes	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
15 red sign flags	2.3	2.1	1.9	1.7	1.5	1.3	1.1	1.0	0.9	0.7	0.5	0.3	0.1	
transistor receiver	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
others	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
sum	99	97	96	95	94	93	92	85	84	83	81	81	80	
Personal equipments		50	50	50	50	50	50	50	50	50	50	50	50	50
Rations		54.0	50.4	46.8	43.2	39.6	36.0	32.4	18.0	14.0	10.8	6.2	3.6	—
Rock and other samples		—	4.6	7.1	11.8	21.2	24.5	40.2	40.2	40.2	40.2	40.2	40.2	40.2
Rider's weight		188	188	188	188	188	150	188	150	188	150	150	113	113
Total≡Wt		592	584	581	574	571	524	574	499	524	473	466	417	403
"LL" Analysis	Wd (kg)	36	36	36	36	35	35	35	34	34	33	33	33	33
	N	13	13	13	13	13	13	13	13	13	12	12	12	12
	D (km)	43.0	27.1	23.0	18.0	29.1	29.6	15.2	45.1	36.5	29.4	24.1	28.4	6.3
	H (hour)	7.5	5.0	5.2	3.7	7.0	7.0	3.0	7.0	8.0	7.5	6.8	7.7	1.5
	V (km/hour)	5.7	5.4	4.4	5.0	4.2	4.2	5.1	6.4	4.6	3.9	3.5	3.7	4.2
	r	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	t	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	f	1.0	0.9	0.8	0.9	0.8	0.7	0.8	0.9	0.8	0.7	0.6	0.5	0.6
	g	1.5	1.5	1.4	1.4	1.4	1.5	1.4	1.6	1.4	1.4	1.4	1.4	1.4
	a	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.1	1.0

Bad .....	0.4
Very bad.....	0.1

“a”—represents function covering other matters than those involved in the above-mentioned four functions, as, for instance: when ability of drivers is remarkably inferior, when a sledge is under sail and particularly when, as on some long special missions, etc., dogs have been given long rest, resulting in varied ratings of vitality being reported of the individual dogs. This function is also another not to be forgotten. This, however, is not any too influential; hence, a maximum 1.2 and a minimum 0.8, or thereabout, may be considered.

The quantitative determination of these functions must be put on a more definitely regular method of calculation in the future. This will have to be fulfilled by further research and study.

Incidentally, this “LL” has been formulated on the basis of the behavior or action of our *Karafuto-ken* (Saghalien dog), and a comparison with one using Huskies is one of the problems awaiting solution in the future. This formula, in which “kg” and “km” are used, naturally needs some measure of adjustment in case other units are used.

Finally, to show the necessary data, Tables 7, 8 and 9 are given here. This is a summary of all the data obtained on the loadings performed on our journeys to Padda, Botnuten, and Olav, as well as of the data pertaining to the “LL” connected therewith.

The upper part of the tables indicates individually what the dogs hauled on each journey, and shows their daily changes. What we consider as requiring special explanation is the column: “rider’s weight”. Taking 75 kg for an average weight of the members (including clothes), we put it as 75 kg when we considered that only one person rode the sledge for the whole day, and similarly, in case of two and three persons doing the same comfortable job, as 150 kg and 225 kg respectively. For intervening members, such as  $1\frac{1}{2}$  persons and  $2\frac{1}{2}$  persons, we add 38 kg, being half of 75 kg, to the unit and get 113 kg and 188 kg respectively. These figures appear a little loosely determined, compared with what we obtained by way of weighing other articles. But we were unable to find out minuter figures. And, as regards the method of determining them, a proper way will have to be evolved by further study in the future.

These figures, summed up, are entered under the column “total”.

With reference to the “LL” analysis, “Wd”, “N” and “V” can be figured upon making a journey. And estimate “r”, “t”, “f”, “g”, and “a”, day by day, computing by “LL” to obtain “Wt”. This “Wt” will come to about the same as the “total” calculated above, unless there is some serious mistake committed in determining the various functions concerned, (subject, maybe, to a maximum marginal error of about 10%). Any marked difference between these figures is due either to some big mistake having been made in the method of determining the

“ rider's weight ”, or else to an erroneous deduction (estimation) of any one of “ r ”, “ t ”, “ f ”, “ g ”, and “ a ”.

More detailed explanations: “ Wd ”—, as per Tables 7, 8 and 9, shows 35 kg, 36 kg, and 36 kg at the time of departure, but reduced to 33 kg, 31 kg, and 33 kg respectively on return, which clearly indicates, speaking of the three journeys, what a hard task it was for these dogs to make Botnnuten one.

“ N ”—Both Tables 7 and 8 give 15 dogs, whereas, in Table 9 for Olav only 13 dogs started on the job. This is because, at that time, *Goro* and *Tetsu* were not up to the mark and left at Syowa Base. And so, 13 dogs were the most that we could avail ourselves of. At this juncture, had we been provided with more dogs at the camp, we would certainly have taken 15. Moreover, on the 13th day of the journey, *Anko* was incapacitated on account of his paws receiving injuries in the soles. He was put along, for the rest of the trip, chained to the rear of the sledge. Hence, “ N ” read 12.

“ D ” and “ H ”—These are the same as explained in detail in Tables 4, 5 and 6, namely, “ V ”=“ D/H ”.

“ r ”—In Table 7 for Padda, 1.3 should have been mentioned, because the sledge we used had Fluoro-ethylene-covered-runners. But the same had already become appreciably worn out during the preceding training, and therefore we used 1.2. In Tables 8 and 9, we gave 1.2, for celluloid was used on both occasion.

“ t ”—For most of Padda and part of Botnnuten, it was below  $-20^{\circ}\text{C}$  (see Tables 4 and 5). On these days, therefore, 0.8 was used ; for other days, 1.0.

“ f ”—Ordinarily, it is 1.0. However, on such occasions as, towards the end of our Padda journey the dogs were intensely tired, or during the Olav journey they had their paws severely injured in the soles, this item had to be evaluated accordingly. Especially, on the Olav journey, as per Table 9, it was 1.0 at the start but, as the days went by, it gradually reduced to 0.9 and 0.8, and on the 4th day—a half-day movement—rose again to 0.9. Subsequently, it fell off again to 0.8 and 0.7, but on the 7th day, another half-day going, we made it as 0.8. For the following three days, we made no movement, and, on the 11th day, registering 0.9, we set out on our homeward journey. On this return course, too, it went down gradually to 0.8, 0.7 and 0.6, until it dwindled 0.5. For the last day, which had a half-day operation only, we noted 0.6.

“ g ”—On whole, our Padda journey serves as the standard by which “ g ” is determined. We passed over the “ Dome icebergs ” on the 3rd day of the journey. There, the snow was never deep, so we put it down at 0.7 at the worst. In the case of the Botnnuten journey, however, we met with immense snows, despite the fact that our movement covered the same place of “ Dome icebergs ”, and we gave it a rating of 0.3. Our return trip showed 0.2, because we had stepped into topographically bad spots and gone through no small measure of hardships. Our Olav journey indicates a fairly good “ g ”.

The above covers an explanatory outline of "LL" and an analysis of our three journeys. This hypothetical formula is never perfect yet, as by this we meant to give an example only of what we have in view. However, we believe that, even at its present stage, "LL" will prove of some good practical value, as, for instance, when planning for a journey one can hypothesize various factors, get "Wt", and easily determine a proper loading at departure. Further, in analyzing old reports issued in the past, it is possible to make a numerical comparison of such journeys by deducing their respective functions. It is also possible that these figures will help those who are inexperienced in dog-sledging to reach, to some extent, a scientific understanding of it.

Any opinion on this subject are warmly solicited, and any proposal of discussions will be cordially entertained.

#### V. Some other notes

Our wintering came, indeed, to a flurried close in February, 1958. The m. s. Soya, with a new wintering party on board to replace us, was again delegated from Japan. Different from her previous experience (at the beginning of 1957) she encountered, on this voyage, vast quantities of pack-ice which prevented her from reaching us, and she could hardly come to a little over 100 km from Syowa Base. For that reason we, the 11-man wintering party, were forthwith ordered to return to the Soya on the sledge-fitted Beaver. We continued to put in the best effort we could to send off the next wintering party to its destination. However hard we fought against the odds of a spell of inclement weather and too much ice that stood in the way, we never succeeded.

So it was the sad destiny of the greatest number of these canine friends of ours of the past year to remain on the Ongul Island (Syowa Base) to the end, waiting for the next party to come and join them.

This fact very clearly perturbed the Japanese nation, so heart-rending, particularly, to the lovers of dogs throughout the country. Again we repeat, we gave every last ounce of our effort in trying to send off the next wintering party on its mission. And we must also do our dogs' justice by putting on the truth here that they remained to the last one, chained as they were on Ongul Island to wait in vain for the arrival of the new party with which to spend another wintering year on the Antarctica.

This is a sad dog news, regrettable, indeed, by any stretch of the imagination. The 15 dogs thus were unable to come home with us to Japan, with the exception of one female dog *Shiro* with her 8 pups, which returned.

Herewith we bid a heartfelt good-bye to, and pray for, the repose of the souls of the three dogs which died while wintering and of the 15 which remained to death on Ongul Island. We dedicate this humble report to the memory of our lost dog-friends (Nov. 30, 1958).

**Authors' Note:** After the manuscript has been written, the two dogs named *Taro* and *Jiro* among the fifteen ones which have been left there were found out by the members of the next expedition (JARE 1958-'59) at Jan. 14, 1959. It was a joyful news not only to Japanese but also to the peoples of all round the world who love dogs. These two are now working at Syowa Base with the wintering party, but no one can tell how they have been able to live out the last hard winter without a man. Besides this, it was very sad to hear that the wintering party (1958-'60) had found there the remains of seven dogs but could not yet find any others.

#### Literatures

- 1) Tetsuo Inukai and Ryoichi Haga: Training of Dog Teams and Preparation of Dog Sledges for the Japanese Antarctic Research Expedition, 1956-57, Part I, Antarctic Record No. 4, 1958.
- 2) Appendix to NANKYOKUKI, the Report of the Japanese Antarctic Expedition, 1910-12. Antarctic Record No. 1~5.
- 3) Nozomi Murakoshi: Meteorological Observations at Syowa Base during the Period from March, 1957, to February, 1958. Antarctic Record No. 4, 1958.
- 4) Torao Yoshikawa and Hiroshi Toya: Report on Geomorphological Results of the Japanese Antarctic Research Expedition, 1956-57. Antarctic Record No. 1, 1957.