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THOMPSON, S. P.
WHITE-TAILED AND MULE DEER

WHITE-TAILED AND MULE DEER ROADKILL REPORT
FOR THE CASTLEGAR ZONE

Compiled for: Conservation Officer Service
Castlegar, B.C.
May 1987

Compiled by: S.P. Thompson

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ACKNOWLEDGEMENTS

The Fish and Wildlife Branch, Ministry of Transportation and Highways, the Insurance Corporation of B.C., and the Castlegar Conservation Officer Service were instrumental in supplying information and feedback pertaining to this report. Guidance and assistance provided by J.N. Corbett (Conservation Officer) is gratefully acknowledged.

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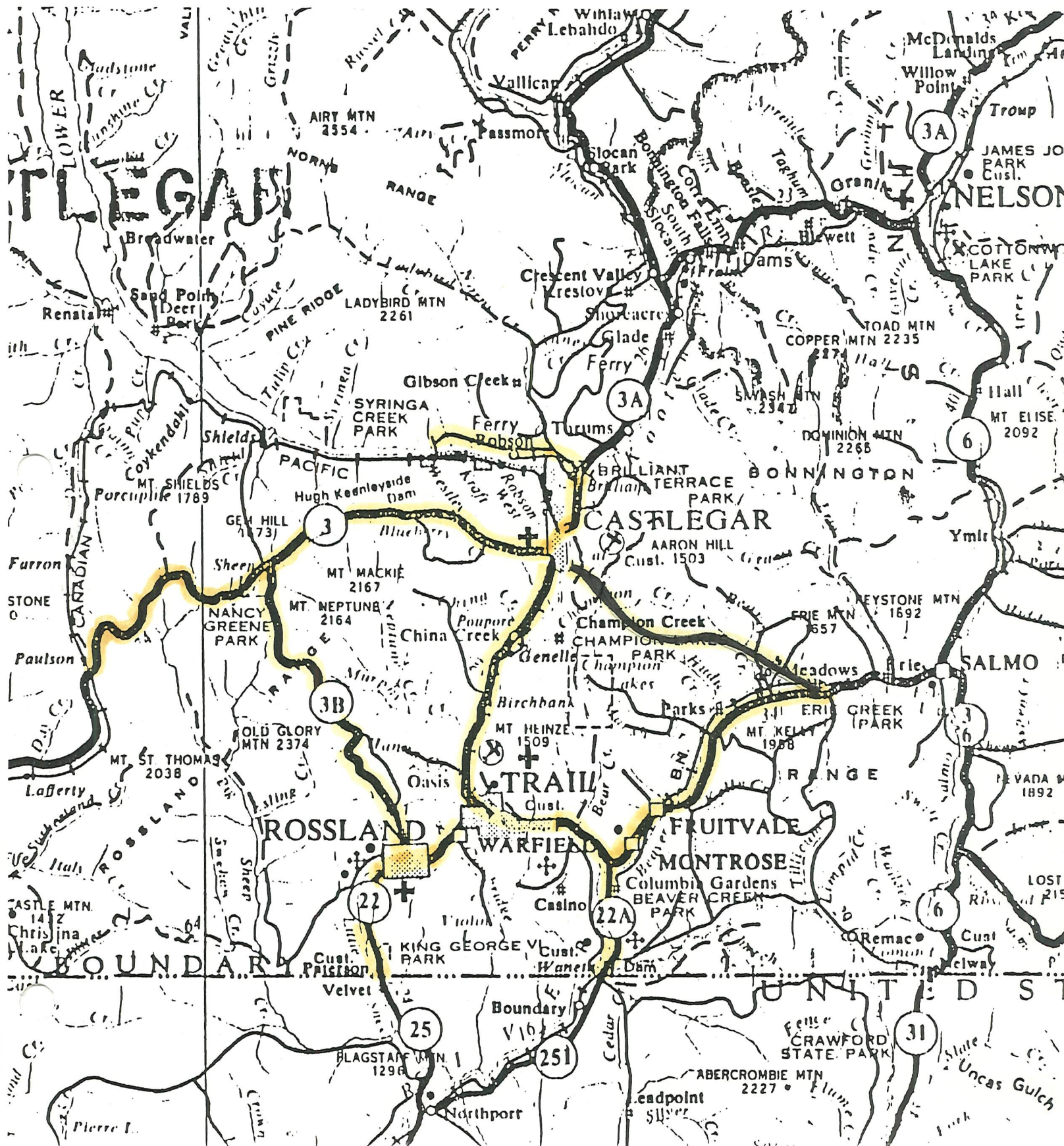
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KEY MAP

-highway segments assessed

SCALE 1: 406,250



1.0 INTRODUCTION

Each year hundreds of white-tailed and mule deer are struck by automobiles on the roadways of British Columbia. The damage to personal property as well as the injury and death of humans and wildlife is tragic and unnecessary. The Ministry of Highways has been submitting monthly road-kill reports to the Castlegar Conservation Officer Service since February 1985. This report is an assessment of these reports as well as data collected from the Insurance Corporation of B.C. and the Fish and Wildlife Branch. This information will be used to assess the deer-vehicle collision problems within the Castlegar Zone and suggest possible solutions to alleviate them.

2.0 LOCATION OF STUDY

The study area is within Wildlife Administration Region 4 or the Kootenay Region (APPENDIX I), and includes only major roadways within the patrol boundaries of the Castlegar Zone which are listed below.

1. Highway 932, Segment 1343 from Castlegar Overpass #2205 to the junction of Highway 3 at Brilliant.
2. Highway 933 from the Robson ferry ramp to Syringa Creek Provincial Park.
3. Highway 3, Segment 1330 from Castlegar to Paulson bridge #1647.

4. Highway 3B from Nancy Greene Lake through Rossland and Trail to the junction of Highway 22A at Waneta.
5. Highway 22 from Trail to Castlegar.
6. Highway 3B, Segment 1350 from the junction of Highway 22A at Waneta to the junction of Highway 3 at Meadows.
7. Highway 22, Segment 1342 from Paterson to Rossland.
8. Highway 22A from Waneta to the junction of Highway 3B and Highway 22A.
9. Highway 932, Segment 1341 from the junction of Highway 3B at Warfield, to the junction of Highway 22 at Tadanac.
10. Highway 3, Segment 1355 from the Castlegar Interchange Overpass to the junction of Highway 3B at Meadows.
11. Highway 3A, Segment 1356 from the exit ramp at Highway 3 to the Brilliant Dam access road.

3.0 METHODS

Three data sources were available to the study: 1) Ministry of Transportation and Highways Regional District monthly reports on road-kill pick-ups (Rossland District), 2) Insurance Corporation of B.C. monthly statements regarding the number of deer-vehicle claims and the accompanying settlement costs (1985-86), and 3) Nelson Fish and Wildlife Branch inventory of wildlife-vehicle collisions in British Columbia (April 1982-March 1983).

The Ministry of Transportation and Highways monthly road-kill reports were effective in pinpointing the location of specific road-kills. Information pertaining to, the gender of the animal, as well as the highway name, number, section, and kilometre landmark location were recorded. Also the presence of wildlife signs and/or reflectors was noted (APPENDIX II).

The road-kill reports were tabulated to determine the number of road-kills found, and the male/female road-kill ratios in the Castlegar Zone. The reports were also categorized by highway section to delineate roadways with high deer-vehicle collision frequencies, as well as frequencies related to location and seasons. The Ministry used the landmark kilometre system to record where the deer was found and this made it possible to pinpoint the location of each road-kill.

The Insurance Corporation of B.C. data was used to determine the number, as well as the average cost, and overall costs per year of deer-vehicle claims in the Castlegar Zone.

The Nelson Fish and Wildlife Branch inventory of wildlife-vehicle collisions in B.C. provided information regarding injuries which were sustained as a result of the collisions, and the characteristics of each collision pertaining to time of day, weather, road class, speed zone, roadway character, and vehicle type. The information, although not pertinent to the study period, reflects general trends in deer-vehicle collisions.

4.0 RESULTS

4.1 Road-kill Reports

From February 1985 to December 1986, Ministry of Highways crews picked up 149 road-killed deer in the Castlegar Zone. The actual number of deer which were killed may be two to four times higher due to road-kills which were unobserved by highways crews and deer which managed to leave the roadway and die unseen (e.g. Wildlife Administration Region #8 uses a 3:1 ratio for off-road to on-road deer kills, Stuart 1984).

The Insurance Corporation of B.C., responsible for the Castlegar Zone, processed a total of 885 deer-vehicle collision claims in the same period. The claims included only vehicles which had collision coverage. Therefore, including vehicles without coverage which were involved in collisions would further increase the total deer road-kill figure.

It is evident the Ministry of Highways monthly road-kill reports are biased and therefore ineffective in determining the actual number of deer killed by vehicles in the Castlegar Zone.

Although the road-kill reports are not useful in determining the number of deer involved in collisions with automobiles, the reports are effective in determining significant trends in deer-vehicle collisions related to time of year, highway section, and specific locations on these highway sections.

The number of road-kills recorded for each month from February 1985 to December 1986 increased during the summer months from May to August of both years (Figs.1 & 2). This may be due to increased deer activity on summer ranges where many of Castlegar Zone's major highways exist.

The deer road-kills found within the Castlegar Zone were predominantly female while males comprised approximately 20% of the total (Figs.3 & 4).

The deer road-kill frequency varied considerably for each major highway in the Castlegar Zone and 4 segments with significantly higher numbers of deer-vehicle collisions were found (see Figs.5 & 6). The 4 highway segments are listed below.

1. Highway 3, Segment 1330 from Castlegar to Paulson Bridge #1647.
2. Highway 3B from Nancy Greene Lake through Rossland and Trail to the junction of Highway 22A at Waneta.
3. Highway 22 from Trail to Castlegar.
4. Highway 3B, Segment 1350 from the junction of Highway 22A at Waneta to the junction of Highway 3 at Meadows.

The remaining highway segments within the Castlegar Zone accounted for approximately 5% of the annual road-kill figure over the two year period, therefore, detailed analyses were not completed (Figs.5 & 6).

4.2 Road-kill Frequencies

Road-kill frequencies related to seasons and specific locations on the highway segments were tabulated for the 4 problem highway segments. The results of the tabulation are contained in the following sections.

4.2.1 Blueberry/Paulson Highway 3

Deer-vehicle collisions along the Blueberry/Paulson Highway were scattered, although an increase in road-kill frequency occurred from kilometre 17 through 19 (Fig.7). This segment of Highway 3 is between the culvert at Big Sheep Creek and a Forest Access Road 2 kilometres west of Nancy Greene Lake.

All road-kills picked up by the Ministry of Highway's crews during the two year period were found between April and October (Fig.8). Highway 3 bisects an ungulate summer range, therefore, the frequency of road-kills decreased during the winter months when the deer migrated to lower elevation winter ranges.

4.2.2 Nancy Greene/Trail Highway 3B

The frequency of road-kills on the Nancy Greene/Trail Highway 3B occurred randomly with no concentrations of kills in specific locations (Fig.9).

Eighty-seven percent of the road-kills picked up during the two years were found from May through September (Fig.10). Highway 3B also bisects an ungulate summer range which

accounts for the decrease in collisions during the winter months.

4.2.3 Trail/Castlegar Highway 22

Eighty-two percent of the road-kills picked up on Highway 22 were found between December and May of both years (Fig.11). Highway 22 bisects a critical ungulate winter range which accounts for the increase in the number of road-kills during that period.

Eighty-two percent of deer picked up along Highway 22 were found from kilometre 10 through 13 (Fig.12). This segment of highway is found between the Birchbank Golf Course Road and the south Genelle access. Deer cross the highway to feed in Birchbank Golf Course and the surrounding area and also to obtain water from the Columbia River. The number of road-kills which occur along Highway 22 are likely to increase due to the vegetation recovering from the Trail smelter fume kill (Guy Woods 1985).

4.2.4 Montrose/Meadows Highway 3B

The Montrose/Meadows segment of Highway 3B stretches for 23 kilometres and passes through the towns of Montrose and Fruitvale. Road-kills occurred in various locations along the entire length of the segment and no critical problem areas were found (Fig.12).

Eighty-five percent of the road-kills picked up were found between March and August in both years. This indicates an increase in deer activity during the summer months (Fig.13). The number of road-kills decreased during the months of September, October, and November which corresponds with the fall hunting season.

4.3 I.C.B.C. Records

The data obtained from I.C.B.C. included wildlife-vehicle collision claims as well as vandalism claims. To obtain the accurate number of deer-vehicle collision claims filed, 50% of the total number of claims and the total dollar value paid out each month was used (Table 1).

As stated previously, the Insurance Corporation of B.C. responsible for the Castlegar Zone had a total of 885 deer-vehicle collision claims in 1985-86 which only included vehicle owners who had collision coverage. The total dollar value paid out to vehicle repairs in the two year period was \$521,911.00. The average cost per claim was \$590.00.

4.4 Fish & Wildlife Collision Inventory

Although the wildlife-vehicle inventory consists of data compiled in 1982-83 it presents general trends in deer-vehicle collisions, excluding injuries, which remain fairly constant from year to year. The injury statistics presented below are representative of the 2 year period contained in the study and may fluctuate considerably each year.

During the period from April 1982 to March 1983, 1350 persons were involved in wildlife-vehicle collisions which required R.C.M.P. assistance. Of those 1350 persons, 312 sustained injuries which did not require hospitalization, 183 sustained injuries which required hospital treatment, and 1 person died as a result of the collision (Stuart 1984).

During that same period the R.C.M.P. reported 770 wildlife-vehicle collisions in the province. Eighty-eight percent of these collisions involved deer. The following statistics pertain to the R.C.M.P. reports.

Sixty-five percent of all deer-vehicle collisions occurred between 1800 hours and 0400 hours of the following day. Of the 770 collisions, 53% occurred on clear days with no environmental instability. Eighty-five point six percent of the collisions occurred on segments of highway with agricultural or undeveloped land surrounding it. Passenger cars were the vehicles most often involved in collisions with wildlife (65%). This statistic is a reflection of the overall abundance of passenger cars which travel on B.C. highways.

5.0 DISCUSSION

The road-kill statistics presented in this report cover a 2 year period which makes it difficult to predict long term trends. The number of road-kills each year is related, not only to specific highway locations and seasonal variations, but also to winter severity, deer abundance, and seasonal and

daily travel patterns. Increased traffic on highways, expansion of urban centres and rural areas, as well as increased deer numbers has all contributed to the rising number of road-kills in the Castlegar Zone.

Of the 4 major problem segments of highway within the Castlegar Zone, Highway 22 from Trail to Castlegar has the most severe road-kill problem. This highway is heavily used by motorists who commute to Trail from Castlegar and surrounding communities, and because it is located in a critical deer winter range, the road-kill numbers are high.

The 3 remaining problem highway segments are unique in that road-kills occur along their entire length which makes it difficult to suggest reasonable solutions to reduce the road-kills due to expense or ineffectiveness.

The I.C.B.C. statistics indicate a more severe road-kill problem in the Castlegar Zone. These deer-vehicle collision statistics coupled with natural death, and hunter harvest could seriously deplete the white-tailed and mule deer populations within the Castlegar Zone. A more intensive, long-term study is needed to effectively determine the influence highway road-kills have on deer populations.

6.0 POSSIBLE SOLUTIONS

To effectively decrease the number of deer-vehicle collisions within the Castlegar Zone methods of deterring deer from venturing onto roadways must be implemented. Several of the solutions presented may not be 100% effective, financially feasible, or appropriate in certain situations, therefore, this section is simply a review of various methods with no specific applications recommended.

6.1 Fencing

Barrier fences which are sufficient in height, strength, and permanency are 100% effective in repelling deer from highway surfaces (Halls et al. 1965). Fencing is the most effective method in reducing deer-vehicle collisions, unfortunately it is also one the most costly. In 1978 the Colorado Division of Highways constructed an 2.4 metres fence, 27.8 kilometres in length, at an average cost of \$26,969.00/ kilometre. A disadvantage to using deer fencing is deer often travel to the ends and enter the roadway or become trapped between the roadway and the fence barrier. The implementation of one-way gates at strategic locations along the fence allows deer to exit the highway right of way safely. Deer fencing may also deny access to needed water or critical feeding areas during the winter months.

6.2 Highway Underpasses

A study regarding highway underpasses which was performed in Colorado indicated that certain factors must be taken into consideration when implementing underpasses such as, adjacent deer numbers and their motivation to move or migrate. The underpasses should be at least 4.3 metres wide and high, of minimal length, and situated where crossings are frequent. Barrier fencing should be used in conjunction to channel deer into the underpass and prevent their crossing over the highway surface. The 1978 U.S. dollar value for construction of an underpass was between \$100,000 to \$150,000 (Wallmo 1981).

6.3 Swareflex Reflectors

These are red reflectors similar to vehicle tail-lights which measure 16.5 cm x 5 cm. The reflectors are mounted on posts and placed at specific intervals along the highway shoulder. The reflectors rely on vehicle headlights to reflect red light into the surrounding landscape, creating an "optical fence" that presumably causes deer to remain motionless until the automobile has passed and the optical fence has collapsed (Schafer 1984). The Austrian Academy of Science tested the reflectors and reported an 80% decrease in deer kills along various roads (Irvine 1980). The cost of the reflectors, considering 50% curves and 50% straight stretches of highway, was \$3800.00/ kilometre in 1980 (Irvine 1980). Including installation and maintenance the cost increased to approximately \$6,000. Although the reflectors are effective only at night, the majority of deer-vehicle collisions occur

during that period which justifies their use.

6.4 Highway Lighting

The use of highway lighting to reduce deer-vehicle collisions has been controversial. A study performed by D. Reed in Colorado revealed that highway lighting did not affect location of deer crossings in that deer continued to cross at preferred locations when these locations were illuminated. It was found that a greater proportion of deer crossed in the highway lighting area after the study was begun and when lights were on than before the study was begun and the lights were off. The effect of increased visibility for drivers along lighted sections of highway is significant, although, studies have shown the overall road-kill frequency remains constant or increases.

6.5 Deer Warning Signs

Deer warning signs, erected to alert motorists to the increased probability of sighting animals and the need to react, are used extensively throughout the Castlegar Zone and B.C., however, the effectiveness of these signs is questionable. In a study of a symbol type of warning sign in California eleven of nineteen signed areas showed reductions, but in only two cases were they statistically significant (Mansfield and Miller 1975).

Lighted, animated signs were tested in Colorado. They were lighted or un-lighted during alternate weeks during the winter of 1972 and 1973. There was no statistical difference in crossings-per-kill ratios between on and off periods in either year of the study (Fojar et al. 1975).

Deer warning signs may be effective when used in conjunction with other methods of road-kill reduction such as reflectors, however, success may be marginal.

6.6 Deer Repellants

Many deer repellants have been tested over the years such as creosote, crankcase oil, fuel oil, kerosene, and butane-fed canons. Even hanging cloth bags containing bloodmeal to repel deer has been used. These various methods have proven ineffective and expensive. Commercial repellants were applied to vegetation and salt licks and proved ineffective and costly over long periods of time (Irvine 1980).

6.7 Salt Blocks

Salt blocks have been used in an attempt to attract deer away from salted highways during winter months. This method failed because highway salt was readily accessible and more abundant (Irvine 1980).

7.0 RECOMMENDATIONS

7.1 Blueberry/Paulson Highway 3

The majority of the road-kill reducing solutions available would be inappropriate for this segment of highway due to the length of the roadway and the absence of heavily used deer crossings where efforts could be concentrated. Deer-vehicle collisions occur throughout the entire length of the highway segment and, unfortunately, cannot be decreased economically.

Large deer crossing signs are posted facing west and east bound traffic between Nancy Greene Lake and Mud Lake which is precisely where a higher frequency of road-kills has occurred. Erecting reflectors within the 3 kilometre segment would decrease the number of road-kills up to 80% at an approximate cost of \$15,000 including installation and maintenance.

7.2 Nancy Greene/Trail Highway 3B

The same problem exists on this highway which exists on the Blueberry/Paulson. Road-kills occur along the entire length with no heavily used deer crossings. Deer warning signs are already in place where deer have been known to cross and/or where road-kills have occurred in the past and this is the only economical solution. Further monitoring of road-kills by highway crews may be helpful in determining hazardous deer crossings in the future.

7.3 Trail/Castlegar Highway 22

Trail/Castlegar Highway has the highest frequency of road-kills related to it's length in the Castlegar Zone. Although road-kills occur at various locations along the highway there is a concentration of kills from kilometre 10 through 13.

Deer warning signs are posted at the segment and have failed to decrease the number of deer-vehicle collisions.

Fencing would be an effective method of reducing the deer-vehicle collisions from 80-100% along the 3 kilometre section. The fencing could be constructed along the west side of the highway, thus maintaining the aesthetic values. The fence could be erected below the highway along the raised, northern portion, and erected along the ridge above the highway which parallels Birchbank Golf Course. The cost of fencing the 3 kilometre segment would be approximately \$81,000. A disadvantage of using fencing in this situation is deer would be denied access to the Columbia River which provides water.

A second alternative would be to erect reflectors along the segment. The cost would be considerably lower, although the varied terrain may render them ineffective because of deer standing above or below the reflected "optical fence".

Decreasing the amount of highway salting in the winter months would also be effective in reducing road-kills during the season when most kills occur.

7.4 Montrose/Meadows Highway 3B

Deer road-kills occurred at various locations along Highway 3B and no heavy concentrations of deer road-kills were found. A deer warning sign situation similar to Nancy Greene/Trail Highway is presently in use. Alternate road-kill reduction methods are not economically feasible, therefore, monitoring of road-kills by the highways crews should be continued. A high frequency of road-kills at specific locations in the future may justify erecting reflectors or fencing.

Roadkilled Deer In Castlegar Zone 1985

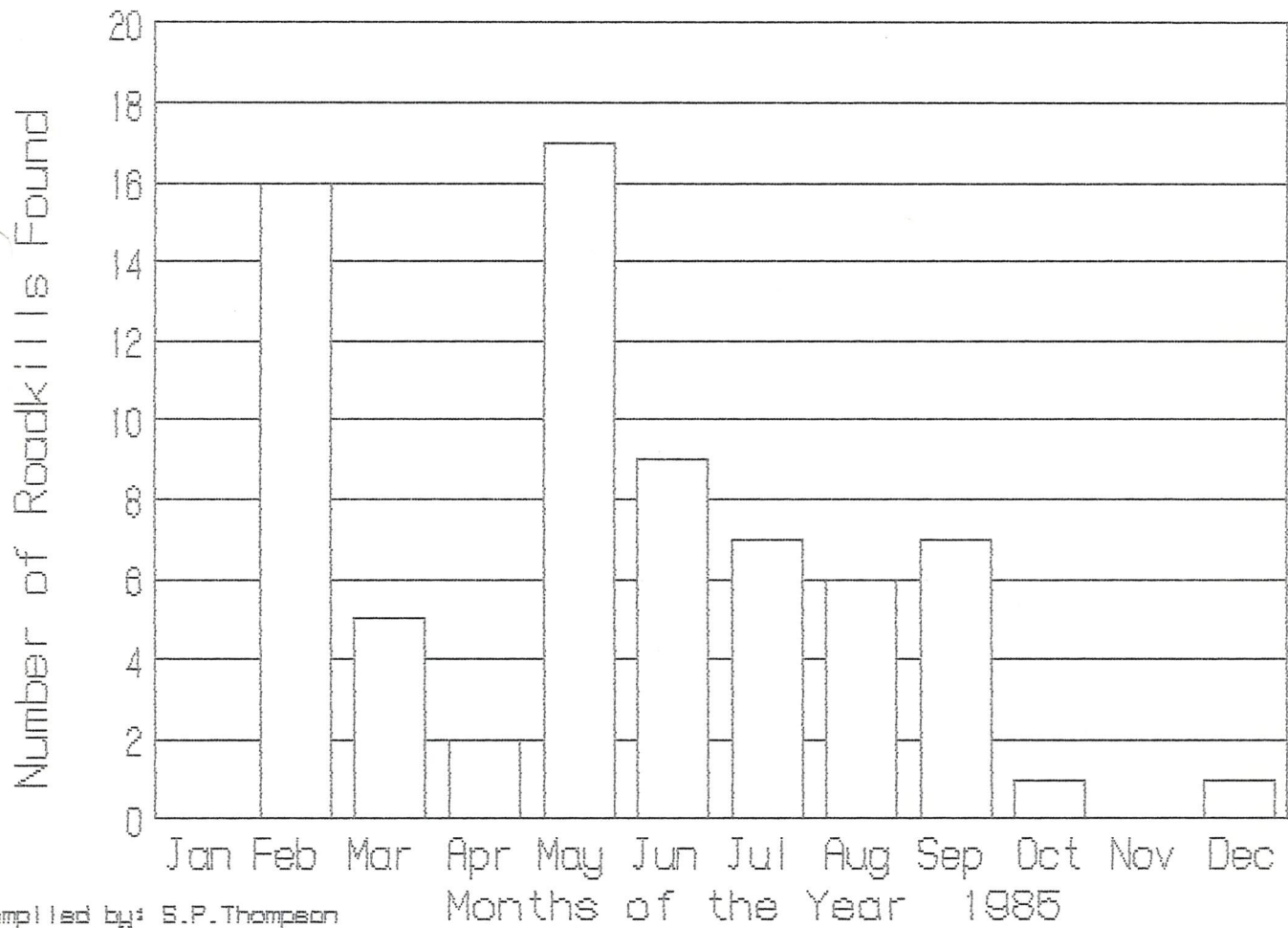


Figure 1.

Roadkilled Deer In Castlegar Zone 1986

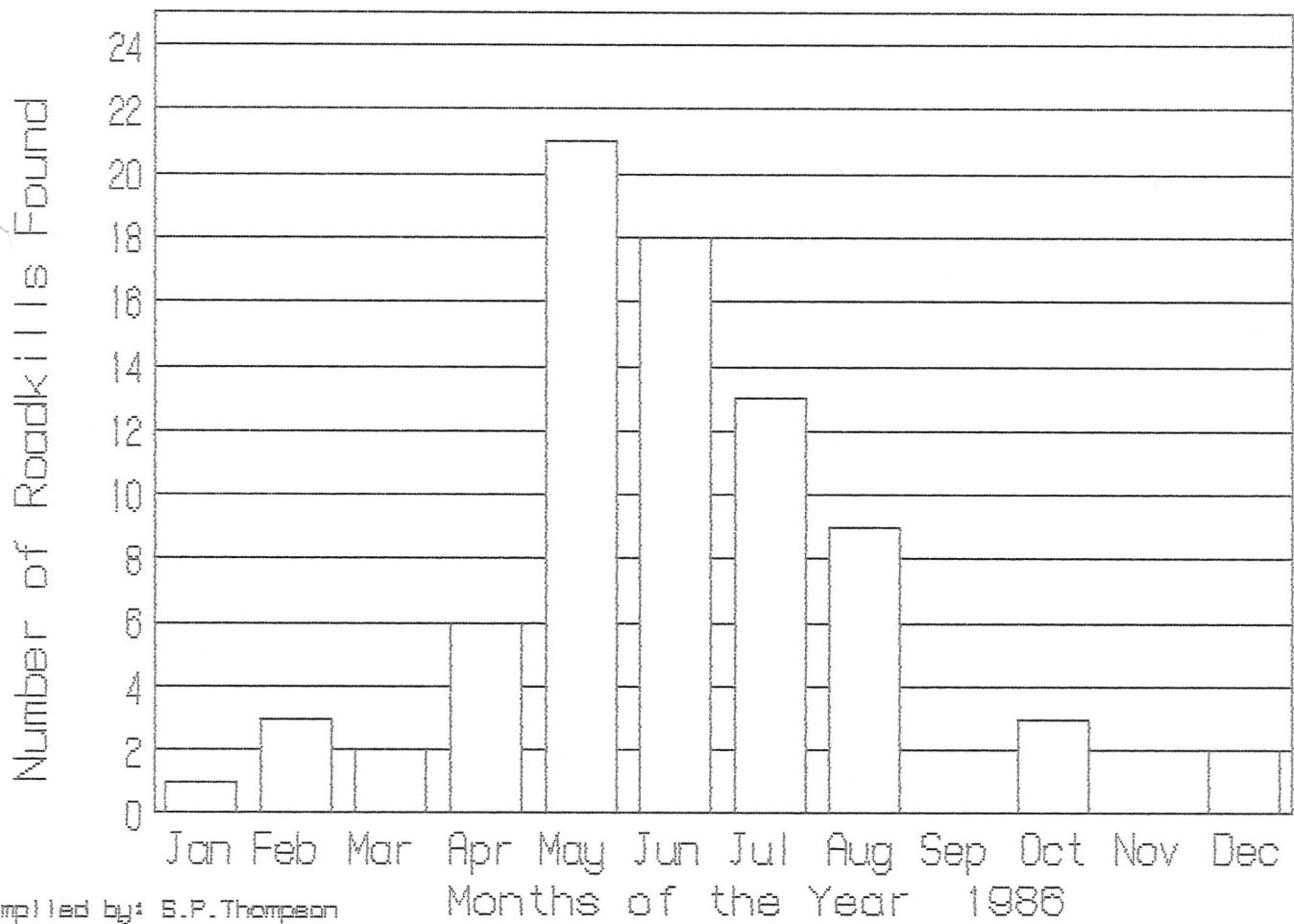
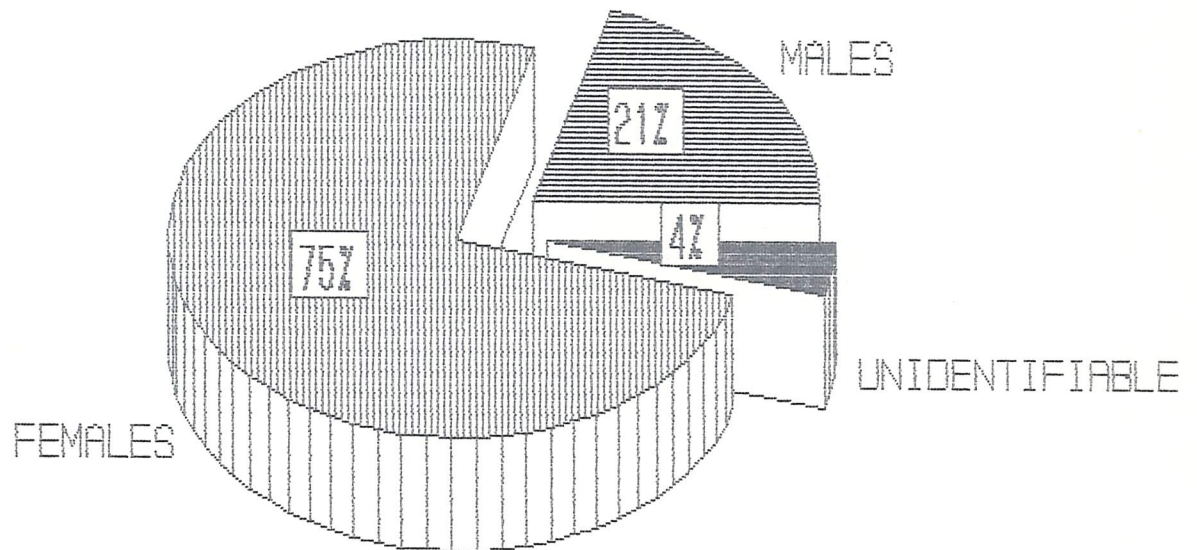


Fig. 2.

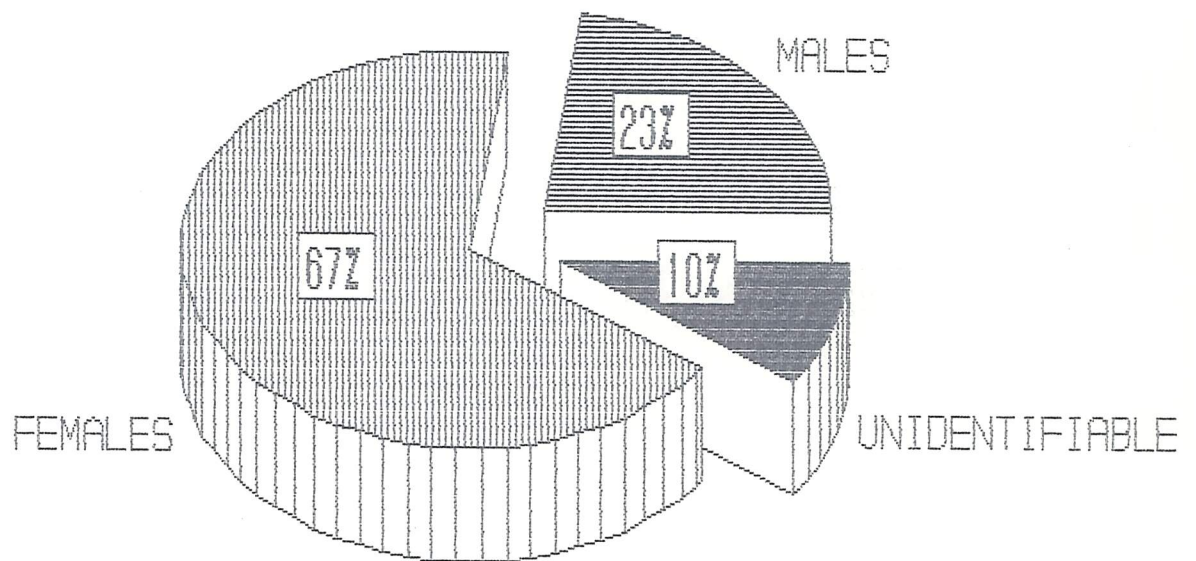
MALE/FEMALE ROADKILL PERCENTAGES 1985



compiled by: S.P. Thompson

Fig. 3.

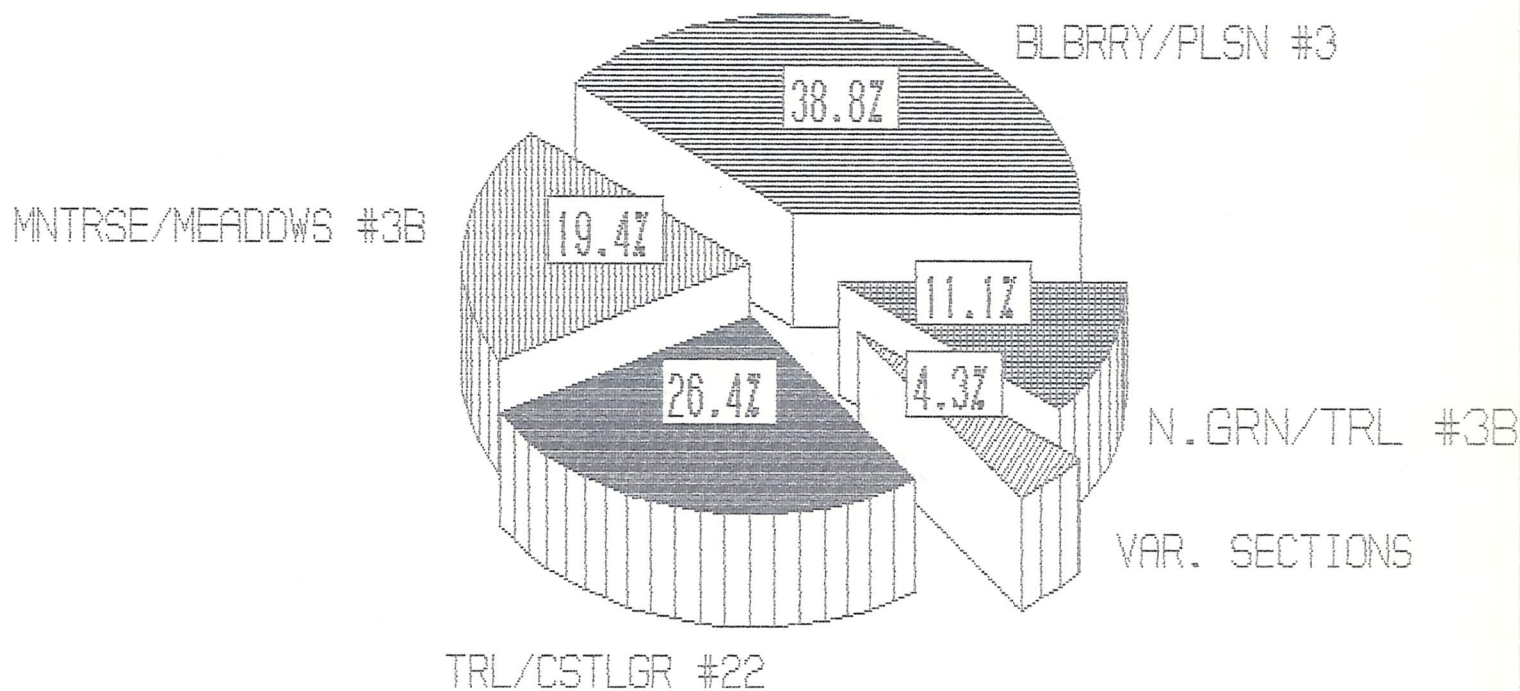
MALE/FEMALE ROADKILL PERCENTAGES 1986



compiled by: S.P. Thompson

Fig.4.

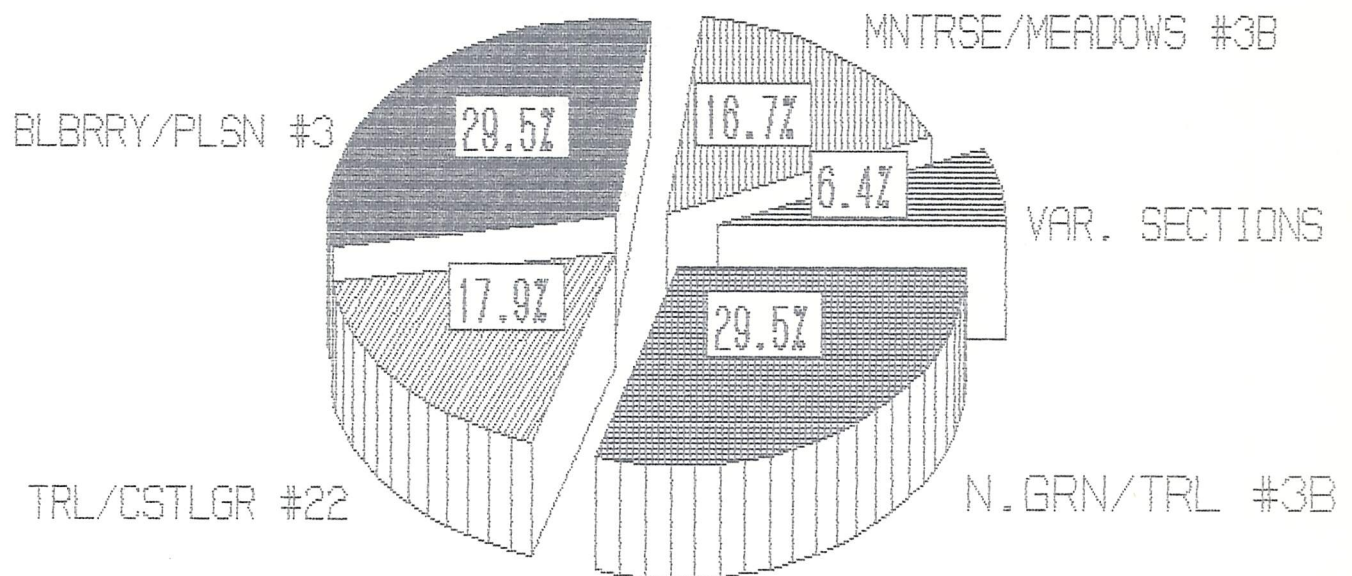
ROADKILL PERCENTAGES RELATED TO HIGHWAY SECTIONS 1985



compiled by: S.P. Thompson

Fig. 5.

ROADKILL PERCENTAGES RELATED TO HIGHWAY SECTIONS 1986

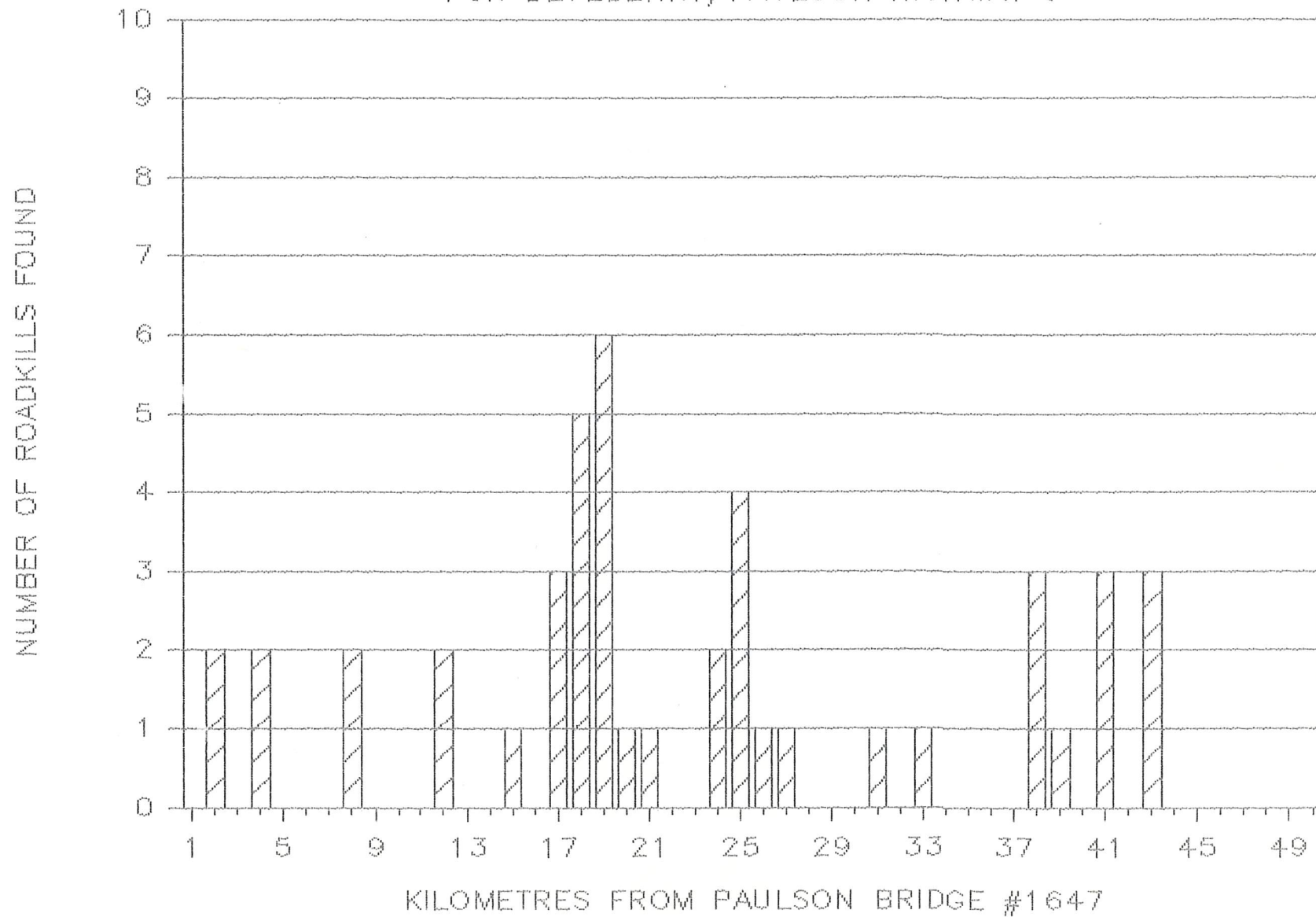


compiled by: S.P. Thompson

Fig. 6.

ROADKILL FREQUENCIES 1985-86

FOR BLUEBERRY/PAULSON HIGHWAY 3



ROADKILL FREQUENCIES 1985-86

RELATED TO SEASONS

BLUEBERRY/PAULSON HIGHWAY 3

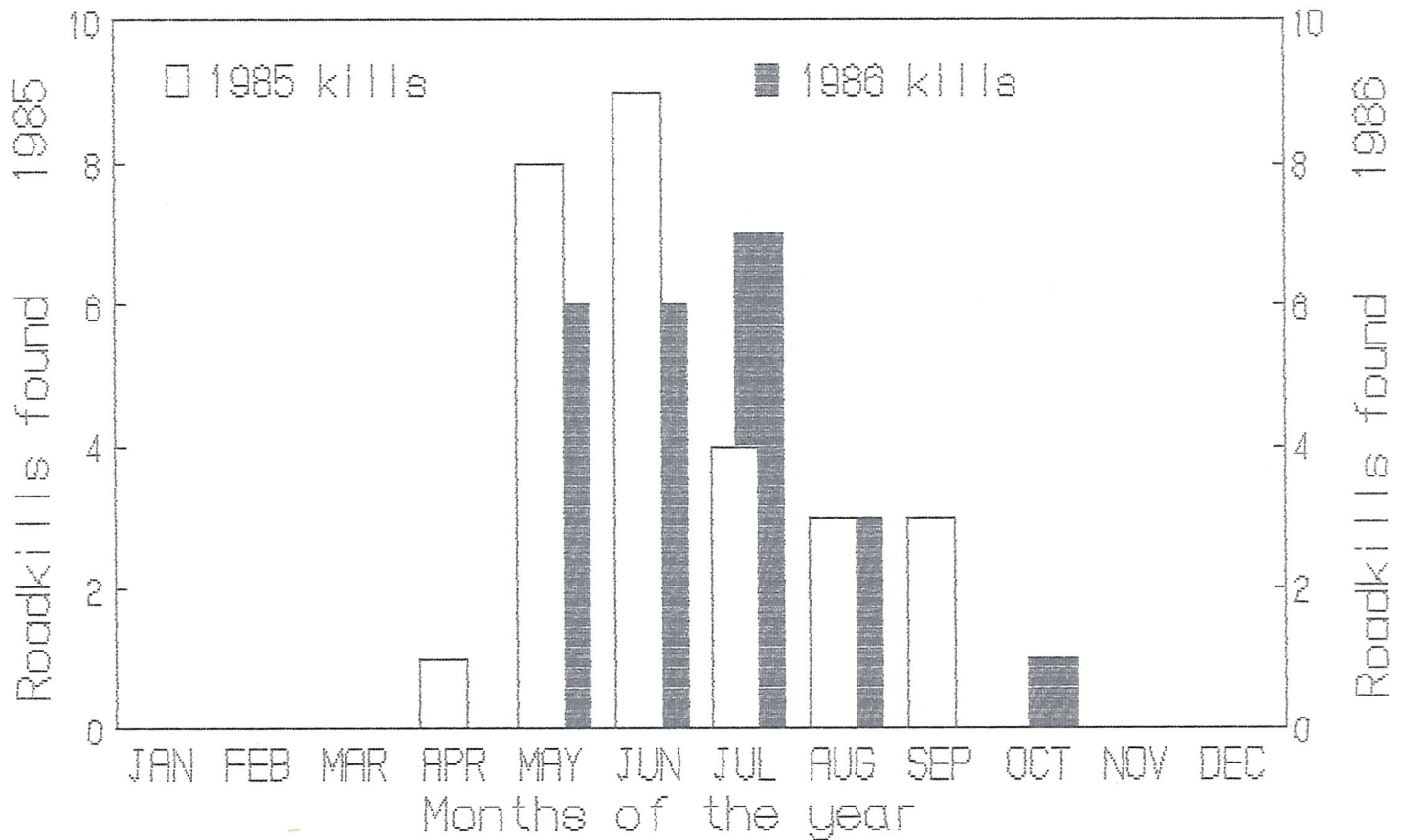
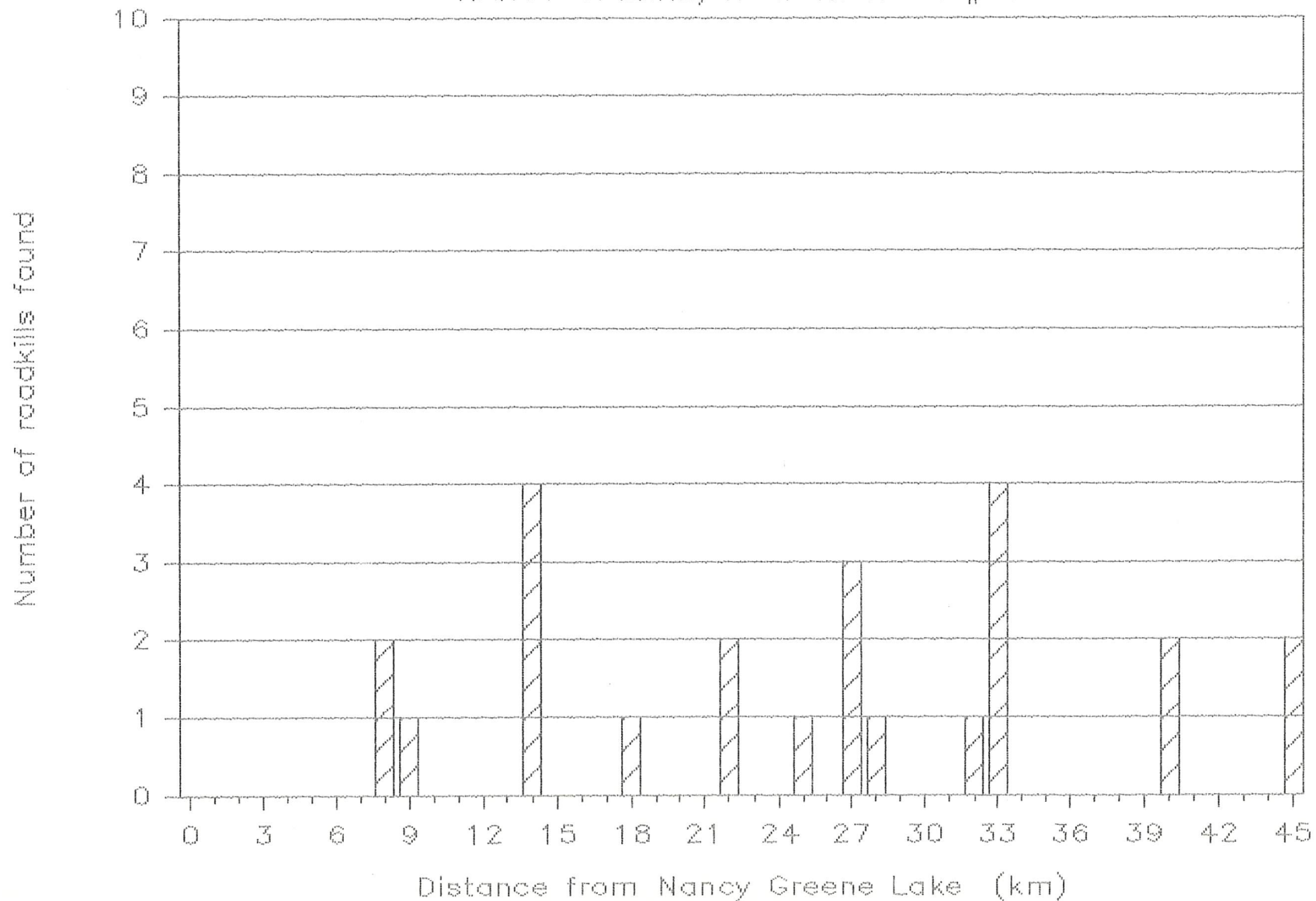


Fig. 8.

ROADKILL FREQUENCIES 1985-86

NANCY GREENE/TRAIL HIGHWAY #3B



ROADKILL FREQUENCIES 1985-86

RELATED TO SEASONS

N. GREENE/TRAIL HIGHWAY 3B

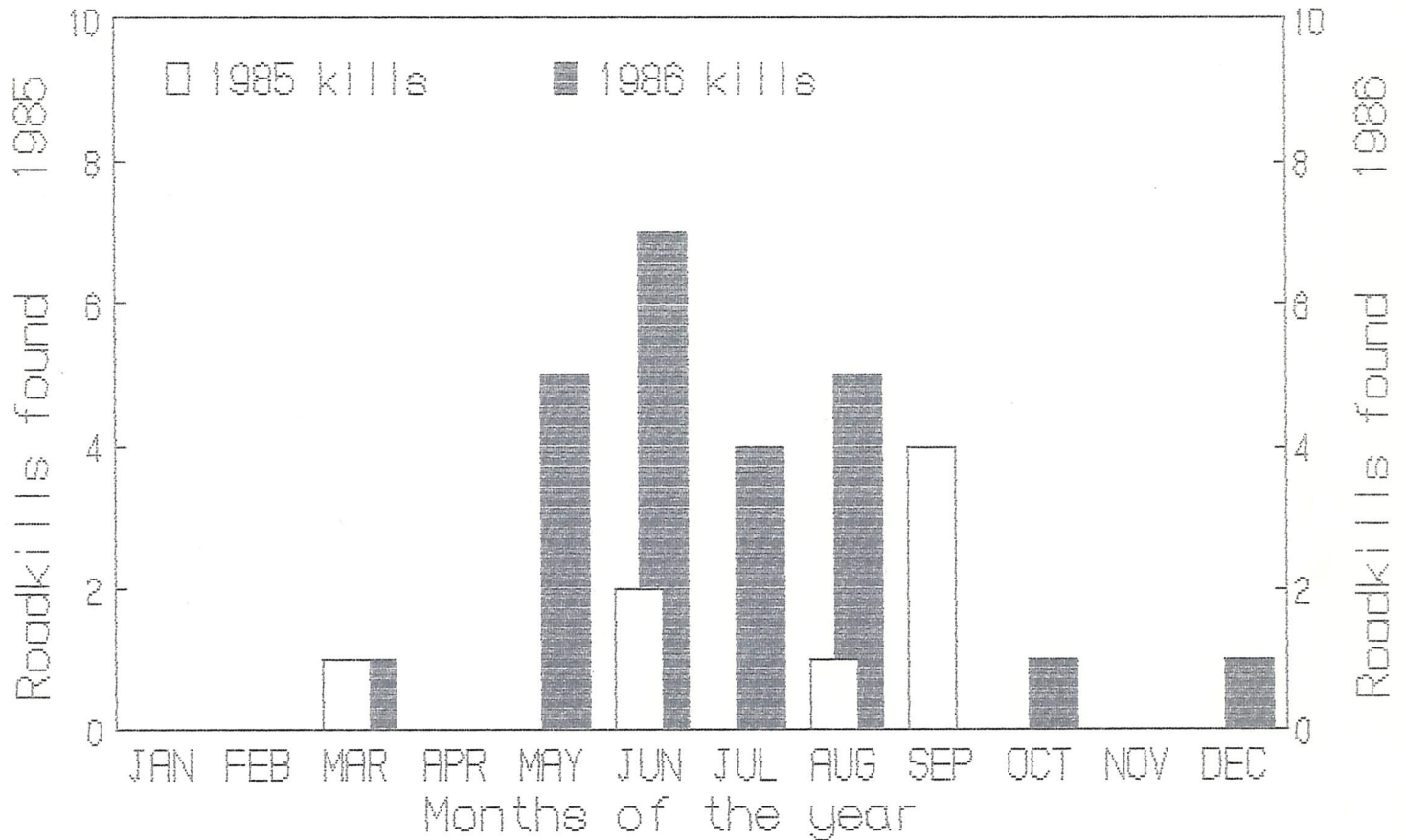


Fig. 10.

ROADKILL FREQUENCIES 1985-86

RELATED TO SEASONS

CASTLEGAR/TRAIL HIGHWAY 22

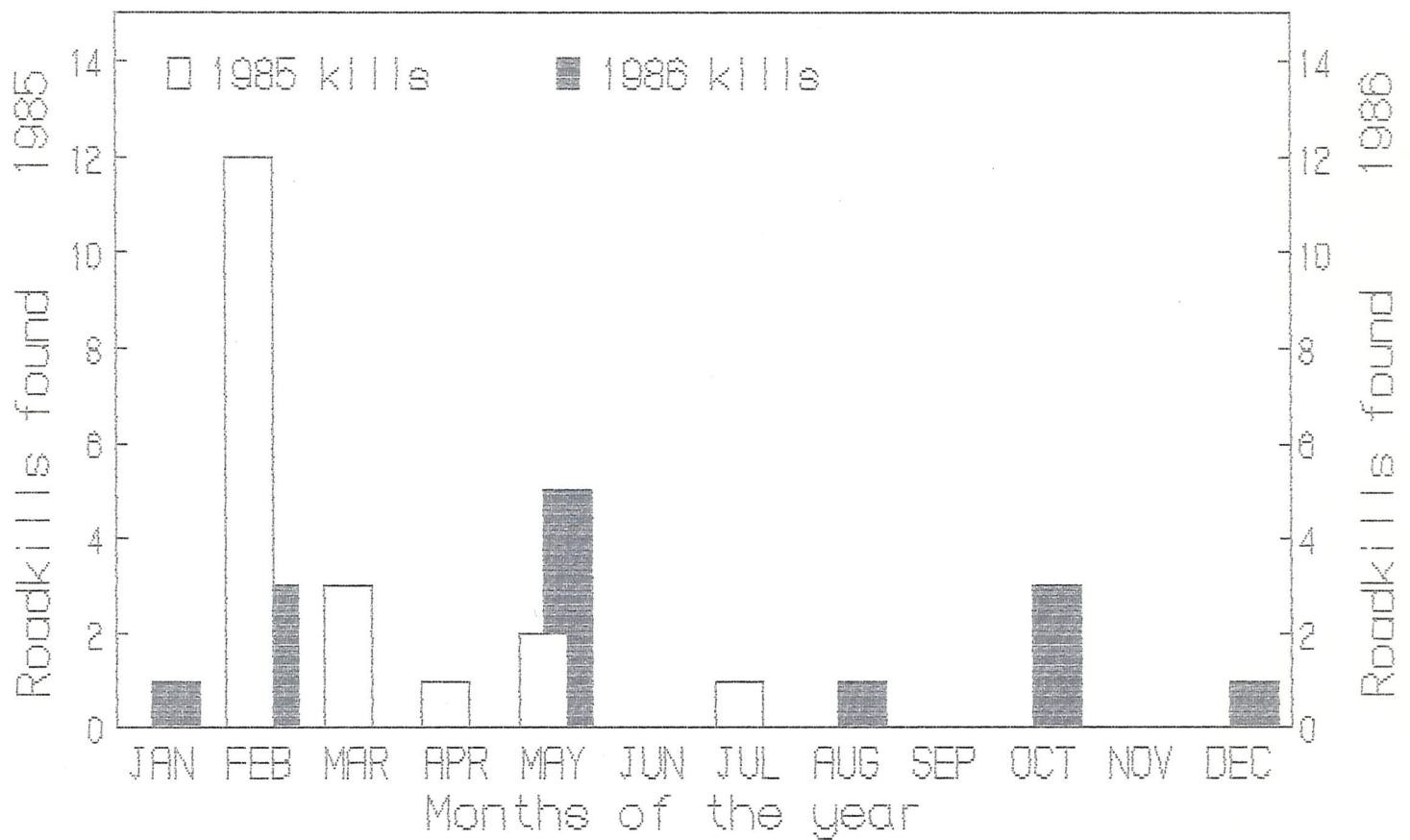


Fig. 11.

ROADKILL FREQUENCIES 1985-86

CASTLEGAR/TRAIL HIGHWAY 22

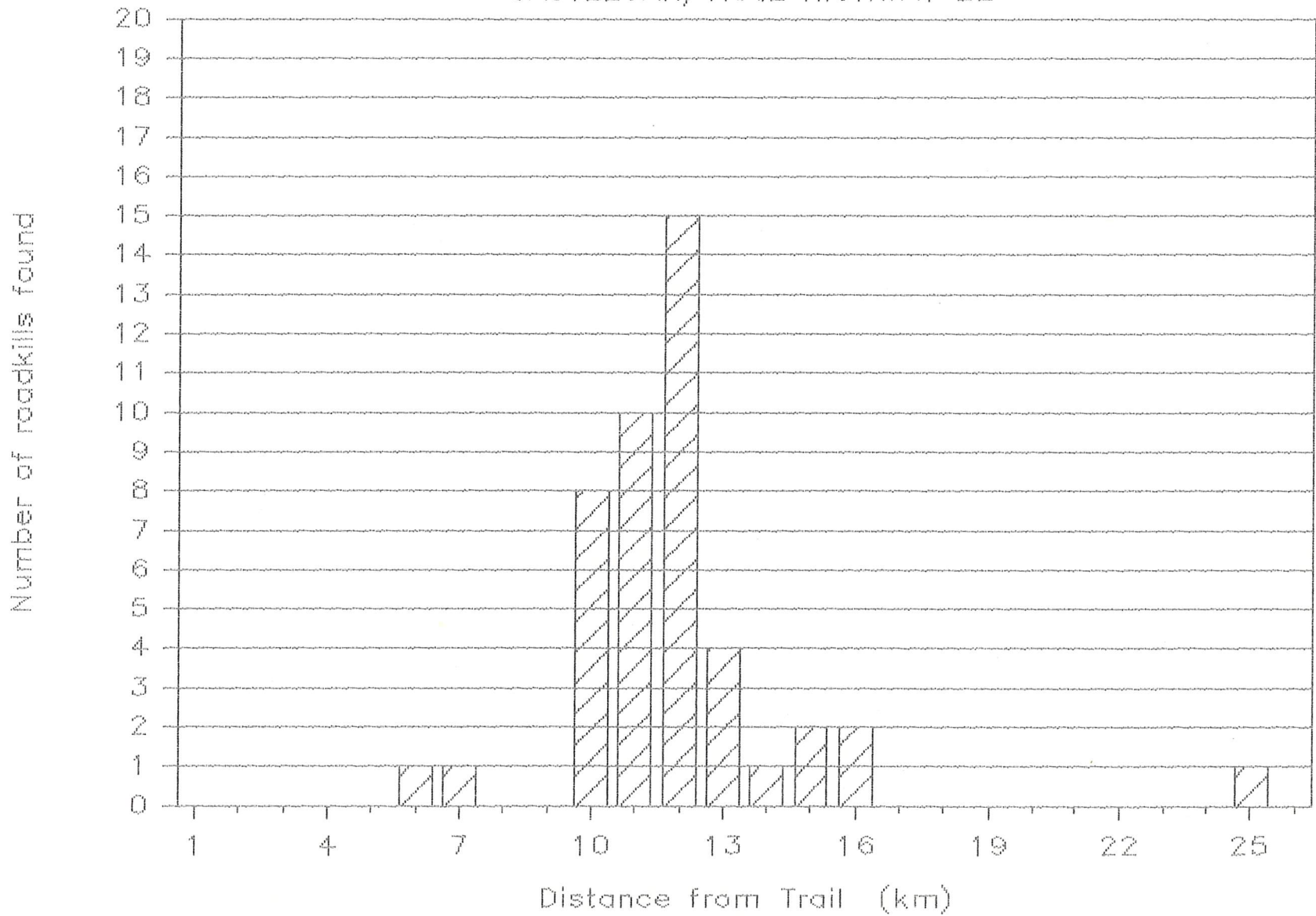


Fig. 12.

ROADKILL FREQUENCIES 1985-86

MONTROSE/MEADOWS HIGHWAY 3B

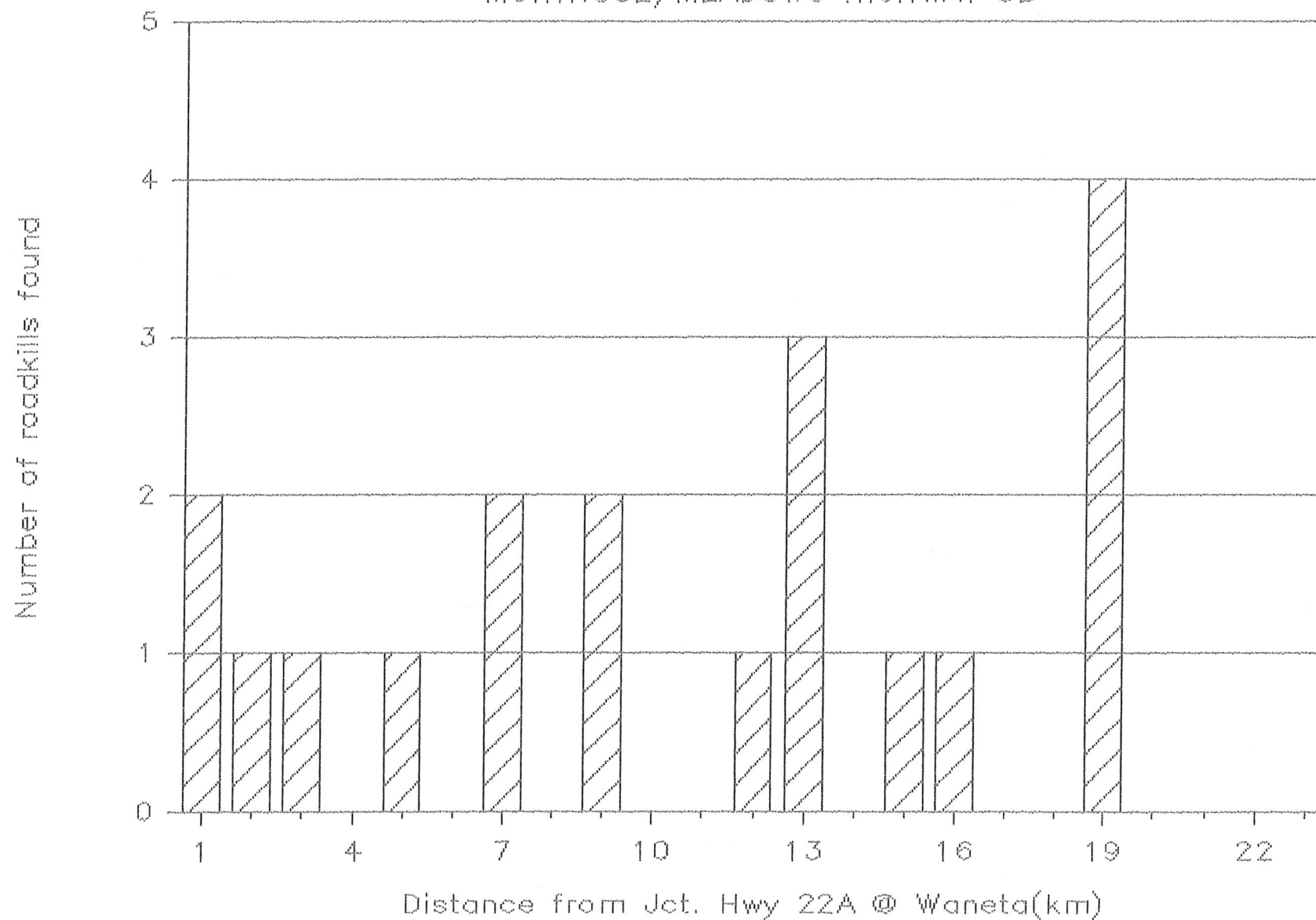


Fig. 13.

ROADKILL FREQUENCIES 1985-86

RELATED TO SEASONS

MONTROSE/MEADOWS HIGHWAY 3B

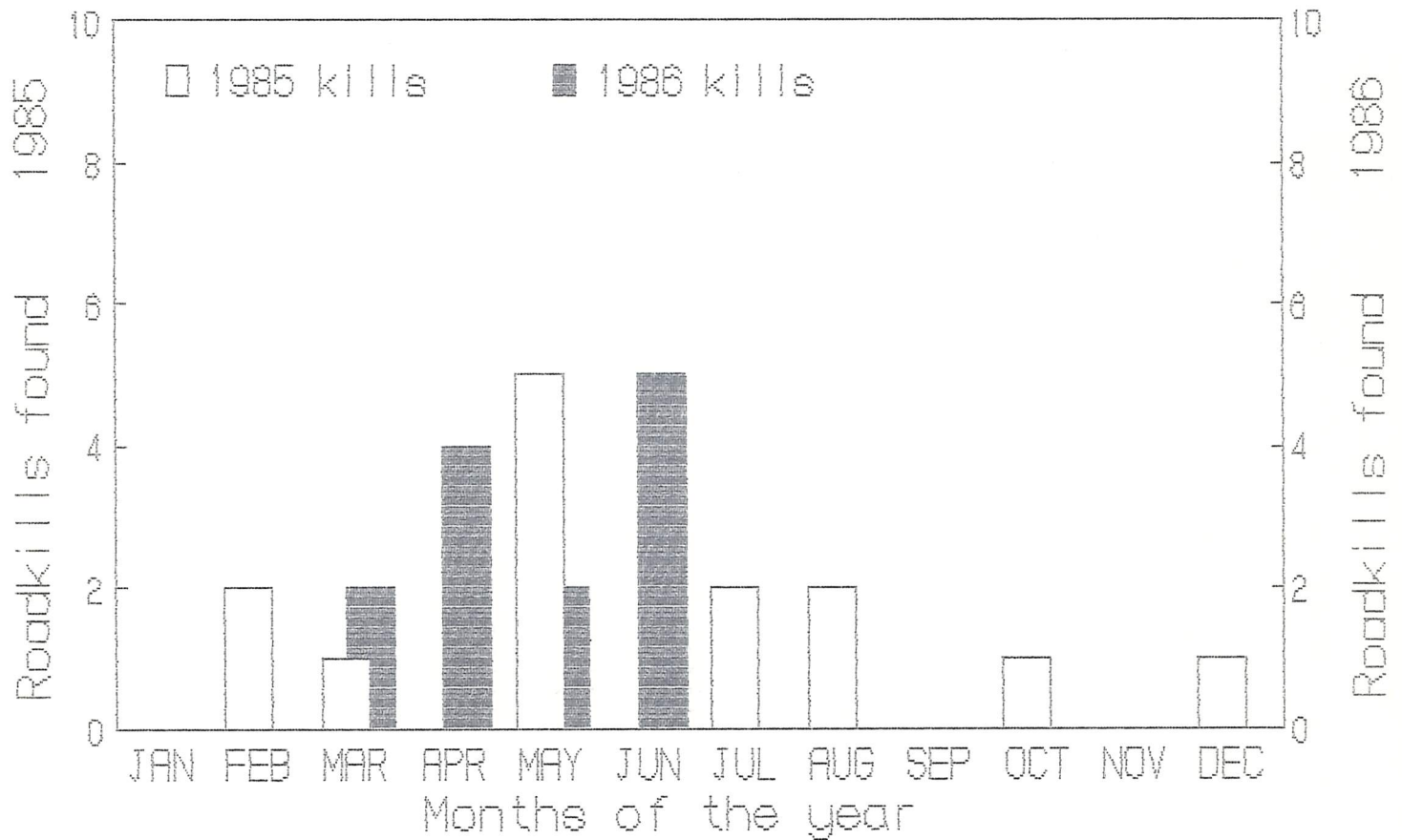


Fig. 14.

Table 1.

I.C.B.C. DEER-VEHICLE COLLISION CLAIMS 1985-86

1985	No. of Claims	Total Paid
Jan	20	\$10,953.00
Feb	39	\$27,881.00
Mar	38	\$17,678.00
Apr	30	\$16,495.00
May	30	\$23,069.00
Jun	30	\$25,015.00
Jul	39	\$25,277.00
Aug	37	\$22,999.00
Sep	38	\$18,933.00
Oct	42	\$25,182.00
Nov	25	\$16,174.00
Dec	40	\$40,055.00
Total	408	\$269,711.00
1986		
Jan	27	\$14,134.00
Feb	37	\$13,700.00
Mar	32	\$17,369.00
Apr	38	\$20,184.00
May	32	\$24,190.00
Jun	48	\$31,740.00
Jul	54	\$29,796.00
Aug	39	\$25,343.00
Sep	54	\$30,958.00
Oct	43	\$13,554.00
Nov	31	\$18,252.00
Dec	42	\$12,980.00
Total	477	\$252,200.00
Total 1985-86	885	\$521,911.00

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APPENDICES



Appendix 1. Kootenay Region

CIRCLE MONTH (enter below)
Jan., Feb., Mar., Apr., May, June,
July, Aug., Sept., Oct., Nov., Dec.

ANIMAL KILL MONTHLY REPORT

REGION #3

DISTRICT ROSSLAND

MONTH	LOCATION (Highway)					WILDLIFE SIGN (Yes or No)	REFLECTORS (Yes or No)	WILDLIFE A - adult - Y - young														COMMENTS	
	NAME	NO.	SEG.	KM	Nearest Town			Deer		Moose		Elk		Bear		Sheep		Cariboo		Coyote	Bobcat		Porcupine
								M	F	U	M	F	U	M	F	U	M	F	U				
April	Fruitvale/Montrose	3B	1350		Fruitvale	No	No	X															
April	Fruitvale/Montrose	3B	1350		Montrose	No	No	X															
April	Fruitvale/Montrose	3B	1350		Montrose	No	No	X															
April	Fruitvale/Montrose	3B	1350		Montrose	No	No		X														
April	Castlegar/Meadows	3		16	Castlegar	No	No	X															
April	Castlegar/Nelson	3A		2	Castlegar	No	No		X														
April	Castlegar/Trail	22		2	Castlegar	No	No	X															
April	Ootischenia Flyover	3A		1	Castlegar	No	No		X														
April	Blueberry Paulson	3		14	Castlegar	Yes	No	X															
April	Blueberry Paulson	3		18	Castlegar	Yes	No		X														
April	Rossland/Paterson	22	1342	0	Paterson	No		X															
April	Castlegar	3	1355	18	Castlegar	No			X														
April	Meadows	3	1355	18	Castlegar	No			X														
April	Paulson	3	1330	55	Castlegar	No			X														
April	Trail/Castlegar	22	1340	8	Trail	No			X														

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