Observations on Portland Inlet System, Northern British Columbia Golden King Crabs *(Lithodes aequispina)* and Their Infestation by a Rhizocephalan Barnacle Parasite *(Briarosaccus callosus)*

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OBSERVATIONS ON PORTLAND INLET SYSTEM, NORTHERN BRITISH COLUMBIA GOLDEN KING CRABS (*Lithodes aequispina*) AND THEIR INFESTATION BY A RHIZOCEPHALAN BARNACLE PARASITE (*Briarosaccus callosus*)

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From three deep-water fjords in the Portland Inlet system, northern British Columbia, 1396 golden king crabs (Lithodes aequispina) suffered 36.7% infestation by the rhizocephalan barnacle parasite Briarosaccus callosus in October-November, 1983. The 72 red king crabs (Paralithodes camtschatica) and the 782 Tanner crabs (Chionoecetes bairdi) coincidentally sampled in the 169 single king crab pot sets were unparasitized. Alice and Hastings Arms golden king crabs suffered similar (38.4-39.7%) parasitism levels whereas Observatory Inlet crabs were only 2.9% parasitized. Portland Inlet yielded only two (unparasitized) L. aequispina and Work Channel none. In all fjords 38.9% of males and 34.8% of females were parasitized. Other aspects covered are: host abundance, between and within fjord differences of parasitized or unparasitized hosts and reproductive status of unparasitized female L. aequispina. Relatively high L. aequispina populations and infestation levels of B. callosus in the extremities of the Portland Inlet system are related to the deep-water habitat preferences of the crabs and the oceanographic isolation of the fjords. A literature survey on what little is known about the biology of L. aequispina is provided.

RÉSUMÉ

Sloan, N. A. 1984. Observations on Portland Inlet system golden kingcrabs (Lithodes aequispina) and their infestation by a rhizocephalan barnacle parasite (Briarosaccus callosus). Can. MS Rep. Fish. Aquat. Sci. 1779: 61 p.

En octobre et novembre 1983, 36.7% des 1,396 crabes dorés (Lithodes aequispina) capturés dans trois fjords profonds du système de l'inlet Portland, en Colombie-Britannique septentrionale, étaient parasités par Briarosaccus callosus, cirripède appartenant à l'ordre des Rhizocéphales. Par contre, les 72 crabes royaux, Paralithodes camtschatica et les 782 crabes des neiges, Chionoecetes bairdi pêchés en même temps dans les 169 mouillages uniques de casiers à crabes n'étaient pas infestés. Le crabe doré peuplant les bras Alice et Hastings avait un taux semblable de parasitisme (38.4-39.7%) qui ne s'élevait qu'à 2.9% chez celui de l'inlet Observatory. Seulement deux L. aequispina (non infestés) one été capturés dans l'inlet Portland et aucun dans le chenal Work. Dans tous les fjords, 38.9% des mâles et 34.8% des femelles étaient touchés. On a aussi étudié les aspects suivants: abondance de l'hôte, différences entre les hôtes infestés et non infestés d'un fjord à l'autre et à l'intérieur d'un même fjord et état reproducteur des L. aequispina femelles non infestées. Des populations relativement abondates de L. aequispina et des niveaux élevés d'infestation de B. callosus à l'intérieur du système de l'inlet Portland sont reliés à la préférence mainfestée par les crabes pour les eaux profondes et l'isolation océanographique des fjords. On présente aussi le peu de données tirées d'ouvrages sur la biologie de L. aequispina.

INTRODUCTION

The deep-water golden (or 'brown') king crab Lithodes aequispina Benedict and the shallow-water red king crab Paralithodes camtschatica (Tilesius) are known to occur in British Columbia waters (Butler and Hart 1962). A small fishery exists for these species mostly in the inlets north of Prince Rupert, including the Portland Inlet system (P. Wallin personal communication). In a 1982 survey of king crabs from Alice and Hastings Arms of the Portland Inlet system (Fig. 1) golden king crabs from the deeps of these Arms were noted to suffer a high incidence of parasitism by the rhizocephalan barnacle Briarosaccus callosus Boschma (S. C. Jewett personal communication). B. callosus castrates the male and female crabs it infects, as do all rhizocephalans which only infect crustacea (Overstreet 1983).

Briarosaccus callosus has a worldwide distribution and infects various king crab species from the NE Pacific, Atlantic, Antarctic and sub-Antarctic (Boschma 1962, 1970; Arnand et Do-Chi 1977). It was described as a new genus and species by Boschma (1930) from Lithodes agassizii Smith taken in 477-880 m off North Carolina and Florida. In the NE Pacific and Bering Sea B. callosus is known to infest Lithodes aequispina (Boschma 1962; McMullen and Yoshihara 1970), Paralithodes camtschatica (Boschma and Haynes 1969; McMullen and Yoshihara 1970), Paralithodes platypus (Brandt) (T. C. Shirley personal communication) and Lithodes couesi Benedict (Boschma 1970; Somerton 1981). Furthermore, the blue king crab Paralithodes platypus can be infested by another rhizocephalan, perhaps Thompsonia sp. (Somerton and McIntosh 1982; D. A. Somerton personal communication). The outside reproductive portion or externa of B. callosus is most often attached to the ventral surface of the abdomen (Fig. 2A & B) by a tough stalk and a root-like system or interna penetrates at least the hepatopancreas of the host for nourishment. Parasitism is here defined by the presence of B. callosus externae, or their scars, on the host. Results of internal examinations of crabs will be reported elsewhere (S. M. Bower unpublished data).

L. aequispina is a little known deep-water king crab species which, until recently, was lightly fished in the NE Pacific. It has recently attracted interest in Alaska as an alternative to P. camtschatica whose fishery has declined. Besides anecdotal mentions in the literature, there is one Japanese paper, one Russian paper and two American technical reports on this species. Hiramoto and Sato (1970) reported on a pot survey from 400-900 m depth off the Boso Peninsula of the east coast of central Honshu. Among their observations they concluded that fishing effort for L. aequispina would "not be compensated by the market value" and little has been heard from Japanese biologists on this species since. Rodin (1970) reported on a bottom trawl survey at 250-850 m depth in the Sea of Okhotsk. Among his observations he concluded that the stock was small and recommended a trial pot fishery. In the NE Pacific, American workers have recorded L. aequispina from pot surveys at 200-400 m on a few seamounts in the Gulf of Alaska where they were caught in relatively low numbers compared to L. couesi (Hughes 1981). McBride et al. (1982) and Otto et al. (1983) have reported data from logs of exploratory pot fishing and Japanese small trawlers operating in the eastern Bering Sea and the Aleutian Islands. McBride et al.(1982) also summarised the above-mentioned Japanese and Russian literature on L. aequispina. Crabs were found mostly between 200-2000 m depth throughout the outer shelf and slope regions of the eastern Bering Sea but were most common among the Aleutians. McBride et al. (1982) could not provide stock estimates from their data but they did suggest that the "natural production" of L. aequispina is probably lower than that of red king crabs P. camtschatica. They concluded that a fishery may be possible in light of the low abundance of P. camtschatica in the eastern Bering Sea area. From their literature review McBride et al. (1982) reported that:

(1) Maximum carapace lengths of male golden and red king crabs was similar (approximately 220 mm).
(2) Golden females mature at a larger size (carapace length 110-140 mm) than reds (76-105 mm).
(3) Eggs per golden female (at 160 mm carapace length) were about 30,000 versus 300,000 for red females of the same size.
(4) Goldens spawned July-October; reds between February-May.
(5) Approximate depth distribution of goldens was 65-920 m versus 18-180 m for reds.

Rodin (1970) reported a rhizocephalan parasite infesting L. aequispina but identified neither the species nor the infestation level experienced by the crab population. Rodin went on to casually speculate that this parasitism was one of the factors responsible for the low catches of L. aequispina. In a later paper Kurochkin and Rodin (1970) reported a 6.4% infestation of B. callosus in 94 L. aequispina taken from 500-550 m in the Sea of Okhotsk. McBride et al. (1982) mention the decreased fertility of golden king crabs due to parasitic castration.

This study was undertaken to describe characteristics of the host population, to reveal levels of infestation in host crabs from different fjords within the Portland Inlet system and to assess the effects of B. callosus on its hosts. The incidental catch of the red king crab P. camtschatica was also monitored for the parasite. Fishing effort concentrated on L. aequipsina in the deeps of Alice Arm, Hastings Arm, Observatory Inlet and the northern portion of Portland Inlet between October 27 to November 6, 1983 and in Work Channel between February 23 to 24, 1984. The second sampling series in Alice and Hastings Arms between February 25 to March 5, 1984 will not be discussed here.

MATERIALS AND METHODS

One hundred and sixty nine sets, each with a single pot, were made in the Portland Inlet system of northern British Columbia (Fig. 1). Alice Arm (Fig. 3, 4) and Hastings Arm (Fig. 4) each had 44 sets, Observatory Inlet (Fig. 5) and Portland Inlet (Fig. 6) had 31 each and 19 sets were made in Work Channel (Fig. 7). Fishing was almost entirely confined to depths > 100 m with a range of 55 to 569 m. According to Picard's (1961) and D. J. Stucchi's (personal communication) descriptive accounts, Portland Inlet is a deep inlet with a deep sill (183 m) seaward of its mouth. The four other sites are all deep basins isolated by sills. The south end of Observatory Inlet (Figure 5) has a well defined sill 40-46 m deep and Alice Arm has a very shallow sill at approximately 18-25 m. The sill in Hastings Arm is a less well defined rise about 55 m deep and Work Channel has a 21 m sill.

Alaskan-made side-entry king crab pots measuring 1.8 x 1.8 x 0.9 m with 9.0 x 12.0 cm mesh were used. Pots had two tunnels with 88 x 19 cm openings or 'tunnel eyes'. Each pot was baited with two 2 litre perforated jars of chopped frozen herring. Soak times varied between 20.1 to 47.5 h. Every attempt was made to haul pots within the first 24 h in order to calibrate effort to a 24 h soak but handling constraints necessitated two hauling days each for Alice Arm, Hastings Arm, and Observatory Inlet. Thus, the CPUE of pots hauled in Alice Arm, Hastings Arm and Observatory Inlet in the first day of fishing were calibrated to a 24 h soak whereas pots hauled in the second day had catches calibrated to a 48 h soak.

L. aequispina were measured for carapace length and right chela height (male only) (Fig. 8A and B) (Wallace et al. 1949) to the nearest mm, weighed to the nearest 0.05 kg and noted for shell class. Class 1 was for light-colored crabs that had moulted recently and class 2 for crabs which failed to moult recently. Older-shelled crabs had darker shells with more abrasion on the coxae and more epizoans. Each crab was also examined for the presence of B. callosus externae or their scars, and autotomized or regenerating limbs. Crabs missing or regenerating limbs were not weighed. The egg-bearing condition of each unparasitized female was monitored, i.e.: whether juvenile, berried with new eggs, berried with more mature, 'eyed' eggs or for the presence of matted setae (post spawned). The carapace lengths of P. camtschatica were measured, their shell class noted, parasite presence established and the female's reproductive state recorded.

RESULTS AND DISCUSSION

FISHING CATCH, EFFORT AND RELATIVE CRAB ABUNDANCE AND DISTRIBUTION

The depths, soak times, catch of golden king crabs (L. aequispina) and CPUE are listed according to set (pot) for each inlet in Appendix tables 1 A-E. A summary of pot depths, soak times, and catch of the three crab species is provided in Table 1. The mean fishing depth in all inlets was > 297 m with a maximum of 569 m in Observatory Inlet. Fishing effort (number of pots and soak times) was similar in Alice and Hastings Arms and less in the other inlets. L. aequispina represented 63% of all crabs taken. Alice Arm > 74%

of the L. aequispina. Catches from the head of Alice Arm, especially those from around 100 m, yielded few golden king crabs (Appendix table 1A). The head of Hastings Arm (Appendix table 1B), although deeper than 100 m, also produced few golden king crabs and golden king crabs were not taken in the shallow sets 082-084. With exception of these two areas in Hastings Arm, crabs were caught at most deep sites although in lower numbers overall than Alice Arm. Observatory Inlet was fished to its greatest depth. Catches there, although relatively small compared to the Arms, were made all along its trough. The tide-swept Inlet mouth (sets 089-093) and the Inlet's northern extremity (sets 117-122) yielded poor catches (Appendix table 1C). Only two golden king crabs were caught from 31 sets in the deep waters of the northeast end of Portland Inlet (Appendix table 1D). Twenty eight of the 31 pots in Portland Inlet had one or more halibut (Hippoglossus stenolepis) which could have decreased crab catches. No L. aequispina and only three C. bairdi were taken in the 19 pots in Work Channel (Appendix table 1E).

The red king crab (P. camtschatica) was taken in low numbers from Alice and Hastings Arms only (Table 1). Tanner crabs (Chionoecetes bairdi Rathbun) were taken in all inlets and comprised 35% of all crabs caught. The male:female ratio for golden king crabs varied significantly from an expected 1:1 ratio (X^2=7.46; p 0.01) with more females whereas the sex ratio of red king crabs did not (χ^2=0.88; p 0.05). The (18:1 male to female ratio for Tanner crabs was probably related to a higher escape rate of females which are smaller than males (Donaldson et al. 1981). All Tanner crabs with old shells had Black Mat Syndrome (Hicks 1982).

Table 2 lists a comparison of mean catch of L. aequispina per set for 24 h versus 48 h pot soak times for each Inlet. Between 36-44% more crabs were taken after 48 h soaks compared to 24 h soaks. Crab catch rate was 13 to 15% less among 48 h pots compared to 24 h pots. The literature on experimental shellfish trap studies is sparse (Miller 1983). The only CPUE study on king crabs was reported by Rothschild et al. (1970) on P. camtschatica from fishermen's log books which are less reliable than experimental fishing for CPUE studies (Miller 1983).

Equivalent fishing effort in Alice Arm as in Hastings Arm (Tables 1, 2) yielded four times the catch in the former. Thus, relative density of L. aequispina was higher in Alice Arm than Hastings Arm. Crab densities were lower still in the other fjords. Oceanographic isolation (relatively low net flushing rates of larvae from the most isolated fjords) and the deep-water habitat preference of brooding L. aequispina are possible reasons for the differing crabs densities in each fjord.

The deep-water preference of L. aequispina compared to the shallow-water preference of P. camtschatica is shown in Table 3 which lists the average pot depths in comparison with the average depth at which the different crab species were caught in each inlet. L. aequispina were most commonly taken in deep water pots (see also Appendix tables 1 A-C) whereas P. camtschatica was only taken in shallow water pots and C. bairdi was caught in all pots although mostly in the deep water pots.

Sanguivorous fish leeches Notostomum cyclostoma (Johansson) and their cocoons were found on all crabs species, especially L. aequispina, in all fjords where crabs were common. This association is probably one of convenience for the leech which uses the crab exoskeletons for cocoon attachment and the crabs for dispersal (Sloan et al. 1984).

INCIDENCE OF Briarosaccus callosus ON Lithodes aequispina

The number and percent of male and female L. aequispina parasitized with B. callosus are listed according to each set in Appendix tables 2A-C. Parasitized individuals were found throughout the fjords. In Alice Arm (Appendix 2,A) only 2 out of the 41 pots containing crabs had no parasitized individuals. The levels of parasitism suffered by L. aequispina from each fjord are summarized in Table 4. Alice and Hastings Arms crabs suffered equivalent levels of parasitism (38.4-39.7%) with males being a little more infested than females. Observatory Inlet L. aequispina had an infestation level of 2.9%. The two Portland Inlet crabs were not parasitized. None of the 72 P. camtschatica were parasitized. All of the 32 female red king crabs bore full new-egg clutches.

Infection level differences between the two Arms and Observatory Inlet may relate to greater flushing in the more seaward Observatory Inlet (Sloan 1984a). Parasite larvae are less likely to be confined to Observatory Inlet to infest crabs.

WITHIN FJORD SEGREGATION OF L. aequispina ACCORDING TO SEX, PARASITISM, DEPTH AND AREA

Some pot yields were sex-specific as in set 005 which had a 19:3 male to female ratio (Appendix table 2A). On a wider scale, segregation of sexes among L. aequispina occurred in both Alice and Hastings Arms (Table 5, A). There were relatively more males captured in the heads of both inlets. From Table 5, B it appears that no marked segregation occurred according to host parasitism in Alice Arm. The head of Hastings Arm yielded more infested hosts than the mouth but there were few samples as the pot yields were low in that area.

The percent males and percent parasitized are ranked according to depth in Table 6. Observatory Inlet catches are separated from Alice and Hastings Arm catches because of the former's great fishing depths. In Alice and Hastings Arms, males dominated at 101-150 m whereas females dominated at 151-200 m. Below 200 m the sex ratios were relatively even. Most of the fishing in Observatory Inlet occurred at >400 m in which the percentage of males increased with depth, especially >500 m. In Alice and Hastings Arms the percent parasitized increased steadily with depth. Observatory Inlet crabs showed no such tendency with such low levels of parasitism in all the crabs sampled. Brooding female and parasitized L. aequispina may migrate downward to spawn.

MORPHOMETRICS OF UNPARASITIZED AND PARASITIZED *L. aequispina*

The relationship between carapace length and wet body weight is recorded in Table 7. Correlation coefficients for this relationship were uniformly high for all the samples of crabs examined. Using the power curve formula: Body weight = b carapace length^{a}; where b and a are intercept and slope respectively from a log-log plot of carapace length on body weight;

Unparasitized *L. aequispina*: Body weight=2.52(x10^{-7})Carapace length$^{3.18}$
r^2=.95 n=722

Parasitized *L. aequispina*: Body weight=15.70(x10^{-7})Carapace length$^{2.79}$
r^2=.92 n=417

All *L. aequispina*: Body weight=4.36(x10^{-7})Carapace length$^{3.06}$
r^2=.94 n=1137

Parasitized crabs were similar in size to unparasitized females whereas the size of parasitized males was decreased.

A comparison of the carapace lengths of unparasitized male and female *L. aequispina* from different fjords is provided in Table 8A and B. Part A of Table 8 shows that the males were largest in Observatory Inlet, smaller in Hastings Arm and smallest in Alice Arm. Females did not show such a consistent pattern although Observatory Inlet crabs were also the largest. The ANOVA results in Table 8B shows that between all fjords the mean sizes of both male or female crabs were significantly different. The largest male and female *L. aequispina* both came from set (pot) 103 in Observatory Inlet (476 m) from which the 5.15 kg male had a 192 mm long carapace and the 3.05 kg female had a 174 mm long carapace.

In Table 9A the mean carapace lengths of unparasitized male and female *L. aequispina* are listed according to depth. The deeper water Observatory Inlet crabs were separated from Alice and Hastings Arms crabs. Part A shows little pattern to trends in male crab sizes with depth although females in the shallows (101-150 m) were noticably smaller than those from 151-200 m. The ANOVA results in part B demonstrated that in females there were at least one pair of depth groups that are highly significantly different.

The carapace lengths of unparasitised and parasitized male and female *L. aequispina* are illustrated in Figure 9 and listed and compared from different inlets in Table 10. In Figure 9 the parasitized males comprise a relatively larger proportion of the small size classes of all males than the parasitized females do of all females. The mean carapace lengths of unparasitized males were larger than those of parasitized males from the same fjord (Table 10). In females, however, this trend does not occur. This table shows that the differences between mean carapace lengths of the unparasitized and parasitized males within Alice Arm and Hastings Arm were highly significant. The significance of observed differences between Observatory Inlet crabs cannot be assigned as too few parasitized male or female crabs were caught. There were no significant differences between the sizes of unparasitized and parasitized female crabs within Alice Arm or Hastings Arm.

The right (crushing) chela height of unparasitized and parasitized male L. aequispina from the different inlets is compared in Table 11. The mean right chela height of unparasitized male crabs were larger than those of parasitized individuals. The observed differences in mean chela heights were signficant except for Observatory Inlet which yielded only one parasitized male. Both the decrease in parasitized male size, weight and right chela size compared to unparasitized males relates to the widely known femininization by rhizocephalan parasites of their hosts (Sloan 1984a). That female body size is not effected by B. callosus is in keeping with the literature on the effects of barnacle parasites on crabs.

LIMB CONDITION AND SHELL CLASS OF UNPARASITIZED AND PARASITIZED L. aequispina

Table 12 compares the incidence of limb loss or limb regeneration with host crab state of parasitism. Mean limbs lost or regenerated did not differ for unparasitized or parasitized crabs and ANOVA of mean limbs lost or regenerating revealed no significant difference. This suggests that moulting is not inhibited by parasitism.

The shell classes of male and female L. aequispina were compared with those of unparasitized or parasitized crabs (Table 13). Shell class 1 males were slightly more parasitized and females of shell class 1 were much more parasitized than those of shell class 2. This may relate to the greater ease of intermoult emergence of B. callosus externae relatively soon after moulting.

Table 14 examines the relationship between limb loss or regeneration with shell class. Mean limbs lost per crab was similar for recently moulted and older shell (class 2) crabs but mean number of limbs regenerating were greater for recently moulted crabs. The observed differences were not signficant for limbs lost versus shell class but were significant for regenerating limbs versus shell class. This lack of difference suggests that moulting by L. aequispina is not inhibited by parasitism.

EFFECTS OF MULTIPLE INFESTATION ON L. aequispina

The incidence of multiple parasites per host is listed in Table 15A. Most parasitised crabs bore one externa although up to four externae per host could occur. Both male and female crabs could be multiparasitised. Scarring, the wound remaining after an externa has been removed, was relatively uncommon and occurred almost twice as often among males (Table 15B). There were seven individuals carrying an externa as well as being scarred. Multiple infestation by different B. callosus larvae infesting a host is considered the most likely cause.

Table 16 shows that the incidence of single and multiple infestation differed significantly from a Poisson distribution (randomness) X^2=24.02; 5df; p 0.001). Thus, there is some interaction between parasites which decreases the chance of other larvae infecting an already parasitized crab.

The effects of multiple parasitism on male and female host size is demonstrated in Table 17. The mean carapace lengths of both males or females with one parasite were larger than those with two or more parasites and these observed differences in mean carapace lengths were significant. This indicates that B. callosus is a metabolic drain on its crab hosts.

REPRODUCTIVE STATE OF UNPARASITIZED FEMALE L. aequispina

The reproductive states of unparasitized female L. aequispina from each set (pot) are listed in Appendix tables 3 A-C. Females were recognized as juveniles, bearing new eggs, bearing more mature eyed eggs and matted setae (post-spawned). A summary of the sexual maturity of all female golden king crabs caught is given in Table 18. Proportions of juvenile and egg-bearing females were relatively similar throughout the sites. The proportion of matted setae females in Observatory Inlet was higher, however, perhaps because of lower infestation level of its crabs. Figure 10 illustrates the size frequencies of the more mature (larger) females compared to the smaller, less mature individuals. All matted setae females had shell class 2 exoskeletons.

L. aequispina may be an asynchronous breeder in the Portland Inlet system which migrates to the depths to spawn.

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Table 1. Summary of fishing catch and effort for king and Tanner crabs from fjords within the Portland Inlet system, October/November, 1983 and February, 1984.

Fjord	Pots fished	Pot depths (m)		Pot soak times (h)		*Lithodes aequispina*			*Paralithodes camtschatica*			*Chionoecetes bairdi*		
		$\bar{x}$	range	$\bar{x}$	range	Male	Female	Total	Male	Female	Total	Male	Female	Total
Alice Arm	44	261	93-382	32.6	20.4-47.5	444	588	1032	36	29	65	261	10	271
Hastings Arm	44	253	82-315	33.3	20.1-45.6	139	119	258	4	3	7	396	20	416
Observatory Inlet	31	409	110-569	34.7	24.9-44.6	62	42	104	0	0	0	66	6	72
Portland Inlet	31	335	205-439	23.6	22.5-24.8	2	0	2	0	0	0	15	5	20
Work Channel	19	233	55-318	24.2	23.5-24.9	0	0	0	0	0	0	3	0	3
Totals	169	297	55-569	30.6	20.1-47.5	647	749	1396	40	32	72	741	41	782

Table 2. Comparison of *L. aeguispina* catch per pot and catch rate between 24 h and 48 h pot soak duration classes in the Portland Inlet system, October, November, 1983.

Fjord	Soak duration class	No. of pots*	*L. aequispina* per pot $\bar{x}$	$\pm$ S.D.	No. of pots*	Catch rate (crabs h^{-1}) $\bar{x}$	$\pm$ S.D.
Alice Arm	24 h	21	20.0	10.5	21	0.83	0.43
	48 h	20	27.2	17.3	20	0.72	0.29
Hastings Arm	24 h	15	6.1	4.6	15	0.26	0.17
	48 h	16	8.8	4.8	16	0.22	0.10
Observatory Inlet	24 h	13	3.9	2.5	13	0.15	0.16
	48 h	9	5.3	4.1	9	0.13	0.11

*pots with no catch excluded.

Table 3. Catching depths of different crab species and of all pots fished according to fjord in the Portland Inlet system, October/November 1983. Catching depth defined as depth at which all specimens of each species were caught.

	Depth (m)							
	Alice Arm		Hastings Arm		Observatory Inlet		Portland Inlet	
Crab species	$\bar{x}$	Range	$\bar{x}$	Range	$\bar{x}$	Range	$\bar{x}$	Range
Lithodes aequispina	296	99-382	298	223-315	482	135-569	354	311-397
Paralithodes camtschatica	121	99-183	131	101-312	-	-	-	-
Chionoecetes bairdi	275	93-382	284	82-315	461	141-549	323	295-389
All pots fished	261	93-382	253	82-315	409	110-569	335	205-439

Table 4. Summary of infestation levels of *Lithodes aequispina* from different fjords within the Portland Inlet system, October/November, 1983.

Fjord	% *L. aequispina* parasitized		
	Male	Female	Total
Alice Arm	43.3	37.1	39.7
Hastings Arm	41.7	34.5	38.4
Observatory Inlet	1.6	4.8	2.9
Total	38.9	34.8	36.7

Table 5A. Separation of *Lithodes aequispina* within Alice and Hastings Arms according to sex, October/November, 1983.

Area of Fjord	Sets (pots) Numbers	n*	% males per pot* $\bar{x}$	±	SD
Head of Alice Arm	001-022	15	59.3	±	13.6
Mouth of Alice Arm	023-044	22	35.6	±	14.1
Alice Arm total	001-044	37	45.3	±	18.3
Head of Hastings Arm	045-066	7	64.4	±	21.3
Mouth of Hastings Arm	067-088	15	50.2	±	19.0
Hastings Arm total	045-088	22	54.8	±	20.4

*only pots yielding ≥5 *L. aequispina* were used.

Table 5B. Separation of *Lithodes aequispina* within Alice and Hastings Arms according to whether parasitized, October/November, 1983.

Area of Fjord	Sets (pots) Numbers	n*	% parasitized per pot* $\bar{x}$	±	SD
Head of Alice Arm	001-022	15	41.6	±	22.4
Mouth of Alice Arm	023-044	22	37.9	±	15.9
Alice Arm total	001-044	37	42.1	±	19.9
Head of Hastings Arm	045-066	7	48.8	±	12.7
Mouth of Hastings Arm	067-088	15	35.6	±	17.5
Hastings Arm total	045-088	22	39.8	±	17.0

*only pots yielding ≥5 *L. aequispina* were used.

Table 6. Percent *Lithodes aequispina* males, and percent of all parasitized *L. aequispina*, according to depth in the Portland Inlet system, October/November, 1983.

	Alice and Hastings Arms			Observatory Inlet			Total		
Depth (m)	Total crabs n	% Males	% Parasitized	Total crabs n	% Males	% Parasitized	Total crabs n	% Males	% Parasitized
<100	1	100	0.0	0	0.0	0.0	1	100	0.0
101-150	112	70.5	17.0	1	100	0.0	113	70.8	16.8
151-200	51	27.4	23.5	0	0.0	0.0	51	27.4	23.5
201-250	191	40.3	33.0	6	83.3	0.0	197	41.6	32.0
251-300	183	47.5	34.4	0	0.0	0.0	183	47.5	34.4
301-350	368	42.9	45.1	0	0.0	0.0	368	42.9	45.1
351-400	384	43.5	48.4	0	0.0	0.0	384	43.6	48.4
401-450	0	0.0	0.0	9	22.2	0.0	9	22.2	0.0
451-500	0	0.0	0.0	26	46.1	3.8	26	46.2	3.9
>500	0	0.0	0.0	62	67.7	3.2	62	67.7	3.3
	1290			104			1394		

Table 7. Regression statistics of the natural logarithm of carapace length (mm) versus the natural logarithm of live wet weight (kg) for *Lithodes aequispina* from different fjords within the Portland Inlet system, October-November, 1983. Power curve formula: Body weight = b carapace length^{a}.

Parasitism/sex	Fjord															
	Alice Arm				Hastings Arm				Observatory Inlet				Total			
	n	b*	a	r^2	n	b*	a	r^2	n	b*	a	r^2	n	b*	a	r^2
Unparasitized males	202	2.31	3.21	.97	69	3.29	3.13	.98	53	1.40	3.30	.98	326	2.80	3.17	.97
Parasitized males	146	15.80	2.79	.94	48	6.88	2.95	.97	1	NSD			195	11.00	2.86	.95
All males	348	3.20	3.14	.95	117	2.05	3.21	.97	54	1.32	3.32	.98	519	2.39	3.19	.96
Unparasitized females	300	30.71	2.65	.94	60	13.70	2.81	.97	36	35.20	2.64	.98	396	19.4	2.75	.95
Parasitized females	185	24.00	2.70	.91	35	22.50	2.70	.85	2	NSD			222	21.7	2.72	.89
All females	485	26.60	2.68	.92	95	16.50	2.77	.91	38	37.00	2.63	.97	618	20.5	2.73	.93
Unparasitized males & females	502	2.40	3.19	.94	129	2.87	3.15	.97	89	3.01	3.15	.96	722	2.52	3.18	.95
Parasitized males & females	331	19.82	2.74	.92	83	11.83	2.84	.92	3	NSD			417	15.70	2.79	.92
All crabs	833	6.11	2.99	.93	212	3.53	3.10	.96	92	3.00	3.15	.96	1139	4.36	3.06	.94

*all b values are x 10^{-7}

NSD = not sufficient data

Table 8. Comparison of mean carapace lengths of unparasitized Lithodes aequispina from different fjords within the Portlnd Inlet system, October/November, 1983.

A.	Carapace lengths (mm)														
	Alice Arm			Hastings Arm			Observatory Inlet			Portland Inlet			All Fjords		
Sex	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.
Unparasitized males	252	139.1	17.1	81	144.9	22.4	61	154.7	18.7	2	150.5	24.8	396	142.8	19.4
Unparasitized females	370	126.1	11.7	78	122.0	18.3	40	141.6	19.2	0	0.0	-	488	126.7	14.4

B. Matrix of subsequent pair wise t-tests from ANOVA of mean carapace lengths of unparasitized L. aequispina from different inlets.

	Alice Arm			Hastings Arm		
Fjord/sex	t-value	df	p	t-value	df	p
Hastings Arm males	2.43	394	<0.05	------	------	------
Observatory Inlet males	5.89	394	<0.001	3.12	394	<0.01
Hastings Arm females	-2.40	485	<0.05	------	------	------
Observatory Inlet females	6.81	485	<0.001	7.36	486	<0.001

Table 9. Comparison of mean carapace lengths of unparasitized *Lithodes aequispina* according to depth from different fjords within the Portland Inlet system, October/November, 1983.

A.	Carapace length (mm)											
	Alice and Hastings Arms						Observatory Inlet					
	Unparasitized males			Unparasitized females			Unparasitized males			Unparasitized females		
Depth (m)	n	$\bar{x}$	$\pm$ S.D.	n	$\bar{x}$	$\pm$ S.D.	n	$\bar{x}$	$\pm$ S.D.	n	$\bar{x}$	$\pm$ S.D.
<100	1	157.0	--	0	0.0	--	0	0.0	--	0	0.0	--
101-150	65	134.3	19.3	28	119.2	12.1	1	174.0	--	0	0.0	--
151-200	12	136.2	17.2	27	134.2	7.7	0	0.0	--	0	0.0	--
201-250	48	138.8	18.1	80	129.0	11.2	5	155.4	23.2	1	134.0	--
251-300	51	144.5	19.8	69	128.0	15.0	0	0.0	--	0	0.0	--
301-350	81	144.3	17.8	121	123.8	12.5	0	0.0	--	0	0.0	--
351-400	75	140.6	17.8	123	122.1	13.4	0	0.0	--	0	0.0	--
401-450	0	0.0	--	0	0.0	--	2	173.5	2.1	7	143.1	18.6
451-500	0	0.0	--	0	0.0	--	12	163.0	15.5	13	157.1	15.6
>500	0	0.0	--	0	0.0	--	41	150.8	18.5	19	130.9	15.1

B. ANOVA of carapace lengths according to depth for male and female *L. aequispina*.

		One way ANOVA results		
Fjord	Sex	F value	dF	p
Alice and Hastings Arms	males	3.01	5,327	<0.05
Alice and Hastings Arms	females	8.25	5,442	<0.001
Observatory Inlet	males	2.58	3,57	N.S.
Observatory Inlet	females	11.09	2,37	<0.001

N.S. = not significant.

Table 10. Comparison of mean carapace lengths of unparasitized or parasitized male or female *Lithodes aequispina* from different fjords within the Portland Inlet system, October/November, 1983.

	Carapace length (mm)						Student's t-test of mean carapace lengths		
	Unparasitized			Parasitized					
Fjord/sex	n	$\bar{x}$ ±	S.D.	n	$\bar{x}$ ±	S.D.	t-value	dF	p
Alice Arm males	252	139.1	17.1	192	129.3	17.0	-6.02	442	<0.001
Hastings Arm males	81	144.9	22.4	58	123.6	18.2	-5.97	137	<0.001
Observatory Inlet males	61	154.7	19.0	1	112.0	--	N.S.D.		
Alice Arm females	370	126.1	11.7	218	128.0	16.5	0.19	586	N.S.
Hastings Arm females	78	122.0	18.3	41	124.6	18.6	0.73	117	N.S.
Observatory Inlet females	40	141.6	19.2	2	127.0	7.1	N.S.D.		

N.S.D. = not sufficient data.
N.S. = not significant ($p>0.05$).

Table 11. Comparison of mean right chela heights of unparasitized versus parasitized male *Lithodes aequispina* from different fjords within the Portland Inlet system, October/November, 1983. Only parasitized and unparasitized crabs within an overlapping range (60-169 mm carapace length) were used for this analysis. Within this size range, mean (± S.D.) carapace length for unparasitized crabs was 148.2 ± 19.4mm and 127.9 ± 17.4mm for parasitized *L. aequispina*.

	Right chela height (mm)						Student's t-test comparing mean right chela heights		
	Unparasitized			Parasitized					
Fjord	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.	t-value	dF	p
Alice Arm	228	38.1	8.1	166	27.5	4.2	-16.92	357	<0.001
Hastings Arm	69	36.6	10.8	53	25.2	3.1	- 8.33	82	<0.001
Observatory Inlet	46	38.8	6.7	1	25.0		N.S.D.		
Total*	345	37.9	8.6	220	28.9	4.0	-20.53	525	<0.001

*Includes 2 Portland Inlet crabs.
N.S.D. = not sufficient data to assign a probability.

Table 12. Comparison of mean limb loss or regeneration of unparasitized versus parasitized Lithodes aequispina from the Portland Inlet system, October/November, 1983.

	Unparasitized		Parasitized	
Limb condition	No. of Crabs	% of Limbs	No. of Crabs	% of Limbs
Limbs lost	884	0.7	512	0.7
Limbs regenerating	884	1.4	512	1.6

Table 13. Comparison of shell class in male and female *Lithodes aequispina* with unparasitized or parasitized condition in the Portland Inlet system, October/November, 1983.

Sex	Shell Class	% parasitized
Male	1	40.0
	2	37.6
Female	1	50.8
	2	26.1

Table 14. Comparison of mean limb loss or regeneration of shell class 1 versus shell class 2 *Lithodes aequispina* in the Portland Inlet system, October/November, 1983.

	Unparasitized		Parasitized	
Limb condition	No. of Crabs	% of Limbs	No. of Crabs	% of Limbs
Limbs lost	593	0.9	803	0.6
Limbs regenerating	593	2.0	803	1.1

Table 15A. Incidence of multiple parasitism in *Lithodes aequispina* from the Portland Inlet system, October/November, 1983.

Fjord	Parasitized males				Parasitized females				
	n	No. with relevant number of externae or scars			n	No. with relevant number of externae or scars			
		1	2	3		1	2	3	4
Alice Arm	193	172	21	0	220	187	25	6	2
Hastings Arm	58	53	4	1	39	36	2	1	0
Observatory Inlet	1	1	0	0	2	2	0	0	0
Total	252	226	25	1	261	225	27	7	2

Table 15B. Incidence of scarring in *Lithodes aequispina* from the Portland Inlet system, October/November, 1983.

Fjord	Parasitized males			Parasitized females		
	n	No. with relevant number of scars		n	No. with relevant number of scars	
		1	2		1	2
Alice Arm	193	24	7	220	19	2
Hastings Arm	58	3	0	39	2	0
Observatory Inlet	1	0	0	2	0	0
Total	252	27	7	261	21	2

Table 16. Distribution of externae or scars of *Briarosaccus callosus* on 1396 *Lithodes aequispina* from the Portland Inlet system, October/November, 1983.

No. of externae or scars per host	Observed frequency	Expected* frequency	$\frac{(\text{Deviation})^2}{\text{Expected}}$
0	884	917.4	1.22
1	450	385.1	10.94
2	52	80.8	10.27
3	8	11.3	0.96
4	2	1.2	0.53
5	0	0.1	0.10
Total	1396	1935.9	$\chi^2 = 24.02$

*Poisson = random.

Table 17. Comparison of mean carapace lengths of parasitized *Lithodes aeuquispina* bearing one externa or scar of *Briarosaccus callosus* versus crabs with two or more externae or scars from the Portland Inlet system, October/November, 1983.

	Carapace length (mm)						Student's t-test comparing mean carapace lengths		
	1 externa or scar			≥2 externae or scars					
Sex	n	$\bar{x}$	± S.D.	n	$\bar{x}$	± S.D.	t-value	df	p
Male *L. aequispina*	226	128.6	17.4	26	120.9	16.1	-1.99	249	<0.05
Female *L. aequispina*	224	129.3	16.0	36	112.8	15.8	-5.55	259	<0.001

Table 18. Summary of female *Lithodes aequispina* reproductive state from fjords within the Portland Inlet system, October-November, 1983.

Fjord	n	Percentage of females				
		Juvenile	New eggs	Eyed eggs	Matted setae	Sterile (Parasitized)
Alice Arm	588	4.5	12.7	12.8	32.9	37.1
Hastings Arm	119	13.4	16.0	10.9	25.2	34.5
Observatory Inlet	42	7.1	16.7	9.5	61.9	4.8
Total	749	5.9	13.4	12.3	33.2	34.8

FIGURES

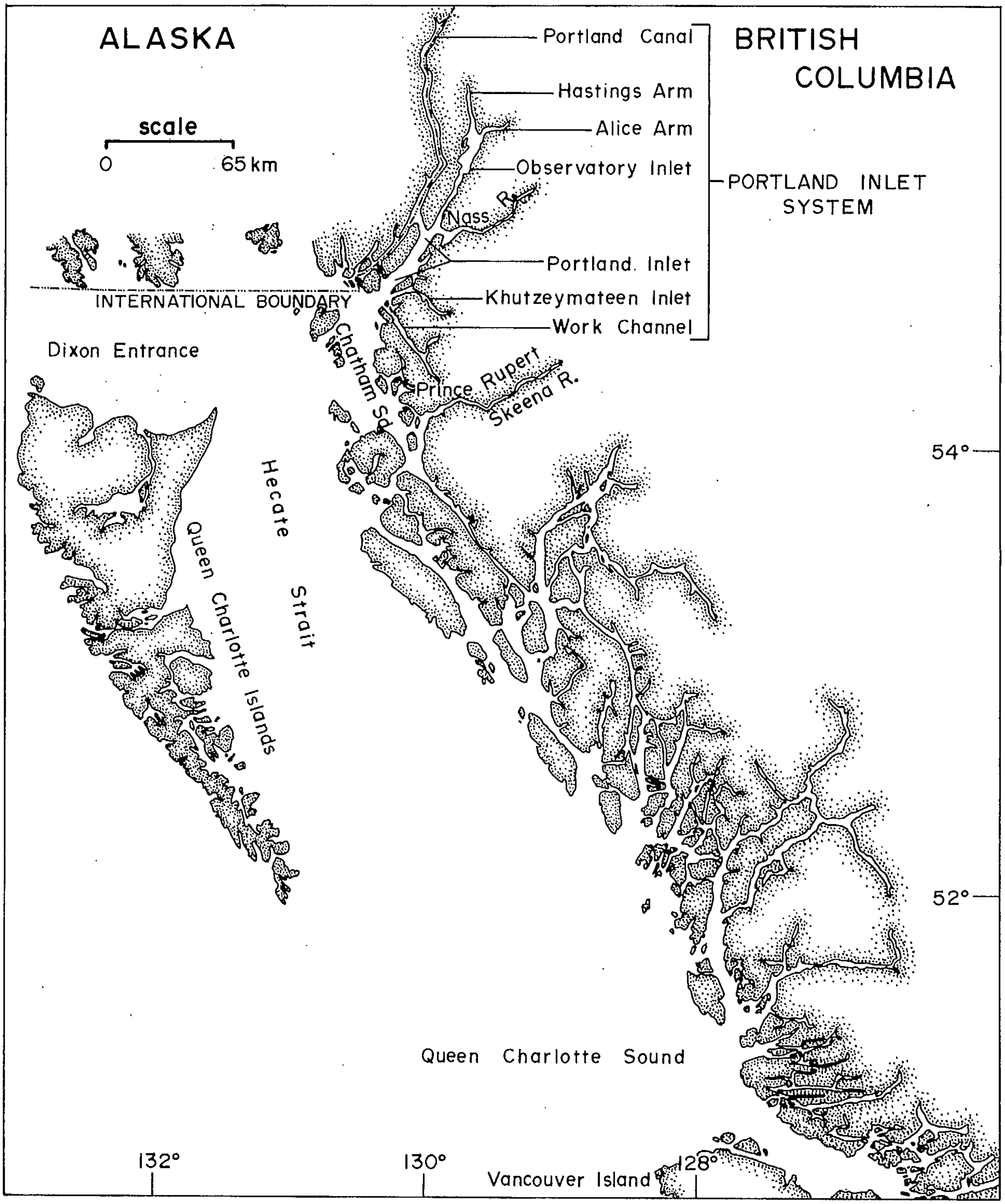

Fig. 1. Map of the northern British Columbia coast showing the position of the Portland Inlet system.

Fig. 2A. Male Lithodes aequispina from Alice Arm bearing a single, large (75 mm long) externa of Briarosaccus callosus.

Fig. 2B. Female Lithodes aequispina from Alice Arm bearing four externae of Briarosaccus callosus.

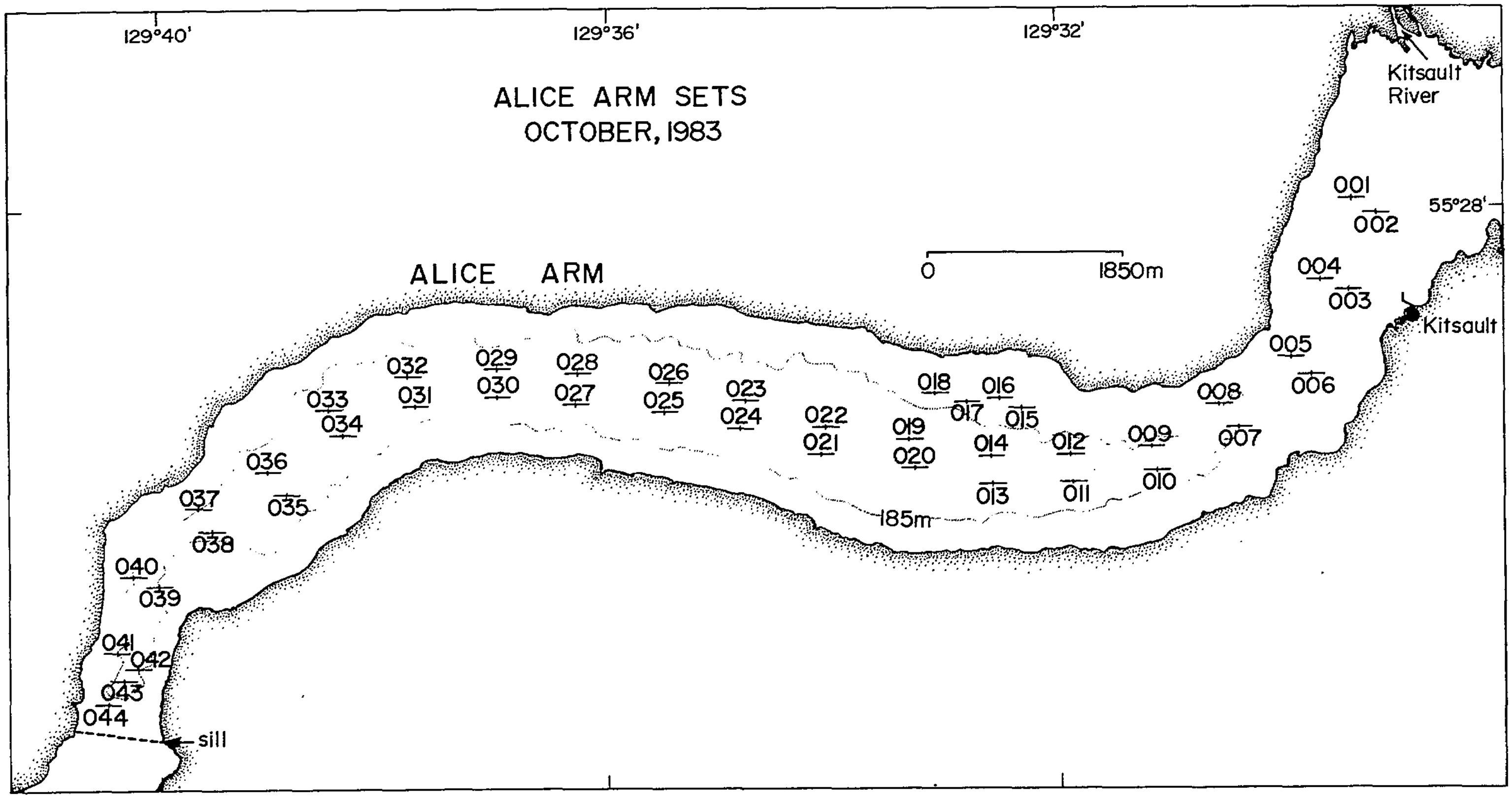

Fig. 3. King crab set (pot) locations in Alice Arm, October 1983. Small cross mark denotes exact location.

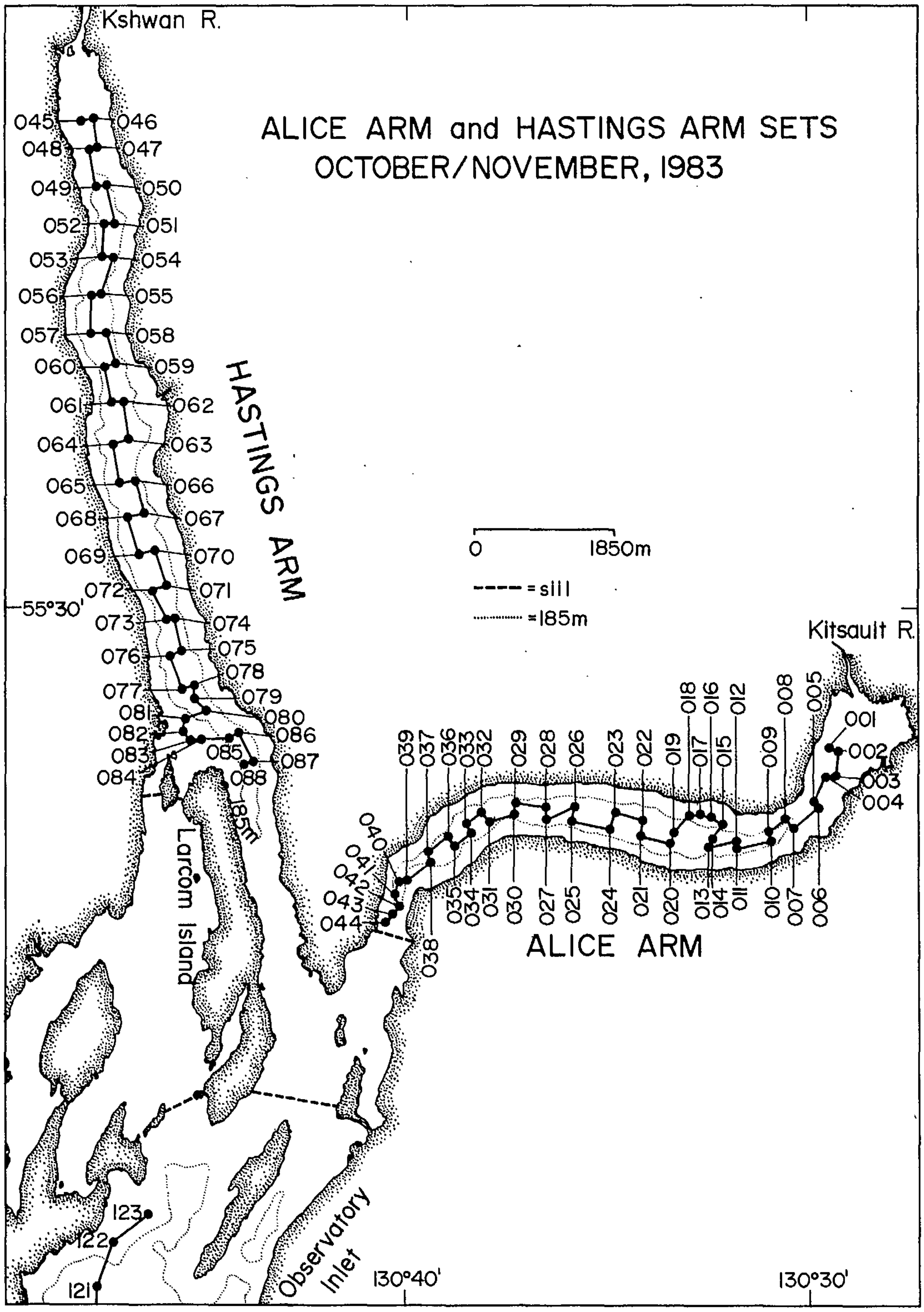

Fig. 4. King crab set (pot) locations in Alice and Hastings Arms, October/November, 1983.

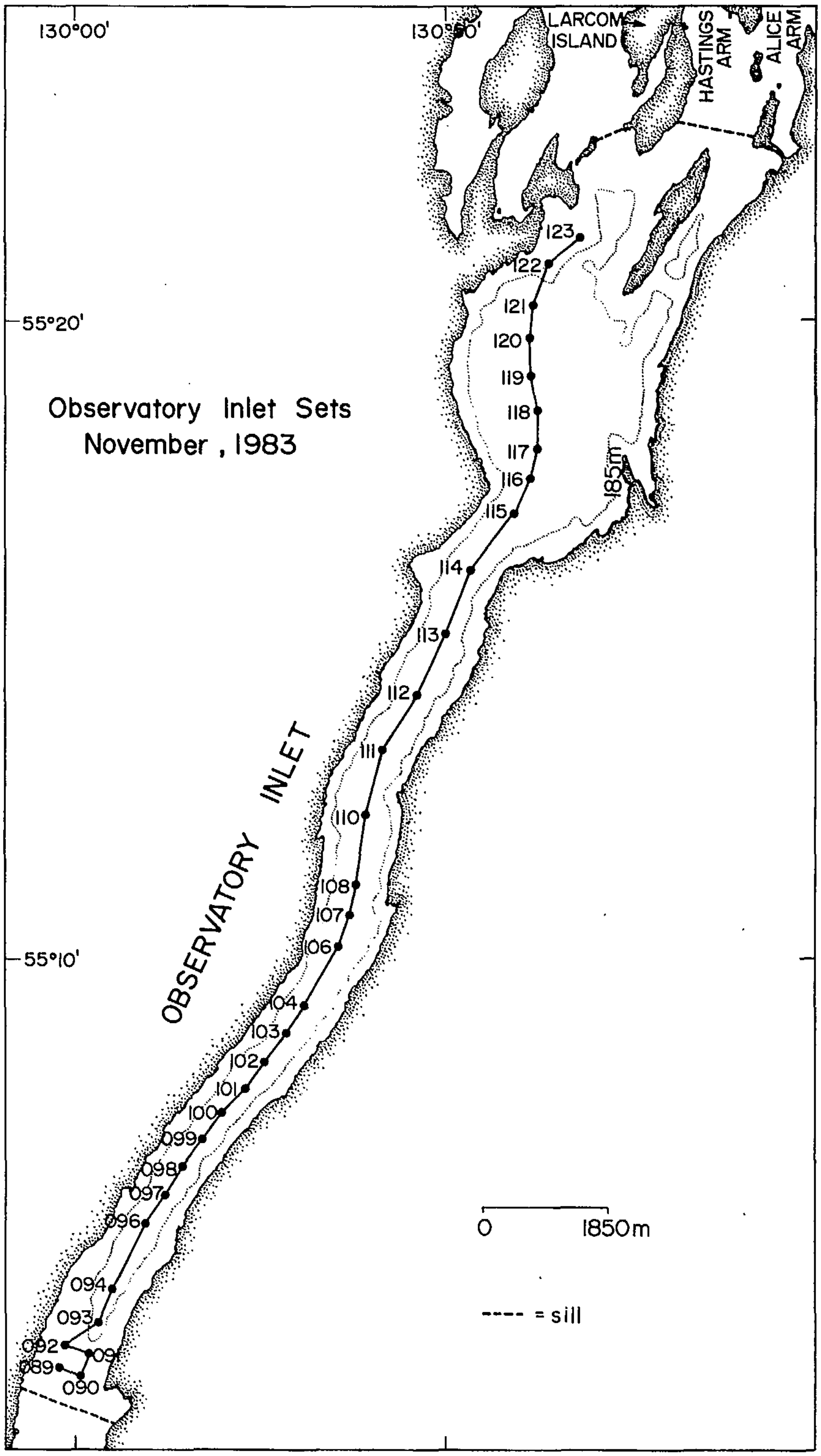

Fig. 5. King crab set (pot) locations in Observatory Inlet, November, 1983.

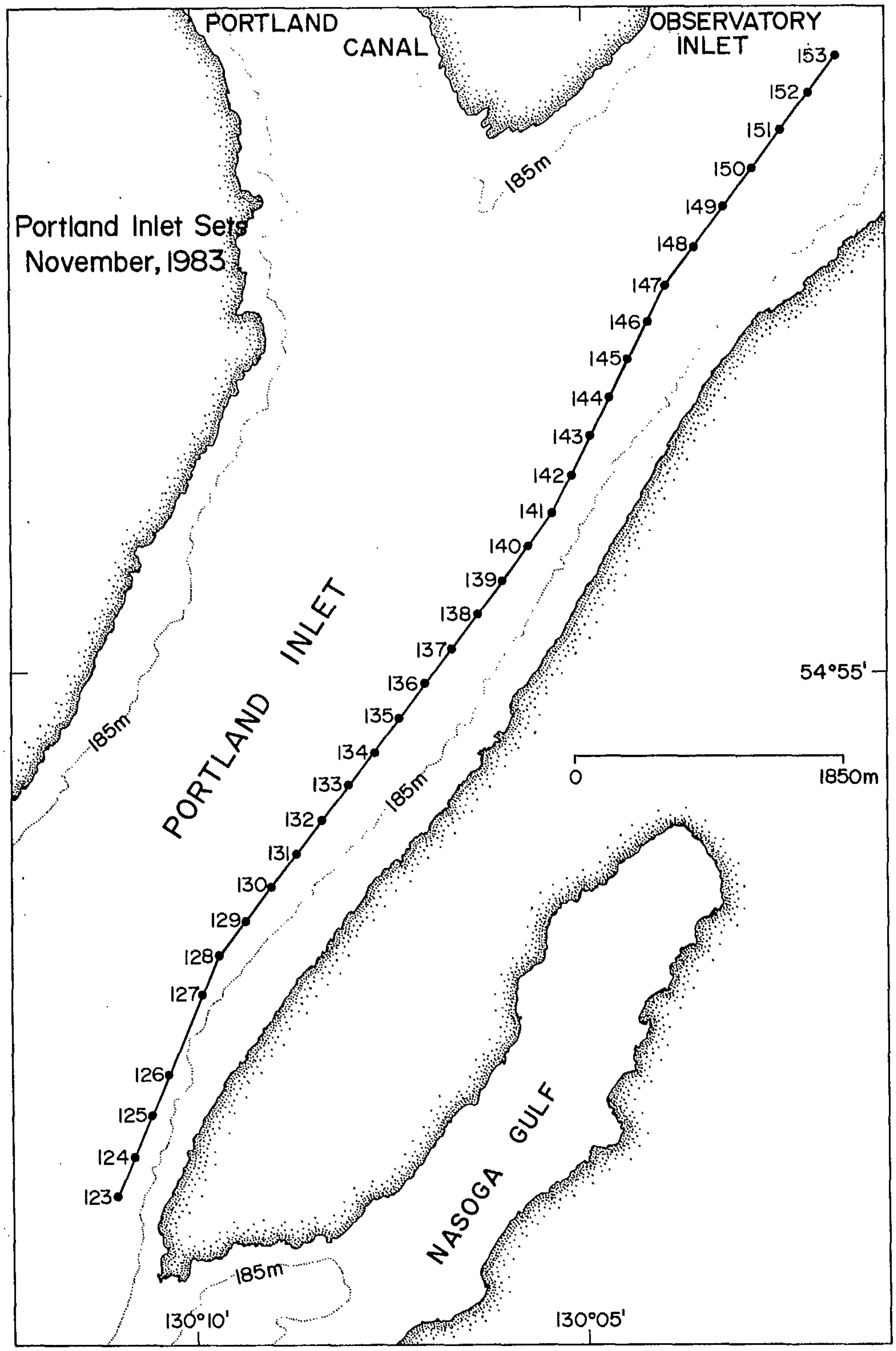

Fig. 6. King crab set (pot) locations in Portland Inlet, November, 1983.

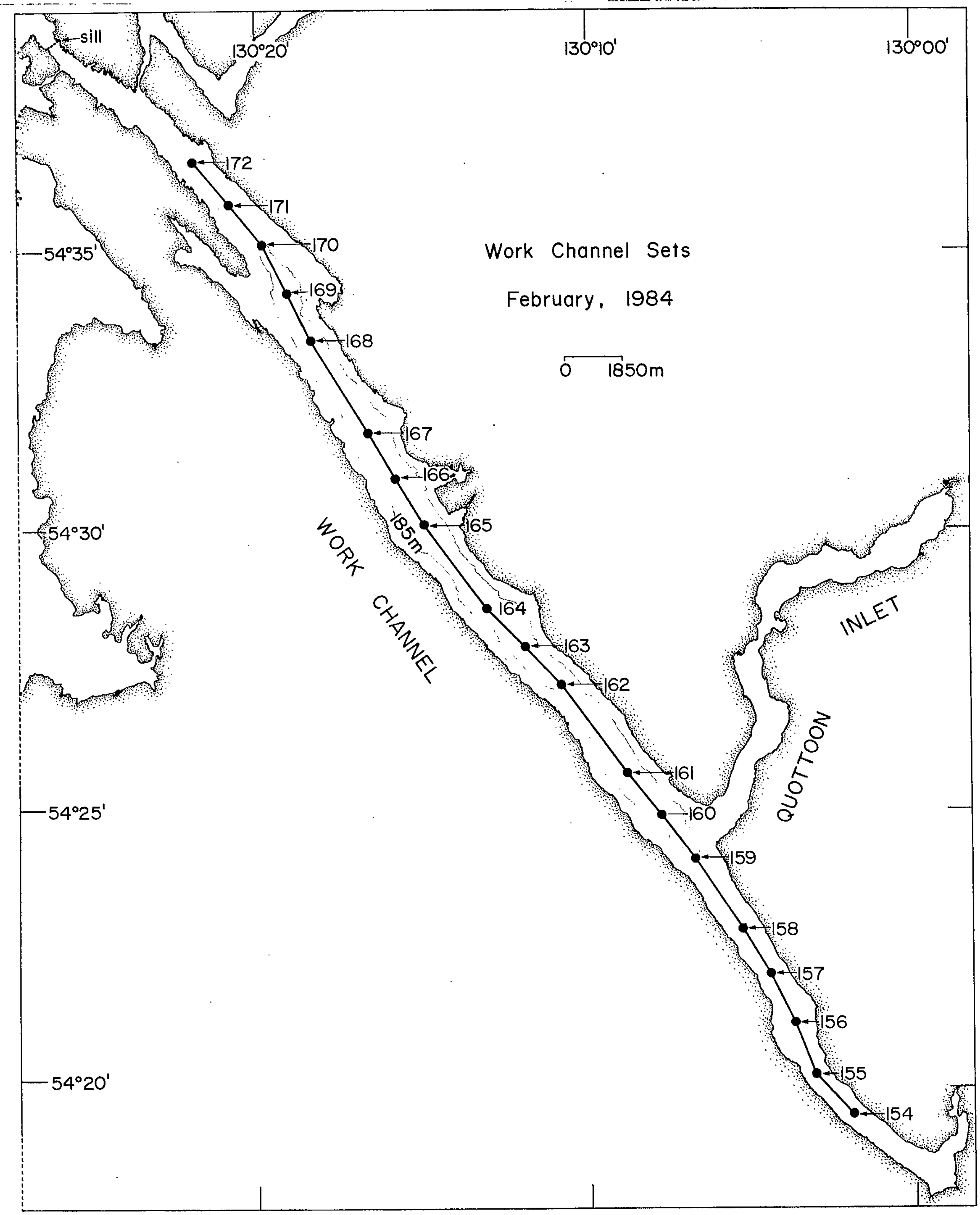

Fig. 7. King crab set (pot) locations in Work Channel, February, 1984.

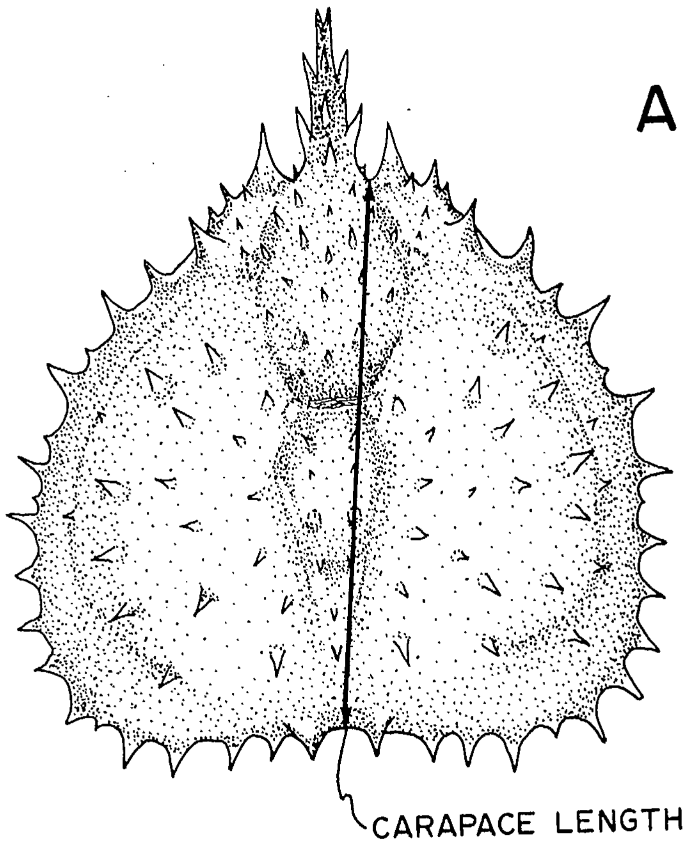

Fig. 8A. Diagram of the carapace length measurement of Lithodes aequispina.

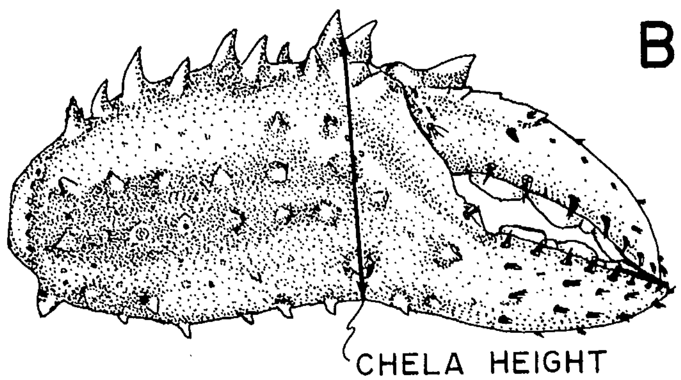

Fig. 8B. Diagram of the right chela height measurement of male Lithodes aequispina.

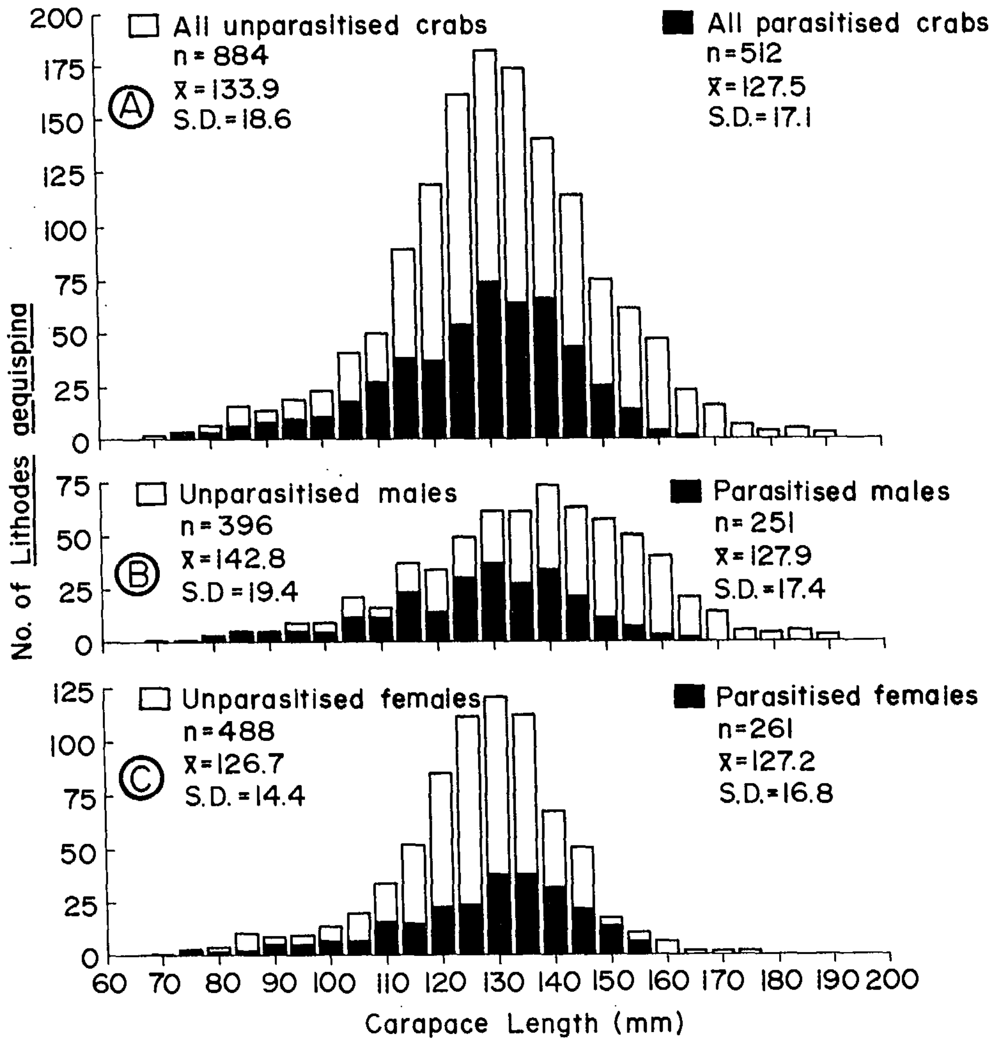

Fig. 9. Histograms of carapace lengths of unparasitized and parasitized Lithodes aequispina. A, all crabs; B, all male crabs only; C, all female crabs only.

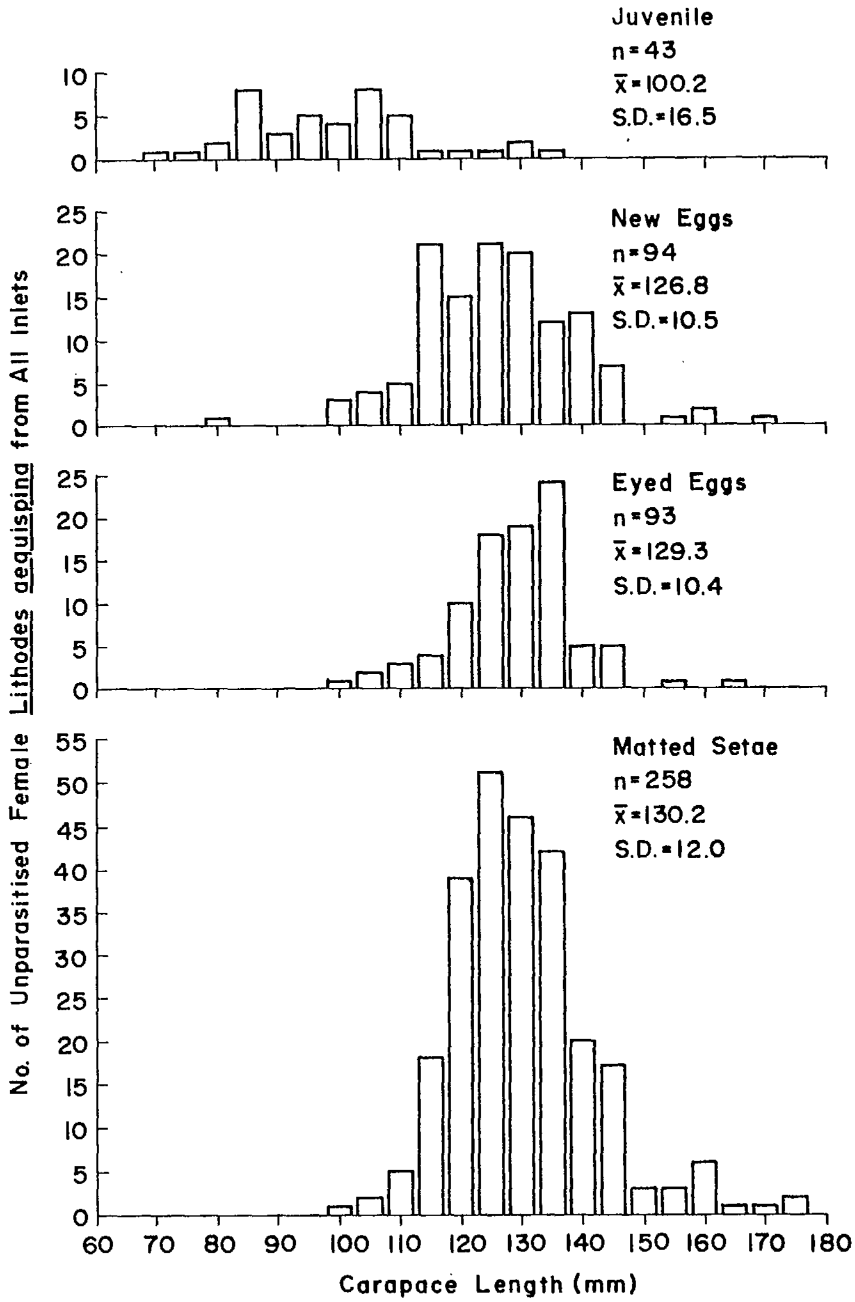

Fig. 10. Histograms of carapace lengths according to different reproduction states of unparasitized female *Lithodes aequispina* from all fjords.

Appendix table 1. A. Depth, effort, catch and CPUE for Lithodes aequispina at each set (pot) in Alice Arm, October, 1983.

Set (pot) number	Pot depth (m)	Soak time (h)	Number of crabs	Number of crabs per hour	CPUE Number of crabs per 24 h (001-024) per 48 h (025-044)
001	99	20.1	0	0.0	0.0
002	99	20.4	0	0.0	0.0
003	99	20.4	1	0.05	1.2
004	106	20.5	1	0.05	1.2
005	128	20.7	22	1.06	25.4
006	93	20.8	0	0.0	0.0
007	183	20.8	19	0.91	21.8
008	183	21.4	6	0.28	6.7
009	183	21.5	4	0.19	4.6
010	219	21.7	25	1.15	27.6
011	265	21.9	23	1.05	25.2
012	232	23.1	26	1.12	26.9
013	329	23.3	21	0.90	21.6
014	329	23.4	29	1.23	29.5
015	132	24.0	38	1.58	38.0
016	137	24.7	26	1.05	25.2
017	132	25.1	16	0.64	15.4
018	128	25.1	10	0.40	9.6
019	340	25.2	18	0.74	17.8
020	349	26.2	28	1.07	25.7
021	369	26.5	22	0.83	19.9
022	366	26.5	29	1.09	26.2
023	366	26.9	36	1.34	32.2
024	382	27.1	20	0.74	17.8
025	388	41.0	31	0.75	36.0
026	388	41.2	34	0.82	39.4
027	388	41.5	22	0.53	25.4
028	390	41.8	33	0.79	38
029	393	42.3	30	0.71	34.0
030	391	42.6	32	0.75	36.0
031	388	42.8	24	0.56	26.8
032	384	43.0	24	0.56	26.8
033	338	43.3	24	0.55	26.4
034	357	43.5	48	1.10	52.8
035	329	43.8	64	1.46	70.0
036	331	44.5	28	0.63	30.2
037	232	44.6	53	1.20	57.6
038	223	47.5	21	0.44	21.2
039	243	47.0	35	0.74	35.6
040	240	45.7	29	0.63	30.2
041	283	45.2	48	1.06	50.8
042	256	44.8	21	0.47	22.6
043	212	44.4	13	0.29	14.0
044	155	44.1	20	0.45	21.6

Appendix table 1 (cont'd). B. Depth, effort, catch and CPUE for *Lithodes aequispina* at each set (pot) in Hastings Arm, October/November, 1983.

Set (pot) number	Pot depth (m)	Soak time (h)	Number of crabs	Number of crabs per hour	CPUE Number of crabs per 24 h (045-068) per 48 h (069-088)
045	133	22.1	0	0.0	0.0
046	132	22.1	0	0.0	0.0
047	163	22.2	0	0.0	0.0
048	157	23.0	0	0.0	0.0
049	172	23.2	0	0.0	0.0
050	183	23.3	0	0.0	0.0
051	223	23.6	3	0.13	0.0
052	227	23.7	0	0.0	0.0
053	238	23.9	4	0.17	4.1
054	245	24.0	3	0.12	2.9
055	260	24.7	3	0.12	2.9
056	261	24.6	0	0.0	0.0
057	269	24.6	2	0.08	1.9
058	274	24.6	0	0.0	0.0
059	271	24.9	8	0.32	7.7
060	274	25.0	1	0.04	1.0
061	276	25.4	5	0.20	4.8
062	274	25.6	10	0.39	9.4
063	293	25.8	10	0.38	9.1
064	298	26.0	8	0.31	7.4
065	311	26.2	5	0.19	4.6
066	305	26.3	18	0.68	16.3
067	307	26.5	9	0.34	8.2
068	309	26.7	11	0.41	9.8
069	313	41.9	11	0.26	12.4
070	302	42.2	14	0.33	15.8
071	256	42.3	4	0.09	4.4
072	313	42.4	13	0.30	14.4
073	311	42.6	12	0.28	13.4
074	300	42.8	17	0.40	19.2
075	305	43.2	12	0.28	13.4
076	311	43.4	5	0.11	5.2
077	309	43.6	15	0.34	16.4
078	309	43.8	10	0.22	10.6
079	313	44.6	12	0.27	13.0
080	315	44.7	9	0.20	9.6
081	192	44.9	0	0.0	0.0
082	101	45.0	0	0.0	0.0
083	82	45.1	0	0.0	0.0
084	82	45.2	0	0.0	0.0
085	300	45.3	3	0.06	2.8
086	296	44.8	7	0.15	7.2
087	300	45.3	3	0.06	1.8
088	285	45.4	9	0.20	9.6

Appendix table 1 (cont'd). C. Depth, effort, catch, and CPUE for Lithodes aequispina at each set (pot) in Observatory Inlet, November, 1983.

Set* (pot) number	Pot depth (m)	Soak time (h)	Number of crabs	Number of crabs per hour	CPUE Number of crabs per 24 h(089-107) per 48 h(108-122)
089	110	24.9	0	0.0	0.0
090	110	27.9	0	0.0	0.0
091	174	25.2	0	0.0	0.0
092	143	25.3	0	0.0	0.0
093	135	27.8	1	0.03	0.7
094	230	25.7	4	0.15	3.5
096	439	25.6	3	0.12	2.9
097	443	27.2	2	0.07	1.7
098	432	27.3	2	0.07	1.7
099	448	27.3	2	0.07	1.7
100	457	27.6	4	0.14	3.4
101	472	27.9	4	0.14	3.4
102	505	28.0	3	0.11	2.6
103	476	28.0	18	0.64	15.4
104	516	27.4	7	0.25	6.0
106	501	27.5	5	0.18	4.3
107	521	27.6	1	0.03	0.7
108	523	43.3	14	0.32	15.4
110	523	43.3	1	0.02	1.0
111	510	43.4	12	0.28	13.4
112	514	43.3	3	0.07	3.4
113	530	44.5	8	0.18	8.6
114	569	43.8	4	0.09	4.4
115	549	44.0	1	0.02	1.0
116	547	44.6	6	0.13	6.2
117	549	44.5	0	0.0	0.0
118	534	43.9	0	0.0	0.0
119	517	44.2	0	0.0	0.0
120	316	44.3	0	0.0	0.0
121	234	44.6	2	0.04	1.8
122	141	44.7	0	0.0	0.0

*Sets (pots) 095, 105, 109 not fished.

Appendix table 1 (cont'd). D. Depth, effort, catch, and CPUE for Lithodes aequispina at each set (pot) in Portland Inlet, November, 1983.

Set (pot) number	Pot depth (m)	Soak time (h)	Number of crabs	Number of crabs per hour	CPUE Number of crabs per 24 h
123	435	23.7	0	0.0	0.0
124	439	23.7	0	0.0	0.0
125	402	23.7	0	0.0	0.0
126	399	23.7	0	0.0	0.0
127	311	23.7	1	0.04	1.0
128	399	23.7	0	0.0	0.0
129	402	23.9	0	0.0	0.0
130	357	24.1	0	0.0	0.0
131	397	24.0	1	0.04	1.0
132	389	24.1	0	0.0	0.0
133	380	24.8	0	0.0	0.0
134	382	23.1	0	0.0	0.0
135	366	23.9	0	0.0	0.0
136	362	23.8	0	0.0	0.0
137	356	23.8	0	0.0	0.0
138	353	23.8	0	0.0	0.0
139	344	23.8	0	0.0	0.0
140	336	23.7	0	0.0	0.0
141	331	22.5	0	0.0	0.0
142	324	23.5	0	0.0	0.0
143	314	23.4	0	0.0	0.0
144	305	23.5	0	0.0	0.0
145	291	23.6	0	0.0	0.0
146	291	23.7	0	0.0	0.0
147	291	23.6	0	0.0	0.0
148	265	23.5	0	0.0	0.0
149	260	23.5	0	0.0	0.0
150	247	23.4	0	0.0	0.0
151	240	22.5	0	0.0	0.0
152	214	22.5	0	0.0	0.0
153	205	22.5	0	0.0	0.0

Appendix table 1 (cont'd). E. Depth, effort, and catch of *Lithodes aequispina* at each set (pot) in Work Channel, February, 1984.

Set (pot) number	Pot depth (m)	Soak time (h)	Number of crabs
154	170	23.5	0
155	181	23,7	0
156	148	23,7	0
157	168	23.7	0
158	170	23.7	0
159	183	23.9	0
160	304	23.9	0
161	315	24.0	0
162	316	24.1	0
163	311	24.2	0
164	318	24.3	0
165	307	24.9	0
166	318	24.9	0
167	311	24.6	0
168	305	24.7	0
169	238	24.6	0
170	170	24.8	0
171	139	24.7	0
172	55	24.7	0

Appendix table 2. A. Incidence of parasitism in Lithodes aequispina from Alice Arm, October, 1983.

Set (pot)	Males			Females			Totals		
		Parasitised			Parasitised			Parasitised	
number	n	n	%	n	n	%	n	n	%
001	0	0	0.0	0	0	0.0	0	0	0.0
002	0	0	0.0	0	0	0.0	0	0	0.0
003	1	0	0.0	0	0	0.0	1	0	0.0
004	1	0	0.0	0	0	0.0	1	0	0.0
005	19	1	5.2	3	1	33.3	22	2	9.0
006	0	0	0.0	0	0	0.0	0	0	0.0
007	7	4	57.1	12	4	33.3	19	8	42.1
008	4	0	0.0	2	1	50.0	6	1	16.6
009	0	0	0.0	4	2	50.0	4	9	50.0
010	16	5	31.2	9	4	44.4	25	9	36.0
011	17	5	29.4	6	4	66.6	23	9	39.1
012	14	6	42.8	12	9	75.0	26	15	57.7
013	11	6	54.5	10	5	50.0	21	11	52.4
014	12	8	66.6	17	14	82.3	29	22	75.9
015	31	4	12.9	7	1	14.3	38	4	10.5
016	14	5	35.7	12	0	0	26	5	19.2
017	8	2	25.0	8	3	37.5	16	5	31.2
018	7	2	28.6	3	0	0	10	2	20.0
019	10	7	70.0	8	6	75.0	18	13	72.2
020	12	7	58.3	16	10	62.5	28	17	60.7
021	12	8	66.6	10	6	60.0	22	14	63.6
022	13	9	69.2	16	7	43.7	29	16	55.2
023	15	8	53.3	21	12	57.1	36	20	55.5
024	6	3	50.0	14	10	71.4	20	13	65.0
025	22	11	50.0	9	5	55.5	31	16	51.6
026	13	7	53.8	21	10	47.6	34	16	47.0
027	7	4	57.1	15	6	40.0	22	10	45.4
028	20	14	70.0	13	6	46.1	33	20	60.6
029	14	7	50.0	16	6	37.5	30	13	43.3
030	6	1	16.6	26	4	15.4	32	5	15.6
031	8	4	50.0	16	10	62.5	24	14	58.3
032	13	7	53.8	11	5	45.4	24	12	50.0
033	8	5	62.5	16	5	31.2	24	10	41.7
034	18	8	44.4	30	8	26.6	48	16	33.3
035	14	6	41.8	50	17	34.0	64	23	35.9
036	7	2	28.5	21	8	38.1	28	10	35.7
037	13	9	69.2	40	12	30.0	53	20	37.7
038	7	4	57.1	14	3	21.4	21	7	33.3
039	14	7	50.0	21	3	14.3	35	10	28.6
040	11	2	18.1	18	4	22.2	29	6	20.7
041	16	9	56.2	32	5	15.6	48	14	29.2
042	3	1	33.3	18	4	22.2	21	5	23.8
043	5	0	0.0	8	1	12.5	13	1	7.7
044	3	0	0.0	17	4	23.5	20	4	20.0

Appendix table 2 (cont'd). B. Incidence of parasitism in Lithodes aequispina from Hastings Arm, October/November, 1983.

Set (pot) number	Males			Females			Totals		
		Parasitised			Parasitised			Parasitised	
	n	n	%	n	n	%	n	n	%
045	0	0	0.0	0	0	0.0	0	0	0.0
046	0	0	0.0	0	0	0.0	0	0	0.0
047	0	0	0.0	0	0	0.0	0	0	0.0
048	0	0	0.0	0	0	0.0	0	0	0.0
049	0	0	0.0	0	0	0.0	0	0	0.0
050	0	0	0.0	0	0	0.0	0	0	0.0
051	1	0	0.0	2	0	0.0	3	0	0.0
052	0	0	0.0	0	0	0.0	0	0	0.0
053	1	0	0.0	3	1	33.3	4	1	25.0
054	2	1	50.0	1	0	0.0	3	1	33.3
055	3	0	0.0	0	0	0.0	3	0	0.0
056	0	0	0.0	0	0	0.0	0	0	0.0
057	2	0	0.0	0	0	0.0	2	0	0.0
058	0	0	0.0	0	0	0.0	0	0	0.0
059	6	5	83.3	2	0	0.0	8	5	62.5
060	1	0	0.0	0	0	0.0	1	0	0.0
061	1	0	0.0	4	2	50.0	5	2	40.0
062	8	6	75.0	2	1	50.0	10	4	40.0
063	6	2	33.3	4	2	50.0	10	4	40.0
064	6	4	66.7	2	1	50.0	8	5	62.5
065	4	1	25.0	1	1	100.0	5	2	40.0
066	11	6	54.5	7	1	14.3	18	7	38.9
067	7	4	57.1	2	2	100.0	9	6	66.7
068	5	2	40.0	6	2	33.3	11	4	36.4
069	9	2	22.2	2	1	50.0	11	3	27.3
070	3	0	0.0	11	4	28.6	14	4	28.6
071	2	1	50.0	2	1	50.0	4	2	50.0
072	7	2	28.6	6	2	33.3	13	4	30.8
073	8	6	75.0	4	0	0.0	12	6	50.0
074	7	4	57.1	10	5	50.0	17	9	52.9
075	2	1	50.0	10	2	20.0	12	3	25.0
076	3	1	33.3	2	0	0.0	5	1	20.0
077	8	3	37.5	7	4	57.1	15	7	46.7
078	7	2	28.6	3	2	66.7	10	4	40.0
079	5	2	40.0	7	3	42.8	12	5	41.7
080	4	3	75.0	5	2	40.0	9	5	55.6
081	0	0	0.0	0	0	0.0	0	0	0.0
082	0	0	0.0	0	0	0.0	0	0	0.0
083	0	0	0.0	0	0	0.0	0	0	0.0
084	0	0	0.0	0	0	0.0	0	0	0.0
085	0	0	0.0	3	1	33.3	3	1	33.3
086	3	0	0.0	4	1	25.0	7	1	14.3
087	3	1	33.3	1	0	0.0	4	1	25.0
088	3	0	0.0	6	0	0.0	9	0	0.0

Appendix table 2 (cont'd). C. Incidence of parasitism in Lithodes aequispina from Observatory Inlet, November, 1983.

Set (pot) number	Males			Females			Totals		
		Parasitised			Parasitised			Parasitised	
	n	n	%	n	n	%	n	n	%
089	0	0	0.0	0	0	0.0	0	0	0.0
090	0	0	0.0	0	0	0.0	0	0	0.0
091	0	0	0.0	0	0	0.0	0	0	0.0
092	0	0	0.0	0	0	0.0	0	0	0.0
093	1	0	0.0	0	0	0.0	1	0	0.0
094	3	1	33.3	1	0	0.0	4	1	25.0
096	0	0	0.0	3	0	0.0	3	0	0.0
097	1	0	0.0	1	0	0.0	2	0	0.0
098	1	0	0.0	1	0	0.0	2	0	0.0
099	0	0	0.0	2	0	0.0	2	0	0.0
100	2	0	0.0	2	0	0.0	4	0	0.0
101	3	0	0.0	1	0	0.0	4	0	0.0
102	1	0	0.0	2	0	0.0	3	0	0.0
103	7	0	0.0	11	1	9.1	18	1	5.5
104	3	0	0.0	4	0	0.0	7	0	0.0
106	3	0	0.0	2	0	0.0	5	0	0.0
107	1	0	0.0	0	0	0.0	1	0	0.0
108	9	0	0.0	5	0	0.0	14	0	0.0
110	1	0	0.0	0	0	0.0	1	0	0.0
111	10	0	0.0	2	0	0.0	2	0	0.0
112	3	0	0.0	0	0	0.0	3	0	0.0
113	3	1	33.3	2	0	0.0	5	1	12.5
114	2	0	0.0	2	1	50.0	4	1	25.0
115	1	0	0.0	0	0	0.0	1	0	0.0
116	5	0	0.0	1	0	0.0	0	0	0.0
117	0	0	0.0	0	0	0.0	0	0	0.0
118	0	0	0.0	0	0	0.0	0	0	0.0
119	0	0	0.0	0	0	0.0	0	0	0.0
120	0	0	0.0	0	0	0.0	0	0	0.0
121	0	0	0.0	0	0	0.0	2	0	0.0
122	0	0	0.0	0	0	0.0	0	0	0.0

Appendix table 3. A. Reproductive state of female <u>Lithodes aequispina</u> in Alice Arm, October, 1983.

Set number	n	Juvenile n	Juvenile %	New eggs n	New eggs %	Eyed eggs n	Eyed eggs %	Total egg-bearing n	Total egg-bearing %	Matted setae n	Matted setae %	Sterile (parasitised) n	Sterile (parasitised) %
001	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
002	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
003	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
004	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
005	3	0	0.0	1	33.3	1	33.3	2	66.7	0	0.0	1	33.3
006	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
007	12	0	0.0	8	66.7	0	0.0	8	66.7	0	0.0	4	33.3
008	2	0	0.0	1	50.0	0	0.0	1	50.0	0	0.0	1	50.0
009	4	0	0.0	1	25.0	1	25.0	2	50.0	0	0.0	2	50.0
010	9	0	0.0	3	33.3	1	11.1	4	44.4	1	11.1	4	44.4
011	6	0	0.0	2	33.3	0	0.0	2	33.3	0	0.0	4	66.6
012	12	0	0.0	0	0.0	0	0.0	0	0.0	3	25.0	9	75.0
013	10	0	0.0	3	3.0	1	10.0	4	40.0	1	10.0	5	50.0
014	17	2	11.8	0	0.0	0	0.0	0	0.0	1	5.6	14	82.3
015	7	1	14.3	5	71.4	0	0.0	5	71.4	0	0.0	1	14.3
016	12	2	16.7	8	66.6	1	8.3	9	75.0	1	8.3	0	0.0
017	8	3	37.5	1	12.5	0	0.0	1	12.5	1	12.5	3	37.5
018	3	1	33.3	2	66.7	0	0.0	2	66.7	0	0.0	0	0.0
019	8	0	0.0	0	0.0	0	0.0	0	0.0	2	25.0	6	75.0
020	16	0	0.0	3	18.7	1	6.2	4	25.0	2	12.5	10	62.5
021	10	0	0.0	2	20.0	0	0.0	2	20.0	2	20.0	6	60.0
022	16	2	12.5	3	18.7	1	6.2	4	25.0	3	18.7	7	43.7
023	21	4	19.0	2	9.5	1	4.8	3	14.3	2	9.5	12	57.1
024	14	1	7.1	0	0.0	0	0.0	0	0.0	3	21.4	10	71.4
025	9	0	0.0	0	0.0	0	0.0	0	0.0	4	44.4	5	55.5
026	21	2	9.5	1	4.8	0	0.0	1	4.8	8	38.1	10	47.6
027	15	1	6.7	0	0.0	0	0.0	0	0.0	8	53.3	6	40.0
028	13	1	7.7	1	7.7	1	7.7	2	13.4	4	30.8	6	46.1
029	16	0	0.0	1	6.2	0	0.0	1	6.3	9	56.2	6	37.5
030	26	1	3.8	2	7.7	1	7.7	3	11.7	18	69.2	4	15.4
031	16	0	0.0	1	6.2	0	0.0	1	6.2	5	31.2	10	62.5
032	11	0	0.0	0	0.0	1	9.1	1	9.1	5	45.4	5	45.4
033	16	0	0.0	0	0.0	0	0.0	0	0.0	11	68.7	5	31.2
034	30	2	6.7	1	3.3	1	3.3	2	6.7	18	60.0	8	26.6
035	50	1	2.0	2	4.0	9	18.0	11	22.0	21	42.0	17	34.0
036	21	0	0.0	1	4.8	2	9.5	3	4.8	10	47.6	8	38.1
037	40	1	2.5	5	12.5	9	22.5	14	35.0	12	30.0	12	30.0
038	14	0	0.0	1	7.1	5	35.7	6	42.8	5	35.7	3	21.4
039	21	0	0.0	3	14.3	9	42.8	12	57.1	6	28.6	3	14.3
040	18	0	0.0	2	11.1	5	27.8	7	38.9	7	38.9	4	22.2
041	32	0	0.0	3	9.4	10	31.2	13	40.6	14	43.7	5	15.6
042	18	0	0.0	3	16.7	8	44.4	11	61.1	3	16.7	4	22.2
043	8	0	0.0	1	12.5	3	37.5	4	50.0	3	37.5	1	12.5
044	17	0	0.0	3	17.6	5	29.4	8	47.0	5	29.4	4	23.5

Appendix table 3 (cont'd). B. Reproductive state of female Lithodes aequispina in Hastings Arm, October/November, 1983.

Set number	n	Juvenile n	Juvenile %	New eggs n	New eggs %	Eyed eggs n	Eyed eggs %	Total egg-bearing n	Total egg-bearing %	Matted setae n	Matted setae %	Sterile (parasitised) n	Sterile (parasitised) %
045	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
046	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
047	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
048	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
049	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
050	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
051	2	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
052	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
053	3	1	33.3	1	33.3	0	0.0	1	33.3	0	0.0	1	33.3
054	1	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
055	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
056	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
057	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
058	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
059	2	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
060	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
061	4	1	25.0	0	0.0	1	25.0	1	25.0	0	0.0	2	50.0
062	2	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0
063	4	1	25.0	1	25.0	0	0.0	1	25.0	0	0.0	2	50.0
064	2	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0
065	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100
066	7	0	0.0	2	23.4	0	0.0	2	23.4	4	57.1	1	14.3
067	2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100
068	6	3	50.0	1	16.7	0	0.0	1	16.7	0	0.0	2	33.3
069	2	0	0.0	1	50.0	0	0.0	1	50.0	0	0.0	1	50.0
070	11	3	27.3	2	18.2	2	18.2	4	36.3	0	0.0	4	28.6
071	2	0	0.0	1	50.0	0	0.0	1	50.0	0	0.0	1	50.0
072	6	0	0.0	2	33.3	0	0.0	2	33.3	2	33.3	2	33.3
073	4	0	0.0	1	25.0	3	75.0	4	100	0	0.0	0	0.0
074	10	0	0.0	3	30.0	0	0.0	3	30.0	2	20.0	5	50.0
075	10	0	0.0	0	0.0	0	0.0	0	0.0	8	80.0	2	20.0
076	2	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
077	7	0	0.0	1	14.3	1	14.3	2	28.6	1	14.3	4	57.1
078	3	0	0.0	0	0.0	1	33.3	1	33.3	0	0.0	2	66.7
079	7	1	14.3	0	0.0	0	0.0	0	0.0	3	42.8	3	42.8
080	5	0	0.0	0	0.0	2	40.0	2	40.0	1	20.0	2	40.0
081	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
082	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
083	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
084	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
085	3	0	0.0	0	0.0	1	33.3	1	33,0	1	33.3	1	33.3
086	4	0	0.0	1	25.0	1	25.0	2	50.0	1	25.0	1	25.0
087	1	0	0.0	1	100	0	0.0	1	100.1	0	0.0	0	0.0
088	6	0	0.0	1	16.7	1	16.7	2	33.0	4	66.7	0	0.0

Appendix table 3 (cont'd). C. Reproductive state of female Lithodes aequispina in Observatory Inlet, November, 1983.

Set number	n	Juvenile n	Juvenile %	New eggs n	New eggs %	Eyed eggs n	Eyed eggs %	Total egg-bearing n	Total egg-bearing %	Matted setae n	Matted setae %	Sterile (parasitised) n	Sterile (parasitised) %
089	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
090	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
091	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
092	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
093	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
094	1	0	0.0	1	100	0	0.0	1	100	0	0.0	0	0.0
096	3	0	0.0	0	0.0	2	66.7	2	66.7	1	33.3	0	0.0
097	1	0	0.0	1	100	0	0.0	1	100	0	0.0	0	0.0
098	1	0	0.0	1	100	0	0.0	1	100	0	0.0	0	0.0
099	2	0	0.0	0	0.0	1	50.0	1	50.0	1	50.0	0	0.0
100	2	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
101	1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0
102	2	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
103	11	0	0.0	1	9.1	1	9.1	2	18.2	8	72.7	1	9.1
104	4	0	0.0	2	50.0	0	0.0	2	50.0	2	50.0	0	0.0
106	2	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0	0	0.0
107	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
108	5	0	0.0	0	0.0	0	0.0	0	0.0	5	100.0	0	0.0
110	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
111	2	0	0.0	1	50.0	0	0.0	1	50.0	1	50.0	0	0.0
112	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
113	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0	0	0.0
114	2	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0
115	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
116	1	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
117	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
118	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
119	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
120	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
121	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
122	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0