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THE RECREATIONAL CAPABILITY AND USE OF THE BROKEN GROUP ISLANDS, PACIFIC RIM NATIONAL PARK

by

© JOHN P. VANDALL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitle THE RECREATIONAL CAPABILITY AND USE OF THE BROKEN GROUP ISLANDS, PACIFIC RIM NATIONAL PARK submitted by John P. Vandall in partial fulfilment of the requirements for the degree of Master of Science.

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Supervisor

.....

.....

Date April 21, 1977

DEDICATION

This thesis is dedicated to the late Dr. Lawrence Anderson who served as my supervisor during the early stages of its formulation. Without his direction, this thesis would not have materialized. For this and much more I am sincerely grateful.

ABSTRACT

The Broken Group islands comprise one section of the proposed Pacific Rim National Park, located on the west coast of Vancouver Island. These islands represent a unique marine environment which is presently subject to a low level of recreational use. The problem was to analyze the recreational resources and use of the Broken Group islands to determine whether or not the present use is appropriate in relation to these resources.

Using the Canada Land Inventory method of classification, the resource base of the islands was evaluated, in the field, to determine their capability for recreational use. This technique estimates the quantity of recreation which land areas can support, while taking into consideration the recreational values accruing to the water areas. A user survey to determine expressed demand was conducted in an attempt to interview all groups visiting the Broken Group islands during July and August, 1975.

The recreational capability and use of the Broken Group islands were found to be generally low. The total of 108 groups interviewed is believed to be close to a 100 percent sample of those who visited the area. The present recreational use does not exceed the carrying capacity set by the natural resource base. Though the level of use which the land can support is low, it can provide a high quality recreational experience.

This is evidenced by the high level of satisfaction indicated by 96 percent of those groups interviewed. The low level of use is expected to continue in the future if access is not improved. The present levels of use of individual sites do not generally correspond to their relative capability ratings.

The quantity of recreational use the Broken Group islands can support may be greater than is revealed in this thesis, which is primarily concerned with the land area. To complement this study an assessment of the recreational capability of the marine area is suggested.

ACKNOWLEDGEMENTS

This thesis is the product of work undertaken in a variety of places over a period of approximately two and a half years. Therefore these acknowledgements are written when I am removed in time and place from many of those persons who aided me. To those individuals whom I fail to mention herein, their help is appreciated.

To Dr. P.J. Smith, my supervisor, I sincerely express my thanks for his criticisms, comments, encouragement and most of all his patience throughout the time it has taken to complete this final draft. I also appreciate the understanding and comments offered by the other members of my examining committee, Dr. P. Heron and Dr. S.I. Smith.

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To Mr. Bill Johnson, my field assistant I sincerely appreciate the work he performed during hours and conditions which are not normally requested by an employer.

During the summer spent in the Broken Group, much assistance was provided by the staff, (in particular Mr. Peter Greengrass) and students of the Bamfield Marine Station; this was gratefully appreciated.

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A number of persons worked on the production of the various drafts. Firstly, I thank Barb Wankiewicz, who worked frantic and long hours on the first draft. Secondly, Belinda Royal, who despite her 'pressing' schedule found the time to complete the final draft. Lastly, to Pat Wankiewicz, for without her help, encouragement and sustanance the first draft would not have been completed prior to leaving Canada. To these individuals I owe much.

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Finally to my wife, Joy, I offer my praise and admiration. Though she did not realize that she was not only marrying myself but also a thesis, she provided the necessary encouragement and distractions along the way.

J.P.V.

February 26, 1977
Njala University College
Sierra Leone
West Africa.

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CHAPTER I

INTRODUCTION

For many people in the developed world, the time available for leisure has greatly increased over the past few decades. Associated with this trend has been an increase in the number of people participating in outdoor recreation, which is one of the ways in which leisure time can be expended. As a result, pressures are being exerted on outdoor recreational resources, especially those areas designated as national and provincial parks. In an attempt to meet the growing demand, and for conservation of resources, new areas are continually being established as parks. To plan for their recreational use and development, a variety of baseline information is required. As an example, this thesis will analyze the recreational resources and present use of a new but undeveloped marine park area on the west coast of Vancouver Island, the Broken Group islands, Pacific Rim National Park.

RECREATION

Recreation, as it is understood in this thesis, is inseparable from the so-called quantitative concept of leisure which stresses the time available for freely-chosen activities.

In this view, leisure is discretionary time, "the time beyond existence and subsistence time" (Clawson, 1964, p.4).[1] Recreation is considered to occur in discretionary time, a fact which seems particularly pertinent to those forms of outdoor recreation which require the designation of large special areas well removed from places of work or residence. It is virtually inconceivable that a recreationist would travel to a national or provincial park in anything other than discretionary time.

Several approaches to recreational research can be differentiated on the basis of their underlying definitions of leisure. Traditionally, recreation has been defined as participation in activities. The advantages and disadvantages of this approach have been summarized by Driver and Tocher (1968, p.10).

> The activity approach has many advantages, such as the ease of identifying who participates in what activity, when, where, and for how long. However, it suffers disadvantages because it does not make explicit the need to consider other relevant questions: Why is the recreationist participating in the activity? What other activities might have been selected if the opportunities existed? What satisfactions or rewards are received from the activity? How can the quality of the experience be enhanced? In other words, the activity approach frequently assumes that supply defines preferences (and sometimes that supply will generate demand), but it does not question what latent preferences are not being met. It causes recreation planners to focus on supply and give too little attention to demand, which is frequently appraised in terms of past consumption.

More recently, to offset the deficiencies of the activity approach, a behavioral approach has been proposed by Driver and Tocher (1968). Recreation is viewed as a psycho-physiological experience. These authors make and explain five postulates:

1. Recreation is an experience that results from recreational engagements
2. Recreational engagements require a commitment by the recreationist
3. Recreational engagements are self-rewarding: the engagement finds pleasure in and out of itself, and recreation is an experience
4. Recreational engagements require personal and free choice on the part of the recreationist
5. Recreational engagements occur during non-obligated time.

(Driver and Tocher, 1968, p.12)

A combination of the two approaches allows for recreation research to analyze the quantitative aspect of recreation with reference to activities, and the qualitative aspect of recreation with reference to the experience of the recreationist. However, for this thesis, which is primarily concerned with the supply function of a recreational area, a definition of recreation which stresses activity was accepted:

> 'Recreation is activity which individuals voluntarily engage in during leisure time, the motivations being personal satisfaction or pleasure derived before, during, and after participation.
>
> (Canada, 1969, p.5)

PROBLEMS OF OUTDOOR RECREATION

Outdoor recreation is simply recreation "in an environment where the significant factors contributing to the opportunity for activity are natural as opposed to man made" (Canada, 1969, p.5). It is expressed on the landscape in a variety of ways. Like other land uses in which land is valued in economic terms, such as agriculture and forestry, outdoor recreation can be studied within

the broad framework of demand and supply. Demand refers to the expressed or latent desire for a commodity or service at a specified time and price. Supply is the quantity of a commodity or a service available at a particular time and price.

Demand

The demand for outdoor recreation has greatly increased over the past few decades. For example, between 1957 and 1970 visitation at Canada's national parks rose from 3.5 million to over 13.5 million, representing an increase of 288 percent (Bryan, 1973, p.258).

The increase in the demand for outdoor recreation areas, facilities and services is attributable to a number of factors. This has been well documented by Wolfe (1964), Clawson (1968), and Bryan (1973). The most important factors which they cite are: increase in population, increase in real and disposable income, increase in mobility due to the automobile and extension of paved highways, and increase in the amount of leisure time.

The major problem with demand is trying to determine exactly what it is for a particular activity or activities, or for a particular site. Demand for outdoor recreation may be assessed at various levels. First, the total population of a specified area, be it a nation[2], province or region, may be studied in order to indicate the total spectrum of the recreation demand at a specific point in time. Such a study would survey those persons who express their demand as well as those whose demand is latent due to lack of facilities, opportunity or funds.

At a second level, specific recreational activities may be studied to identify all their characteristics in detail. This would involve a study of a population with both latent and expressed demands for the specific activity.

The third level of demand is site specific. Its assessment is concerned with the expressed demand and would indicate the present level and pattern of use of a specific recreational area. This type of study, in fact, is the first central purpose of this thesis.

Supply

The supply of outdoor recreation areas, facilities and services has been largely handled by the public sector through the direct participation of various levels of government.[3] However, private enterprise also performs an important function in catering to specific minority demands and often complements existing public park areas by offering specialized services and facilities.

The increase in the demand for outdoor recreation has necessitated the re-evaluation of existing recreational areas and the establishment of new ones. Within existing areas, increased demand has led to problems related largely to the development of ancillary facilities and to over-use.[4] The majority of studies which have evaluated problems of over-use have dealt with public recreational areas under national or provincial jurisdiction. The problems are three-fold; physical, ecological, and psychological.[5] Physically-oriented problems are usually associated with those physical elements subjected

directly to use, such as soils and the resultant problems of erosion and compaction. Ecological problems are concerned with living organisms and the intricate balance and relationship among them and with the physical resource. Studies of these problems would deal with destruction of vegetation and degradation of habitats. The psychological problems associated with over-use are often concerned with the perceived level of use which detracts from the overall recreational experience of the individual or group.[6]

To analyze these recreational problems, the concept of carrying capacity was adopted from the biological sciences. Recreational carrying capacity refers to "the number of persons for which an area can provide recreation while maintaining the conditions that originally make it desirable for that purpose" (Sudia and Simpson, 1973, p.25). Carrying capacity encompasses the physical, biological, social and psychological elements which contribute to a recreational experience. Therefore, the application of the carrying capacity concept to recreation can have implications for the planning of existing recreational areas.

The definition of carrying capacity, quoted above, "implies that natural characteristics of the area are of primary importance and form the basis for management" (Sudia and Simpson, 1973, p.25). Identification of new areas for recreation "should be limited to conditions and characteristics of the natural resource themselves" (Davis, 1971, p.3). Therefore, the concept of the carrying capacity of the natural environment can be employed as the basis for identifying new recreational sites.

The inventory techniques, developed on these principles, are designed to assess the capability of land and water resources to support recreation (Canada, 1969; Ontario, 1968; Taylor and Thomson, 1966). Capability is a somewhat broader concept than carrying capacity because it also embraces the specific features which will attract people to a recreational site and influence the quality of the recreational experience that they can expect. For example, the Canada Land Inventory (CLI) Land Capability Classification for Outdoor Recreation is based on the "quantity of recreation which may be generated and sustained per unit area of land per year under perfect market" (Canada, 1969, p.7), but it also recognizes that different types of resource features will facilitate different types of recreational activities. A number of papers have demonstrated the need for and value of capability surveys, predominantly in relation to the CLI (Cressman and Hoffman, 1968; Rowe, 1971; Hamill, 1971). This thesis is in the same stream. Its second central purpose is to evaluate the resource base of a particular site, the Broken Group islands, to determine its capability for recreational use.

Carrying capacity of a social or psychological nature refers not only to the relationship of users with one another but also the relationship between the resource base and the users. In this study, information concerning users' attitudes toward the resource base was solicited to complement the capability study.

These baseline studies of recreation capability and present use and user attitudes should provide important information to Parks Canada planners so that the Broken Group islands can be managed to maintain the quality and recreational attraction of their environment.

Supply and Demand Relationships

One of the fundamental problems of outdoor recreation is a locational problem of imbalance between the centres of demand and supply. Traditionally, the major recreation areas have been within national or provincial parks which were fairly remote from the urban population centres, but it has come to be recognized that the development of new recreational areas, to match the centres of supply with demand, should not

> centre on the acquisition of the unique and dramatic resources for the public but on the broad availability of outdoor recreation for enjoyment by everyone, and often; nearby open areas for weekend visits by moderate-income urbanites are more characteristic of our recreational needs than the annual trip to a far-away area of unforgettable beauty by the fortunate persons who can get there.
>
> (Perloff and Wingo, 1962, p.26)

Clawson (1968) has proposed a model of user, intermediate and resource-oriented parks and recreation areas. This model "is perceived as reducing land use conflicts and environmental damage by concentrating facilities-oriented, high-use recreation areas closer to cities" (Nelson, 1976, p.112). Under this system national parks would be classified as resource-oriented areas. Classification of Canada's national parks as resource-oriented is compatible with their policy to "preserve for all time areas

which contain significant geographical, geological, biological or historic features as a national heritage for the benefit, education and enjoyment of the people of Canada" (Canada, 1975, p.3).

In national parks which were established to preserve areas of outstanding natural environment which could not be matched elsewhere or replaced, the problem of imbalance between the centres of supply and demand is often reflected in the incompatibility of intensive forms of recreational use in resource-oriented areas. However, "people will seek out the unusual outdoor areas (national parks) for their common (intensive) types of outdoor recreation if an adequate supply of the more common types of areas conveniently located, is not available" (Clawson, 1968, p.63). What is required is a re-evaluation of the total supply function of outdoor recreation. "National parks cannot be planned and managed as if they were the only kinds of outdoor recreation areas; their place in the whole parks system may be critical, in planning their management" (Clawson, 1968, p.65).

In recent years Canada has pursued a systems approach to the development of new park areas based on the goal of establishing a park within each 'Natural Region' of Canada (Canada, 1971c). These regions are primarily discerned on the basis of physiography. This has led to the development of parks in the north, where it has been jurisdictionally possible, or in the less settled parts of Canada. One park which has been recently proposed is Pacific

Rim National Park which includes the islands of the Broken Group, the marine based area which is the subject of this thesis.[7]

Planning for the Broken Group islands should be resource-oriented because it is a national park and should provide opportunities for extensive or dispersed forms of recreation. The islands are reasonably close to large population clusters in Canada and the United States. Therefore, they will undoubtedly appeal to a large number of recreationists, whose only interest may be in intensive forms of recreation. This has definite implications for the management of the area. For example, improvement of access to the Broken Group islands could encourage use which is not compatible with a marine, resource-oriented park.

THE MARINE PARKS CONCEPT

The concept of marine parks has been slow in evolving even though the first reserve was designated in Florida in 1935.[8] As a result of increased pollution, and recreational use of the marine resources and adjacent shorelines, the need for the establishment of marine parks and reserves, primarily for conservation reasons, has developed.

World-wide attention was focused on the concept of marine parks and reserves during the First World Conference on National Parks held in Seattle during 1962. A resolution was passed asking:

> the governments of all those countries having marine frontiers and other appropriate agencies, to examine as a matter of urgency the possibility of creating marine parks or reserves to defend underwater areas of special significance from all forms of human interference and further recommends the extension of existing national parks and equivalent reserves with shorelines into the water to the one fathom depth on the territorial limit or some other appropriate offshore boundary.
>
> (First World Conference on National Parks, Recommendation 15)

During the conference, Pablo Rosera Galarza proposed the following comprehensive definition of a marine park:

> A marine park is an area of land in contact with the sea, whether submerged or emerged; in the first case it is a submarine park land, in the second it may be totally separated from the continental mass, as an island, or it may maintain contact with the continent, taking on several geographical forms such as a peninsula, a cape or any of the various land formations which have contact with the sea.
>
> (Galarza, 1968, p.361)

Prior to the First World Conference on National Parks the majority of marine parks were in the tropical regions of the Atlantic Ocean, while the Pacific Ocean had only two (Wallis, 1961). Since the conference, the concept has gained appeal as is illustrated by the increase in the number of marine parks established. As of 1970, Hawaii, California, and Florida had been foremost in establishing marine parks. Japan has also been active since the Eleventh Pacific Science Conference was held in Tokyo in 1966; by 1972, Japan had designated twenty-two Marine Areas (Tamura, 1972). Several of these areas have been developed for intensive use at rather high costs. Other countries which have established marine parks are Australia, Kenya, South Africa, Bahamas, Philippines, Ecuador, and the Marshall and Palua Islands

of the United States Pacific Islands Trust Territory. Extensive surveys of the coasts of Canada and Tanzania have been completed. In Canada much of the ground work was conducted with reference to a proposal to establish the Strait of Georgia as a national underwater park.[9] British Columbia has established a number of marine parks, but these are no more than small anchorages with minimal development.

A review of the established marine parks indicates the purpose or functions that such areas can serve. These include: i) preservation for ecological reasons, whether as unique ecological units, or as representative environments, or for protection against environment degradation; ii) preservation of scenic underwater sites for their educational and interpretative value; iii) marine based recreation; iv) marine science research; and v) preservation of historical or archaeological sites.

Areas provided for marine-based recreation are normally highly developed to maximize the interaction between the users and the marine environment. They should be located near large population centres so that maximum use is made of the expensive facilities. Schultz (1967) has discussed the various types of recreational activities and facilities which are normally associated with underwater resources. These range from skin and scuba diving to subsurface craft, including both open and closed submarines, surface water craft with below deck portholes and glass bottoms, suspended walkways, and underwater tunnels and observatories.

Ever since the concept of marine parks was developed, the preservation and conservation of the marine resources have been the paramount factors. Ray (1972, p.262) has suggested that marine parks cannot be established and managed like terrestrial parks even though "coastal zone management, of which parks and reserves are a significant part, cannot be successful without recourse to land management as well." The sea cannot be fenced in due to its three dimensional mobility and the extent and nature of the marine ecosystem. In his address during the Second World Conference on National Parks, Ray concluded:

> The park idea, like any worthwhile idea must evolve. I do not envisage a sea cut up by boundaries which separate the preserved from the exploitable while, offshore, the laissez-faire of the commons is maintained. For marine parks this would spell disaster. I see parks existing only within the framework of regional management, including both land and sea, or else they will not work at all.
>
> (Ray, 1972, p.266)

PLANNING CONCEPTS

Throughout the previous discussion on the problems associated with outdoor recreation in general, and marine parks in particular, the importance of planning was stressed. Generally, "planning is viewed as a process - a series of evolutionary and rationally organized steps which lead to proposals for guided ... development" (Chapin, 1972, p.349). Recreational planning is an integral part of the land use planning process and as such can be carried out on two general scales (Palmer, 1967, p.19).

Broad scale planning integrated with general land use planning would determine where new recreational areas could be established relative to areas of competing land uses. Broad scale planning should view the total spectrum of recreational areas within a specific jurisdiction and attempt to integrate the various elements into one system. This type of planning approach should not only alleviate incompatibility of uses but also indicate deficiencies within the system.

The second level of planning is site specific and essentially involves master planning of a single park area. Before a discussion of this planning process, a review of general concepts would be of value.

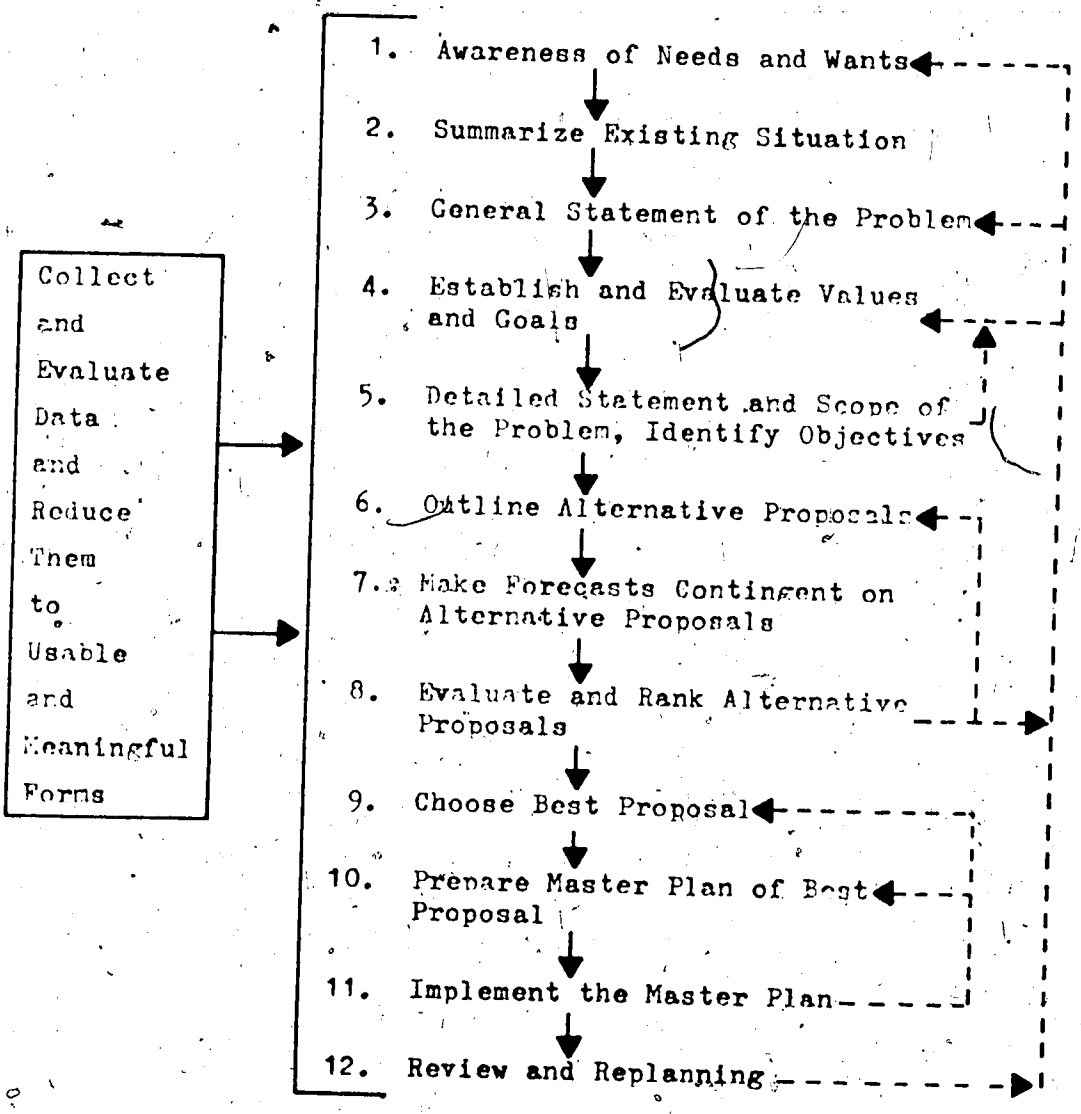
There are two basic approaches to planning which have been discussed by Faludi (1973, pp.131-132). First in time is "the blueprint mode", which has characterized past planning. This has been defined as an approach "whereby a planning agency operated a programme thought to attain its objectives with certainty." Currently, however, there is a trend towards the adoption of a "process mode" which admits the uncertainty of the world. The process mode of planning "is an approach whereby programmes are adapted during their implementation as and when incoming information requires such changes." The process mode emphasizes the continuing nature of planning, whereas blueprint planning is essentially static. In the process mode, then, the central concern is for policies and principles rather than for a detailed view of a future state, the blueprint. The future simply cannot be forecast with the assurance that is presumed in blueprint plans.

Faludi has also described how planning has been pursued through one of two methods, depending on whether attention has been focused on means (functional) or on ends (normative). In functional planning the goals are given, whereas normative planning is "chiefly concerned with the ends of action of a system. The goals of normative planning are those of the system itself" (Friedmann, 1966/7, p.172). Goals have been defined as "an end towards which a design trends, an aim or purpose" (Chadwick, 1971, p.125). Faludi stresses that a combination of these two can lead to rational planning "only where both the ends and the means of action are judged rationally, that is when it is both functional and normative, can planning be described as substantially rational" (Faludi, 1973, p.173).

The master planning process to be outlined below is one which is similar to many which are oriented towards the normative mode. Uleck (1971) has proposed a twelve-stage process which is "an organized sequence of steps requiring conscious and continuous action." The process, with a few minor adaptations, is outlined in Figure 1.[10] The steps of the process can be categorized into a number of stages. Steps one through three involve a scanning of the environment "in which needs and wants are experienced which might be satisfied by action on the environment" (McLoughlin, 1969, p.96). It is at this stage that baseline information concerning the supply and consumption of recreational opportunities should be collected. The fourth and fifth steps essentially establish the goals and objectives which serve as the guiding principles for

FIGURE 1

STEPS IN THE MASTER PLANNING PROCESS



Heavy arrows (——▶) show the order in which the steps are performed.

Dashed arrows (- - -▶) show some of the major feedback linkage between steps, that is, interdependencies.

(Adapted from Ulack, 1971)

the remainder of the planning process. Step six outlines alternative proposals which are designed to meet the goals and objectives in various ways. The seventh through ninth steps essentially evaluate alternative proposals in light of detailed information on the environment, the result of applying models designed to envision the implications of each proposal, evaluated in cost/benefit terms. Based on these evaluations, an alternative is selected. Step ten, the preparation of the master plan, is a further refinement of the alternative and suggests specific management strategies. The master plan:

> is a statement of wilful intention that sets forth accepted goals and the way those goals are to be achieved. The master plan systematically outlines the actions that are to be taken acquiring land, in designing and constructing facilities and in structuring human behavioral patterns associated with the development plan.
>
> The master plan need not and probably should not contain all the details of means-end identification. The plan should be somewhat flexible to accommodate change with a minimum of cost and effort. And it should serve as an instrument for evaluating and overseeing the actual physical development of the natural resource base to judge progress toward stated goals.
>
> (Uleck, 1971, p.209)

The master plan document is specific, but subject to revision when necessary.

Once the master plan is formulated and adopted, it can then be implemented. Implementation requires that site plans be formulated. These site plans deal with specific developments such as campgrounds and therefore reflect the 'blueprint mode' of planning.

The plan is subject to review at some specified time interval with regard to the results obtained, the plan's impact, and any changes which may have occurred in the environment. The goals and strategies of the plan could then be altered in light of this new information or situation. This last step is what characterizes the planning as continuous and dynamic.

THE RESEARCH PROBLEM

Since 1969, Parks Canada has expanded its system into predominantly northern and coastal environments. Little information exists, however, concerning the present recreational resources and use of these areas. The situation is epitomized in the Broken Group islands, of Pacific Rim National Park. This marks the first expansion of Parks Canada into an offshore marine area on either the east or west coasts. Presently the area is subject to recreational use even though formal park development has not taken place. This situation provides a unique opportunity to study the recreational use of a naturally suitable marine environment. The overall problem therefore is: what are the recreational resources of the Broken Group islands, and is the present use appropriate for the area?

RESEARCH OBJECTIVES

When analysing resources for outdoor recreation an integrated approach combining physical, human and cultural factors is required. "There is a danger when studying leisure, of

examining individual aspects in isolation, thereby creating artificial divisions within a complex system where the process of interaction itself has a profound effect" (Owen and Duffield, 1974, p.55). An integrated approach to recreational resource evaluation was proposed by Baker (1961). To evaluate supply prospects effectively, he recommended three related lines of investigation: i) basic research into the relationship of the natural environment to recreation; ii) a present recreational land use inventory; and iii) a land capability inventory. To determine how use relates to capability, information on why people use an area along with their evaluations of the resources are required.

The objectives of the thesis therefore, are as follows:

1) To determine the recreational capability of the Broken Group islands
2) To identify the present level, location, type and period of recreational use
3) To determine the reasons for the present recreational use
4) To identify the recreational resources as evaluated by the users
5) To analyze the user information and synthesize this with the recreational capability of the area so as to draw conclusions about the appropriateness of the present recreational use of the area in relation to the recreational capability.

RESEARCH METHODOLOGY

The recreational capability of the study area was evaluated according to the CLI Land Capability Classification for Recreation. This is basically an objective method for estimating the quantity and quality of recreation that the land resource could support at a specific time. Both the shorelands and the uplands of the islands of the Broken Group are interpreted. Recreational values of the water body "accrue to the adjoining shore land unit and as such are not classified" (Canada, 1969, p.4). It is assumed that demand and accessibility are uniform over the inventory area, and that present land use and management do not influence the ratings. A preliminary investigation was based on hydrographic charts and air photos. The final interpretation was based on vegetation, landform and soil reports, and a site survey. The results are presented on a series of maps at a scale of 1:18,750.

A user inventory was conducted in the summer of 1975. A personal interview questionnaire was devised to solicit information on i) profile data, ii) travel patterns, iii) motivations, iv) recreational activities, v) resource evaluation, and vi) satisfaction. Analysis of the data includes frequency counts, means, and cross tabulations.

PRESENTATION OF THE THESIS

The thesis is divided into five chapters. This first chapter has outlined the scope of the thesis in relation to outdoor recreation problems and planning concepts. It has discussed the concept of recreation that has been adopted for thesis purposes and introduced the concept of marine parks.

The second chapter is a regional description which examines the physical, biological and cultural components of the landscape in relation to their recreational attractions. The third chapter outlines the CLI capability system used in the resource inventory and presents the results of the interpretation for the Broken Group islands. Advantages and disadvantages of the personal interview technique were discussed along with a presentation of the results in chapter four. The fifth and final chapter synthesizes the capability and user inventory results and presents a number of planning considerations resulting from the total exercise.

NOTES

1. For a discussion of the concepts of leisure, see Murphy (1974) who proposes a dynamic conceptualization of leisure using six categories; and Parker (1971) who classifies the definitions of leisure into three broad categories: residual, normative and qualitative.

2. This was one of the objectives of the Outdoor Recreation Resource Review Commission (ORRRC) which was established in the United States in 1958. The study culminated in a report on Outdoor Recreation in America (United States, 1962) and was a synthesis of twenty-seven study reports. Wolfe (1964) has reviewed in detail both the study and background reports.

3. Clawson (1968) has traced the development of recreation and park areas, excluding national parks, in the United States and Canada.

4. Ecological problems created as a result of these developments are discussed in International Union for the Conservation of Nature and Natural Resources (IUCN), 1967; Nelson, 1968; Pole, 1973; and Bryan, 1973.

5. For a general discussion of the physical and ecological problems see: IUCN, 1967; Marsh, 1968; and Bryan, 1973. For a discussion of the problems related to trail use and campsite use see: Dotzenko, Papamichos and Romine, 1967; Thorsell, 1969; and McQuaid, 1973.

6. For example, see Lucas (1962) who investigated crowding in a wilderness area.

7. An overview of Pacific Rim National Park and its development has been recently written by Beatty (1976).

8. Previous reviews of the development of the marine parks concept and a survey of established marine parks and reserves can be found in Randall, 1969 and 1971; and Marsh, 1970.

9. A number of Canadian government reports have been concerned with the establishment of the Straight of Georgia as a national park. These are:

   1) "Symposium on the Proposal to Name Strait of Georgia a National Park" (Canada, 1970a).

   2) "A Theme Study of the Marine Environment of the Straits Between Vancouver Island and the British Columbia Mainland" (Canada, 1970b).

3) "National Marine Parks Straits of Georgia and Juan De Fuca" (Canada, 1971b).

10. These adaptations were: inclusion of 'wants' in the first step, inclusion of 'objectives' in the fifth step and inclusion of 'review' in the eleventh step.

CHAPTER II

REGIONAL DESCRIPTION

On April 21, 1970, an agreement was signed between the Province of British Columbia and the Government of Canada to establish in principle Pacific Rim National Park.[1] Located on the west coast of Vancouver Island, Pacific Rim is composed of three sections: i) Long Beach, between the villages of Tofino and Ucluelet; ii) the Broken Group islands, which includes more than 50 islands centrally located in Barkley Sound; a iii) the West Coast Trail, extending from Bamfield to Port Renfrew (Fig. 2).

To date none of the three sections has been proclaimed as a national park. The federal legislation concerned allows for the official designation of the sections as a national park once all the requirements of British Columbia legislation have been met. The latter legislation:

1. authorized the provincial government to enter into an agreement with the federal government to establish a national park in the Renfrew, Barclay and Clayoquot districts;
2. empowered the provincial government to acquire title to those lands not owned by the federal or provincial governments and pay one-half of the cost of land acquisition;
3. established that title could be acquired by purchase, gift, exchange or appropriation, and lands could be exchanged for other Crown lands;

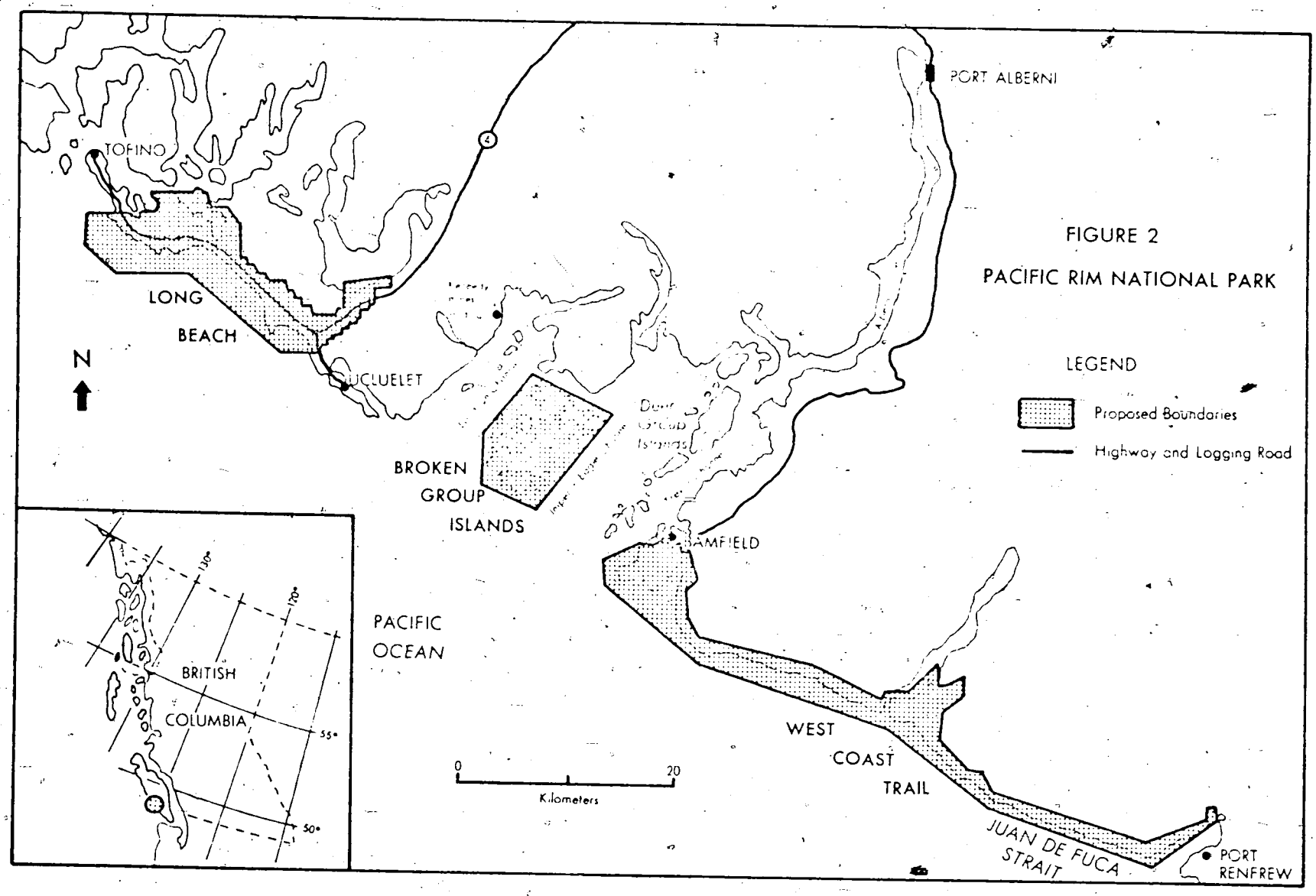


FIGURE 2

PACIFIC RIM NATIONAL PARK

4. established that the lands, once acquired, could be transferred to the federal government;
5. stated that the Lieutenant-Governor-in-Council could make regulations and orders
   a) designating lands to be "park lands" within the meaning of the act
   b) designate any portions of park lands, (lands in the Renfrew, Barclay, and Clayoquot districts) as the portion to which the act applies.

(Miller, 1972, p.12)

At the present time there are disputes over boundaries and leases, and land has still to be acquired from private ownership. The boundaries of both the Long Beach and West Coast Trail sections are in dispute over the distance to which the park should extend offshore; whether in relation to the 20 or 10 fathom contour lines. The Broken Group islands is the only section whose boundaries are firm.

SITE AND SITUATION

The Barkley Sound region has, until recently, been a fairly inaccessible area of Vancouver Island. The livelihood of its inhabitants is closely tied to the natural resources of the area. This is illustrated by the small fishing villages of Bamfield (population 141; Canada, 1971d, p.9) and Ucluelet (population 1,0187; Canada 1971a, p.5). The area is also important for logging, and provides timber for the large lumber, pulp and paper mills of Port Alberni (population 20,063; Canada, 1971a, p.5), the regional, commercial centre for west-central Vancouver Island.

Recently, the economic base has been diversified by the provision of services and facilities for those tourists attracted by Long Beach and the challenging West Coast Trail. The newly paved highway between Port Alberni and Tofino brings an influx of visitors every summer to the Long Beach area.[2] Bamfield, which is assessible by an unrestricted logging road, has also developed, serving as a terminus for many West Coast Trail hikers, as well as being the site of a marine biological station. The Broken Group islands have not experienced the full impact of these regional developments yet, but they can be expected to attract more use as they become better known and more accessible.

Due to their situation in Barkley Sound (the most southerly major sheltered anchorage on the west coast of Vancouver Island), the Broken Group islands are accessible by a number of routes other than from the ocean side. From Port Alberni, pleasure craft can cruise the length of the Alberni inlet to Barkley Sound with minimal difficulty, depending on the tidal, wind and wave conditions. Public passage is also available year-round on the M.V. Lady Rose, a passenger and cargo ship which has been operating between Port Alberni, Bamfield and Ucluelet since before the development of roads. Between Port Alberni and Ucluelet, passengers of the Lady Rose may embark or disembark at any number of sites within the islands. From either Kennedy mines landing in Toquart Bay, which is accessible from Highway No. 4 via a logging road, or from Ucluelet or Bamfield, a boat trip to the Broken Group islands is approximately one-half to three-quarters of an hour's duration, depending on the type of boat and surface conditions.

SURFACE AND SUBMARINE CONFIGURATION

Carter (1971) has described Barkley Sound as:

> a large, roughly rectangular embayment, 24 km wide and up to 20 km long that is divided into three main channels (Trevor, Imperial Eagle, Loudoun) by the islands of the Broken and Deer Groups. Leading into the sound are several fjords (Pipestem, Effingham, Alberni Inlets) incised into the rugged topography of the Vancouver Island Ranges (these inlets coalesce to form Barkley Sound). This relief contrasts with the narrow, low lying Estevan Coastal Plain (Holland, 1964) that skirts the northern shores of the sound.
>
> (Carter, 1971, p.442)

The majority of Pacific Rim National Park is classified within the Estevan Coastal Plain which is described as "less than 150 ft (45m) above sea level and interrupted by irregular hills and isolated knobs seldom more than 250 ft (75m) high" (Holland, 1964). The individual islands within the Broken Group generally rise to more than 60 m above sea level (ASL) while the local relief within the coastal plain is usually less than 45 m. The highest point within the islands is on Nettle Island at 96 m ASL. The islands, therefore, may be considered as an extension of the Vancouver Island Ranges at a lower elevation.

The designated boundaries of the Broken Group islands comprise a total of 93 km^2, of which approximately 20 percent is land (Fig. 3). The remaining 80 percent includes a stretch of the Pacific Ocean to the southwest and calmer channels and bays among the islands.

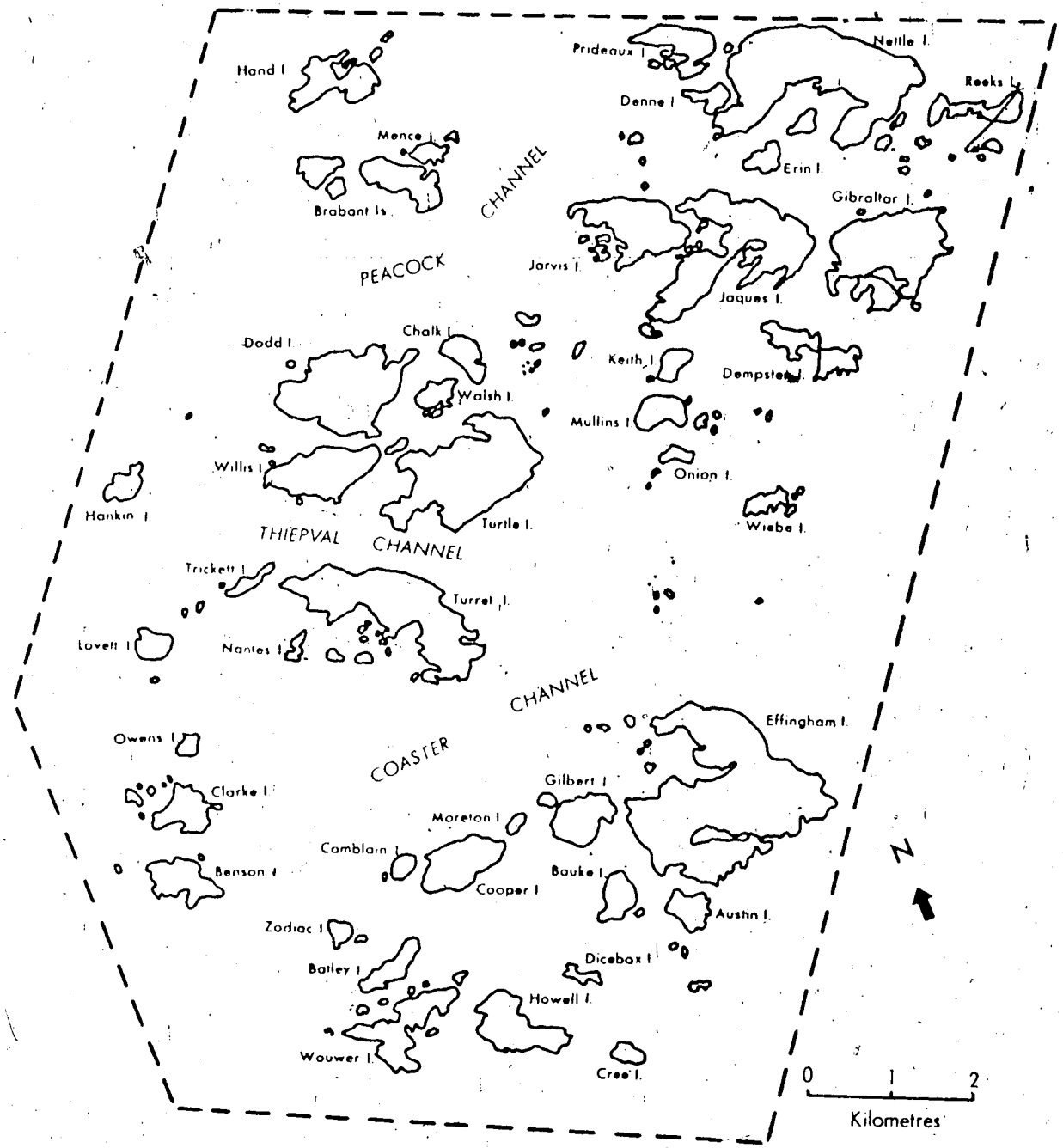


FIGURE 3

THE BROKEN GROUP ISLANDS

The islands within the Broken Group are relatively small; fifteen are between 4 ha and 15 ha, thirteen are between 15 ha and 50 ha, and only seven are over 50 ha. Effingham Island is the largest, with an area of 240 ha.

This area underwent extensive glaciation during the Pleistocene period. The recent emergence of the coastline, the exposed resistant bed rock, and the steep offshore slope account for the lack of shoreline features of marine origin (Holland, 1964). The shoreline is generally rugged with only a few minor accumulations of beach material of either sand or calcareous composition.

The few beach areas within the islands are the most attractive shoreline for recreation. However, these are liable to change in slope and size when subjected to storm waves. They are subject to erosion during the winter months and deposition in the spring and summer. These beaches support such activities as beaching of small boats, camping, sunbathing and beachcombing. Those having western exposure are the most attractive, because they face the evening sun.

Where there are soft layers within sedimentary and volcanic rocks, sea caves and blow holes have been carved out by wave and surf action. Several are found on the east shore of Effingham Island and on the southern shores of Wiebe and Dempster. Rock ledges formed by surf action are found on Wouwer, Benson, Howell and Cree Islands. Only those on Wouwer and Benson are accessible. These offer a valuable viewing and exploring experience. Sea cliffs have

> developed along sections of the coastline where there are occurrences of readily eroded rocks such as the softer Cretaceous and Tertiary shales and shaly sandstones, or extensive accumulations of till and glacial materials.
>
> (Holland, 1964, p.114)

Several occur on Benson, Cree, and Howell Islands.

A few tidal flats are found throughout the islands. These afford opportunity for intertidal study and general exploring. There are a number of lagoons which are suspected to be inundated with salt water at high tide and during the winter months when storms are more prevalent. These are located on Hand, Gibraltar and Wouwer Islands.

The islands are split into four major units by the Peacock, Thiepval and Coaster Channels, whose depths extend to a maximum of 65 m (Appendix B - Chart No. 3658). Among the islands the maximum depth varies considerably, from less than a meter to over 40 m. A large number of shoals, not all of them charted, makes piloting both tedious and challenging. Sheltered bays which can be used as anchorages include Effingham Bay, Salal Harbour[3] and the reach between Erin and Nettle Islands.

MARINE ENVIRONMENT

The marine environment is perhaps the most attractive and accessible element of the Broken Group islands. The subtidal life and the few wrecks found among the islands are particularly attractive to divers. The most outstanding wreck found in the area is the VanLene, located on a shoal off the shore of Austin

Island. The intertidal life is quite diversified and is the subject of study for recreationists, and for biologists from the Bamfield Marine Station. The variety of sea mammals which can be seen throughout the islands adds a significant element to the overall recreational experience.

Substratum

The substrata range from mud to solid rock. These have been categorized and described by Lee and Bourne (1973, p.9). Mud of a particle size less than 0.002 cm

> is restricted to areas where wave action or currents are minimal. . . . In the subtidal zone of channels between the islands, mud forms a thin cohesive layer over sand and gravel.

Sand of the particle size 0.002 to 1.923 cm

> comprises a major proportion of the substratum . . . especially in the subtidal areas below about 10 meters. . . . On many of the smaller intertidal beaches the soil layer is only a few centimeters deep, overlaying gravel or rock substratum.

Gravel ranges from 2.0 to 25.4 cm in diameter.

> Larger beaches in the islands . . . are gravel mixed with varying amounts of sand and mud. Subtidally gravel is found commonly at the base of rock walls or at the edge of boulder fields.

The rock substratum is widely distributed and includes

> boulders (0.3 to 1.23 m in diameter), intertidal and subtidal beaches, vertical cliffs and other large expanses of rock. . . . Boulder beaches are not common but are found subtidally at the base of rock cliffs along exposed areas.

Water Characteristics

The following information on the water characteristics was compiled from information recorded at Bamfield (Wilimovsky, 1969). Tides are of the mixed semi-diurnal type having a maximum

amplitude of 3.9 m. Tides greatly influence the amount of shoreline available for recreation at a particular time, especially at those beach sites with a low offshore gradient. Tidal action also makes it difficult for the inexperienced sailor to beach or moor his boat close to shore. Although tides may inhibit the more popular forms of beach activities on an intensive scale, there is a potential for beachcombing and exploring tidal pools.

The most significant variation of surface water temperatures can be expected to occur spatially rather than seasonally. Temperatures recorded at various times and points within the islands during the summer of 1975 ranged from 0° to 19°C. Within sheltered and shallow bays they were commonly between 15° and 17°C. These temperatures, although cool, do not necessary prevent swimming. The thermocline occurs at about 4 to 6 meters, below which the temperature is uniformly between 8° and 10°C. Diving below the thermocline requires that a wet or dry suit be worn.

Water clarity is a function of the concentration of planktonic organisms and suspended matter in the water. Casual observation suggests that there does not appear to be any influence from pollution. The minimum compensation depth (1 percent incident light) as determined from seechi disk readings would approach 12 to 15 m below the surface. This occurs during the summer at the time of plankton blooms. During the winter, the water is much clearer, and attractive for swimming and skin and scuba diving.

Biota

The most notable mammals in the Broken Group are a herd of approximately 50 to 60 sea lions (Eumetopias jubatus, Steller sea lions; Zalophus Californianus, California sea lions) which inhabit Sea Lion Rocks year round.[4] These may be viewed on a day when the sea is calm, at varying distances depending on the type of boat and how much water it draws. Pacific harbour porpoise (Phocoena phacaena), killer whales (Orcinus Orca), and seals (Callorhinus ursinus, Northern fur seal; Phoca vitulina richardi, Pacific harbour seal) are also frequently seen throughout the islands.

Several areas adjacent to the Broken Group islands boundary are popular for coho and spring salmon (Oncorhynchus spp.) fishing. These are within the vicinity of Swale Rock and Meares Bluff. Within the islands, commercial fishing is prohibited.

A dominant feature of the marine environment is the exposure to surf. Exposure is largely a function of orientation to open seas, depth of offshore water and the local configuration of the shore. The Broken Group islands, situated in a sheltered sound, have exposed, semi-exposed and sheltered areas. As a result the intertidal and subtidal life is more abundant and varied than in many areas on the west coast of Vancouver Island. Lee and Bourne have explained:

> It should be understood that the lee or rocky areas and narrow channels between islets can provide pockets of shelter on an otherwise exposed coast. Species zonation can lead to the postulation of many arbitrary stages along this gradient.
>
> (Lee and Bourne, 1973, p.8)

The intertidal life in the islands exhibits a large variety of marine life at low tide including bi-valves which in recent years have been prohibited from consumption due to the red tide.[5] Subtidal life includes green sea urchins (Strongylocentratus d obebachiensis), northern abalone (Haliotis kamtschatkana), and prawns (Pandalus spp.). From conversations with visitors and residents these are not as abundant as they once were, due to the harvesting pressures by sport and, particularly, by commercial interests.

CLIMATE

According to the Koppen system, the climate at the Broken Group islands is classified Cfb, a marine west coast climate. This is substantiated by the data recorded at Ucluelet (Table 1). The area experiences approximately 290 cm of precipitation per year, 70 percent of which falls within the winter half-year from October through March. During the remaining months, the monthly average is 14 cm. Temperatures are relatively mild; the monthly average temperature is over 5°C throughout the year. Six months average over 10°C.

The prevailing winds in the summer are from the northwest and are relatively much calmer than those which can be expected from the southeast. In winter, the prevailing wind is from the southwest to west depending on the cyclonic source.

TABLE 1

CLIMATIC DATA FOR UCLUELET

Element	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Latitude 48°58'N Longitude 125°32'W Elevation 18 ft. ASL													
Mean Rainfall (cm)	41.88	29.69	30.12	22.05	12.14	10.33	9.22	6.98	14.14	30.03	26.32	42.24	287.09
Mean Snowfall	11.93	3.81	1.27	-	-	-	-	-	-	-	-	2.28	19.00
Mean Total Precipitation	43.07	30.04	30.73	22.05	12.14	10.17	9.22	6.98	14.14	30.03	36.23	42.46	289.02
Maximum Precipitation in 24 hrs.	11.81	11.30	12.00	12.47	9.90	9.89	8.25	7.11	9.01	11.55	11.35	12.49	12.49
Mean Daily Temperature (Deg. C)	15.50	5.00	6.50	8.50	11.00	14.00	15.00	15.00	13.00	10.00	7.00	5.00	9.50
Mean Daily Maximum Temperature	8.50	9.00	10.50	13.00	16.00	18.50	19.50	20.00	18.00	15.00	11.00	9.50	14.00
Mean Daily Minimum Temperature	2.00	1.00	3.00	3.50	6.00	9.50	9.50	10.00	9.50	6.00	3.50	2.00	5.00
Maximum Temperature	17.00	20.00	21.00	2.50	29.50	31.00	33.00	34.50	30.00	24.00	18.50	14.50	34.50
Minimum Temperature	-15.00	-9.00	-8.00	-5.00	-7.00	1.50	2.00	1.50	-1.00	08.00	-7.50	11.00	-15.00

Source: Canada, 1967, p.41

Extensive fog banks, experienced during the summer, are probably due to the prevailing winds from the northwest forcing the warm surface water off the coast. "Upwelli of the cold bottom water creates conditions favourable for fog" (Pincock and Turner, 1956). Local fog banks experienced throughout or surrounding the islands are probably due to ocean warmed air contacting night cooled air from the adjacent land masses. In late summer, the probability of fog is 25 percent (Pierce, 1973).

The weather experienced during July and August of 1975 was extremely variable. This is one of the few negative elements that detracts from the island's recreational attractiveness. Daily maximum air temperatures were usually between 15° and 20°C. It rained on approximately 40 percent of the days, the majority of these days occurring during the latter half of August. The weather patterns appeared to influence the recreational use of the islands. The mornings were fairly calm, and this was the time when the majority of local fog banks occurred. When present, these fog banks would burn off before noon. During the afternoon the wind would increase along with the wave height. Depending on the type of boat and direction of travel, a trip between the islands and the mainland could take two to three times longer in the afternoon than in the morning.

SOILS AND VEGETATION

Pierce (1973), has extensively surveyed and classified the soils of the Broken Group islands. The predominant soil type in the area is humo ferric podzol. The podzol soils are further differentiated on the basis of their parent material, whether basal or ablation tills. The soils associated with basal tills range in depth from 0 to 25 cm and are usually found on hill tops and the upper slopes. The soils associated with ablation tills are generally deeper and not as well drained. They extend to a maximum depth of 75 cm and are usually found on the mid to lower slopes. Other soil types in the area include organic bogs, rocky headlands and middens.[6] The only soils prohibiting usage are ablation tills, on steep slopes, where they may be susceptible to mass wasting. The organic horizon is fairly deep due to the vigorous vegetative growth.

Generally, the vegetation inhibits recreational use of a large amount of the landscape. Shorelines are often found to possess impenetrable growth restricting entry to the interior unless a well-maintained trail exists.

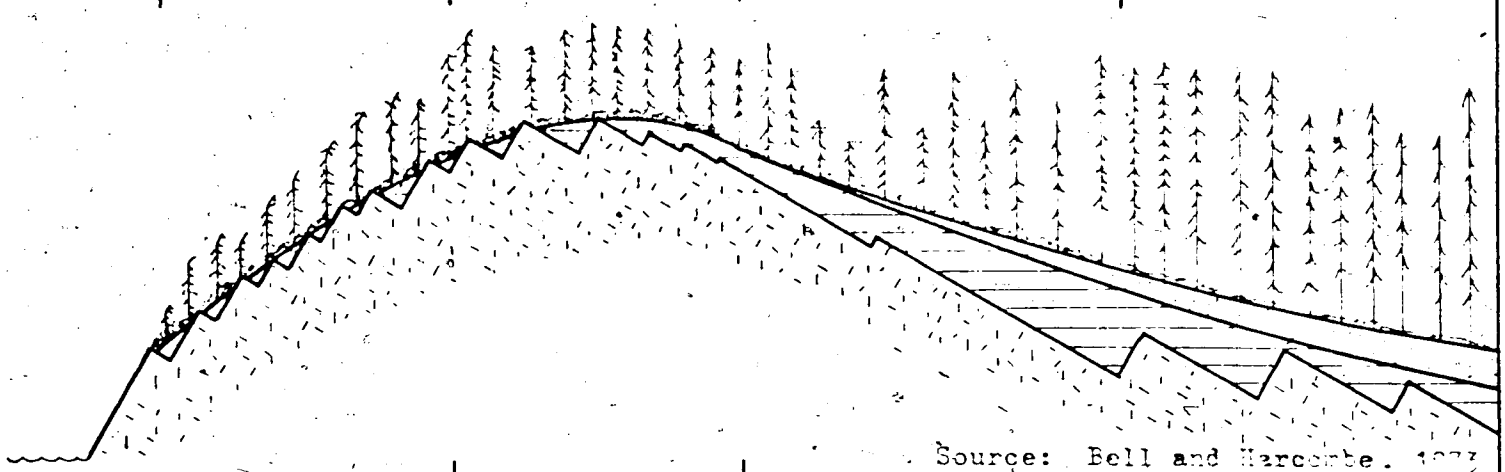
Over 80 percent of the islands are covered by the Thuja plicata (western red cedar) - Tsuga heterophylla (western hemlock) forest community (Bell and Harcombe, 1973). These tree species are associated with till soils (Figure 4).

Within the Picea sitchensis (sitka spruce) forest community, the Picea sitchensis, Tsuga heterophylla forest type is the most significant for recreation.

FIGURE 4

VEGETATION AND SOIL RELATIONSHIP IN THE BROKEN GROUP ISLANDS

VEGETATION	Dominant tree	Thuja plicata	Thuja plicata	Thuja plicata	Tsuga heterophylla
	Dominant Understorey	Vaccinium ovatum	Vaccinium ovatum	Gaultheria shallon Polystichum munitum	Blechnum spicant
	Physiognomy	stunted and shaped by wind	uniform stands of small trees	irregular canopy all tree sizes	dense tall canopy and well-developed ground vegetation



Source: Bell and Marcombe, 1973

PHYSICAL FEATURES	Wind exposure	strongly exposed	moderately exposed	moderately exposed	sheltered
	Surficial materials	till pockets or shallow till over rock	shallow till over rocks	shallow (or no) ablation till over compacted till	deep ablation till over compacted till (lower slope)

> In the northwest tip of Turret Island, a variation of this type occurs. The dense tree canopy blocks most of the sunlight from forest floor and a shrub and herb understory is almost completely absent. A few small areas such as this are also found in the southern end of the Picea forest on the Effingham midden and immediately behind one of the smaller middens on Turret Island. These latter open sites, though restrictive in number have a high recreation potential in terms of providing sheltered tenting areas, with need for minimum understory clearing.
>
> (Bell and Harcombe, 1973, p.27)

Within both the Thuja plicata - Tsuga heterophylla and Picea sitchensis forest communities the understory is dominated by Gaultheria shallon (salal), Vaccinium spp. (blueberries, huckleberries) and Blechnum spicant (deer fern) and Sphagnum spp. (sphagnum mosses). The Gaultheria shallon shrub community occurs on the exposed sites of the islands' outer edges.

MAMMALS AND BIRDS

Studies of the mammals and birds of Pacific Rim National Park were conducted by Hatler (1972) and Hatler, Campbell and Dorst (1973). These reports have been submitted to Parks Canada, but were not available for reference in this thesis. During the time spent on the islands, deer (Odocoileus hermionus columbianus), racoons (Procyon lotor vancouverensis) and mink (Mustelidae vison evagor) were the most commonly observed mammals. Bald eagles (Haliaeetus leucocephalus) and cormorants (Phalacrocorax spp.) were the only outstanding birds seen.

SETTLEMENT AND RECREATIONAL USE

The evidence of settlement within the Broken Group islands is well concealed by its vegetation, but its discovery can add greatly to a recreational experience. The settlement history of the area should provide a valuable resource for park interpretive programs.

Before the white men arrived, the Nootka Indians were living off the land and the abundant sea resources found within the vicinity of the Broken Group islands. Their lifestyle harmonized well with their environment and their impact on the landscape was therefore slight. Evidence of their occupation still remains, however, in the form of shell and forest middens, fish traps and a number of burial caves (Fig. 5). The most extensive and deep middens can be found on Nettle, Effingham, Dicebox, Turret and Willis Islands. Fish traps are scattered throughout the islands in association with minor tidal flats.

Evidence of white man's influence on the Broken Group islands is largely in the form of scattered patch and selective logging which can be seen on Hand, Willis, Prideaux and Nettle Islands. On Prideaux there is an abandoned mine. Benson Island proved to be expecially interesting,

> because several tree species, including Populus (sp.) (poplar), Fraxinus (sp.) (ash), Sorbus aucuparia (mountain ash) and Aesculus hippocastanum (horse chestnut), apparently were planted by Benson in the 1890s. According to records in the cabin on Benson Island, he developed the extensive shell midden as a subsistence farm, post office, sports fishing

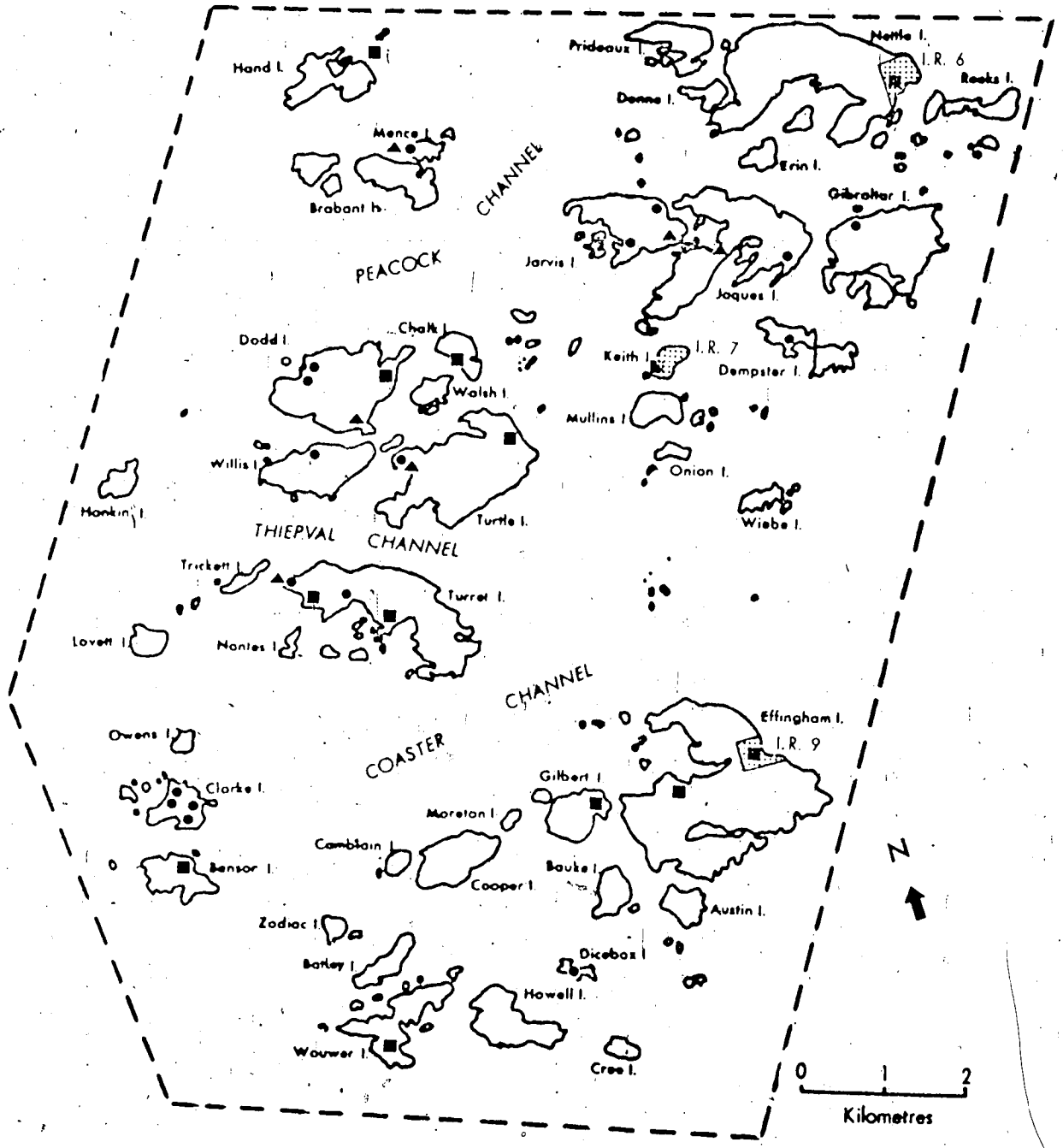


FIGURE 5

INDIAN RESERVES, CULTURAL DEPOSITS AND FISH TRAPS

LEGEND

- Indian Reserve
- ■ Urtica dioca shell midden community
- ● Forested shell midden
- ▲ Fish traps

> resort, and as a base for hand logging with oxen through the islands. Benson died about 1918 and the farm has gradually returned to bush, though many of his trees still remain.
> (Bell and Harcombe, 1973, p.71)

Presently only one permanent resident remains in the islands. He is locally known as 'Salal Joe' and resides aboard a floating shack in Salal Harbour. Eight summer cabins have been built in the area, five by residents of Port Alberni and the remainder by Americans (Fig. 6).

In recent years the islands have been subject to increasing recreational use. A number of campsites are located throughout the islands, usually in association with middens or fresh water sources. This is evidenced by trampling and clearing of the underbrush and particularly the refuse left behind. Three trails have been established, one on each of Effingham, Benson and Gibraltar islands. Hiking along the trails on Effingham and Gibraltar Islands affords an opportunity to view their forests. The trail on Benson begins at the old farm site and opens out at the exposed west shore of the island on a cliff offering an outstanding view of the ocean and islands.

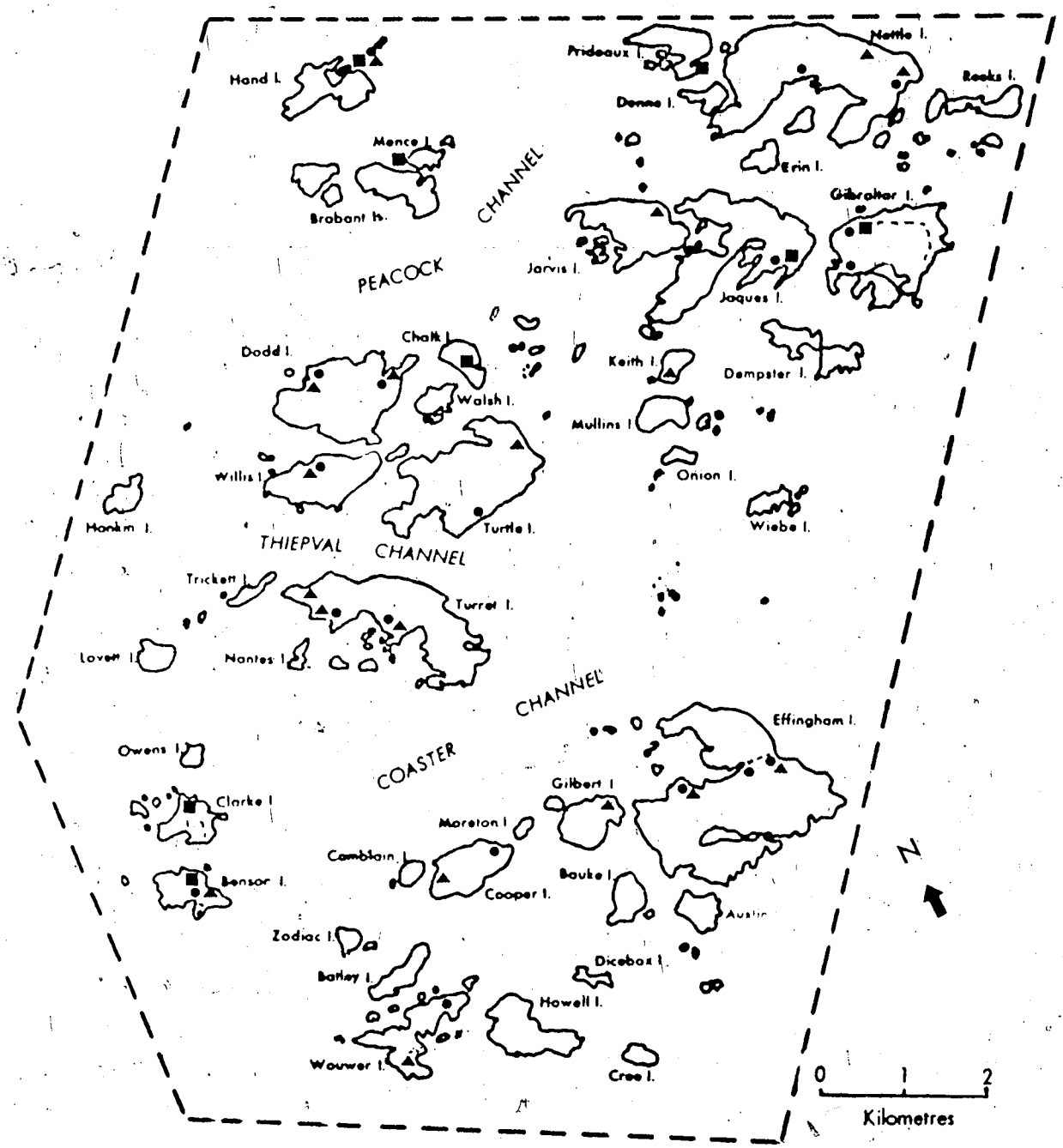


FIGURE 6

CAMPSITES, CABINS, TRAILS AND FRESHWATER SOURCES

LEGEND

▲ Campsites

■ Cabins

--- Trails

● Fresh-water

NOTES

1. For a discussion on The Origin of Pacific Rim National Park see Miller, 1972.

2. Beatty (1975, p.10) states "visits to Pacific Rim have risen from 193,000 in the 1972-73 fiscal year to exceed 282,000 in 1974-75."

3. Salal Harbour refers to the sheltered body of water bounded by Willis, Dodd, Chalk, and Turtle Islands.

4. Sea Lion Rocks refers to the small, rocky islands and shoals immediately west of Wouwer Island.

5. Red tide is a paralytic, shellfish poisoning. A shellfish ingested with a toxic, dinoflagellate, a microscopic, one celled plankton animal, will poison warm blooded animals when consumed (Jensen, 1973).

6. A midden is an accumulation of cultural refuse, in this case left by the Nootka Indians.

CHAPTER III

RECREATIONAL CAPABILITY

The need for information on land capability has developed from the increasing competition among different land uses for limited land and water resources. Although population and per capita levels of consumption have increased, the amount of land and water available has remained virtually static. While technology has provided the opportunity to use resources more intensely and to expand into new areas, the need to plan for effective use of existing resources is paramount. These resources should be planned and developed for an optimum level of use which would prevent degradation of the resource base.

Several land inventory methods for recreational capability have been proposed. These have been reviewed by McCutcheon (1966), Anderson (1967), and Nowicki (1969). The methods range from Hill's (1966) detailed site evaluation to a relatively simple and subjective method proposed by Taylor (1965). Between these extremes is the technique devised for the Canada Land Inventory Land Capability Classification for Outdoor Recreation which is an objective but largely qualitative attempt to inventory natural resources according to their capability for recreational use. Although the CLI technique was not devised to deal specifically

with marine based recreation, the classification of shoreland areas does account for the recreational attractions of the adjacent water areas. This was an important reason for adopting the CLI technique for this thesis. In addition, it is a technique which has had wide application; it is easily applied and understood, and it lends itself to graphic representation.

THE CANADA LAND INVENTORY

The Canada Land Inventory was developed in 1965 as a methodology to organize specific land use data for broad types of planning. It was intended to provide an estimate of quality, quantity, and distribution of land resources for forestry, agriculture, wildlife and recreation. These estimates are based on the capability of the land to support and sustain these land uses. This information, providing a common ground for comparison, could then be used to develop effective land use plans.

The capability classification for recreation classifies land "according to its natural capability to provide opportunity for recreation" (Canada, 1969, p.6). The stated objectives of the classification program were the following:

1) to provide a reliable and authentic overview of the quality, quantity and distribution of natural recreational resources . . .
2) to indicate the type of recreation to which land is best suited
3) to identify lands or features possessing outstanding or unique recreational values

4) to provide basic information to aid governments in the formulation of policies and programs related to their functions of promotion, development and regulation of lands for recreation.

(Canada, 1969, pp.3-4)

The CLI technique was not meant to be applied to the management of small areas. Nevertheless, there is much value in using it as a basic inventory tool for small areas, such as the Broken Group. It can yield detailed information concerning the recre[illegible] resource base, which, when combined with specific studies [illegible] ironmental features as vegetation, landforms and s[illegible] provide the resource capability inputs that are essential [illegible] formulation of site plans. If nothing else, the development options are thrown into sharper relief by such a process.

The basis of the CLI recreation capability classification "is the quantity of recreation which may be generated and sustained per unit of land under perfect market conditions" (Canada, 1969, p.7). A number of assumptions are made which indicates the difference between capability and potential:

- Sound recreational management and development practices are assumed for all areas in practical relation to the natural capability of each.
- No judgement is made concerning the possibility of major modification of land which make it suitable for recreational use.
- Location and present access development do not influence classification.
- Uniform demand and accessibility conditions are assumed throughout the inventory area.

> Present use or management does not influence ratings . . . land is evaluated in its present state, permanent man made structures in a non-urban setting may be considered to be recreational features.
>
> (Canada, 1969, p.6-7)

For this thesis, these assumptions were accepted, with one exception: present use was allowed to influence the classification, insofar as it broadened the surveyor's perception of the resources in relation to specific recreational activities they could support; particularly with respect to the fact that canoeists visited the area, which was not previously conceived.

Classification

Land, comprising rock, soil, water, air, fauna, flora and cultural additions, is initially divided into two broad categories, shorelands and uplands. Water bodies as such are not classified. The recreational value of the water largely accrues to the adjoining shoreland. For lack of a methodology specifically applicable to water areas, any recreational value accruing there independently cannot be indicated. This was one of the shortcomings of using the CLI system in a marine area.

Shoreland is designated first, and anything beyond its boundaries is considered upland. Shoreland is

> a broad term embracing the various components of land fronting on a water body which is either capable of supporting recreational activity or is large enough to do so. . . .
>
> Shoreland extends from the 5 foot (approximately 1.5 m) depth contour at normal low water, inland from the shoreline to a natural boundary or to its boundary which encompasses the direct zone of influence of the water.
>
> (Canada, 1969, pp.110-111)

Shoreland components are defined as follows:

a) Wet Beach: the area of a beach below the normal high water line, usually outward to the 5 foot (approximately 1.5 m) depth contour at normal low water

b) Dry Beach: the area of a beach above the normal summer high water or high-tide level but normally subject to wash by high water, or storm waves

c) Beach: the width of the shore zone which includes the wet and dry beaches

d) Backshore: that part of the shoreland reaching inland from the dry beach normally as far as the extreme extent of storm action or ice erosion. For purpose of the inventory however backshore refers to the zone of influence of the water body embracing the associated development area.

(Canada, 1969, p.111)

The majority of the shoreland-upland boundaries of the Broken Group islands are based on a natural boundary related largely to vegetation type and penetrability. Where a boundary does not exist, or the land adjacent to the shoreland is within the direct influence of the water, a shoreland unit can extend across the island. Conversely, if an island's shoreline is inaccessible for recreational use from the water, the shoreland and the adjacent land area will have the same classification.

As with all CLI inventories the land capability classification for outdoor recreation is based on a rating scale of seven classes (Table 2).

TABLE 2

LAND CAPABILITY CLASSES FOR OUTDOOR RECREATION

Class	Description
1	Very high
2	High
3	Moderately high
4	Moderate
5	Moderately low
6	Low
7	Very low

Source: Canada, 1969, pp.8-9

There are 25 subclasses denoting recreational features or attractions that contribute to an area's capability for supporting intensive or extensive use. These subclasses represent the groupings of the resource requirements of 'popular' recreational activities (Table 3).

The class of a land unit is "determined by the quantity of recreation which a particular association of features within the land unit is judged capable of generating" (Canada, 1969, p.10). For each land unit a maximum of three subclasses is indicated.

The ordering of the subclasses will influence the class designation of a land unit. The dominant feature is the major determinant of the class value. The secondary and tertiary features, will contribute to the capability of the site but are not always significant enough to raise the class of the land unit.

TABLE 3

CLI RECREATION SUBCLASS DESCRIPTION

Symbol	Subclass or Feature	Description
A	Angling	Land providing access to water affording opportunity of angling or viewing of sport fish.
B	Beach	Shoreland capable of supporting family beach activities.
C	Canoe Tripping	Land fronting on and providing direct access to waterways with significant capability for canoe tripping.
D	Deep Inshore Water	Shoreland with deeper inshore water suitable for swimming or boat mooring or launching.
E	Vegetation	Land with vegetation possessing recreational value.
F	Waterfalls and Rapids	Waterfall or rapids.
*G	Glacier	Significant glacier view or experience.
H	Historic Sites	Historic or pre-historic site.

TABLE 3 - continued

Symbol	Subclass or Feature	Description
J	Gathering and Collecting	Area offering particular opportunities for gathering and collecting items of popular interest.
K	Organized Camping	Shoreland or upland suited to organized camping, usually associated with other features.
*L	Landforms	Interesting landform features other than rock formations.
M	Small Surface Water	Frequent small water bodies or continuous streams occurring in upland areas.
*N	Lodging	Land (usually shoreland) suited to family or other recreation lodging use.
O	Upland Wildlife	Land affording opportunity for viewing of upland wildlife.
*P	Cultural Landscape	Areas exhibiting cultural landscape patterns of agricultural, industrial or social interest.
Q	Topographic	Areas exhibiting variety, in topography or land and water relationships, which enhances opportunities for general outdoor recreation such as hiking and nature study or for aesthetic appreciation of the area.
R	Rock Formations	Interesting rock formations.

TABLE 3 - continued

Symbol	Subclass or Feature	Description
*S	Skiing Areas	A combination of slopes, snow conditions and climate providing downhill skiing opportunities.
*T	Thermal Springs	Thermal springs.
U	Deep Water Boating Area	Shoreland fronting water accommodating yachting or deep water boat tripping.
V	Viewing	A vantage point or area which offers a superior view relative to the class of the unit(s) which contain it, or a corridor or other area which provides frequent viewing opportunities.
W	Wetland Wildlife	Land affording opportunity for viewing of wetland wildlife.
*X	Miscellaneous	Miscellaneous features with recreational capability.
Y	Family Boating	Shoreland providing access to water suitable for popular forms of family boating.
*Z	Man Made Features	Areas exhibiting major, permanent, non-urban man-made structures of recreational interest.

* Denotes features not found in the Broken Group islands.

Source: Canada, 1969, pp.111-114.

The subclasses are ranked according to the subjective judgement of the surveyor. The feature which can attract and sustain the greatest amount of recreational use for a site will be indicated as the dominant feature. The secondary and tertiary features will be the next prominent. General guidelines for determining which subclasses should be delimited, and their influence on the rating, are outlined in the CLI Report No. 6 (Canada, 1969, P.77).

In the field, in the Broken Group, it was found that many sites were difficult to assess as they possessed several equally outstanding features, one associated with the marine resource and the other associated with the land. In such a case, the land based feature would be indicated as dominant and the site would be ranked a higher class than if only the land based feature was outstanding. At other times, the guidelines for determining land classes in relation to a specific subclass had to be relaxed. For example, several sites which had caves, classified as the dominant subclass (R), should not have been assigned a class lower than a 3. However, the sites had to be downgraded because they were not easily accessible or could not be subject to intensive use.

One of the major problems with the CLI classification scheme is that "only the first and second capability classes can be quantitatively assigned. Subjectivity increases as the capability level decreases" (Corbett, 1973, p.77). Using the CLI technique, however, it is possible to group and rank individual

sites relative to one another. None was capable of rating higher than class 3. Although classification of the sites is consistent relative to one another, the sites may not be comparable to others located outside the Broken Group, classified with similar class units.

Mapping

The CLI guidelines for mapping were devised so that the classification could be compiled onto maps at a scale of either 1:250,000 or 1:50,000. At either scale, it would be impossible to indicate the specific features found within the Broken Group islands. Therefore, maps at a scale of 1:18,750 are used here.

Each land unit is assigned a combination of symbols. First, the capability class is indicated, followed by the type of land unit (i.e. shoreland or upland) and one to three subclasses. A typical unit would be designated as:

4S-BJC or $4S\begin{matrix}B\\J\\C\end{matrix}$

which indicates a class 4 shoreland unit of moderate capability for dispersed recreational use. Beach activities (B) constitute its prime attraction but it also offers opportunities for gathering and collecting items of popular interest (J) and it fronts on water having significant capability for canoe tripping (C).

Classification Procedures

Preliminary classification of the Broken Group islands was conducted through the interpretation of air photos (British Columbia, 1970) and hydrographic chart No. 3638 (Canada, 1972) which provided valuable shoreline and topographic information.

The field survey was conducted during July and August 1975. It proved to be primarily a shoreline identification and classification, as observed from a boat. This was because of a number of logistical factors particular to the study area: the extensive shoreline was extremely variable and rugged; water levels varied with the tides; shore access was a problem because of the ocean swells and waves; and poor weather was experienced during the latter half of August. Another major problem was the short field season, during which considerable time also had to be devoted to the interview survey. As a result, it was not possible to traverse the total length of shoreline on foot, but those shorelands which were particularly attractive or accessible were investigated more closely. The information collected for a shoreland unit included length and width of the unit, slope, offshore gradient, texture of shore material and other significant observations.

The upland areas were investigated on foot when it appeared that the vegetation was penetrable and that the unit was accessible from the shore. Most of the shore is dominated by thick, vigorous vegetative growth, predominantly composed of Gaultheria shallon, which restricted access into the interior of most of the islands. The degree of penetrability could often be determined from air photographs and a map of penetrability (Harcombe and Bell, 1973). In several areas it was found that the actual penetrability did not reflect that observed from the air photos or indicated on the

map, possibly due to the vigor of recent growth. The information collected concerning the uplands included estimates of penetrability, area of the site, slope and moisture conditions.

The final classification was based on the preliminary investigation, the field survey, and geological, landform, soils, and vegetation studies. The recommendations found in these studies which dealt with recreation limitations and attractions were taken into account.

INTERPRETATION OF THE BROKEN GROUP ISLANDS

The recreational capability classification of the Broken Group is shown in Figures 7A through 7I (Fig. 7, Index Map). The frequency of unit types for shoreland and upland areas appears in Tables 4 and 5 respectively. The class of land units which have a low number of sites are the most notable from a recreational point of view. These identify specific attractions and therefore do not represent extensive portions of the islands.

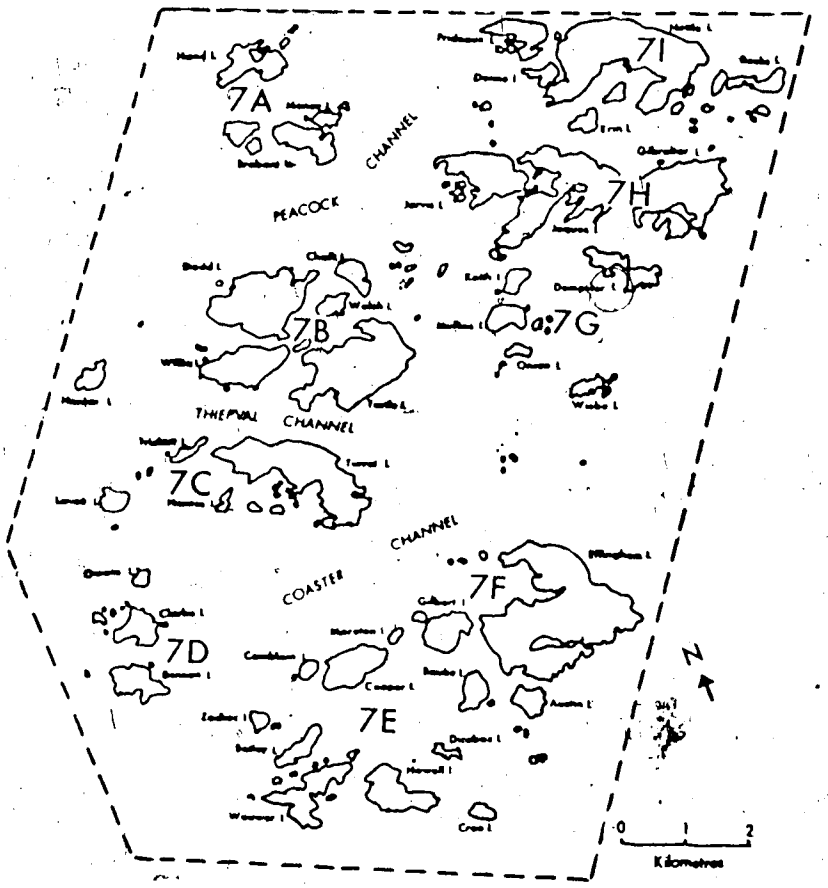
Shorelands

The highest capability rank found in the Broken Group is class 3 which reflects the limited number of sites where beaches are found and the limited size of those beaches. Class 3 identifies a moderately-high capability based on intensive or moderately intensive activities.

Class 3: Five of the six class 3 sites are ranked according to their capability for beach activities (B), or for the suitability of their backshores capable for organized

FIGURE 7

INDEX MAP
TO
FIGURES 7A TO 7I



FIGURES 7A TO 7I

THE RECREATIONAL CAPABILITY UNITS OF THE BROKEN GROUP ISLANDS

Scale approximately 1:18,750

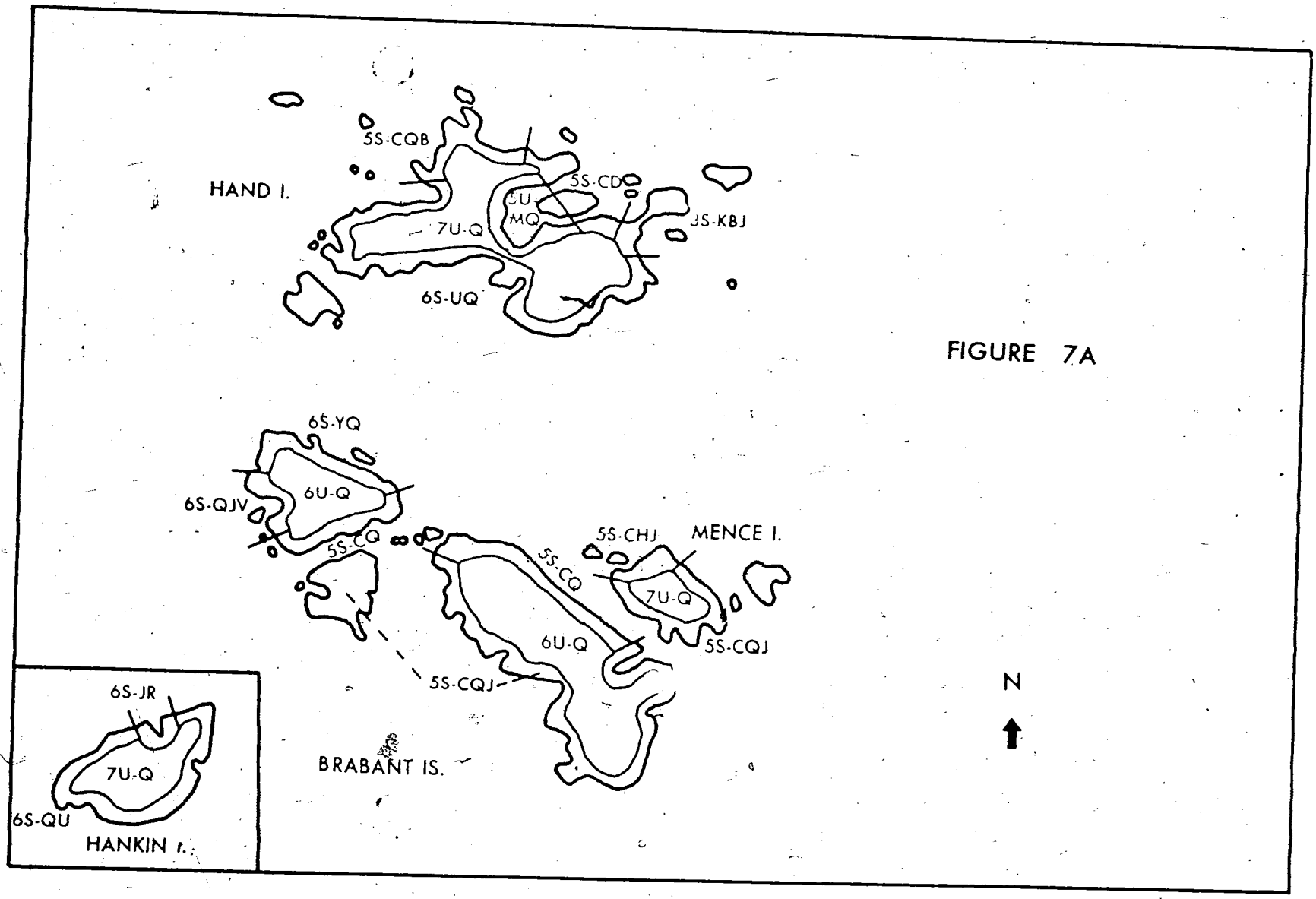

HAND I.
5S-CQB
5S-CD
7U-Q
6S-UQ
6S-YQ
6S-QJV
6U-Q
5S-CQ
5S-CHJ
MENCE I.
7U-Q
5S-CQJ
6U-Q
BRABANT IS.
6S-JR
7U-Q
6S-QU
HANKIN I.
N

FIGURE 7A

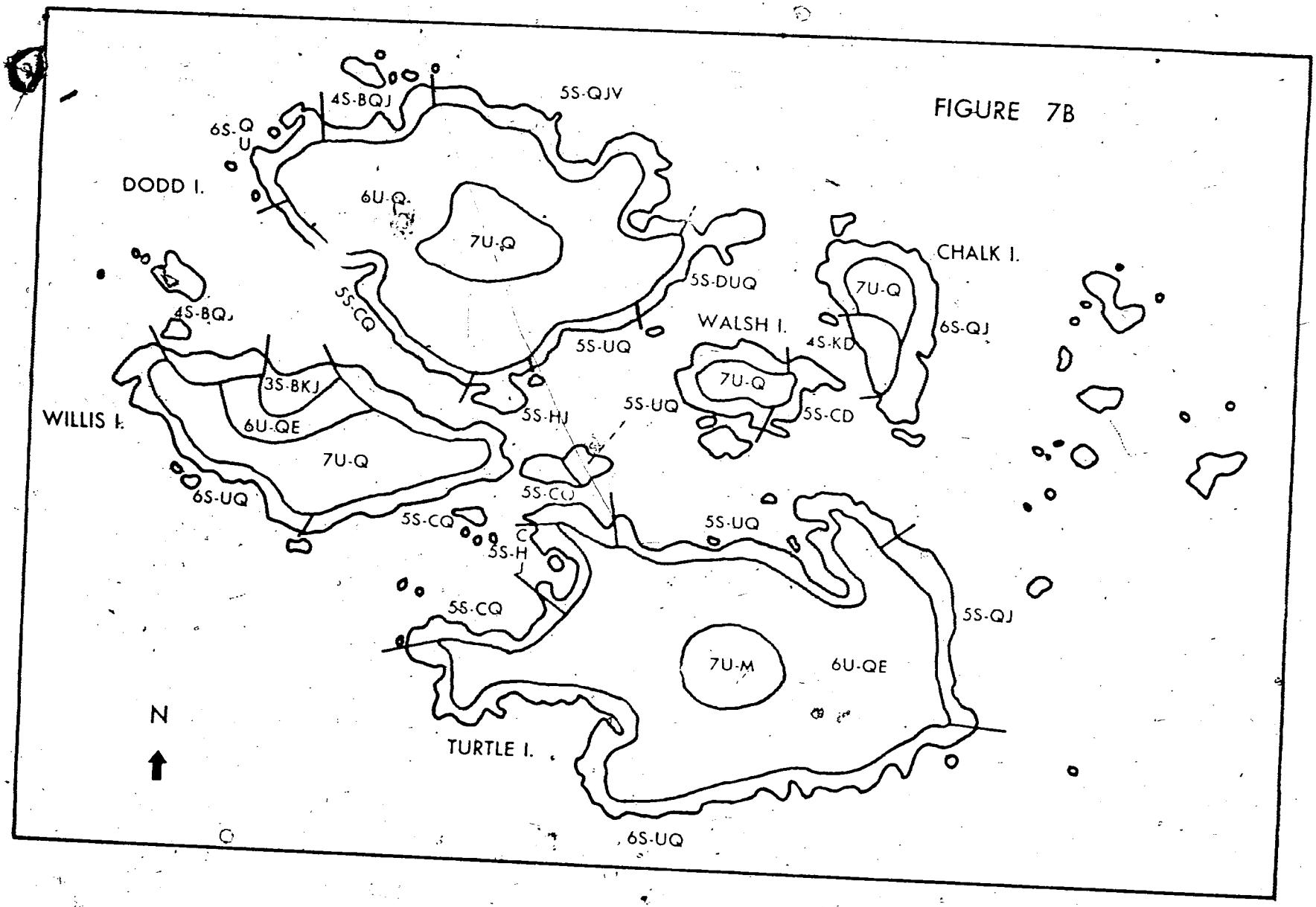


FIGURE 7B
DODD I.
WILLIS I.
CHALK I.
WALSH I.
TURTLE I.
N
4S-BQJ
5S-QJV
6S-QU
6U-Q
7U-Q
5S-CQ
5S-DUQ
4S-BQJ
5S-UQ
3S-BKJ
6U-QE
5S-HJ
7U-Q
6S-UQ
5S-CQ
5S-CQ
C
3S-H
5S-CQ
7U-M
6U-QE
6S-UQ
7U-Q
6S-QJ
4S-KD
7U-Q
5S-CD
5S-UQ
5S-UQ
5S-QJ

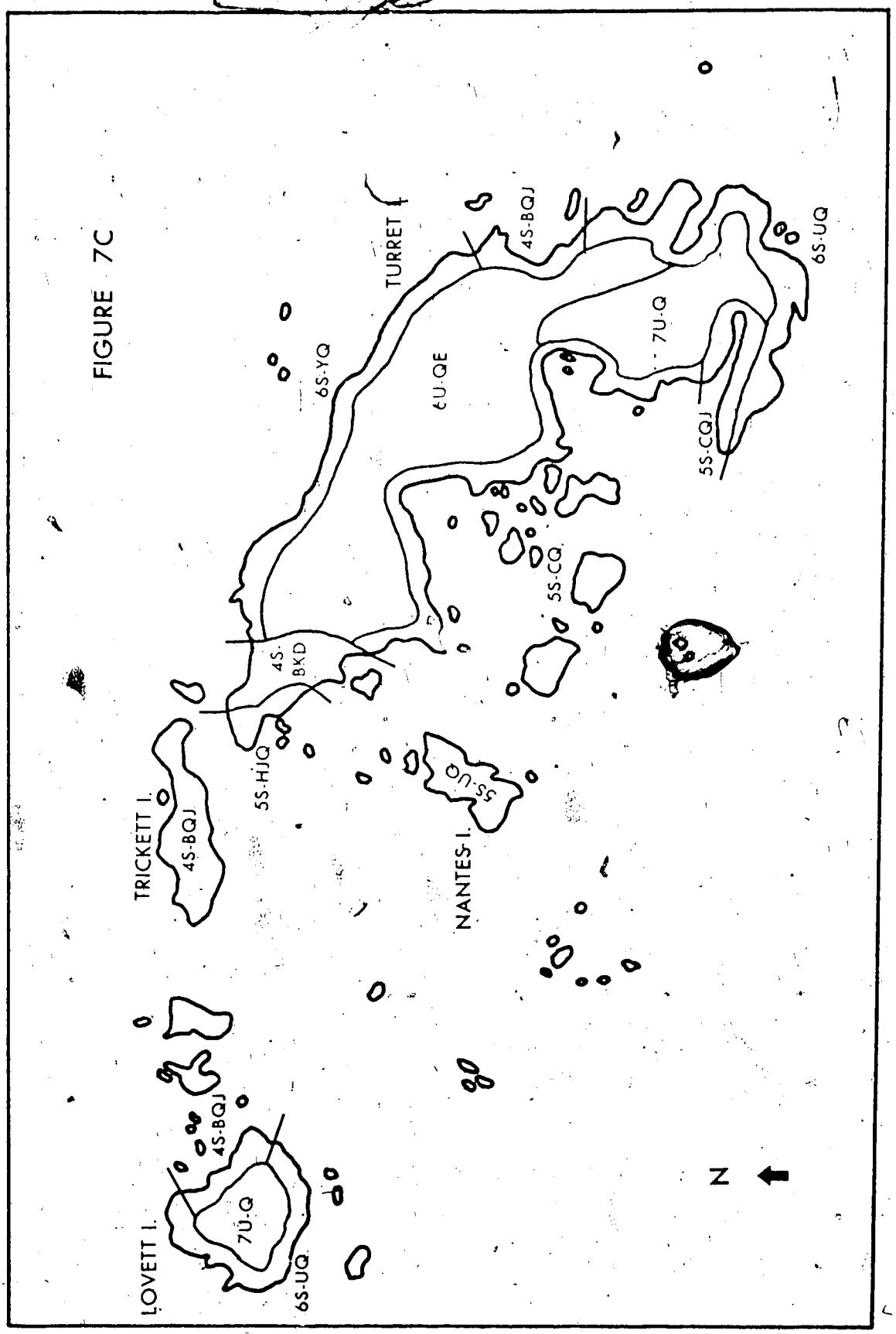


FIGURE 7C
TURRET I.
4S-BQJ
6S-UQ
6S-YQ
6U-QE
7U-Q
5S-CQJ
5S-CQ
4S-BKD
5S-HJQ
TRICKETT I.
4S-BQJ
NANTES I.
5S-CQ
LOVETT I.
4S-BQJ
7U-Q
6S-UQ
N

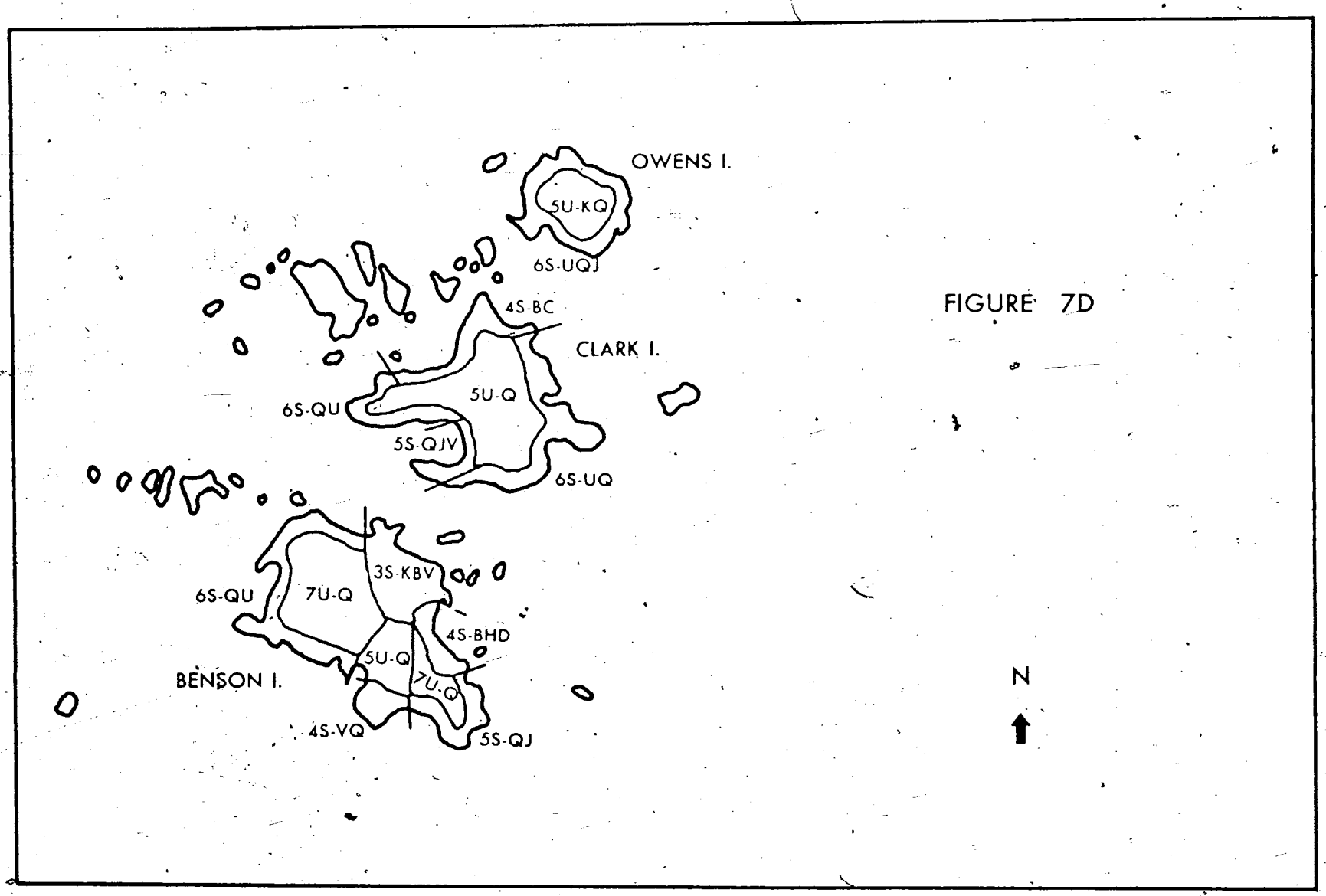

OWENS I.
5U-KQ
6S-UQJ
4S-BC
CLARK I.
5U-Q
6S-QU
5S-QJV
6S-UQ
3S-KBV
6S-QU
7U-Q
4S-BHD
5U-Q
BENSON I.
7U-Q
4S-VQ
5S-QJ
N

FIGURE 7D

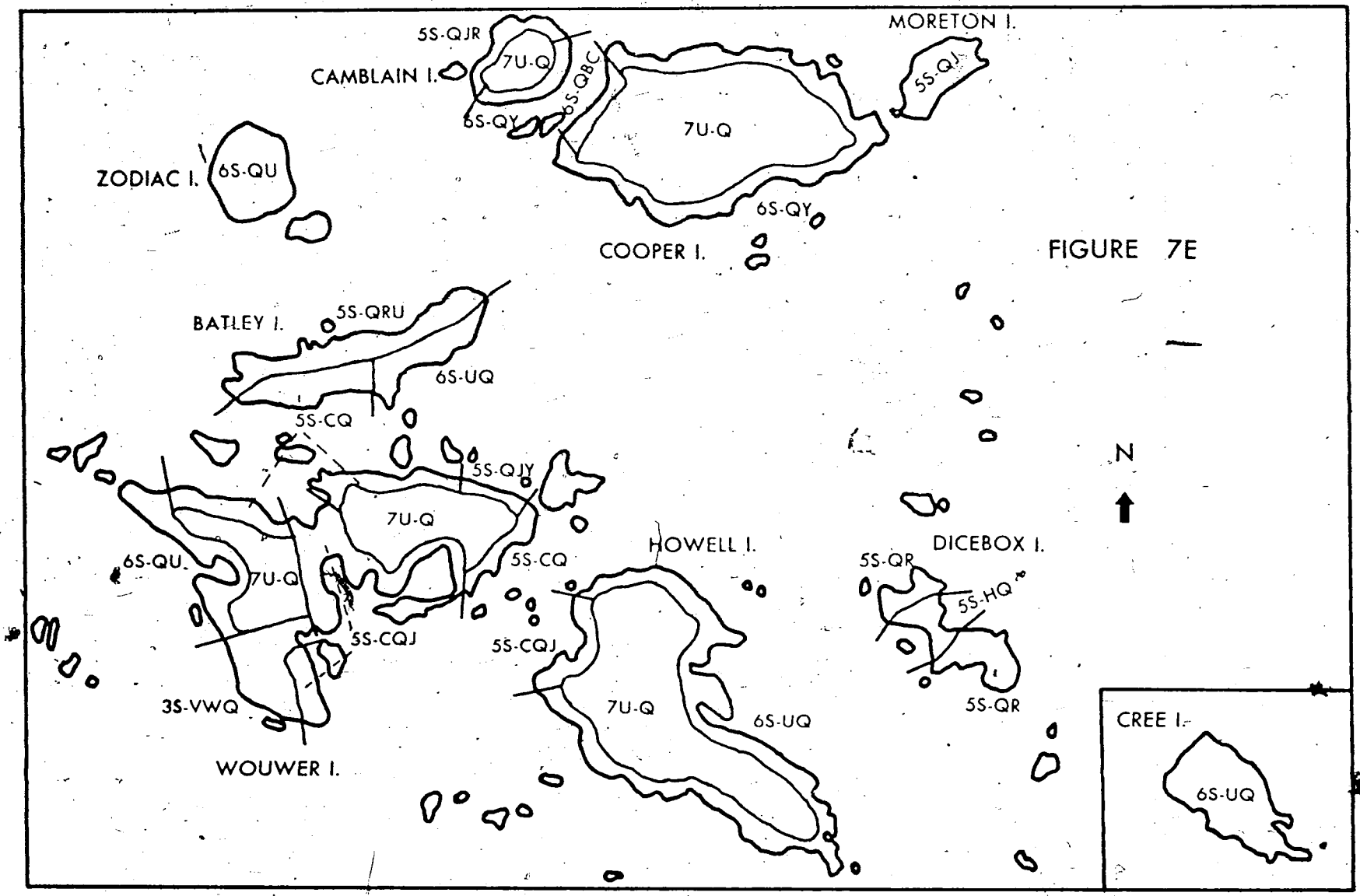

5S-QJR
7U-Q
CAMBLAIN I.
6S-QBC
6S-QY
MORETON I.
5S-QJ
7U-Q
ZODIAC I.
6S-QU
6S-QY
COOPER I.
BATLEY I.
5S-QRU
6S-UQ
5S-CQ
5S-QJY
7U-Q
6S-QU
7U-Q
5S-CQ
5S-CQJ
5S-CQJ
HOWELL I.
7U-Q
6S-UQ
3S-VWQ
WOUWER I.
N
DICEBOX I.
5S-QR
5S-HQ
5S-QR
CREE I.
6S-UQ

FIGURE 7E

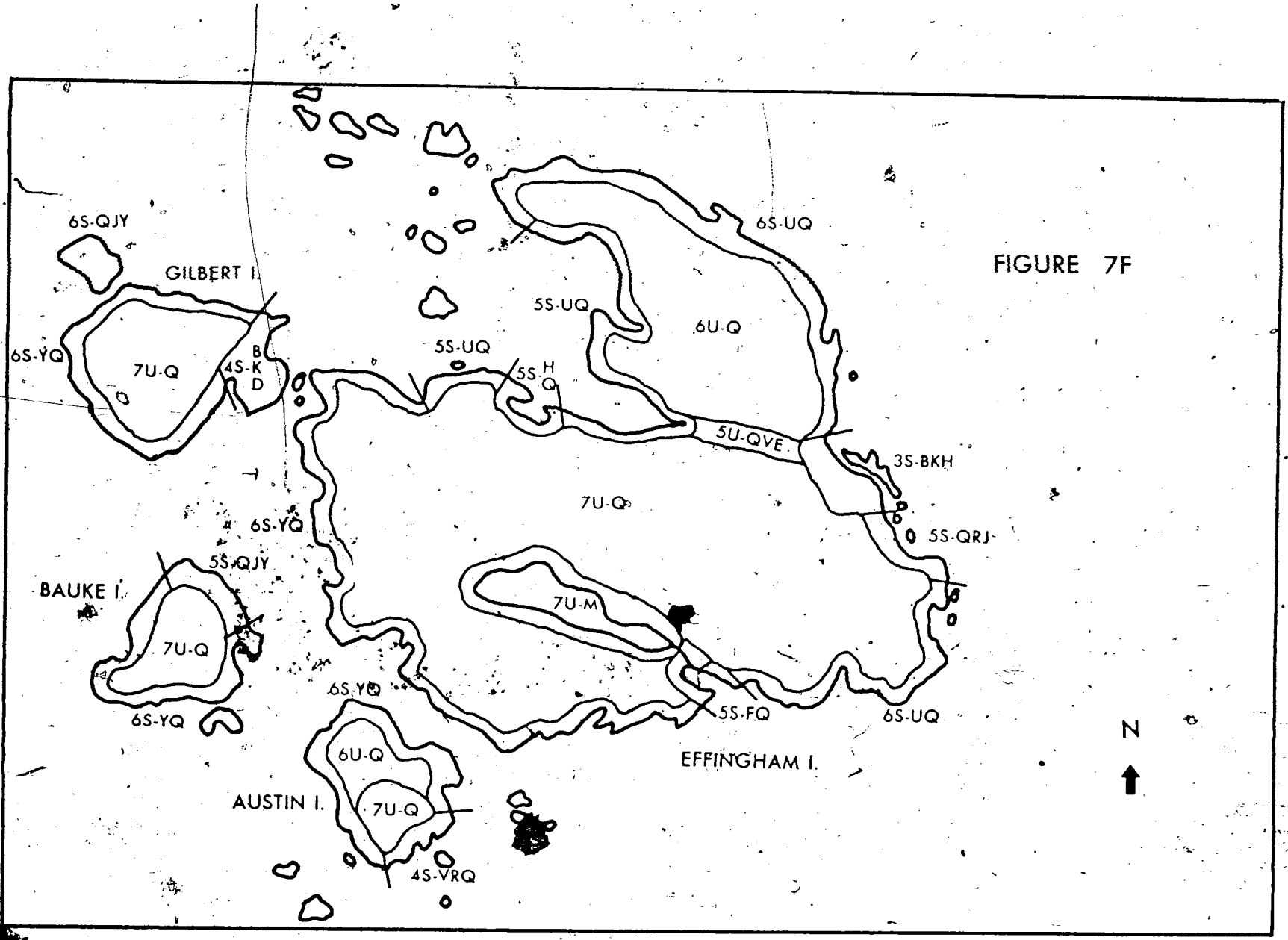

6S-QJY
GILBERT I.
6S-YQ
7U-Q
4S-K
B
D
5S-UQ
5S-UQ
5S-H
Q
6S-UQ
6U-Q
5U-QVE
3S-BKH
7U-Q
5S-QRJ
6S-YQ
5S-QJY
BAUKE I.
7U-Q
7U-M
6S-YQ
6S-YQ
5S-FQ
6S-UQ
EFFINGHAM I.
6U-Q
AUSTIN I.
7U-Q
4S-VRQ
N

FIGURE 7F

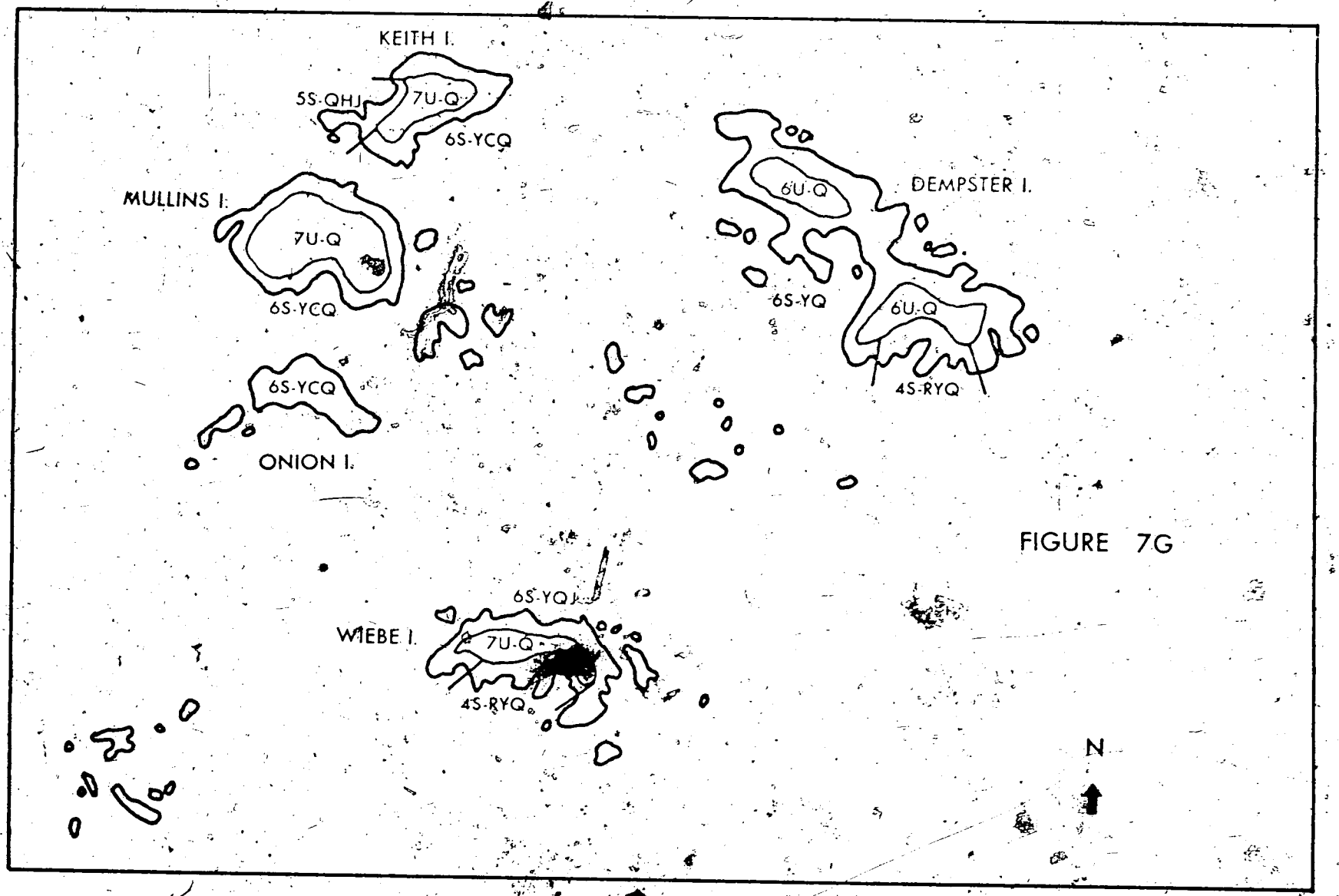
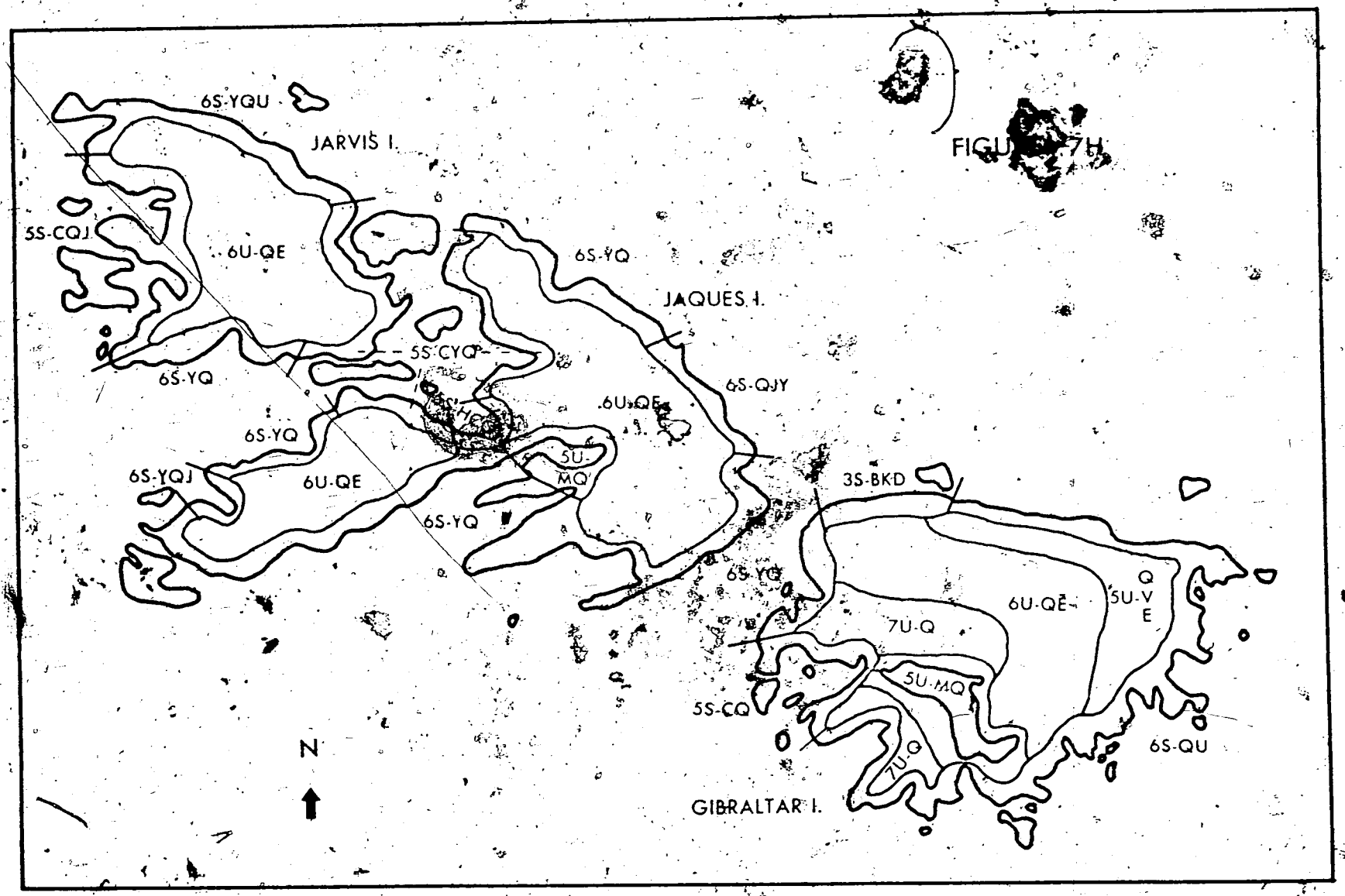

KEITH I.
5S-QHJ
7U-Q
6S-YCQ
MULLINS I.
7U-Q
6S-YCQ
6S-YCQ
ONION I.
6U-Q
DEMPSTER I.
6S-YQ
6U-Q
4S-RYQ
6S-YQ
WIEBE I.
7U-Q
4S-RYQ
N

FIGURE 7G


6S-YQU
JARVIS I.
FIGURE 7H
5S-CQJ
6U-QE
6S-YQ
JAQUES I.
5S-CYQ
6S-YQ
6S-QJY
6U-QE
6S-YQ
6S-YQJ
6U-QE
5U-MQ
3S-BKD
6S-YQ
6S-YQ
6U-QE
5U-VQE
7U-Q
5U-MQ
5S-CQ
6S-QU
7U-Q
N
GIBRALTAR I.

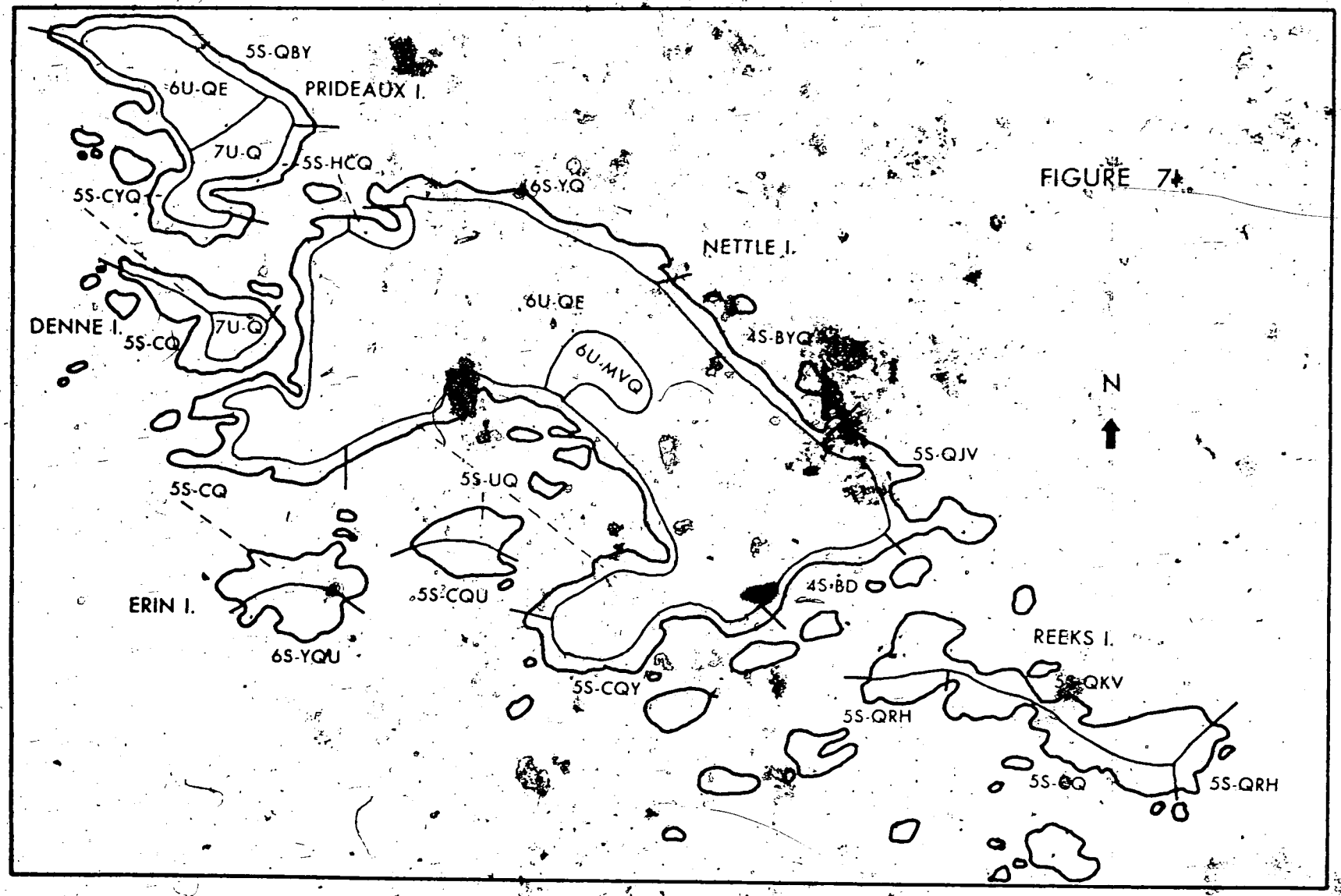

5S-QBY
6U-QE
PRIDEAUX I.
7U-Q
5S-HCQ
5S-CYQ
6S-YQ
NETTLE I.
DENNE I.
5S-CQ
7U-Q
6U-QE
6U-MVQ
4S-BYQ
N
5S-QJV
5S-UQ
5S-CQ
ERIN I.
5S-CQU
4S-BD
REEKS I.
6S-YQU
5S-CQY
5S-QKV
5S-QRH
5S-QQ
5S-QRH

FIGURE 7

TABLE 4

FREQUENCY AND CHARACTERISTICS OF

SHORELAND CAPABILITY UNITS

CLASS	UNIT	FREQUENCY	DESCRIPTION
Class 3S			
	-BKD	1	Class 3 units include five sites with beaches and backshores having a moderately high capability for beach activities and organized camping. These sites are associated with middens and freshwater streams. One site has a capability for viewing.
	-BKH	1	
	-BKJ	1	
	-KBJ	1	
	-KBV	1	
	-VWQ	1	
	Total	6	
Class 4S			
	-BC	1	Class 4 units include eleven sites with beaches as the dominant class. These beaches were downgraded on the basis of their size, structure or presence of aquatic nuisances. Two sites each are noted for their capability for viewing and camping.
	-BD	1	
	-BHD	1	
	-BKD	2	
	-BQJ	5	
	-BUQ	1	
	-KD	1	
	-VQ	1	
	-VRQ	1	
	-RYQ	2	
	Total	16	
Class 5S			
	-CD	2	Class 5 units are noted largely for the capability which accrues to the adjacent water body for canoeing, family boating or deepwater boating. Historic sites are also included in Class 5 units. The remainder are classified for other dispersed recreational activities.
	-CHJ	2	
	-CQ	18	
	-CQB	1	
	-CQJ	8	
	-CQU	1	
	-CQY	1	
	-CYQ	5	
	-BUQ	1	
	-[illegible]Q	1	
	-HCQ	3	
	-HJ	1	
	-HJQ	1	
	-HQ	2	
	-QHJ	1	
	-QBY	1	
	-QJ	3	

TABLE 4 - continued

CLASS UNIT	FREQUENCY	DESCRIPTION
Class 5S (continued)		
-QJR	1	
-QJV	3	
-QJY	2	
-QKV	1	
-QR	2	
-QRH	2	
-QRJ	1	
-QRU	1	
-UQ	7	
Total	72	
Class 6S		
-JR	1	The majority of class 6 sites are adjacent to deep water boating and family boating areas. The remainder are classified on the basis of their diverse landscape.
-QBC	1	
-QJ	1	
-QJV	1	
-QJY	2	
-QU	7	
-QY	2	
-UQ	12	
-UQJ	1	
-YCQ	3	
-YQ	13	
-YQJ	2	
-YQY	2	
Total	48	

TABLE 5

FREQUENCY AND CHARACTERISTICS OF

UPLAND CAPABILITY UNITS

CLASS UNIT	FREQUENCY	CLASS DESCRIPTION
Class 5U		
-KQ	1	Class 5 includes sites which
-MQ	3	parallel trails, or surround
-Q	2	lagoons. One site is noted for
-QUE	2	its' capability for organized
Total	8	camping.
Class 6U		
-MUQ	1	Class 6 sites are dominated by the
-Q	7	Thuja plicata - Vaccinium ovatum
-QE	9	forest type. One bog has capability
Total	17	for viewing.
Class 7U		
-M	2	Class 7 sites are those with diverse
-Q	27	landscape covered with aesthetic but
Total	29	impenetrable vegetation.

camping (K). All are associated with either a shell midden or a forested midden. All but the two sites on Benson and Clarke Islands have small fresh water streams which flow irregularly in the summer.

Willis, Gibraltar, and Effingham Islands are the locations for class 3 sites with the beach designated (B) as the dominant subclass. Their beaches are quite similar in composition and form (for the Gibraltar Island example (3S-BKD) see Plate 1). The length is approximately 200 m, the width varies from 2 to 30 m at high tide, and the beach materials generally vary from sand to gravel. The offshore gradient on Gibraltar and Effingham Islands (10 to 15 percent) is greater than on Willis Island (3 to 4 percent), which warranted the inclusion of the subclass (D), indicating shoreland with deeper inshore water, in the site unit for Gibraltar Island. The same was not true of the site on Effingham Island, which was more significant for its historic value (H).

In all three cases, the backshores have an open vegetative understory suitable for organized camping. The site on Gibraltar, though, is limited to a depth of approximately 150 m due to a sharp bluff about 10 m high. The Effingham Island site (3S-BKH) occupies the former site of an Indian village and one of the most extensive middens in the islands.

Organized camping (K) was identified as the dominant subclass when a suitable backshore was found to occupy a greater area than the beach, which may be limited for intensive recreational

PLATE 1

Class: 3S-BKD Site: Gibraltar Island
Photo was taken at low tide looking towards the west. The beach is composed of small pebbles and sand and extends for another 20 to 30 m to the east.

use due either to size, gradient or presence of aquatic nuisances. The class 3 sites on Hand Island (3S-KBJ) and Benson Island (3S-KBV) fell into this group.

On Hand Island the backshore is dominated by a regenerating vegetation community. The vegetation cover opens up towards the centre of the island providing an effective wind break (Plate 2). The area is fairly level and can support activities associated with camping. A small well has been dug which provides fresh water.

The beach on Hand Island is composed of calcareous material with a beach gradient of 1 to 5 percent. The dry beach gradient is greater at 5 to 10 percent. The maximum width of the beach at high tide was 5 to 6 m. At low tide the shore, due to its low offshore gradient, is attractive for gathering and collecting (J) shells and marine specimens.

The backshore on Benson Island extends from the north beach area inland to the old farm site. The area of approximately 2.5 ha occurs in an open midden (Plate 3). Water is presently supplied to the area by a gravity system, installed by the island's previous owner. The beach has a gradient of 10 to 15 percent and there is a kelp patch immediately offshore. Several rock outcrops provide viewing opportunities.

The remaining class 3 unit is a wave dissected platform on the south-west shore of Wouwer Island (3S-VWQ). It offers an opportunity for viewing the open ocean and the shoreline (Plate 4).

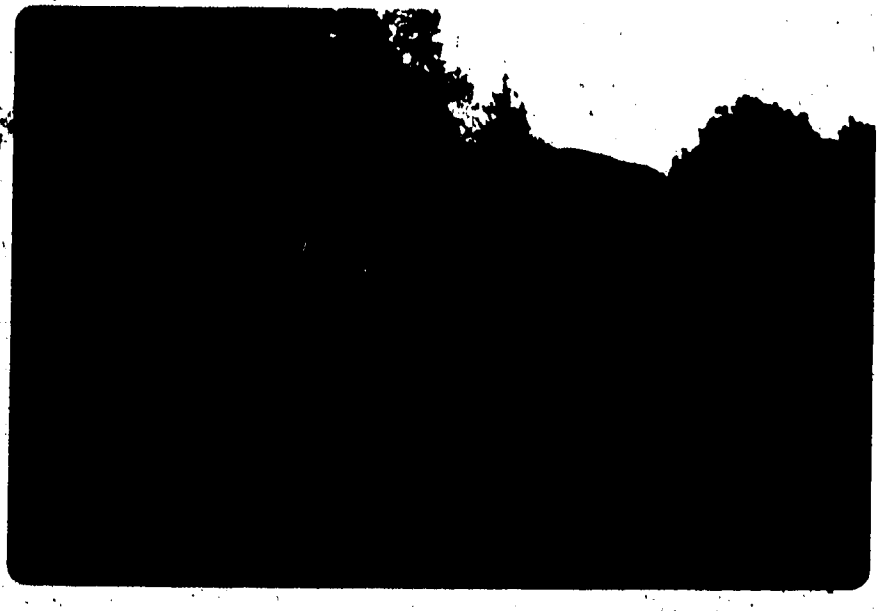


PLATE 2

Class: 3S-KBJ Site: Hand Island
Photo was taken looking north in the central clearing. A beach area is just beyond the trees in the background. Another beach is located south of the site.

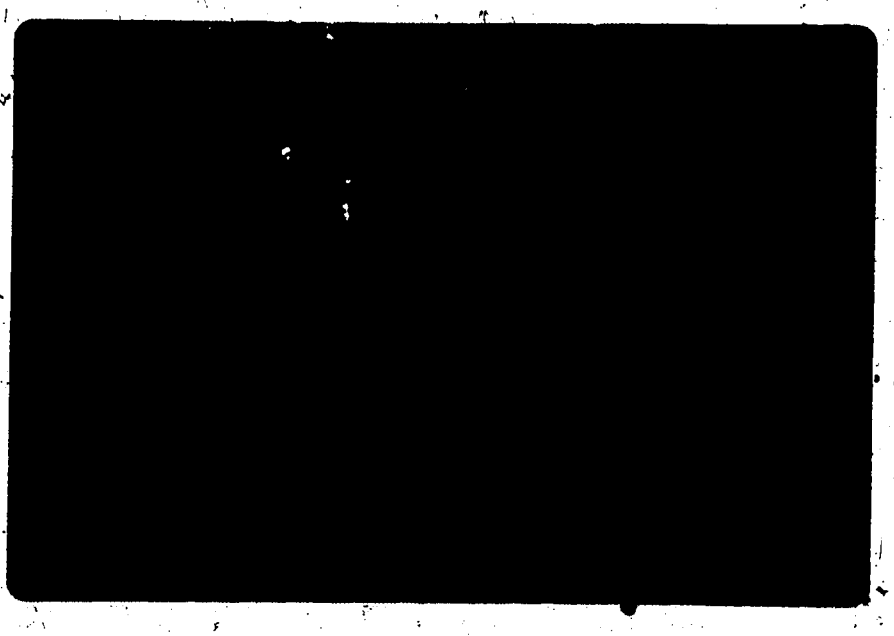


PLATE 3

Class: 3S-KBV Site: Benson Island
Photo was taken looking towards the southern boundary of the old farm site which occupies a midden. The beach included in this unit is immediately north.

PLATE 4

Class: 3S-VWQ Site: Wouwer Island
Photo taken looking west.

This view is one which is locally superior. Viewing of wetland wildlife (W) was also included in this site due to the herd of sea lions which inhabit Sea Lion Rocks immediately west of the shore (Plate 5).

Class 4: The class 4 sites, representing moderate capability, are dominated by areas which have some capability for beach activities. They are downrated by negative factors related to offshore nuisances, such as weeds and rocks, and the frequent interruptions of the sand beaches by rock outcrops.

The most frequently occuring class 4 type (4S-BQJ) is found on Dodd, Willis, Trickett, Turret and Lovett Islands. The site on Dodd is illustrated in Plate 6 and is broken into three sections, with the largest approximately 50 m in width and 30 m at its maximum depth. The offshore gradient is approximately 10 percent. The area is limited for use as a swimming beach, but it is interesting for hiking (Q) and gathering and collecting (J).

The unit which includes Trickett Island is illustrated in Plate 7 taken at low tide. The shallow offshore gradient makes this area one of the most interesting and largest intertidal areas within the Broken Group islands. The site extends from the east end of Trickett Island to include the two small islands immediately to the west. At low tide the total length of shoreline is approximately 350 m. There are several isolated pockets of beach material, composed of either sand or calcareous deposits. These provide opportunities for beaching small boats, swimming and collecting shells. There are several caves which makes the site particularly attractive for hiking and exploring.

PLATE 5

Class: 3S-VWQ Site: Sea Lion Rocks
Photo taken looking north towards Wouwer Island.

PLATE 6

Class: 4S-BQJ Site: Dodd Island
Photo taken looking north. This is the largest of three beach areas occurring within this unit.

PLATE 7

Class: 4S-BQJ Site: Trickett Island
Photo taken at lów tide looking eastward.

Other areas where beaches are the dominant subclass occur on Benson Island (4S-BHD), Clarke Island (4S-BC) and the north shore of Nettle Island (4S-BYQ). The beach on Benson (Plate 8) is variable in size and slope, and its easterly exposure makes it subject to storm waves from the south-east in the summer. This site is classified for the historical significance attached to the backshore, where a post office and hotel were formerly located. Evidence of these is present in the form of foreign vegetation species and the number of antique bottles strewn throughout the area. The offshore gradient is approximately 15 to 20 percent, and the combination of beach and gradient is particularly attractive for boat mooring and docking (D).

The beach on Clarke Island is sheltered on the west shore, and is accessible by small boat or canoe (C) from the north side. Nettle Island has a narrow strip of beach between 5 and 10 m in width which is broken by rocky outcrops. It extends for approximately 500 m and is suitable for hiking and exploring (Q) and family boating (Y). The backshore is inaccessible.

Two beach sites on Nettle Island (4S-BD) and Gilbert Island (4S-BKD) have adjacent water bodies which make the area attractive for docking, mooring and swimming. Both sites include middens which are located immediately behind the shore. The site on Gilbert Island is open and gently rolling and has been subject to intensive use. It is suitable for organized camping.

There are two sites which have reasonable capability for organized camping. One is on the western extremity of Turret Island (4S-BKD), where it extends from the north to south shore

PLATE 8

Class: 4S-BHD Site: Benson Island
Photo taken looking north. Historic site is immediately to the right of the area shown in the photo.

beach areas. A midden is included. The forest type is Picea sitchensis - Tsuga heterophylla. The understory is open, and the terrain gently rolling with a slope varying from 5 to 30 percent. There is an opportunity for viewing upland wildlife. A small stream is included within the unit, but the flow is rather limited in the summer. The other site with capability for camping is on the west shore of Chalk Island (4S-KD). The vegetation is as open as that on Turret. The adjacent water immediately offshore can be used for boat mooring and docking (D).

On Benson and Austin Islands there are two sites which provide frequent viewing opportunities (V). On Benson Island (4S-VQ) the viewpoint is located at the terminus of a trail approximately 40 m above sea level offering a significant viewing experience. The trail also opens up onto a sea cliff and the lower shore bench, which is interesting for hiking and exploring and tidal pool study (Plate 9).

On the eastern shore of Austin Island (4S-VR) is another site rated for its viewing experience. This is directly attributable to the wreck of the VanLene, on a shoal immediately offshore (Plates 10 and 11). A cave is also found along the east shore of Austin Island.

Several sites which include caves at sea level are classified for rock formations (R) on Wiebe and Dempster Islands (4S-RYQ). Normally, for sites where the rock formations warrant a dominant subclass, the lowest class rating is 3. However, because these caves can be viewed and entered only from the water,

PLATE 9

Class: 4S-VQ Site: Benson Island
Photo taken looking west towards Ucluelet.

PLATE 10

Class: 4S-VR Site: Austin Island
Wreck of the Vanlene.

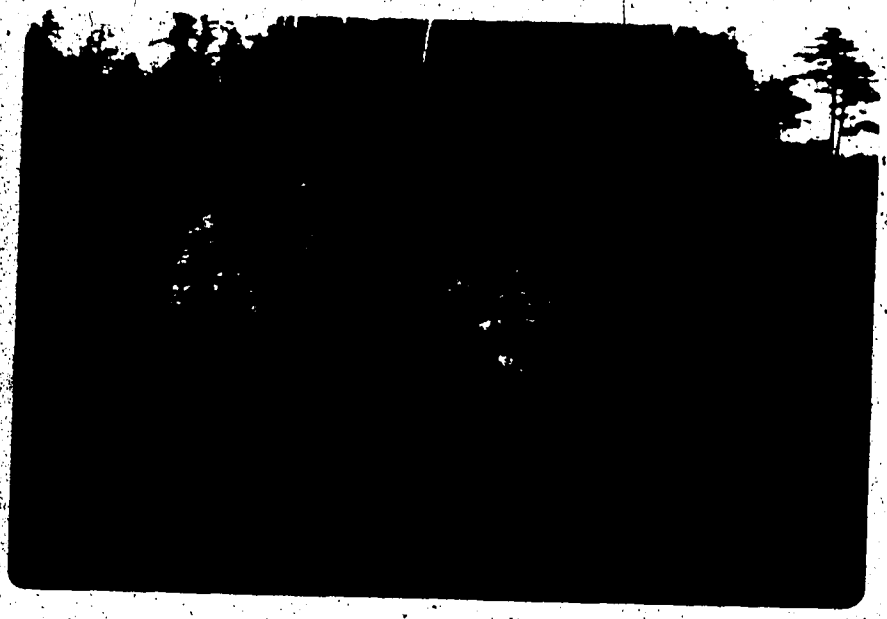


PLATE 11

Class: 4S-VR Site: Austin Island
Cave on the east shore. This cave is similar to those also found on the south shore of Wiebe and Dempster Islands.

their capability was downgraded by one class. The biological life of the caves makes them interesting for exploring but entry is dangerous because of the risk of surge currents.

Class 5: The most frequent of all sites are those classified as 5S. These can be grouped according to the dominant subclasses which include canoeing (C), hiking and nature study (Q), historic sites (H), mooring and docking (D) and deep water boating (U).

The majority of Class 5 sites are those with canoeing as the dominant subclass (5S-CQ and 5S-CQJ). They are found in sheltered areas which exhibit a variety of topography and scenery and have generally shallow water. The majority of sites are related to shorelines which can be hiked and explored, with a few offering opportunity for gathering and collecting (Plate 12).

Hiking occurs as the dominant subclass on sites which are narrow at high tide, yet may be traversed. These are often associated with areas suitable for gathering and collecting (Plate 13).

Two units on Reeks Island are designated for their rock formations (5S-QRH). These are Indian burial caves, which are not easily accessible from the adjacent shoreline but nonetheless offer a significant experience for those who can locate and expolre them. Also on Reeks Island is a site (5S-QKV) which has capability for camping and viewing.

The majority of historic sites are classified as class 5. Those occurring on Hence (5S-CHJ), Dodd (5S-HJ), Turret (5S-HJQ) and Jacques (5S-HCQ) are associated with fish traps which are

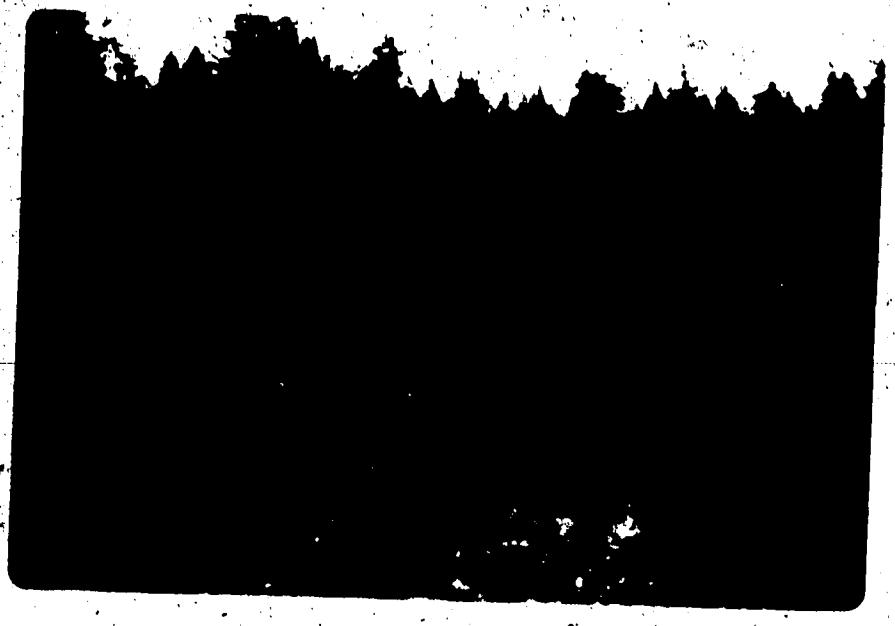


PLATE 12

Class: 5S-CQJ Site: Jarvis Island
Photo taken looking east at low tide.

PLATE 13

Class: 5S-QBY Site: Prideaux Island
Photo taken looking east. This beach site has capability for hiking and exploring. Offshore there is a major channel suitable for family boating.

exposed at low tide (Plate 14). On Dicebox is a deep and extensive midden which was once a whaling station (5S-HQ). On Prideaux the old mine site is classified 5S-HCQ. An underwater archaeological site with a shoreland capable for hiking is found on Effingham (5S-HQ).

The shorelands surrounding Salal Harbour, as well as those around Effingham Bay, the bay enclosed between Nettle and Erin Islands, and the 'Hole-in-Jacques', are classified as having capability for deep water boat tripping, boat mooring and docking and offshore swimming. These sites occur in sheltered anchorages protected from the dominant winds, where the depth is a minimum of 2 fathoms (Plate 15).

Several sites are notable for their intertidal pools. The first is found on southeast Benson (5S-QJ) which is accessible from the beach site immediately to the north. On Dicebox (5S-QR) there is a cave with interesting intertidal species. This cave is accessible at low tide from the midden site.

Class 6: The lowest class along the shoreline is class 6. The capability is restricted to topographic patterns (Q), family boating (Y) or deep water boating (U).

Family boating (Y) is dominant along the major designated channels and waterways. In areas where boat access is restricted by shoals or generally shallow water, and there is no other feature with recreational capability, the shoreland unit is classified for its scenic value (Q). This means that it has little direct recreational value, because of inaccessible shorelines, but does add to the overall viewing experience (Plate 16).

PLATE 14

Class: 5S-HJ Site: Dodd Island
Photo taken looking east across Salal Harbour. Fish traps are shown in the foreground.

PLATE 15

Class: 5S-UQ Site: Effingham Island
Photo taken looking east towards the head of the bay. The shoreline is typical of that which occurs in class 6 where deep water boating is a dominant subclass.

PLATE 16

Class: 6S-QY Site: Cree Island
Photo taken looking east towards Bamfield.

Uplands

The upland units, designated on those islands which warranted them because of their size or the distinctiveness between shoreland and upland, had moderately low (class 5) to very low capability (class 7) for dispersed forms of recreational use.

Class 5: The highest capability rating for the uplands is limited to eight sites. Four include and run parallel to existing trails, three include salt water lagoons, and one has some capability for camping. The trails occur on Benson (5U-Q), Clarke (5U-Q), Gibraltar (5U-QVE) and Effingham (5U-QVE) Islands. The section of the trail which runs along a number of fallen trees on Benson Island is illustrated in Plate 17. The soils of the trail can support only limited use because of erosion, but the predominant Gaultheria shallon vegetation which flanks it is likely to be able to withstand human impacts better. On the other hand, if the trail is not used regularly it will rapidly be overgrown.

The trails on Gibraltar and Effingham Islands occur in areas where the vegetation is dominated by the Tsuga plicata - Tsuga heterophylla forest type, which have a capability for trail development. These trails were established on the middle slopes and offer an opportunity for viewing the upland areas.

The three units which include lagoons are located on Gibraltar, Hand and Jaques Islands (5U-MQ). They are easily accessible from a number of points on the shore, and are significant for hiking, viewing and nature study.

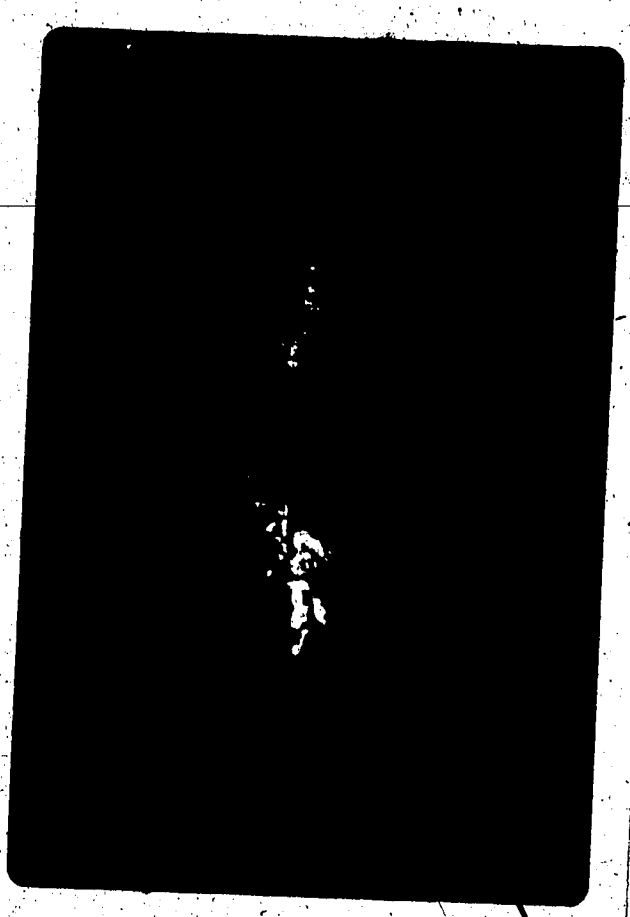


PLATE 17

Class: 5U-Q Site: Benson Island
The trail on Benson Island was established where the dominant vegetation in the understory is Gaultheria shallon.

One site on Owens with a Thuja plicata - Vaccinium ovatum forest type, a slope of up to 30 percent, and a well drained and open understory was noted for its capability for organized camping (5U-KQ). The only present problem with the area is that the shoreland is inaccessible due to the lack of beaching sites.

Class 6: The upland areas are dominated by the types 6U-QE and 6U-Q. The sites designated as 6U-QE are those which have vegetation which complements dispersed recreational activities. In those areas where the Thuja plicata forest community is found, and is accessible and penetrable, the subclass E, denoting vegetation with recreational significance, was noted. If it is not accessible or penetrable this subclass was not included.

A site which includes a fresh water marsh is found on Nettle Island (6U-NUQ). It occupies a lowland area, which was dammed by beaver, and is accessible along a fresh water stream which flows into a bay south of Nettle Island. This stream is thought to be one of the few in the Broken Group flowing year round.

Class 7: The remainder of the uplands is designated as class 7 and predominantly 7U-Q. Sites of this type have little recreational capability due to the dense vegetation and limited accessibility. They are dominated by the Tsuga plicata - Vacinnium ovatum forest type.

Finally, some areas of lake and marsh are classified 7U-M. The only lake is found on Effingham Island (Plate 18). The shore area is inaccessible because of the gentle slope, fallen

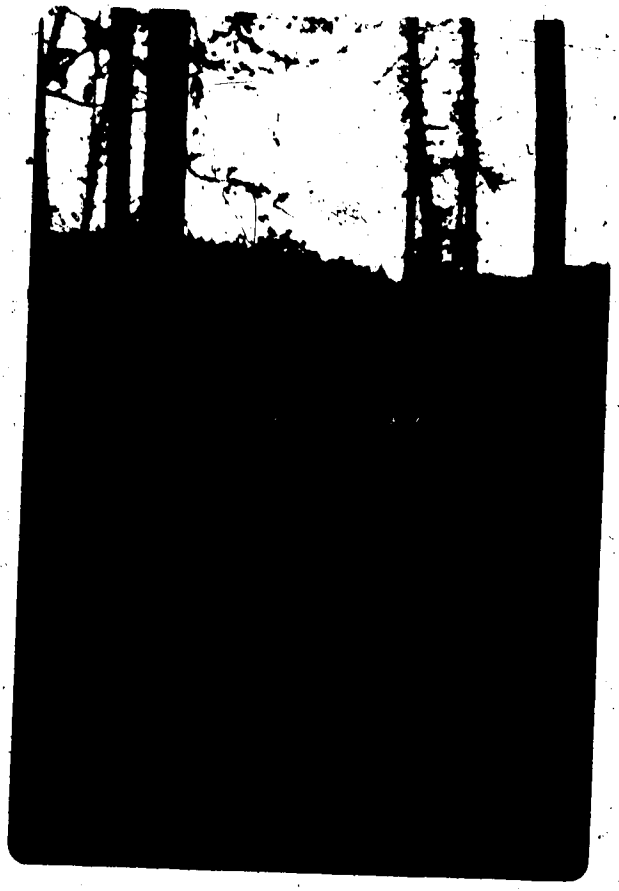


PLATE 18

Class: 7U-M Site: Lake on Effingham Island

vegetation and fluctuating water levels. This is also the major problem with trying to hike to the marsh on Turtle Island.

Marine Capability

The CLI inventory embraces the recreational capability of the uplands and shorelands. The recreational value of the water was accounted for in the shoreland rating. In a number of cases, however, features which are totally marine based were excluded. Although an extensive study of the recreational attractions and capability of the subtidal area was not conducted, a number of sites stand out from hydrographic charts and from field work. For example, the wreck of the Thiepval is indicated on chart No. 3638 (Appendix B) in Thiepval channel. This is the one wreck which can be located fairly easily and can be reached by divers. It lies in approximately 5 fathoms of water on a shoal. Other areas are important for their abundant sea life, and particularly for northern abalone (Haliotis kamtschatkana) which are found south of the Brabant Islands and the south side of Kettle.

Undoubtedly, there are a large number of attractive subtidal areas within the Broken Group. However, until a systematic technique can be developed to identify those with recreational significance their capability cannot be assessed.

CONCLUSION

The overall capability of the Broken Group islands is fairly low, which means that they can support recreational activities which range from dispersed to, at best, moderately intensive. Moreover, the sites with the highest ratings (3 or 4) also include middens, which raises the prospect of use conflicts. Although these areas are attractive for recreational use, it may be that they should be preserved as historic features.

In general, throughout the islands, the most notable recreational capability is attributable to the shorelands. The only significant upland sites are along the established trails.

Those islands with the highest capabilities include those which were previously developed. This includes, most notably, Benson Island, with its midden, historic site, trail, viewpoint and a number of tidal pools, and Gibraltar Island with its trail and beach site. The other islands which are particularly attractive, as a whole, are Clarke, Wouwer and Trickett. Islands with attractions of limited extent are Effingham, Nettle, Hand, Willis and Turret.

CHAPTER IV

USER SURVEY

A number of techniques are particularly useful to social research studies concerned with collecting data about recreation. These techniques range from verbal or written communication with users of a recreation site, or the general population, to mechanical and electronic devices used to monitor the use of a specific site (Burton, 1971). The nature of the research problem, and the time and funds available to the investigator, dictate which technique or techniques are most applicable.

This thesis is concerned with a specific area, and the relationship between the present expressed demand and the physical resource base. The information required includes the present type and patterns of use, the motivations and satisfaction of the users, and the users' evaluations of the physical elements of a recreational site. An on-site interview was devised to meet these data requirements.

THE INTERVIEW SURVEY

Burton and Cherry (1970) have summarized the advantages and disadvantages of the interview survey. Many of the advantages are attributable to its flexibility:

> The skilled interviewer can make sure that the respondent fully understands the nature of the information that he or she is being asked to give; he, or more usually she, can probe more deeply into the subject's responses; she can show the respondent cards, lists and similar material and so focus his attention more completely on the subject of interest; above all she can establish rapport with the respondent, and thereby, maintain the latter's interest and participation in the survey.
> (Burton and Cherry, 1970, p.41)

These advantages were important to the survey conducted in the Broken Group, largely due to the fact that it is a new recreation area based on a marine environment. It was essential to communicate with the users in such a way as to obtain supplementary information such as impressions and opinions of the area, and of marine based recreation in general.

Another advantage of the interview technique is that a high response rate is usually obtained. Since the Broken Group islands are not heavily used, it was essential to obtain the maximum number of interviews. At the conclusion of this survey, the response rate was 100 percent.

One of the disadvantages of the interview technique stems directly from rapport. "Over-rapport" with the respondents can produce bias in their responses: "The respondent may tend, for example, to give answers and express opinions which he thinks the interviewer expects to hear from him or which he thinks the interviewer would approve of" (Burton and Cherry, 1970, p.42). This problem arose during the course of the survey in the Broken Group, as the majority of respondents were hospitable and talkative. Each interview was therefore completed as quickly

as possible following initial contact with the respondent. However, in most cases some member of the group would eventually ask for facts or opinions concerning the area. This information proved on several occasions to influence recreational behavior. As a result, observations of behavior following the interview were deleted from the study.

Another disadvantage concerns the interviewer's recording of responses. If he or she is not careful, the recorded responses could reflect his or her personal expectations and understandings. The responses in this survey were recorded where possible in predetermined categories; otherwise, they were recorded verbatim and grouped at a later date.

The Interview Questionnaire

The questionnaire utilized for this user survey included both open and closed questions. Responses were recorded directly onto the interview form. The final draft was determined following a pilot survey conducted in the area for a period of one week during which eight interviews were collected. The only change made as a result of the pilot survey was firming up the various response categories. A copy of the questionnaire is found in Appendix A.

The questionnaire can be divided into a number of categories: i) profile data, ii) travel patterns, iii) motivations, iv) recreational activities, v) resource evaluation, and vi) satisfaction.

The profile data collected in the survey were: group type, age and sex of each mamber, residence, and occupation. Occupation of the respondent indicates, in general terms, his or her social and economic status. Specific inquiries about income can cause more problems, such as making the respondent defensive, than the information obtained would be worth to the overall interview. The profile data were used to classify the remaining data.

The questions regarding travel patterns were of two types. The first was concerned with the characteristics of the trip: place of origin, boat type and size, whether or not the Broken Group was a destination or stopover point, the length of the intended stay in the area, location of the last overnight stop, and intended location of the next stop. The second type of question was concerned with the frequency of visits to the area: whether or not this was the first visit, in what year was the first visit made, how often were the visits in the summer (June through August) and winter (September through to May), and whether these were usually daily or overnight visits.

To determine motivation, several questions were posed to indicate how the respondents had learned of the area and why they had chosen to visit it rather than another area.

The next set of questions about recreational activities was designed to indicate i) what activities were participated in and ii) the reasons for choosing the particular site. Several questions were used to compare the Broken Group with other areas,

and were directed at the recreational activities which were participated in outside the area. Each group was also asked to indicate what types of recreational equipment were brought on the trip.

A series of questions attempted to solicit the respondents' evaluations of the physical elements associated with a recreational site. Shaffer (1969) has described this as the direct approach of measuring perceptions, where one asks a sample of people how they feel about the environment. The responses to the questions are a subjective measurement of the environment. These results were compared with the objective measurements taken with instruments in order to indicate what criteria could be used for assessing a site for recreational capability. The rationale has been previously described:

> Technically, any human description of the environment is a perception and therefore subjective. The difference between objective and perception measurements is the difference between physically defined descriptions of the environment in standardized quantities, on the one hand, and quantitative descriptions of what the unaided human senses observe. The objective measurement is a standardization in terms of prescribed instruments and methods. Emphasis is on describing the environment in such a way that the description is as nearly objective as possible. Measurement of perceptions is concerned with description of the environment as observed by individuals. Thus, the perception measurement uses the human being as the instrument for observations into meaningful quantities.
>
> (Peterson and Neumann, 1969, p.226)

For example, the physical elements which are important in choosing an anchorage for recreational purposes include wave height, water temperature and turbidity, and the presence of currents. The Broken Group respondents were asked to describe these physical

elements and rate the anchorage. Beyond rating a particular site, the value of these questions proved limited. The results were highly variable and, with the small sample size, did not yield any significant relationships with the objective measurements. Perceptions are based on previous experience and attitudes. Therefore, they can be as varied as the respondents themselves. The attempt was superficial and the information required to make it meaningful would have constituted a major research problem in its own right.

The last section of the questionnaire was concerned with the level of satisfaction reached by the users and included a comparison of the present experience with others. The question dealing with the latter was a problem for many respondents:

37. Are there areas along the west coast of British Columbia where you have had a recreational experience similar to the present one in the Broken Group islands?

( ) Yes ( ) No

If yes, how does the present experience rate with those?

( ) Excellent ( ) Good ( ) Fair ( ) Poor
( ) Very Poor

Many were not sure if the word 'rate' actually meant 'compare', which would have indicated little. For example, if the respondent had been dissatisfied with a previous experience and was also dissatisfied with the present one then the two would compare excellently. However, even when the question was explained as meaning whether or not the experience was better than others, many simple replied it was different and just as good. The responses should have been recorded and then categorized at a later date.

Several questions were asked which could have importance with respect to development proposals for the area. The first question was whether or not the respondents knew the area was a national park and their comments on the subject. The second was concerned with the availability of fresh water and where the visitors planned to obtain it. Thirdly, opinions were sought on the uniqueness of the Broken Group as a whole, and of the specific recreational site.

For objective information, physical data were measured and recorded for each site. The information recorded depended on the type of site. At all sites, air temperature, wind speed and direction, cloud cover, and the occurrence of precipitation and fog were recorded. If the interview was conducted on land, the site was described according to recreational use, vegetation cover, type of ground material, the approximate slope and moisture conditions. If the interview was conducted on water, the temperature was recorded at a depth of one meter, and a turbidity value was collected along with an estimate of wave height. When there was some indication of currents and the type of bottom material, these were also noted.

Surveying

The survey was conducted from the tenth of July through the first of September, 1975. The study area was divided into two sections which could be easily and efficiently sampled on alternate days (Figure 8). In this way, the majority of overnight visitors and the maximum number of day-use visitors were interviewed. Surveying was somewhat inhibited because of the size of the area,

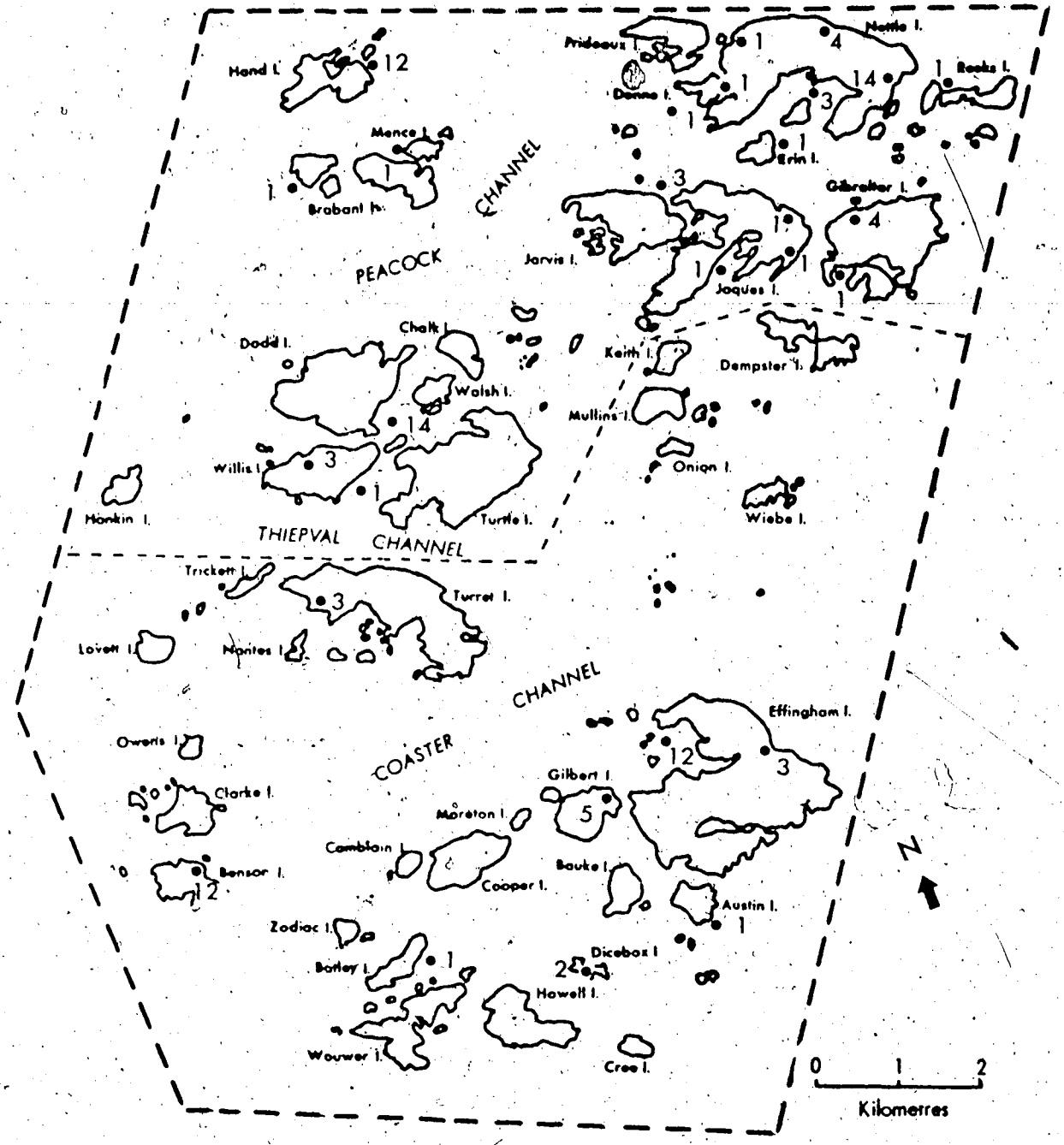


FIGURE 8

LOCATION OF INTERVIEW SITES

LEGEND

- - - - Interview section boundary

• 4 Interview location and number of interviews collected at each

the length of shoreline and the limited number of hours which could be spent searching for visitors. The survey was conducted seven days a week, with the majority of the daylight hours spent cruising randomly within a sector searching for visitors. During inclement weather or heavy fog, surveying had to be curtailed.

Each group observed was contacted once. The head of the family, the leader of an organized group, or a senior member of each party was asked to be the respondent. Subsequent behavior which was observed within the park area was also noted, but proved to be an insignificant part of the survey and, as indicated previously, a possible source of bias. It is therefore omitted from the discussion.

The majority of visitors were interviewed while they were anchored for either a mealtime or an overnight period. Those interviewed while on land were normally camping or beachcombing. Visitors in transit or fishing were excluded from the survey as it would have been an imposition to hail the passing craft. These were interviewed at a later time if they anchored within the area. Those groups visiting Clarke Island, a private developed site, were not interviewed.

The survey was an attempt to interview all those who visited the area. A total of 108 questionnaires was collected. From conversations with the resident park warden and the visitors, it is felt that almost everyone who visited the area was interviewed. Some visitors undoubtedly were missed as they remained in the area for only a few hours or entered during the late

evening for an overnight period. The survey may be somewhat biased towards the overnight visitors simply because the probability of their being interviewed was higher than for day-use visitors.

ANALYSIS AND RESULTS

The data were compiled for basic statistical parameters such as frequencies and means. Cross tabulations were also performed with the most notable included in the following discussion.

The results of the questionnaire will be discussed according to the following general categories already noted: i) profile data, ii) travel patterns, iii) motivations, iv) recreational activities, and v) satisfaction.

Profile Data

Questions one through four deal with the profile data. These include a description of the type of group, sex and age description, place of residence and occupation of the respondent.

The largest number of groups was composed of one or more families (48.1 percent; Table 6). The categories friends and couples, represented 25.9 percent and 19.4 percent respectively. Organized groups accounted for 3.7 percent. One large group of sailors from Seattle, who participated in the annual Nor-Pac race, was not included, even though the racing committee was contacted. The committee communicated some comments about the Broken Group islands and Barkley Sound in general, but the particular questions of this survey could not be commented on with certainty.

TABLE 6

TYPE OF GROUP

	Number of Groups	Percentage
One person	2	1.9
One couple	21	19.4
One family	27	25.0
Two or more Families	25	23.2
Group of Friends	28	25.9
Organized Groups	4	3.7
Other	1	0.9
Total	108	100.0

The majority of visitors were males (58.6 percent) and adults, twenty years and over (72.3 percent; Table 7). Adolescents (ten to nineteen years) and children under ten years accounted for 19.1 and 8.6 percent respectively; though family groups included nearly 60 percent of all persons.

The place of residence for the majority of the groups was in Canada (Table 8). The largest portion is accounted for by those groups from the local area; Port Alberni with 21.3 percent and Ucluelet with 12.0 percent. The remainder were primarily from other centres on Vancouver Island or the metropolitan area of Vancouver. These was only a small number of non-British Columbia residents.

The United States residents (27.8 percent) were predominantly from the Puget Sound area which includes the cities of Seattle, Bremerton and Tacoma.

Families represented the major portion of all groups from both countries. They represent 59.0 percent and 41.0 percent of the groups from the United States and Canada respectively.

TABLE 7

SEX AND AGE

Years	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Under 10	22	7.0	25	11.1	47	8.8
10 to 19	66	21.2	38	16.9	104	19.4
20 to 29	61	19.6	45	20.0	106	19.7
30 to 39	67	21.5	49	21.8	116	21.6
40 to 49	41	13.1	29	12.9	70	13.0
50 to 59	43	13.8	34	15.1	77	14.3
60 to 69	11	3.5	5	2.2	16	3.0
70 and over	1	0.9	-	-	1	0.2
Total	312	100.0	225	100.0	537	100.0
Percentage	58.1		41.9		100.0	

TABLE 8

PLACE OF RESIDENCE

	Number of Groups	Percentage
Canada		
Ucluelet	13	12.0
Port Alberni	23	21.3
Victoria	8	7.4
Vancouver	12	11.1
Other	11	10.2
Sub Total	67	62.0
United States		
Seattle	18	16.7
Other	23	21.3
Sub Total	41	38.0
Total	108	100.0

The occupations of the respondents are indicated in Table 9. Professional, business, trade and technical occupations comprise a total of 81.4 percent. Over half of the United States respondents were represented by professionals. The largest single share of the trades and technical occupations came from Port Alberni (a forestry production centre).

TABLE 9

OCCUPATION OF THE RESPONDENT

	Number of Respondents	Percentage
Professional	52	48.1
Business	14	13.0
Trades and Technical	22	20.4
General Labourer	4	3.7
Student	4	3.7
Retired	4	3.7
Other	8	7.4
Total	108	100.0

Travel Patterns

Questions five through ten deal with the travel patterns of the users. This includes information on the characteristics of this trip and the frequencies of visits.

The departure points of the users is indicated in Table 10. Port Alberni is the point of origin for 23.1 percent of the users. Only 3.7 percent came from Port Alberni via the M.V. Lady Rose. Toquart Bay was as popular a departure point as Ucluelet or Seattle. Each accounted for 13.0 percent of the groups. The popularity of Toquart Bay is due to the fact that one can easily drive to the Kennedy mines landing and then follow a short, well protected route to the Broken Group islands.

TABLE 10

POINT OF ORIGIN

	Number of Groups	Percentage
Port Alberni	25	23.1
Bamfield	5	4.6
Ucluelet	14	13.0
Seattle	14	13.0
Toquart Bay	14	13.0
Vancouver	10	9.2
Other	26	24.1
Total	108	100.0

The most popular types of water craft found in the Broken Group islands were sailboats and power boats (Table 11).

TABLE 11

TYPE OF WATER CRAFT

	Number	Percengage
Sailboat	49	30.8
Motor Sail	1	0.6
Power	46	28.9
Power Displacement	26	16.4
Canoe	19	12.0
Kayak	11	6.9
Inflatables	7	4.4
Total	159	100.0

Sailboats overwhelmingly originated from the urban centres (94.2 percent). Port Alberni was represented by the largest number of power boats (43.1 percent). Power-displacement boats were largely from the United States (55.0 percent) with another 20 percent accounted for by fishing boats from Ucluelet.

Suprisingly, the Broken Group islands are a popular area for canoes and kayaks. The majority of the craft belonged to organized groups from Seattle and Port Alberni. The area is easily accessible for canoeists from Toquart Bay or from either Ucluelet or Port Alberni via the M.V. Lady Rose.

Respondents from professional occupations accounted for the ownership of 76.5 percent of the sailboats. Sailboats are usually more expensive relative to other boat types. Power boat ownership was spread amongst the various occupations; however, 35.1 percent were accounted for by those in the trades and technical group.

The number of boats by size class is shown in Table 12. The dominant category is the 3.1 meter to 6.0 meter which represents 41.5 percent of all the boats. This category is dominated by power boats (66.7 percent), while sailboats dominated in the 6.1 to 12.0 meter range with 52 percent.

TABLE 12

BOAT SIZE

	Number	Percentage
0-3.0 meters	7	4.4
3.1-6.0 meters	66	41.5
6.1-9.0 meters	42	26.4
9.1-12.0 meters	36	22.7
12.1 meters and over	8	5.0
Total	159	100.0

The Broken Group islands were the destination point for 73.1 percent of the groups. Of the remainder, the greater portion were circumnavigating Vancouver Island ultimately to arrive home at one of the urban centres (Table 13).

TABLE 13

ULTIMATE DESTINATION

	Number of Groups	Percentage
Circumnavigating Vancouver Island	4	34.6
Barkley Sound in General	6	23.1
Points Further North-Useless Inlet, Hot Springs Cove, Kloyoquot Sound	4	15.4
Points Further South	3	11.5
Other	4	15.4
Total	26	100.0

The lengths of stay of all groups are indicated in Table 14. The majority stayed for a week or less with the average value being 6.3 days. This value is suspect as it was observed that the anticipated or stated length of stay was often greater than the actual. Using the length of stay values the calculated number of visitor days was 3,361. This is relatively small in comparison to the estimate for the Long Beach portion of Pacific Rim National Park which is 1973 was 428,740 visitor days (Meyer and Bryan, 1974).

TABLE 14

LENGTH OF STAY

Days	Number of Groups	Percentage
1	7	6.5
2	17	15.7
3	13	12.1
4	10	9.3
5	10	9.3
6	1	0.9
7	28	25.9
8	2	1.9
9	1	0.9
10	5	4.6
11	1	0.9
12	1	0.9
14	9	8.3
21	1	0.9
30	2	1.9
Total	108	100.0
Average 6.3 days		

Questions nine and ten attempted to determine where the visitors had spent their last night and where they planned to spend the night following the interview (Table 15). Only 13.9 percent had spent the previous night at their permanent residence.

TABLE 15

PLACE WHERE NIGHT WAS SPENT

	Last Night		Tonight	
	Number of Groups	Percentage	Number of Groups	Percentage
Permanent Residence	15	13.9	4	3.7
'Hole-in-Jacques'	2	1.9	2	1.9
Nettle Island	9	8.3	20	18.5
Turret Island	4	3.7	5	4.6
Chalk Island	2	1.9	1	0.9
Hand Island	8	7.4	11	110.2
Effingham Bay	10	9.2	22	20.4
Salal Harbour	8	7.4	12	11.1
Other	50	46.3	29	26.8
Not sure	-	-	2	1.9
Total	108	100.0	108	100.0

This indicates the large distances which had to be covered by the majority of visitors. The most popular points within the islands were Effingham Bay, Nettle Island, Salal Harbour, Turret Island, 'Hole-in-Jacques' and Chalk Island which in total accounted for 40.0 percent of the re ponses.

For the night following the interview only 3.7 percent of the groups were planning to spend the night at home. Points within the Broken Group accounted for at least 67.0 percent of those spending the night away from home.

The proportion of groups which had at least one member who had visited the area previously was 48.1 percent. The dates of the first visit are also listed in Table 16.

TABLE 16

YEAR OF FIRST VISIT

Year	Number of Groups
1920	1
1925	1
1935	2
1940	1
1958	1
1959	1
1960	2
1962	2
1963	1
1964	4
1965	7
1967	3
1968	3
1969	4
1970	5
1971	1
1972	3
1973	4
1974	12
Total	58

Over a fifth of all returning visitors had first visited the area in 1974. According to place of residence, recreationists from Ucluelet, Port Alberni and Victoria were more likely to be return visitors than to be visiting the area for the first time. From 1966 on, though, there was a notable increase in the number of groups from beyond the local area. Many respondents suggested that the reason for this was overcrowding in the Gulf and San Juan Islands. This supports Clarke's (1969) finding that the level of marine recreational activity in the Gulf and San Juan Islands is self-regulating in response to facilities and overcrowding. Visitors were found to "go further afield to escape the crowds".

The larger portion of those who had visited the area previously (42.1 percent) visited once during the summer (Table 17).

TABLE 17

FREQUENCY OF VISITS IN SUMMER AND WINTER

Number of Times per Season	Summer		Winter	
	Number of Groups	Percentage	Number of Groups	Percentage
1	24	42.1	3	23.0
2	7	12.2	3	23.0
3	7	12.2	2	15.3
5	1	1.8	1	7.7
6	3	5.2	1	7.7
8	1	1.8	-	-
10	1	1.8	-	-
12	7	12.2	-	-
20	1	1.8	1	7.7
24	1	1.8	2	15.3
25	2	3.5	-	-
30	1	1.8	-	-
33	1	1.8	-	-
Total	57	100.0	13	100.1
Averages	5.9 visits per summer		7.4 visits per winter	

A far fewer number of groups visit the area in the winter. The survey, however, cannot indicate the actual level of use during the winter since there may be many who use it only during that season. It was stated several times that many scuba divers visit the area in the winter season only. This is the period in which water conditions, such as turbidity, are most favourable for diving. Those who visit the area in more than one season are predominantly from the local area.

Of those who had visited the area preiously, 86.2 percent had visited for at least a 2 day overnight period. Day vistors were predominantly from the local area.

Motivations

To try to determine why the Broken Group islands were chosen as a place to visit, questions were asked about: how the group found out about the area, the purpose for their trip and the reasons for specifically visiting the Broken Group islands.

Most groups (69.4 percent, Table 18) learned of the area through friends or family. This suggests that the area is attractive and rewarding as it has been recommended by someone who has most likely visited the area.

TABLE 18

HOW THE GROUPS FOUND OUT ABOUT THE AREA

	Number of Responses	Percentage
Correspondence with Parks Canada	2	1.9
Tourist Office	1	0.9
Pamphlets	1	0.9
Maps	17	15.7
Friends/Family	75	69.5
Other	12	11.1
Total	108	100.0

Purposes for the visit are categorized in Table 19. Among the general reasons indicated were recreation, vacation, enjoyment and relaxation. The more specific reasons were fishing and sightseeing.

TABLE 19

PURPOSE FOR VISITING THE BROKEN GROUP ISLANDS

	Number of Responses	Percentage of Groups
Recreation	41	39.9
Vacation	16	14.8
Get away from town	8	7.4
Isolated	3	2.8
Relaxation	12	11.1
Sightseeing	18	16.7
Enjoyment	17	15.7
Fishing	20	18.5
Other	21	19.4

NOTE: Each group could have indicated up to two reasons. The numbers and percentages reflect the total number of times each reason was chosen whether or not it was a first or second choice.

The reasons for specifically visiting the Broken Group islands are indicated in Table 20. The most frequently stated response was accessibility. The majority of those who cited this response were from the local area. The remainder were from the urban centres who often stated that the area was relatively more accessible than other undeveloped areas further north. The next two reasons most frequently mentioned were that it is a new area to explore (18.5 percent) and that there are few people (17.7 percent).

TABLE . 20

REASON FOR CHOOSING TO VISIT THE BROKEN GROUP ISLANDS

	Number of Responses	Percentage of Groups
Few People	19	17.6
Southern Most Park	1	0.9
Familiar with the Area	10	9.3
Areas was En Route	9	8.3
Accessible	34	31.4
Cabin Available	3	2.8
New Area	20	18.5
Sheltered Area	10	9.3
Other	43	39.9
Total	149	

NOTE: Each group could have indicated up to two reasons. The numbers and percentages reflect the total number of times each reason was chosen whether or not it was a first or second choice.

Recreational Activities

Locations where the interviews were conducted are shown in Figure 8. There was a concentration of visitors in the area of Salal Harbour (13.8 percent), Kettle Island Indian Reserve (13.0 percent), Effingham Bay (11.1 percent) and Benson Island (11.0 percent). The majority of interviews were conducted in the northern section which is sheltered from the waves and wind. Within each sector most points are located in sheltered anchorages (78.7 percent) or in association with midden sites (51.0 percent).

The types of activities each group was observed to be engaged in are listed in Table 21. The majority were interviewed while anchored (57.4 percent) while 28.7 percent were camping.

TABLE 21

OBSERVED RECREATIONAL ACTIVITY

	Number of Groups	Percentage
Anchored	62	57.4
Camping	31	28.7
Beachcombing	8	7.4
Hiking	4	3.7
Canoeing	2	1.9
Diving	1	0.9
Total	108	100.0

Each respondent was asked to identify the recreational activities his or her group was engaged in at each particular site. These activities could be land or water-based but limited to the immediate vicinity where the interviews were conducted (Table 22). Within the activities mentioned most frequently were beachcombing (39.9 percent), relaxing and reading (34.2 percent), camping (31.5 percent) and fishing (26.8 percent).

TABLE 22

RECREATIONAL ACTIVITIES PARTICIPATED IN AT SITE OF THE INTERVIEW

	Number	Percentage of Groups
Camping	34	31.5
Water Skiing	-	-
Hiking	13	12.0
Pleasure Boating	22	20.0
Skin/Scuba Diving	9	8.3
Picnicking	16	14.8
Relaxing/Reading	37	34.2
Beachcombing	43	39.9
Viewing/Photography	22	20.2
Casual Play	11	10.2
Swimming	8	7.4
Fishing	29	26.8
Other	33	30.6

The majority of the groups (71.3 percent) had also engaged in recreational activities, similar to those indicated above in other areas along the west coast besides the Broken Group. For the remainder, however, the study region was the only place they participated in the mentioned activities.

Table 23 indicates what other activities have been or would be participated in while in the area. The most popular were fishing (37.0 percent), general cruising and exploring (35.2 percent) and beachcombing (26.8 percent). The visitors were asked to state where they had participated in these activities, or planned to do so. Many respondents could not recall, or were not certain where they would go. It appears that in an undeveloped area such as the Broken Group, which is not widely publicized, spatial recreational behaviour is largely spontaneous and unplanned. Recreational activities engaged in are largely of the passive and dispersed type.

TABLE 23

RECREATIONAL ACTIVITIES ENGAGED IN WHILE IN THE BROKEN GROUP ISLANDS

	Number	Percentage of Groups
Beachcombing	29	26.8
Fishing	40	37.0
Camping	5	4.6
Relaxing	1	-0.9
Sailing	8	7.4
Canoeing	3	2.8
Exploring	28	35.2
Casual Playing	2	1.9
Other	26	24.0

The reasons for recreating at each site are compiled in Table 24. Almost 50 percent of these are related to physical factors such as anchorages and beaches. One of the more important reasons included in the "other" category (34.3 percent), especially in the case where the respondent was in the vicinity of the Nettle Island Indian Reserve, was proximity to Swale Rock, a popular fishing area. Another reason cited was availability of fresh water.

TABLE 24

REASONS FOR RECREATING AT A SPECIFIC SITE

	Number of Responses	Percentage
Good Anchorage	33	30.5
Good Beach	18	16.7
Friend's Advice	12	11.1
Cabin Available	8	7.4
Other	37	34.3
Total	108	100.0

In the cases where physical factors were not cited in the above question, a question specifically asking for the attractive physical characteristics of the site was posed. Again, the most frequently indicated features were anchorages (51.4 percent) and beaches (40.6 percent; Table 25).

While en route to or returning from the Broken Group, a number of activities could be engaged in by the visitors outside the area. Cruising was the most popular, followed by fishing and camping (Table 26).

TABLE 25

ATTRACTIVE PHYSICAL CHARACTERISTICS OF THE SITE

	Number of Responses	Percentage of Groups
Sheltered Anchorage	56	51.4
Sandy Beach	44	40.6
Fishing	1	0.9
Fresh Water	5	4.6
Environment	21	19.4
Exposure to the Sun	2	1.9
Swimming	2	1.9
Other	11	10.2

TABLE 26

RECREATIONAL ACTIVITIES PARTICIPATED IN OUTSIDE THE BROKEN GROUP ISLANDS ON THIS TRIP

	Number of Responses	Percentage of Groups
Camping	20	18.5
Hiking	13	12.0
Swimming	20	18.5
Cruising	44	40.7
Skin/Scuba Diving	12	11.1
Fishing	39	36.0
Other	8	7.4

The types of recreational equipment brought by each group are indicated in Table 27. Besides boats, the most common were fishing equipment, skin and scuba gear, and prawn and carb traps. Many respondents indicated a desire to trap prawns or crabs, but had not considered it a recreational activity. Since a meal of

either one would undoubtedly add greatly to their experience, trapping should be considered in a similar recreational category as fishing.

TABLE 27

RECREATIONAL EQUIPMENT

	Number of Groups	Percentage of Groups
Boat	104	96.4
Fishing Gear	89	82.4
Hiking Gear	23	21.3
Water Skis	6	5.6
Skin/Scuba Gear	40	37.0
Camping Gear	52	48.2
Traps	42	39.9
Other	20	18.5

Satisfication

Respondents were specifically asked about their groups' satisfaction with their present visit. Over 96 percent stated that they were very satisfied or satisfied.

One of the deficiences of the questionnaire was that the respondents were not asked to indicate how long they had been in the area at the time of the interview. Each interview was undoubtedly conducted at a different stage of visit for each group; therefore, some responses did not reflect a retrospective attitude towards the area.

The number of groups which planned to return was 70.4 percent. Only one group stated that they would definitely not return. Of the 65.6 percent who felt they had had a similar recreational experience before, 91.0 percent rated the Broken Group as excellent or good in relation to other areas.

Several final questions were asked which would have bearing on the development of the area as a national park.

Even though the Broken Group islands have not been widely publicized by Parks Canada, 81 percent believed that the area was part of Pacific Rim National Park. There are several possible reasons for this. It may be simply that the respondents wished to appear knowledgeable in the eyes of the interviewer and as result answered the question in the affirmative whether or not this was actually the case. Secondly, Parks Canada's wardens have been patrolling the area for the past two years and communicating with the visitors to demonstrate Parks jurisdiction over the area.

Many respondents had favourable comments about the area being a national park, although many feared it would attract too many visitors. Some felt that more services should be provided such as sanitation pick-up, fresh water and moorages. None of the groups indicated they had visited the area because it had been established as a park area.

An important factor which has to be considered prior to development is fresh water availability. As stated previously, it is rather limited on the islands. The majority of visitors brought water from home (35.2 percent) or from a nearby town (44.4 percent). However, 20 percent still relied on obtaining it in the area.

Almost every respondent felt that the Broken Group islands as a whole were unique which may indicate that a national park is warranted. Just over two-thirds felt that the specific interview site was unique.

CONCLUSION

The recreational use of the Broken Group islands, as indicated by this user survey, is low. A total of 108 groups was interviewed during the summer of 1975. The visitors were predominantly from the local area, Vancouver, Victoria and the Puget Sound region of the United States. The majority of users chose the Broken Group as their destination point because of its accessibility. The use of the area, as indicated by the number of returning recreationists, is increasing.

The recreational use of the islands is largely marine based. The majority of groups indicated that either a sheltered anchorage or a good beach was the primary reason for choosing a recreational site. A sheltered anchorage was important, as three-quarters of the groups cruised to the area aboard largely self-contained sail and power boats. The major on-shore recreational activity was beachcombing.

The specific interview site and the Broken Group islands as a whole were felt to be unique by the majority of respondents.

Close to 100 percent of the groups were satisfied, or very satisfied with their recreational experience in the islands. Over two-thirds of the groups planned to return to the islands in the future.

CHAPTER V

CONCLUSION

The overall problem of this thesis was to determine the recreational capability of the Broken Group islands, and to determine in relation to this whether the present recreational use is appropriate for the area. The previous two chapters have presented information on the recreational character of the islands. Chapter III was concerned with recreational capability as defined by the specific attractions, of features, of the shoreland and upland sites, and the quantity of use these sites could be expected to support and sustain. Chapter IV presented the results of the user survey, which included information on the characteristics of the users and their recreational behaviour, as well as information concerned with the specific interview site. A synthesis of these two sets of data will indicate the appropriateness of the present recreational use of the Broken Group islands.

RESULTS

Recreational Capability

The capability of the Broken Group islands was assessed according to the CLI: Land Capability Classification for Outdoor Recreation. The results ranged from moderately high (class 3) to

low (class 6) for the shorelands, and from moderately low (class 5) to very low (class 7) for the uplands. Though the area as a whole received a generally low capability rating, this is a measure of the quantity of recreation which the area could support and does not reflect the quality of the recreational experience that can be expected.

Several shoreland sites within the islands have a moderately high capability (class 3) but they are few in number (only 4 percent of the total shoreland sites), and small in total area. Five of the six class 3 sites are associated with beaches and backshores occupying midden sites. The other was classified for the view which it affords of the open ocean.

Sites of moderate capability (class 4) accounted for 11 percent of the total number of shoreland units. These are located in areas having beaches with significant limitations, either in size or in physical structure. The beaches are particularly suitable for dispersed activities such as hiking and beachcombing. Other class 4 sites are noted for their rock formations and for their capability for camping and viewing.

Class 5 indicated moderately low capability and represents 51 percent of the total shoreland units. These sites were rated basically for the capability which accrues to the adjacent water body, particularly for canoeing and family boating. They are found in the sheltered areas of the islands where the waters are normally calm. Eight sites were classified for their historic significance, and the remainder for dispersed recreational use such as hiking, gathering and collecting.

The lowest shoreland class unit in the Broken Group (class 6) indicates a low capability for outdoor recreation. It applies to 34 percent of the total shoreland sites, the majority of which receive their ratings because they are adjacent to either deep water boating areas of family boating areas. Otherwise, they are classified according to the diversity of the landscape and its aesthetic attractiveness.

The majority of the upland sites were classified as having low (class 6) to very low capability (class 7). Only 15 percent of the upland sites were ranked as having moderately low capability (class 5). These are mostly along established trails or surrounding lagoons, while one was rated for its capability for organized camping.

Class 6, representing 32 percent of the upland sites, corresponds with the vegetation type, Thuja plicata - Vaccinium ovatum. These sites have low capability for dispersed recreational use, such as hiking.

The lowest ratings went to those class 7 units (54 percent of the upland sites) which have impenetrable vegetation. A lake and marsh in the upland area were also assigned a very low capability.

User Survey

The following summary of the results of the user survey is directed at those questions dealing with the specific objectives of the thesis and having relevance to the designation of the area as a national park.

During the user survey, 108 groups of people were interviewed. It is believed that this is close to a 100 percent sample of those recreationists who visited the Broken Group islands during July and August of 1975.

Sixty percent of the interviews were conducted in five main areas. These are the northern section of Hand Island, the east side of Nettle Island in the vicinity of the Indian reserve, Salal Harbour, Benson Island, and Effingham Bay.

The majority of groups (86 percent) were either anchored or camping on shore at the time of the interview. The most frequently mentioned recreational activities that were participated in at each interview site were beachcombing, reading or relaxing, camping and fishing.

Accessibility was the most frequently stated reason for visiting the Broken Group islands. Barkley Sound is considered to be more accessible than other undeveloped areas further north. Other reasons mentioned were that it was a new area to explore and that there were few people.

The reasons for choosing a particular site were largely related to physical factors which include a good anchorage, a good beach and the availability of a cabin. Of the groups interviewed, the majority felt that the specific interview site was unique. Nearly every group felt that the Broken Group islands were unique as a whole.

Almost every group was either satisfied or very satisfied with their trip. This was reinforced by the fact that nearly half of the groups included at least one person who had visited the area previously, and three-quarters of the groups planned to return some time in the future.

SYNTHESIS

In the following discussion, the recreational capability and use of the specific interview sites will be synthesized. The quantity of recreational use which each site will support, as indicated by the capability class, will be compared with the number of groups found at each site. The subclasses indicate the activities for which a site is best suited, and can be compared with the types of recreational activities engaged in by the groups at each site. The activities are listed in Table 28.

Each capability site, which was also the site of an interview, will not necessarily be analyzed individually. In several areas, recreational use was not limited to a specific site but was spread over a larger area. This was particularly important in those areas which had adjacent sites with relatively high capability, since the opportunity for interaction between sites contributed much to the overall recreational experience.

The general conclusion from the synthesis is that the present recreational use of the Broken Group islands is compatible with the recreational capability of both the shoreland and upland areas. The most common types of recreational activities are

TABLE 28

RECREATIONAL ACTIVITIES
PARTICIPATED IN AT THE INTERVIEW SITE

Interview Site	Number of Groups Participating per Activity											
	Camping	Hiking	Pleasure Boating	Skin/Scuba Diving	Picnicking	Relaxing Reading	Beachcombing	Viewing/Photography	Casual Play	Swimming	Fishing	Other
Nettle Island	5	2	4	0	2	4	5	5	1	3	4	3
Nettle Island north beach	4	0	1	0	0	2	3	0	0	0	1	0
Salal Harbour	0	0	4	2	1	5	6	2	2	2	6	7
Effingham Bay	1	2	2	1	1	5	3	2	2	0	2	4
Effingham I.R.	0	0	0	0	1	0	2	0	1	0	1	2
Benson Island	4	4	2	0	1	4	7	2	0	1	2	0
Hand Island	7	1	4	2	2	7	7	5	1	1	3	2
Gilbert Island	2	1	1	0	0	3	2	2	2	0	1	2
Gibraltar Island	2	0	0	0	0	1	0	0	0	0	1	1
Turret Island	3	0	1	1	1	2	2	1	1	0	1	0
Willis Island	2	1	0	0	11	0	2	0	0	0	0	0
Jaques and Jarvis Islands	0	0	0	1	0	1	1	0	0	1	1	1
Dicebox Island	1	0	0	0	1	0	1	0	0	1	0	0
Other	2	0	2	3	1	2	2	4	0	0	3	3

comparatively extensive, and cannot be said to be exceeding the carrying capacity set by the natural resource base. At the same time, however, the recreationists are not generally aware of the comparative merits of the individual land units. Those sites which were shown by the CLI evaluation to have the highest recreational capability did not necessarily have the greatest volume of use. Factors other than the resource base, such as local accessibility and knowledge of the area, are highly significant in determining the actual use patterns.

Nettle Island

As indicated by the number of interviews completed, Nettle Island was the most heavily used island of the Broken Group. The main concentration of interview sites was in the area of the Indian reserve, where fifteen groups were contacted. The reason for this high number of interviews in relation to the low capability is the attraction of the sheltered anchorage in the bay. The area is particularly attractive for fishermen, since it is the closest anchorage to Swale Rock, a well known fishing spot. Five of those interviewed at the Indian reserve were camping on the shoreline, which was rated only for its suitability for beachcombing, viewing, and photography.

Four interviews were conducted at the beach site on the north shore of Nettle Island. The groups were either camping or beachcombing. The narrow shoreline is not particularly suited for camping, which is incompatible with beach activities such as beachcombing.

Salal Harbour

Most of the groups interviewed in Salal Harbour, which was rated for its capability as an anchorage, were in fact anchored. Here, fishing and beachcombing were the more popular activities engaged in. The area is not particularly suitable for salmon fishing but beachcombing is possible at low tide at several sites along the shoreline bounding Salal Harbour.

Effingham Island

All thirteen groups interviewed in Effingham Bay were at anchor, and they were largely engaged in on-board related activities. On land, activities include hiking and beachcombing. Hiking is associated with the Effingham Island trail extending from the head of the bay to the Indian reserve on the east shore. The fact that this trail, along with the Effingham Bay anchorage, is indicated on chart No. 3638 has undoubtedly influenced the level of use the area receives, which is presently compatible with its capability.

Three interviews were collected from groups at anchor immediately offshore from the Indian reserve. Only one of these remained for an overnight period. The activities engaged in, in the vicinity of the Indian reserve (beachcombing, picnicking, and fishing), were suited to the shoreline capability.

From the interviews collected at the Indian reserve it appears that this site is seldom used, even though it can support more dispersed forms of recreational use. Because of its location on the outer margin of the Broken Group the Indian reserve does not attract as much interest as sites within the islands.

Benson Island

The majority of use on Benson Island is concentrated on the eastern shore, where the capability varies from moderately low to moderately high on the shoreland sites. Four groups were interviewed while at anchor, four groups while camping and four while hiking. The beaches are presently the only areas where camping is engaged in, although the backshore is more suitable for this use.

The island attracts many people who know of the particular features it has to offer, such as the cabin and trail. Some groups were attracted specifically for the beaches, others for its sheltered waters.

Hand Island

Twelve groups were interviewed in the vicinity of the northern portion of Hand Island. Here the shoreline is classified as possessing a moderately low to a moderately high capability. Seven groups were interviewed while they were camping on the shoreline, three while beachcombing and two while at anchor. The only problem occurring with the present use is that camping on the narrow beach is incompatible with intensive forms of beach activities.

The island's attractive features are its beach, cabin and generally safe anchorage. It is also the closest point to Toquart Bay.

Gilbert Island

Five groups were interviewed in the vicinity of the midden site on Gilbert Island. Of those groups interviewed two were at anchor, and two were camping. It appears from the survey that the area receives little use, but this is not borne out by the evidence of slashed vegetation and copious refuse.

The capability of this site is rated as moderate, because of the beach and the grass cover on the midden. However, the environmental degradation which has already occurred should be cause to prohibit the use of the area until it can regenerate.

Gibraltar Island

Those interviewed at the beach site on Gibraltar Island were either camping in tents or using the existing cottages. The area is capable of supporting organized camping if conducted in the proper manner. One of the four groups interviewed had caused considerable damage to the cabins and had left the beach strewn with refuse.

The attractive features of the site are the beach, the cabins, the anchorage and the fresh water stream.

Turret Island

At the midden site on west Turret, three interviews were collected from groups who were camping. Beachcombing was participated in, and is also a feature of the adjoining historical site.

The site was stated to be attractive because it is sheltered and secluded, which probably accounts for the low level of use, even though it has a moderate capability.

Willis Island

All three groups were interviewed at the midden site located on the western shore of Willis Island. Two groups were camping, the other was beachcombing. The site is suited to both activities because of the shoreline's physical structure, its open backshore understory, a fresh water stream and the opportunity to beach a small boat. The site, rated for moderately high capability, could support more use than it is presently subjected to.

Jaques and Jarvis Islands

In the area of water which separates Jaques and Jarvis Islands on the north side, three interviews were collected while the groups were at anchor. The site was chosen because of its good holding ground and the opportunity to explore the 'Hole-in-Jaques'. The site was not rated as an anchorage, but such use is not incompatible with the designated capability.

Dicebox Island

Two interviews were conducted at the midden site on Dicebox. One group was camping and the other beachcombing. The area is most suited to extensive forms of use such as beachcombing.

Individual Sites

The remainder of the interview sites had individual locations. The main recreational activities associated with these were beachcombing (one interview), diving (two interviews), canoeing (two interviews), camping (one interview), and anchoring (ten interviews).

Of those who were anchored, four were stopped for only a short time. The other six were anchored in an inlet on the south shore of Jaques Island, or immediately off the north-west shore of Wouwer Island, or on the north shore of Reeks Island, or between Nettle and Erin Islands (site of three interviews). Only the last three areas were designated as having a capability for such use.

Canoeists were interviewed in the vicinity of the historic site of Mence Island and near Treble Islands. Divers were interviewed on the south side of the Brabant Islands and near the Vanlene. Both activities occurred at sites which were designated as having a capability for them.

Quality of Experience

The main approach of this thesis as dictated by the definition of recreation that was adopted, was to assess the supply function of the Broken Group islands. Through the use of the CLI recreation capability inventory it was possible to determine the types of recreation which the islands can support, and from that, to reach at least general conclusions about the intensity of recreational use that they desirably sustain. The CLI technique, though, does not deal directly with the quality of recreational experience, information on which had to be derived from the user survey.

The quality of the individual recreational experience, as far as can be ascertained from the level of satisfaction reported by the majority of groups, is high. Satisfaction is a culmination of all the experiences obtained in the area, and so is not

necessarily site specific. Two key points arise from this. First, reactions to a number of sites, rather than individual sites, are important to the quality of such an experience. Second, an area of low capability for recreation (as measured by a technique as CLI kind) can nonetheless yield a high quality recreational experience. The recreational capability inventory indicated the comparative level of use which the resources can tolerate without deterioration. In this manner the attractions and features which are important to the individual recreational experience can be maintained for those who visit the area in the future.

Summary

In general the present use of the Broken Group is appropriate for the recreational capability of the shoreland and upland areas. The recreational activities associated with each interview site were normally of the dispersed or extensive type, which conforms to the generally low capability ratings. At the same time, individual sites were indicated which are presently under-utilized, or where the recreational use was not the most suitable for the resource base. As the visitor population increases, individual users can be expected to be more discriminating in choosing a recreational site suited to their particular needs. The resulting recreational use pattern should be more closely related to the resource capability assessment.

One of the major reasons that the present use is appropriate is that sailors who are equipped to cruise the ocean are generally self-contained. It is not necessary that they go ashore

for anything but dispersed types of recreation. Therefore, from a resource point of view, the area could support more marine visitors, especially within those higher capability areas where visitors were not found and which seem to be largely overlooked as yet.

THE BROKEN GROUP ISLANDS AS A MARINE NATIONAL PARK

The establishment of marine parks has resulted from the need to protect marine resources from pollution and incompatible use. Designation of the Broken Group as a national park area where none of these pressures are experienced is an excellent opportunity for Parks Canada to preserve an unspoiled marine environment which exhibits a high diversity of marine life, is considered to be unique by its users, and has an attractive setting with its variety of land and seascapes.

National parks are established primarily with the recognition that recreation is a major resource use (Canada, 1975). However, several factors in general, and location and size in particular, tend to reflect a marine park's intended purpose (Marsh, 1970). For the Broken Group islands, both size and location indicate that low intensity recreational use can be their primary function.

The most important consideration for the Broken Group islands is not their absolute location but rather their accessibility. One of the criteria which Randall (1969) has indicated as important in identifying marine areas for recreational use is

that they be in close proximity to urban areas. The majority of users from the urban centres visiting the Broken Group have to cruise the Strait of Juan De Fuca, which can be both challenging and dangerous, in fairly large and expensive boats. Even though a majority of the visitors stated that accessibility was the prime reason for visiting the islands, they are still relatively inaccessible to large segements of the population. Therefore, improving access, and developing the islands for intensive recreational use, would require high capital input, which, on a cost-benefit basis may be more warranted at a site closer and more accessible to the centres of demand. The low accessibility factor is what has protected the area from intensive use, preserved the marine environment, and made it attractive for those who presently visit the area.

The second factor, size, is important to the conservation of marine resources. It is necessary to establish buffer zones to protect critical areas from damaging use (Canada, 1970). However, the Broken Group islands embrace so small an area that a buffer zone to protect their environment would have to be beyond their boundaries. Since this would be difficult to establish and maintain, it is essential that the recreational use of the Broken Group islands be within the limits of their resource capability.

Randall (1969) has suggested several other criteria which are important to consider when designating marine areas for recreational use. These include variety of underwater landscape,

and flora and fauna, clarity of water, and freedom from hazards of heavy surf, currents and high tides. The Broken Group are ideally suited for recreational use in respect of all these qualities.

Another purpose for which the Broken Group islands can be suited is scientific. The marine biological station in Bamfield is the base for research in the Barkley Sound region in general and the Broken Group in particular. The designation of the Broken Group as a park area was viewed by those advocating the Bamfield Marine Station "as an advantage to the extent that it excludes commercial and private development of what are now ecologically unspoiled areas" (Wilimovsky, 1969, p.16). To utilize the Broken Group for scientific study would be compatible with recreation as the primary use, as long as the recreational use is within the capability limits of the resource base.

For these reasons, derived from the site, situation and location of the Broken Group, designation of the area as a national park for resource-oriented recreational use is highly warranted. The use of the islands for primarily recreational purposes at a low level of intensity need not conflict with the use of the area for scientific purposes. Therefore, designation of the Broken Group islands as a marine national park area can be viewed as a positive step towards the conservation of Canada's Marine resources.

RELEVANCE TO PLANNING AND MANAGEMENT

During the initial scanning phase of the master planning process a variety of baseline information concerned with specific environmental features, such geology, soils, landforms, and vegetation, is required. When the primary function of the park is to provide for recreation, as is the case for the Broken Group (as dictated by national parks policy; Canada, 1975) it is imperative that the baseline information include an analysis of the area's recreational character, which encompasses both supply and demand functions. This thesis was primarily concerned with assessing the physiography of the Broken Group islands from a recreational perspective. Thus, it focused on the recreational supply function of the islands, but also considered expressed demand, and its relationship to the resource base. In general, it has to be considered that the Broken Group islands should be planned for low intensity use to maintain their present character which provides an opportunity for a high quality recreational experience for comparatively small numbers of people.

The specific implications this study has for planning and management have to be considered in light of the limits of the technique used. Firstly, the CLI technique is based only on those elements which exist on the landscape at the time of assessment. Therefore, any development to increase the capacity of a site was not taken into consideration.

Secondly, the CLI technique was not designed to indicate the recreational features and capability of the marine resources. It only considers the recreational value of the water as long as there are implications for the shoreland with respect to anxillary facilities or services required. The low capability of the Broken Group islands with reference to the quantity of recreation the land can support has been demonstrated.

If a capability inventory technique focusing on the marine resources could be devised and applied to the Broken Groun it would provide information to complement the land capability inventory complete herein. Results from marine research conducted in the area could be valuable in assessing the capability. It is quite possible that a marine capability inventory would indicate that the area can tolerate a higher level of marine-based recreational use. A study with such results should have little management implications for the shoreland and upland areas. The recreational activities which occur on land would be of the dispersed type for which the islands are particularly suited. Many of the recreational activities which are marine based do not require that services and facilities be provided in the immediate vicinity. Marine-based recreationists are usually well equipped and self-contained. The only facility which was requested by many of the groups interviewed was for the provision of sanitation containers which would negate the need for burning refuse on the beach.

The third limitation of the CLI assessment is related to its underlying principle. Although the CLI technique is based on the concept of carrying capacity it does not yield results which indicate exact numbers of visitors an area or site can support. What a CLI inventory does offer to the planner is a comparative assessment of the general level of intensity and types of recreation which a site can support. It will indicate which sites are most significant for specific recreational activities and can therefore be used as a basis for encouraging resource-compatible use.

The nature of the expressed demand also has planning and management implications. The user survey provided data on the characteristics and behavior of the users. It indicates the level and type of recreational activity to which the Broken Group islands are presently subjected. Although the present level of use is fairly low, it can be expected to increase, as indicated by the high level of satisfaction of the users, the number of visitors who have returned in recent years, and the number who plan to return in the future.

With increased visitation recreational use can be expected to cluster around those beach and anchorage sites which are most attractive. If present patterns of use are expected to continue in the future, there is a potential for intensive and extensive forms of recreational activity to occur simultaneously on several of the beach sites. The incompatability of

these uses necessitate that the dispersed forms of use, such as camping, be encouraged on a more suitable resource base, so that the beaches are reserved for more intensive use.

It should not be necessary to publicize those sites which have a relatively high capability, but which are not now being used. One of the most frequently mentioned recreational activities that was engaged in by those interviewed was exploring and cruising. The discovery of new areas by the recreationist to escape the crowded ones, add a significant element to the overall experience.

[redacted] major implications arising from this thesis concerns t[redacted]onship between the centres of demand and the supply [redacted]tion offered by the Broken Group islands. As a national park area the islands will attract considerable interest, especially from those relatively close population centres. The major management problem will be to try to maintain a low level of use. Intensity of use has been demonstrated as being directly related to access. Even though the islands' present state of access is relatively difficult, accessibility was the major reason cited for visiting the islands. Therefore, use of the area could be expected to increase sharply if access were improved. Without improving access, use can be expected to increase to a level more suited to the resource base.

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APPENDICES

APPENDIX A

USER SURVEY

BROKEN GROUP ISLANDS - PACIFIC RIM NATIONAL PARK

SUMMER, 1975

NUMBER:_____

DATE:_____

TIME:_____

LOCATION:_____

HELLO! WE'RE CONDUCTING A RECREATIONAL USER SURVEY IN THIS AREA FOR PARKS CANADA. I'D LIKE TO ASK YOU A NUMBER OF QUESTIONS THAT WILL SHOW THE PRESENT LEVEL OF RECREATIONAL USE OF THE BROKEN GROUP ISLANDS ALONG WITH WHY THE AREA IS BEING VISITED. THE INFORMATION YOU GIVE HERE WILL BE USED AS THE BASIS FOR A MASTER THESIS AND SO THAT THE BROKEN GROUP ISLANDS CAN BE DEVELOPED AND MANAGED FOR THE BEST USE IN THE FUTURE. ALL INDIVIDUAL RESPONSES WILL BE KEPT CONFIDENTIAL. YOUR CO-OPERATION AND COMMENTS ARE APPRECIATED.

1. HOW WOULD YOU DESCRIBE YOUR GROUP?

( ) ONE PERSON
( ) ONE FAMILY
( ) GROUP OF FRIENDS
( ) OTHER:_____
( ) ONE COUPLE
( ) 2 OR MORE FAMILIES
( ) ORGANIZED GROUP

2. WHAT IS THE AGE AND SEX OF THE MEMBERS OF YOUR GROUP?

	M	F
UNDER 10	( )	( )
10 - 19	( )	( )
20 - 29	( )	( )
30 - 39	( )	( )
40 - 49	( )	( )
50 - 59	( )	( )
60 - 69	( )	( )
70 AND OVER	( )	( )

3. WHERE IS YOUR PERMANENT RESIDENCE LOCATED?

( ) BAMFIELD
( ) PORT ALBERNI
( ) VANCOUVER
( ) OTHER, CANADA
( ) UCLUELET
( ) VICTORIA
( ) SEATTLE
( ) OTHER, U.S.A.

4. WHAT IS YOUR OCCUPATION?

( ) PROFESSIONAL
( ) TRADES AND TECHNICAL
( ) STUDENT
( ) OTHER:_____
( ) BUSINESS
( ) GENERAL LABOURER
( ) RETIRED

5. WHERE, ALONG THE COAST DID THIS TRIP ORIGINATE?

( ) PORT ALBERNI
( ) BAMFIELD
( ) UCLUELET
( ) SEATTLE
( ) OTHER:_____
( ) TOQUART BAY
( ) VANCOUVER
( ) VIA LADY ROSE

6. ARE THE BROKEN GROUP ISLANDS A DESTINATION ( ) OR A STOPOVER POINT OF A LONGER TRIP ( )?

IF IT IS A STOPOVER POINT, WHAT IS YOUR ULTIMATE DESTINATION?

_____

7. IS THIS YOUR FIRST VISIT TO THE BROKEN GROUP ISLANDS?
( ) YES ( ) NO

IF NO, WHEN DID YOU FIRST VISIT THE AREA? 19_____

HOW OFTEN DO YOU VISIT THE BROKEN GROUP ISLANDS IN THE SUMMER (_____); WINTER(_____)?

DO YOU VISIT THE AREA PRIMARILY ON A DAILY BASIS ( ) OR DO YOU STAY IN THE AREA OVERNIGHT ( )?

8. HOW LONG DO YOU INTEND TO STAY IN THE BROKEN GROUP ISLANDS ON THIS TRIP? _____

9. WHERE DID YOU STAY LAST NIGHT?

( ) PERMANENT RESIDENCE
( ) OTHER:_____

10. WHERE DO YOU PLAN TO STAY TONIGHT?

( ) PERMANENT RESIDENCE
( ) OTHER:_____

11. HOW DID YOU ORIGINALLY FIND OUT ABOUT THE BROKEN GROUP ISLANDS?

( ) CORRESPONDENCE WITH PARKS CANADA
( ) TOURIST OFFICE AND/OR PAMPHLETS
( ) MAPS
( ) FRIENDS/FAMILY
( ) OTHER:_____

12. WHAT IS (ARE) THE MAIN PURPOSE(S) OF YOUR TRIP TO THE AREA?

1. _____
2. _____
3. _____

13. WHY DID YOU CHOOSE TO VISIT THIS AREA RATHER THAN A DIFFERENT ONE ALONG THE WEST COAST OF B.C.?

_____

_____

14. PRIOR TO THIS INTERVIEW DID YOU REALIZE THAT THE BROKEN GROUP WAS A SECTION OF A NATIONAL PARK?

( ) YES ( ) NO

COMMENTS: _____

15. WHAT IS (ARE) THE MAIN RECREATIONAL ACTIVITY(IES) YOU OR YOUR GROUP ARE ENGAGED IN AT THIS PARTICULAR SITE?

( ) CAMPING
( ) HIKING
( ) SKIN/SCUBA DIVING
( ) RELAXING/READING
( ) VIEWING/PHOTOGRAPHY
( ) SWIMMING
( ) OTHER: _____
( ) WATER SKIING
( ) PLEASURE BOATING
( ) PICNICKING
( ) BEACHCOMBING
( ) CASUAL PLAY
( ) FISHING

16. WHAT RECREATIONAL ACTIVITIES HAVE YOU OR YOUR GROUP PARTICIPATED IN OR PLAN TO PARTICIPATE IN WHILE IN THE BROKEN GROUP ISLANDS AREA? AT WHAT SITES?

1. _____
2. _____
3. _____
4. _____
5. _____

17. WHAT IS (ARE) YOUR REASON(S) FOR RECREATING AT THIS PARTICULAR SITE?

( ) GOOD ANCHORAGE
( ) FRIENDS ADVICE
( ) OTHER: _____
( ) GOOD BEACH
( ) CABIN AVAILABLE

18. WHAT ARE THE NATURAL PHYSICAL CHARACTERISTICS WHICH ATTRACTED YOU TO THIS SPECIFIC SITE?

1. _____

2. _____

19. ARE THERE OTHER AREAS ALONG THE WEST COAST OF B.C. WHERE YOU ENGAGE IN THE RECREATIONAL ACTIVITIES INDICATED IN NO. 15?

( ) YES ( ) NO

20. IN YOUR OPINION ARE THE PHYSICAL CHARACTERISTICS OF THIS SITE UNIQUE ( ) OR COMMON ( )? ARE THE BROKEN GROUP ISLANDS AS A WHOLE UNIQUE ( ) OR COMMON ( )?

21. WHERE DO YOU PLAN TO OBTAIN FRESH WATER?

( ) FROM HOME
( ) FROM A NEARBY TOWN
( ) IN THE AREA ... WHERE? _____

IF INTERVIEWED WHILE ON THE WATER:

22. HOW WOULD YOU RATE YOUR PRESENT ANCHORAGE WITH RESPECT TO SAFETY?

( ) EXCELLENT ( ) GOOD ( ) FAIR ( ) POOR ( ) VERY POOR

23. HOW WOULD YOU DESCRIBE THE WATER WITH RESPECT TO:

WAVE CONDITIONS ... ( ) CALM ( ) WAVY ( ) CHOPPY ( ) ROUGH

TEMPERATURE ..... ( ) WARM ( ) COOL ( ) COLD

VISIBILITY ..... ( ) CLEAR ( ) MODERATELY CLEAR ( ) TURBID

24. ARE THERE ANY CURRENTS THAT YOU KNOW OF?

( ) YES ( ) NO

IF YES, COULD YOU PLEASE DESCRIBE THEM?

_____

IF SKIN OR SCUBA DIVING:

25. HOW WOULD YOU DESCRIBE THE FLORA AND FAUNA OF THE MARINE ENVIRONMENT WITH RESPECT TO:

QUANTITY ... ( ) ABUNDANT ( ) LITTLE ( ) SCARCE

QUALITY .... ( ) GOOD ( ) FAIR ( ) POOR

26. HOW WOULD YOU DESCRIBE THE BOTTOM?

( ) SANDY ( ) VEGETATED
( ) ROCKY ( ) MUDDY

27. ARE THERE ANY HAZARDS TO DIVING IN THE AREA?

( ) YES ( ) NO

IF YES, WHAT ARE THEY? _____

28. HOW MANY DIVES WOULD YOU ESTIMATE YOU HAVE LOGGED? _____

29. HOW WOULD YOU RATE YOUR PRESENT DIVING EXPERIENCE IN THE BROKEN GROUP ISLANDS?

( ) EXCELLENT ( ) GOOD ( ) FAIR ( ) POOR ( ) VERY POOR

IF INTERVIEWED WHILE ON LAND:

30. HOW WOULD YOU DESCRIBE THE SHORE WITH RESPECT TO:

SHORE MATERIAL ... ( ) SANDY ( ) PEBBLY ( ) ROCKY ( ) CALCAREOUS

SLOPE ..... ( ) GENTLE ( ) MODERATELY STEEP ( ) STEEP

31. HOW WOULD YOU RATE THE SHORE?

( ) EXCELLENT ( ) GOOD ( ) FAIR ( ) POOR ( ) VERY POOR

IF INTERVIEWED WHILE CAMPING:

32. HOW WOULD YOU DESCRIBE YOUR CAMPSITE WITH RESPECT TO:

SLOPE ..... ( ) LEVEL ( ) MODERATELY STEEP ( ) STEEP

VETETATIVE COVER ..... ( ) OPEN ( ) MODERATELY COVERED ( ) DENSE

GROUND MOISTURE CONDITIONS ... ( ) DRY ( ) MOIST ( ) WET

33. IN YOUR OPINION IS THE VIEW:

( ) GOOD ( ) FAIR ( ) POOR

34. WHAT RECREATIONAL ACTIVITIES HAVE YOU OR YOUR GROUP PARTICIPATED IN OUTSIDE THE BROKEN GROUP ISLANDS ON THIS TRIP?

( ) CAMPING ( ) HIKING
( ) SWIMMING ( ) CRUISING
( ) SKIN/SCUBA DIVING ( ) FISHING
( ) OTHER: _____

35. TO DATE HOW SATISFIED ARE YOU WITH YOUR PRESENT VISIT TO THE BROKEN GROUP ISLANDS?

( ) VERY SATISFIED ( ) SATISFIED ( ) NOT SURE/NO OPINION
( ) DISSATISFIED ( ) VERY DISSATISFIED

36. DO YOU THINK THAT YOU WILL VISIT THE BROKEN GROUP ISLANDS AGAIN?

( ) DEFINITELY ( ) PROBABLY ( ) MAYBE ( ) NOT LIKELY

37. ARE THERE AREAS ALONG THE WEST COAST OF B.C. WHERE YOU HAVE HAD A RECREATIONAL EXPERIENCE SIMILAR TO THE PRESENT ONE IN THE BROKEN GROUP ISLANDS?

( ) YES ( ) NO

IF YES, HOW DOES THE PRESENT EXPERIENCE RATE WITH THOSE?

( ) EXCELLENT ( ) GOOD ( ) FAIR ( ) POOR ( ) VERY POOR

38. WHAT TYPES OF RECREATIONAL EQUIPMENT HAVE YOU ALONG WITH YOU?

( ) BOAT
( ) HIKING GEAR
( ) CAMPING GEAR
( ) OTHER:_____

( ) FISHING GEAR
( ) WATER SKIS
( ) SKIN/SCUBA GEAR
( ) TRAPS_____

RESPONDENT WAS:

( ) VERY COOPERATIVE
( ) GENERALLY COOPERATIVE
( ) GENERALLY UNCOOPERATIVE

OBSERVATION SHEET

WEATHER

TEMPERATURE:_____

WIND SPEED:_____ DIRECTION:_____

CLOUD COVER: ( ) CLEAR ( ) PARTIALLY CLOUDY ( ) OVERCAST

PRECIPITATION: ( ) NONE ( ) LIGHT ( ) HEAVY

FOG PRESENT: ( ) YES ( ) NO

DESCRIPTION OF SITE

LAND: ( ) SHORELAND ( ) UPLAND
( ) TRAIL ( ) CAMP ( ) PICNIC SITE ( ) OTHER:_____

VEGETATIVE COVER: ( ) OPEN ( ) MODERATELY COVERED ( ) DENSE

GROUND MATERIAL: ( ) SANDY ( ) PEBBLY ( ) ROCKY ( ) FINE SOIL
( ) CALCAREOUS

DRAINAGE: ( ) WET ( ) MOIST ( ) DRY

SLOPE:_____

WATER

TEMPERATURE:_____

TURBIDITY:_____

CURRENT:_____

WAVE HEIGHT:_____

BOTTOM MATERIAL:_____

TRANSPORTATION

REGISTRATION NUMBER:_____

TYPE: ( ) SAIL ( ) MOTOR SAIL
( ) POWER, PLANNING ( ) POWER, DISPLACEMENT
( ) CANOE ( ) KAYAK
( ) INFLATABLE

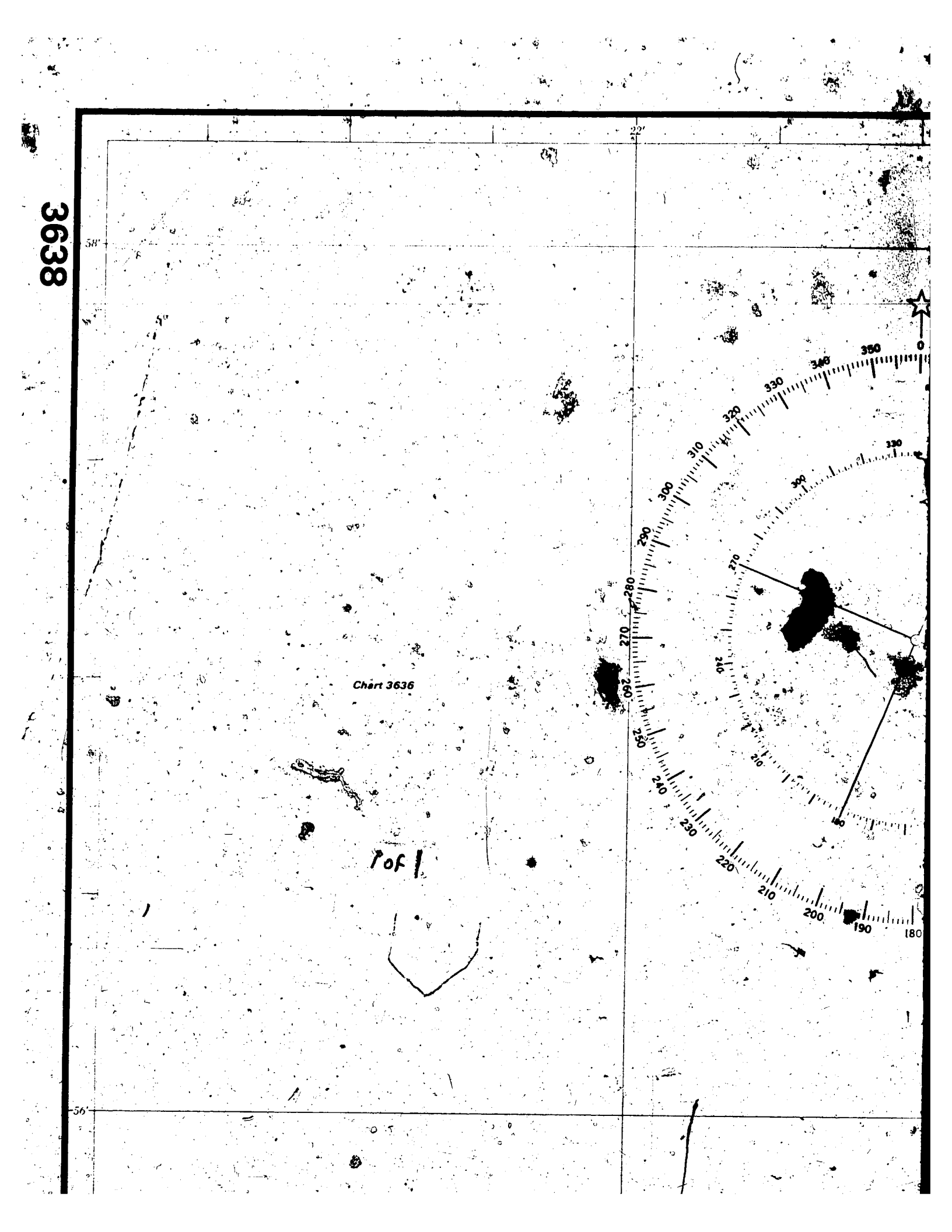
SIZE:_____

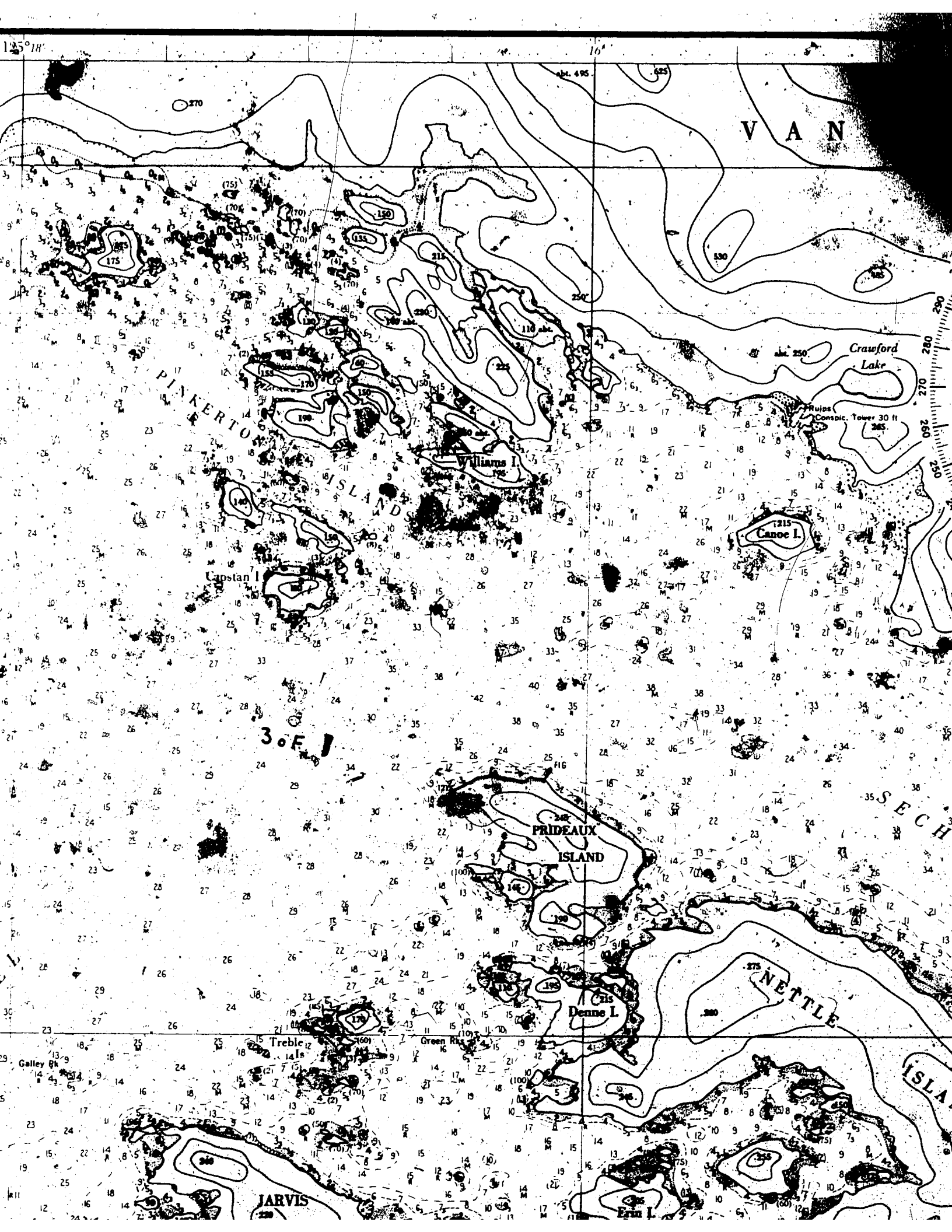
GENERAL OBSERVATION OR OUTSTANDING FEATURES:

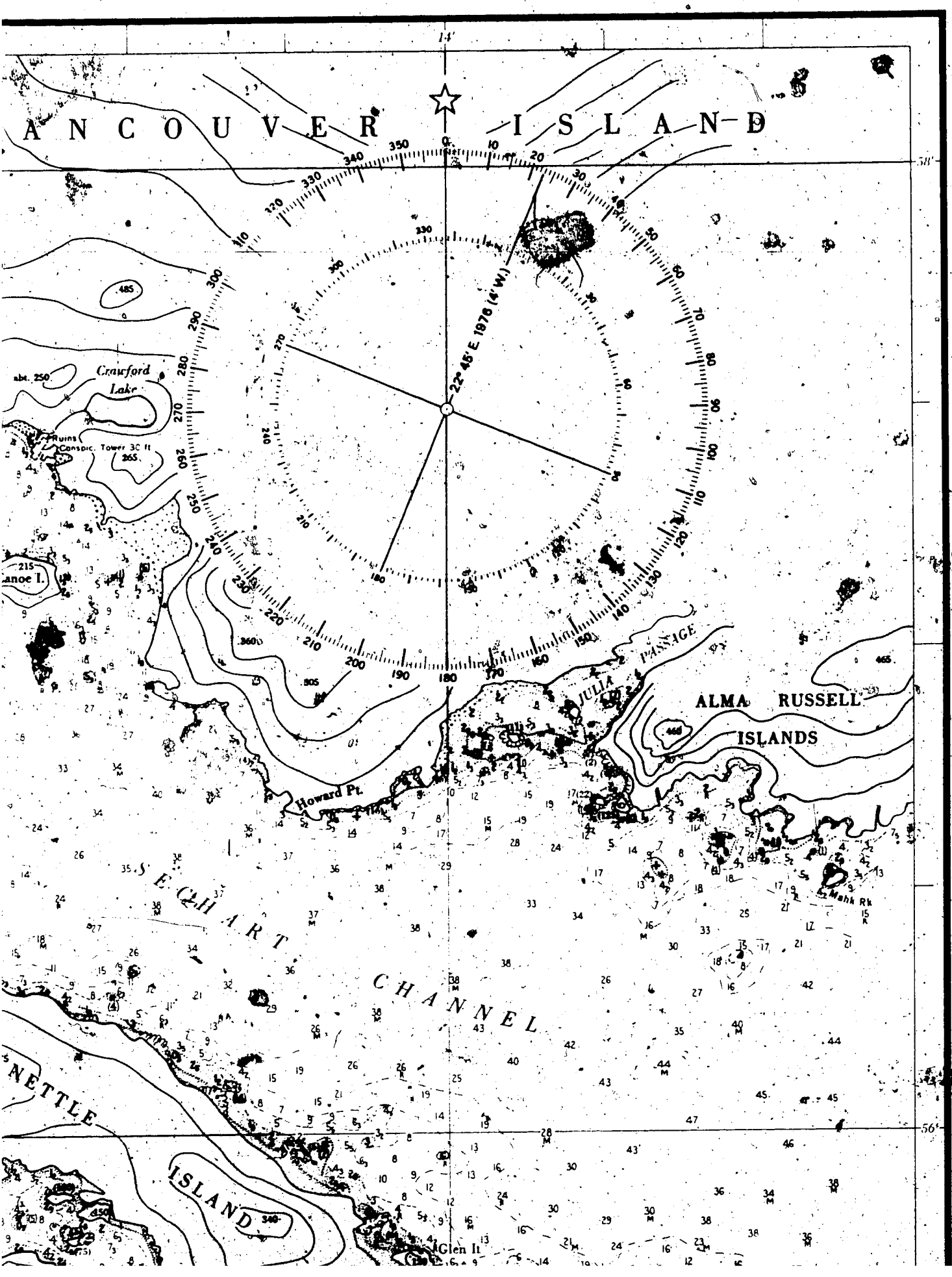
APPENDIX B

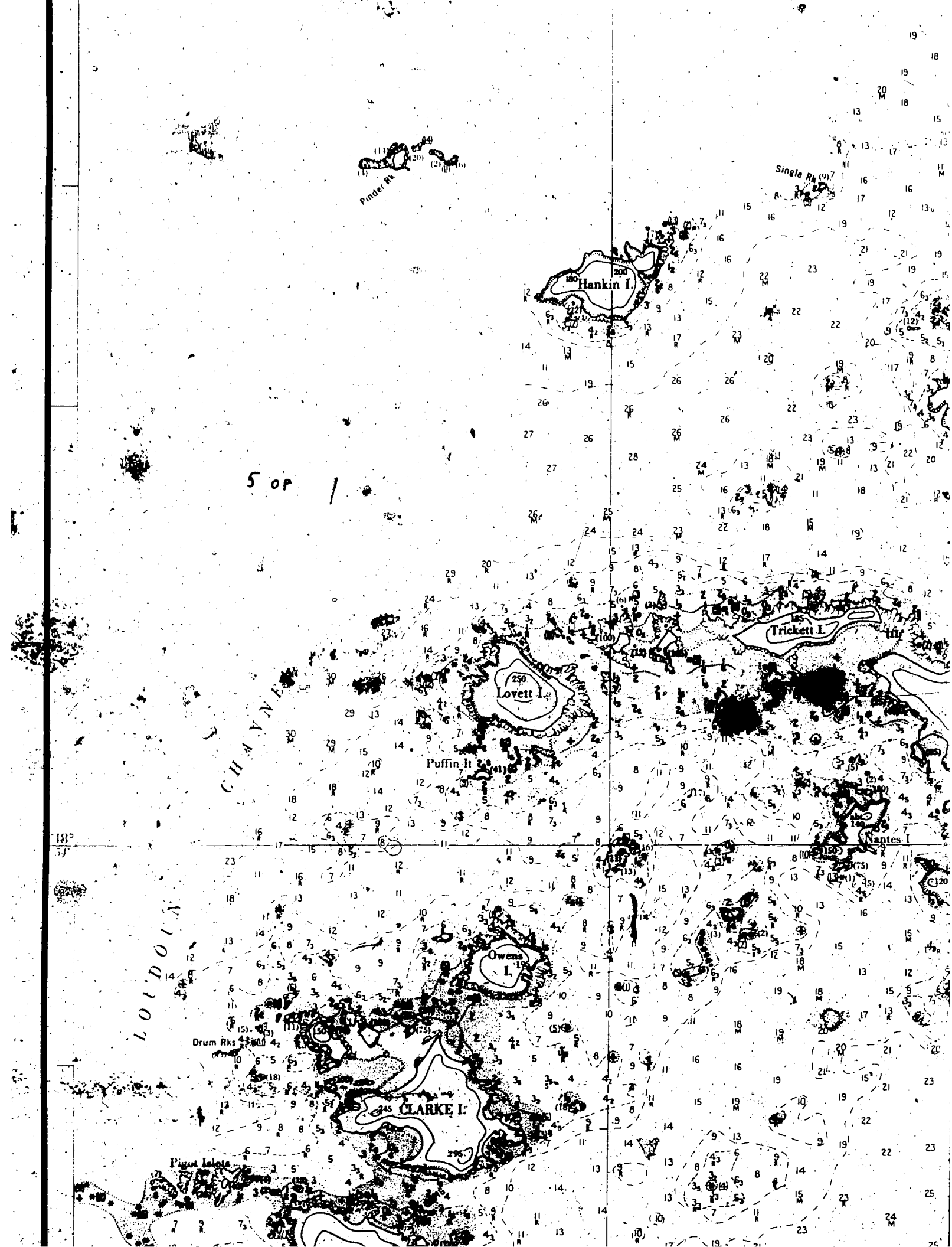
CANADIAN HYDROGRAPHIC CHART NO. 3638

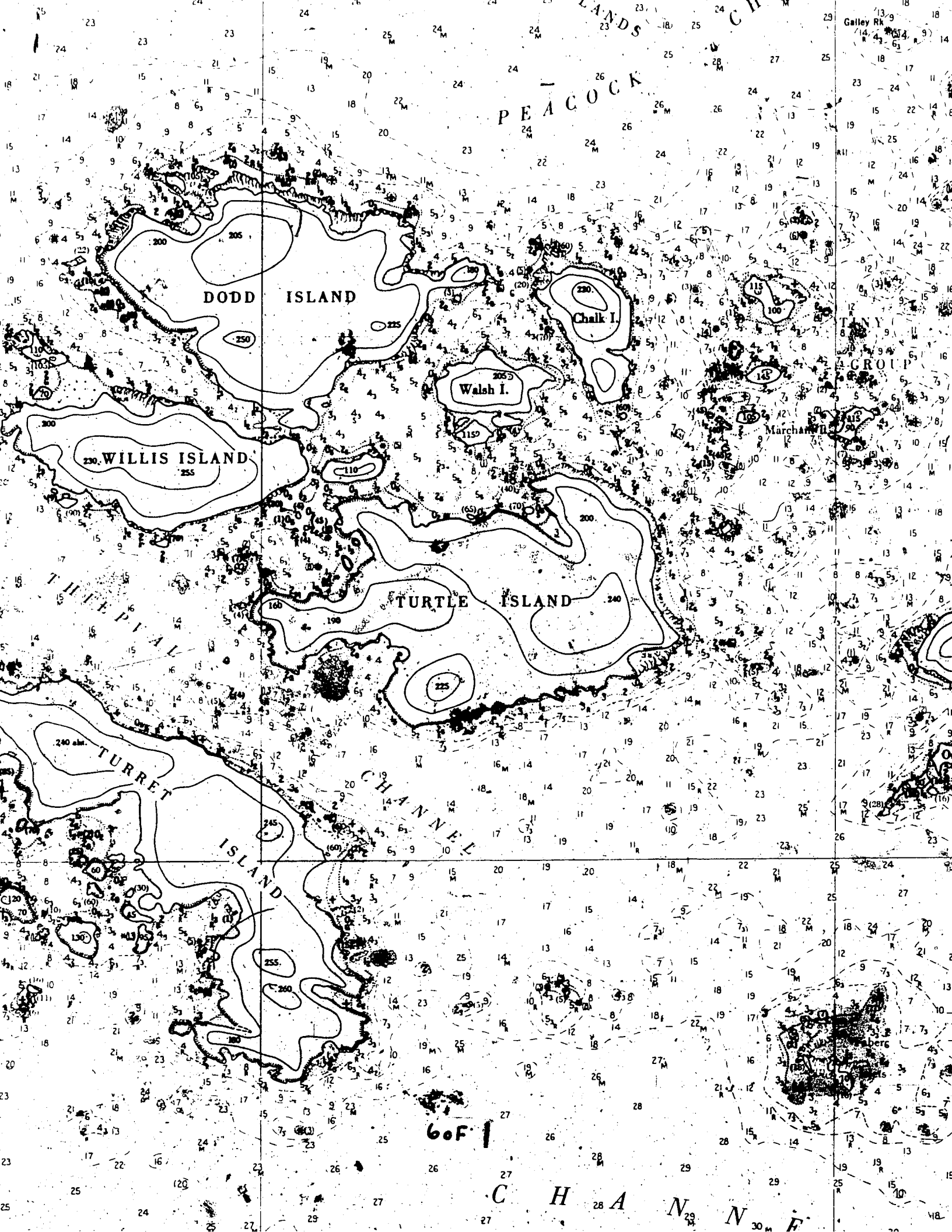
(Map Enclosed in Back Cover Pocket)

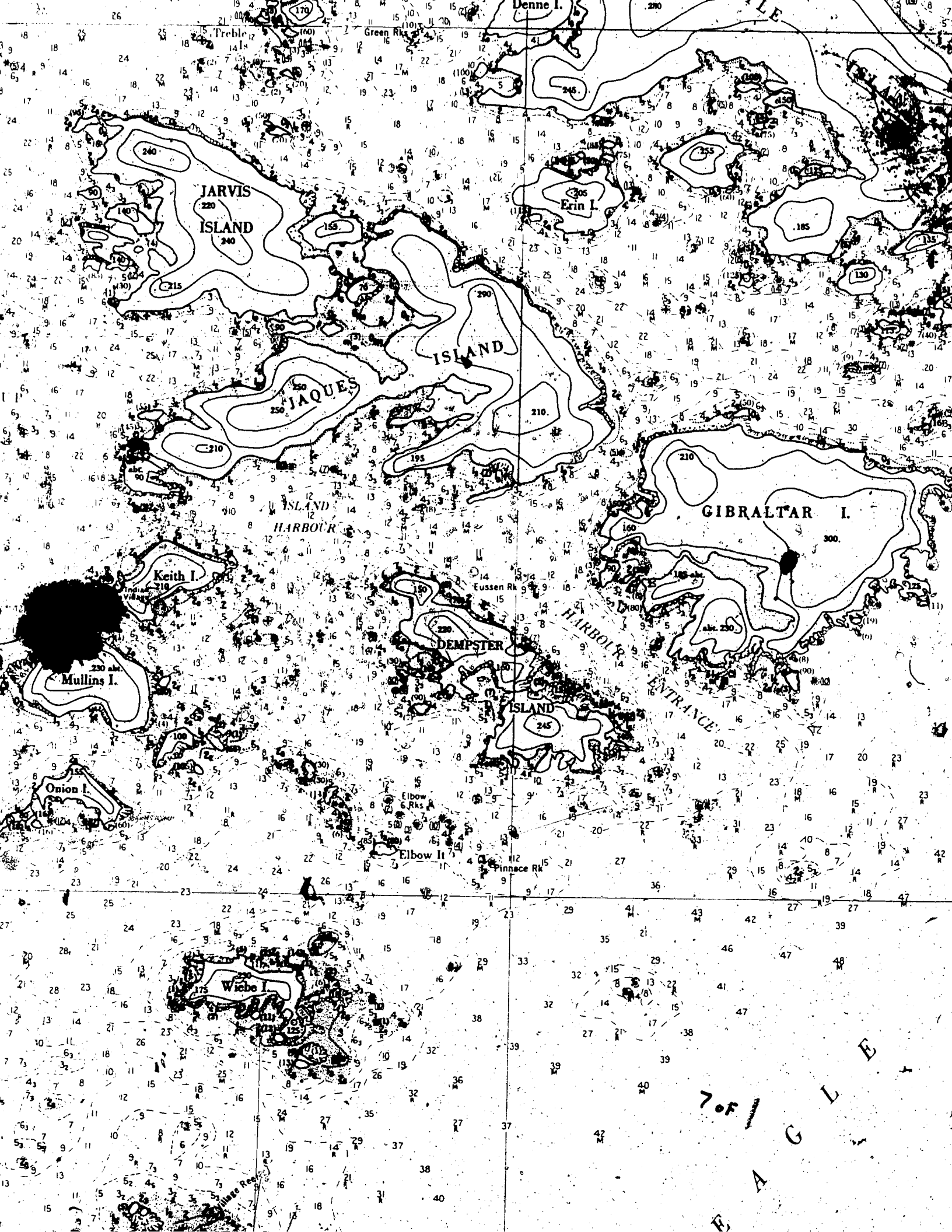

3638
58'
56'
Chart 3636
1 of 1
0
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180

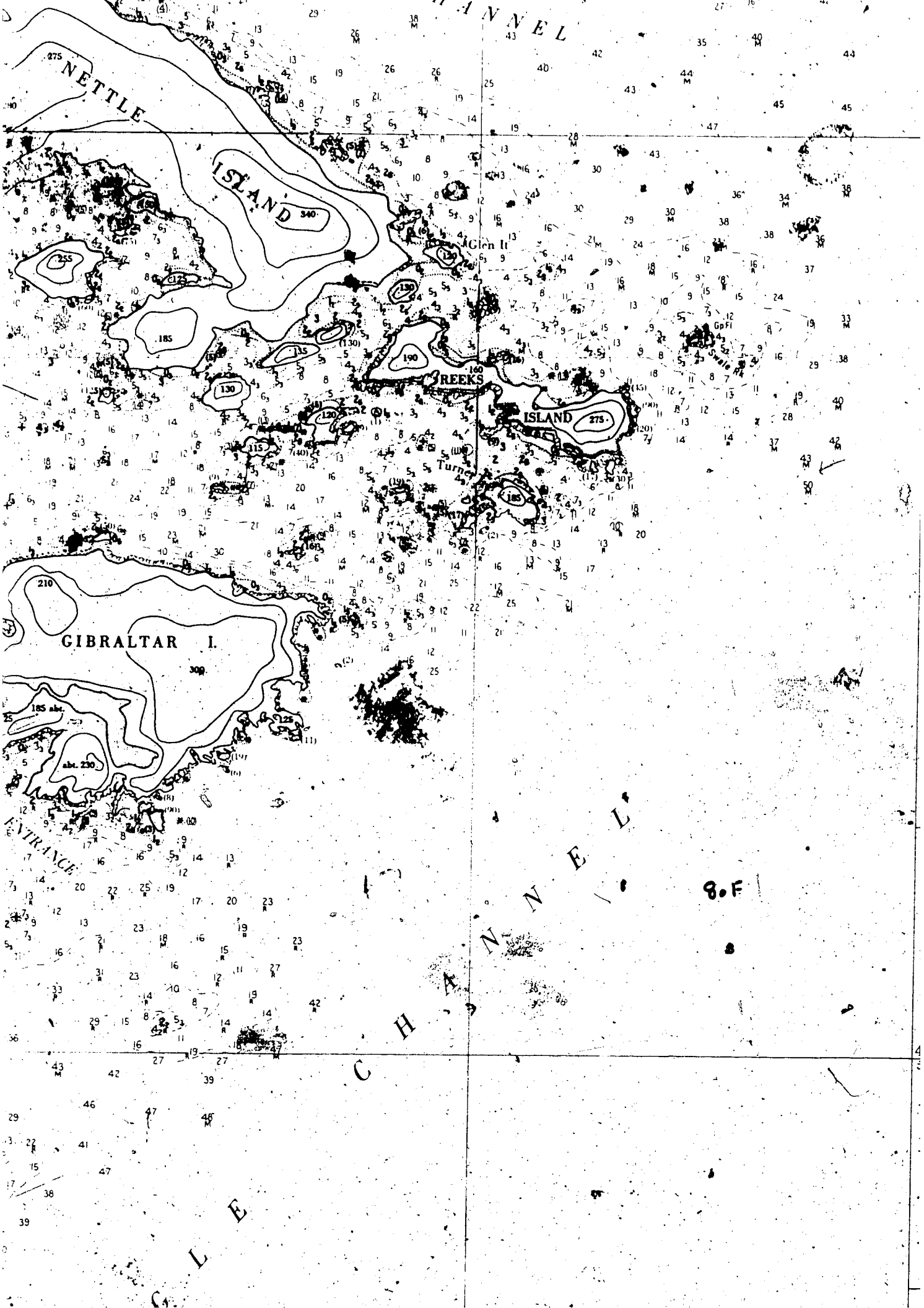

135°18'
16'
VAN
Crawford Lake
Ruins
Compic. Tower 30 ft
PINKERTON ISLANDS
Williams I.
Canoe I.
Capstan I
3 o F I
PRIDEAUX ISLAND
FIG
SECH
NETTLE
ISLA
Denne L.
Treble Is
Green Rks
Galley Pk
JARVIS
Erin I.

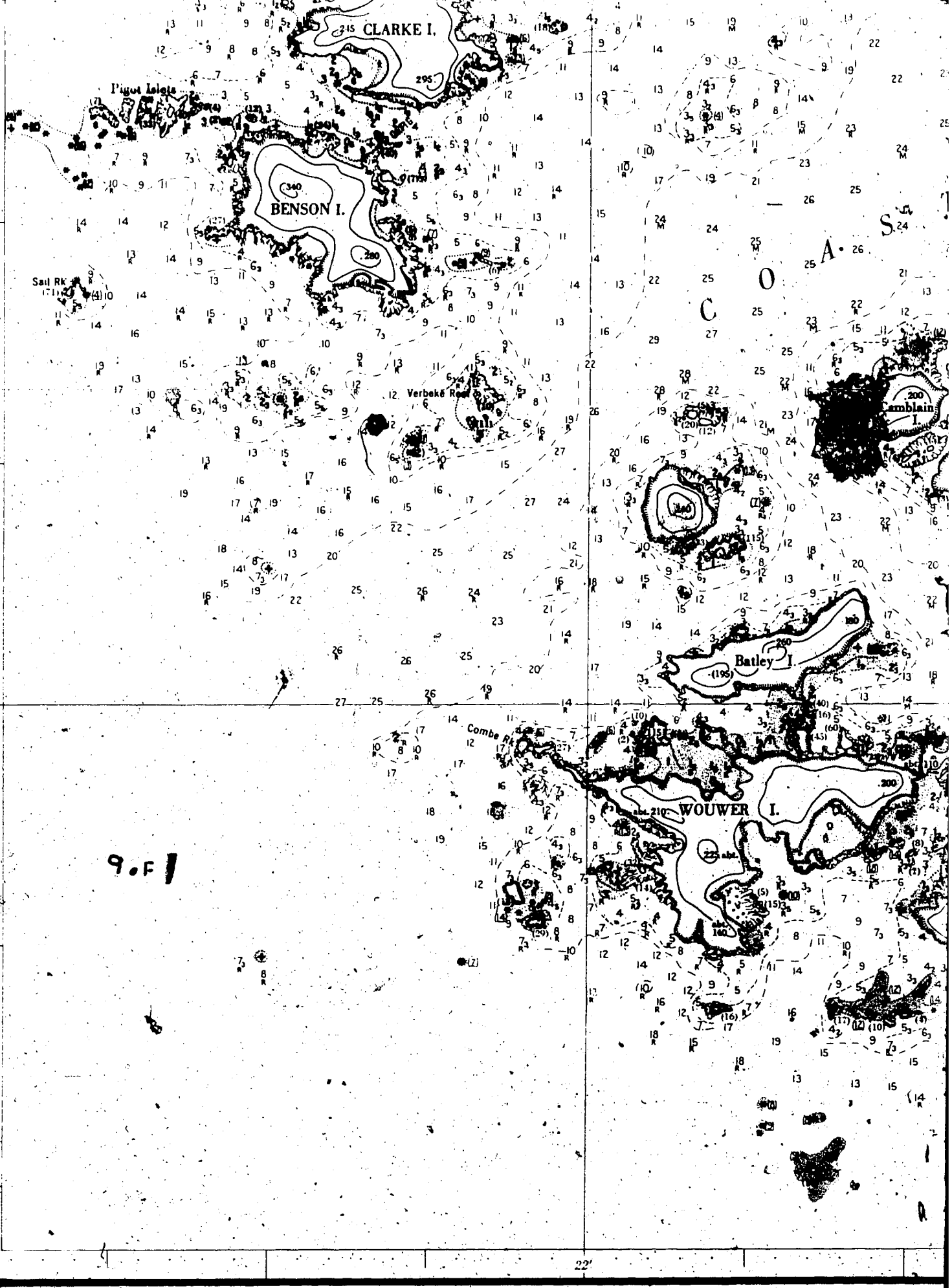

ANCOUVER ISLAND
22° 48' E 1978 (4' W.)
Crawford Lake
abt. 250
Ruins
Conspic. Tower 30 ft
265
485
215
anoe I.
JULIA PASSAGE
ALMA RUSSELL ISLANDS
Howard Pt.
Mahk Rk
SEYMOUR CHANNEL
NETTLE ISLAND
Glen It


Pinder Rk
Single Rk
Hankin I.
Trickett I.
Lovett I.
Puffin It
Nantes I
Owens I.
Drum Rks
CLARKE I.
Pivot Islets
CHANNEL
LOUDOUN


PEACOCK
DODD ISLAND
Chalk I.
Walsh I.
WILLIS ISLAND
TURTLE ISLAND
TIMPIAL
TURRET ISLAND
CHANNEL
CHANNEL
Galley Rk
TINY GROUP
Marchant R.
Faberg
60F 1


Denne I.
Treble I.
Green Rks
JARVIS
ISLAND
Erin I.
JAQUES
ISLAND
ISLAND
HARBOUR
GIBRALTAR I.
Keith I.
Indian Village
Eussen Rk
DEMPSTER
ISLAND
HARBOUR ENTRANCE
Mullins I.
Onion I.
Elbow Rks
Elbow It
Pinnace Rk
Wiebe I.
Village Reef
EAGLE

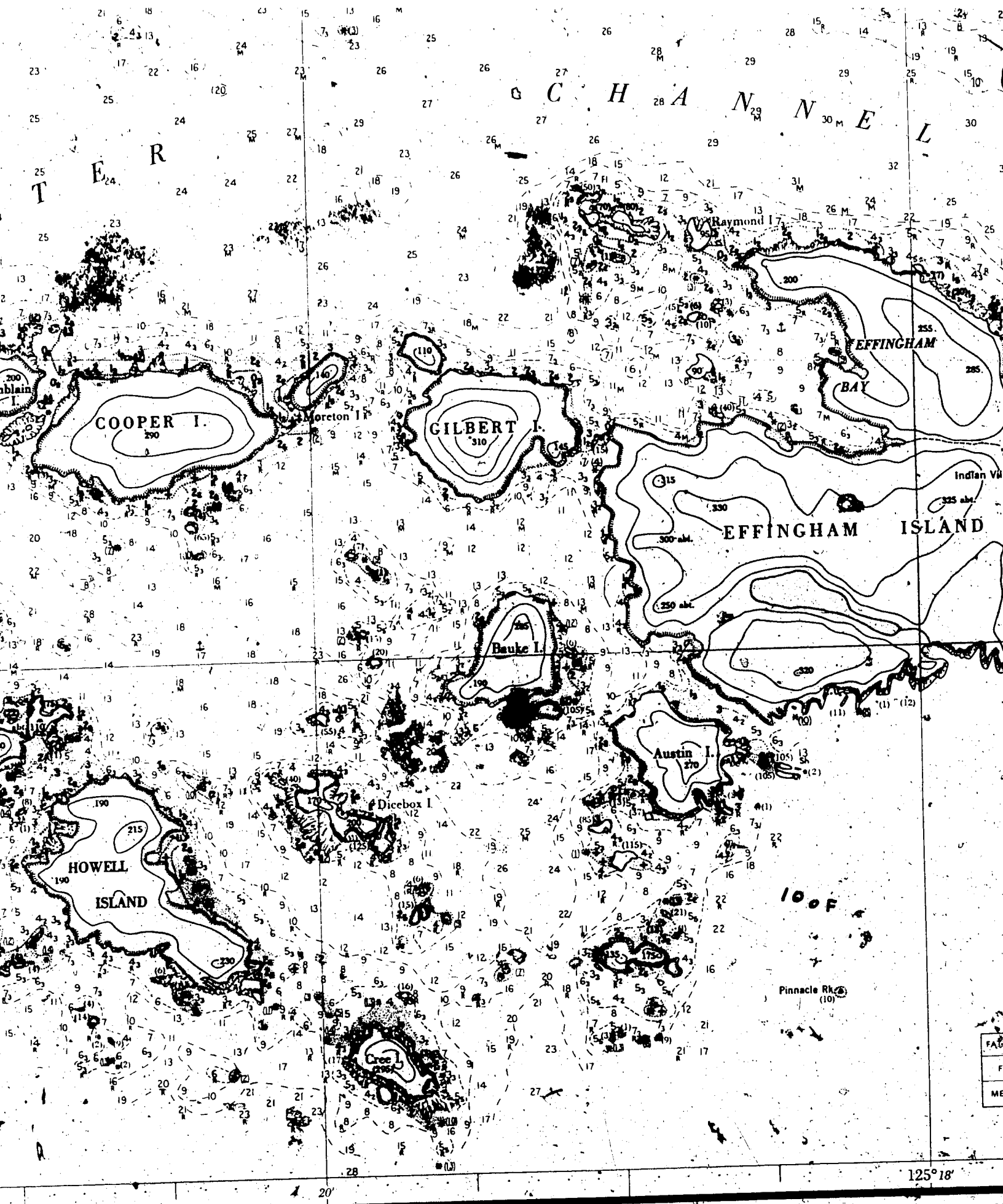

NETTLE
ISLAND
CREEKS
ISLAND
GIBRALTAR I.
CHANNEL
CHANNEL
8.F



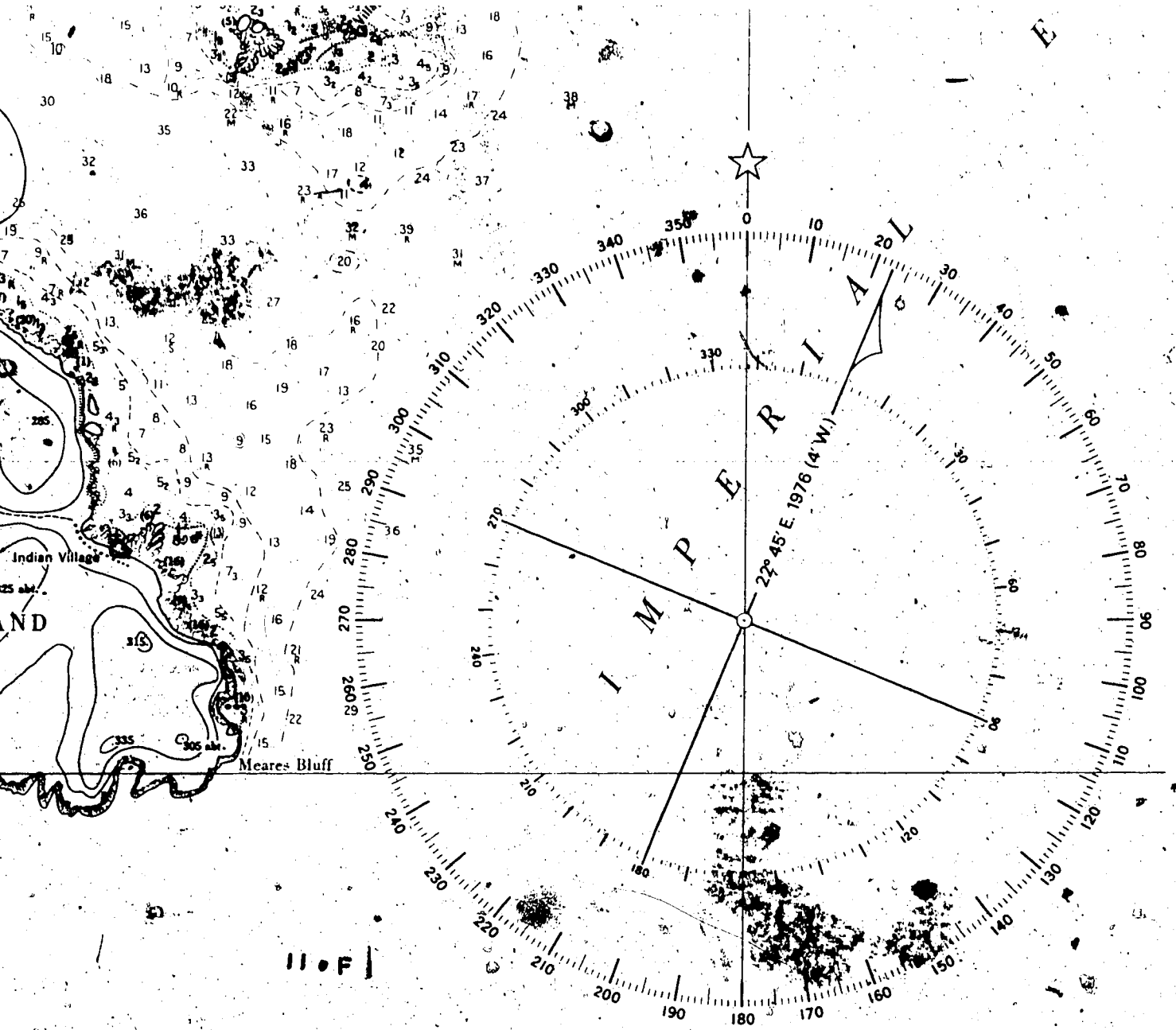
9.F1

PREVIOUS EDITIONS: 1934 '37 '46 '55
NEW EDITION JAN. 8 1960 REPRINT OCT. 15 1976

CORRECTIONS FROM CANADIAN
NOTICES TO MARINERS TO: 1976 778



PUBLISHED BY THE CANADIAN HYDROGRAPHIC S
DEPARTMENT OF THE ENVIRONMENT, OTTAW



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Information concerning Canadian Nautical Charts, Sailing Directions, Tide Tables and other Government publications of interest to mariners may be obtained on request to the Dominion Hydrographer, Canadian Hydrographic Service, Department of the Environment, Ottawa.

Canadian "Notices to Mariners" published weekly, contain important navigational information including amendments to Canadian Charts, Sailing Directions, Lists of Lights and Lists of Radio Aids. These "Notices" may be obtained free on request to the Director, Aids and Waterways, Canadian Coast Guard, Ministry of Transport, Ottawa.

FATHOMS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
FEET 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102
METRES 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Scal

Cables 10 5 0

1000 0

1000 500 0

16'

HIC SERVICE
TTAWA
1976

CANADA

BRITISH COLUMBIA

VANCOUVER ISLAND

BROKEN GROUP

(BARKLEY SOUND)

Surveyed by Mr. H.D. Parizeau, Comdr. J.H. Knight and assistants, 1931

Swale Rock Light : Lat. 48° 55' 33"33 N., Long. 125° 13' 14"76 W.

Bearings refer to the True Compass and are given from Seaward (thus 295° etc.)

SOUNDINGS IN FATHOMS
(under 11 in fathoms and feet)
reduced to Lowest Normal Tides

Water areas with depths of 6 fathoms or less are tinted blue
Underlined figures on drying banks or in brackets against drying rocks express heights in feet above the datum of soundings; all other heights are expressed in feet above High Water.
For complete list of Symbols and Abbreviations see Chart No. 1

Natural Scale 1 : 18,243

Projection : Polyconic

TIDAL INFORMATION

PLACE	Height above Datum of Soundings				
	Large Tides		Average Tides		Mean Sea Level
	Higher H.W.	Lower L.W.	Higher H.W.	Lower L.W.	
	feet	feet	feet	feet	feet
Bamfield Inlet (Lat. 48° 50' N., Long. 125° 8' W.)	13·2	0·4	11·2	2·7	7·1

BENCH MARK

The datum of this chart is 10·60 feet below a brass plug, set in a shelf of rock, near the wharf which lies immediately below the Bamfield Inlet Cable Office.

Scale of Latitude and Distance
5 0 10 Cables or 1 Sea Mile

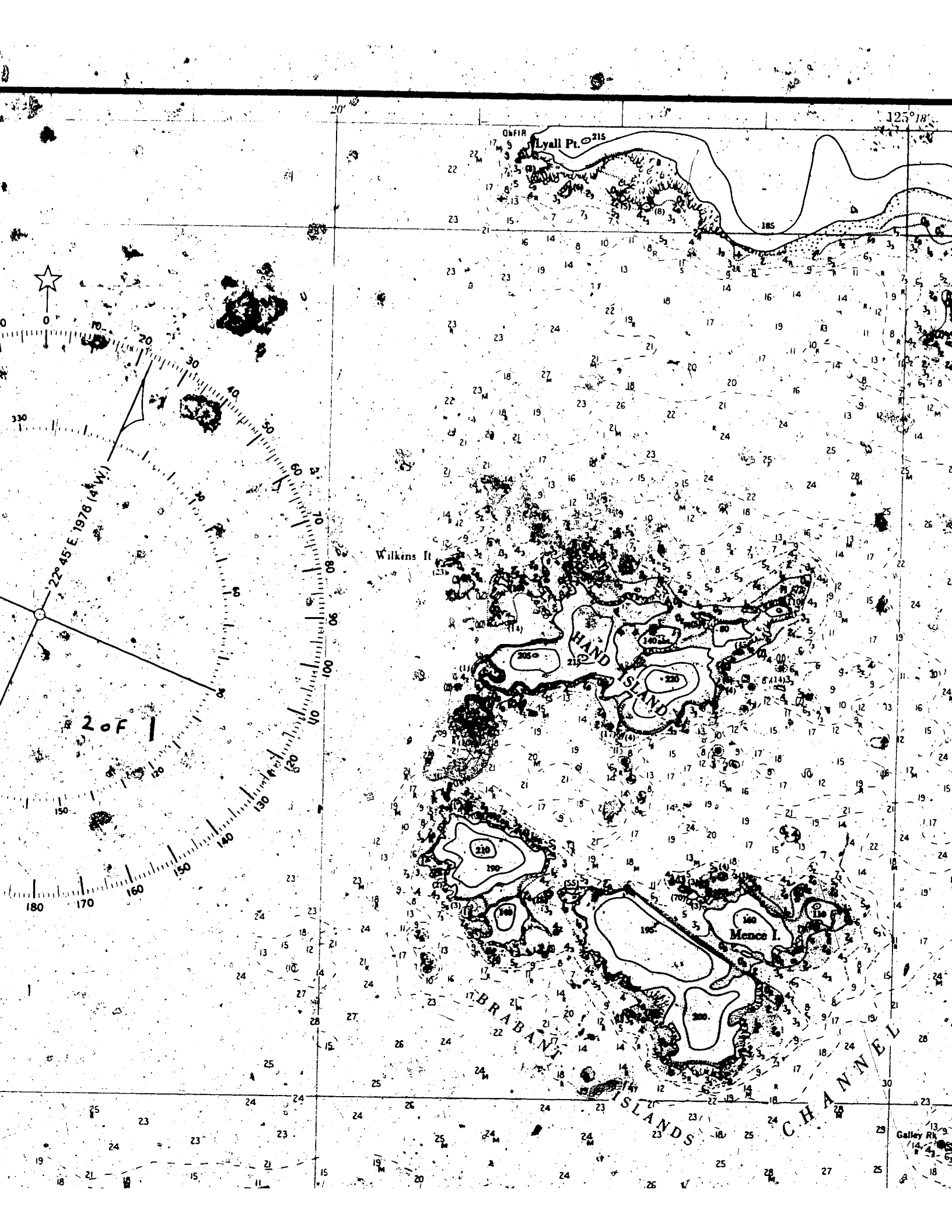
Scale of Feet
5000 10000

Scale of Metres
500 0 2000

52'

14'

(2 of 12)


20'
125°18'
Lyall Pt.
215
185
Wilkens It
HAND ISLAND
220
205
210
190
160
Mence I.
BRABANT ISLANDS CHANNEL
Galley Rk
22° 45' E 1976 (4'W)
2 OF 1