

# Gwa'sala-'Nakwaxda'xw Nation Fisheries Program

NEKITE RIVER SALMON ENUMERATION AND ASSESSMENT PROGRAM



**Gwa'sala-'Nakwaxda'xw Nation**

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NEKITE RIVER SALMON ENUMERATION AND ASSESSMENT PROGRAM

**Prepared for:**

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## **INTRODUCTION**

The Nekite River is located at the head of Smith Inlet on the Central Coast of B.C. (Figure 1). This river system has long been recognized for its high fisheries values, especially for chum salmon (*Oncorhynchus keta*). Fisheries and Oceans Canada (DFO) has allocated significant resources in previous years for enumeration and habitat creation within the Nekite Watershed. In 1986, DFO constructed a spawning channel located approximately 10km upstream of the Nekite River estuary in an effort to improve chum production levels that were inadequate to support a commercial fishery (Winther et al, 1988). DFO maintained and enumerated the channel for seven years, but finally abandoned it in 1990 when funding restrictions prevented further involvement.

As the Nekite River is within the traditional territory of the Gwa'sala-'Nakwaxda'xw Nation, involvement in the project was natural and convened in 1995 for the Band. For several years now, the Gwa'sala-'Nakwaxda'xw Fisheries Department has worked in the Nekite River watershed, with an ever-expanding program taking place. This year, a chum enumeration project was carried out by selected field staff over a period of approximately six weeks. The program included a mark-recapture trial on chum salmon, stream inspections on the mainstem Nekite River, enumeration of fish utilizing the spawning channel, and biological sampling of coho, chum, and pink salmon.

The following report summarizes activities undertaken by the Gwa'sala-'Nakwaxda'xw Nation Fisheries Department in the Nekite River for the 2008 field season.

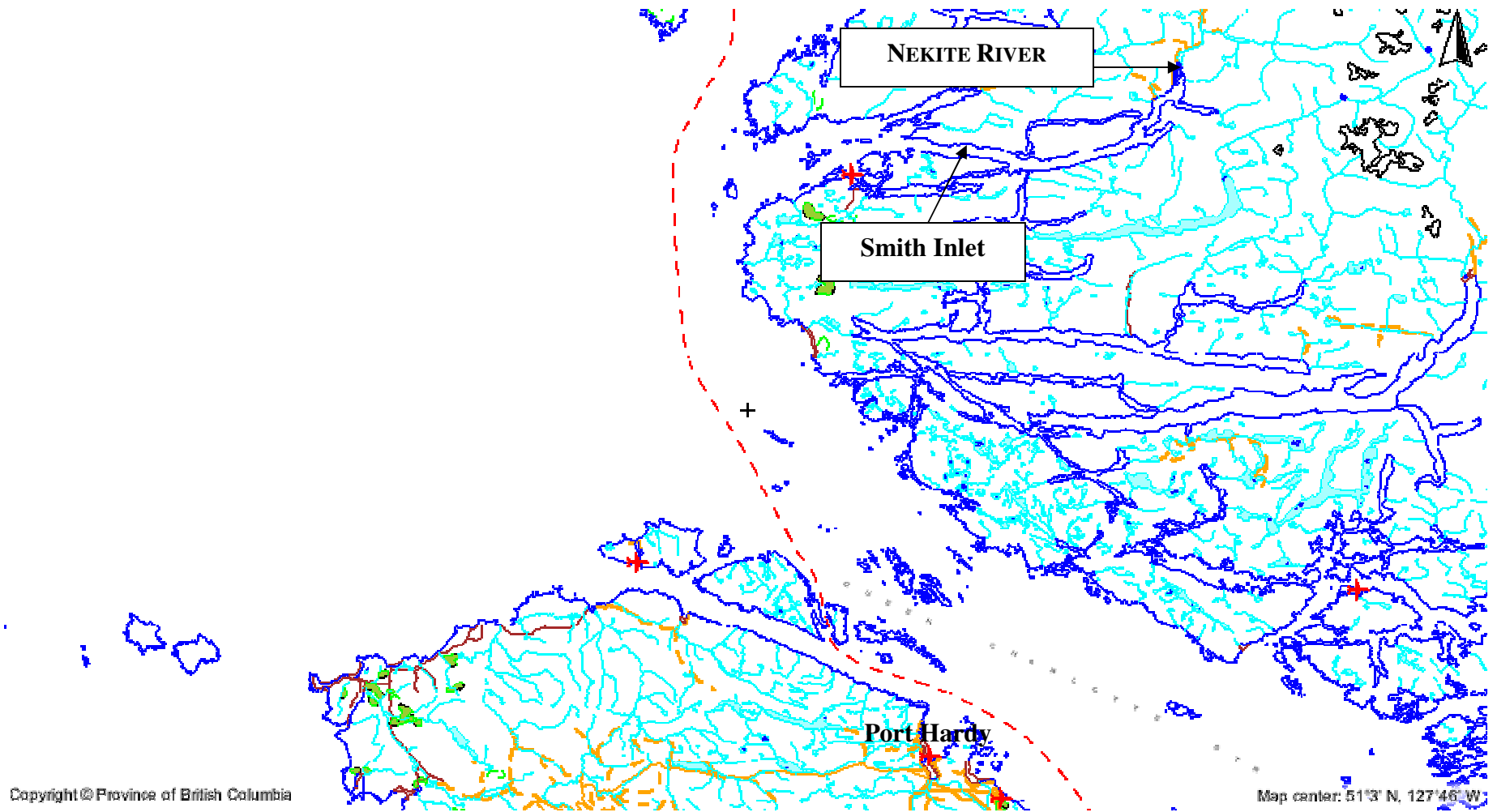


Figure 1. General location map showing the location of the Nekite River on the Central Coast of B.C.

## **METHODOLOGY**

### *Preparation*

The Nekite River is located at the head of Smith Inlet, several miles from any settlement or town. This isolated location requires that careful project planning and preparation be carried out prior to the commencement of field activities. At the spawning channel, a cabin was constructed for use by DFO operations personnel. Since DFO is no longer maintaining the channel, the Gwa'sala-'Nakwaxda'xw Nation made arrangements to use the facility for the duration of the program. Near the beginning of August, members of the field crew flew into the cabin with basic supplies and spent approximately a week preparing the cabin and spawning channel for upcoming work.

Once set-up of the cabin was complete, preparation of the spawning channel was initiated. Minor clearing of riparian vegetation was conducted along the banks to provide a clear line of sight into the channel. The channel was then separated into 50m increments and marked with flagging tape. A staff gauge and thermometer were placed at the spawning channel intake to provide a means for sampling daily water levels and water temperatures, and an additional thermometer was placed at the cabin to measure ambient temperatures.

On August 26, 2008, the crew returned to conduct the first round of chum marking and complete set-up of the facility for the season. A skiff was used to transport the crew and supplies part way up the river and an ATV was brought in to provide transportation to the cabin.

*Spawning Channel Data Collection*

The Nekite River spawning channel was sampled twice a day (usually at 7:30am and 5:30pm) for the duration of the project, starting September 08, 2008 and continuing until October 14, 2008. Water levels and water temperatures were collected at the spawning channel intake, and ambient temperature and weather were also recorded. Enumeration of fish utilizing the spawning channel occurred once a day. All fish utilizing the channel were recorded by gender and species within each 50m section of the channel.

Dead-pitching was also conducted on the spawning channel once daily, or more frequently if water levels prevented crews access to the mainstem. All fish dead-pitched were examined for the presence of a Floy tag and secondary opercular punch. Random samples of chum were sampled for post-orbital hypural length, gender, and scale samples.

*Nekite River Mainstem Data Collection*

A number of different projects were conducted on the Nekite River mainstem as part of the overall enumeration program. The mark-recapture program, a procedure used for collecting escapement data, was initiated on August 26. Marking on this occasion occurred using beach seine nets in a tidally influenced area within the Lower Nekite River. Fish were marked using Floy tag and received an opercular punch as a secondary mark, and had their sex and condition recorded. All fish were released after marking in

roughly the same location as where they were captured. A total of 1,575 chum salmon were marked over 13 separate tagging events.

Recapture of the marked chum salmon was conducted by dead-pitching of the entire anadromous portion of the Nekite River mainstem, as well as of the Nekite River spawning channel, and the Piper River (a major tributary of the Nekite River) mainstem. The dead-pitches began on the system immediately after the first group of chum salmon had been marked and were conducted until October 16, once the chum salmon run had subsided. All fish dead-pitched were examined for the presence of a tag or secondary mark, and random samples of chum salmon were sampled for post-orbital hypural length, gender, and scale samples.

#### *Stream Inspection Logs*

This year DFO continued to encourage the Gwa'sala-'Nakwaxda'xw Nation Fisheries Crew to carry out stream walks according to their Stream Inspection Log (SIL) format. These inspections require detailed information about water and weather conditions, reach specific observations of live and dead salmon, the number and age of bears and other wildlife, and any observations regarding unusual conditions within the stream segment examined. Stream inspections were carried out by the Fisheries Crew who are now very comfortable with the SIL format utilized by DFO. A total of seven SIL,s were completed for the Nekite River and the Piper River on the days of September 5, 10, 12, 17, 21, 23 and October 1, 2008. A total of four SIL's were completed on the Walkum River on the days of September 12, 24, 29 and October 09, 2008. The Walkum River and the Nekite River are located in close proximity to each other. Similar run

timing of the two stocks has also been noted. Weekly stream walks were conducted on the Walkum River to better address the issue of tag loss. Stream walks of the Walkum River ensured that there was not a significant number of fish tagged in the Nekite estuary migrating into the Walkum River.

### *Biological Data*

The Fisheries Crew also gathered biological data on pink and coho salmon this year. The salmonids were sampled for post-orbital hypural length, gender, and scale samples. DNA was also taken via an opercular punch. Standard data collection methods were employed with proper records maintained. These samples have already been sent to DFO Stock Assessment for analysis.

## **DATA AND ANALYSIS**

The programs conducted by the Gwa'sala-'Nakwaxda'xw Nation on the Nekite River have the overall objective of assessing the returning salmon population abundance. The information gathered during daily operations must be analyzed in order to produce overall estimates that inform management.

An abundance estimate for the chum run in the Nekite River was produced through the analysis of several direct data sets. These included the stream inspections that were conducted, dead-pitch information for the system by species, daily channel counts, and the aerial count estimates.

## **RESULTS AND DISCUSSION**

### *Spawning Channel*

The daily counts for the spawning channel collected from September 08, 2008 to October 14, 2008 are presented in Appendix 1, Table 1. The chum salmon sex ratio in the spawning channel was 1.05:1, male to female. Channel utilization peaked on September 15, 2008 for chum salmon with 77 fish observed (Figure 2). The pink salmon sex ratio in the spawning channel was 0.37:1, male to female. The highest number of pink salmon observed in the channel was 22 on September 08, 2008 (Figure 3).

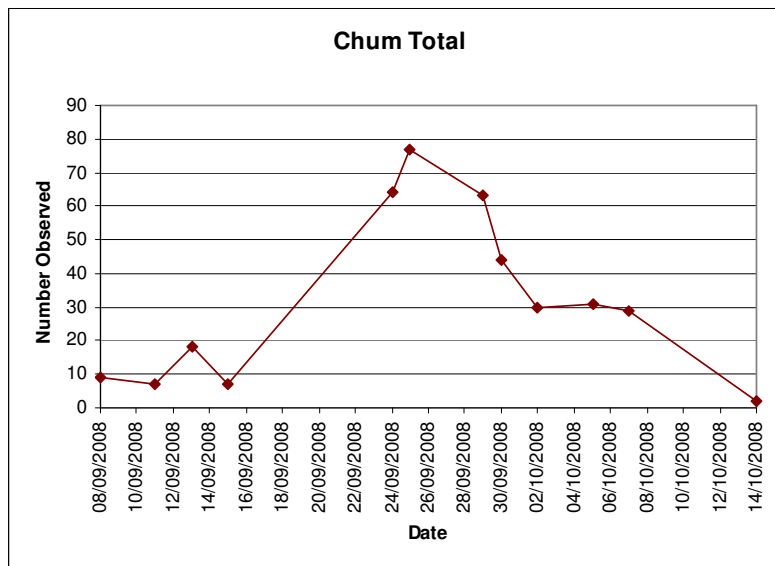


Figure 2. Graphed results of daily chum salmon enumeration activities on the Nekite River spawning channel for the 2008 field season.

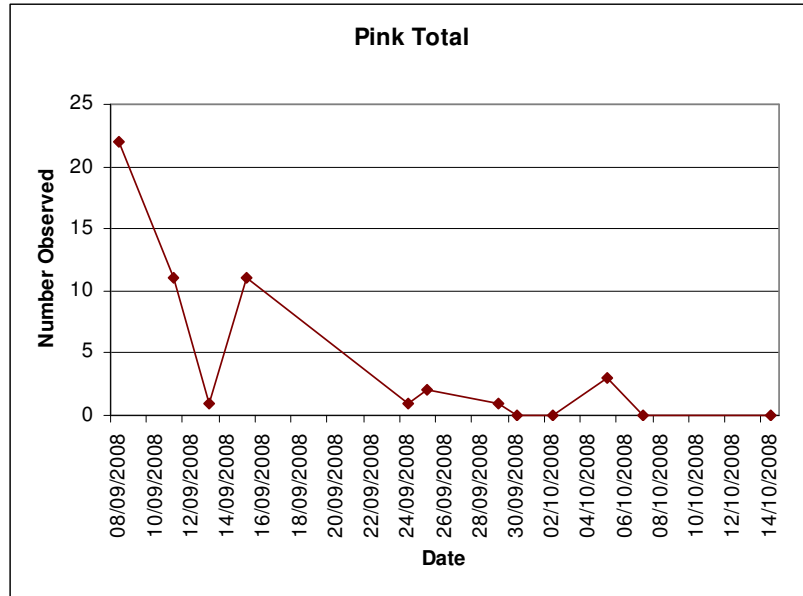


Figure 3. Graphed results of daily pink salmon enumeration activities on the Nekite River spawning channel for the 2008 field season.

*Nekite River Mark-Recapture Program*

The estimated number of total adult chum salmon returning to the Nekite River in 2008 was 8,072 as a result of the mark recapture methodology (Appendix 1, Table 5). In general, mark-recapture trials have improved confidence limits when the total number of marks (in this case tagged fish) is a significant portion of the population and when the total number of captures is high enough to capture significant number of the marks (identified as recaptured). A total of 629 adult chum salmon were dead pitched, with 67 female recaptures and 29 male recaptures. Adult female chum salmon were recaptured at a rate of 4%, while males were recaptured at a rate of 2%. The sex ratio for adult chum salmon was found to be 0.98:1 male to female.

This year the total number of tagged chum salmon was 1575 adults (Appendix 1, Table 2). This compares to 1707 adults during the 2006 field season. The total number of tagged fish in this year's program, therefore, decreased by 8%. The number of

captures, which for this experiment is dead-pitched fish, was 629 during 2008 compared to 12,733 during 2006 (Appendix 1, Table 3) compared to 3,566 during 2005 (an decrease of 95% and 18% respectively). The dramatic decrease in the number of fish dead-pitched was contributed to a significant increase in the number of bear kills and the significantly reduced escapement compared to previous years.

Due to the substantial effort of the Gwa'sala-'Nakwaxda'xw Nation Fisheries Crew this year, a large number of chum were sampled and tagged. The fish tagged had been in the river a short period of time. This was evident as many individuals were in good condition. Due to the effort exerted by the Gwa'sala-'Nakwaxda'xw Nation Fisheries Crew it is likely that the chum that were dead pitched had been deceased for a short period of time. Tag loss was also believed to be minimal. Residence times calculated are believed to accurate.

#### *Stream Inspection Logs*

Four separate Stream Inspection Logs were collected by the Fisheries Crew. The data collected on these forms include specific information on river conditions, reaches examined, live fish observed (by species), dead fish observed (by species), as well as estimations regarding fish countability and activity of fish observed. The information gathered during these inspections was utilized to inform population estimates for both the chum and pink salmon runs in the watershed.

#### **SUMMARY**

The repeated low escapement of adult chum salmon returning to the Nekite River watershed in 2008 is cause for concern. Estimates made by DFO Stock Assessment, with

the utilization of data collected by the GN Band, identified a run size of approximately 8072 adults. This estimate was generated by utilizing the SIL data, deadpitch data, and historical residency times. This small return is a fraction the size of historical returns recorded in this system.

The field activities undertaken by the Gwa'sala-'Nakwaxda'xw Nation this year were extensive. Long-term program objectives such as spawning channel enumeration were carried out as well as a mark-recapture program that involved the tagging of a significant portion of the reproductive stock. Many obstacles were faced by the GN crew when dead-pitching this year; inclement weather conditions and resultant fluctuations in river levels made dead-pitching a challenge. Due to the low escapement, bears in the area also consumed more of the carcasses than in previous years, making the search for tags more time consuming. Data collected during the course of the program including run timing, escapement estimates, spawning channel utilization, and biological traits (DNA, lengths, etc.) were collected and will form part of the management plan for the area.

This program continues to be important to the GN Band as it provides training for the Fisheries field staff. Information collected through this program may shed light on the cause of the dramatically reduced number of chum spawners returning to the Nekite River and perhaps one day lead to the execution of a commercial fishery for this stock.

**Appendix – Data gathered during field activities on the Nekite River.**

Table 1. Daily counts of chum and pink salmon observed in the Nekite River spawning channel during the 2008 field season.

	Chum			Pink		
	Male	Female	Total	Male	Female	Total
08-Sep-08	5	4	9	11	11	22
11-Sep-08	3	4	7	0	11	11
13-Sep-08	6	12	18	0	1	1
15-Sep-08	3	4	7	0	11	11
24-Sep-08	47	17	64	0	1	1
25-Sep-08	36	41	77	1	1	2
29-Sep-08	32	31	63	1	0	1
30-Sep-08	29	15	44	0	0	0
02-Oct-08	18	12	30	0	0	0
05-Oct-08	8	23	31	1	2	3
07-Oct-08	8	21	29	0	0	0
14-Oct-08	0	2	2	0	0	0
Totals	<b>195</b>	<b>186</b>	<b>381</b>	<b>14</b>	<b>38</b>	<b>52</b>

Table 2. Nekite River tagging summary for chum salmon.

Date	# Fish Tagged	Species	# Male	# Female	Location
26-Aug-08	57	Chum	36	21	Nekite River
05-Sep-08	81	Chum	40	41	Nekite River
06-Sep-08	72	Chum	39	33	Nekite River
07-Sep-08	131	Chum	68	63	Nekite River
08-Sep-08	315	Chum	123	192	Nekite River
09-Sep-08	119	Chum	69	50	Nekite River
10-Sep-08	180	Chum	109	71	Nekite River
11-Sep-08	79	Chum	47	32	Nekite River
12-Sep-08	165	Chum	85	80	Nekite River
13-Sep-08	132	Chum	59	73	Nekite River
14-Sep-08	117	Chum	56	61	Nekite River
15-Sep-08	89	Chum	36	53	Nekite River
16-Sep-08	2	Chum	0	2	Nekite River
17-Sep-08	13	Chum	4	9	Nekite River
18-Sep-08	8	Chum	1	7	Nekite River
20-Sep-08	15	Chum	13	2	Nekite River
<b>Total</b>	<b>1575</b>		<b>785</b>	<b>790</b>	

Table 3. Nekite River dead-pitch data for the 2008 field season.

Date	Dead Pitch (Chum)		Dead Pitch Total	Bear Kill (Chum)		Bear Kill Total
	Male	Female		Male	Female	
11-Sep-08	1	1	2	0	0	0
16-Sep-08	4	2	6	0	0	0
17-Sep-08	1	0	1	60	15	75
20-Sep-08	14	6	20	87	27	114
21-Sep-08	7	7	14	0	0	0
25-Sep-08	4	1	5	0	0	0
26-Sep-08	8	4	12	28	12	40
27-Sep-08	0	0	0	6	6	12
28-Sep-08	4	3	7	17	10	27
29-Sep-08	5	7	12	78	82	160
30-Sep-08	76	87	163	55	36	91
01-Oct-08	15	32	47	0	0	0
02-Oct-08	53	82	135	53	60	113
03-Oct-08	4	5	9	3	5	8
04-Oct-08	4	9	13	12	24	36
05-Oct-08	1	7	8	11	5	16
06-Oct-08	15	17	32	21	8	29
07-Oct-08	5	8	13	0	0	0
08-Oct-08	23	37	60	1	3	4

09-Oct-08	2	12	<b>14</b>	0	0	<b>0</b>
14-Oct-08	0	3	<b>3</b>	0	0	<b>0</b>
15-Oct-08	1	4	<b>5</b>	1	1	<b>2</b>
16-Oct-08	15	33	<b>48</b>	3	8	<b>11</b>
<b>Total</b>	262	367	<b>629</b>	436	302	<b>738</b>

Table 4. Daily record of climatic conditions at the Nekite River during the field operations in 2008.

Date	Time	Water		Ambient	Weather Conditions	Initial
		Level (m)	Temp (°C)	Temp (°C)		
04-Sep-08	8:30	3.7	11	14	Clear	PS
	18:30	3.2	11	18	Clear	CW
05-Sep-08	7:30	4	10	14	overcast w/ light rain	CW
	16:30	5.5	11	16	light rain	PS
06-Sep-08	7:00	5.6	11	13	overcast	PS
	18:30	4.8	11	18	Clear	PS
07-Sep-08	7:30	4	10	10	Clear	PS
	19:00	3.6	11	18	Clear	PS
08-Sep-08	7:30	3.2	10	16	Clear	PS
	18:30	3.2	11	18	Clear	PS
09-Sep-08	7:30	3	11	14	Clear	PS
	17:30	2.9	12	18	Clear	PS
10-Sep-08	6:30	2.8	11	14	Clear	PS
	19:00	2.6	11	16	Clear	PS
11-Sep-08	6:30	2.5	10.5	14	light rain	PS
	18:30	2.4	10	16		PS
12-Sep-08	8:30	2.6	11	16		PS
	18:00	2.4	11	14	Clear	PS
13-Sep-08	8:30	2.4	10	12		PS
	19:00	2.2	11	14	Clear	PS
14-Sep-08	7:30	2	11	12	overcast/ fog	CW
	18:00	1.9	12	14	Clear	CW
15-Sep-08	8:30	1.8	10	12	Clear	CW
	16:00	1.8	11	14	Clear	CW
16-Sep-08	8:00	1.8	10	12	Clear	CW
	18:00	1.8	11	14	Clear	CW
17-Sep-08	7:30	1.8	10	12	Clear	CW
	18:30	1.8	11	16	Clear	CW
18-Sep-08	7:30	1.8	10	14	overcast	CW
	17:30	1.6	11	18	clear	CW
19-Sep-08	7:50	1.8	10	16	overcast	CW
	19:30	1.8	11	14	overcast	CW
20-Sep-08	7:55	1.8	10	12	overcast	CW
	17:05	1.7	11	16	overcast	CW
21-Sep-08	8:00	1.8	11	12	overcast	DP

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	17:30	2.5	11	16	overcast	DP
22-Sep-08	9:00	1.6	10	12	overcast	CW
	17:30	1.6	8	18	overcast	CW
23-Sep-08	8:30	1.4	8	12	clear	CW
	17:30	1.2	10	16	light rain	CW
24-Sep-08	7:15	5.8	10	14	light rain	CW
	18:00	5.4	10	16	overcast	CW
25-Sep-08	6:50	5.2	9	18	overcast	CW
	17:30	4.6	10	16	overcast	CW
26-Sep-08	9:00	3.6	9	12	light rain	CW
	18:30	4.2	10	16	light rain	CW
27-Sep-08	8:00	10.6	9	12	light rain	CW
	18:30	8.4	10	18	clear	CW
28-Sep-08	7:40	5.7	9	12	clear	CW
	18:35	5	9	16	clear	CW
29-Sep-08	8:00	4.2	9	10	clear	CW
	15:30	3.6	10	16	clear	CW
30-Sep-08	7:30	3.4	10	12	clear	CW
	16:00	3.4	10	16	clear	CW
01-Oct-08	7:30	3	10	12	Fog	DP
	16:30	3	10	16	Clear	DP
02-Oct-08	7:30	3	10	14	Fog	CW
	16:00	3.2	11	17	Heavy Rain	DP
03-Oct-08	8:00	6.6	11	12	Light Rain	DP
	17:30	5.2	10	14	Light Rain	DP
04-Oct-08	7:30	6.4	10	11	Light Rain	CW
	16:30	9	10	11	Heavy Rain	DP
05-Oct-08	8:00	8	10		Light Rain	DP
	16:30	7.5	12		Light Rain	DP
06-Oct-08	8:00	7	10		Clear	DP
	15:30	5.8	9		Light Rain	DL
07-Oct-08	8:30	14	9		Heavy Rain Overnight	DL
	17:30	11	9		Rain all day	DL
08-Oct-08	7:30	9.6	8.5		light rain	DL
	18:00	8	8.5		Periods of Rain	DL
09-Oct-08	8:00	8	8.5		Some rain Overnight	DL
	14:30	6.9	8.5		Clear	DL
10-Oct-08	9:00	5.5	6		Clear/ Heavy Frost	DL
14-Oct-08	10:00	6.8	6		Clear	CW
	16:00	6	6		Overcast	CW
15-Oct-08	7:30	4.8	6	14	Clear	CW
	17:30	4.2	6		Clear	CW
16-Oct-08	7:30	3.8	6	8	Clear	CW

Table 5. Population estimate based on the Petersen Mark-Recapture Method.

	Tagged	Condition			Recaptured	Captured
		1	2	3		
<b>Female</b>	790	775	9	6		262
<b>Male</b>	785	760	16	9		367
<b>Total</b>	1575	1535	25	15	122	629

**Calculations**

$$N = (M+1)(C+1) / (R+1)$$

N =                8072.1951

**Variance of N =**

$$(M+1)^2(C+1)(C-R)/(R+1)^2(R+2)$$

422891.569

**Standard Error**

Sqrt of  
Variance  
650.301137

**95% confidence interval =**

$$N \pm t(\text{standard error})$$

1277.19143

Lower Limit	6795.0037
Upper Limit	9349.3866