

FISHERIES RESEARCH INSTITUTE
College of Fisheries
University of Washington
Seattle, Washington 98195

Circular No. 79-3

PRELIMINARY RESULTS OF LINGCOD TAGGING
IN NORTHERN PUGET SOUND, 1977-1979

by

Stephen B. Mathews, Mark LaRiviere,
Morris W. Barker, and Lawrence L. Moulton

May 31, 1979

This work was performed under grants
(04-7-158-44021 and NA79AA-D-00054)
from National Oceanic and Atmospheric Administration
to the Washington Sea Grant Program

PRELIMINARY RESULTS OF LINGCOD TAGGING
IN NORTHERN PUGET SOUND, 1977-1979

INTRODUCTION

During the spring of each of 3 years, 1977, 1978, and 1979, tagging cruises directed toward lingcod (*Ophiodon elongatus*) were conducted in the vicinity of the southern end of San Juan Island. These efforts are to estimate mortality rates and other biological parameters, as part of a long-term study of the population dynamics of lingcod in northern Puget Sound. The present report presents the preliminary results of the cruises, detailing times, areas, dates, and methods of capture; tag numbers and types; and length and sex determinations. Additionally, the returns to date are summarized.

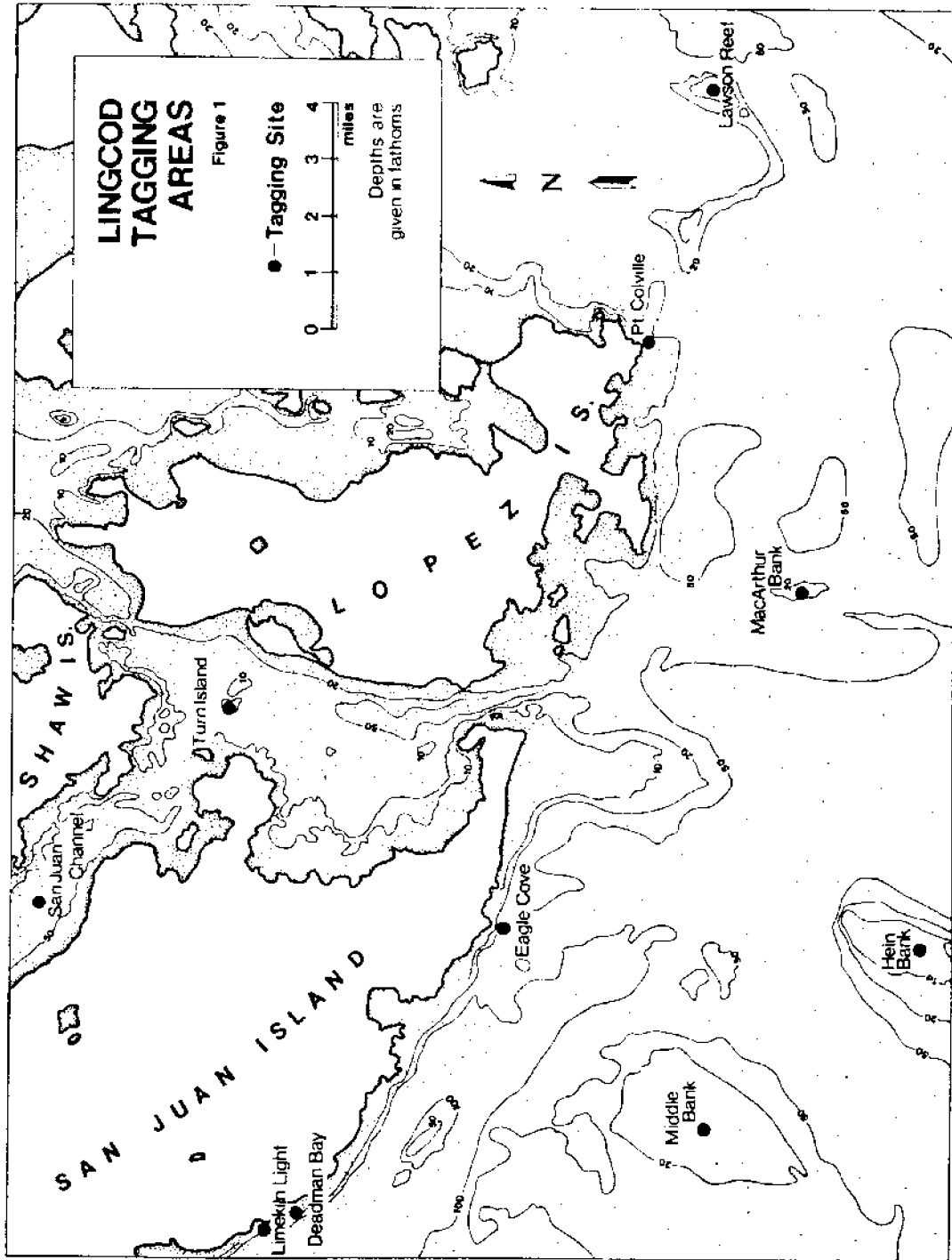
METHODS

Hook-and-line capture methods were used, both commercial trolling and rod-and-reel jigging. The former method produced most of the fish, although the latter method was productive in areas too shallow, rocky, or kelp-infested for effective trolling. Main tagging areas were Middle Bank, Hein Bank, and a 10-fathom reef in San Juan channel near Turn Island (Fig. 1). Lesser numbers were tagged at several other locations including Eagle Point, Pt. Colville, and the 15- to 19-fathom "second hump" some 6 mi SW of Middle Bank.

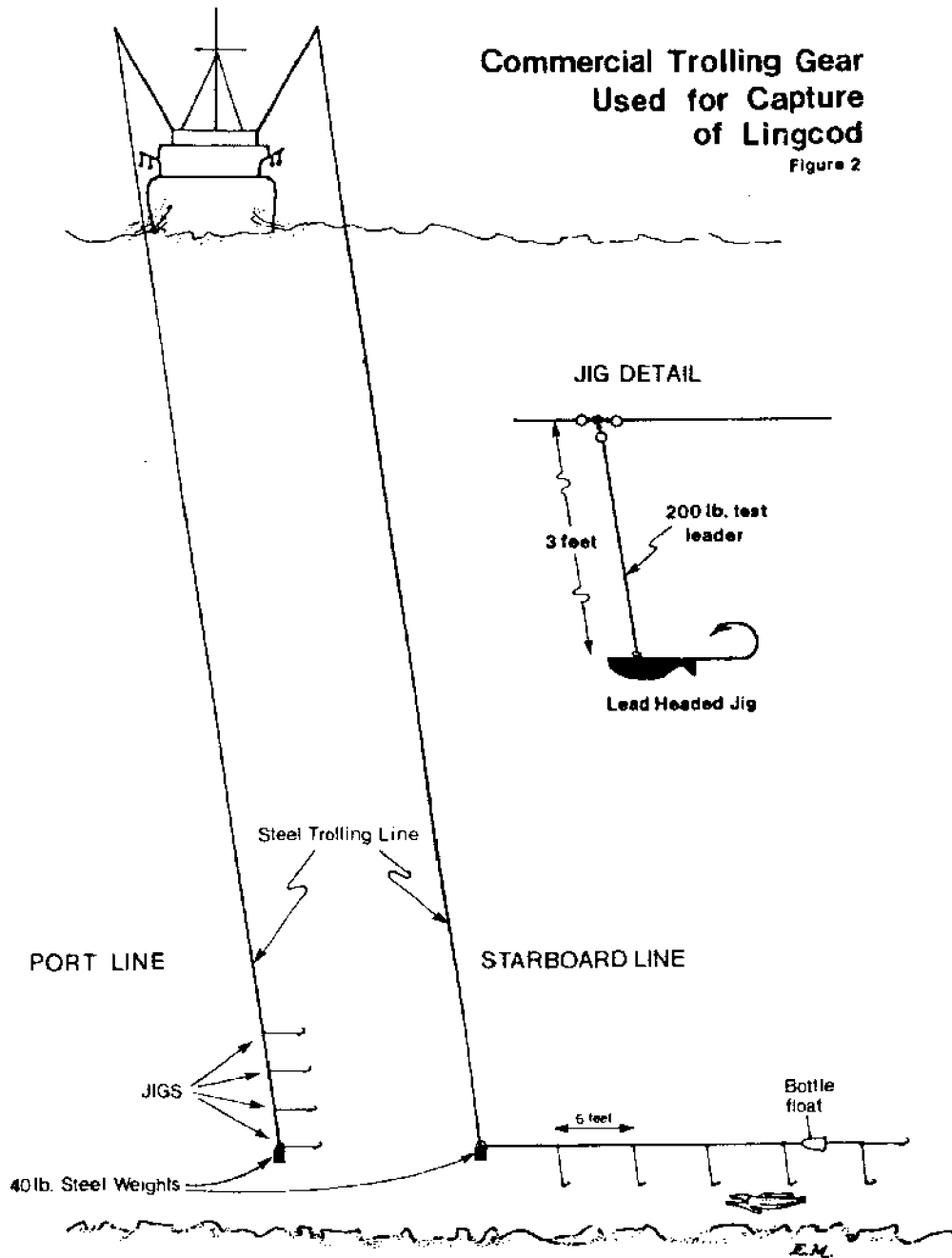
During 1977, the 35-ft commercial troller ETHEL, owned and operated by the senior author, was used. Most tagging was done during the period May 7-18. In 1978 the 46-ft commercial troller CINDY LEE, owned and operated by Robert Daut of Clear Lake, Washington, was chartered and fished during the period March 27-April 8. In 1978, the 42-ft commercial troller PAUL REVERE, owned and operated by Donald "Bud" Carleson of Sequim, Washington, was chartered and fished March 10-17. The charter agreements with Daut and Carleson, which proved quite satisfactory, provided payments of \$100 per day of operation plus \$5 for every lingcod tagged. The skipper provided fuel and gear, while the University provided food.

The commercial lingcod trolling gear is illustrated in Fig. 2. The lead jugs used were baited variously with lingcod or rockfish stomachs or skin strips of lingcod, flatfish, or rockfish. The baits were secured lengthwise to the hook with the bottom two-thirds split down the middle to produce a fluttering action. Skin strips were hooked with pigmented side downward. Rag strips of various colors were sometimes attached to the jigs.

Two lines of 560-lb stainless steel trolling wire were fished, one on each side of the boat. One side contained a string of jigs supported by a float, as shown in Fig. 2. The other side had 3 or 4



**Commercial Trolling Gear
Used for Capture
of Lingcod**
Figure 2



lines on 3'-leaders, such as #6 or #7 brass and/or chrome spoons, or 6" or 7" plugs. The gear was trolled very closely to the bottom.

Rod-and-reel methods consisted of jigging with black or purple rubber worms, with tandem 3/0 salmon mooching hooks. A 2-oz sliding mooching lead, followed by a swivel, a 3-ft leader, and the line proved to be effective. This gear was most effective for lingcod if fished along the bottom, although weedless hooks are recommended since hang-ups will be frequent.

The lingcod were landed, unhooked with care, and either tagged and released immediately or held in a tub with saltwater. Less than 5% of the fish caught were considered to be in less than good to excellent condition, and these were not tagged. Most fish released appeared active and healthy. Spaghetti-end dart tags were used offering a reward if returned to the Washington State Department of Fisheries. Some fish were double-tagged in 1977 and 1978, using additionally a Dennison T-bar tag. Tags were placed below the posterior-half of the spinous dorsal fin on the right side of the fish.

In 1977 and again in 1979, several tagged lingcod were held in saltwater tanks at the University of Washington marine laboratory in Friday Harbor for observation of tag loss or handling mortality. Other than 4 that died within 24 hrs from an air leak in the water system causing nitrogen supersaturation, none lost tags or died during holding periods ranging from 2 month to 2 years. Presently, 4 lingcod captured and tagged March 16, 1979 are being held for further observations. They began actively feeding after two weeks and are all in good shape.

RESULTS

The following numbers were tagged and released: 1977 - 96; 1978 - 87; and 1979 - 384. Additional lingcod caught but not tagged included: 2 in 1977 which were live-held; 7 in 1978 which were either in poor condition or sacrificed for bait; 8 in 1979 which were live-held; and 11 in 1979 which were in too poor condition to release.

While jigging with rod and reel, substantial numbers of other species, greenlings and rockfish, were taken, but when trolling incidental catches were few. During all 3 years, the incidental catch on troll gear totaled 3 chinook salmon (14- to 20-inch), one coho salmon, 17 quillback rockfish, one bocaccio rockfish, and one yelloweye rockfish.

Tagging information for each individual consisting of tag number, length, sex, release data, and release location, is summarized in Appendix Tables 1, 2, and 3.

Sex determinations from examination of the anal papilla indicated a predominance of males. In 1978, of the 94 lingcod captured, 91 were males and 3 females. In 1979, of the 392 captured and in condition suitable for tagging or holding, 339 were males and 53 females. Sex was not determined in 1977. Length-frequencies by age are summarized in Fig. 3. The strength of the 1975 year-class is clearly indicated. According to age-length studies by Chatwin (1956) and Beamish and Chilton (1977), the 40-50 cm group in 1977 would represent 2-year-olds, the 54-64 cm fish in 1978 would represent 3-year-olds. 60-70 cm fish in 1979 would represent 4-year-olds. Further analysis of the strength of the 1975 year-class awaits age and growth analysis based upon dorsal spine sectioning, which is presently being done by the Washington State Department of Fisheries (WDF).

Recaptures to date are summarized in Table 1. Two notable recaptures were made March 16 and 17, 1979, during tagging at the 10-fathom reef near Turn Island. These fish had been tagged at the same location the previous year. Both were males. The tag wounds had healed completely. The 1978 tags were removed from both these fish and they were re-tagged and released.

It is noteworthy that of the 12 recoveries in 1977, 1978, and 1979, all were taken at the same location they were tagged, indicating virtually no migration patterns.

Although it is somewhat preliminary evidence, the 1979 tagging, together with catch and tag return data provided by Bud Carleson from his commercial fishing trips after the April 1, 1979 opening, provides the basis for a Petersen-type population estimate for Middle Bank. Carleson reported a commercial catch of 400 lingcod during the period April 1-24 from Middle Bank, two of which had been tagged there during March 10-17. Of the 384 lingcod tagged totally in 1979, 257 were tagged at Middle Bank; thus letting $M = 257$, $C = 400$, $R = 2$, and using Chapman's (1951) unbiased mark-recapture formula for population size,

$$\hat{N} = \frac{(M + 1)(C + 1)}{(R + 1)} = 34,486$$

as an estimate of the Middle Bank lingcod population. Because of the small number of recoveries, 95% confidence limits are very high, approximately $\hat{N} \pm \hat{N}$. However, since (1) there is little evidence of emigration or immigration, (2) tag loss and handling mortality are not obvious problems according to observations of tank-held fish, and (3) since several weeks had elapsed between tagging and recapture, these calculations and considerations indicate there may be a substantial lingcod population on Middle Bank.

Length-Frequencies of Tagged Lingcod

Figure 3

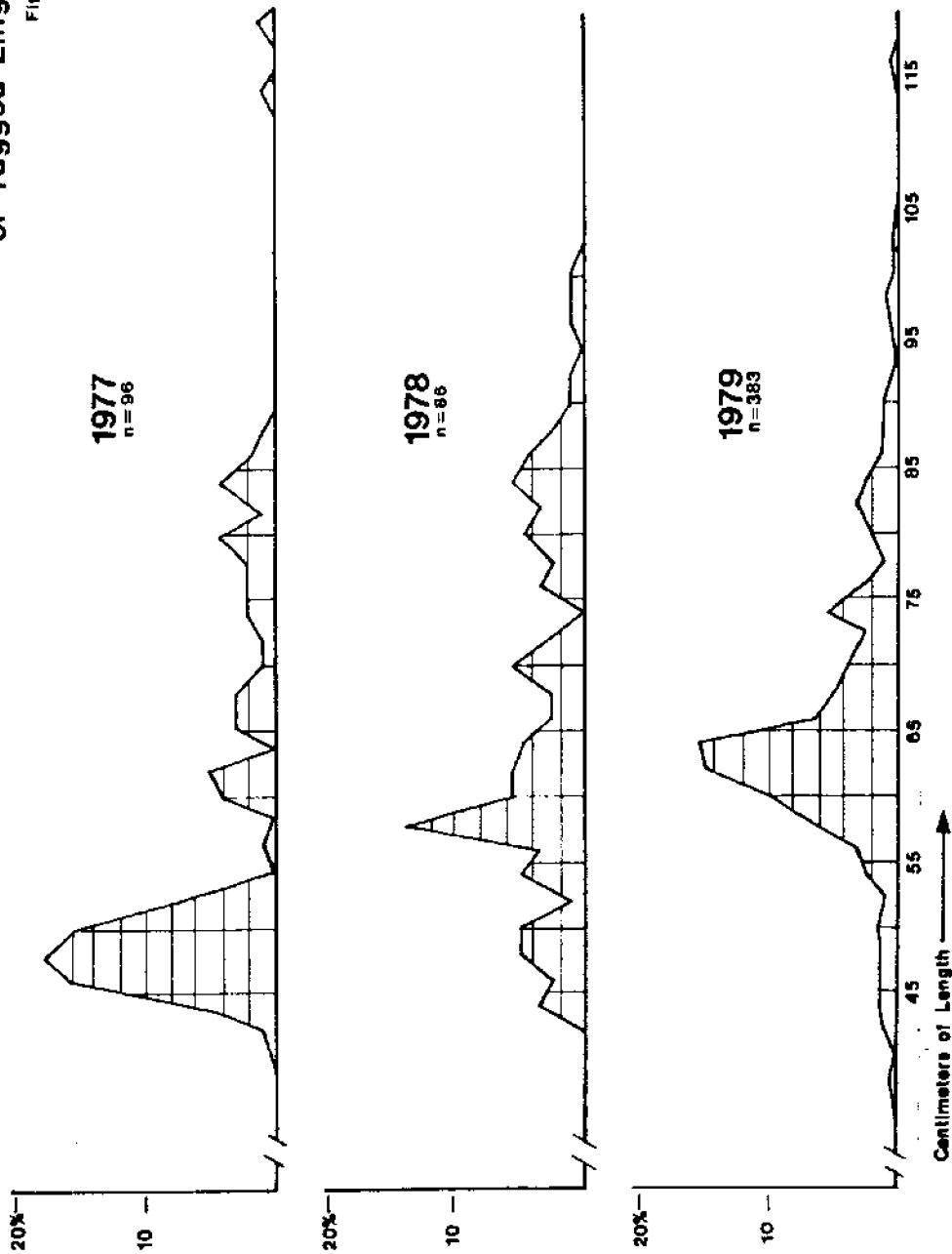


Table 1. Summary data on recaptured lingcod.

Tag type and number	Recapture data			Tagging data			Comments
	Date	Location	Length cm	Date	Location	Length cm	
Dart E17543	17 Mar 79	Turn Island	77.0	16 Mar 79	Turn Island	77.0	Recaptured on tagging cruise
Dart 04545	17 Mar 79	Turn Island	75.0	5 Apr 78	Turn Island	71.5	Recaptured on tagging cruise
Dart 04557	16 Mar 79	Turn Island	80.0	5 Apr 78	Turn Island	81.2	Recaptured on tagging cruise
Dart T01608	17 Oct 77	Eagle Pt.	-	12 May 77	Eagle Pt.	47.7	SCUBA dive
Dart T03906	13 May 78	Hein Bank	-	17 May 77	Hein Bank	49.8	-
Dart T01656 T-Bar A10922	9 Apr 78	Middle Bank	-	8 May 77	Middle Bank	86.3	Commercial
Dart T1658	1978	Middle Bank	-	8 May 77	Middle Bank	60.9	-
Dart T3916	21 Oct 78	Hein Bank	-	17 May 77	Hein Bank	53.3	-
Dart T1459	23 Apr 77	Lime kiln	-	8 Aug 76*	Lime kiln	35.0	SCUBA dive
Dart T1042	1 Feb 77	Pt. Caution	-	7 Jul 76*	Pt. Caution	60.5	-
Dart 17438	24 Apr 79	Middle Bank	63.0	13 Mar 79	Middle Bank	64.0	Commercial, MV PAUL REVERE
Dart 17281	1 Apr 79	Middle Bank	66.0	11 Mar 79	Middle Bank	67.0	Commercial, MV PAUL REVERE

*Some tagging of lingcod was done during 1976 incidentally to tagging effort directed toward rockfish.

DISCUSSION

No attempts are made herein to estimate mortality rates. Most of the tags were placed during 1979, and too little time has yet elapsed for many recoveries.

The relative success of the 1979 cruise in terms of numbers caught and tagged was due to two factors. First, we were fortunate in securing Bud Carleson, a long-time successful commercial fisherman for lingcod. He is an exceptionally knowledgeable and skillful fisherman, with some 40 years experience in trolling and jigging lingcod. Secondly, individuals in the apparently abundant 1975 year-class had reached a sufficient size to be fully exploitable by trolling.

All tags were supplied by WDF. The 1979 tags were superior to similar tags used on the 1977 and 1978 cruises in that the tag number was printed on that portion of the tag not embedded in the fish; thus, when recognized as one of our tags, the number could easily be read without extracting the tag from the fish. The tag material does not seem to promote algal growth, and wounds caused by tag insertion had healed well on the two 1979 recaptured lingcod which had been at large for a year.

The method of trolling for lingcod used in this study was effective for capturing the fish. Trolling was successful in the San Juan Channel region despite the more rugged terrain as compared to Middle Bank and Hein Bank. With an experienced skipper, one can catch and tag up to 100 lingcod per day.

LITERATURE CITED

- Beamish, R. J. and D. Chilton. 1977. Age determinations of lingcod (Ophiodon elongatus) using dorsal fin rays and scales. J. Fish. Res. Board Can. 34:1305-1313.
- Chatwin, B. M. 1956. Age and growth of lingcod (Ophiodon elongatus). Fish. Res. Board Can., Pac. Coast Sta. Prog. Rep. 105:22-26.
- Chapman, D. C. 1951. Some properties of the hypergeometric distribution with application to zoological sample censuses. Univ. Calif. Publ. Stat. 1:131-160.

Appendix Table 1. Summary of 1977 lingcod tagging data.

Dart tag number	T-Bar tag number	TL mm	Date of release	Location
TO 1608		477	12 May 77	Eagle Pt. San Juan Island
TO 1607		480	"	"
TO 1606		1150	"	"
TO 1604		895	"	"
TO 1601		680	"	"
TO 1580		1200	"	"
TO 3916		533	17 May 77	Hein. Bank
TO 3917		508	"	"
TO 3918		489	"	"
TO 3919		692	"	"
TO 3920		501	"	"
TO 3921		476	"	"
TO 3922		489	"	"
TO 3923		511	"	"
TO 3924		469	"	"
TO 3925		482	"	"
TO 3926		514	"	"
TO 3927		444	18 May 77	"
TO 3928		438	"	"
TO 3929		482	"	"
TO 3931		609	"	"
TO 3932		457	"	"
TO 3933		469	"	"
TO 1610		476	12 May 77	Eddy Cove, Shaw Island
TO 3875		463	15 May 77	Hein Bank
TO 3876		469	"	"
TO 3877		457	"	"
TO 2442		571	13 May 77	Turn Island, San Juan Channel
TO 3907		514	17 May 77	Hein Bank
TO 3908		469	"	"
TO 3909		476	"	"
TO 3910		488	"	"
TO 3911		520	"	"
TO 3912		457	"	"
TO 3913		431	"	"
TO 3914		447	"	"
TO 3857		444	15 May 77	"
TO 3858		457	"	"
TO 3860		472	"	"
TO 3861		469	"	"
TO 3862		476	"	"
TO 3863		498	"	"
TO 3864		501	"	"
TO 3865		514	"	"
TO 3866		444	"	"
TO 3867		457	"	"
TO 3868		501	"	"
TO 3869		639	"	"
TO 3870		457	"	"

Appendix Table 1. Summary of 1977 lingcod tagging data. - Continued.

Dart tag number	T-Bar tag number	TL mm	Date of release	Location
TO 3871		527	15 May 77	Hein Bank
TO 3872		520	"	"
TO 3873		495	"	"
TO 3874		476	"	"
TO 1576		700	24 Mar 77	Deadman Bay, Lopez Island
TO 1577		495	25 Mar 77	Limekiln Light, San Juan Island
TO 1578		455	26 Mar 77	"
TO 3905		476	17 May 77	Hein Bank
TO 3906		498	"	"
TO 1673	A10937	787	10 May 77	Turn Island
TO 1674	A10938	660	11 May 77	"
TO 1675	A10939	736	11 May 77	Middle Bank
TO 1676		495	"	"
TO 1679	A10943	800	"	"
TO 1680	A10942	863	12 May 77	"
TO 2416		533	"	Hein Bank
TO 2417		488	"	"
TO 2418		508	"	"
TO 2419		488	"	"
TO 2420		532	"	"
TO 2421		488	"	"
TO 2422		482	"	"
TO 2423		476	"	"
TO 2424		521	"	"
TO 2425		482	"	"
TO 3943		690	10 Sept 77	Eagle Pt.
TO 1656	A10922	863	8 May 77	Middle Bank
TO 1657		508	"	"
TO 1658		609	"	"
TO 1659	A10923	800	"	"
TO 1661	A10925	837	"	"
TO 1662	A10926	800	"	"
TO 1664	A10927	634	"	"
TO 1665	A10930	825	"	"
TO 1666		609	9 May 77	Fishermen's Bank, Shaw Island
TO 1669	A10931	771	"	Middle Bank
TO 1670	A10933	800	"	"
TO 1671	A10935	622	"	"
TO 1672	A10936	634	"	"
TO 3881		723	16 May 77	Turn Island
TO 3883		609	"	"
TO 1647				
TO 1648		736	7 May 77	Middle Bank
TO 1649				
TO 1650				
TO 1651	A10918	838	"	"
TO 1652			"	"
TO 1653	A10902	634	"	"

Appendix Table 1. Summary of 1977 lingcod tagging data. - Continued.

Dart tag number	T-Bar tag number	TL mm	Date of release	Location
	A10910	673	7 May 77	Middle Bank
	A10906	850	"	"
	A10909	787	"	"
	A10912	850	"	"
	A10911	850	"	"
	A10916	774	"	"
TO 1655	A10917	482	"	"
	A10908	659	"	"

Appendix Table 2. Summary of 1978 lingcod tagging data.

Dart tag number	T-Bar tag number	TL (mm)	Sex		Date of release	Location
			1-male	2-female		
04501	06052	935	2		27 Mar 78	Hein Bank
04502	06051	838	1		26 Mar 78	"
04503	06053	583	1		27 Mar 78	Middle Bank
04504	06054	580	1		"	"
04505	06055	856	1		"	"
04506	06057	545	1		"	"
04507	06059	576	1		"	"
04508	06061	630	1		"	"
04509	06062	680	1		"	"
04510	06060	708	1		"	"
04511	06063	793	1		"	"
04512	06064	723	1		"	"
04513	06065	779	1		28 Mar 78	"
04514	06066	810	2		"	"
04515	06067	652	1		"	"
04516	06068	702	1		"	"
04517	06070	895	1		"	"
04518		1010	2		"	"
04519		510	1		29 Mar 78	Cattle Pass
04520		493	1		3 Apr 78	Turn Island
04521		500	1		"	"
04522		550	1		"	10-Fm Rock, San Juan Channel
04523		614	1		"	"
04524		629	1		4 Apr 78	Middle Bank
04525		596	1		"	"
04526		620	1		"	"
04527		850	1		"	"
04528		662	1		"	"
04529		620	1		"	"
04530		986	1		"	"
04531		828	1		"	"
04532		592	1		"	"
04533		591	1		"	"
04534		873	1		"	"
04535		864	1		"	"
04536		725	1		"	"
04537		845	1		"	"
04538		830	1		5 Apr 78	10-Fm Rock, San Juan Channel
04539		895	1		"	"
04540		651	1		"	"
04541		867	1		"	"
04542		442	1		"	"
04543		591	1		"	"
04544		797	1		"	"
04545		715	1		"	"

Appendix Table 2. Summary of 1978 lingcod tagging data. - Continued.

Dart tag number	T-Bar tag number	TL mm	Sex		Date of release	Location
			1-male	2-female		
04546		586	1		5 Apr 78	10-Fm Rock, San Juan Channel
04547		507	1		"	"
04548		542	1		"	"
04549		506	1		"	"
04550		491	1		"	"
04551		818	1		"	"
04552		608	1		"	"
04553		646	1		"	"
04554		705	1		"	"
04555		580	1		"	"
04556		528	1		"	"
04557		812	1		"	"
04559		574	1		"	"
04560		590	1		6 Apr 78	"
04561		597	1		"	"
04562		547	1		"	"
04563		970	1		"	"
04564		475	1		"	Hoffman Cove, Shaw Island
04565		565	1		"	"
04566		600	1		"	"
04567		765	1		"	10-Fm Rock, San Juan Island
04568		675	1		"	Hoffman Cove, Shaw Island
04569		450	1		"	"
04570		450	1		"	"
04571		845	1		"	"
04572		635	1		"	"
04573		460	1		"	"
04574		479	1		"	"
04575		687	1		"	"
04576		910	1		"	"
04577		700	1		7 Apr 78	Middle Bank
04578		850	1		"	"
04579		585	1		"	"
04580		590	1		"	"
04581		770	1		"	"
04582		605	1		"	"
04583		646	1		"	Pt. George, Shaw Island
04584		556	1		8 Apr 78	Hoffman Cove, Shaw Island
04585		492	1		"	"
04586		757	1		"	"
04587		800	1		"	10-Fm Rock, San Juan Channel
04599		593	1		2 Apr 78	Turn Island

Appendix Table 3. Summary of 1979 lingcod tagging data.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17200	100	2		10 Mar 79	Second Hump
201	105	2		"	"
202	81	1		"	"
203	73	1		"	"
204	72	2		"	"
205	75	1		"	Middle Bank, 14-25 fathoms
206	60	1		"	"
207	60	1		"	"
208	57	1		"	"
209	60	2		"	"
210	75	1		"	"
211	64	1		"	"
212	64	1		"	"
213	83	1		"	"
214	65	1		"	"
215	62	1		"	"
216	66	1		"	"
217	79	1		"	"
218	65	1		"	"
219	62	1		"	"
220	67	1		"	"
221	63	1		"	"
222	63	1		"	"
223	63	1		"	"
224	71	2		"	"
225	75	1		"	"
226	75	1		"	"
227	76	1		"	"
228	63	1		"	"
229	83	1		"	"
230	61	1		"	"
231	74	1		"	"
234	83	1		"	"
235	87	1		"	"
236	72	1		"	"
237	68	1		"	"
238	64	1		"	"
239	72	1		"	"
241	65	1		"	"
242	57	1		"	"
243	84	1		"	"
244	85	1		"	"
245	71	2		"	"
246	65	1		"	"
247	77	1		"	"
248	65	1		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17249	65	1		10 Mar 79	Middle Bank, 14-25 fathoms
250	64	1		"	"
251	81	1		"	"
252	68	1		"	"
253	69	1		"	"
254	61	1		"	"
255	76	1		"	"
256	90	1		"	"
257	66	1		"	"
258	68	2		"	"
259	71	1		"	"
260	59	1		"	"
262	62	1		"	"
263	61	1		"	"
264	59	1		"	"
266	80	1		"	"
267	64	1		"	"
269	77	1		"	"
270	65	1		"	"
273	60	1		"	"
274	60	1		"	"
275	78	1		"	"
276	84	1		"	"
277	63	1		"	"
278	86	1		11 Mar 79	Middle Bank, 20-30 fathoms
279	62	1		"	"
280	82	1		"	"
281	67	1		"	"
282	67	1		"	"
283	66	1		"	"
284	74	2		"	"
285	67	1		"	"
286	88	1		"	"
287	75	1		"	"
288	60	1		"	"
289	63	1		"	"
291	63	2		"	"
292	65	1		"	"
293	67	1		"	"
294	70	2		"	"
295	61	1		"	"
296	68	2		"	"
297	74	1		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17298	67	1		11 Mar 79	Hein Bank, 3-15 fathoms
299	70	1		"	"
300	59	1		"	"
301	74	2		"	"
302	63	1		"	"
303	59	1		"	"
304	82	1		"	"
305	54	1		"	"
306	64	1		"	"
307	44	1		"	"
308	59	1		"	"
310	54	1		"	"
312	63	1		"	"
313	66	1		"	"
314	64	1		"	"
315	43	1		"	"
316	60	1		"	"
317	48	2		"	"
318	54	2		"	"
319	44	1		"	"
320	64	1		"	"
321	66	1		"	"
323	76	1		"	"
324	60	1		"	"
325	60	1		"	"
326	75	1		"	"
327	67	1		"	"
328	45	1		"	"
329	46	1		"	"
330	58	1		"	"
331	63	1		"	"
332	59	2		"	"
333	63	1		"	"
334	56	1		"	"
335	66	1		"	"
336	68	1		"	"
337	65	1		"	"
338	76	1		"	"
339	58	1		"	"
340	62	1		"	"
341	56	1		"	"
342	66	1		"	"
343	55	1		"	"
344	50	2		"	"
345	62	1		"	"
346	48	1		"	"
347	61	2		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17348	47		2	11 Mar 79	Hein Bank, 3-15 fathoms
349	46		1	"	"
350	49		1	"	"
351	51		1	"	"
352	61		1	"	"
353	62		1	"	"
354	44		1	"	"
355	47		2	"	"
356	59		2	12 Mar 79	Point Colville, Lopez Island
357	62		1	"	"
358	59		1	"	"
359	56		1	"	"
360	57		1	"	"
361	53		1	"	"
362	59		1	"	"
363	57		1	"	"
364	58		1	"	"
365	65		1	"	"
366	50		2	"	"
367	58		1	"	"
368	91		1	"	"
369	60		1	"	"
370	85		1	"	"
371	68		1	"	"
372	62		1	"	"
373	47		2	"	"
374	49		2	"	"
375	43		1	"	"
376	43		1	"	"
377	97		2	"	McArthur Bank
378	63		1	"	Middle Bank, 20-30 fathoms
379	65		1	"	"
380	69		2	"	"
381	63		2	"	"
382	73		1	"	"
383	66		1	"	"
384	76		1	"	"
385	81		2	"	"
386	62		1	"	"
387	64		1	"	"
388	90		1	"	"
389	67		2	"	"
390	68		1	"	"
391	65		1	"	"
392	68		1	"	"
393	99		2	"	"
394	74		1	"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17395	64	1		12 Mar 79	Middle Bank, 20-30 fathoms
396	70	1		"	"
397	86	1		"	"
398	74	1		"	"
399	59	1		"	"
400	73	1		"	"
402	67	1		"	"
403	73	1		"	"
404	87	1		"	"
405	90	2		"	"
406	64	1		"	"
407	62	1		"	"
408	65	2		"	"
409	60	1		13 Mar 79	Middle Bank, 14-25 fathoms
410	99	1		"	"
411	85	1		"	"
412	69	2		"	"
413	79	1		"	"
414	81	1		"	"
415	85	2		"	"
416	69	2		"	"
417	67	1		"	"
418	64	1		"	"
419	65	1		"	"
420	88	1		"	"
421	65	1		"	"
422	60	1		"	"
423	59	1		"	"
424	65	1		"	"
425	65	1		"	"
426	66	1		"	"
427	64	2		"	"
428	75	1		"	"
429	64	1		"	"
430	65	1		"	"
431	65	1		"	"
432	65	1		"	"
433	68	1		"	"
434	63	1		"	"
435	65	1		"	"
436	73	2		"	"
437	63	1		"	"
438	64	1		"	"
439	75	1		"	"
440	60	1		"	"
441	64	1		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17442	63	1		13 March 79	Middle Bank, 14-25 fathoms
443	64	1		"	"
444	64	1		"	"
445	63	1		"	"
446	70	2		"	"
447	60	1		"	"
448	58	1		"	"
449	59	1		"	"
450	83	1		"	"
451	59	1		"	"
452	55	1		"	"
453	58	1		"	"
454	66	1		"	"
455	60	1		"	"
456	67	1		"	"
457	65	1		"	"
458	64	2		"	"
459	62	1		"	"
460	68	2		"	"
461	63	1		"	"
462	65	1		"	"
463	62	1		"	"
464	59	1		"	"
465	63	1		"	"
466	64	1		"	"
467	61	1		"	"
468	60	1		"	"
469	63	1		"	"
470	74	1		"	"
471	58	1		"	"
472	62	1		"	"
473	64	1		"	"
474	70	2		"	"
475	89	1		"	"
476	81	1		"	"
477	63	1		"	"
478	61	1		"	"
479	81	1		"	"
480	68	1		"	"
481	117	2		"	"
482	63	1		"	"
483	64	1		"	"
484	65	1		"	"
485	62	1		"	"
486	64	1		"	"
487	67	2		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17488	70	2		13 Mar 79	Middle Bank, 14-25 fathoms
489	69	2		"	"
490	65	1		"	"
491	64	1		"	"
492	67	1		"	"
493	64	1		"	"
494	71	1		"	"
495	61	1		"	"
496	67	1		"	"
497	62	1		"	"
498	63	1		"	"
499	61	1		"	"
500	60	1		"	"
501	62	2		"	"
502	63	1		"	"
503	62	1		"	"
505	61	1		"	"
506	64	1		"	"
507	62	1		"	"
508	66	1		"	"
509	58	1		"	"
510	52	1		"	"
511	48	2		"	"
512	55	1		"	"
513	62	1		"	"
514	60	1		"	"
516	64	1		"	"
518	56	1		"	"
515	73	2		16 Mar 79	Hein Bank
517	85	1		"	"
519	85	1		"	"
520	64	1		"	"
522	85	1		"	"
523	65	1		"	"
525	67	1		"	"
526	65	1		"	Hein Bank, 3-15 fathoms
527	76	1		"	"
528	69	1		"	"
530	57	1		"	10-fathom Rock, San Juan Channe
531	51	1		"	"
532	59	1		"	"
533533	51	1		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17534	76	1		16 Mar 79	10-fathom Rock, San Juan Island
535	57	1		"	"
536	58	1		"	"
537	63	1		"	"
538	80	1		"	"
540	70	1		"	"
541	71	1		"	"
542	83	1		"	"
543	77	1		"	"
544	82	1		"	"
545	59	1		17 Mar 79	"
547	82	1		"	"
548	74	1		"	"
549	74	1		"	"
550	67	1		"	"
551	99	2		"	"
552	56	1		"	"
553	71	1		"	"
554	79	2		"	"
556	55	1		"	"
557	66	1		"	"
558	60	1		"	"
559	70	1		"	"
560	82	1		"	"
561	53	1		"	"
562	62	1		"	"
563	54	1		"	"
564	65	1		"	"
565	55	1		"	"
566	75	1		"	"
567	70	1		"	"
568	59	2		"	"
569	86	1		"	"
570	60	1		"	"
571	53	1		"	"
572	75	1		"	"
573	75	1		"	"
574	60	1		"	"
575	62	1		"	"
576	56	1		"	"
578	63	2		"	"
579	63	1		"	Middle Bank, 14-25 fathoms
580	50	1		"	"

Appendix Table 3. Summary of 1979 lingcod tagging data. - Continued.

Dart tag number	TL (cm)	Sex		Date of release	Location
		1-male	2-female		
E17581	63	1		17 Mar 79	Middle Bank, 14-25 fathoms
582	44	1		"	"
583	60	1		"	"
584	60	1		"	"
585	60	1		"	"
586	void				
587	62	1		"	"
588	64	1		"	"
589	62	1		"	"
590	83	1		"	"
591	61	1		"	"
592	62	1		"	"
593	64	1		"	"
594	64	1		"	"
595	39	1		"	"
596	63	1		"	"
597	67	1		"	"
598	62	1		"	"
599	67	1		"	"
600	66	1		"	"
601	83	1		"	"
602	62	1		"	"
603	63	1		"	"
604	65	1		"	"
605	72	1		"	"