

Robson Bight (Michael Bigg)

Ref. No.:

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ECOLOGICAL RESERVES COLLECTION
GOVERNMENT OF BRITISH COLUMBIA
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PRELIMINARY REPORT

Non-consumptive Use and Management of Whales,
Robson Bight Study Area, 1986

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May 1987

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Introduction

In the past two decades whales have been used as a focus for general wildlife conservation issues. More specifically considerable effort has been made by individuals, some national governments, and non-governmental organizations to restrain commercial whaling pending a more rational assessment of costs and benefits. Throughout the controversies over whaling, high levels of media exposure developed a wider interest in whales. Part of the expanded interest is a rapidly growing constituency of recreational whale-watchers (Kaza 1983).

Recreational whale-watching began in southern California in the 1950's where it has exhibited a cycle of rapid growth, slight decline, followed by stabilization (Tilt 1985). The major period of expansion took place in the mid and late 1970's primarily to other American locales, and remote areas served by American nature cruises. More recently several other countries have developed recreational whale-watching sites due to interest in both cetacean research, and economic returns. The latter can be significant (Kelly 1983).

The Management Problem

Whale-watching depends on a predictable occurrence of whales in an area that is accessible to human populations. Whales are unlikely to concentrate in a random manner. It is therefore probable that some life history requirement is being met by close-shore concentrations of whales at established whale-watching sites. The effect of interfering with such habitat use patterns may be to force whales into sub-optimal habitats with potentially detrimental effects on local populations.

The management objective of a recreational whale-watching site should deal with minimizing the disturbance of natural whale activity patterns,

yet maximize the number of people who can enjoy a satisfactory contact with the whales and their environment. There are three main information needs implied by that objective. First, is the knowledge of what constitutes a normal behaviour pattern. Second is the need to know what disturbs whales sufficiently to alter a normal behaviour pattern, and the consequences of such an alteration. Third is an understanding of the human users in terms of what constitutes a satisfactory experience, and whether that can be enhanced in both quantity and quality without disturbance of the whales.

When these animals do concentrate it is often in areas of high biological productivity. Where this occurs there may be conflict with established human resource systems such as fishing and other marine harvesting operations. The traditional human users can pose a difficult management problem. Considerable baseline biological research must be done in order to know what levels of resource extraction are allowable before limiting the natural system.

The lack of information about whale behaviour and ecology is compounded by the limited set of tools for regulation of a marine site. Unlike a terrestrial system, the regions of marine ecosystems are difficult to delimit. Most marine mammals have quite large ranges, therefore a static areal designation would usually offer only partial control. Other problems that are more difficult in a marine setting than a comparable terrestrial situation involve boundary marking, education, enforcement, and conflicts within the non-consumptive user groups.

The Robson Bight Ecological Reserve

In 1982 an Ecological Reserve was established to protect Robson Bight and adjacent shorelines from "incompatible development" and set it aside for its high scientific study value related to concentrations of killer whale (Orcinus orca). Robson Bight, including the adjacent rubbing beaches, is designated to provide a refuge for the killer whales in a small, but apparently important, segment of their range. The Reserve setting deals with management of direct and indirect conflict between four resource systems:

- (1) forestry operations in the Tsitika River valley, on the shoreline and adjacent slopes, and log storage and transport on the waters of the Bight;
- (2) commercial fishing operations concentrate in the Reserve to harvest the same migratory salmon that are suspected to attract the killer whales;
- (3) research and commercial photography, sanctioned by the Ecological Reserves authorities;
- (4) recreational users including commercial charters, private boats, and non-permit research and photography boats.

Currently management of the area is accomplished by the area designation, guidelines for observing killer whales, an extra-jurisdictional camping ban on adjacent crown and private lands, an information pamphlet, limited signage, and a co-operative protocol established by the volunteer wardens and research interests. For various reasons these management tools fail to deal with segments of all four of

the resource systems in their interaction with the non-consumptive users. It is the purpose of this document to report on the first phase of a research project initiated in 1986 to describe the nature of the non-consumptive use and management of the whales associated with the Ecological Reserve and make preliminary recommendations for non-consumptive use management.

The Research Plan

The data requirements for an understanding of the whale management needs fall into two main categories, biological and social. The biological research aspect involves definition of what constitutes a disturbance to the whales, and at what levels does such a disturbance stress the whales. This question, commonly referred to as the "harassment" issue, has provided a conundrum to biological researchers. The difficulty lies in establishment of the cause and effect of particular whale behaviours. Many studies have used the respiration rate as a measure of effect caused by human disturbance. For example, studies by Baker et al (1982, 1983) on humpback whales (Megaptera novaeangliae) in Glacier Bay, Alaska indicated a change in respiration rates was caused by their experimental treatments described as "obtrusive boat traffic". Other studies summarized by Darling (1986) for Ecological Reserves indicate the same has been reported for killer whales. However, the demands of a scientifically valid test of whale response would require a logistically sophisticated experimental design to provide sufficient control of alternative explanations. Until this work is carried out, a management oriented definition has been suggested by way of boat behaviour guidelines (e.g. Dept. of Fisheries and Oceans 1984) that appear to be an

estimate of what constitutes a disturbance.

Our research does not address the ethological nature of the harassment issue. Rather it seeks to analyse human behaviour around the whales in the context of the established guidelines.

We sought to record several different dimensions of human activity using two methods. The first involved an observation program of non-consumptive whale-oriented activities. The number of encounters by different boat types, duration of encounter, number of whales and group structure, and spatial pattern of encounters was recorded by an unobtrusive observer with a spotting scope and directional equipment on a cliff overlooking Robson Bight and adjacent sections of Johnstone Strait. The observer's information was supplemented by radio contact with a boat crew also monitoring the encounters.

The second data collection method involved contact with whale-watchers after their whale encounters and delivery of a mail-return questionnaire. The survey was designed to obtain three types of information, the level of interest and interaction with whales, the nature of the trip, including economic values, that brought them to the site, and a socio-economic profile of the user.

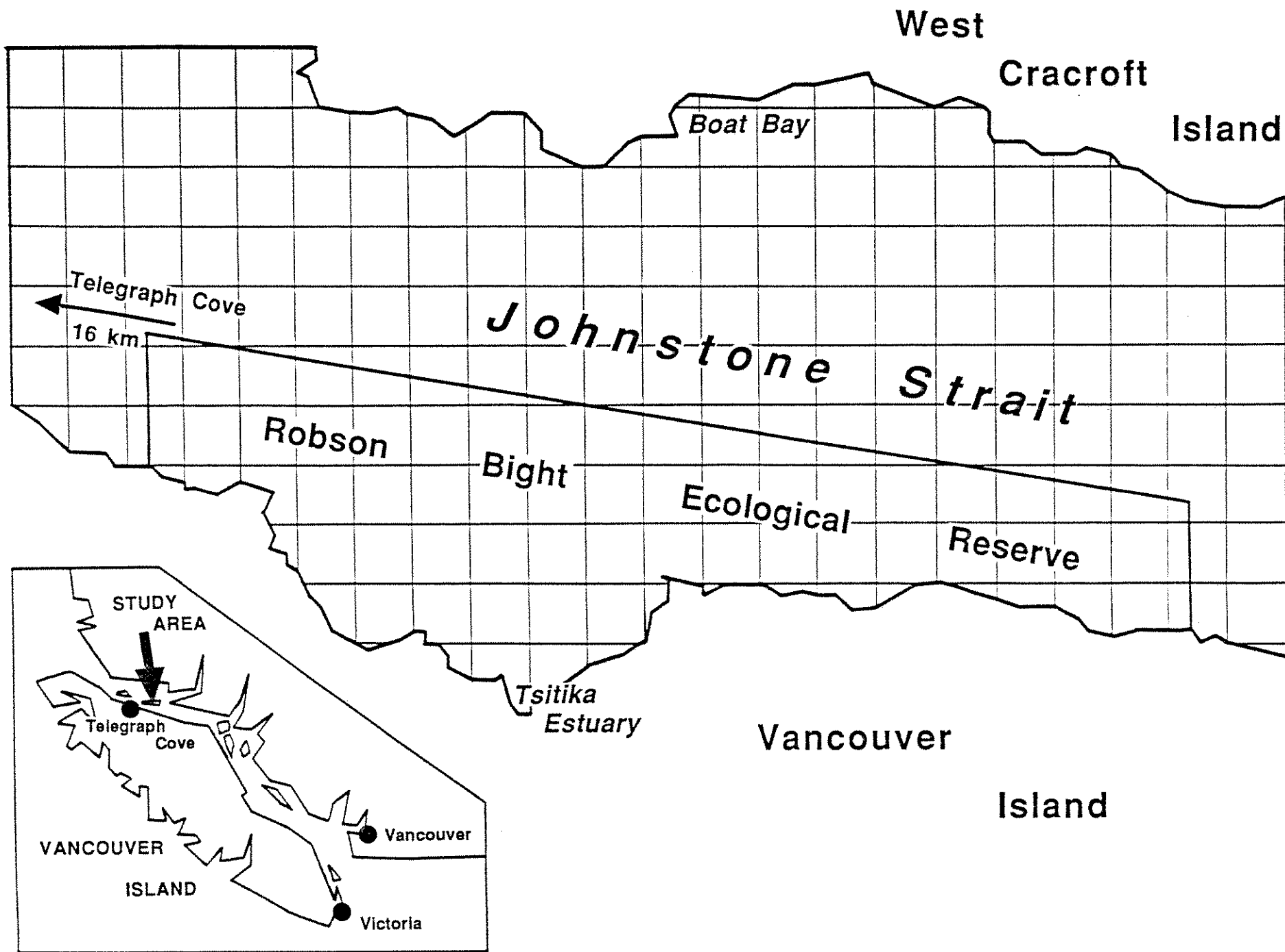
This report focuses on the results of the observation program that describes the levels and types of use, and the spatial extent of the use in the observation area (Figure 1). Later reports will document the analysis of the data regarding the human dimension of whale-watching.

Results

We recorded observations from 339 whale-watching encounters on 39 days between July 2 and August 27, 1986. The mean number of encounters

FIGURE 1

ROBSON BIGHT STUDY AREA



per day was 8.6 ($s = 4.78$) with five days having 15 or more encounters per day (Fig. 2). Encounters were classified into nine different boat types (See Appendix 1 for boat classification). As indicated in Table 1 most of the encounters were made by research vessels (29.8%), followed by charter motor vessels and small pleasure motor craft.

The duration of encounters were recorded for each boat class. The total recorded duration ($n = 318$) was 246.42 hours with a mean duration of 46.49 minutes per encounter. Different boat types exhibited a wide range of encounter durations. Table 2 indicates the general pattern. Pleasure boats have shorter encounters, with the exception of small motor vessels which are the most manoeuvrable craft and thus able to maintain contact with whale groups. As expected, research vessels spend the longest time with whales, followed by charter vessels. Kayaks have the shortest durations due to their inability to maintain the whale's speed.

Boat behaviour during encounters has a uniform morphology. Vessels usually run parallel to the whale groups for various periods, and with various distances between themselves and the whales. Closer encounters are attempted by "leapfrogging" in front of the whales travel path and drifting while the whales approach the boat. Research vessels usually follow and travel in close parallel patterns for long periods of time. This behaviour is occasionally emulated by inexperienced or unconcerned boaters who follow and chase whales. Of 339 recorded encounters, 28 (8.26%) had examples of running into or chasing a whale group. The major boat type involved is small pleasure motor vessels (Table 3).

At a different scale undue contact may be defined as violation of the 100 metre approach distance guideline. This is commonplace, but almost

**NUMBER OF WHALE-WATCHING
ENCOUNTERS OBSERVED PER
DAY, ROBSON BIGHT, 1986**

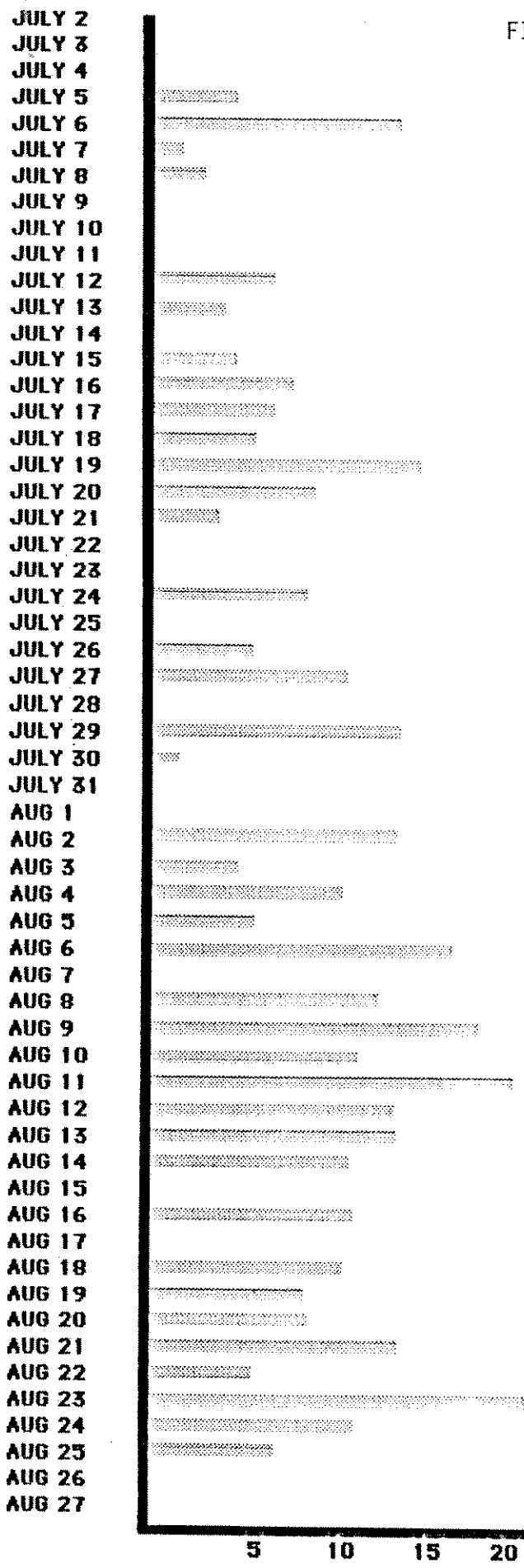


Table 1: Records of Whale-watching Encounters by Boat Type, Robson Bight, July-August, 1986

| <u>Boat Type</u> | <u>Number of Encounters</u> | <u>Percent of Encounters</u> |
|---|-----------------------------|------------------------------|
| Charter Motor Vessels | 78 | 23.0% |
| Charter Sailing Vessels | 11 | 3.2% |
| Small ¹ Pleasure Sailing Vessels | 7 | 2.1% |
| Large ² Pleasure Sailing Vessels | 19 | 5.6% |
| Small Pleasure Motor Vessels | 67 | 19.8% |
| Large Pleasure Motor Vessels | 31 | 9.1% |
| Kayaks | 17 | 5.0% |
| Launches | 5 | 1.5% |
| Research - Jacobsen ³ | 44 | 13.0% |
| Research - Bain ⁴ | 51 | 15.0% |
| Research - Other | 6 | 1.8% |
| Miscellaneous | 3 | 0.9% |

1 Small vessels denote less than 30 ft. in length.

2 Large vessels denote more than 30 ft. in length.

3 Jeff Jacobson, permit researcher Humboldt State Univ. Arcata Cal.

4 David Bain, permit research crew, Univ. of Cal. Santa Cruz

Table 2: Duration of Whale-watching Encounters by Boat Type

| Boat Type | No. of records | Mean Duration (Min.) | Standard Deviation | Range (Min.) | Total Duration (Min.) | Coefficient of Variation |
|--------------------------------|----------------|----------------------|--------------------|--------------|-----------------------|--------------------------|
| Charter Motor Vessels | 76 | 51.39 | 36.39 | 5.00-195.00 | 397.00 | 63.21 |
| Charter Sailing Vessels | 10 | 39.70 | 25.09 | 15.00-100.00 | 397.00 | 63.21 |
| Small Pleasure Sailing Vessels | 7 | 19.71 | 9.77 | 10.00- 30.00 | 138.00 | 49.59 |
| Large Pleasure Sailing Vessels | 21 | 34.14 | 34.95 | 2.00-160.00 | 717.00 | 102.37 |
| Small Pleasure Motor Vessels | 64 | 47.75 | 45.75 | 2.00-239.00 | 3056.00 | 95.80 |
| Large Pleasure Motor Vessels | 30 | 32.87 | 24.36 | 4.00-107.00 | 986.00 | 74.13 |
| Kayaks | 16 | 17.06 | 12.65 | 2.00- 43.00 | 272.00 | 74.41 |
| Launches | 5 | 18.60 | 2.19 | 15.00- 20.00 | 93.00 | 11.78 |
| Research | 89 | 58.65 | 54.76 | 3.00-345.00 | 5220.00 | 93.36 |
| Total | 318 | 46.49 | | | 14785 | |

Table 3: Cases of Whale-watching Vessels that include "Running into" or "Chasing" Behaviour Records

| <u>Boat Type</u> | <u>Frequency</u> | <u>Percent</u> |
|---|------------------|----------------|
| Charter Motor Vessels | 2 | 7.1% |
| Charter Sailing Vessels | 1 | 3.6% |
| Large Pleasure Sailing Vessels | 2 | 7.1% |
| Small Pleasure Motor Vessels ¹ | 11 | 39.3% |
| Large Pleasure Motor Vessels | 4 | 14.3% |
| Research | <u>8</u> | 28.6% |
| | 28 | |

¹ Includes 3 launches, 2 from Charter Sailing Vessel and one from a Charter Motor Vessel.

impossible to record at every occurrence. Based on our contact with whale-watchers we believe there are two groups of non-permit users that come into close contact with whales. The first group have no prior knowledge of guidelines, and are copying the behaviour of permit research vessels. The second group consists of purposeful encounters by people who require close contact for their own purposes, which are not sufficient to obtain a permit. In our experience this group was made up of some non-local charter operators with a commitment to their customers for close encounters, and some photographers.

In terms of general whale group behaviour we recorded three items, group speed, orientation, and spacing (see Appendix 2 for classification details). The most frequent behaviour pattern at the onset of an encounter was slow-directional-loose, which was also the most frequent behavioural record after an encounter (Table 4). Of all complete records ($n = 123$) only 20% exhibited a change in any one of the three behaviour. Some changes in behaviour may be indicative of a negative reaction to the encounter. Whale groups divided on 8 occasions, although they tightened their spacing on 3 occasions. Group speed increased on three occasions, one of which was from a motionless resting state. The orientation of groups became directional after 8 encounters, and became non-directional after 6 encounters.

Specific behaviours of individual whales were recorded during encounters (Table 5). The most frequent individual behaviour that we recorded was percussive pectoral fin slapping, which were often episodic repeated displays by one animal.

The spatial analysis of whale-watching activity at the Robson Bight

Table 4: Whale Group Behaviour Records at Robson Bight
July-August 1986

| Whale Group Behaviour | | <u>At Contact</u> | | |
|-----------------------|--------------------|----------------------|------------------|-------------------|
| <u>Speed</u> | <u>Orientation</u> | <u>Spacing</u> | <u>Frequency</u> | <u>Percentage</u> |
| Fast | Directional | Tight ¹ | 5 | 2.02% |
| Fast | Directional | Dispersed | 2 | 0.81% |
| Slow | Directional | Tight | 51 | 20.56% |
| Slow | Directional | Loose | 34 | 54.03% |
| Slow | Directional | Dispersed | 24 | 9.67% |
| Slow | Non-directional | Loose | 12 | 4.84% |
| Slow | Non-directional | Dispersed | 7 | 2.82% |
| Motionless | Directional | Tight | 2 | 0.81% |
| Motionless | Directional | Loose | 5 | 2.02% |
| Motionless | Non-directional | Tight | 5 | 2.02% |
| Motionless | Non-directional | Dispersed | <u>1</u> | <u>0.40%</u> |
| | | | 248 | 99.98% |
| | | <u>After Contact</u> | | |
| Fast | Directional | Tight ¹ | 5 | 2.66% |
| Fast | Directional | Dispersed | 2 | 1.06% |
| Slow | Directional | Tight | 1 | 0.53% |
| Slow | Directional | Loose | 115 | 61.17% |
| Slow | Directional | Dispersed | 27 | 14.36% |
| Slow | Non-directional | Loose | 25 | 13.30% |
| Slow | Non-directional | Dispersed | 3 | 1.59% |
| Motionless | Directional | Tight | 5 | 2.66% |
| Motionless | Directional | Loose | 2 | 1.06% |
| Motionless | Non-directional | Tight | 1 | 0.53% |
| Motionless | Non-directional | Dispersed | <u>2</u> | <u>1.06%</u> |
| | | | 188 | 99.98% |

¹ For classification see Appendix 2

TABLE 5: Records of Individual Whale Behaviours
During Whale-watching Encounter

| <u>Behaviour</u> | <u>Frequency</u> |
|-------------------------|------------------|
| Breach | 31 |
| Tail Wave | 9 |
| Spyhop | 24 |
| Surface roll | 10 |
| Pectoral Fin Wave | 19 |
| Pectoral Fin Slap | 158 |
| Feeding | 4 |
| Hanging at Surface | 40 |
| Porpoising | 10 |
| Splashing, undetermined | 15 |

study area was carried out by recording the angular distance from the observer with a sighting compass, and estimating the linear distance from a grid map. The encounter's progress was recorded roughly every 5 to 20 minutes depending on the speed and sinuosity of the event. The tracks were followed until the encounter ended, or was lost from sight. A total of 292 tracks were recorded that ranged from 100 metres to several kilometres in length.

The most numerous track records came from research vessels (30.13%), followed by charter motor vessels (26.02%) and small pleasure motor vessels (19.86%) (Table 6). The tracking data was converted from continuous lines to discontinuous total track lengths per 500 metre square blocks. The track length per block variable gives a measure of the level of use by whale-watchers per unit area. During the process of digitizing the track lengths into discrete variables the Ecological Reserve boundary was overlain and several blocks were subdivided with components inside and outside of the Reserve. The small slivers along the boundary line will have small values as a result of their orientation relative to the prevailing direction of the encounters. Most of the tracks traverse parallel to the outer Reserve boundary therefore the small facing area of the slivered blocks have less chance of being contacted by a track.

Figure 3 shows the use level by all whale-watching craft. Figures 4 and 5 show the division of total use by research vessels and recreation vessels respectively. The recreational craft are sub-divided in figures 6 and 7 into the charter vessels and pleasure vessels. One particular subset of the pleasure vessels, the kayakers, is shown in figure 8.

The general trend indicated by the maps is for equally high use

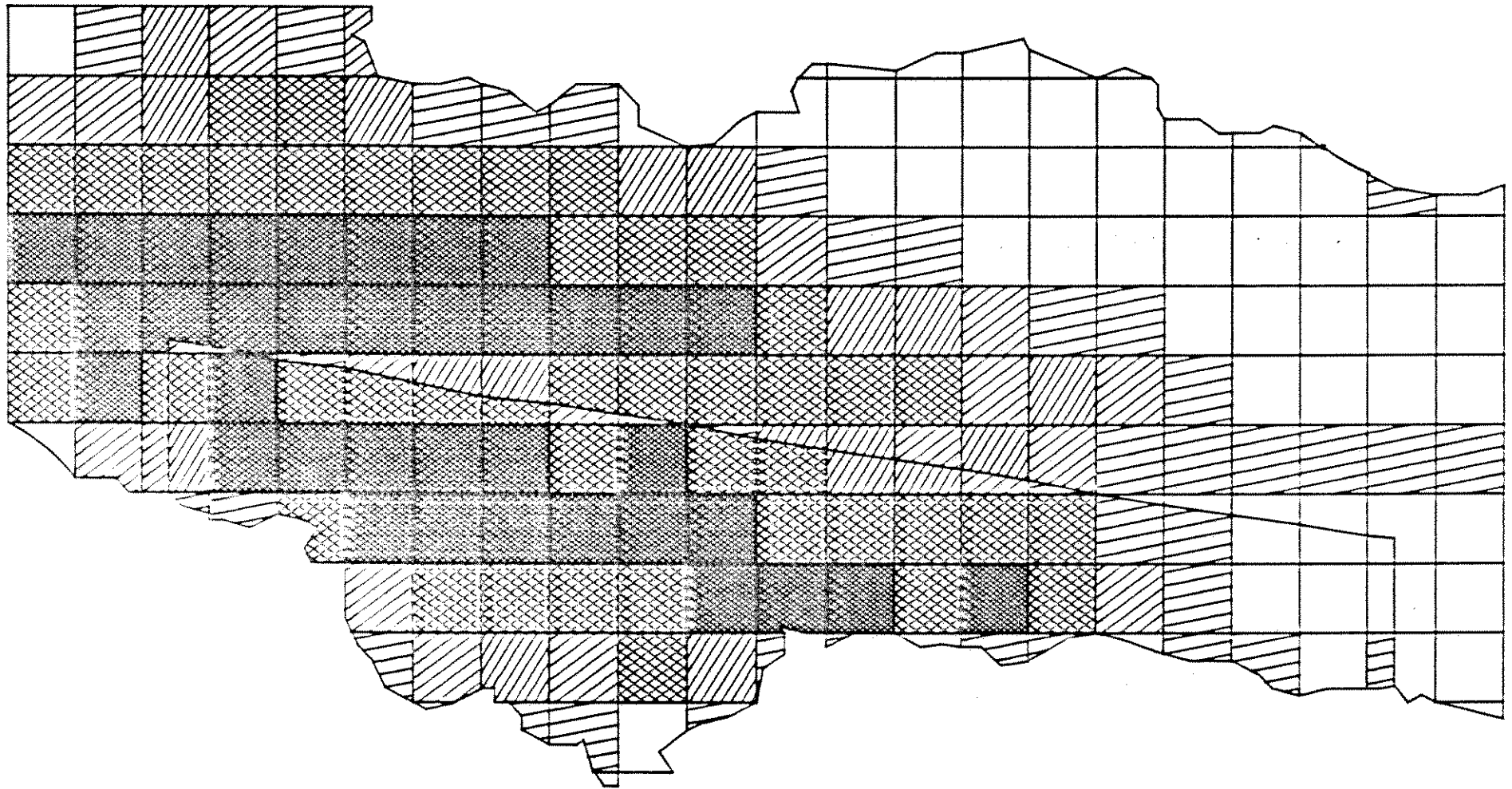
TABLE 6: Number of Whale-watching Tracks Recorded by Boat Type

| ===== | | |
|--------------------------------|-----|--------|
| Boat Type | | |
| Charter Motor Vessels | 76 | 26.02% |
| Charter Sailing Vessels | 9 | 3.08% |
| Small Pleasure Sailing Vessels | 6 | 2.05% |
| Large Pleasure Sailing Vessels | 16 | 5.48% |
| Small Pleasure Motor Vessels | 58 | 19.86% |
| Large Pleasure Motor Vessels | 25 | 8.56% |
| Kayaks | 12 | 4.11% |
| Launches | 2 | 0.68% |
| Research - Jeff Jacobsen | 33 | 11.30% |
| Research - David Bain | 49 | 16.78% |
| Research - other | 6 | 2.05% |
| | 292 | 99.97% |

FIGURE 3

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING BOATS SUMMER 1986



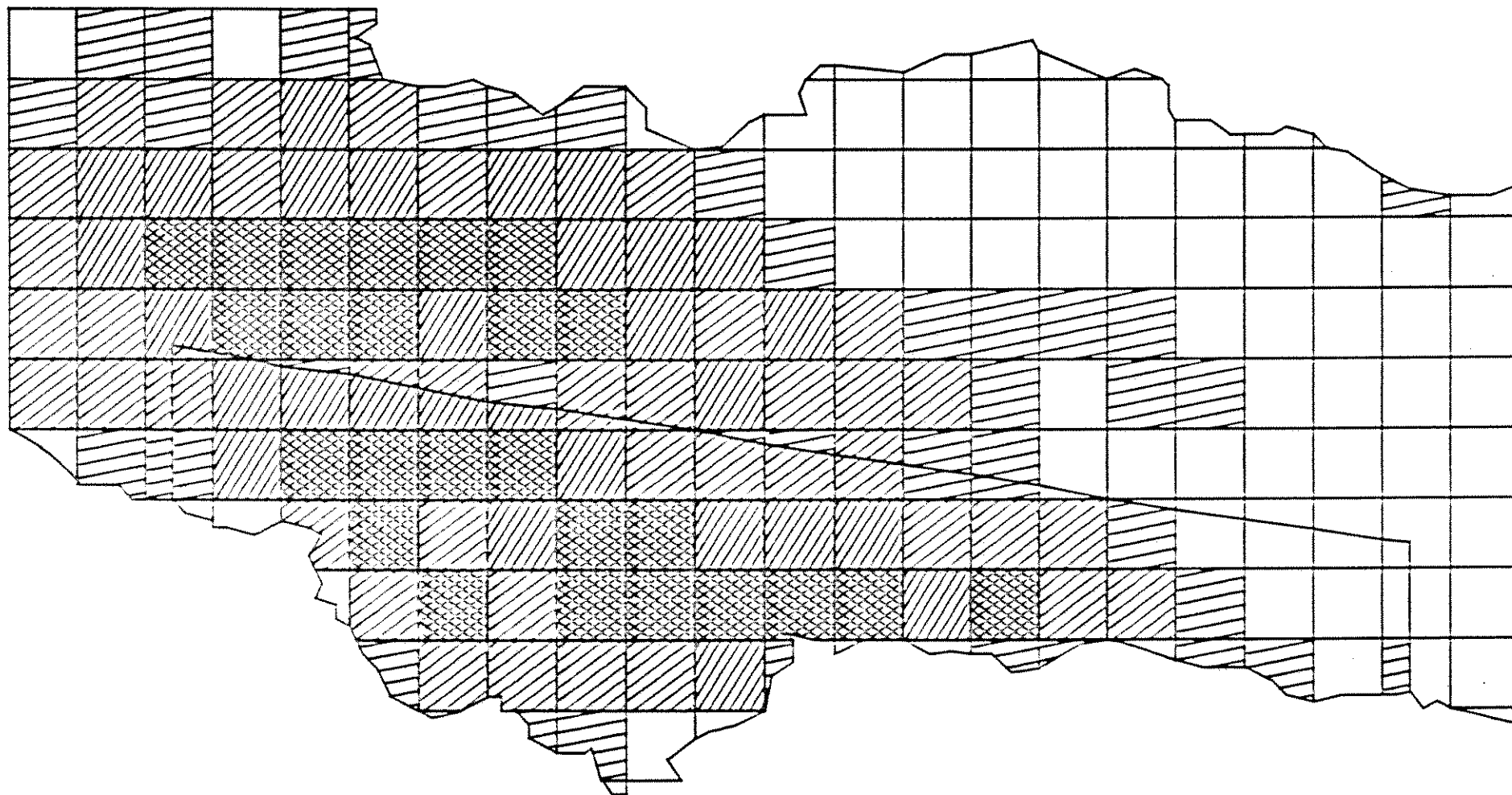
USE

| | | | | | |
|---|----------------|--|----------------|---|-----------------|
|  | NO USE |  | VERY LOW < 1KM |  | LOW 1-3KM |
|  | MODERATE 3-5KM |  | HIGH 5-10KM |  | HIGHEST 10-22KM |

ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE RESEARCH BOATS SUMMER 1988



USE



NO USE



MODERATE 3-5KM



VERY LOW < 1KM



HIGH 5-10KM



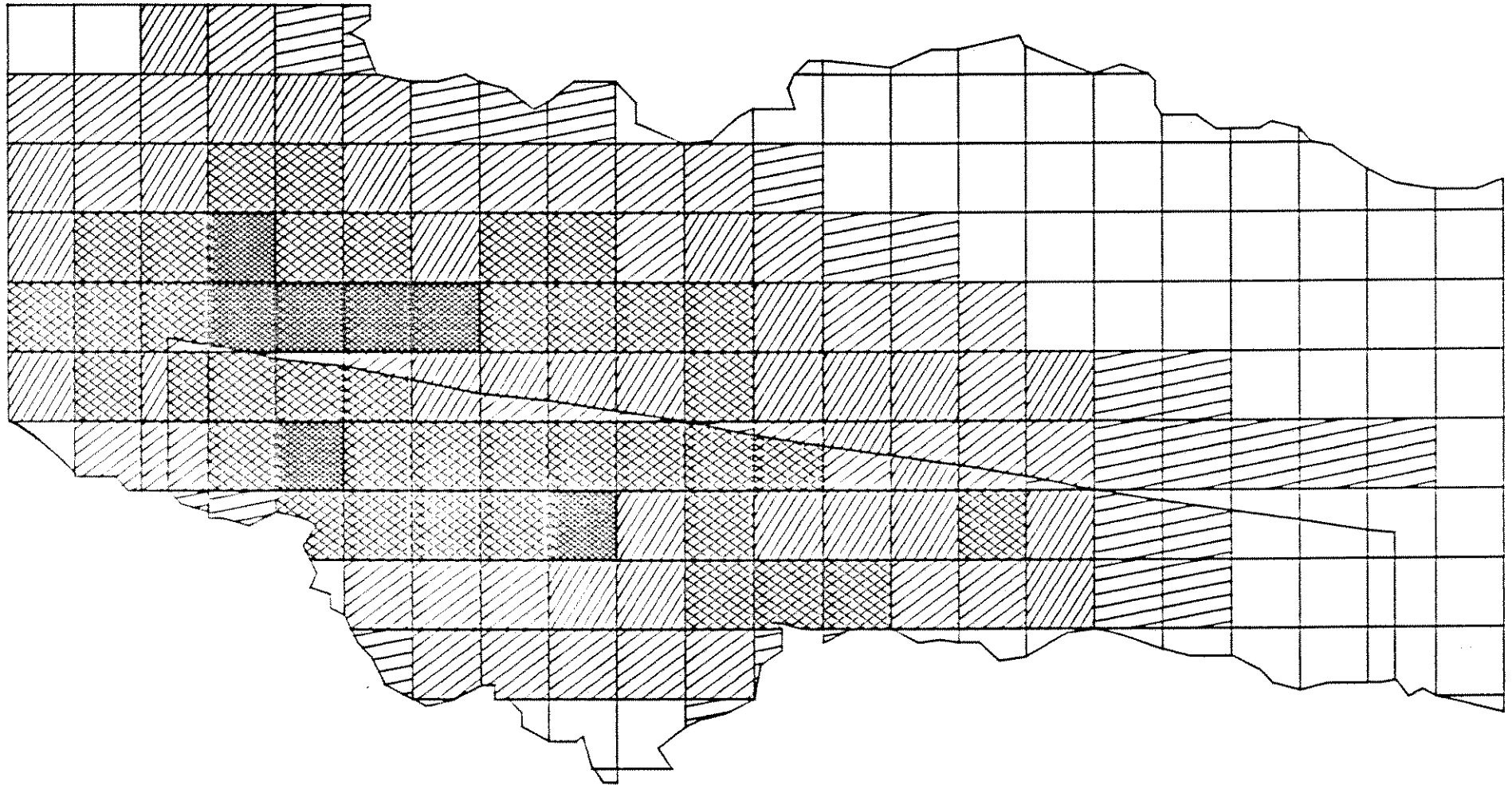
LOW 1-3KM

ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK







FIGURE 5

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL RECREATIONAL WHALE-WATCHING BOATS SUMMER 1986



USE

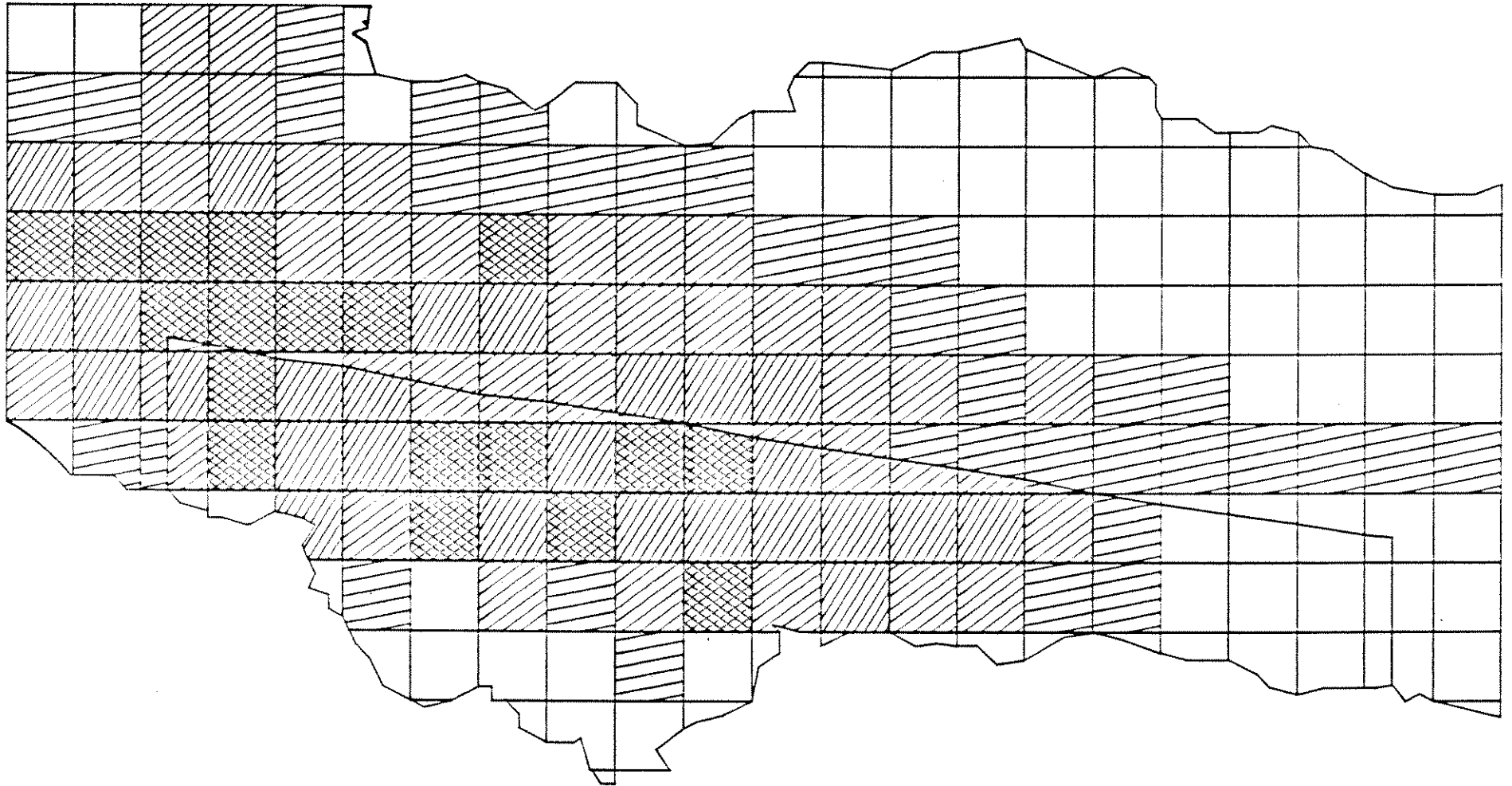
| | | | | | |
|---|----------------|--|----------------|---|-----------------|
|  | NO USE |  | VERY LOW < 1KM |  | LOW 1-3KM |
|  | MODERATE 3-5KM |  | HIGH 5-10KM |  | HIGHEST 10-22KM |

ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK





FIGURE 6

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING CHARTER BOATS SUMMER 1986



USE

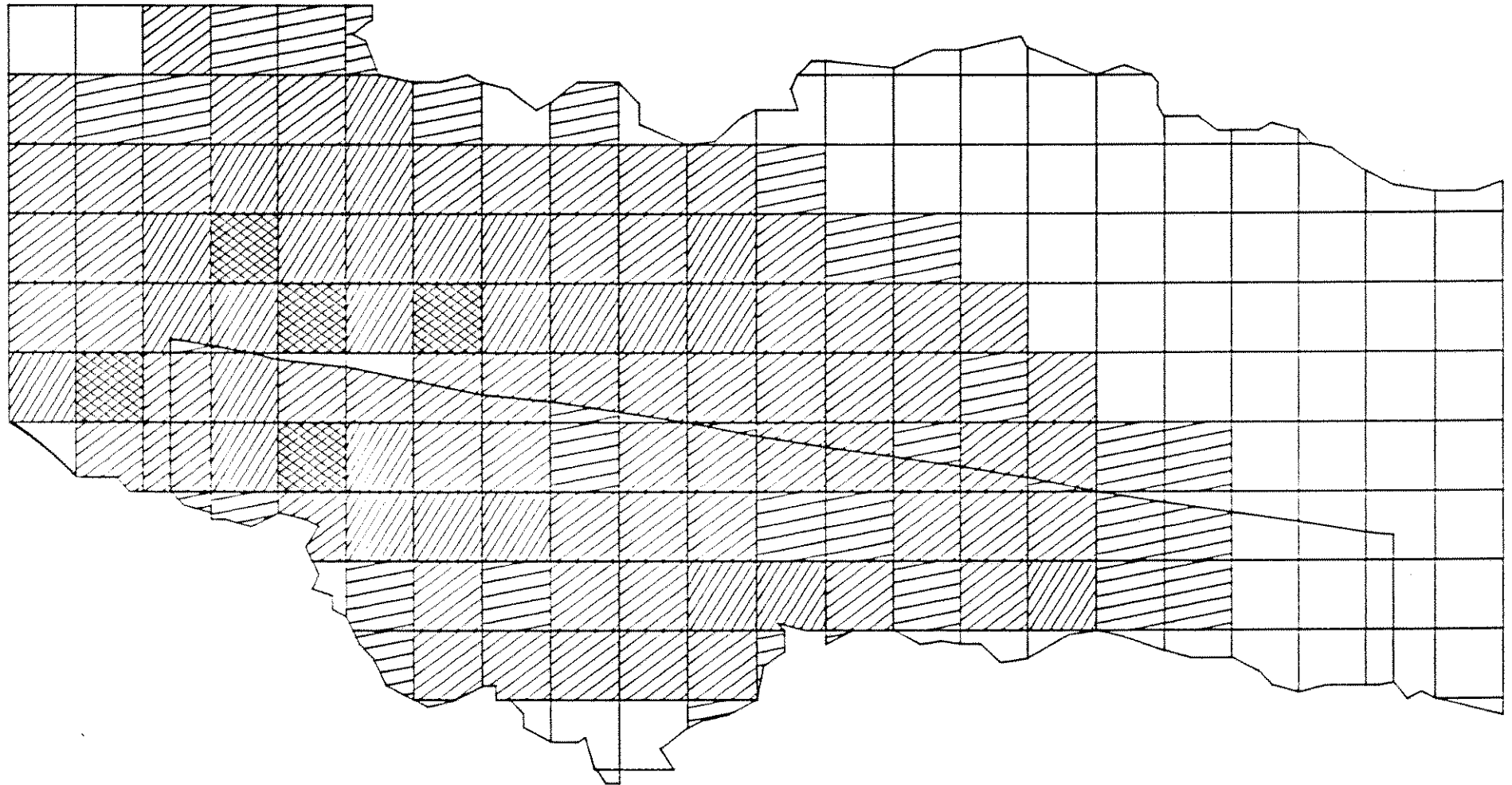
| | | | | | |
|---|----------------|--|----------------|---|-----------|
|  | NO USE |  | VERY LOW < 1KM |  | LOW 1-3KM |
|  | MODERATE 3-5KM |  | HIGH 5-10KM | | |

ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK






FIGURE 7

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING PLEASURE BOATS SUMMER 1986



USE

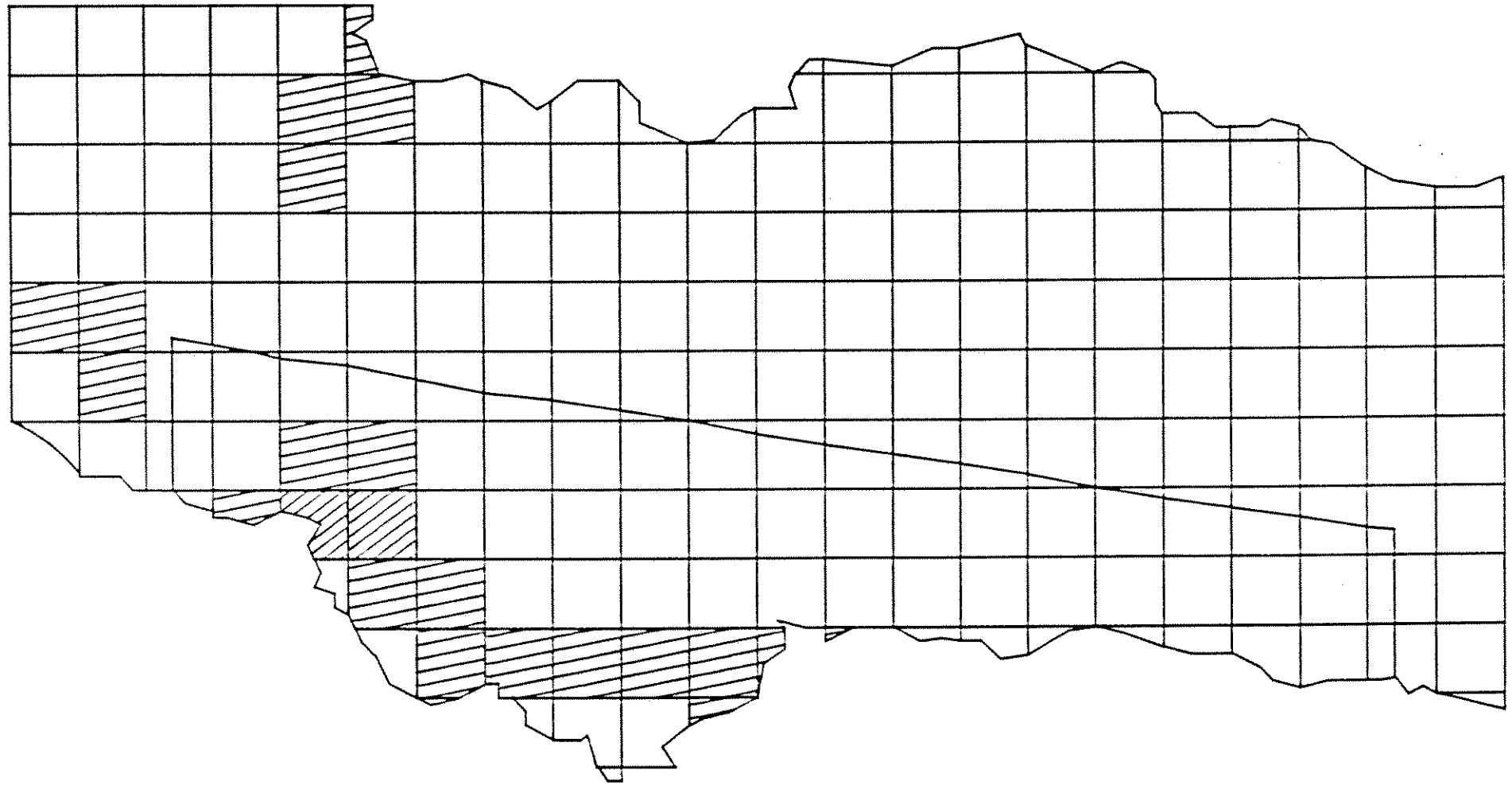
| | | | | | |
|---|----------------|--|----------------|---|-----------|
|  | NO USE |  | VERY LOW < 1KM |  | LOW 1-3KM |
|  | MODERATE 3-5KM |  | HIGH 5-10KM | | |




ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK

FIGURE 8

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING KAYAKS SUMMER 1988



USE  NO USE  VERY LOW < 1KM  LOW 1-3KM
ALL LEVELS OF USE ARE IN KM OF BOAT TRAVEL
PER 500 METER SQUARE BLOCK

levels in and outside of the Reserve. The permit researchers are responsible for most of the inshore traffic in the Reserve, while the recreational users use the open water area directly offshore of the Tsitika estuary. Within the recreational group, the charter operators use less of the shoreline areas, often remaining offshore close to the Reserve boundary. The pleasure boats use pattern reflects the sometimes adventitious nature of their encounters. The pattern is diffuse and uniform over most of the area.

The kayakers merit special attention for several reasons. First, they are primarily suited to close shore travel. Secondly the operators tend to feel that their lack of a noisy outboard motor makes their presence in the reserve less onerous than other craft. Their use pattern during whale encounters is often well inside the reserve. The encounters on the Cracroft Island shore (Fig. 8) are a product of the charter/research camp located on the nearby shore.

Eaton

Within the absolute use levels by each boat type the percentage of use was mapped to indicate the areas with highest relative use. Figure 9 shows that the highest relative use took place in open water areas offshore, but inside the Reserve, and in the open water of Johnstone Strait. The research vessels (Fig. 10) made high use of mid-Strait areas, blocks on the west end of the Bight, and on the eastern shorelines near the rubbing beaches. The recreational traffic (Fig. 11) concentrate in mid-Strait off the western end of the Bight, and in the open water of the Bight within the Reserve boundary. Charter vessels focus on the open water areas along the Reserve boundary, and avoid the inshore areas of the Bight and rubbing beaches (Fig. 12). Pleasure boats (Fig. 13) use the

FIGURE 9

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING BOATS SUMMER 1986

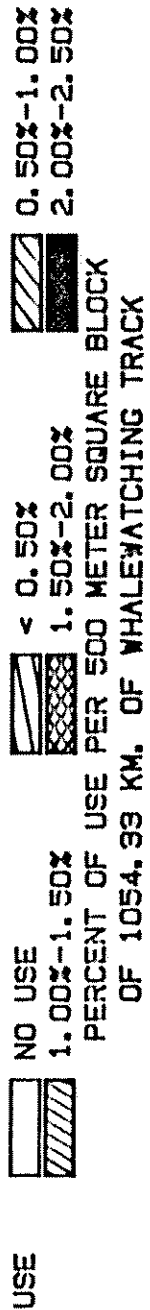
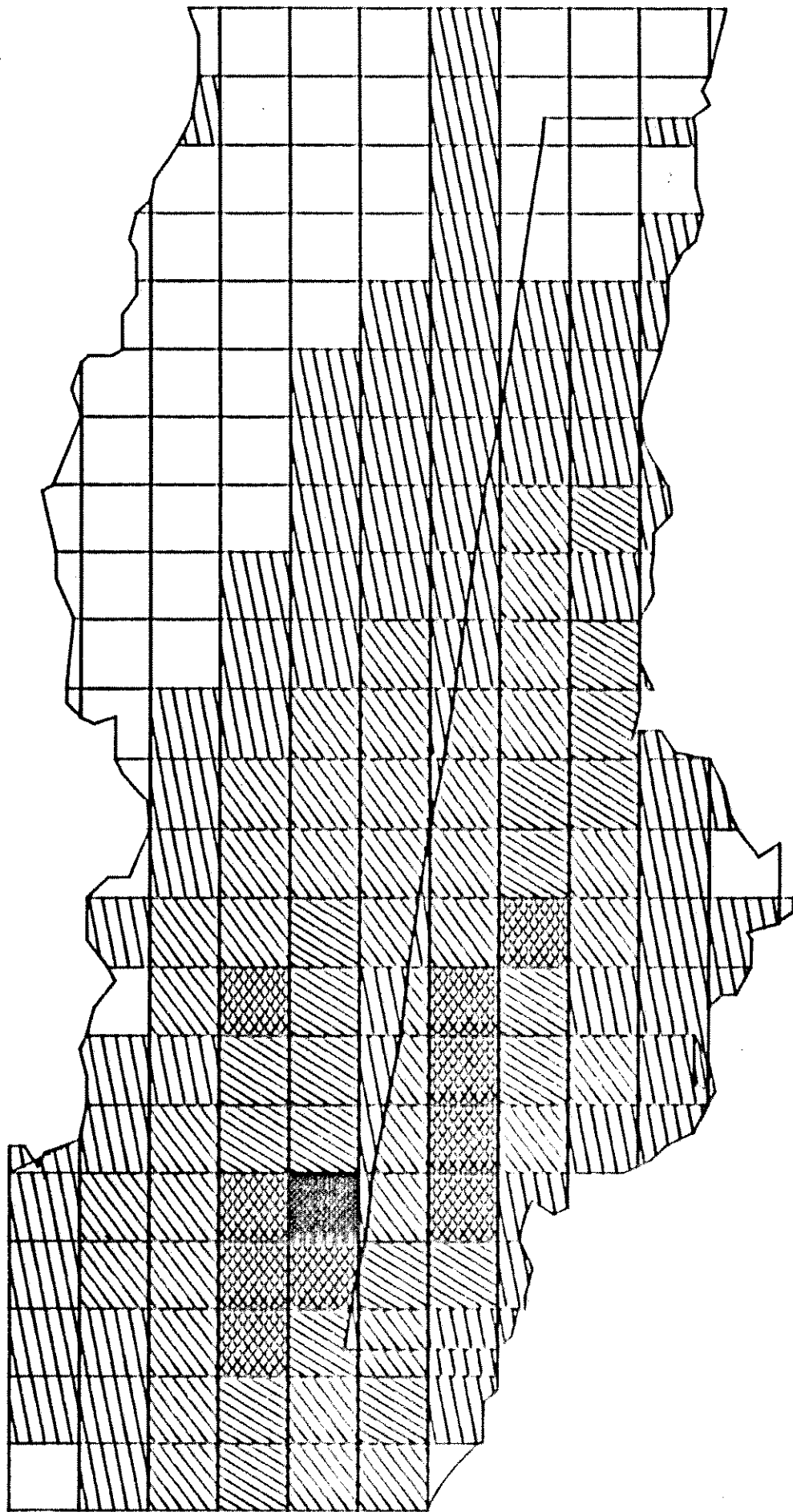
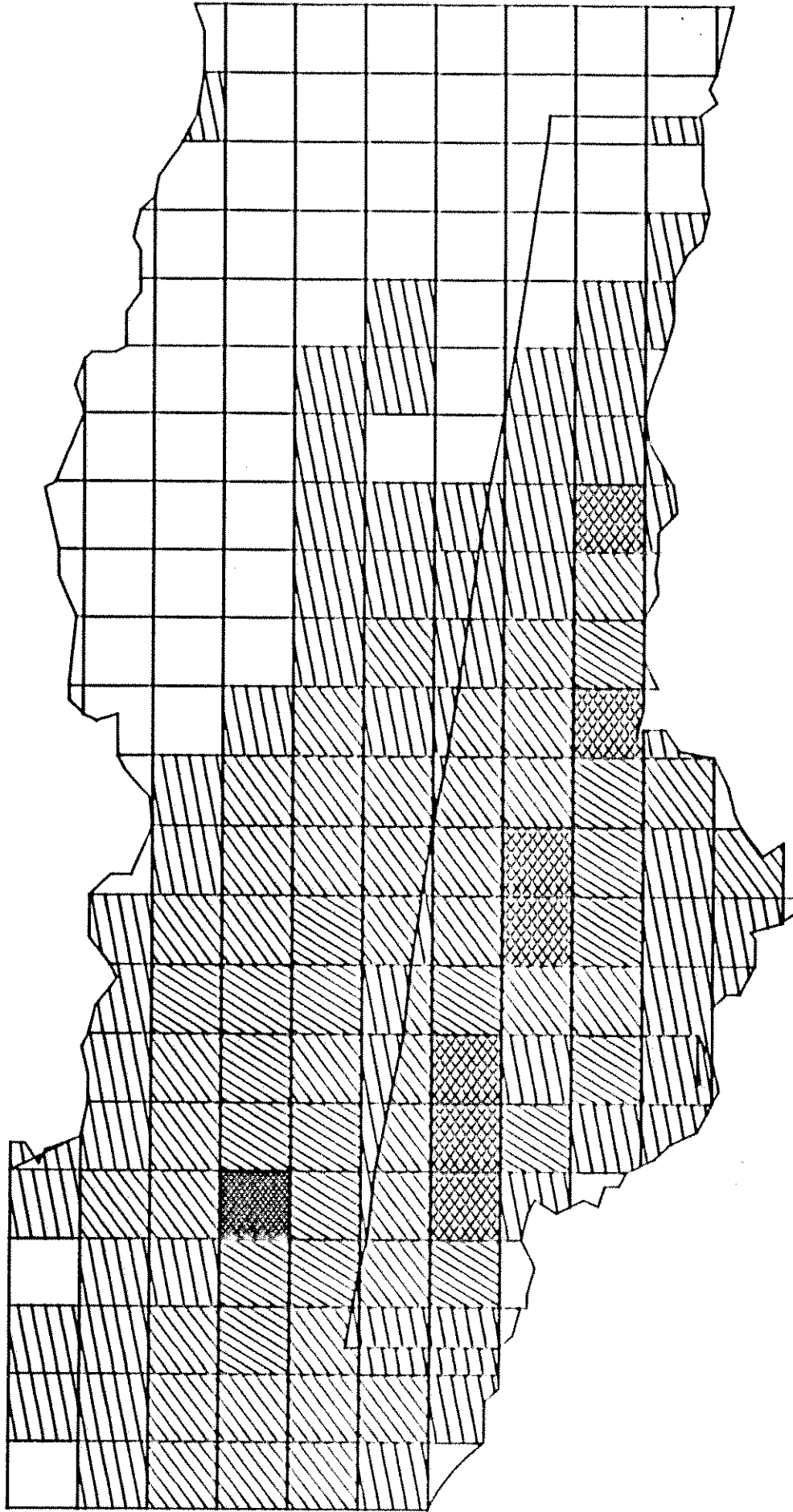


FIGURE 10

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE RESEARCH BOATS SUMMER 1988



USE

| | | |
|-------------|-------------|-------------|
| NO USE | <0.50% | 0.50%-1.00% |
| 1.00%-1.50% | 1.50%-2.00% | 2.00%-2.50% |

FIGURE 11

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL RECREATIONAL WHALE-WATCHING BOATS SUMMER 1988

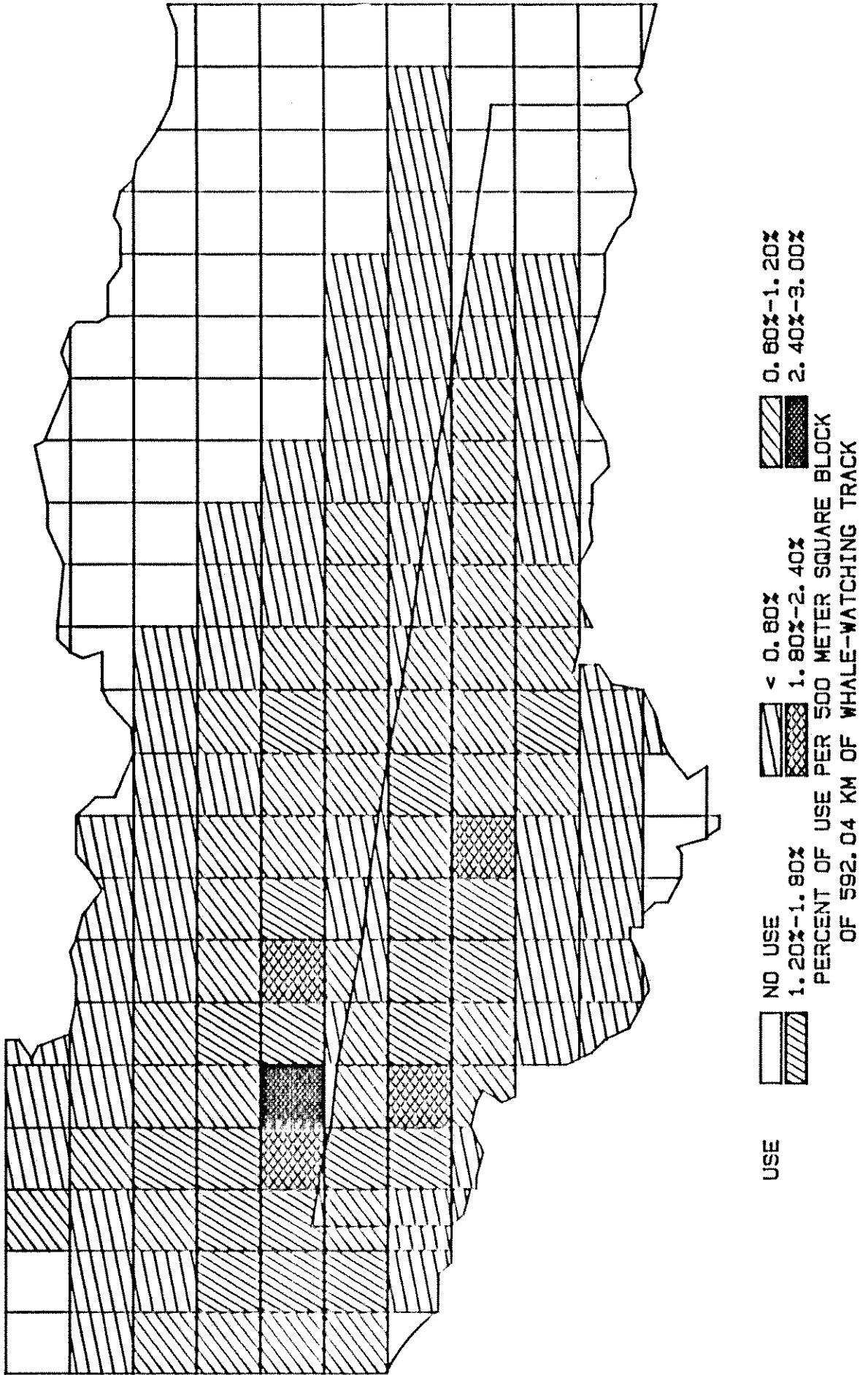


FIGURE 12

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING CHARTER BOATS SUMMER 1988

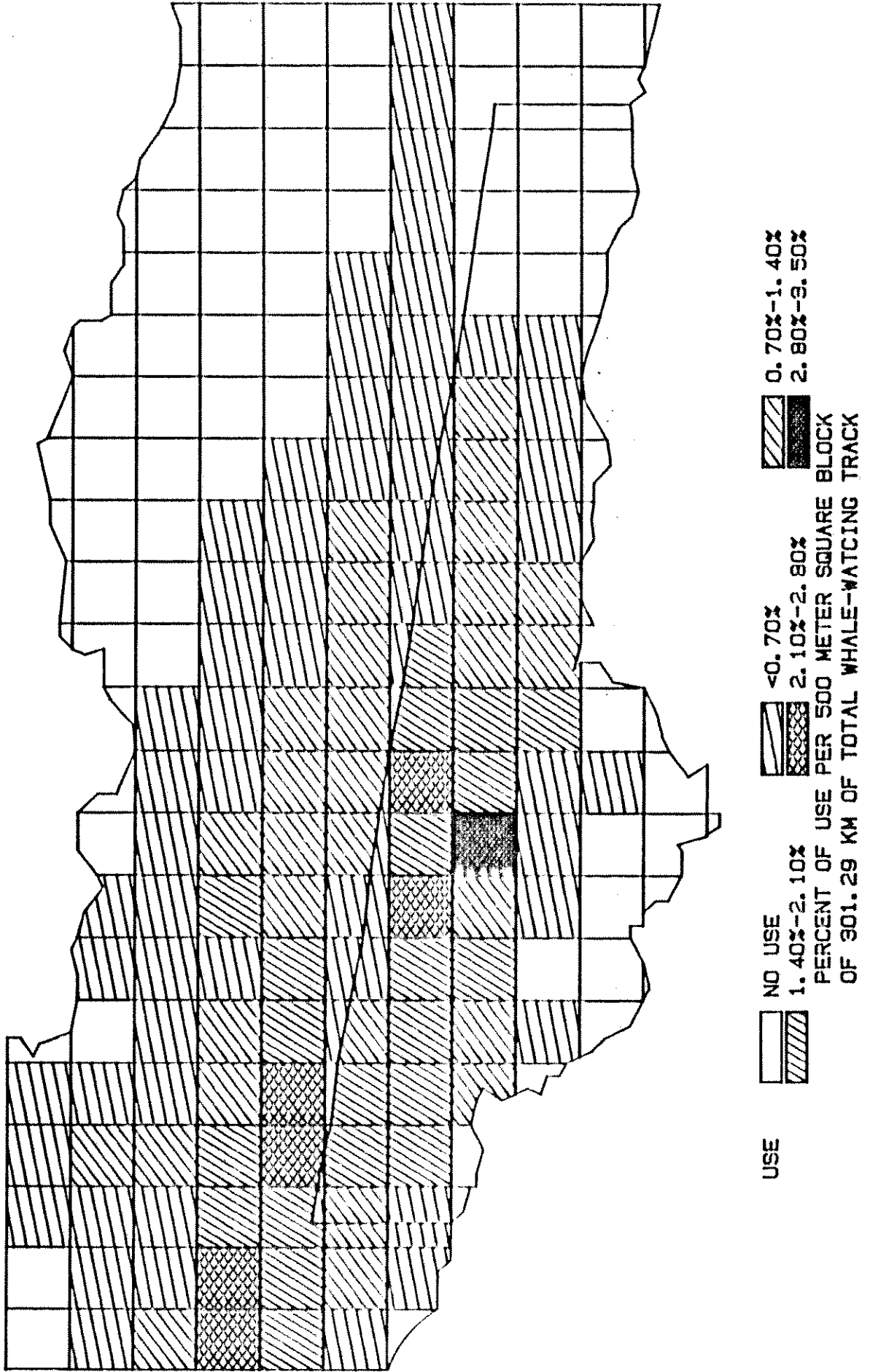


FIGURE 13

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING PLEASURE BOATS SUMMER 1988

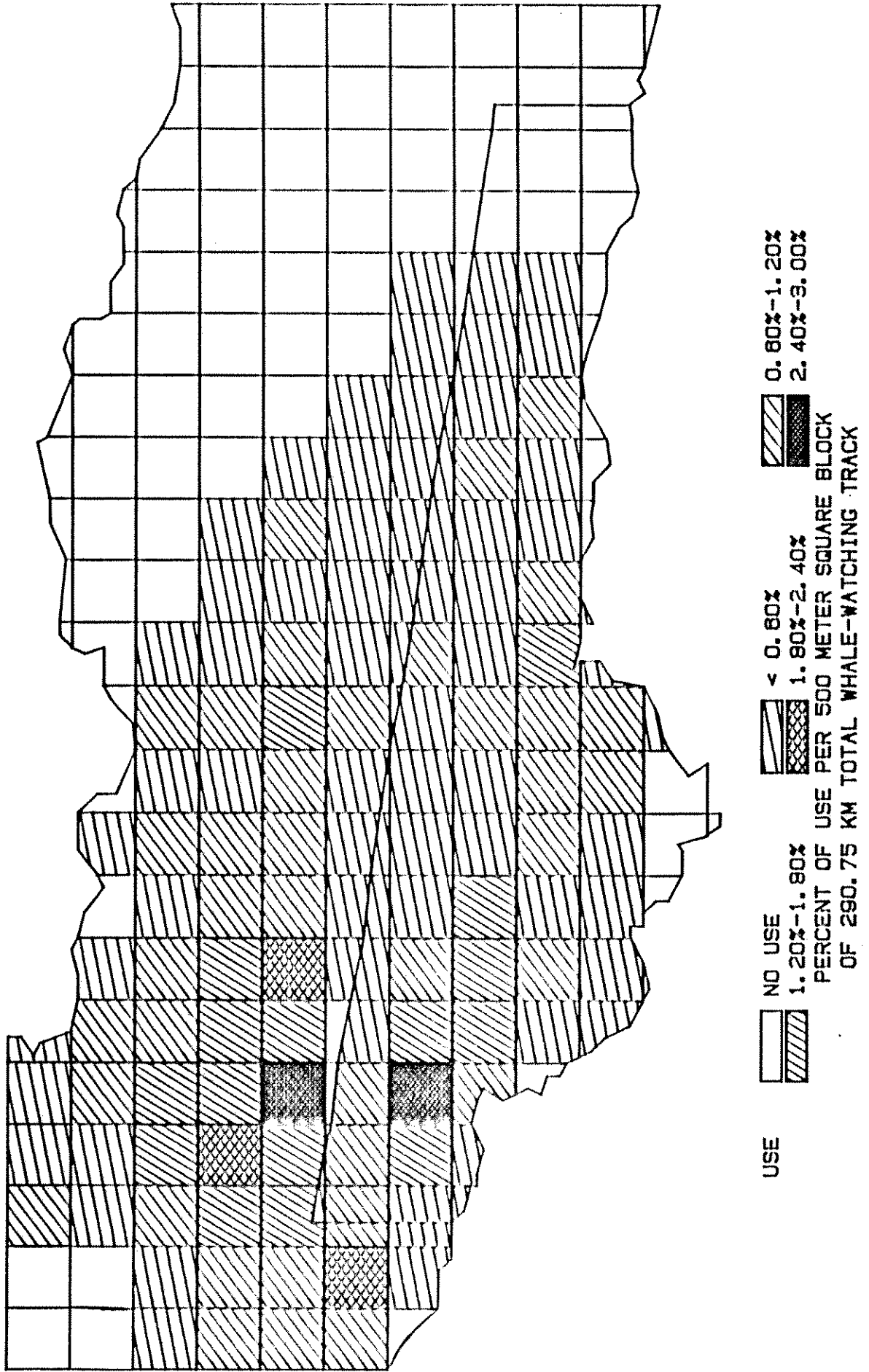
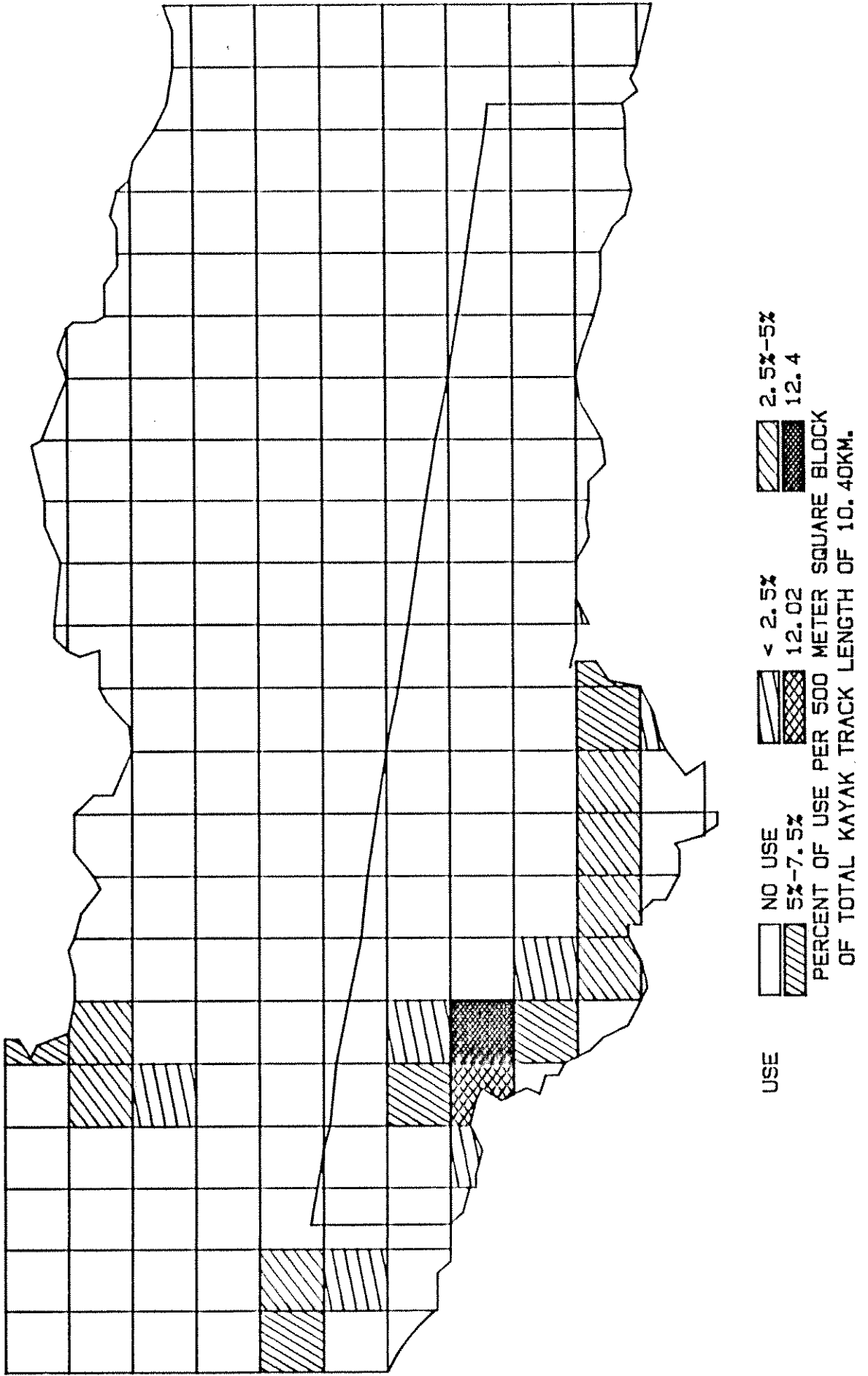


FIGURE 14

WHALE-WATCHING USE LEVELS

ROBSON BIGHT STUDY AREA
ALL WHALE-WATCHING KAYAKS SUMMER 1988



the western end of the Bight most heavily, but tend not to show a concentrated use pattern. The kayakers focus specifically on the western edge of the Bight well within the Reserve (Fig. 14).

Analysis

The most immediate observation from the monitoring program is that the Ecological Reserve boundary is not functional. Only a few types of user presently defer to the boundary, and even in those cases it serves as a zone rather than a line of demarcation for separating whales from boats activity. Our observations and contacts with whale users strongly suggest that violation of the Reserve is largely unintentional. If the objective is to selectively control boat traffic within a geographical area, that area must be marked. This action should effectively curtail unintentional non-permit activity inside the Reserve.

Secondly our data indicates that the recreational user group is far from homogeneous. Different user groups exist that are most readily separated by boat type. The user types have different preferences, both spatially and experientially, that should be integrated into a management plan so all can be maximized, and none unduly curtailed. This type of program may be developed along the lines of selective or guided access to designated areas for specific boat types. We will have more insight into this dimension after fully analysing recreationist profile data.

Following are some observations related to the management of the four whale interactive systems discussed earlier - forestry, fisheries, research, and recreation.

Conflicts with Forestry

The industrial forestry interests in the water area of the Bight have

been forestalled by the establishment of the Ecological Reserve. However, a serious threat to the Reserve's integrity may be posed by logging activity in the Tsitika River valley that will allow land access to the Bight. In the present configuration the Ecological Reserve does not control the adjacent uplands. Observational evidence provided by Hoyt (1984) and others suggests that unmanaged land viewing of the whales may be a deterrent to their use of the rubbing beaches.

A second conflict with forestry involves the clear-cutting that is taking place on adjacent valleys and slope faces, and that is planned for the Robson Bight area. Although the data is not yet quantified, our observations indicate that a major component of the user satisfaction is the natural setting. Significant numbers of users noted with dismay that large clear-cut logging areas were becoming a major landscape feature.

Management Recommendations for Adjacent Forestlands

The uplands surrounding the Ecological Reserve should be managed to serve as a buffer between less compatible land/water uses. The two major points that should be addressed are access and the visual landscape.

If access to the Reserve shorelines is allowed it should be restricted to specific viewpoints and during specified time periods. This would entail Ecological Reserves or some other government agency gaining statutory control over the uplands and developing the needed facilities.

Management of the landscape requires more complex integration of resource use objectives. The objective that would contribute the highest utility to the wildlife-oriented recreationist is the prevention of clear-cut logging on the slopes that face the Reserve. The minimum objective would entail an unlogged buffer strip of sufficient width to prevent

debris from travelling downslope onto the Reserve shores.

Realistically it may not be possible to engage in co-operative management with logging interests to whom the land's resources have already been allocated. If that is the case, management might consider seeking to remove the uplands of the Robson Bight area from the forest resource base.

Conflicts with Fisheries

Conflicts between the recreational whale interests and the commercial fishery exist at two levels. First, the fish harvesters and the whales are utilizing the same resource base, migratory salmon. Whether or not they are in competition is a complex ecological question that would require more study. Outside of the realm of feeding the whales do interact with fishing boats. During the 1986 summer fishing openings there were two net entanglements, which are generally believed to be extremely rare. In addition, fishing boats use virtually all of Robson Bight proper as well as the rubbing beaches for beach setting seine nets, and overnight mooring.

Current thinking on the subject of fishing boat disturbance of whales suggests that since these craft are not directly oriented to the whales, they have less effect than do recreational craft. If boat traffic, including the acoustic and physical presence of the boat, does disturb whales, there is no reason to believe that a fishing boat setting nets on the rubbing beaches has any different effect than a recreational craft.

In addition, there is a management problem when dealing with recreationists who see fishing boats operate in close proximity to the whales in the Reserve. In our contact with recreationists on the site we

were hard pressed to offer a suitable, logical explanation of why fishing boats were allowed in the Reserve, and they were not allowed the same access.

The problem of traditional users is one of the chief concerns with the use of area designations for marine conservation and management. The proposed National Marine Park strategy (Mondor 1985) indicates that Parks Canada has chosen to not exclude traditional fishing interests from National Marine Parks. In the American experience, such issues were at least partially responsible for the disagreement over the establishment of a Hawaiian Humpback Sanctuary (Hudnall 1978, Tilt 1985).

If it is not feasible to control the fishing or mooring of fishing vessels in the Reserve, then interpretive and educational programs should include two aspects. First, directed to the recreationists, there should be an explanation of the dispensation given to fishing vessels. Secondly, directed to the fishermen, there should be an effort to educate them to the Reserve and ask their co-operation by not engaging in purposeful harassment, avoiding sensitive areas such as the rubbing beaches, and stopping the excessive littering that presently occurs.

Conflicts with Permit Users

According to our observations, permit holders are the highest users of the whales in and around the Robson Bight Ecological Reserve. An analysis of the research and photographic users of the area is being undertaken that will summarize the nature of these activities (Taylor in prep.).

Management of Permit Users

One concern that became evident from our contacts with the other users was the need for identification and explanation of the permit system. The present pennant system of identification is sufficient for people who are aware of the program. For others, however, the flags explain very little. The development of signage or interpretive materials should explain the nature of the permit system. It may also be valuable to increase the size and visibility of the pennants.

Conflicts with Recreational Users

Conflicts among recreational users are many and varied due to the heterogeneous nature of the group. Certain factions, such as kayakers, have a different expectation and satisfaction need than do some charter passengers or general cruise vessel passengers. There is also considerable variation in the levels of knowledge and concern exhibited by boat operators. Some vessels indicate respect for the boating guidelines, both intuitively and via other information sources, while others deliberately disregard guidelines and common sense to engage in close contact with whales.

Based on our observation of one season, the level of proper behaviour by recreational boaters is remarkable. The major problem involves incursions into the Reserve when whales are present. It is unreasonable to expect a higher level of compliance with rules when the area has a minimal level of boundary marking and educational signage.

The large majority of our contacts with all types of boaters was positive. In almost all cases people were willing to abide by rules once they were informed of them. A small group of people can be termed chronic

offenders of Reserve protocol. These consist mainly of people with a short-term economic reason for contacting whales. For the most part, the chronic offenders are well known within the user group but are not susceptible to peer pressure from the volunteer wardens. The most effective approach to dealing with these people may be to contact them with written documentation of the details of unsuitable behaviour and remind them of the proper procedure and possible consequences of non-compliance.

Considerably more data is currently being analyzed regarding the recreational user. We are preparing information about expectations, satisfactions, attitudes, previous knowledge, commitment, and socio-economic variables. Once this material becomes available more specific statements will be made about real and potential conflicts among recreationists.

Management Recommendations for Recreational Users

The primary need for management of recreational users is an education program. This program should include signs on the shoreline boundary of the Reserve and major points of trip departures. The signs should include: the location and dimensions of the Reserve, the regulations for behaviour in the Reserve, guidelines for boating around whales, an explanation of the permit research program, and an explanation of the commercial fishery in the Reserve. As a supplement to signs on the site, the Ecological Reserves pamphlet would be useful to inform people from distant locales before they arrived at the Reserve and were forced to change plans on the spot. If possible the information from the pamphlet should be published in newsletters of whale interest groups, boating

publications, newspapers, and dispersed at tourism information offices in Vancouver, Victoria, and Seattle.

The education program may require support in the form of enforcement presence. The current system of volunteer wardens supported by cooperating researchers and other users has been sufficient for almost all enforcement needs to date. The success is partly due to the personal prestige of individuals involved, and the relatively small levels of users that are not cognizant of the rules. If demand continues to grow it may outstrip the capabilities of this sort of enforcement system. For that reason an enforcement/interpreter person may be needed in the near future to overtake the focus of the enforcement work. This person would require a small maneuverable radio-equipped vessel, with training for boat handling in close quarters with both whales and other boats.

The enforcement protocol should be developed along the lines of the concepts used by the National Marine Fisheries Service (see Tilt 1985 for a summary). The program has a soft approach orientation that assumes any violation is the product of a lack of information. If the need arises, the enforcement person should have the capability to press the regulation via cooperation with either Fisheries Officers, R.C.M.P. personnel, or other enforcement staff if available.

As Darling (Draft 1986) points out, enforcement requires both a legal basis, and the will to apply the law. Although no agency has yet applied the Cetacean Protection Regulations of the Fisheries Act, the need may arise as the number of whale users grow. Preparations should be made in advance should the need arise to enforce the legal statute. A protocol should be established with both the administrative and field levels of the

Department of Fisheries and Oceans staff to ascertain their level of support for controlling whale-oriented activity at and around the Robson Bight Ecological Reserve.

Concluding Remarks

Activity at Robson Bight directed towards killer whales does not appear to have met any critical thresholds. According to biological researchers at the site the whales have not given any overt indication of the effects of human traffic that are yet detectable. Initial indications are that human users are meeting high expectations except for minor inconveniences brought about by area restrictions.

There are, however, suggestions that human use levels will rise. If they do so, the present level of management presence will not suffice to support the objectives of the Ecological Reserve. Future management problems are best met by two methods. First, by continued research into both the whale and human behaviour that will provide data to fine tune management programs. Second, by the development of a Master Plan that clearly embodies the objectives and priorities for the Reserve and the whales, and provides options to deal with increased visitor demand.

Section 2

This report covers the initial section of the research we have initiated on non-consumptive use and management of whales. A second report is in preparation that will describe detailed studies of human dimensions including experiential and economic elements of man-whale interaction in the Robson Bight area.

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APPENDIX 1

Boat Typlogy

- Charter Motor Vessel - any size boat without sails known to be a chartered craft.
- Charter Sailing Vessel - any size boat equipped with sails known to be a chartered craft.
- Small Pleasure Sailing Vessel - private sail boats under 30 feet in length.
- Large Pleasure Sailing Vessel - private sail boats over 30 feet in length.
- Small Pleasure Motor Vessel - private motor vessel under 30 feet in length
- Large Pleasure Motor Vessel - private motor vessel over 30 feet in length.
- Kayaks - single kayaks double kayaks and canoes.
- Launch - any small craft launched from a mother vessel
- Research - any vessel known to be engaged in whale research or permit commercial photography

APPENDIX 2

Whale Activity Classification

| | | |
|---------------------|----|---|
| Group spacing - | D | Dispersed group over 20 m. between whales |
| | L | Loose assembly 5 to 20 m. between whales |
| | T | Tight group lesss than 5 m. between whales |
| | C | Whales in contact with each other |
| Activity Level | F | Fast, over 4 kn. |
| | S | Slow, less than 4 kn. |
| | M | Motionless |
| Orientation | E | Directional travel |
| | N | Non-directional, either motionless, or milling and resting. |
| Specific Behaviours | | If the whales are exhibiting specific behaviours such as aerial or feeding at the time of encounter, record them here using the codes from below. |
| Specific Behaviour | B | Breach, over 1/3 of body |
| | J | Lob-tailing - tail wave |
| | Z | Spyhopping |
| | R | Rolling, at or sub-surface |
| | P | Pectoral fin slap |
| | G | Feeding, prey visibles |
| | X | Sexual activity |
| | Po | Porpoise |
| | Tl | Fluke slapping |
| | Sp | Splashing-undetermined |