

Robson Bight (Michael Bigg)

Ref. No.:

390



B.C. MINISTRY OF LANDS AND PARKS
MIRACLE ZONE

ECOLOGICAL RESERVES COLLECTION
GOVERNMENT OF BRITISH COLUMBIA
VICTORIA, B.C.
V8V 1X4

ROBSON BIGHT (MICHAEL BIGG) ECOLOGICAL RESERVE VISITOR MANAGEMENT PROGRAM

1991 SEASON REPORT

NOVEMBER 1991



PREPARED BY: M.L. WONG, R.E. TAYLOR AND D.A. BRIGGS



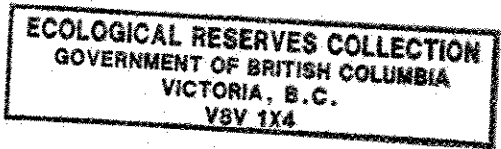
bion research inc.

environmental consultants

bion research inc.

environmental and engineering consultants

November 22, 1991



Our file: BCP-RB
Your file: 3-3-39
GST Reg. # R127001865

Mr. Ted Kremer
B.C.Parks
Miracle Zone
R.R. #1, Site 11, C-1
Black Creek, B.C.
V0R 1C0

Dear Mr. Kremer:

RE: ROBSON BIGHT (MICHAEL BIGG) ECOLOGICAL RESERVE
1991 VISITOR MANAGEMENT PROGRAM

We are pleased to present the 1991 season report for the above project

The report is organized into five major sections Introduction, Methods and Materials, Results and Discussion, Conclusions and Recommendations. Each component of the project is present in the following order for each section; Warden/Research/Education. An executive summary precedes the report for your convenience.

If you have any comments please feel free to call us at (604) 322-9200.

Yours sincerely,
BION RESEARCH INC.

A large, stylized handwritten signature in black ink, appearing to read "Marke L. Wong".

Marke L. Wong, R.P.Bio.
Project Manager

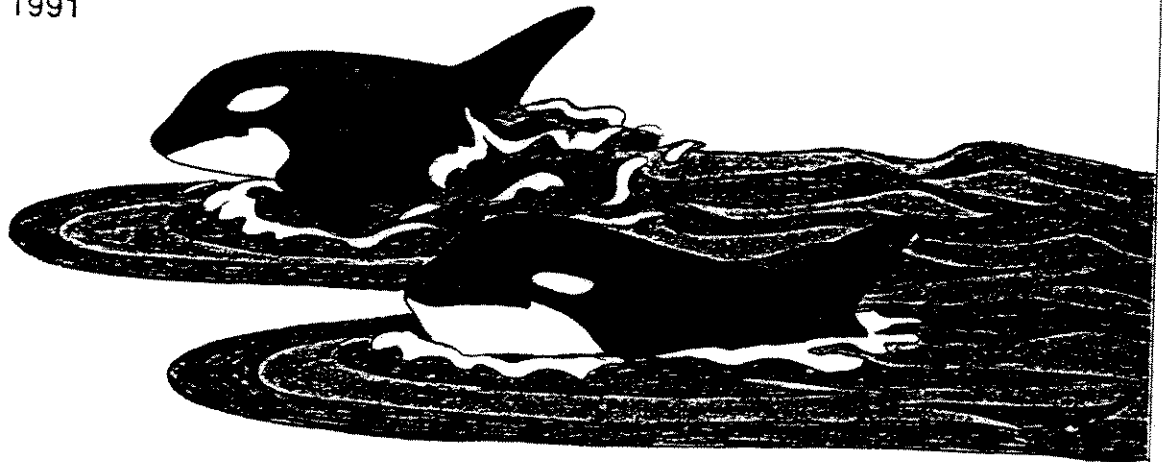


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EXECUTIVE SUMMARY

Background Information

In 1982, B.C. Parks established the Robson Bight (Michael Bigg) Ecological Reserve (RMBBER) to protect killer whale habitat and insure the continued presence of whales in this area. Past research has raised concerns that human activities including commercial and recreational vessel traffic threaten the use of this area by killer whales.

Since the establishment of the reserve, the province has maintained a volunteer warden service. In 1987, 1989, and 1990, on-site visitor management programs were conducted to direct boating use away from RMBBER, monitor visitor use and whale encounters, assist researchers and to provide information to boaters and visitors in the vicinity of the Reserve. Bion Research was contracted in June 1991 to continue this program and to incorporate a research and land-based visitor education component.

1991 Program Description

On-site Warden/Information officers concentrated efforts on directing recreational vessels away from the reserve to alleviate vessel traffic pressure within the reserve. Visitors were requested to stay out of the reserve and were provided with information on whale watching guidelines and RMBBER management strategies.

Research on whale and vessel activity was collected to provide insight on the effects of vessel activity on killer whales and to assist in the long term management of the Reserve. Whale activity was recorded by whale hours (*wh*). Whale disturbance was assessed by correlations of whale and vessel activity over time and by short-term behavioral response to vessels.

A land based Visitor services interpretation program was conducted at local communities and campsites to educate visitors on the Reserve and whale watching guidelines.

Results and Discussion

Visitors to the Ecological Reserve were generally poorly informed about proper whale watching guidelines and the objectives of the ecological reserves with the exception of commercial charter operations.

Management of the reserve including decreasing vessel traffic and voluntary compliance, would be more effective through increased public education through brochures, information signs and boundary markers.

Mean daily whale activity for Johnstone Strait was recorded at 416wh/d. RBMBER mean daily whale activity was recorded at 41.8wh/d. Reserve whale activity was concentrated in Zone 6 and was characterized by activity peaks in the early afternoon and in the early evening. Summer activity peaked during the week of July 9th. A significant drop in activity was correlated to a strong increase in commercial fishing vessel activity.

Rubbing activities were confined to Zone 6. Mean rub times were observed at 6-9min. Mean rub times are lower than those reported by past researchers. This may reflect increased whale disturbance by vessel traffic.

Whale activities were especially sensitive to vessel activities in Zone 5 and 6 despite the higher concentration of vessel activity in Zones 3 and 4. This was felt to be a reflection of higher levels of rubbing and resting activities which take place in these zones. Whales tend to be more sensitive to disturbance to disturbance when engaged in these activities.

Recommendations

The following general recommendations were formulated to increase the effectiveness of the ecological reserve. Details are provided in Section 5.0.

- 1) Prohibit ecological reserve access to all vessel traffic (including commercial fishing vessels).
- 2) Increase level of visitor education (including commercial fishing vessel operators).
- 3) Increase level of cooperation and interest between levels of government agencies, communities and interest groups
- 4) Operational modifications will allow more effective management of the reserve

ACKNOWLEDGEMENTS

Bion Research would like to thank the following individuals and organizations for their assistance and support in making this B.C. Parks funded project possible.

Mr. Ted Kremer and Mr. Martin Dueck of B.C. Parks, Miracle Zone acted respectively as contract supervisor and contract manager.

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Mr. Jim Borrowman and Mr. Bill McKay (Stubbs Island Charters) provided invaluable assistance in logistical support and local knowledge of the marine area and whale activity.

The following groups assisted this project in supplying much appreciated supplies and/or facilities

PFC Foods, Victoria, B.C.

Mountain Equipment Coop, Vancouver, B.C.

Regional District of Mount Waddington, Port McNeill, B.C.

Alder Bay Campsite, Alder Bay, B.C.

Haidaway Inn, Port McNeill, B.C.

Telegraph Cove Resort, Telegraph Cove B.C.

The Vancouver Aquarium assisted this project by providing many person days of field assistance by the following aquarium staff.

Penny Elwick, Kathryn Behrich, Lisa McIntosh, Marisa Nichini, Erin Stoddard and Kory Beckett

Dr. Paul Spong and Ms. Helena Symonds of Orcalab provided assistance in compiling activity estimates for the Blackfish Sound/ Western Johnstone Strait area.

Ms. Pam Stacey and the 1991 Robson Bight Research Group (University of Victoria) provided appreciated assistance in whale identification and field support.

The following individuals greatly assisted the project in warden, research and operations support.

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Steve Wischniowski, Head Warden
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1.0 INTRODUCTION

1.1 Background

Located on the Northeast coast of Vancouver Island, Johnstone Strait is well known as the best location in the world to observe killer whales in their natural habitat (Figure 1). Since the early 1970's, researchers have conducted routine annual monitoring of killer whale abundance and behaviour (Bigg et al. 1976, 1990; Ford, 1980, 1981, 1984; and Nichol 1990). Pods of killer whales return to this area each summer to feed on salmon, socialize, rest and rub on pebble beaches near Robson Bight. Killer whales are not known to congregate in such large numbers with such predictable movement patterns anywhere else in the world. Recent research on human activities in the Reserve (Kruse, 1984; Briggs, 1985, 1986, 1988 and 1991a,b; Darling, 1986; Duffus and Dearden, 1987 and Taylor 1988a,b) tend to support concerns that disturbance of whales while rubbing and resting in the Reserve area may interfere with the natural behaviour patterns of the whales. Habitat encroachment from whale watching, logging and commercial fishing all contribute to the disturbance of the whales in this special core use area and therefore threaten the long term use by whales.

The B.C. northern resident community of killer whales has a total population of 197 individuals (1991). This is made up of 16 pods or family groups. The known range of the northern residents extends from southern Desolation Sound to northern British Columbia, excluding most of the west coast of Vancouver Island and the Queen Charlotte Islands (Bigg et al., 1987). Although they are observed throughout this range, a high percentage of the northern resident population can be found in the Johnstone Strait/Blackfish Sound area between June and November. Such a predictable presence of killer whales appears to be unique, and for this reason, western Johnstone Strait has been labelled "core" habitat for the northern resident community of killer whales.

In 1982, B.C. Parks established the Robson Bight (Michael Bigg) Ecological Reserve (RMBBER), Reserve #111. This 1248 hectares of marine and 505 hectares of land buffer represents B.C. Parks' commitment to the preservation of the ecological integrity of this special ecosystem. Since the establishment of the reserve, the province has maintained a volunteer warden service. In 1987, 1989, and 1990, visitor management programs were conducted on-site to direct boating use away from RMBBER, monitor visitor use and whale encounters, assist researchers and to provide information to boaters and visitors in the vicinity of the Reserve. Bion Research was contracted in June 1991 to continue this program and to incorporate a research and land-based visitor education component.

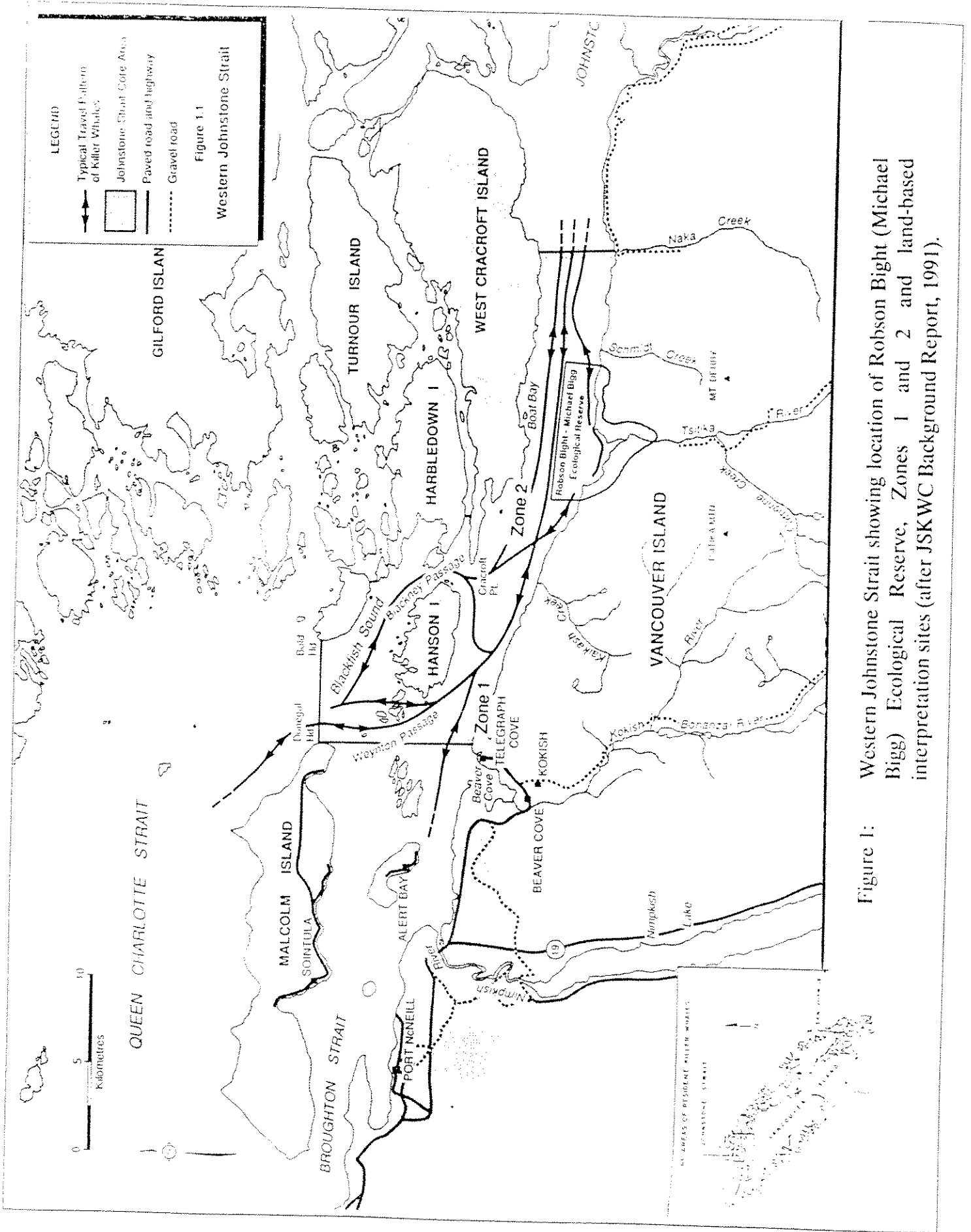


Figure 1: Western Johnstone Strait showing location of Robson Bight (Michael Bigg) Ecological Reserve, Zones 1 and 2 and land-based interpretation sites (after JSKWC Background Report, 1991).

1.2 Objectives

The Ministry of Lands and Parks objective for the 1991 season was to ensure that the whales were not disturbed in the area of the ecological reserve. The following objectives were established in order to accomplish this goal;

- 1) To patrol the marine reserve boundary and greet boaters entering the Reserve area, distribute information provided by the B.C. Parks, answer questions, to request that boaters stay out of RBMBER and to request compliance with whale observation guidelines.
- 2) To facilitate enforcement of the Ecological Reserve Act that applies to the water access portion of lands in the Reserve.
- 3) To keep daily records of the numbers of visitors and whales in the Reserve and record visitor/whale interactions.
- 4) To keep abreast of the whale research programs operating in the Robson Bight area and act as a liaison between researchers and visitors.
- 5) To submit a report to the Ministry Representative detailing the operations of the program, including summation of all data and records as part of this contract.
- 6) To compile information on the duration and nature of whale movements and vessel traffic in and around the ecological reserve.
- 7) To provide weekly audio-visual programs in Telegraph Cove (or Bauza Cove) and surrounding communities, such as Port McNeill, to;
 - a) Promote public interest and understanding of killer whale biology, history, behaviour and management for the purpose of pre-educating Ecological Reserve visitors on the RBMBER program and whale watching guidelines.
 - b) Integrate the purpose and necessity of whale watching guidelines.
 - c) Promote the Robson Bight Ecological Reserve as an important Killer Whale sanctuary.

2.0 METHODS AND MATERIALS

The 1991 program was divided into three main components;

- 1) Warden/Information Officer Service
- 2) Killer Whale/Vessel Traffic Research
- 3) Land-based Education Program

The warden/information service was conducted to address the need for immediate mitigation of vessel traffic within the reserve area. The killer whale/vessel traffic research and the education program was designed reduce future visitor activity within the Reserve and to promote and encourage whale watching guidelines. The warden/information service program was conducted on the water in and around the Reserve. The research observations were made from a cliff located across from the Reserve and from Boat Bay on West Cracroft Island (Figure 2). The education program consisted of biweekly interpretive audio/video presentations at local communities. All staff were based in a tent camp in Boat Bay on West Cracroft Island in Johnstone Strait. Staff for each component worked cooperatively to achieve the program objectives. Wardens made daily trips to drop-off/pick-up research crews at the observation cliff. A pool of volunteer staff was maintained to assist in all components of the project.

2.1 Warden/Information Program

Warden service began on June 28, 1991 and continued through September 2, 1991 (67 days). Warden/Information Officers patrolled the RBMBER area from approximately 0800 - 2000 hours (depending on level of traffic and weather conditions). Boats used were 12' and 14' Achilles inflatable boats with 25 hp and 30 hp respectively. Boat service was overlapped during peak visitor periods.

All visitor encounters were made in a cheerful, friendly and informative manner. Guidelines for approaching vessels were generally as follows;

- 1) slow and safe approach (VHF contact if possible)
- 2) greeting and identification
- 3) information exchange and interpretation
- 4) voluntary compliance request

B.C. Parks Ecological Reserve pamphlets on Robson Bight and whale watching guidelines were distributed. The information officers informed visitors of the purpose of RBMBER and of ongoing research activities in the area. Simultaneous multiple visitors were prioritized and dealt with accordingly. Whale oriented vessel

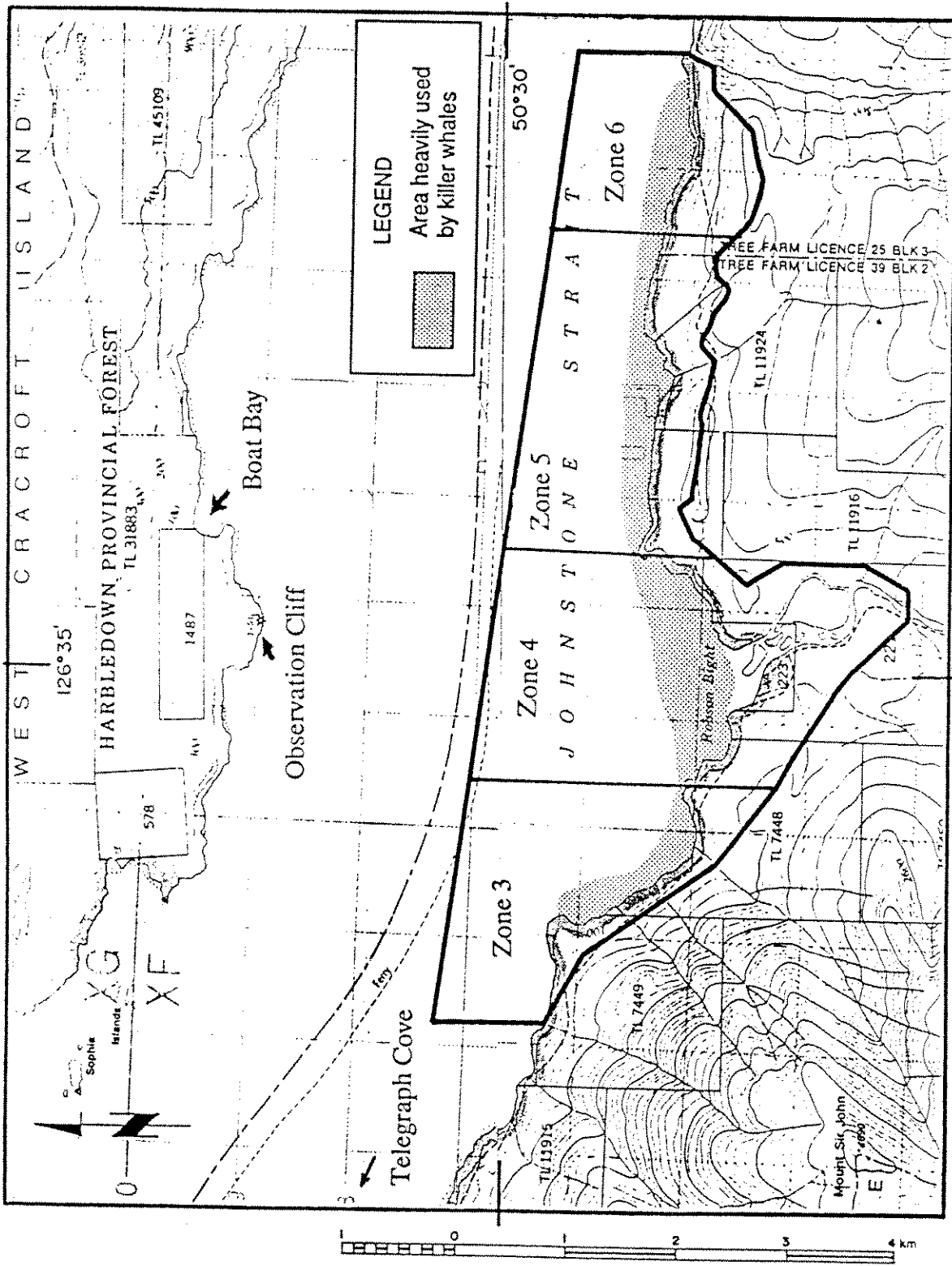


Figure 2: Robson Bight (Michael Bigg) Ecological Reserve Location of study area, zones 3-6, base camp.

were defined as those vessels, looking for, following or approaching whales. Contacts were prioritized as follows;

- 1) Whale oriented vessels in Reserve
- 2) Whale oriented vessels outside Reserve boundary
- 3) Non-whale oriented vessels approaching Reserve
- 4) Non-whale oriented vessels inside Reserve (ie. Commercial Fishing Vessels)

Data on visitor interactions were recorded for long-term management considerations. Data included:

- * Contact Time
- * Contact Location
- * Vessel Type (Recreational, Commercial, Kayak etc.)
- * No. of Passengers
- * Visitor Origin (B.C., Canada, International)
- * Level of RBMBER Awareness (Yes/No)
- * Voluntary Compliance (Yes/No)

Vessel type was classified by the following criteria;

CFV Commercial Fishing Vessel
CCV Commercial Charter Vessel
COL Ocean Liner
GPV Government Patrol Vessel
PRV Photographer/Research Vessel
RKG Recreational Kayak Groups *
RPV Recreational Power Vessel
RSV Recreational Sailing Vessel

* Kayaks were recorded by groups

2.2 Research and Monitoring

The study area includes six zones.

- Zone 1: Western Johnstone Strait and Blackfish Sound
- Zone 2: Kaikash Creek to Naka Creek
- Zone 3: West Reserve boundary to Robson Point
- Zone 4: Robson Point to East point of Robson Bight
- Zone 5: East Robson Bight point to West Beach
- Zone 6: West Beach to East RBMBER Border

Figure 1 illustrates locations of zones 1-2. Figure 2 illustrates the locations of each zone (3-4), base of operations and the observation cliff. Observations were made from July 1 to August 31, 1991 (n = 62 days). Poor weather conditions inhibited research observations on 12 days. Days of partial observation were excluded from results. Visual references of zone boundaries and distance estimates were estimated using a reference vessel, nautical chart and theodolite in the first week of recording. Whales and subpods were identified visually by their unique natural markings (Bigg et al., 1987) and by acoustic subpod identification (Ford and Fisher, 1982). Whale activity was estimated by acoustic subpod identification (Ford and Fisher, 1982).

Whale activity data included; time of day, identity of individual whales, subpod, no. of individuals, location (by zone), direction of travel and activity state. Whale activity and vessel traffic in Zones 3-6 (RBMBER) were recorded continuously. Whale activity and in Zones 1 and 2 (Johnstone Strait) was recorded at ten minute intervals and cross-referenced with data of other researchers. Whale activity was primarily measured using whale-hours (*wh*). Whale-hours were calculated by the following formula

$$wh = t_1 \times n$$

where:

wh = whale hours
 t_1 = duration of subpod visit
n = total no. of individuals in subpod

Vessel traffic was assessed by vessel visits (*vv*). Vessel visits is calculated by the enumeration of each vessel as it entered each zone. Level of marine traffic was assessed for each zone of the study area. Marine traffic was categorized into the following groups;

Commercial Fishing Vessels	CFV
Recreational Vessels	(RPV,RSV,RKG)
General Marine Traffic	(Commercial vessels > 10m in length)
Aircraft	(AIR)

Aircraft visually estimated flying at elevations less than 300-400ft were also recorded. Inside RBMBER, vessel and plane traffic was observed continuously. A boat or plane visit was defined as one arrival into one of the four zones in RBMBER. .

Whale behaviour was divided into rubbing, resting and other. Other behaviours included travelling, feeding and socializing. These behaviours were thought to be less sensitive to disturbance from vessel activity and were not analyzed further. Behaviours were defined after Ford (1984).

Short-term responses of whales were used to assess the level of disturbance caused by vessel activity. Short term responses were defined as changes in whale activity or direction of travel. In Zone 6 these responses also included;

- a) Whales leave area and do not return
- b) Whale leave area and return after vessel leaves
- c) Whales pass by rubbing beaches
- d) Whales engage in a short rub only (< 10 min)

2.3 Education/Interpretation Program

Visitor programs were scheduled twice a week at two of three locations (Port McNeill, Telegraph Cove and Alder Bay). Locations were selected to target starting points of Johnstone Strait whale watching visitors in order to maximize visitor contact. Visitor program schedules were run in local newspapers and posted at Telegraph Cove, Port McNeill, Alder Bay and the four Type II information shelters.

High interest groups whose clients frequent Robson Bight (ie. Ecosummer Expeditions, The Haida Way Inn, Telegraph Cove Resort and Alder Bay Resort) were contacted before program commencement and informed of the visitor programs scheduled for presentation. Groups were encouraged to promote the program to their clientele. Programs were scheduled as follows:

Telegraph Cove Resort, Telegraph Cove:

July 5, August 2, 16, 30

Alder Bay Resort, Alder Bay:

July 12, 26, August 9, 23

The Haida Way Inn, Port McNeill

July 13, 20,27, August 3, 10, 17 24, 31

Bion supplied the following materials to the program:

- 1 slide projector *
- 1 slide screen *
- 1 VCR *
- 1 T.V. Monitor *
- 4 min KW video by Mike Bigg (courtesy Vancouver Aquarium)
- Killer whale slide collection (courtesy B.C. Parks)
- Various props (i.e. SCUBA equipment, model killer whales)
- B.C. Parks related pamphlets and brochures

* Courtesy Regional District of Mt. Waddington

All programs were conducted in the format and style of B.C. Parks regular park interpretive programs with minor modifications to accommodate the mandate of the ecological Reserve.

3.0 RESULTS AND DISCUSSION

3.1 Warden/Information Officer Program

361 vessel contacts (group contacts for Kayaks etc.) for a total of 2825 passengers were made over a total of 55 warden service days. A total of warden patrol 11 days were lost to foul weather. Recreational vessels (RPV, RSV, RKG) represented 81.0% of all vessels contacted. These groups totalled 293 vessels and 1108 passengers. Table 1 presents a summary of warden service visitor statistics.

Table 1: Summary of Warden Contact Data 1991

Vessel Type Complied	No. of Vessels	No. of Visitors	P/V Ratio	Vessels Contacted (%)	Vessels In Reserve (%)	Vessels Informed (%)	Vessels (%)
CFV	19	37	1.9	5.3	63.0	N/A	N/A
CCV	22	406	18.5	6.1	18.0	91.0	100.0
COL	3	**1200	1066	0.8	33.3	33.3	66.6
GPV	14	33	2.4	3.9	64.0	21.0	21.0
PRV	10	41	4.1	2.8	50.0	50.0	80.0
RKG	92	466	5.1	25.5	18.0	47.0	93.0
RPV	127	416	3.3	35.2	76.9	13.1	89.8
RSV	74	226	3.1	20.5	64.8	18.3	93.0
Total	361	**2825	N/A	N/A	N/A	N/A	N/A
Mean	45.1	603.1	138.1	N/A	53.5	28.3	83.9

* P/V = no. of passengers to no. of vessels ratio

** No. of passengers contacted could have been much higher. However only one of the COL's permitted passenger contact over the ships PA system.

Mean number of visitors contacted per day decreased from 61.6v/d (1989) to 51.4v/d (1991). This decrease is attributed to the decreased contact with larger CCV groups and is not at all representative of vessel activity. Figure 7 shows the increase in recreationally oriented vessel contacts from 1987 - 1991. These figures represent both the increased priority of recreational vessel contact and the increase in the volume of recreational traffic. Of note is the decreased contact with CCV's. Table 2 compares warden statistics from previous years. Visitor contacts peaked at 1300

hours and dropped off slowly throughout the afternoon. 84.7% of all vessels contacted were made between 1100 and 1700 hours. Figure 8 shows the frequency distribution of diurnal visitor contacts.

Table 2: Vessel Percentage and Total No. of Visitors Contacted per Year

Vessel Type (n=55)	Vessel Type Percent			Visitor Contact (n=51)	
	1987 (%)	1989 (%)	1991 (%)	1989	1991
Charter (CCV)	51.8	40.3	6.1	789	406
Power (RPV,PRV,GPV)	10.8	19.3	41.8	356	490
Sail (RSV)	3.7	12.1	20.5	248	226
Kayak (RKG)	16.9	23.3	25.5	451	466
Ocean Liner (COL)	0.0	>0.5	0.8	1559	**1200
Other (CFV or other)	16.8	4.5	5.3	92	32
Total				3495	2825
Mean				61.6	51.36

* 1990 visitor contact data was not included as data was not representative of actual warden contact

** No. of passengers contacted could have been much higher. However only one of the COL's permitted passenger contact over the ships PA system.

Wardens targeted recreational vessels which made up 81.2% of all vessels contacted. Figure 3 illustrates the percentage of vessel contacts by vessel type. Recreational vessels (RPV/RSV/RKG's represented the majority of vessels contacted.

A high number of all vessel contacts (53%) were made within the RBMBER boundaries (Figure 4). This "in reserve" vessel activity is attributed to a generally low level of mariner understanding (71.6%) regarding the Reserve boundaries and guidelines (Figure 5). Post contact compliance was generally very good (84%) among all vessel groups. (Figure 6). Future education programs should be directed at groups exhibiting a low level of understanding. The land based visitor services programs conducted this year will hopefully assist in alleviating some of this "In Reserve" traffic in future years.

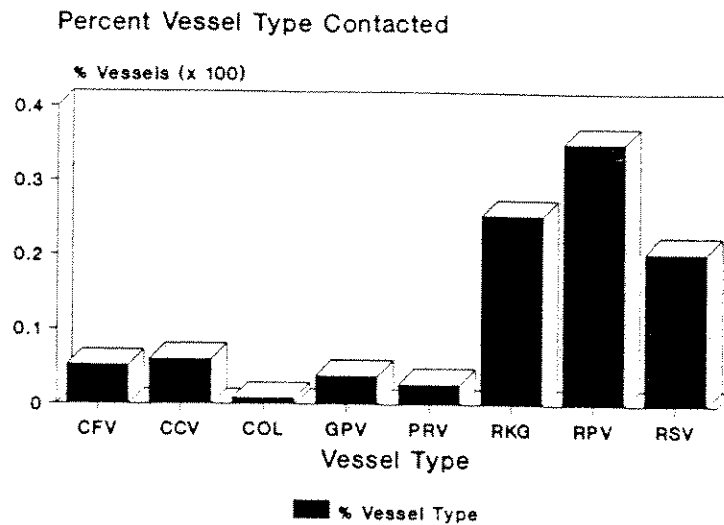


Figure 3: Summary of vessel type percentages contacted by the warden/information officers during June 28 - September 4, 1991. This illustrates the success in warden contact in targeting recreation vessels.

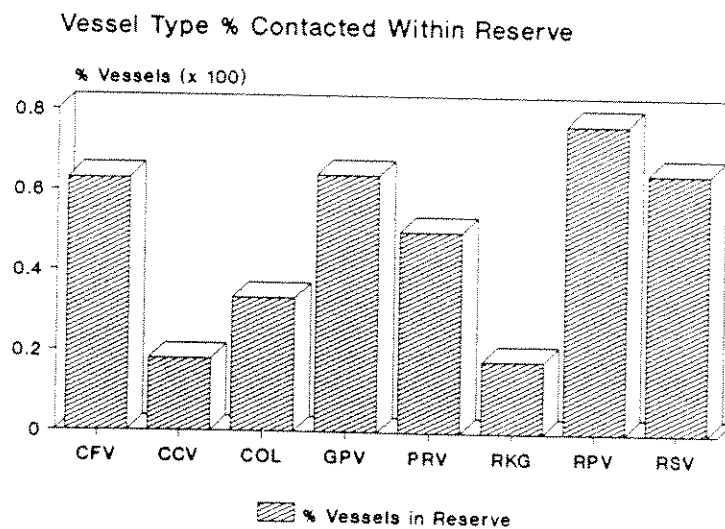


Figure 4: Summary of vessel percentages contacted within the reserve boundary. Over 60% of all RPV, RSV, GPV and CFV's contacted were within the reserve boundaries. This was attributed to a lack of understanding as shown in Figure 5.

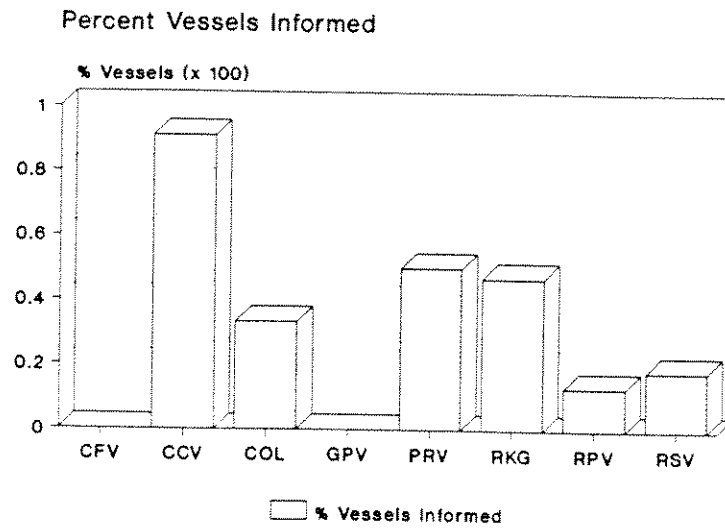


Figure 5: Summary of vessel percentages contacted which exhibited and expressed a high level of understanding regarding the objectives of RBMBER and its boundaries. CCV a significantly higher level of understanding than all other groups. CFV's and GPV's are omitted as they are presently exempt from RBMBER boundaries.

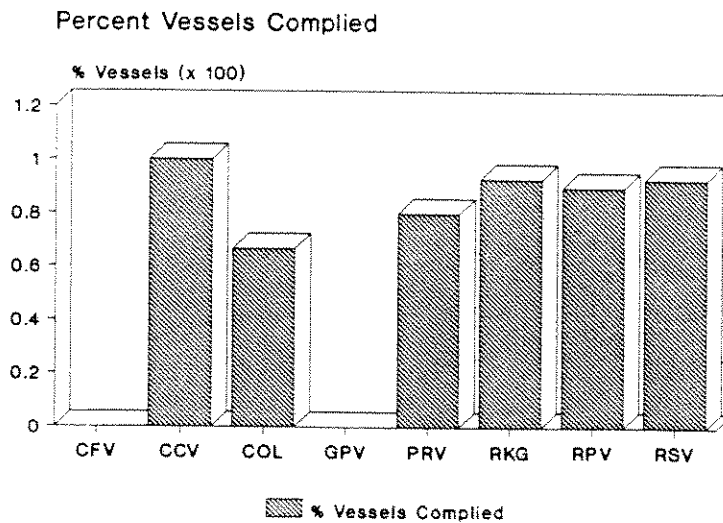


Figure 6: Summary of vessel percentages which exhibited voluntary compliance with the Warden/Information Officer's request for boundary observation. CFV's and GPV's are omitted as they are presently exempt from RBMBER boundaries.

Vessel Contacts 1987, 1989, 1991

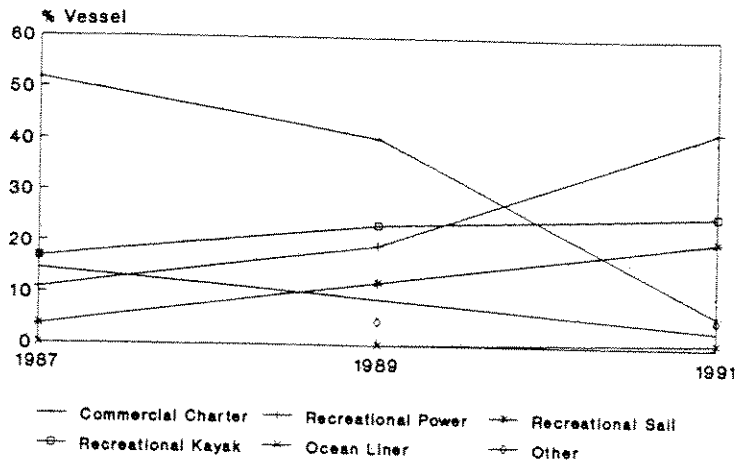
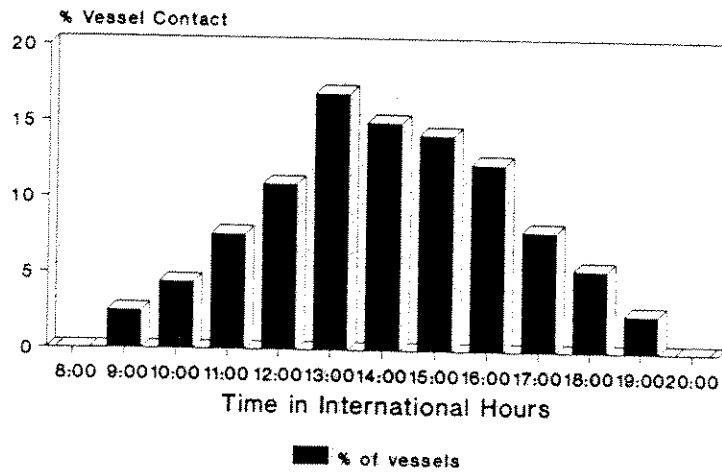


Figure 7: Warden/Information Officer contacts with recreational vessels in 1991 was increased significantly from the 1987-88 program. CCV contact was reduced due to the lower priority this vessel class had in this season. 1990 Information Officer statistics were omitted as they reflected subjective vessel enumeration rather than vessel contacts.

Daily Vessel Contact



June 28 - September 2, 1991

Figure 8: Daily vessel contact peaked at 1300hrs and dropped off more slowly throughout the afternoon. 75% of all warden contacts took place between 1200-1600 hours.

RKG's represented a significant proportion of RBMBER visitors. (450 - 466 assuming a majority of single person kayaks). 18% of groups contacted were within Reserve boundaries. RKG's were relatively well informed (47%) and exercised a high level of post contact compliance (93%).

50% of all PRV's were contacted in the Reserve. They were 50% informed and exhibited 80% compliance.

3.1.2 Operations

The RBMBER program has special logistical and operational characteristics which make it more difficult and more expensive to operate than other visitor services programs. It is marine-based in a remote location and has a dual mandate to monitor and provide information. The 1991 program was made possible through the cooperation and dedication of many sponsors, volunteers and staff. This level of cooperation however beneficial cannot necessarily be counted on during future operations.

Because B.C. Parks and the Department of Fisheries and Oceans share responsibility for killer whale management in this area, the program should be operated cooperatively utilizing shared resources. This may include financial and jurisdictional support. In addition, pre-program communications by B.C. Parks with other government agencies (ie. Coast Guard, Fisheries and Oceans, Environment Canada) and visitor groups (commercial cruise lines, adventure travel operations, local communities) would increase voluntary compliance and information dispersion.

A) Visitor Contact and Compliance

As a result of the 1991 "no entry" policy of B.C. Parks for the ecological Reserve. 1991 Visitor contacts concentrated on the RBMBER boundaries. Until 1989 visitors were permitted to enter the Reserve when whales were not present. Past warden programs concentrated on providing information regarding the whales and whale watching techniques rather than boundary compliance. The "no entry" policy without adequate support materials (ie. brochures, signs, boundary references) pre-occupied wardens with explaining RBMBER boundary references and requesting compliance rather than providing more information on whales and whale watching guidelines.

During fisheries openings CFV's were moored and/or fishing in the Reserve for the majority of days between August 5 and September 5. This served to lower voluntary compliance with Reserve boundaries by recreational vessels.

The Canadian Coast Guard, Environment Canada and Department of Fisheries and Oceans should be requested to include RBMBER information in their regular bulletins to mariners. This would resolve some of the confusion by fishermen that the B.C. Parks Wardens were Fisheries Officers and would assist cooperation in boundary compliance. Similar information could be provided via a press release or public service announcement to the appropriate fishing and boating publications (ie. Westcoast Fisherman, Pacific Fishing, Boating World, Pacific Yachting).

B) Warden Vessels

Visitor numbers at RBMBER were lower than expected this year due to poor weather, and a general decline in Vancouver Island tourism. Visitor contact was not greatly enhanced by utilizing two warden vessels except during occasional periods of heavy vessel traffic. Future operations should utilize the second vessel on a on-call basis only. This will allow better use of labour for program logistical support which was greatly assisted this year by volunteer staff. This volunteer staff can not be relied upon for subsequent years of operations and creates its' own logistical and liability problems.

Identification flags supplied by B.C. Parks were implemented near the end of the season. The flags provided increased visibility and credibility during approaches to other vessels.

C) Accommodations

Donations from several staff members and a volunteer were used this season to upgrade Boat Bay accommodations. The continued use of Boat Bay should be secured by B.C. Parks for the Warden and Research program. It is recommended that this take place in the form of a Crown Lands Lease and a letter of agreement with Tree Farm Licensee, Fletcher Challenge (Canada) Ltd. A floating base camp in boat bay would provide more substantial base operations to the warden program. This would;

- * Provide safer moorage for warden vessels,
- * Reduce wildlife contact (ie. bears).
- * Increase camp safety and communications
- * Reduce setup effort
- * Reduce general labour
- * Allow for extended seasonal monitoring

Secure moorings are a must for a floating camp as Boat Bay is partially exposed to southeast storms.

D) *Jurisdiction*

Stronger policy on land-based activities should be considered. Dumping activities of domestic refuse from commercial and recreational vessels and other high impact activities (ie. camping) have been observed around the mouth of the Tsitika River. These activities should be strictly enforced in keeping with the conservation goals of the RBMBER.

As discussed in the 1989 visitor program report, the possible method for implementing such a program would be to defer Fisheries Act powers through the BC Parks warden program or have a stronger presence and communications with local Fisheries Officers.

Benefits would include:

- * Sharing of the contract cost
- * Increased authority of the information officer program to deal with potential harassment of killer whales
- * A mandate to contact people in other locations within Johnstone Strait and Blackfish Sound, where encounters between visitors and whales often occur
- * A mandate to talk to commercial fishermen who are moored (and potentially recreate) within RBMBER
- * A higher profile for both agencies

It should be noted that this program should be operated primarily as an information program rather than emphasizing the enforcement aspect, it would be more appropriate to the nature of the problem. Whale watchers primarily disturb whales out of enthusiasm and ignorance, rather than from harmful intent. The opportunity exists to gain many allies for the program if an educational approach is used.

3.1.4 Brochures

The Robson Bight Ecological Reserve brochures were distributed to RBMBER visitors and served as an integral part of the warden/information program. They served as an excellent information package regarding whale watching guidelines for areas away from the Reserve. However, it also served as an inadvertent advertising medium for the RBMBER attracting potential whale-watchers to the area. This is in direct conflict the conservation objectives and no entry policy of the Reserve.

BC Parks has tried to limit the availability of the brochure, in keeping with its conservation objectives, but the lack of comparable publications for management outside the Reserve has kept the demand high.

The federal government and some local organizations have produced some whale watching guidelines. However, these guidelines are not consistent with the Robson Bight brochure. B.C. Parks should update the Robson Bight brochure prior to the 1992 season to reflect the "no entry" policy and any other changes to management. B.C. Parks should support the publication of a general purpose brochure on killer whale watching to be produced by the federal government and made widely available. Information presented in this second brochure should be consistent with that presented in the Robson Bight brochure and should include the "no entry" policy on RBMBER and provide alternatives to potential whale watchers.

3.1.5 Information Signs

Information signs produced by B.C. Parks in 1991 were erected at Type II shelters at Kaikash Creek, Blinkhorn Peninsula and Boat Bay. They were attractive and duplicated the information in Robson Bight brochure. This represented an excellent management strategy. Unfortunately no information sign was installed at Telegraph Cove. Telegraph Cove is the closest launch point for RBMBER recreational visitors. This would serve as the most effective location to present RBMBER information, particularly the "no entry" position of B.C.Parks. This would save many recreational boaters the trip to Robson Bight only to be turned away by the wardens. This is true particularly for kayaking groups which must expend a great deal of energy to reach RBMBER. Point of launch information would help them plan their trip to other areas offering better shelter and where access is not restricted.

Many visitors reported reading the sign at Kaikash Creek, however the Blinkhorn and Boat Bay signs were not as effective. Information signs should be relocated to sites which maximize visitor contact and assist visitors in planning their trip.

3.1.6 Boundary display and Marker Buoys

As in 1989, one of the most frequent comments made by RBMBER visitors was that the Reserve boundaries should be marked on Canadian Hydrographic Service (CHS) marine charts. Publication of the RBMBER boundaries on CHS marine charts would help mariners identify the Reserve boundaries. This would increase voluntary compliance. It is understood that the one of the strategies of the ecological reserve is to keep a low profile and that publication of its' location may actually attract more visitors. However the presence of killer whales at Robson Bight is currently widely known and marine chart publication would likely serve greater purpose in defining boundaries to mariners rather than cause undue level of traffic.

Visitors were sometimes upset that they did not have enough information to make a decision in the best interest of the whales. It is likely that publishing the location of the Reserve will create its own set of problems, but it is hoped that the presence of the wardens will offset heightened awareness.

The marker buoys installed by the B.C. Parks and the Canadian Coast Guard in May 1991 temporarily served as visual references for the marine boundaries of the Reserve. Unfortunately the buoys did not have sufficient moorings. Two of the three buoys broke free of their moorings, one of these was recovered. The third buoy was removed by the wardens to prevent its loss. On one occasion a commercial ocean liner was observed running over a buoy. The buoy also presented a potential hazard to the fouling of commercial fishing gear.

Future buoys should appear on CHS charts and should be lighted with radar reflectors. Johnstone Strait is one of the busiest navigable commercial water-ways of the Canadian Pacific Coast and any buoys placed in this area should have proper markings so it does not act as a hazard to navigation rather than a navigation aid.

The new large boundary signs located on the shore of the Reserve are highly visible and will effectively delineate the east-west extent of the Reserve. This should provide adequate visual references to the Reserve boundaries in lieu of marker buoys. The shore markings should also be placed on CHS charts with instructions to mariners in defining the Reserve boundaries (ie. distance from shore)

3.2 RESEARCH AND MONITORING

Whale activity in Western Johnstone Strait (Wenytan Pass to Naka Creek) was observed to be significantly greater than past observations. A total of 25,012 whale hours (*wh*) were recorded for 1991 (Briggs pers comm., 1991). This data is estimated for a 24 hour period from July 1 to August 31, 1991 and represents the highest yet recorded activity including 1987 (16,294*wh*). Caution must be used in the interpretation of these estimates as observer effort in past studies is difficult to assess and data is compiled from several different independent research projects using a variety of enumeration techniques.

Population percentage observed in the Johnstone Strait area (Zone 1-6) in 1991 was the highest since 1987 (Table 1). 154 of the 197 (78%) northern residents were sighted (Briggs pers comm., 1991.)

3.2.1 Johnstone Strait (Zone 2)

Diurnal whale activity in Zone 2 (0800-2000hrs) was recorded at 13,292*wh*. Mean daily whale activity (averaged weekly) peaked during the week of July 29th

Johnstone Strait Summer Whale Activity

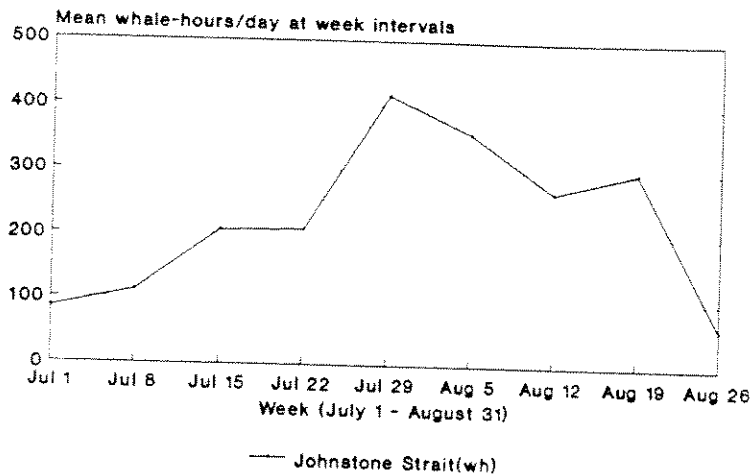


Figure 9: Mean daily whale activity for Johnstone Strait peaked during the week of July 29th. Similar activity patterns were observed in RBMBER and Zone 6.

Reserve Whale and Vessel Activity

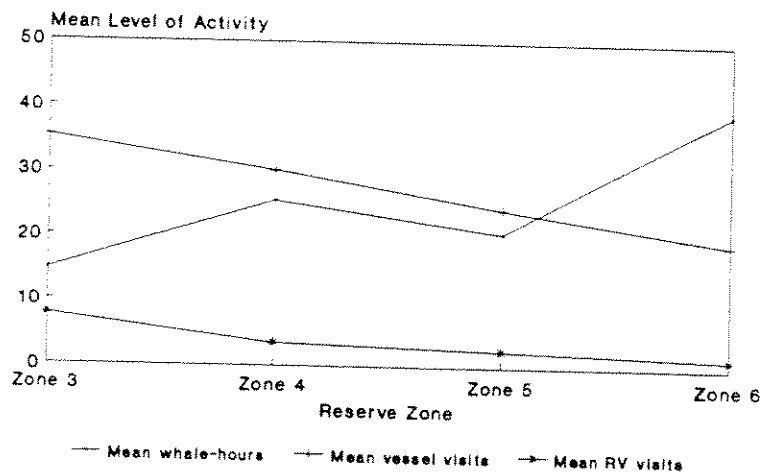


Figure 10: Mean daily whale activity was highest in zone 6 (39.2wh) and lowest in zone 3 (14.7wh). Total vessel activity and recreational vessel activity was decreased from Zone 3 to 6. This may be due to the increased amount of protection from foul weather and proximity to Telegraph Cove Zones 3 and 4 offer.

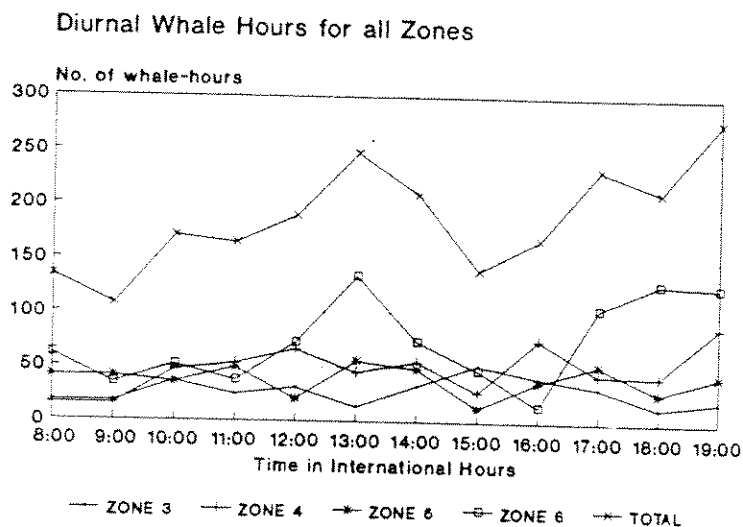
(416wh/d) (Figure 9). Overall mean daily whale activity was 223.5wh from July 1 to August 31.

Whales spent 81% of their time in Zone 2 and the remaining 19% in RBMBER. Caution must be used in the interpretation of whale activity by zone as zones are not equal in size. therefore a high percentage of time recorded in one zone does not necessarily directly reflect the importance of an area to the whales (ie. Johnstone Strait, Zone 2 seems to be used primarily as a corridor to the RBMBER, Zones 3-6).

3.2.2 RBMB Ecological Reserve (Zones 3-6)

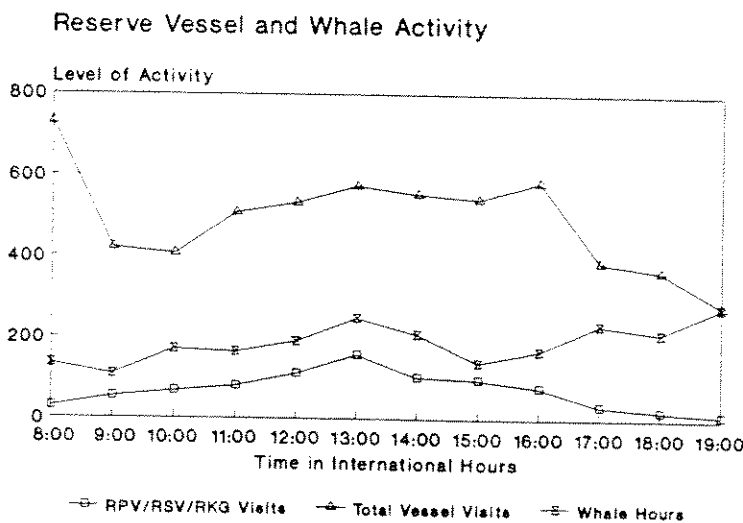
Diurnal whale activity in RBMBER (0800-2000hrs) was recorded at 2,255wh. Mean daily whale activity for 1991 (41.8wh/d) was slightly lower than in 1990 (56.5wh/d). Activity was concentrated in Zone 6 (39.2%) and peaked in the early afternoon (1300-1400hrs) and again in the early evening (1700-2000hrs) (Table 3)(Figures 10,11,12). Whale activity use patterns (by zone) were similar to those observed by Briggs (1991).

Vessel activity was concentrated in zones 3 and 4 (Table 3)(Figure 10). These areas offer better protection from wind and waves and were used extensively by CFV's between fisheries openings. Zones 3 to 4 are also closer to the primary point of origin for recreational boaters and popular recreational fishing areas. Caution must be used in the interpretation of vessel activity as the numbers do not directly express the duration of time spent in a zone by any one vessel. Data is biased towards vessels which travel between zones frequently (ie. CFV's). Vessels leaving and returning to a zone would elevate visit numbers by being observed multiple times. This method may in fact be a better indication of overall vessel "activity" as it measures active vessels more frequently than non active vessels.



n = 64, July - August 1991

Figure 11: Diurnal whale activity in the reserve peaked sharply at 1300 hrs and again at 1900 hrs. Activity spikes were stronger in Zone 6 than for other zones.



n=64, July - August, 1991

Figure 12: Recreational vessel (RPV,RSV,RKG) activity peaked at 1300 hours in coincidence with the first activity peak of whale-hours. This is likely an observation of recreational vessel actively seeking whale encounters.

Table 3: Total Activity for Reserve Zone

Activity Type	Zone 3	Zone 4	Zone 5	Zone 6	Reserve
Whale Hours	332.2	547.1	464.1	884.9	2255.4
Mean whale-hours per Day	6.2	10.1	8.6	16.5	41.8
% Whale Activity	14.7	25.5	20.6	39.2	NA
CFV (vv)	1200	1157	899	717	3973
RPV,RVS,RKG					
GPV,PRV (vv)	423	192	142	81	838
Other (vv)	53	49	45	19	166
(COL, Tugs, Barges etc.)					
AIR (<400ft)(vv)	234	233	228	215	910
Total Vessel Visits (vv)	1910	1631	1314	1032	5887
Mean Vessel Visits per Day (vv)	35.3	30.2	24.3	19.1	109

A) Daily Activity

Diurnal whale activity was calculated from 0800 to 2000hrs for each zone of the Reserve. Zone 6 exhibited two distinct temporal peaks of activity in the early afternoon (1300-1400hrs) and again in early evening (1700-2000hrs) (Figure 11). Zones 3-5 showed generally less activity. Activity increases in these zones may be indicative of travelling time to and from Zone 6.

Recreational vessel activity peaked in early afternoon (1300-1400hrs) in coincidence with the first whale activity spike and with warden contacts (Figure 12). This is thought to be due to the whale orientation of recreation vessels and the recreational orientation of warden boats. The lack of a second RV activity peak is likely due to the late hour of the day. RV's tend to be off the water well before dark and must make the return trip to Telegraph Cove.

B) Summer Activity

Mean whale hours per day for all zones generally increased through out July peaking during the week of July 9th (Figure 13). Dips in summer whale activity were observed for RBMBER during the week of July 22 and August 12. The August 12 drop in activity coincides with a dramatic increase in CFV vessel activity (Figure 14).

It follows that whale activity in this area should model CFV activity as both groups target the season movements of pacific salmon into Johnstone Strait. This dip in activity may directly reflect avoidance behaviour by killer whales during episodes of "active" fishing by CFV's and/or a threshold limit on general vessel traffic (active and anchored). If this is the case CFV activity may be interfering with the natural occurrence of whales in this area by competing for food resources and by interrupting natural behaviours (ie. resting, rubbing etc.). Caution must be used in the interpretation of this data as the July 22 dip in whale activity does not correlate to vessel activity and may be a natural occurrence or due to other factors. Subsequent seasons of observation under this project should yield more definitive results on the CFV/whale relationship.

Recreational vessel activity peaked in late July/early August (mean $vv/day = 20$) in coincidence with increased whale activity. The thought to represent the whale oriented activities of these groups (Figure 15). Activity data did not show direct correlations of recreation vessel impact on whales. However observations on behavior tend to support the disturbance of whales by recreational traffic particularly when resting or rubbing.

CFV activity peaked sharply in August in coincidence of fisheries openings. Recreational Vessel Activity (RPV,RSV,RKG) and air traffic also peaked in August. Figure 12 shows mean levels of activity per day for July and August.

C) Subpod Activity

Northern pod population percentage observed in RBMBER was 48% (n=92). This accounted for 54% of the 44 northern resident subpods. Whale activity (*wh*) within the reserve was dominated by four of the 24 subpods which entered the reserve. A30's, A12's, A11's and A24's accounted for 52% of RBMBER whale activity. The remainder was distributed among the other subpods. Four of the remaining subpods were individuals. This use pattern is similar to that reported by Nichols (1990).

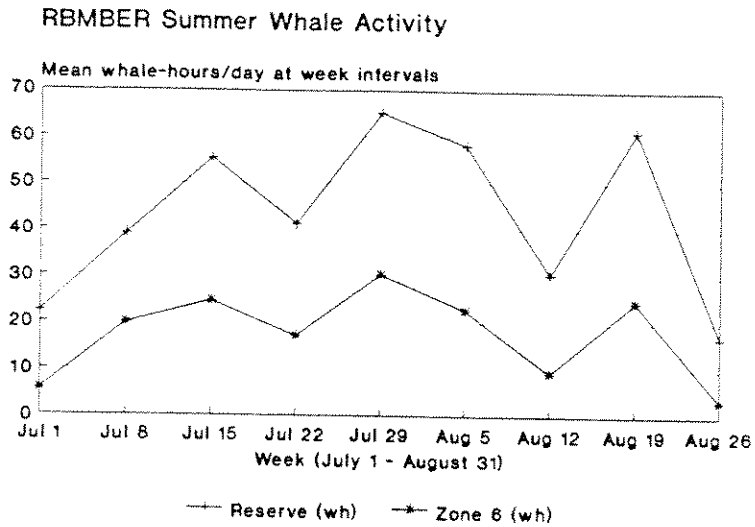


Figure 13: Mean daily whale activity increased from July 1 peaking during the week of July 29th. Two drops in mid-summer activity were observed. A major drop of approximately 50% occurred during the week of August 12. This coincides with the strong peak in CFV activity (Figure 14) and suggests a direct correlation. A 25% drop early during the summer is unexplained. Caution should be used in the interpretation of this data as activity drops could be due to other factors as well.

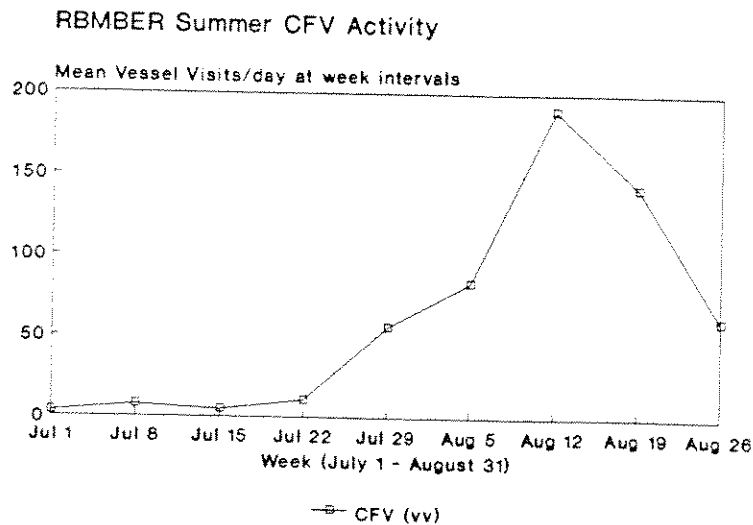


Figure 14: Mean daily CFV vessel visits increased sharply during the week of August 12. This coincided with local fisheries openings and a decline in whale activity.

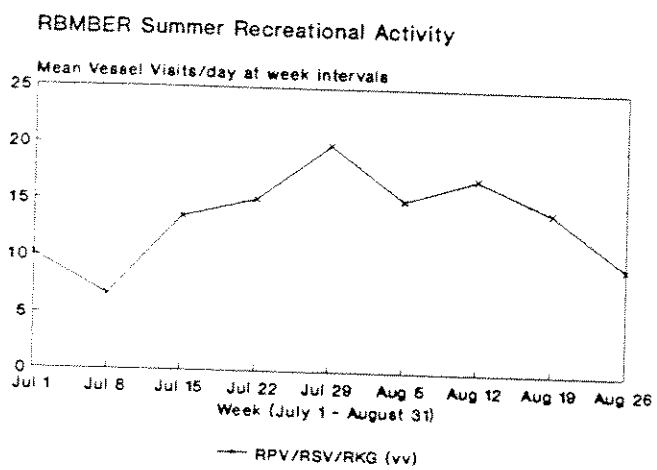


Figure 15: Mean daily recreational vessels vessel visits increased throughout July peaking on July 29th and dropping off through August. An activity drop during the week of July 8th is correlated to poor weather conditions.

D) *Whale Behaviour*

ACTIVITY STATES

Resting: Whales spent 13% of their time in RBMBER resting. This corresponds to the 13% allotted to the behaviour time budget of killer whales for Johnstone Strait by Ford (1984). Resting behaviour was concentrated in Zone 5 which accounted for nearly one half of all RBMBER resting time.

Rubbing: Whales spent an estimated 82% of their time in Zone 6 rubbing at either of the two rubbing beaches (East Beach = 70%; West Beach = 12%). This accounted for 5.5% of the 1991 behaviour budget for Johnstone Strait. A correlated well to the 4% rubbing observed by the behaviour budget defined by Ford (1984).

Mean rub times were between 6 and 9 minutes. These figures are lower than those reported by Briggs (1991) for 1987-1989 (mean rub times = 6-12min) and by Ford (1984) (mean rub times = 35min). This trend of decreasing mean rub time may reflect direct impacts of vessel activity in Zone 6.

Other behaviours defined by Ford (1984) such as feeding, socializing and travelling were grouped together and constituted the remainder of the behaviour budget. These behaviours were more difficult to separate from others and were felt not to be as sensitive to disturbance by vessel activity as rubbing and resting. Rubbing was observed only in Zone 6 and resting was concentrated in Zone 5.

SHORT-TERM RESPONSES AND VESSEL IMPACT

117 short term responses by whales to vessel activity which resulted in activity or direction changes were observed. These were concentrated in Zones 5(n=27) and 6(n=67). Percentage of short term response caused by vessel activity were dramatically higher in Zone 5 and 6 (Figure 16).

Some caution should be used in the interpretation of this data as observations of short term behavioural responses of whales to vessel activity are difficult to interpret due to the subjective nature of qualifying whale behaviour. It is felt that subsequent years of research will better quantify whale and vessel activity in the Reserve so that correlations between changes in activity levels may be drawn more objectively. In addition the total effect of vessel traffic is difficult to interpret as no historical pre-impact baseline data is available for the Reserve. Past observations of rubbing activity have been recorded in the Reserve in areas other than Zone 6. The absence of this activity in recent years could be due to the high level of vessel activity observed in these areas. Whale activity is lowest in Zone 3 where vessel activity is

Short-term responses of Whales

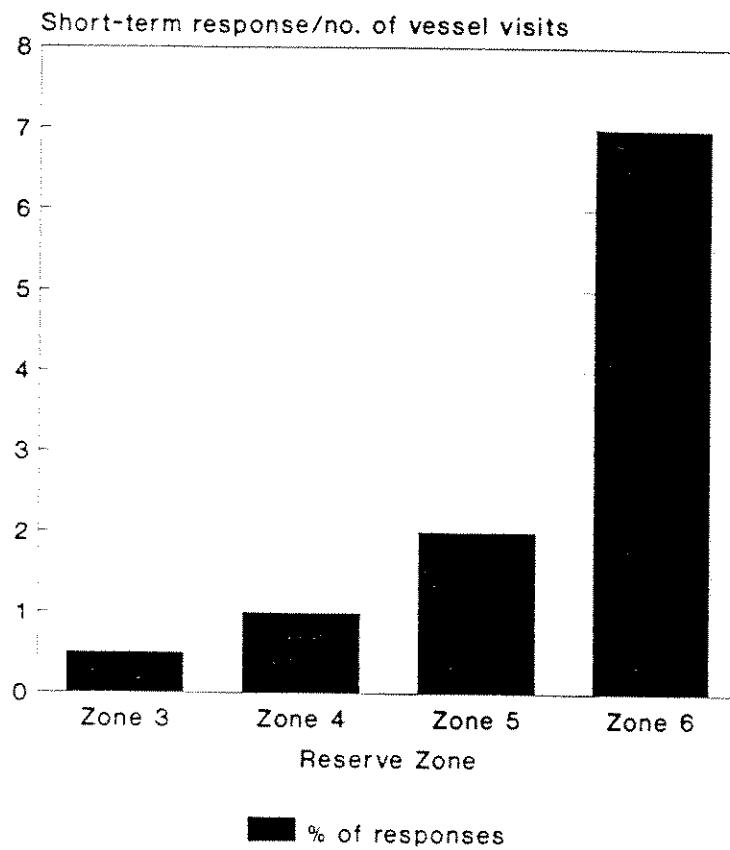


Figure 16: Percentage of short-term responses per vessel visit. Zones 5 and 6 show greater sensitivity to vessel activity. This may be attributed to the rubbing activity and greater amount of resting activity in these zones.

highest. Similarly whale activity and short-term responses are highest in Zone 6 where vessel activity is lowest. The cause and effect of this relationship is not clear cut. The possibility of whale activity increasing throughout the Reserve if vessel activity is restricted is worth investigation and should be implemented as a baseline study. A minimum of three seasons of study should be permitted to allow researchers to establish an activity baseline for whale use of the Reserve area. This would provide resource managers with a much better understanding of whale use patterns and would help to ensure the continued presence of killer whales in RBMBER.

3.3 LAND BASED VISITOR PROGRAM

Of 17 scheduled presentations 2 were cancelled due to poor weather conditions. Total attendance for all presentations was 575 visitors. Mean attendance was 38.8 visitors per presentation with range of 4 - 68. Mean attendance was highest at Telegraph Cove (41.8%). Table 6 illustrates the attendance record, locations and dates for all presentations.

Table 6: *Visitor Attendance Land Based Visitor Services Programs 1991*

Month	Day	Port McNeill	Alder Bay	Telegraph Cove
July	05			61
	12		Rain	
	13	55		
	19			68
	20	4		
	26		26	
	27	45		
August	2			35
	3	45		
	9		33	
	10	45		
	16			51
	17	11		
	23		55	
	24	41		41
	30	25		25
	31			
Total		205	119	251
Mean		34.2	39.6	41.8
Grand Total All Locations = 575				
Mean Attendance All Locations = 38.8				

Audience interest and background seemed to vary between location. Haida Way Inn visitors were the most diverse group reflecting the variety of hotel guests (ie. kayaking groups). Relatively few local people attended despite numerous notices

posted around Port McNeill. Alder Bay visitors were mostly sportfishing oriented and were generally less informed than other groups about RBMBER or whale watching guideline. Telegraph Cove had the most informed group and the highest level of RBMBER visitation. This is likely due to it's close proximity to the Reserve and presence of whale watching charter companies (ie. Stubbs Island Charters).

The use of props with the interpretive slide show was very successful in maintaining visitor interest by entertaining with a education message.

Advanced advertising was difficult this year due to the short lead time for project start-up. An information session for tour operators and local tourism representatives would hopefully raise the profile of the program within the community. A number of local people expressed interest in attending the program, including the mayor. Assistance in pre-season contact by B.C. Parks would greatly assist this information program.

Program effect is difficult to assess as warden/information officers would not receive direct feedback from with boaters complying with the programs message. Ideally, if the program's message was completely successful, boaters would not only become "good whale watchers", but they would also tend to avoid RBMBER. Wardens contacted relatively few boaters who had previously been at the interpretive talk.

The interpretive program should continue in its present format and venue, with improvements to advertising for local and recreational boater contacts. More local media involvement and well-placed advertising should be encouraged in the future.

4.0 CONCLUSIONS

Recreational vessel activity within RBMBER is associated with lack of understanding of the Reserve's management goals and boundaries. Recreational vessel activity tends to model levels of whale activity. This is thought to be due to the whale oriented activities of recreational vessels.

Commercial charter vessels are well informed regarding RBMBER policy and tend to exercise sound whale watching procedures.

Peak periods of commercial fishing vessel activity seems to be disturbing whale activity in the Reserve. This is enhanced by the present ecological reserve exemption of CFV's. This is of particular concern in Zone 5 and 6 when whales are engaged in resting and rubbing activities respectively. Restrictions of active fishing or mooring in these areas may assist alleviating direct impacts on whales. Further research is required to establish baseline whale activity data. All vessels should be strictly prohibited from entering the reserve during this study. A minimum of three years is recommended.

Resting behaviour is concentrated in Zone 5. Rubbing behaviour is exclusive to Zone 6. Whale activity is most sensitive to disturbance from vessel activity in Zones 5 and 6 with particular emphasis on Zone 6.

Whale activity in the reserve is characterized by increased activity in the early afternoon and again in the early evening. This is especially true for Zone 6. When in Johnstone Strait whales spend the majority of time/per area in the reserve and at Zone 6 engaged in rubbing activities.

Whale activity in the reserve is dominated by 4 of 44 northern resident subpods. These 4 groups (A30's, A12's, A11's and A24's) accounted for 52% of whale activity in the RBMBER.

5.0 RECOMMENDATIONS

- 1) Prohibit access to all vessel traffic
 - a) Past observations of rubbing activity have been recorded in the Reserve in areas other than Zone 6. The absence of this activity in recent years could be due to the high level of vessel activity observed in these areas.
 - b) The possibility of whale activity increasing throughout the Reserve if vessel activity is restricted is worth investigation and should be implemented as a baseline study. A minimum of three seasons of study should be permitted to allow researchers to establish an activity baseline for whale use of the Reserve area.
- 2) Increase level of visitor education (including commercial fishing vessel operators).
 - a) The Canadian Coast Guard, Environment Canada and Department of Fisheries and Oceans should be requested to include RBMBER information in their regular bulletins to mariners.
 - b) Release of information on whale watching guidelines and RBMBER should be considered via a press release or public service announcement to the appropriate fishing and boating publications (ie. Boating World, Pacific Yachting).
 - c) B.C. Parks should update the Robson Bight brochure prior to the 1992 season to reflect the "no entry" policy and any other changes to management.
 - d) Information signs should be relocated to sites which maximize visitor contact and assist visitors in planning their trip.
 - e) B.C. Parks should support the publication of a general purpose brochure on killer whale watching to be produced by the federal government and made widely available. Information presented in this second brochure should be consistent with that presented in the Robson Bight brochure and should include the "no entry" policy on RBMBER and provide alternatives to potential whale watchers.

- f) Publication of the RBMBER boundaries on CHS marine charts would help mariners identify the Reserve boundaries. This would increase voluntary compliance.
- 3) Increase level of cooperation and interest between levels of government agencies, communities and interest groups
- a) B.C. Parks and the Department of Fisheries and Oceans should increase cooperation in this area utilizing shared resources. This may include financial and jurisdictional support.
 - b) Pre-season communications by B.C. Parks with other government agencies (ie. Coast Guard, Fisheries and Oceans, Environment Canada) and visitor groups (commercial cruise lines, adventure travel operations, local communities) could greatly increase voluntary compliance and information dispersion.
 - c) Defer Fisheries Act powers through the B.C. Parks warden program and/or increase Fisheries Officer presence in the area.
- 4) Operational modifications will allow more effective management of the reserve
- a) Future warden operations should utilize a second vessel on a on-call basis only. This will allow better use of labour for program logistical support which was greatly assisted this year by volunteer staff.
 - b) Use of identification flags or signs on warden vessels should be continued. The flags provided increased visibility and credibility during approaches to other vessels.
 - c) The continued use of Boat Bay should be secured by B.C. Parks for the Warden and Research program. It is suggested that this take place in the form of a Crown Lands Lease and a letter of agreement with Tree Farm Licensee, Fletcher Challenge (Canada) Ltd.
 - d) A floating base camp (barge) in boat bay could provide a more substantial base operations to the warden program and increase safety and communications.
 - e) The research and monitoring program should continue to assess whale and vessel activity in the RBMBER and the immediate area. Efforts

should center upon daily and summer activity and correlating whale and vessel activity.

- f) The land-based visitor program should continue it's present format and venue with an increased level of advertising.