Study of the Perception Dynamics of Members of Wintering Parties at Syowa Station

—Analysis, from the Standpoint of Perception Structure, of the Requests for Improvement of Facilities—

Takeo KONDO*, Akio KUROYANAGI*, Yasuhiro UOZAKI* and Wataru KATO*

昭和基地における越冬隊員の意識動態研究

—意識構造からみた施設改善要求の分析—

近藤健雄*・畔柳昭雄*・宇崎泰寛*・加藤　渉*

要旨: 南極におけるさまざまな科学研究や昭和基地建設の工学的研究は数多くあるが，隊員の越冬生活に関した研究は，ほとんど行われていないのが現状である．そこで，本研究では昭和基地に越冬した第1次より第22次までの越冬隊員を被験者として，隊員の生活実感を中心とした，越冬生活にかかわる環境要因と施設との関係を明らかにし，居住性の評価を行うこととした．また，基地施設の居住性向上のために，最も重要な生活環境要因を明らかにし，その整備，改善の方向を導き出し，同時に新昭和基地計画のための提言を行っている．

Abstract: No report has so far been practically presented about studies referring to the dwelling ability of the station focusing principally on the wintering life of the station staff engaged in scientific researches of various kinds carried out in Antarctica and in engineering researches for the construction of Syowa Station.

Under such circumstances, the present study has been made to elucidate the relationship between the environmental factors related to the wintering life and the facilities of the station, focusing principally on the living perception of the station staff, where the dwelling ability of the station is evaluated by using the members of the lst to 22nd wintering perties as testees.

However, the principal theme of this study is to elucidate the most important living environmental factors required to improve the dwelling ability of the facilities of the station, to determine the course of improvement and upgrading and to present propositions for planning of a new Syowa Station.

1. Introduction

Japanese Antarctic station "Syowa" was established in January 1957 by the 1st Japanese Antarctic Research Expedition (JARE-1). The station has been maintained, with several years intermission, by the wintering party members. This paper reports the results of a survey about the living conditions at the station, aimed at supplying

* 日本大学理工学部海洋建築工学科. Department of Marine Architecture and Engineeing, College of Science and Technology, Nihon University, 8-14, Kanda Surugadai 1-chome, Chiyoda-ku, Tokyo 101.

basic data required to design the facilities to be provided in connection with the redevelopment and removal of existing facilities as well as construction of a new station. Thus, the main objective of this study is to examine the principal environmental factors related to the realization of the amenity (comfortable dwelling ability) required to mitigate the rigorousness of the wintering life, by identifying, through the actual living perception based on the experience of the wintering staff, the potential needs of improvement and modification of the station. Furthermore, it might be expected that the elucidation of the concrete details of the required improvements and modifications which is made by picking up the facilities and equipments composing each one of the said factors will make it possible to define clearly the way of the living environment that ought to be in connection with the Antarctic exploration activities.

Environment is the generic name of all factors that have the possibility of exerting influence on the life of people, and comprises the totality of the natural and artificial phenomena that surround the human being. Thus, it is necessary to examine how the human being recognizes and evaluates the environment, in order to explain scientifically the relationship between the environment comprising the totality of the life of the human being and the psychology of the human being living in the environment in question. In this connection, it is necessary to establish uniform criteria in order to make it possible to compare, in conformity with the same yardstick, distinct environmental factors exerting influences on the human being. Thus, it is necessary to elucidate how the said factors are interweaved within the conscience of the human being, in order to explain his psychological structure and define the relevant design conditions. In conformity with the said conception, this study attempts to identify in the first place how people with actual wintering experiences at Syowa Station evaluate its living environment, in order to find out an objective image of the environment in question. In this connection, it is necessary to determine the coordinates for evaluation. In this study the evaluation of the amenity of the station is defined in terms of the degree of satisfaction, which is used as a yardstick for the sake of evaluation. In other words, the evaluation expressed in terms of degree of satisfaction is interpreted as requests expressed by the wintering staff for improvement of living environment factors. In connection with the identification of the requests and necessity of improvement and modification from the standpoint of the degree of satisfaction, it must be born in mind that there are two distinct kinds of improvements and modifications, *i.e.*, the ones which the parties concerned are conscious of and the potential ones. Therefore, the living environment should be identified in a systematic way, and furthermore that latent evaluation concealed behind the requests should be analyzed through a careful psychological investigation.

2. Method of Study

2. 1. Framework of the living environment evaluation items

In connection with the analysis of the life of the wintering staff at Syowa Station, this study assumes that the living environment consists of three distinct systems, *i.e.*, 1) facilities system (basic living activities), 2) natural system (calamities), and 3) social

system (human system). It is assumed that these three systems have mutual and inclusion relationship with each other, resulting in a living environment as a whole. It is thought that the amenity of the station is provided through a balance of the environmental factors of each one of the said systems. This paper reports the results of a study carried out in connection with the aforementioned aspects of the living environment of Syowa Station.

In this study the analysis is carried out from the four standpoints mentioned below, by taking into consideration the attributes of the members of the wintering party, because the attributes of each wintering member are presumed to exert influence on the evaluation of the living environment expressed in terms of degree of satisfaction.

(1)	Identification of the attributes of the members of the wintering party	Age at the epoch of wintering Married/unmarried Contraction of disease Wintering year
(2)	Identification of the living environment evaluation tendency	7 indexes, 34 items
(3)	Identification of the evaluation tendency by attribute	Tendency of age Tendency by wintering year
(4)	Identification of the principal factors composing the living environment	

The way that ought to be taken for the environmental improvement of Syowa Station is elucidated from a global standpoint, by identifying the problems regarding the current wintering life and the requests about future improvements and modifications through the steps of procedure described in the foregoing.

2.2. Method of survey

Objects of study consist of 259 valid replies out of 263 replies received, including 30 replies received after 24 December 1982 (233 replies were received by 24 December). The percentage of valid replies was $259/374=69.3\%$ (Of the total of 394 inquiries we mailed, 20 were sent back due to the change of address and other reasons). The questionnaires were mailed directly to each of the testees, who sent them back to us after answering the questions contained therein. The contents of the questionnaire consist of evaluation of 34 items referring to the attributes of the testees and evaluation of the living environment expressed in terms of degree of satisfaction (7-stage evaluation criteria), five items referring to the global evaluation of the bases as a whole expressed in terms of degree of satisfaction (7-stage evaluation criteria) in addition to questions referring to other aspects such as leisure time, desirable forms of leisure, facilities of the station and other relevant details.

2.3. Method of analysis

(1) Identification of the age, wintering year, civil status (married/unmarried) and experience of disease through simple tabulation.

(2) Identification of the mutual relationship between the attributes of the testees through cross tabulation.

(3) Identification of the requests referring to the improvement of the living environment, through the elucidation of the tendency of the degree of satisfaction regarding the living environment evaluation items, by calculating the average value, standard deviation, and skewness through basic statistical magnitudes.

(4) Identification of the relationship between the global evaluation of the station and each one of the living environment evaluation items through the correlation coefficient.

(5) Identification, through the analysis of the relevant factors, of the structure of consciousness of the evaluation in terms of degree of satisfaction, identification of the latent factors related to the environmental improvement, and identification of the structure of the living environment factors.

3. Trends Observed in the Wintering Party Members

3.1. Relationship between attributes and tendencies

Results of cross tabulation of the married and the unmarried testees and their experience of disease (Table 1) show that there is no relationship between the marriage attribute of the testees and their experience of disease (χ^2 value 0.34, degree of freedom 1).

Next, also the results of cross tabulation of either married or unmarried testees and the period required to get accustomed to the wintering life (Table 2) show no relationship between the two items (χ^2 value 8.27, degree of freedom 8). Data indicate that 25% of the wintering party members got accustomed immediately after their arrival at Syowa Station, irrespective of married and unmarried testees. Most of the testees got accustomed to the wintering life within the first six months, and in particular more than 65% got accustomed within the first two months.

Results of cross tabulation between the experience of disease and the time to get accustomed to the wintering life (Table 3) show a slight relationship between the

Table 1. Maritus status and disease.

	Yes	No
Married	44	125
%	17.2	48.8
Unmarried	19	68
%	7.4	26.6

Table 2. Maritus status and period before steady wintering.

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
Married	43	57	37	22	3	1	5	0	0	0	1	0	1	170
%	25.3	33.5	21.8	12.9	1.8	0.6	2.9	0.0	0.0	0.0	0.6	0.0	6.0	100
Unmarried	18	40	21	5	2	0	1	0	0	0	0	0	0	87
%	20.7	46.0	24.1	5.7	2.3	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	100

Table 3. Experience of diseases and the before steady wintering.

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
Yes	11	18	19	10	0	1	4	0	0	0	0	0	0	63
%	17.5	28.6	30.2	15.9	0.0	1.6	6.3	0.0	0.0	0.0	0.0	0.0	0.0	100
No	49	79	39	17	5	0	2	0	0	0	1	0	1	193
%	25.4	40.9	20.2	8.8	2.6	0.0	1.0	0.0	0.0	0.0	0.5	0.0	0.5	100

experience of disease and the time to get accustomed with the life at the station (χ^2 value 18.58, degree of freedom 8). Approximately 65% of the members without experience of disease got accustomed with the wintering life within one month from their arrival, whereas approximately 45% of the testees with experience of disease got accustomed with the wintering life within one month after their arrival, indicating that people without experience of disease tend to get accustomed to the wintering life sooner.

3.2. Tendency of the degree of satisfaction of the living

3.2.1. Environment evaluation items

The average value and standard error (standard deviation divided by the square root of the number of samples) of the 7-stage evaluation ranging from extremely satisfactory to extremely unsatisfactory are calculated from data referring to the totality of the testees, for the 34 items for evaluation of the living environment.

According to the profiles of the average value and standard error thus obtained (Fig. 1), the evaluation items with tendency to the dissatisfaction side are water supply and drainage of facilities, ease of washing and drying, ease of garbage disposal, countermeasures to cope with water leakage, etc. On the other hand, the evaluation items with tendency to the satisfaction side are temperature inside facilities, comfort of refectory, structure of building, comfort of rest rooms and dormitories, lighting in facilities, layout of private rooms, leisure time, etc. Generally speaking, there is no tendency of pronounced biasing to the satisfaction side or dissatisfaction side. It must be born in mind however, that the items tending to the dissatisfaction side are related to facilities regarded as essential for the basic life of wintering party members, and these are the problems that must be solved anyhow in connection with the environmental improvement of Syowa Station.

3.2.2. Distribution of the evaluation values expressing degree of satisfaction (kurtosis and skewness)

Next, the state of the distribution of the 7-stage evaluation criteria of each evaluation item (Table 4) is examined from the standpoints of kurtosis and skewness. As for the kurtosis, from the statistical standpoint there is no evaluation item more cuspid that the normal distribution at the 5% level (kurtosis of 3.87 or more) and all items have either distribution approximating the normal one or have more flat distribution (kurtosis less than 2.55). As for the skewness, there are many evaluation items that have distribution trending toward the right with regard to the average value at the 5% level (skewness less than 0.251) and that trending toward the level (skewness 0.251 or more). The tendency of dissatisfaction is stronger particularly in

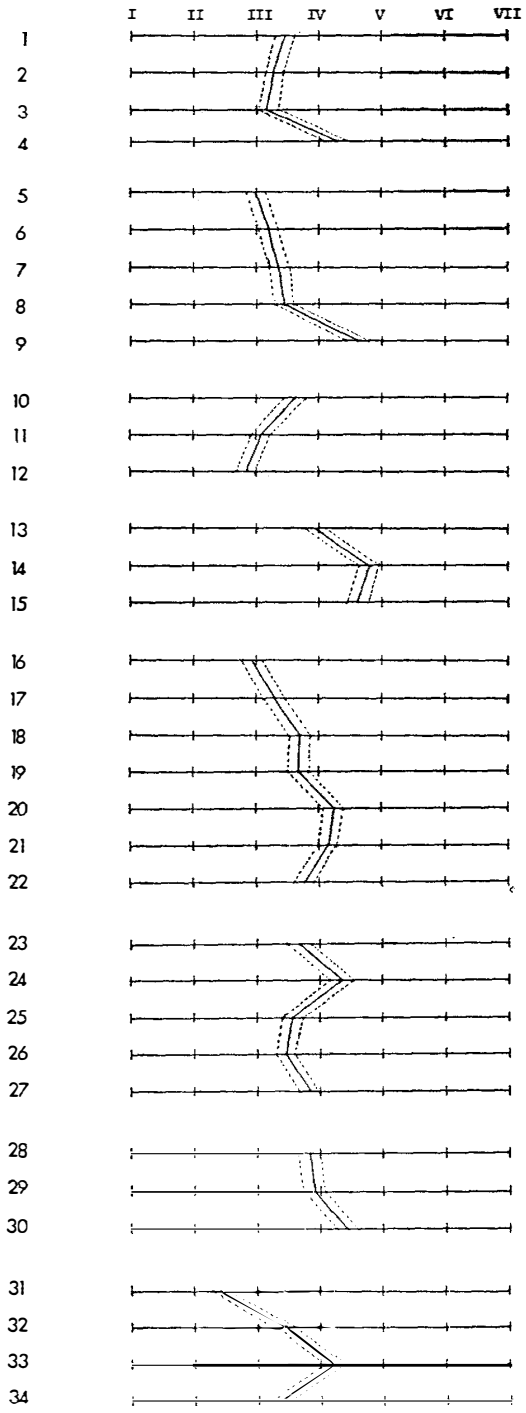


Fig. 1. Relation between the degree of satisfaction and environmental factors.

Items of Figs. 1 to 3t.

Scale of facilities
1. Size of each facility (room) such as refectory, etc.
2. Layout of each private room
3. Layout of each facility such as refectory, etc.
4. Size of private rooms

Structure and equipment
5. Structure of buildings
6. Interior finishing of private rooms
7. Interior finishing of facilities
8. Electrical installation of facilities
9. Water supply and drainage system of facilities

Living environment
10. State of the humidity in facilities
11. State of the lighting in facilities
12. State of the temperature in facilities

Basic life
13. Ease of cleaning of facilities
14. Ease of washing and drying
15. Ease of disposal of garbage

Private life
16. Comfort of rest rooms and dormitories
17. Comfort of reading and research
18. Space of storage of clothes
19. Ease of storage and clothes-changing
20. Comfort of toilets
21. Comfort of bathrooms and washing room
22. Hobby

Living comfort
23. Sound insulation from outside
24. Sound insulation from adjacent rooms
25. Cleanliness of air in facilities
26. Quality of design of facilities
27. Distance from living area to refectory, bathroom, toilets, etc.

Measure to cope with disasters
28. Fire prevention measures of facilities
29. Measures to cope with blizzard
30. Measures to cope with water leakage

Life as a whole
31. Comfort of refectory
32. Accessibility of facilities
33. Completeness of leisure facilities
34. Spending of leisure time

I. Extremely satisfactory
II. Very satisfactory
III. More or less satisfactory
IV. Vague
V. More or less unsatisfactory
VI. Very unsatisfactory
VII. Extremely unsatisfactory

Table 4. Results of calculation of the average value of the global tendency of degree of satisfaction.

	Items of questions	Average	Kurtosis	Skewness
Scale of facilities	Size of each facility (room) such as refectory, etc.	3.30	2.90	0.40
	Layout of each private room	3.14	2.57	0.32
	Layout of each facility such as refectory, etc.	3.28	2.42	0.21
	Size of private rooms	4.10	1.98	−0.23
Structure and equipment	Structure of buildings	3.08	2.47	0.36
	Interior finishing of private rooms	3.27	2.42	0.34
	Interior finishing of facilities	3.37	2.45	0.16
	Electrical installation of facilities	3.49	2.38	0.27
	Water supply and drainage system of facilities	4.70	2.44	−0.56
Living environment	State of the humidity in facilities	3.78	2.21	0.05
	State of the lighting in facilities	3.08	2.56	0.45
	State of the temperature in facilities	3.81	3.00	0.68
Basic life	Ease of cleaning of facilities	3.86	2.45	−0.05
	Ease of washing and drying	4.61	2.67	−0.56
	Ease of disposal of garbage	4.66	2.57	−0.31
Private life	Comfort of rest rooms and dormitories	3.03	2.56	0.55
	Comfort of reading and research	3.39	2.30	0.32
	Space of storage of clothes	2.66	1.91	0.05
	Ease of storage and clothes-changing	3.72	2.14	−0.10
	Comfort of toilets	4.42	2.23	−0.35
	Comfort of bathrooms and washing room	4.30	2.35	−0.40
	Hobby	3.74	2.77	0.13
Living comfort	Sound insulation from outside	3.37	2.30	0.38
	Sound insulation from adjacent rooms	4.20	1.95	−0.21
	Cleanliness of air in facilities	3.58	2.35	0.14
	Quality of design of facilities	3.60	2.75	0.08
	Distance from living area to refectory, bathroom, toilets, etc.	4.02	2.28	−0.00
Measure to cope with disasters	Fire prevention measures of facilities	4.20	2.34	−0.15
	Measures to cope with blizzard	4.07	2.30	−0.08
	Measures to cope with water leakage	4.55	2.66	−0.32
Life as a whole	Comfort of refectory	2.51	2.80	0.53
	Accessibility of facilities	3.50	1.18	0.10
	Completeness of leisure facilities	4.05	2.31	−0.12
	Spending of leisure time	3.27	2.75	0.23

the case of itesm that have average value in dissatisfaction side and skewness trending towards the right of the average value. On the other hand, items with distribution trending to the left have stronger tendency of satisfaction. Thus examining the tendency of the living environment evaluation items by taking into consideration the skewness as well as the aforementioned tendency expressed by the average value, all items located in the unsatisfactory side, *i.e.*, water supply and drainage of facilities, ease of washing and drying, ease of garbage disposal, countermeasures to cope with water leakage, and comfort of toilets, have a distribution trending toward the right of the average value at the 5% level, showing therefore a clear tendency to the dissatisfaction side. On the other hand, most of the items with average value located at the satisfaction side have distribution trending toward the left, showing therefore a clear tendency to the satisfaction side. The inclination of the 7-stage evaluation criteria of the items indicating the tendency of satisfaction/dissatisfaction towards the satisfaction side or the dissatisfaction side beyond their average values and the flatness of their distribution (absence of kurtosis) indicates the existence of singular evaluations regarding the items in question, *i.e.*, the existence of testees whose evaluation is just the opposite of the evaluation of the majority of the testees. In other words, it is presumed that the members of the wintering party have the same perception of duty and the same objectives, but in reality there are differences among the individual requests regarding the evaluation of the living environment during the wintering life. Such being the case, the evaluation tendency is examined by age group (section 3.3.) and by wintering year (section 3.4.).

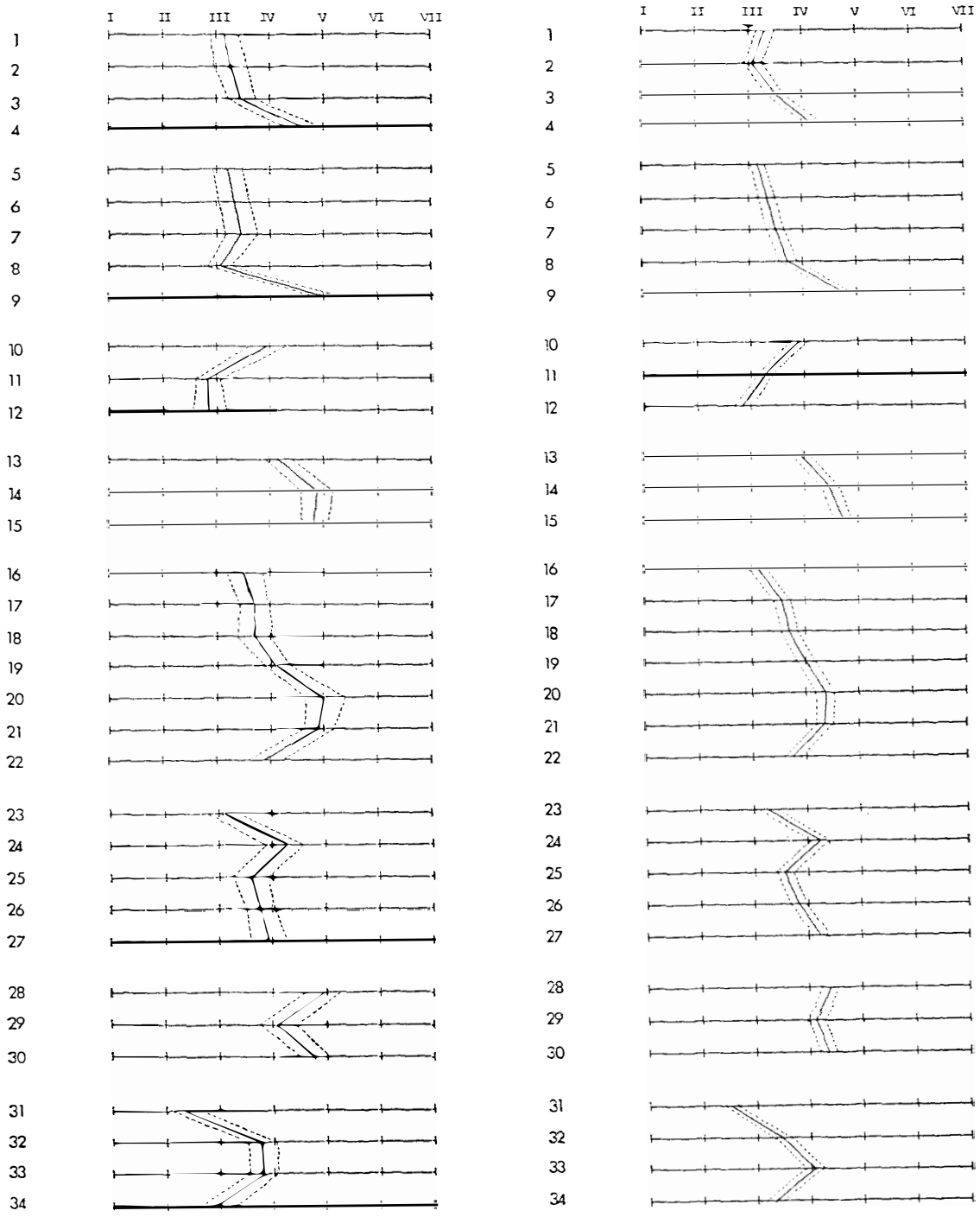
3.3. Tendency of the degree of satisfaction by age group

The testees are divided into six age groups, *i.e.*, 20 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 years, 40 to 44 years and 45 years or older, and the average value and standard error of the living environment evaluation items are calculated for each group (Fig. 2). As for the group of 45 years or older, the number of testees is small and the error is extremely large. Therefore, it is very risky to use them to examine tendencies in the study carried out this time. As for the tendency of the degree of satisfaction in the other five categories, the same tendency as the profile of the tendency of degree of satisfaction given by the total profile pattern, Fig. 1, is observed throughout all groups, *i.e.*, both the items showing tendency of satisfaction and the ones showing tendency of dissatisfaction present the same tendency as the total profile pattern. In other words, there is no conspicuous difference in the evaluation of the living environment obtained from testees of different age groups.

3.4. Tendency of the degree of satisfaction by wintering year

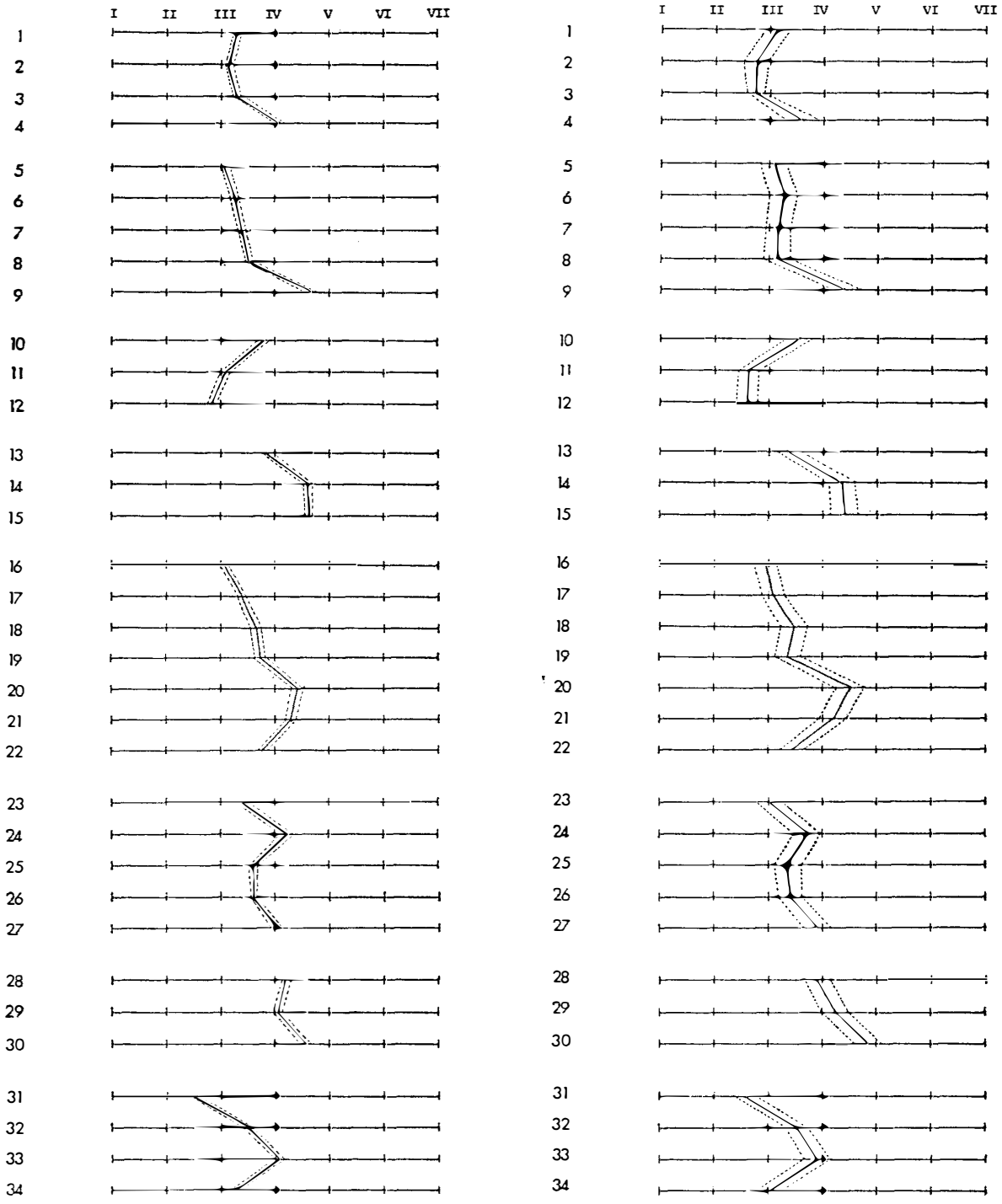
The tendency of satisfaction/dissatisfaction of the living environment is examined by taking into consideration the errors around the average value. In the 1st wintering party (Fig. 3a) the items showing inclination toward the dissatisfaction are the water supply and drainage equipment of facilities, comfort of toilets, fire prevention measures of facilities and measures to cope with water leakage. Tendency toward satisfaction side is observed in most of the other items.

In the 3rd wintering party (Fig. 3b) the items trending towards the dissatisfaction side are water supply and drainage equipment of facilities, ease of washing and drying



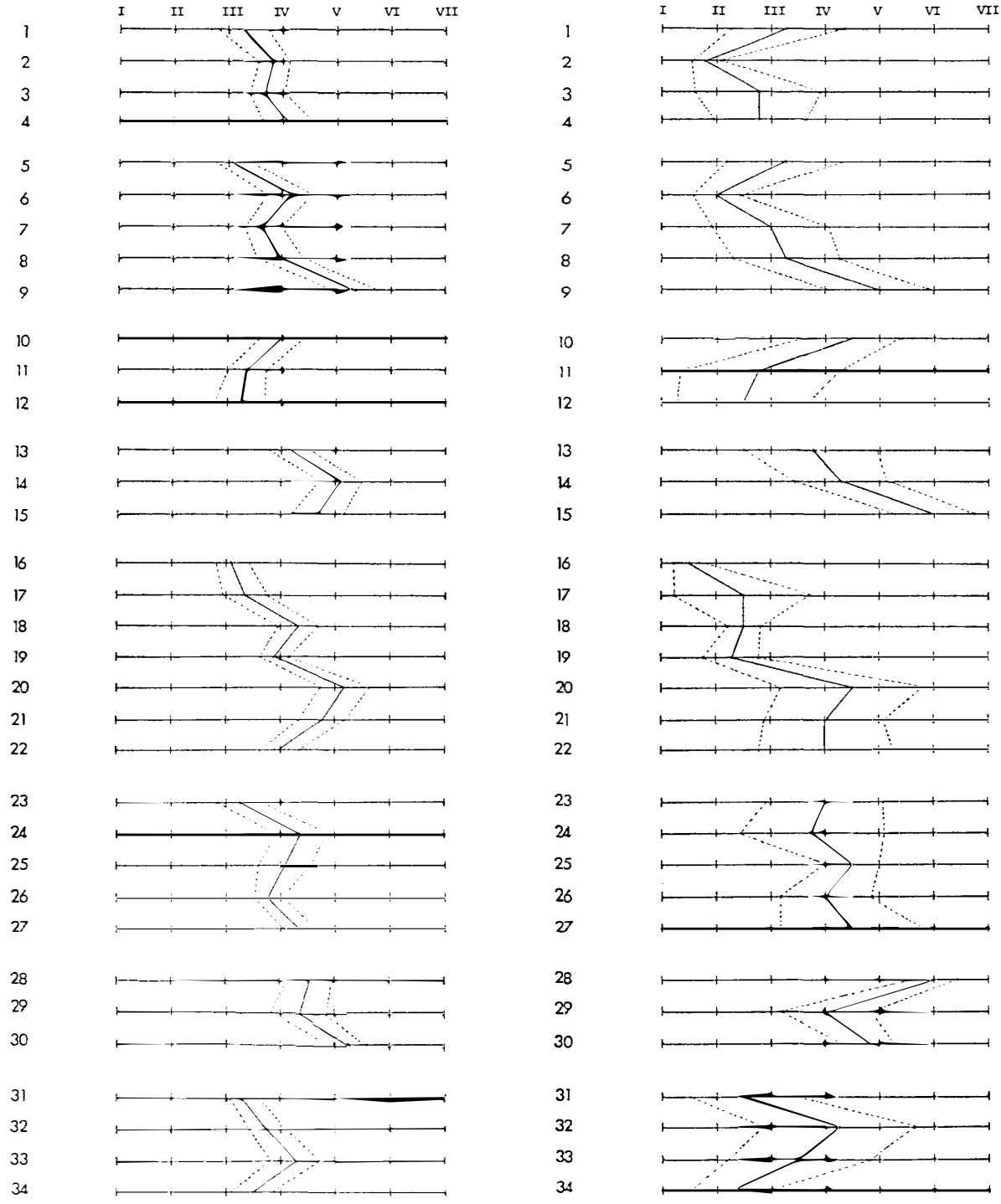
a. 20–24. b. 25–29.

Fig. 2. Degree of satisfaction against age classification.



c. 30–34. d. 35–39.

Fig. 2. Degree of satisfaction against age classification.



e. 40–44. f. More than 45.

Fig. 2. Degree of satisfaction against age classification.

and measures to cope with water leakage. On the other hand, this wintering party is characterized by a strong inclination towards the satisfaction side in connection with the distance of traffic line.

In the 4th wintering party (Fig. 3c) the items trending towards the dissatisfaction side are the same as those ones of the 1st and 3rd wintering parties, *i.e.*, water supply and drainage equipment of facilities, comfort of toilets and measures to cope with blizzard. There is no item with particular inclination towards the satisfaction side, and generally speaking this is a wintering year characterized by many items trending towards the dissatisfaction side.

In the 5th wintering party (Fig. 3d) the item trending towards the dissatisfaction side is the comfort of toilets. On the other hand, the item trending towards the satisfaction side is the spending of leisure time. In this wintering year there is no conspicuous tendency except the two items mentioned above, and there are many items with vague evaluation.

In the 7th wintering party (Fig. 3e) the items trending towards the dissatisfaction side are sound insulation from adjacent rooms, space for storage of clothes and ease of storage and cloth-changing, which suggests dissatisfaction regarding items related to the privacy and convenience of individuals. Items trending towards the satisfaction side are state of the temperature in facilities and sound insulation from outside. Generally speaking, there is pronounced inclination towards the dissatisfaction side also in this wintering year.

In the 8th wintering party (Fig. 3f) there is no item in particular trending conspicuously towards the dissatisfaction side. Both the number of members and the volume of commodities transported to the station were increased substantially from the 7th to 8th wintering years and it is presumed that the problems mentioned by the 7th wintering party could be solved to some extent. The items trending towards the satisfaction side are the size of refectory and other facilities, structure of buildings, state of the temperature in facilities and comfort of refectory.

In the 9th wintering party (Fig. 3g) the items trending somewhat to the dissatisfaction side are comfort of toilets, ease of disposal of garbage, etc., all related with sanitary equipment. On the other hand, there are many items trending toward the satisfaction side (*e.g.*, size of refectory, layout of various facilities, structure of buildings, state of lighting in facilities, state of the temperature in facilities, comfort of refectory, etc.)

In the 10th wintering party (Fig. 3h) there is no items in particular trending conspicuously towards the dissatisfaction side, and there are many items regarded as satisfactory, in the same way as in the 8th and 9th wintering years. The same tendency as in the 8th, 9th and 10th wintering years is observed also in the 11th wintering party (Fig. 3i).

In the 12th wintering party (Fig. 3j) the only item trending towards the dissatisfaction side is ease of disposal of garbage. On the other hand, the items trending towards the satisfaction side are comfort of refectory and state of the temperature in facilities in the same way as in the 8th to 11th wintering years, in addition to the comfort of rest rooms and dormitories.

Also in the 13th wintering party (Fig. 3k) there is no item in particular trending

conspicuously towards the dissatisfaction side and the same items as in the 8th to 12th wintering years trend towards the satisfaction side. The same tendencies as above are observed also in the 14th wintering party (Fig. 3l), with exception of the water supply and drainage equipment of facilities trending towards the dissatisfaction side. In the 15th wintering party (Fig. 3m) the tendencies are similar to those of the 8th to 14th wintering years, with exception of the countermeasures to cope with blizzard trending towards the dissatisfaction side.

In the 16th wintering party (Fig. 3n) there is no item in particular trending conspicuously towards the dissatisfaction side. Generally speaking the evaluation is rather vague, with exception of the comfort of refectory trending towards the satisfaction side.

In the 17th wintering party (Fig. 3o) the items trending slightly towards the dissatisfaction side are the water supply and drainage equipment of facilities, and ease of garbage disposal. On the other hand, comfort of rest rooms and dormitories, and comfort of refectory are items trending towards the satisfaction side.

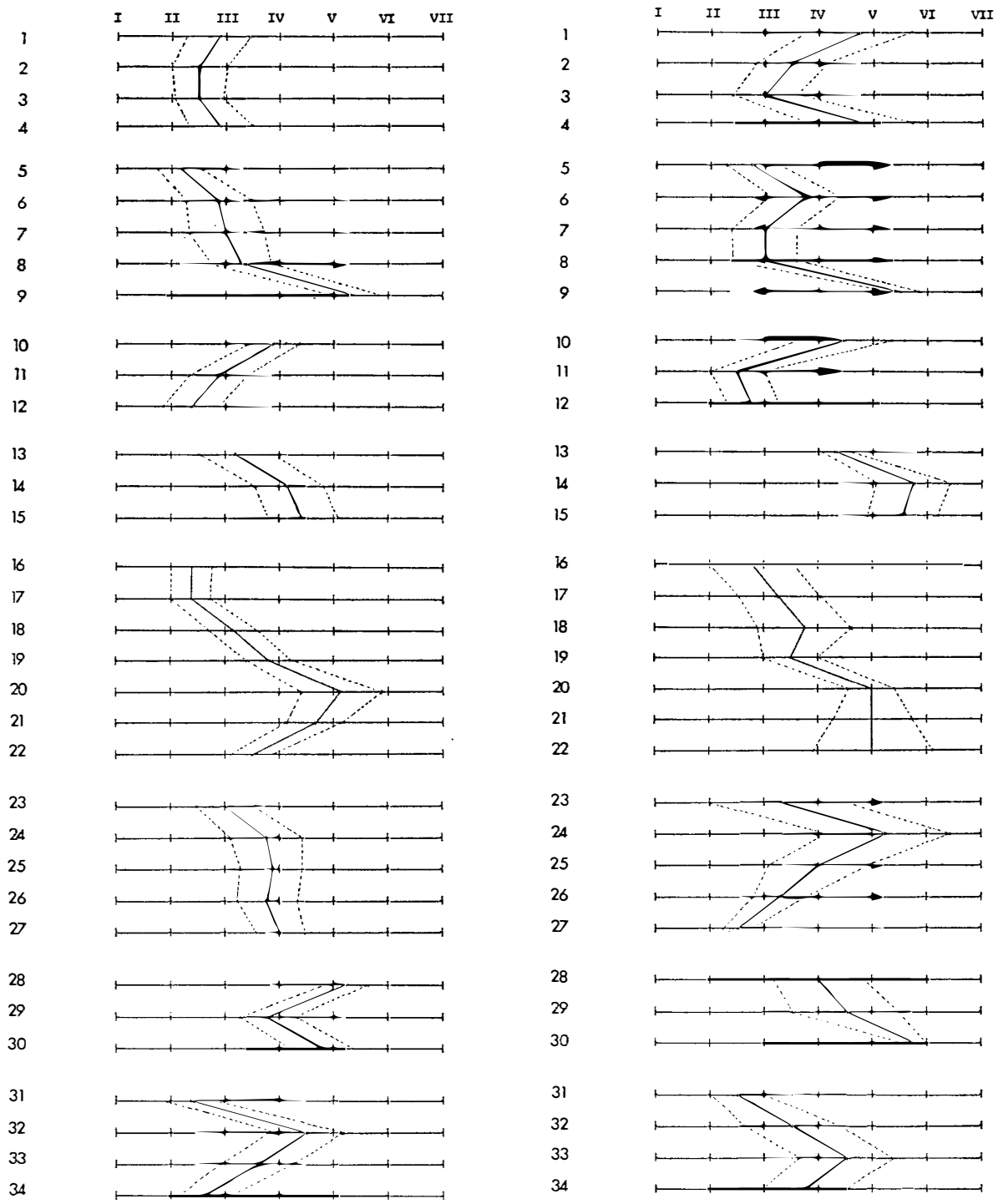
In the 18th wintering party (Fig. 3p) there is no item in particular trending conspicuously towards the dissatisfaction side. Nevertheless, it must be born in mind that all items related to prevention of disasters, *i.e.*, fire prevention measures of facilities, measures to cope with blizzard and measures to cope with water leakage, trend somewhat to the dissatisfaction side. Items trending to the satisfaction side are the same as those observed from the 8th wintering year on.

In the 19th wintering party (Fig. 3q) water supply and drainage equipment of facilities trends somewhat to the dissatisfaction side while comfort of the refectory trends to the satisfaction side. All other items show a trend of rather vague evaluation.

In the 20th wintering party (Fig. 3r) the items trending towards the dissatisfaction side are ease of washing and drying, measures to cope with water leakage, and water supply and drainage equipment of facilities. The items trending towards the dissatisfaction side, that seem to have calmed after the 8th wintering year, are increasing once again. In particular, items related to fire prevention measures trend strongly towards the dissatisfaction side compared with other wintering years. The only item trending to the satisfaction side is state of the room temperature.

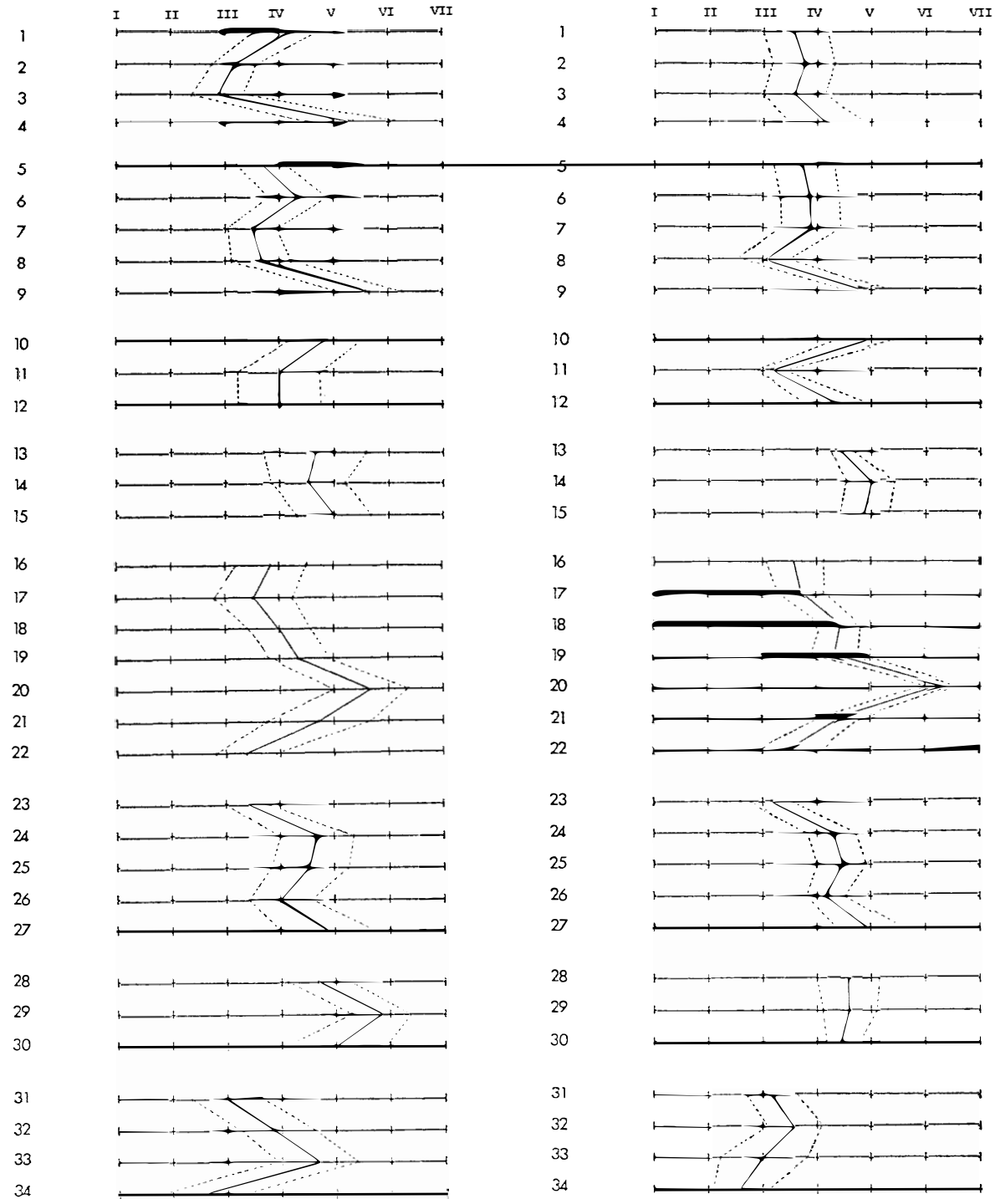
In the 21st wintering party (Fig. 3s) the inclination towards dissatisfaction is not so conspicuous compared with the previous years, but ease of washing and drying, and measures to cope with water leakage trend somewhat towards the dissatisfaction side. The items trending to the satisfactions side are the same as those of the 8th to 19th wintering years, and particularly the comfort of refectory trends conspicuously towards the satisfaction side.

In the 22nd wintering party (Fig. 3t) the items trending towards the dissatisfaction side are water supply and drainage equipment of facilities, and measures to cope with water leakage. Water supply and drainage equipment of facilities is a long overdue problem since the construction of Syowa Station, and measures to cope with water leakage is an item trending strongly to the dissatisfaction side in recent years, and they require urgent solution in connection with the environmental improvement of the station. The items trending to the satisfaction side are comfort of refectory, and comfort of rest rooms and dormitories.



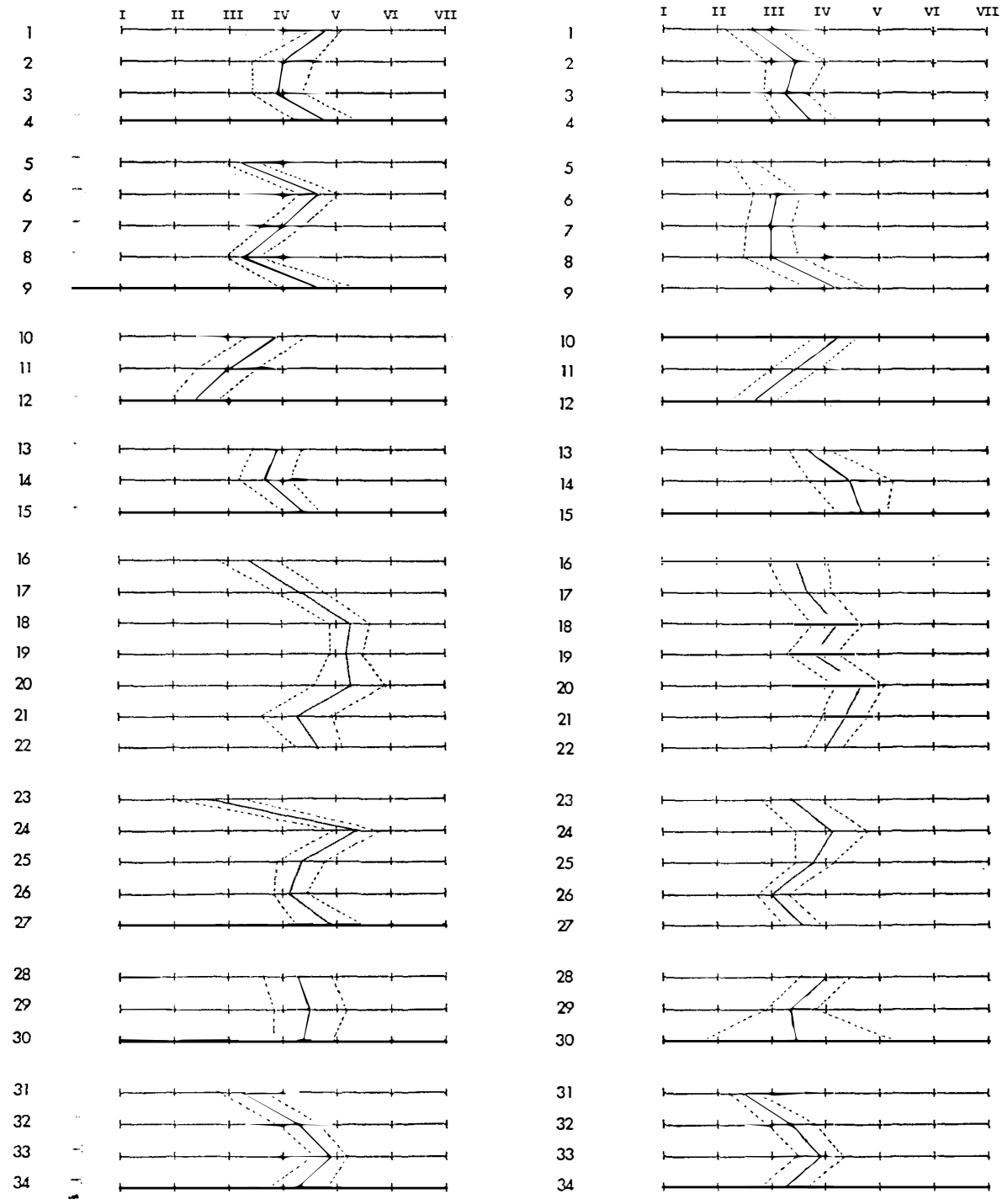
a. JARE-1 (1957) b. JARE-3 (1959)

Fig. 3. Satisfaction pattern for each wintering party.



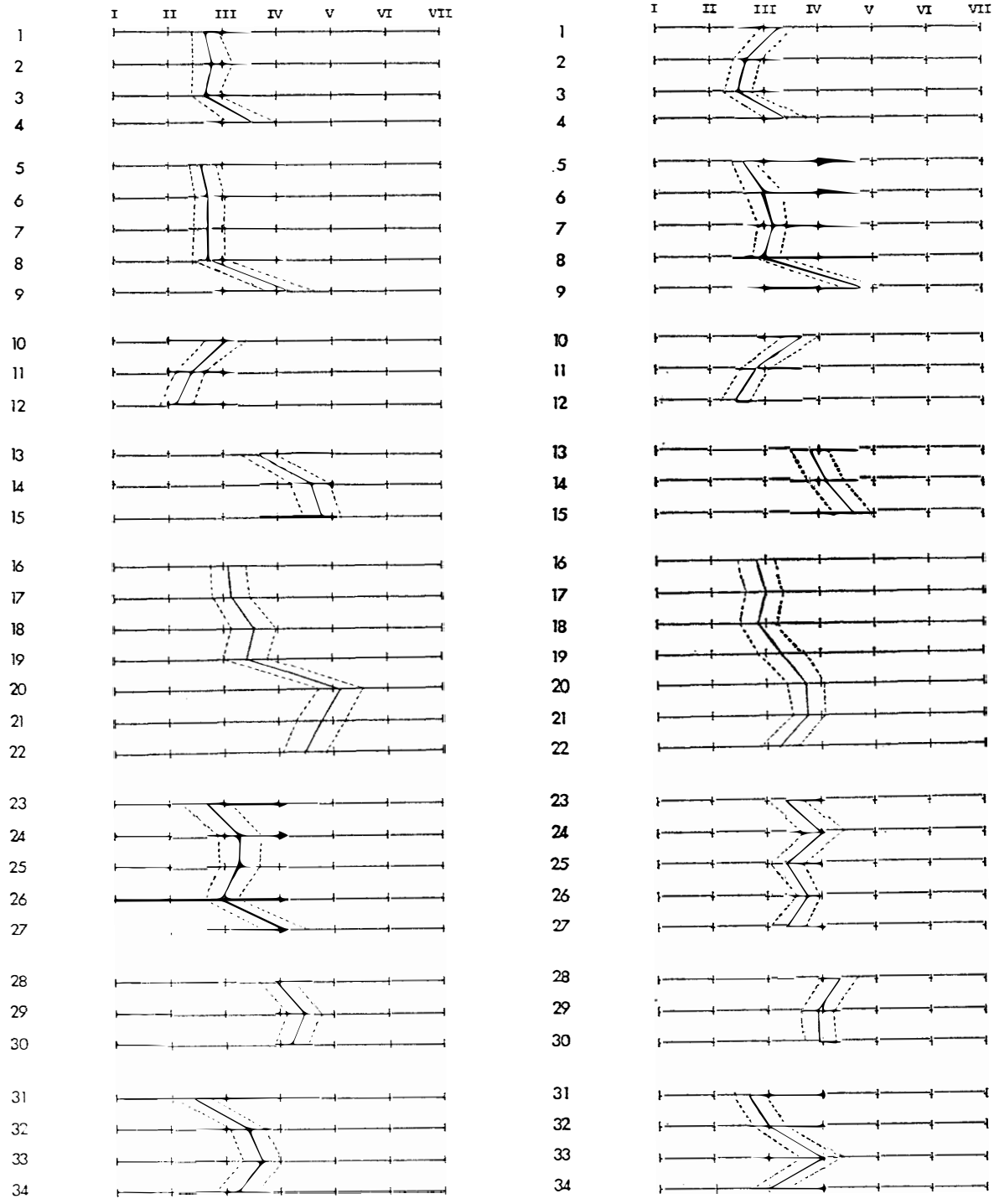
c. JARE-4 (1960) d. JARE-5 (1961)

Fig. 3. Satisfaction pattern for each wintering party.



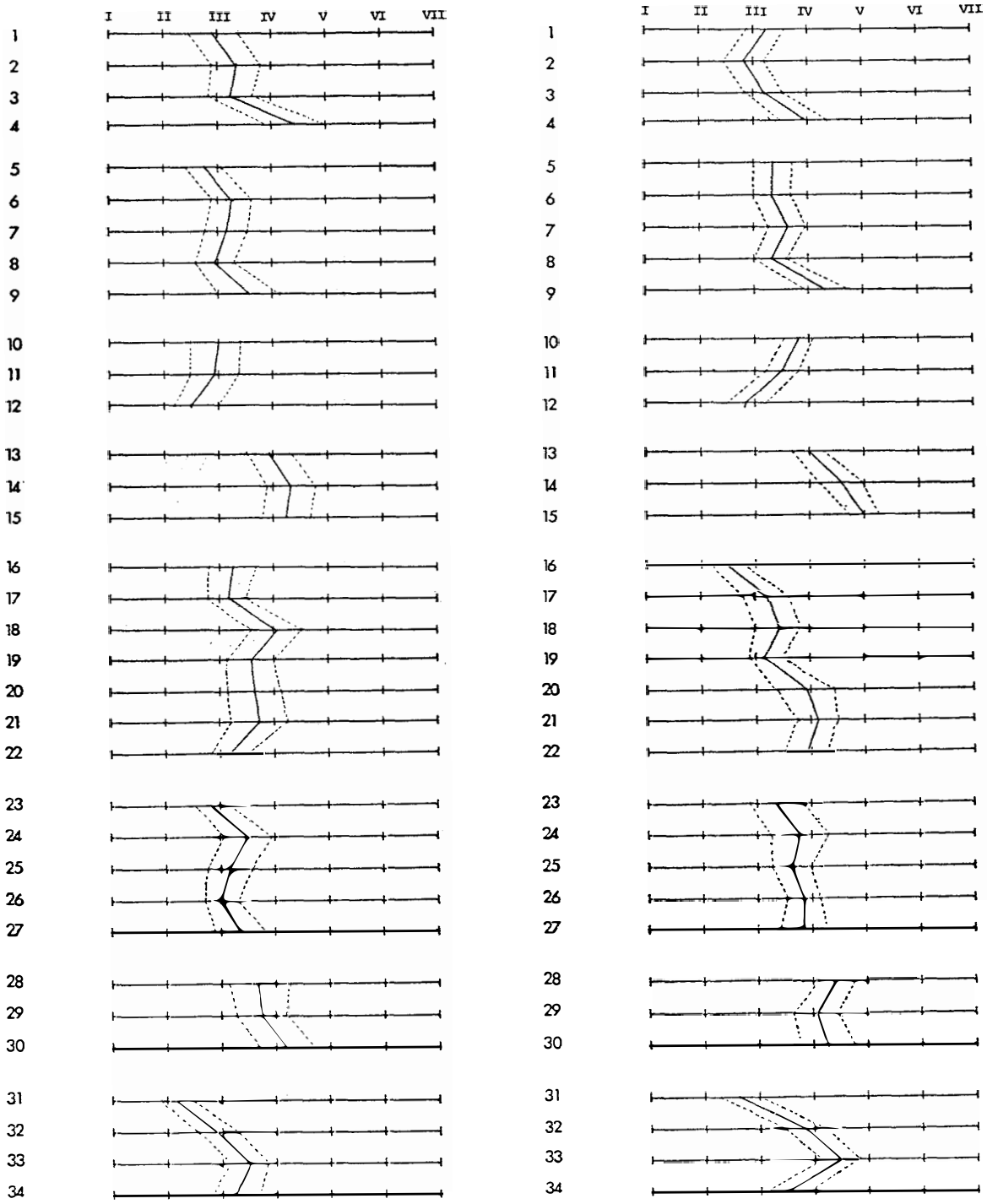
e. JARE-7 (1966) f. JARE-8 (1967)

Fig. 3. Satisfaction pattern for each wintering party.



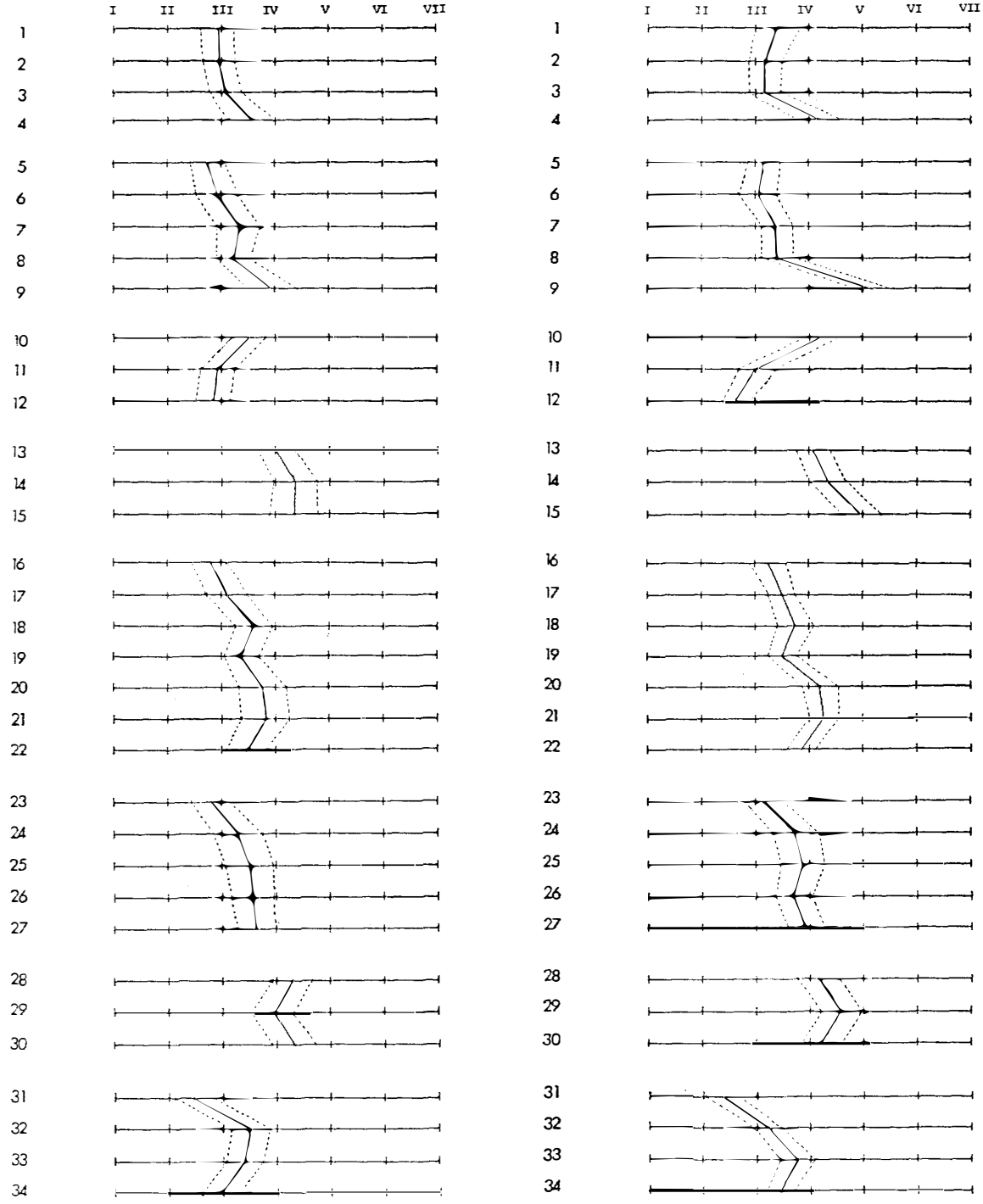
g. JARE-9 (1968) h. JARE-10 (1969)

Fig. 3. Satisfaction pattern for each wintering party.



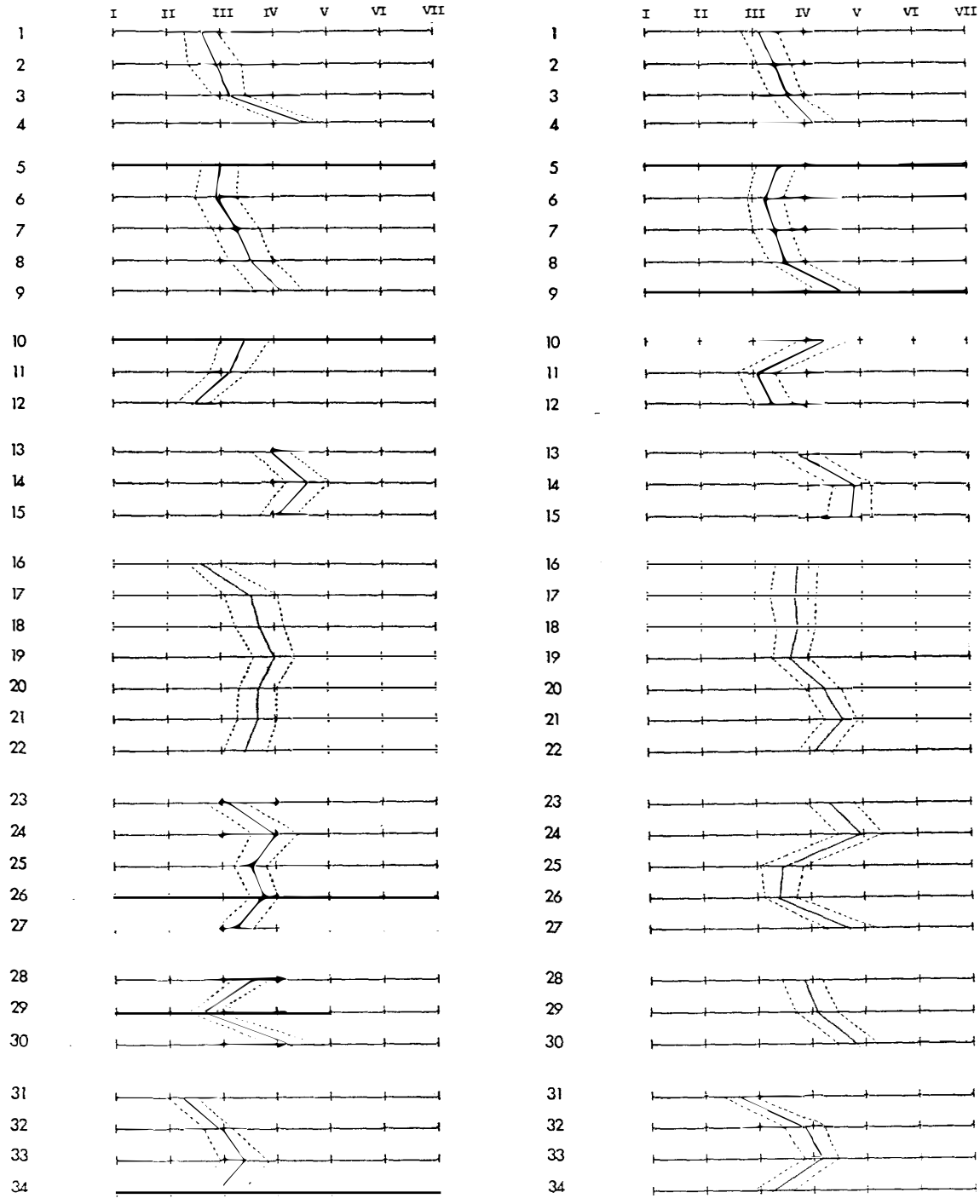
i. JARE-11 (1970) j. JARE-12 (1971)

Fig. 3. Satisfaction pattern for each wintering party.



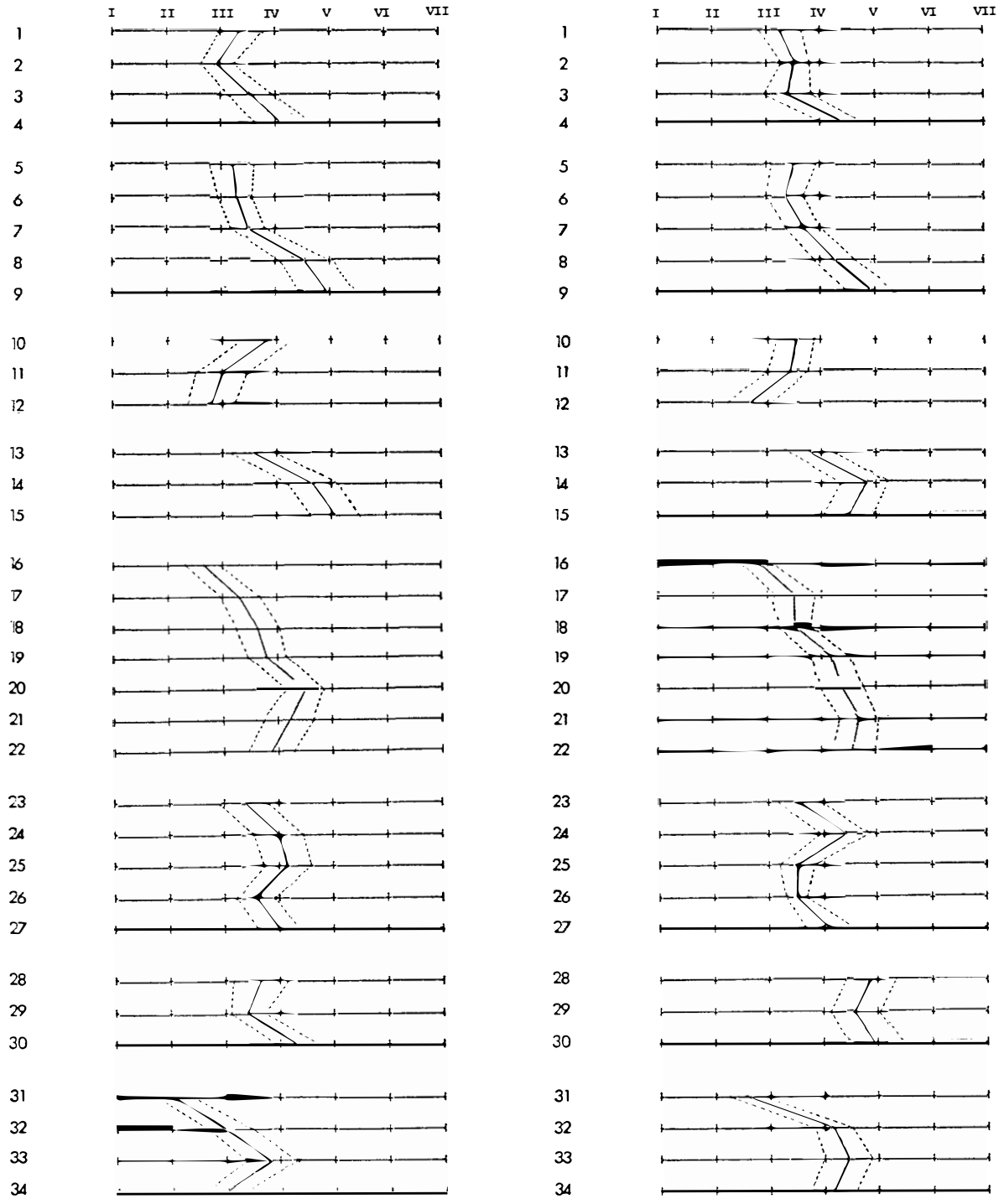
k. JARE-13 (1972) l. JARE-14 (1973)

Fig. 3. Satisfaction pattern for each wintering party.



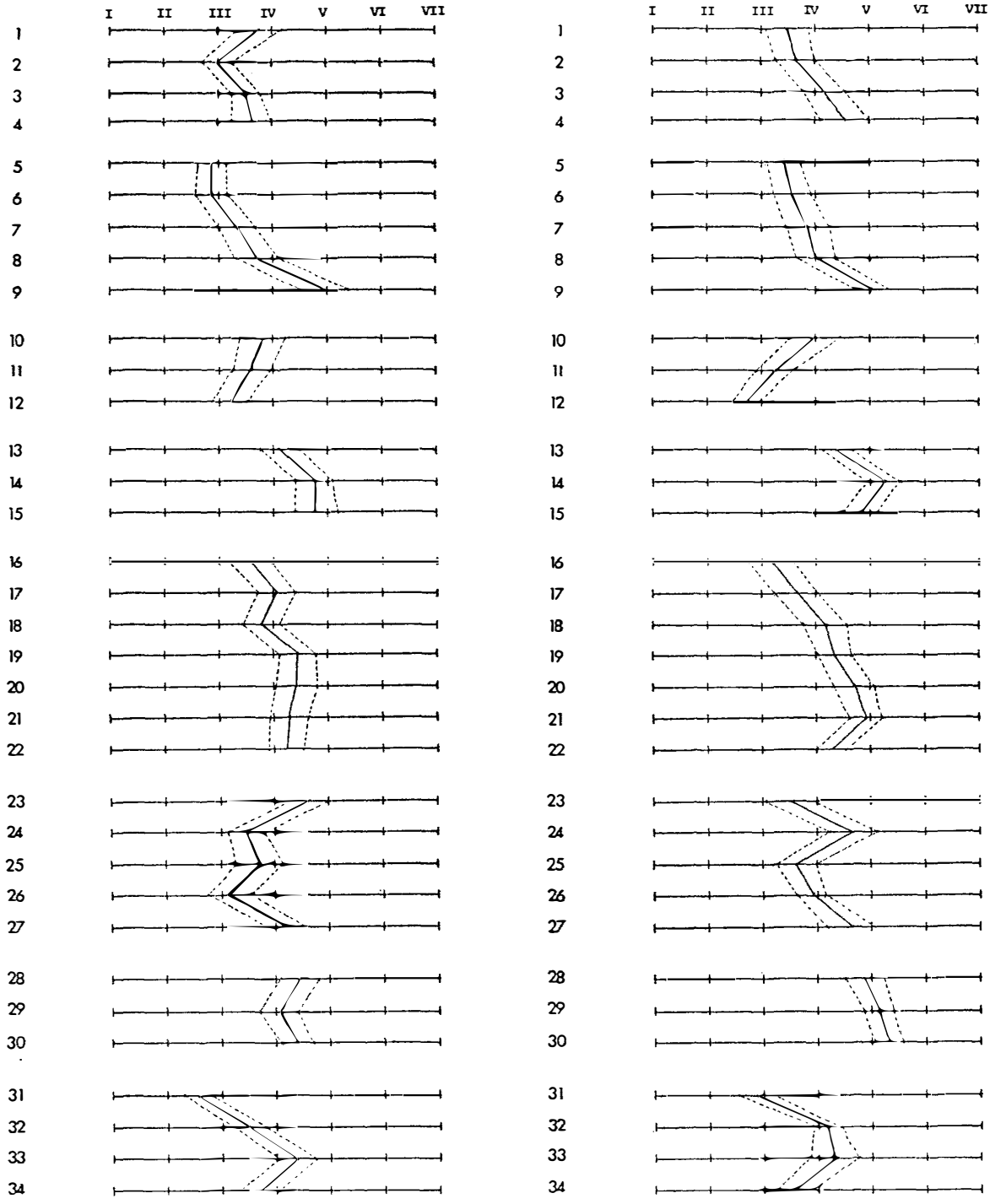
m. JARE-15 (1974) n. JARE-16 (1975)

Fig. 3. Satisfaction pattern for each wintering patty.



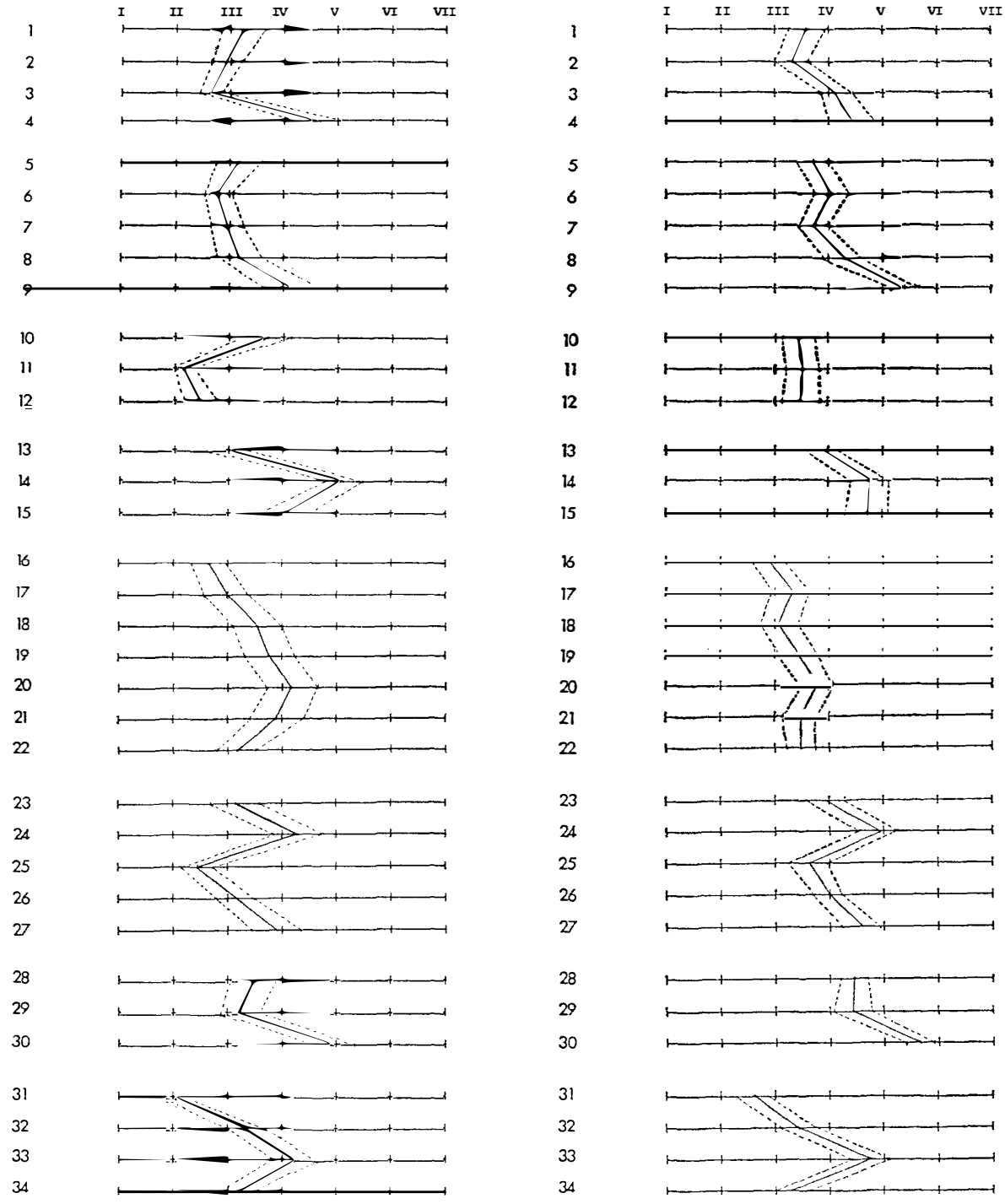
o. JARE-17 (1976) p. JARE-18 (1977)

Fig. 3. Satisfaction pattern for each wintering party.



q. JARE-19 (1978) r. JARE-20 (1979)

Fig. 3. Satisfaction pattern for each wintering party.



s. JARE-21 (1980) t. JARE-22 (1981)

Fig. 3. Satisfaction pattern for each wintering party.

The two items mentioned just above have either enjoyed satisfactory evaluation or remained at vague evaluation through all wintering years, with no case of receiving unsatisfactory evaluation. In other words, there have been no problems in particular regarding the aspects of meal and rest and sleeping that are the fundamental physiological requests regarding the basic conditions of the human life.

As can be seen, there are distinct trends of evaluation every wintering year, and different problems and improvement requests have been presented in connection with the living environment. These distinctions in the evaluation tendency are presumably attributable to the different environmental conditions in Antarctica encountered in each wintering year.

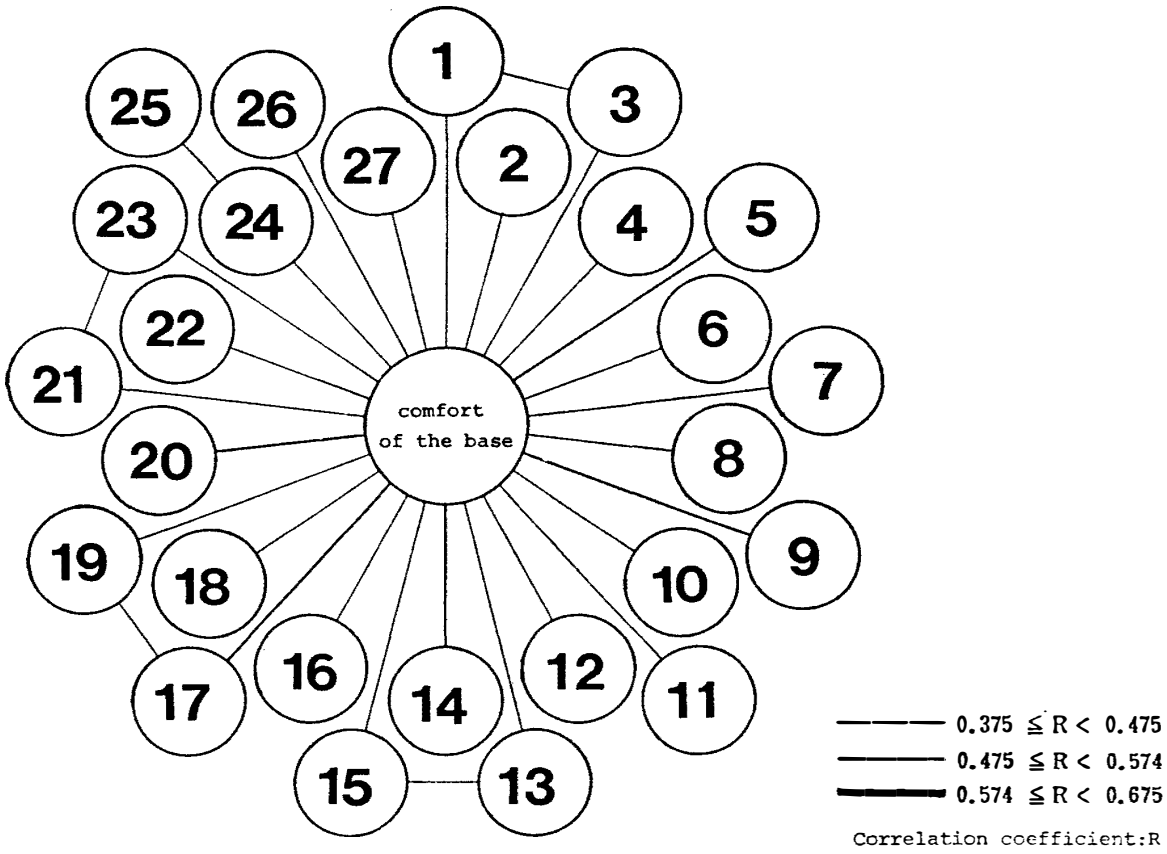
4. Structure of Consciousness of the Evaluation of the Degree of Satisfaction

4.1. Correlation between overall evaluation of the life at the station and living environment evaluation items

In this study an overall evaluation of the life at the station is carried out by examining five items, *i.e.*, comfort of the station, convenience of the station, comfort of private rooms, convenience of private rooms, and privacy. The correlation between the overall evaluation of these five items and the 34 items which have been employed in evaluating the living environment will be examined in this section. The relationship between the overall evaluation of the five items and the living environment evaluation items can be understood through the foregoing examination. It must be born in mind that it is risky to judge the degree of relationship based exclusively on the correlation coefficient, but in this study the tendency of the relative relationship between the 34 items and each one of the five items for overall evaluation is examined through the correlation coefficient. Such being the case, the ranges of the correlation coefficients are calculated in the first place, and then they are converted into 5-stage classification scales by dividing them into five even parts (1: 0.176 to 0.275, 2: 0.275 to 0.375, 3: 0.375 to 0.475, 4: 0.475 to 0.574, 5: 0.574 to 0.675).

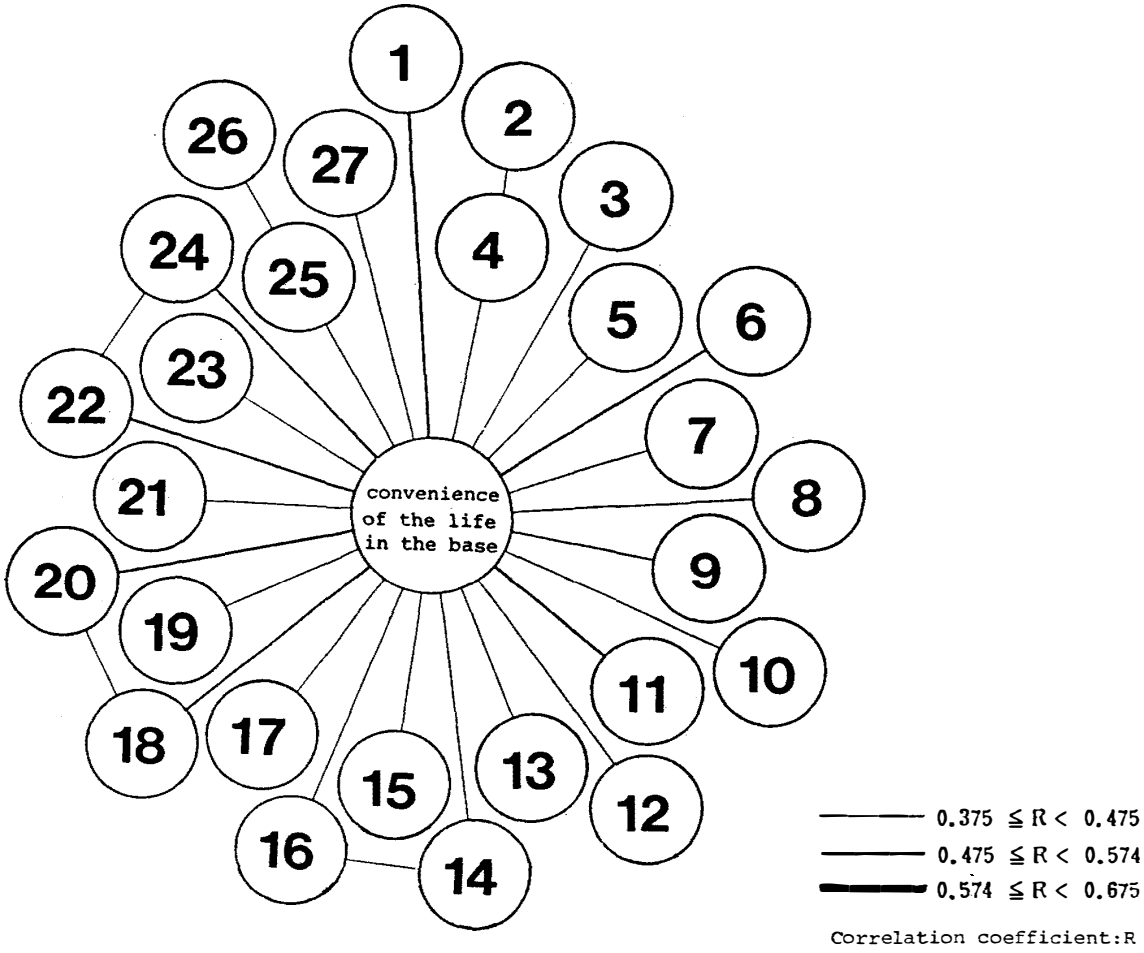
From the correlation diagram between the comfort of the station and each one of the 34 items (Fig. 4), the items with stronger correlation are layout of private rooms, state of cleanliness of air in facilities, comfort of reading and research, spending of leisure time, and size of refectory and other facilities. It may be safely said that the living environment evaluation of the five items mentioned before have particularly strong correlation with the comfort of the station. On the other hand, spending of leisure time and completeness of leisure facilities have strong correlation within the 34 items, and it is presumed that the completeness of leisure facilities is closely related with the comfort of the station.

The items having strong correlation with comfortable life (convenience) of the station (Fig. 5) are layout of private rooms, expending of leisure time, comfort of refectory, completeness of leisure facilities, comfort of toilets, comfort of bathrooms and washing room and traffic line distance. Layout of private rooms and spending of leisure time are superposed on the case referring to the comfort mentioned above, and these items are presumed to exert important influences on the improvement of the



1. Interior finishing of private rooms
2. Size of private rooms
3. Interior finishing of facilities
4. Electrical installation of facilities
5. Layout of each private room
6. State of the temperature in facilities
7. State of the lighting in facilities
8. State of the humidity in facilities
9. Cleanliness of air in facilities
10. Ease of cleaning of facilities
11. Comfort of refectory
12. Quality of design of facilities
13. Space of storage of clothes
14. Comfort of reading and research
15. Ease of storage and clothes-changing
16. Comfort of rest rooms and dormitories
17. Spending of leisure time
18. Hobby
19. Completeness of leisure facilities
20. Size of each facility (room) such as refectory, etc.
21. Comfort of toilets
22. Layout of each facility such as refectory, etc.
23. Comfort of bathrooms and washing room
24. Sound insulation from adjacent rooms
25. Sound insulation from outside
26. Traffic line distance
27. Structure of buildings

Fig. 4. Correlation diagram (comfort of the station).



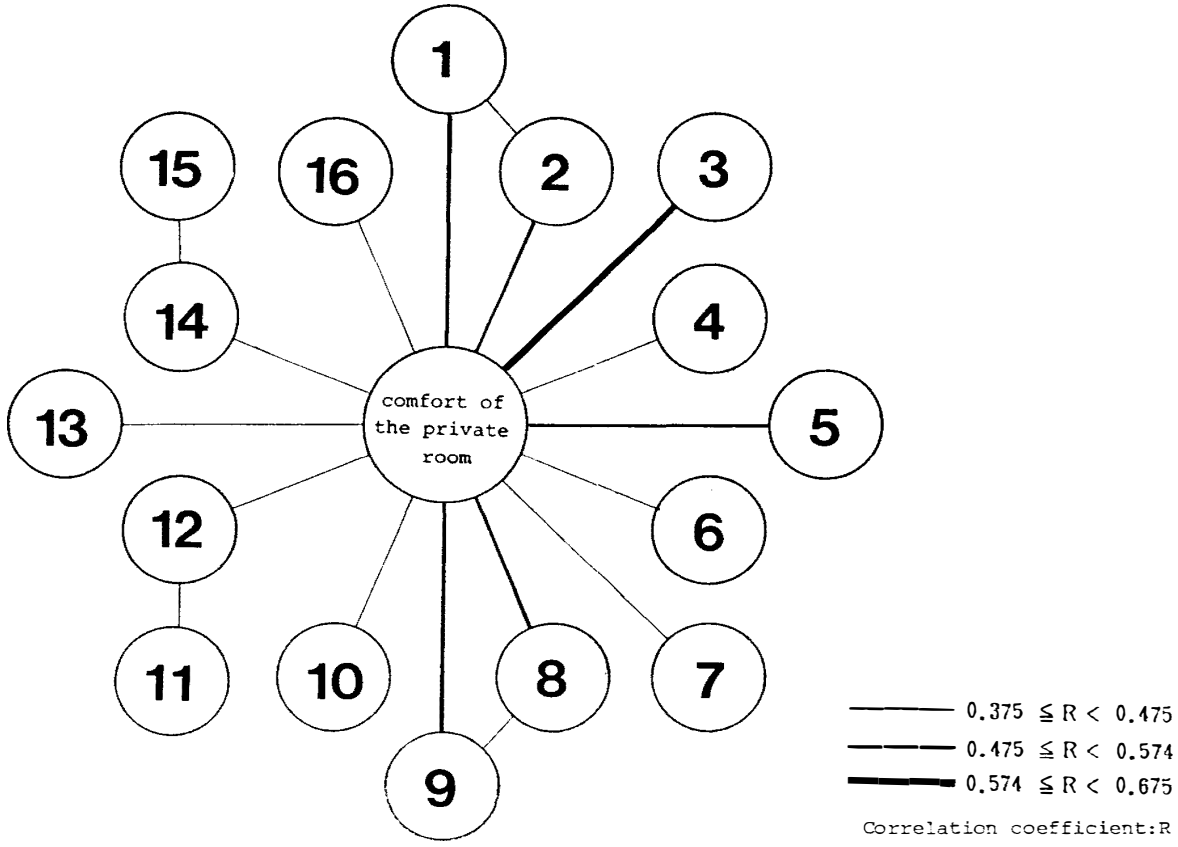
1. Traffic line distance
2. Interior finishing of private rooms
3. Size of private rooms
4. Interior finishing of facilities
5. Electrical installation of facilities
6. Layout of each private room
7. State of the temperature in facilities
8. State of the lighting in facilities
9. Cleanliness of air in facilities
10. Ease of cleaning of facilities
11. Comfort of refectory
12. Quality of design of facilities
13. Comfort of reading and research
14. Space of storage of clothes
15. Size of each facility (room) such as refectory, etc.
16. Ease of storage and clothes-changing
17. Hobby
18. Spending of leisure time
19. Ease of washing and drying
20. Completeness of leisure facilities
21. Water supply and drainage system of facilities
22. Comfort of toilets
23. Accessibility of facilities
24. Comfort of bathrooms and washing room
25. Sound insulation from adjacent rooms
26. Sound insulation from outside
27. Layout of each facility such as refectory, etc.

Fig. 5. Correlation diagram (convenience of life at the station).

environment of the station as a whole.

Comfort of private rooms (Fig. 6) has the strongest correlation with size of private rooms. Furthermore, it has also correlations with many items such as state of air in facilities, space for storage of clothes and other belongings, ease of storage and clothes-changing, spending of leisure time, sound insulation from adjacent rooms, size of the refectory and other facilities, and interior finishing of private rooms.

Convenience of private rooms (Fig. 7) has the strongest correlation with size of private rooms, in the same way as in the foregoing case of the comfort of private

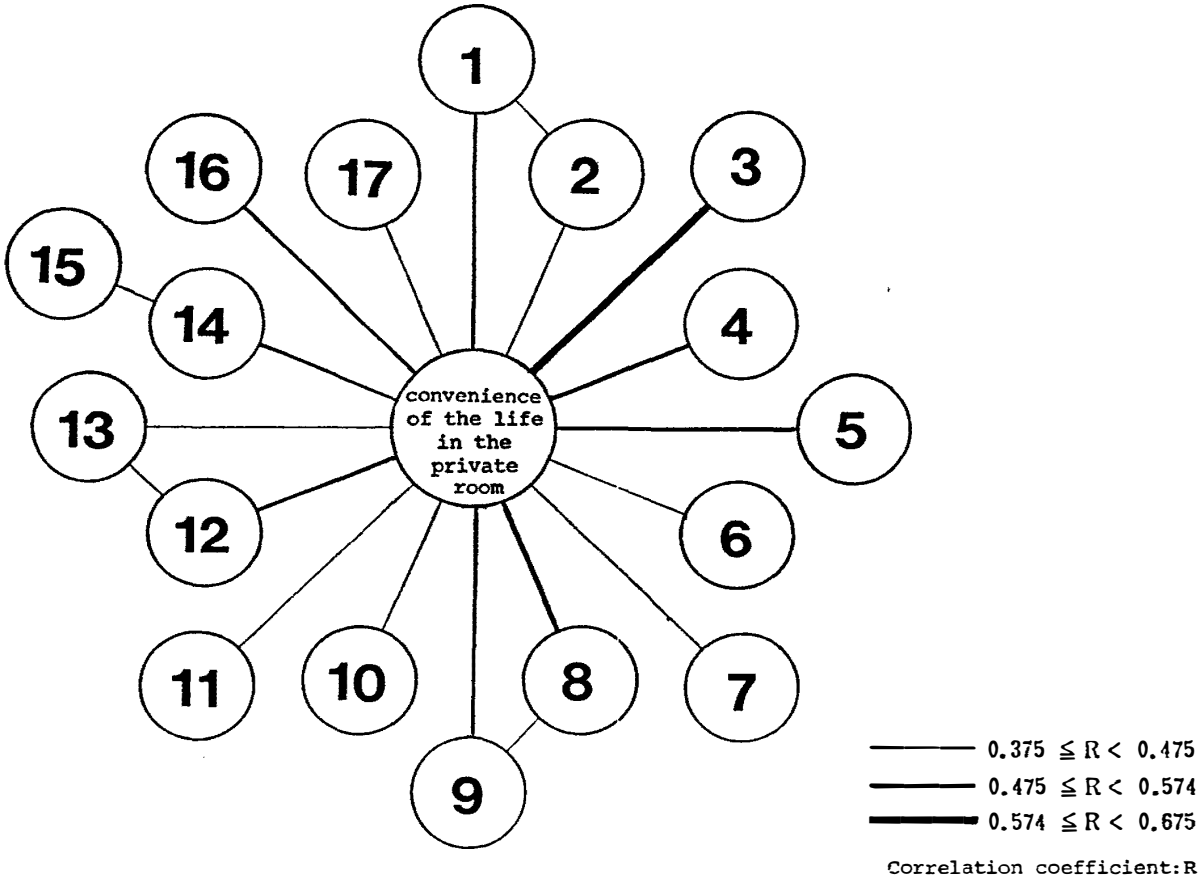


1. Interior finishing of private rooms
2. Interior finishing of facilities
3. Size of private rooms
4. Electrical installation of facilities
5. Layout of each private room
6. Cleanliness of air in facilities
7. Quality of design of facilities
8. Space of storage of clothes
9. Ease of storage and clothes-changing
10. Comfort of reading and research
11. Completeness of leisure facilities
12. Spending of leisure time
13. Size of each facility (room) such as refectory, etc.
14. Sound insulation from adjacent rooms
15. Sound insulation from outside
16. Layout of each facility such as refectory, etc.

Fig. 6. Correlation diagram (convenience of life in private rooms).

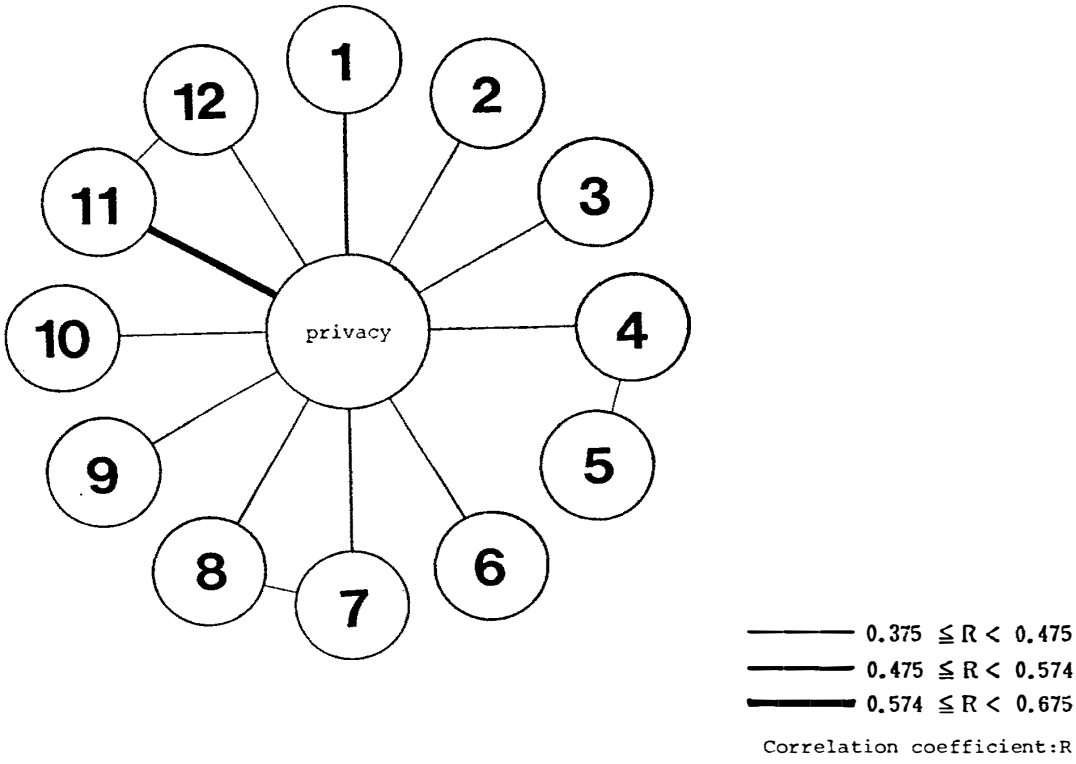
rooms. Most of the other items are also superposed on those related to the comfort. The items related to the comfort and convenience of individuals are presumed to have strong correlations with each other in connection with their evaluation.

Privacy (Fig. 8) has the strongest correlation with sound insulation from adjacent rooms, followed by size of private rooms and spending of leisure time. As can be seen, there are living environment evaluation items that have correlations with various



1. Interior finishing of private rooms
2. Interior finishing of facilities
3. Size of private rooms
4. Layout of each private room
5. Cleanliness of air in facilities
6. Comfort of refectory
7. Quality of design of facilities
8. Space of storage of clothes
9. Ease of storage and clothes-changing
10. Comfort of reading and research
11. Comfort of rest rooms and dormitories
12. Spending of leisure time
13. Completeness of leisure facilities
14. Sound insulation from adjacent rooms
15. Sound insulation from outside
16. Size of each facility (room) such as refectory, etc.
17. Layout of each facility such as refectory, etc.

Fig. 7. Correlation diagram (comfort of private rooms).



1. Size of private rooms
2. Layout of each private room
3. Quality of design of facilities
4. Ease of storage and clothes-changing
5. Space of storage of clothes
6. Comfort of rest rooms and dormitories
7. Spending of leisure time
8. Completeness of leisure facilities
9. Hobby
10. Size of each facility (room) such as refectory, etc.
11. Sound insulation from adjacent rooms
12. Sound insulation from outside

Fig. 8. Correlation diagram (privacy).

overall evaluations, and furthermore among the 34 items there are various items with strong correlation with each other.

4. 2. Identification of the structure of consciousness through factor analysis

The tendency in the evaluation of the degree of satisfaction of wintering party members has been identified with the foregoing results but the items employed in the preceding section are apparently independent of each other. Therefore, it is necessary to identify the correlation between each item as well as the structural properties laying behind them in order to make it possible to identify the environmental factors composing the wintering life. Such being the case, the correlation between each item is elucidated from the aforementioned structure, by using the factor analysis. In this section a factor analysis is carried out by means of the main factor method, based on the correlation coefficient between the 34 living environment evaluation items

obtained in section 4.1. Factors up to the 8th one, with characteristic value of 1.0 or more, are submitted to varimax rotation. The load, characteristic value and contribution rate of each factor are listed in Table 5. The eight factors that are latently related to the structure of consciousness indicate that the evaluation items having factor loads of large absolute values in connection with the 1st factor are interior finishing of private rooms, interior finishing of facilities, size of private rooms, etc. In connection with the 2nd factor they are state of the temperature in facilities, state of the lighting in facilities, state of the humidity in facilities, etc. In connection with the 3rd factor they are space for storage of clothes and belongings, ease of storage and cloth changing, comfort of reading and research, etc. In connection with the 4th factor they are spending of leisure time, completeness of leisure facilities and hobby. In connection with the 5th factor they are ease of disposal of garbage, ease of washing and drying and water supply and drainage equipment of facilities. In connection with the 6th factor they are the measures to cope with blizzard and fire prevention measures.

In connection with the 7th factor they are sound insulation from outside and sound insulation from adjacent rooms. In connection with the 8th factor they are layout of facilities, traffic line distance, etc. Furthermore, each factor is interpreted with the purpose of identifying more concretely the structure of consciousness of the members of wintering parties. Table 6 shows the result of rearrangement of the living environment evaluation items in conformity with the factor load values corresponding to each factor. The interpretation of the factors through the group of items with closer relationship with each factor indicates that the 1st factor is interpreted as a familiar living environment, and it has a close relationship with the structure of buildings and the size of facilities. The 2nd factor is interpreted as comfort of rooms and the 3rd factor convenience. The 4th factor is interpreted as comfort of facilities and the 5th factor living equipments, and it must be born in mind that comfort of toilets, and comfort of bathrooms and washing room are the items related with these factors. The 6th factor is interpreted as disaster prevention measures, the 7th factor sound insulation and the 8th factor layout of facilities. These eight factors, picked up as elements composing the structure of consciousness lying behind the evaluation expressed in terms of the degree of satisfaction, are regarded as principal environmental factors composing the wintering life. The examination of mutual relationships between the living environment evaluation items composing these eight items indicates that items composing each factor that trends towards the dissatisfaction side are not independent, but mutually related with other items. For example, the dissatisfaction regarding the size of private rooms that composes a familiar indoor environment is related with the interior finishing of private rooms and layout of each private room, which are all related with private rooms. On the other hand, the factors familiar indoor environment and living equipment have strong relationships with other factors, and it is presumed that the dissatisfaction regarding the items that compose these factors contributes decisively to the evaluation of the wintering life as a whole. Therefore, they are regarded as environmental factors that exert important influences on the environmental improvement. In particular, all items composing the living environment require urgent improvement, because they trend toward the dissatisfaction side. On the other hand, comfort in rooms, disaster prevention measures and sound

Table 5. Factor load list.

Evaluation item	Average value	Standard deviation	1st factor	2nd factor	3rd factor	4th factor	5th factor	6th factor	7th factor	8th factor
1	3.297	1.452	0.446	0.200	0.257	0.460	0.007	0.106	0.056	0.019
2	3.139	1.308	0.555	0.067	0.352	0.202	0.161	0.108	0.109	0.293
3	3.278	1,282	0.378	0.133	0.130	0.146	0.136	0.057	0.176	0.656
4	4.097	1.686	0.638	.044	0.464	0.177	0.125	0.014	0.093	0.009
5	3.085	1.261	0.412	0.324	0.062	0.017	0.085	0.220	0.119	0.517
6	3.274	1.366	0.729	0.180	0.192	0.129	0.038	0.213	0.066	0.139
7	3.367	1.310	0.690	0.314	0.138	0.104	0.084	0.202	0.037	0.240
8	3.490	1.448	0.574	0.377	0.047	0.099	0.347	0.180	0.126	0.037
9	4.699	1.611	0.226	0.255	0.061	0.352	0.635	0.129	0.066	0.074
10	3.780	1.543	0.116	0.606	0.026	0.287	0.190	0.123	0.042	0.132
11	3.077	1.322	0.290	0.651	0.165	0.202	0.124	0.122	0.089	0.043
12	2.815	1.340	0.169	0.719	0.153	0.037	0.145	0.157	0.106	0.232
13	3.857	1.331	0.192	0.496	0.314	0.059	0.419	0.246	0.103	0.134
14	4.614	1.509	0.198	0.097	0.327	0.082	0.647	0.199	0.112	0.227
15	4.656	1.505	0.078	0.151	0.204	0.118	0.649	0.267	0.194	0.003
16	3.031	1.400	0.060	0.291	0.545	0.179	0.032	0.027	0.323	0.171
17	3.386	1.475	0.079	0.193	0.663	0.192	0.090	0.078	0.289	0.226
18	3.656	1.515	0.328	0.092	0.773	0.125	0.134	0.137	0.019	0.035
19	3.718	1.370	0.275	0.118	0.712	0.173	0.225	0.112	0.003	0.039
20	4.421	1.645	0.066	0.197	0.300	0.484	0.437	0.216	0.034	0.274
21	4.297	1.509	0.032	0.214	0.260	0.458	0.512	0.195	0.018	0.362
22	3.737	1.376	0.076	0.226	0.189	0.626	0.227	0.103	0.150	0.189
23	3.367	1.601	0.037	0.202	0.054	0.124	0.106	0.177	0.824	0.095
24	4.197	1.705	0.176	0.063	0.185	0.202	0.108	0.063	0.793	0.165
25	3.575	1.462	0.067	0.516	0.320	0.152	0.280	0.179	0.391	0.012
26	3.602	1.186	0.296	0.462	0.110	0.130	0.150	0.263	0.311	0.085
27	4.023	1.564	0.017	0.223	0.096	0.295	0.260	0.177	0.138	0.638
28	4.205	1.502	0.077	0.138	0.042	0.099	0.309	0.654	0.137	0.019
29	4.073	1.519	0.184	0.144	0.147	0.084	0.164	0.701	0.054	0.032
30	4.552	1.489	0.142	0.062	0.005	0.079	0.255	0.522	0.213	0.301
31	2.514	1.154	0.143	0.486	0.274	0.306	0.202	0.392	0.043	0.132
32	3.498	1.331	0.023	0.138	0.228	0.374	0.021	0.558	0.018	0.143
33	4.054	1.516	0.315	0.136	0.067	0.658	0.201	0.184	0.260	0.066
34	3.266	1.407	0.249	0.081	0.203	0.745	0.081	0.140	0.187	0.083
	Characteristics value		3.398	3.271	3.177	2.993	2.738	2.449	2.137	1.927
	Contribution rate		9.99	9.62	9.34	8.80	8.05	7.20	6.28	5.67
Cumulative contribution rate			9.99	19.62	28.96	37.76	45.81	53.02	59.30	64.97

Table 6. Component of satisfaction.

Name of factor	No.	Evaluation item
Indoor familiar environment	6	Interior finishing of private rooms
	7	Interior finishing of facilities
	4	Size of private rooms
	8	Electrical installation of facilities
	2	Layout of each private room
Indoor comfort	12	State of the temperature in facilities
	11	State of the lighting in facilities
	10	State of the humidity in facilities
	25	Cleanliness of air in facilities
	13	Ease of cleaning of facilities
	31	Comfort of refectory
	26	Quality of design of facilities
Convenience	18	Space for storage of clothes
	19	Ease of storage and cloth-changing
	17	Comfort of reading and research
	16	Comfort of rest rooms and dormitories
Comfort of facilities	34	Spending of leisure time
	33	Completeness of leisure facilities
	22	Hobby
	20	Comfort of toilets
	1	Size of each facility (room) such as refectory, etc.
Living equipment	15	Ease of disposal of garbage
	14	Ease of washing and drying
	9	Water supply and drainage system of facilities
	21	Comfort of bathrooms and washing room
Disaster prevention measures	29	Measures to cope with blizzard
	28	Fire prevention measures of facilities
	32	Accessibility of facilities
	30	Measures to cope with water leakage
Sound insulation	23	Sound insulation from outside
	24	Sound insulation from adjacent rooms
Layout of facilities	3	Layout of each facility such as refectory, etc.
	27	Traffic line distance
	5	Structure of buildings

Legend: Factor road 0.4 or more.

insulation are clearly separated from other factors, and can be interpreted as independent ones.

4.3. Characteristics of the evaluation expressed in terms of degree of satisfaction for each wintering year, based on the structure of consciousness

The points the testees score for each one of the eight factors picked up in section 4.2. will be summed up in this section. The score range is calculated from the maximum and minimum values of these factor scores, and then the factor score is converted into an 11-stage classification yardstick (0 to 11). In the case of the 7-stage evaluation of the degree of satisfaction, the closer to 7 the stronger the trend toward dissatisfaction, and therefore in the case of the factor score it is presumed that the closer to 10 the stronger the trend towards dissatisfaction or the stronger the recognition of insufficiency. The tendency expressed in terms of factor score is the average of each wintering year, and the peculiarities referring to the 8th factor are identified by year.

In the 1st wintering party (Fig. 9a) the 3rd, 4th, 5th and 6th factors trend towards the dissatisfaction side. The other factors trend strongly towards the satisfaction side. In other words, the factors related to convenience, comfort of facilities, living equipment and measures for prevention of disaster are under unsatisfactory conditions from the standpoint of environmental improvement. It is presumed that this is a manifestation of the uneasiness of the 1st wintering party to the unknown environment as well as the dissatisfaction to the incompleteness of the basic dwelling facilities.

The 3rd wintering party (Fig. 9b) manifests dissatisfaction to the 4th, 5th and 7th factors, *i.e.*, comfort of facilities, living facilities and sound insulation. In reality, however, it is hazardous to conclude that these manifestations are of positive characteristics, because there are few samples for the 3rd wintering year.

In the 4th wintering party (Fig. 9c) there is particularly conspicuous dissatistaction about the indoor comfort, which ought presumably to have been improved in the 1st and 3rd years. There is dissatisfaction also in connection with the disaster prevention equipment. On the other hand, the comfort of facilities is found to be improved.

In the 5th wintering party (Fig. 9d) there is dissatisfaction about indoor comfort, in the same way as in the 4th wintering party, in addition to convenience and layout of facilities. This year is characterized by the occurrence of many problems.

In the 7th wintering party (Fig. 9e) there is particularly strong manifestation of dissatisfaction about convenience. It is presumed that the indoor comfort has been improved, because the evaluation trends towards the satisfaction side. On the other hand, there is dissatisfaction regarding comfort of facilities.

In the 8th wintering party (Fig. 9f) there is dissatisfaction in connection with the convenience, but the other seven factors are regarded as satisfactory. It is presumed that the environmental factors have been improved compared with the 1st to 7th wintering years.

In the 9th wintering party (Fig. 9g) the familiar indoor environment and sound isolation have been improved up to satisfactory levels, and there is no factor in particular with conspicuous manifestation of dissatisfaction.

In the 10th wintering party (Fig. 9h) there is dissatisfaction about the indoor

comfort and in the 11th wintering party (Fig. 9i) about convenience, but generally speaking the other factors seem to have improved.

In the 12th, 13th and 14th wintering parties (Figs. 9j, 9k and 9l) there are no environmental factors in particular with conspicuous manifestation of dissatisfaction. The evaluations of all eight factors trend uniformly towards a rather satisfactory side, suggesting that the environment of the station is kept at a satisfactory level.

The same tendency as in the foregoing 12th, 13th and 14th wintering years is observed also in the 15th wintering party (Fig. 9m), with a particularly conspicuous improvement in the disaster prevention measures. One can find no factor in particular with conspicuous manifestation of dissatisfaction in the period from the 8th to 15th wintering year, and it is presumed that the environment was kept at a satisfactory level during that period.

In the 16th wintering party (Fig. 9n) there is a manifestation of dissatisfaction regarding sound insulation, but all other factors have the same tendency as in the 12th to 14th wintering years.

In the 17th wintering party (Fig. 9o) living equipment is regarded as unsatisfactory, and familiar indoor environment is regarded as rather unsatisfactory. The disaster prevention measures are regarded as satisfactory, in the same way as in the 15th wintering year.

In the 18th wintering party (Fig. 9p) there is a manifestation of dissatisfaction regarding comfort of facilities and disaster prevention equipment, but there is no conspicuous peculiarity regarding other factors.

In the 19th wintering party (Fig. 9q) sound insulation is regarded as unsatisfactory, and indoor comfort and comfort of facilities are regarded as rather unsatisfactory. On the other hand, familiar indoor environment and layout of facilities are regarded as satisfactory.

In the 20th wintering party (Fig. 9r) there is a manifestation of dissatisfaction regarding disaster prevention measures, whereas, layout of facilities and indoor comfort are regarded as satisfactory.

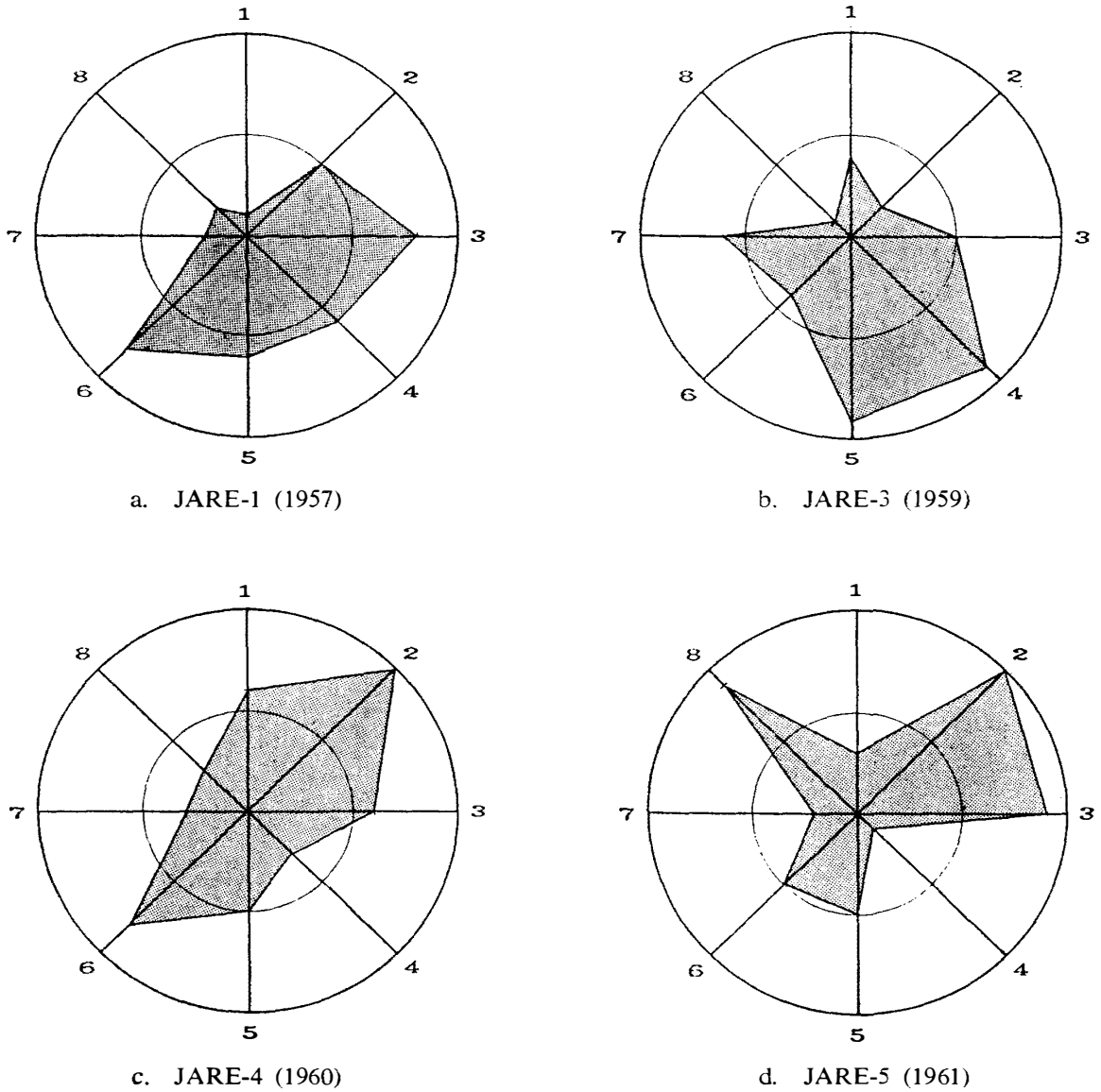
In the 21st wintering party (Fig. 9s) there is no problem in particular in connection with the eight environmental factors in the aggregate. In particular, indoor comfort and disaster prevention measures, the latter being regarded as unsatisfactory in the 20th wintering year, are found to have been improved giving a satisfactory environment to the station as a whole.

In the 22nd wintering party (Fig. 9t) there are manifestations of dissatisfaction regarding layout of facilities, familiar living environment and sound insulation. There have been few environmental factors regarded as unsatisfactory since the 8th wintering year, but an increasing manifestation of dissatisfaction is observed once again in this wintering party in connection with the three aforementioned factors. Indoor comfort and disaster prevention measures are regarded as satisfactory.

As can be noted from the foregoing considerations about the tendency of the eight environmental factors for each wintering year, there is no continuous gradual improvement of each factor in chronological order. In other words, factors regarded as unsatisfactory in a given year is improved after two or three years, but they appear again to receive a manifestation of dissatisfaction after the elapse of following years.

This tendency is particularly conspicuous in connection with the disaster prevention measures, and particular attentions should be paid to this aspect in connection with environmental improvements in the future. In view of the extremely severe natural conditions of Antarctica, there are problems regarding the durability of facilities and equipments, and the factors that compose the environmental insufficiency and incompleteness must be improved steadily year after year.

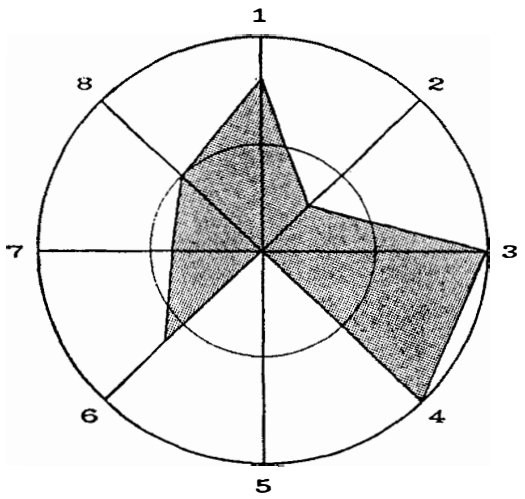
Generally speaking, in the period from the 1st to the 7th wintering year there are many environmental factors that are regarded as unsatisfactory, and in the period from the 8th to the 21st wintering year there are relatively few factors with conspicuous manifestation of dissatisfaction, but in the 22nd wintering year the tendency of dissatisfaction becomes stronger once again, suggesting the necessity to consider further improvements in the future.



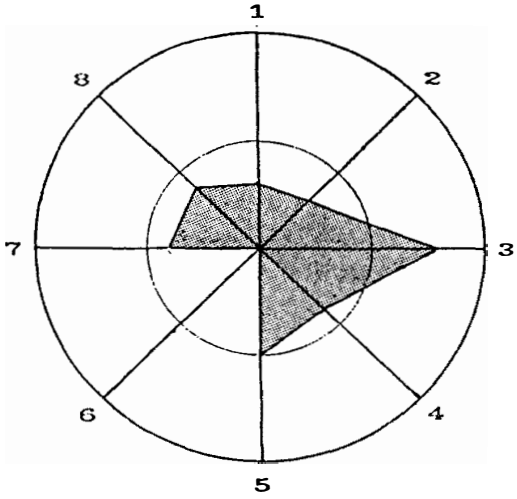
a. JARE-1 (1957) b. JARE-3 (1959)

c. JARE-4 (1960) d. JARE-5 (1961)

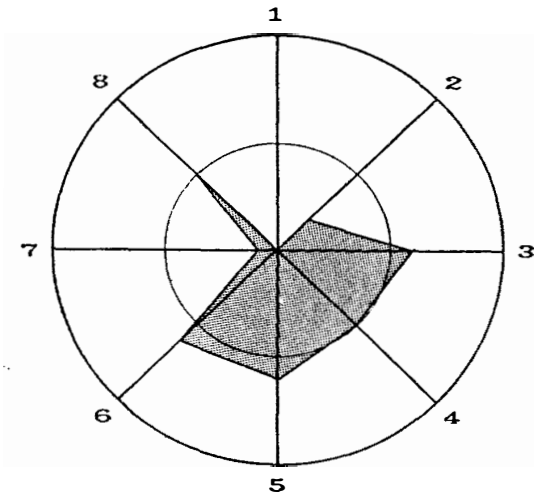
Fig. 9. Tendency of the 8th factor score for each wintering party.



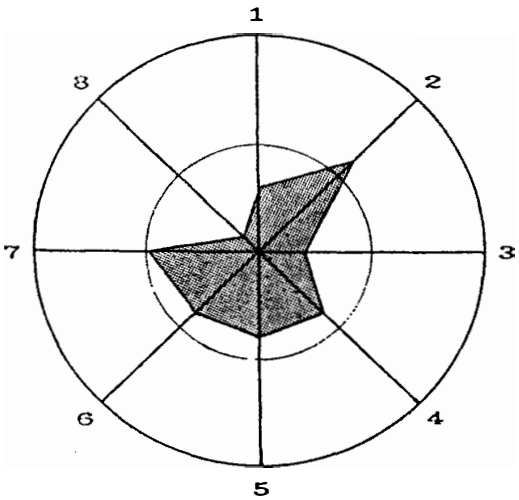
e. JARE-7 (1966)



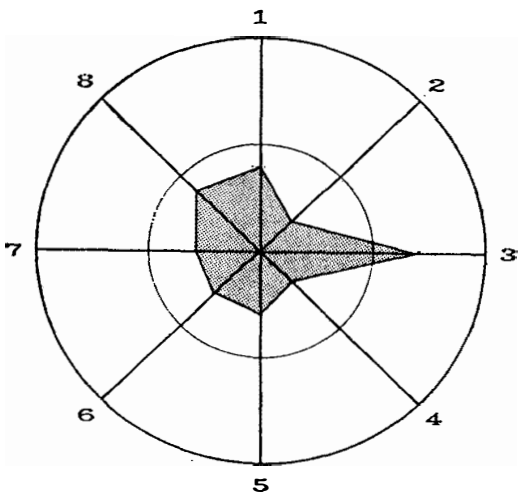
f. JARE-8 (1967)



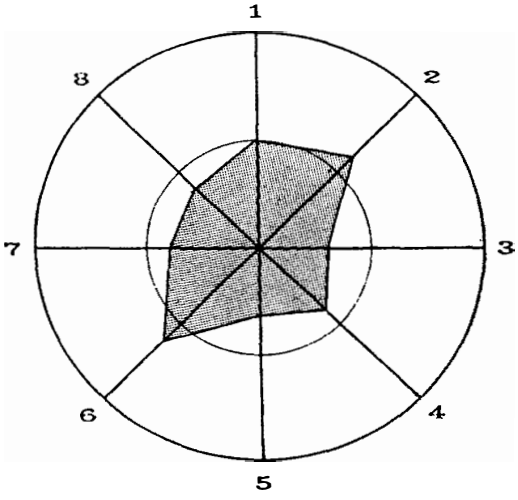
g. JARE-9 (1968)



h. JARE-10 (1969)

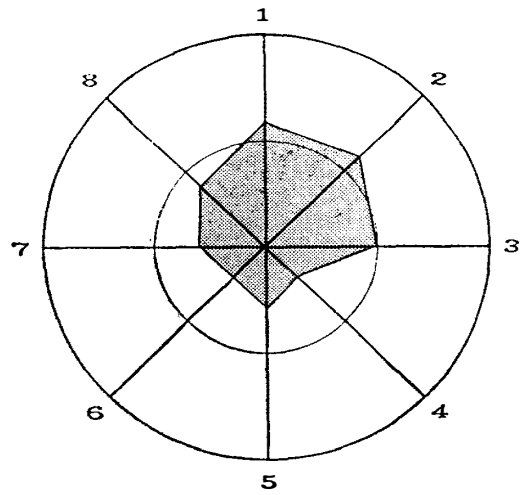


i. JARE-11 (1970)

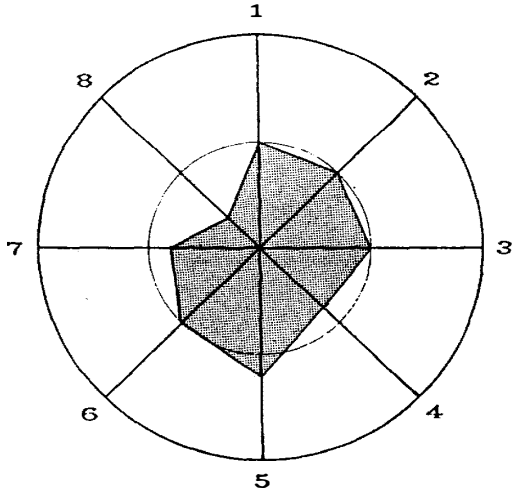


j. JARE-12 (1971)

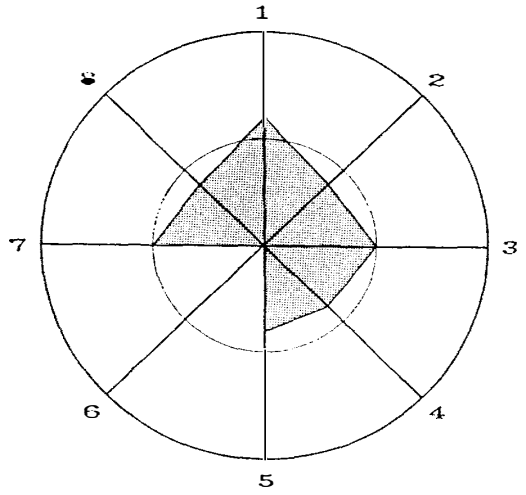
Fig. 9. Tendency of the 8th factor score for each wintering party.



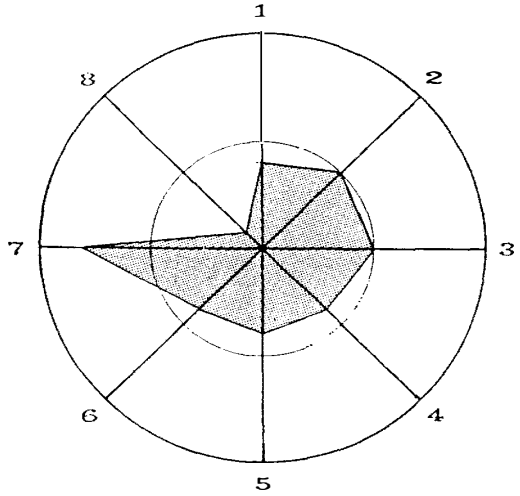
k. JARE-13 (1972)



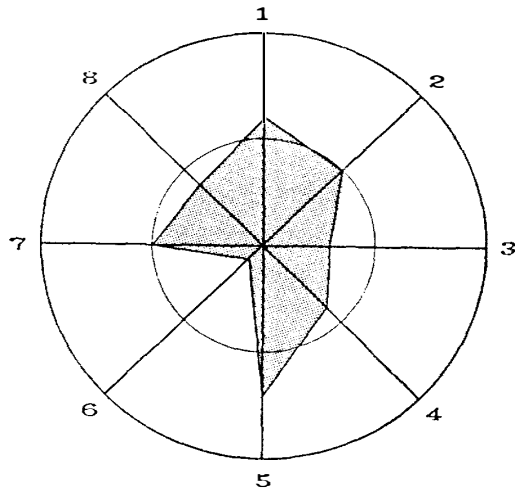
l. JARE-14 (1973)



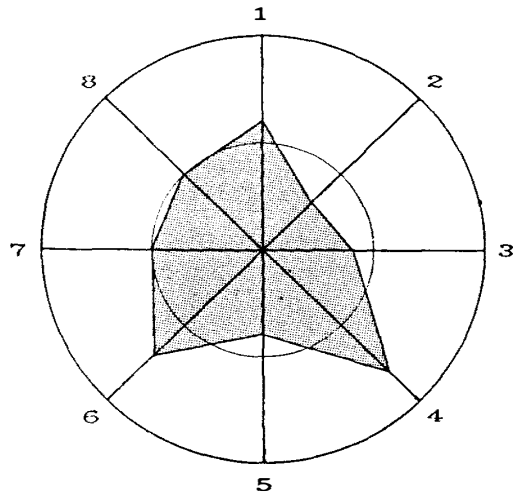
m. JARE-15 (1974)



n. JARE-16 (1975)

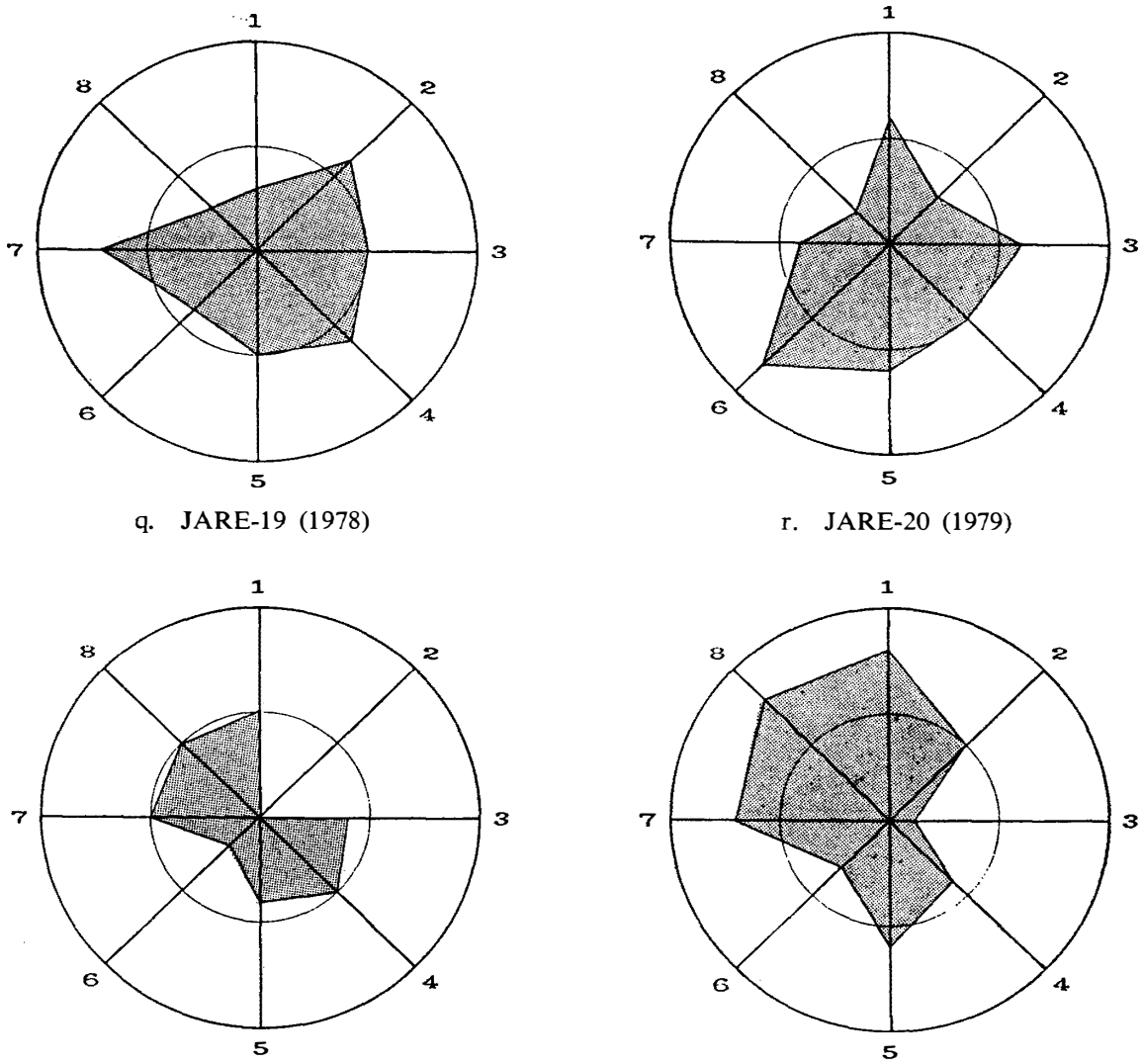


o. JARE-17 (1976)



p. JARE-18 (1977)

Fig. 9. Tendency of the 8th factor score for each wintering party.



q. JARE-19 (1978) r. JARE-20 (1979)

s. JARE-21 (1980) t. JARE-22 (1981)

Fig. 9. Tendency of the 8th factor score for each wintering party.

5. Discussion

It is indispensable to solve problems related to the living environment of the station, in order to provide a comfortable dwelling to the members of a wintering party conducting surveys and researches under the severe natural conditions of Antarctica. As can be noted from the results presented in Chapters 3 and 4, it is necessary to improve aspects such as the indoor environment of private rooms, which is a factor related to the private life, as well as the water supply and drainage equipment, comfort of bathrooms and washing room, comfort of toilets, etc., which are factors related to the living equipment. On the other hand, from the standpoint of the safety of human life it is necessary to provide disaster prevention equipments with sufficient durability. It is presumed that the amenity of the wintering life at the station will be improved as a whole by implementing the design of facilities focusing principally on

three basic environmental factors, *i.e.*, familiar indoor environment, living equipments and disaster prevention measures.

Furthermore, it is considered from the standpoint of the comfort of facilities that the improvement of sports facilities, that belong to the class of leisure facilities mentioned in the previous report (Analysis, from the Standpoint of Perception Structure, of the Requests for Improvement of Facilities I), is an important factor related to the environmental improvement. In connection with the improvement of these facilities, particular attention must be paid to the systematic planning of the environmental improvement, by taking into consideration the durability of each facility and equipment. In other words, it is necessary to consider a steady improvement and repair before the manifestation of the problems. On the other hand, it must be born in mind that a sense of value held by each member of the wintering team is diverging rapidly compared with the uniformity in the past. Under such circumstances, it becomes necessary to draw up a plan providing the members of a wintering party with psychological comfort, and furthermore the cultivation, in each individual member, of a sense of participation in the construction of the station is a theme to be considered hereafter.

As can be seen from the foregoing discussion on the overall planning of facilities as well as the way to be taken for the environmental improvement, the facilities and equipments that have problems at present and require urgent improvements are as follows:

—Living equipments
- (1) Water supply and drainage equipment
- (2) Bathroom and washing equipment
- (3) Garbage disposal equipment
- (4) Toilet

—Private rooms
- (1) Sound insulation from adjacent rooms
- (2) Size of private rooms

—Disaster prevention equipment
- (1) Measures to cope with water leakage

—Leisure facilities
- (1) Sports facilities

Should an appropriate improvement be realized in the equipments and facilities mentioned above, the dwelling ability of the station is expected to improve as a whole considerably.

(Received August 2, 1984; Revised manuscript received September 25, 1984)