



BRITISH  
COLUMBIA

Ministry of  
Transportation

# WARS 2000

## Wildlife Accident Reporting System

2000 Annual Report

(1991 to 2000 Synopsis)

### **Ministry of Transportation**

Engineering Branch

Environmental Management Section

940 Blanshard Street

PO BOX 9850 STN PROV GOVT

Victoria, British Columbia V8W 9T5



# WARS Wildlife Accident Reporting System

## 2000 Annual Report

### TABLE OF CONTENTS

<b>INTRODUCTION.....</b>	<b>1</b>
OVERVIEW .....	1
METHODOLOGY .....	1
REPORTING .....	6
ASSUMPTIONS AND CONSTRAINTS .....	6
DATA QUALITY .....	6
WARS ENHANCEMENTS.....	7
REGION AND DISTRICT BOUNDARY CHANGES .....	7
<b>WILDLIFE-RELATED MOTOR VEHICLE ACCIDENT FACTORS .....</b>	<b>8</b>
<b>REGIONAL AND DISTRICT ACCIDENT STATISTICS .....</b>	<b>9</b>
OVERVIEW .....	9
REGIONAL COMPARISONS .....	9
DISTRICT COMPARISONS .....	12
HIGHWAY COMPARISONS WITHIN DISTRICTS .....	13
<b>WILDLIFE ACCIDENT LOCATIONS .....</b>	<b>21</b>
WILDLIFE ACCIDENT LOCATION REPORTING .....	21
WILDLIFE ACCIDENT LOCATION RANKINGS BY SPECIES .....	21
WILDLIFE ACCIDENT LOCATIONS BY SPECIES MAPS .....	21
<b>WILDLIFE SPECIES ACCIDENT SUMMARIES .....</b>	<b>38</b>
ACCIDENT RATES BY SPECIES .....	38
<b>WILDLIFE VEHICLE ACCIDENT MITIGATION METHODS .....</b>	<b>60</b>
OVERVIEW .....	60
HABITAT MODIFICATION.....	60
EXCLUSION FENCING .....	60
WILDLIFE WARNING SIGNS.....	62
WILDLIFE WARNING REFLECTORS .....	64
WILDLIFE WARNING REFLECTOR INSTALLATION CASE STUDIES.....	65
<i>a) Highway 3 (Segment 1325)</i> .....	65
<i>b) Highway 3 (Segment 1375)</i> .....	65
SPECTROMETRIC EVALUATION OF WILDLIFE WARNING REFLECTORS.....	67
<b>COST OF WILDLIFE-RELATED MOTOR VEHICLE ACCIDENTS.....</b>	<b>68</b>
WILDLIFE-RELATED MOTOR VEHICLE ACCIDENTS.....	68

REPORTED ACCIDENTS.....	68
UNREPORTED ACCIDENTS.....	69
ACCIDENT CLEAN-UP.....	70
LOST PROVINCIAL HUNTING LICENSE REVENUES .....	70
LOST VALUE OF WILDLIFE .....	71
LOST VALUE OF WILDLIFE FOR RESIDENT AND NON-RESIDENT HUNTERS .....	71
LOST VALUE OF WILDLIFE FOR NON-HUNTING RESIDENTS .....	73
<b>REFERENCES.....</b>	<b>74</b>

**LIST OF TABLES**

	<b>Page</b>
Table 1. Wildlife-Related Motor Vehicle Accident Factors .....	8
Table 2. Wildlife Accidents in B.C. (1991 to 2000) .....	9
Table 3. Wildlife Accidents by Region (1991 to 2000) .....	10
Table 4. Regional Wildlife Accident Comparisons (1991 to 2000).....	10
Table 5. Annual District Wildlife Accident Comparisons .....	12
Table 6. Annual Wildlife Accident Variation by District .....	13
Table 7. Wildlife Accidents by District and Highway (1991 to 2000).....	14
Table 8. Top Ten Wildlife Accident Location Rankings by Species (1991 to 2000).....	22
Table 9. Wildlife Accidents by Species (2000).....	38
Table 10. Wildlife Accidents by Province, Regional and District by Known Species (2000) .....	39
Table 11. Total Annual Number of Animals Killed by Species (1991 to 2000).....	40
Table 12. Total Monthly Distribution of Wildlife Accidents by Known Species (1991 to 2000).....	41
Table 13. Locations of Wildlife Exclusion Fencing.....	61
Table 14. Hourly Distribution of Animal Collisions in Southern Interior of B.C. ....	67
Table 15. Wildlife-related Fatal, Injury and Property Damage Only Accidents (1987 to 1995).....	68
Table 16. ICBC Wildlife-related Motor Vehicle Accident Claims (1997 to 2000) .....	69
Table 17. Societal Costs of Motor Vehicle Accidents (BCTFA).....	69
Table 18. Provincial Hunting License Fees for Residents and Non-residents .....	71
Table 19. Resident and Non-resident Hunters Net Value to B.C.....	72
Table 20. Rocky Mountain Elk Foundation Elk and Bighorn Sheep Tag Auction Results.....	73

**LIST OF FIGURES**

	<b>Page</b>
Figure 1. Wildlife Accidents (1991 to 2000).....	9
Figure 2. Total Monthly Wildlife Accidents by Region (1991 to 2000) .....	11
Figure 3. Total Monthly Wildlife Accidents by Species .....	42
Figure 4. Total Monthly Moose, Elk, Coyote and Porcupine Accidents (1991 to 2000).....	43
Figure 5. Total Monthly Deer Accidents by Sex .....	46
Figure 6. Total Monthly Deer Accidents by Age .....	47
Figure 7. Total Monthly Moose Accidents by Sex .....	48

Figure 8. Total Monthly Moose Accidents by Age .....	49
Figure 9. Total Monthly Elk Accidents by Sex .....	50
Figure 10. Total Monthly Elk Accidents by Age.....	51
Figure 11. Total Monthly Bear Accidents by Sex .....	52
Figure 12. Total Monthly Bear Accidents by Age.....	53
Figure 13. Total Monthly Coyote Accidents by Sex .....	54
Figure 14. Total Monthly Coyote Accidents by Age.....	55
Figure 15. Total Monthly Sheep Accidents by Sex .....	56
Figure 16. Total Monthly Sheep Accidents by Age .....	57
Figure 17. Total Monthly Porcupine Accidents by Sex.....	58
Figure 18. Total Monthly Porcupine Accidents by Age .....	59
Figure 19. Wildlife Warning Signs.....	63

### LIST OF MAPS

	Page
Map 1. Numbered Highways in British Columbia.....	2
Map 2. Transportation Regions and Major Highways of British Columbia .....	3
Map 3. Regional and District Boundary .....	4
Map 4. Road and Bridge Maintenance Service Areas.....	5
Map 5. Total Deer Accidents (1991 - 2000) .....	24
Map 6. Deer Accidents / km / year (1991 - 2000) .....	25
Map 7. Total Moose Accidents (1991 - 2000) .....	26
Map 8. Moose Accidents / km / year (1991 - 2000) .....	27
Map 9. Total Elk Accidents (1991 - 2000) .....	28
Map 10. Elk Accidents / km / year (1991 - 2000) .....	29
Map 11. Total Bear Accidents (1991 - 2000) .....	30
Map 12. Bear Accidents / km / year (1991 - 2000) .....	31
Map 13. Total Coyote Accidents (1991 - 2000) .....	32
Map 14. Coyote Accidents / km / year (1991 - 2000) .....	33
Map 15. Total Sheep Accidents (1991 - 2000) .....	34
Map 16. Sheep Accidents / km / year (1991 - 2000) .....	35
Map 17. Total Porcupine Accidents (1991 - 2000) .....	36
Map 18. Porcupine Accidents / km / year (1991 - 2000) .....	37

**APPENDIX A**

Wildlife Accident Reporting System (WARS) form H-107 (2001/06)

**APPENDIX B**

Ministry Maintenance Contract Areas

**APPENDIX C**

Wildlife Warning Reflector Installations (April 2001)

## WILDLIFE SPECIES ACCIDENT SUMMARIES

### Accident Rates by Species

In 2000, approximately 80% of the wildlife-vehicle accidents recorded on British Columbia numbered highways involved deer. Of the remaining reported accidents; moose were involved in over 6%, elk were involved in over 3%, bears were involved in 2%, coyotes were involved in over 2%, and all other wild animals, ranging from badgers to wolves, made up the remaining 7% (Table 9). The entire record for the 4,768 wild animals of known species reported for all regions and districts is listed in Table 10. Comparisons between 1991 and 2000 accidents are shown in Table 11.

Trends appear when the monthly distribution of wildlife-vehicle accidents for all species is compared for each Region (Table 12). When all records for the period between 1991 and 2000 are compared, the accident rate for all Regions peaks in May and November (Figure 3). Since deer represent approximately 80% of the wildlife killed on provincial highways, the general trend parallels the trend found for deer. The high numbers of deer killed obscures the trends for other species (Figure 4).

**Table 9. Wildlife Accidents by Species (2000)**

Species	Number	%
badger	2	0.04
bear	101	2.12
beaver	19	0.40
bobcat	4	0.08
caribou	3	0.06
cougar	2	0.04
coyote	105	2.20
deer	3,836	80.45
eagle	1	0.02
elk	167	3.50
fox	14	0.29
horned owl	2	0.04
lynx	1	0.02
moose	323	6.77
muskrat	3	0.06
otter	2	0.04
porcupine	40	0.84
rabbit	6	0.13
raccoon	51	1.07
sheep	15	0.31
skunk	10	0.21
other	61	1.28
<b>Total</b>	<b>4768</b>	<b>100.00</b>

Table 10. Wildlife Accidents by Province, Region and District by Known Species (2000)

A) Provincial Distribution																								
		all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
Totals		4707	3	100	19	4	3	4	103	3836	1	167	14	2	1	323	9	2	34	6	51	15	10	0
B) Regional Distribution																								
Region		all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
1		255	0	10	3	0	0	0	39	183	0	0	0	0	0	2	1	1	0	0	15	0	1	0
2		909	1	28	4	4	0	0	26	789	0	3	5	0	0	27	0	0	3	0	3	12	4	0
3		1453	1	15	1	0	0	1	13	1252	1	130	0	1	0	21	2	0	1	2	4	3	5	0
4		916	1	15	1	0	0	2	19	625	0	18	5	0	1	227	0	0	1	1	0	0	0	0
5		197	0	26	4	0	3	0	5	72	0	0	4	1	0	46	6	0	29	0	1	0	0	0
6		977	0	6	6	0	0	1	1	915	0	16	0	0	0	0	0	1	0	3	28	0	0	0
C) District Distribution																								
Region	District	all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
1	4	127	0	4	0	0	0	0	5	106	0	0	0	0	0	0	1	1	0	0	9	0	1	0
1	6	38	0	0	1	0	0	0	17	14	0	0	0	0	0	0	0	0	0	0	6	0	0	0
1	7	90	0	6	2	0	0	0	17	63	0	0	0	0	0	2	0	0	0	0	0	0	0	0
2	8	294	0	3	1	0	0	0	7	271	0	3	0	0	0	0	0	0	1	0	0	7	1	0
2	13	191	0	6	2	0	0	0	3	172	0	0	0	0	0	5	0	0	1	0	1	0	1	0
2	14	84	1	7	0	1	0	0	6	60	0	0	1	0	0	5	0	0	1	0	2	0	0	0
2	15	116	0	8	1	0	0	0	5	98	0	0	0	0	0	1	0	0	0	0	0	3	0	0
2	17	224	0	4	0	3	0	0	5	188	0	0	4	0	0	16	0	0	0	0	0	2	2	0
3	9	533	0	1	0	0	0	1	2	520	1	1	0	0	0	1	0	0	1	0	3	0	2	0
3	10	214	0	5	0	0	0	0	5	189	0	11	0	0	0	3	0	0	0	0	1	0	0	0
3	11	639	1	4	1	0	0	0	2	491	0	115	0	1	0	14	2	0	0	2	0	3	3	0
3	12	67	0	5	0	0	0	0	4	52	0	3	0	0	0	3	0	0	0	0	0	0	0	0
4	18	138	1	0	0	0	0	2	0	112	0	0	0	0	1	22	0	0	0	0	0	0	0	0
4	19	56	0	4	0	0	0	0	1	19	0	1	3	0	0	28	0	0	0	0	0	0	0	0
4	20	166	0	8	1	0	0	0	6	87	0	2	1	0	0	60	0	0	0	1	0	0	0	0
4	21	478	0	3	0	0	0	0	9	346	0	14	0	0	0	105	0	0	1	0	0	0	0	0
4	22	78	0	0	0	0	0	0	3	61	0	1	1	0	0	12	0	0	0	0	0	0	0	0
5	25	113	0	20	1	0	0	0	4	48	0	0	2	0	0	32	6	0	0	0	0	0	0	0
5	26	44	0	2	3	0	0	0	0	17	0	0	0	0	0	1	0	0	20	0	1	0	0	0
5	28	40	0	4	0	0	3	0	1	7	0	0	2	1	0	13	0	0	9	0	0	0	0	0
6	1	307	0	1	2	0	0	1	1	293	0	1	0	0	0	0	0	0	0	1	7	0	0	0
6	2	266	0	1	0	0	0	0	0	257	0	2	0	0	0	0	0	1	0	0	5	0	0	0
6	3	404	0	4	4	0	0	0	0	365	0	13	0	0	0	0	0	0	0	2	16	0	0	0



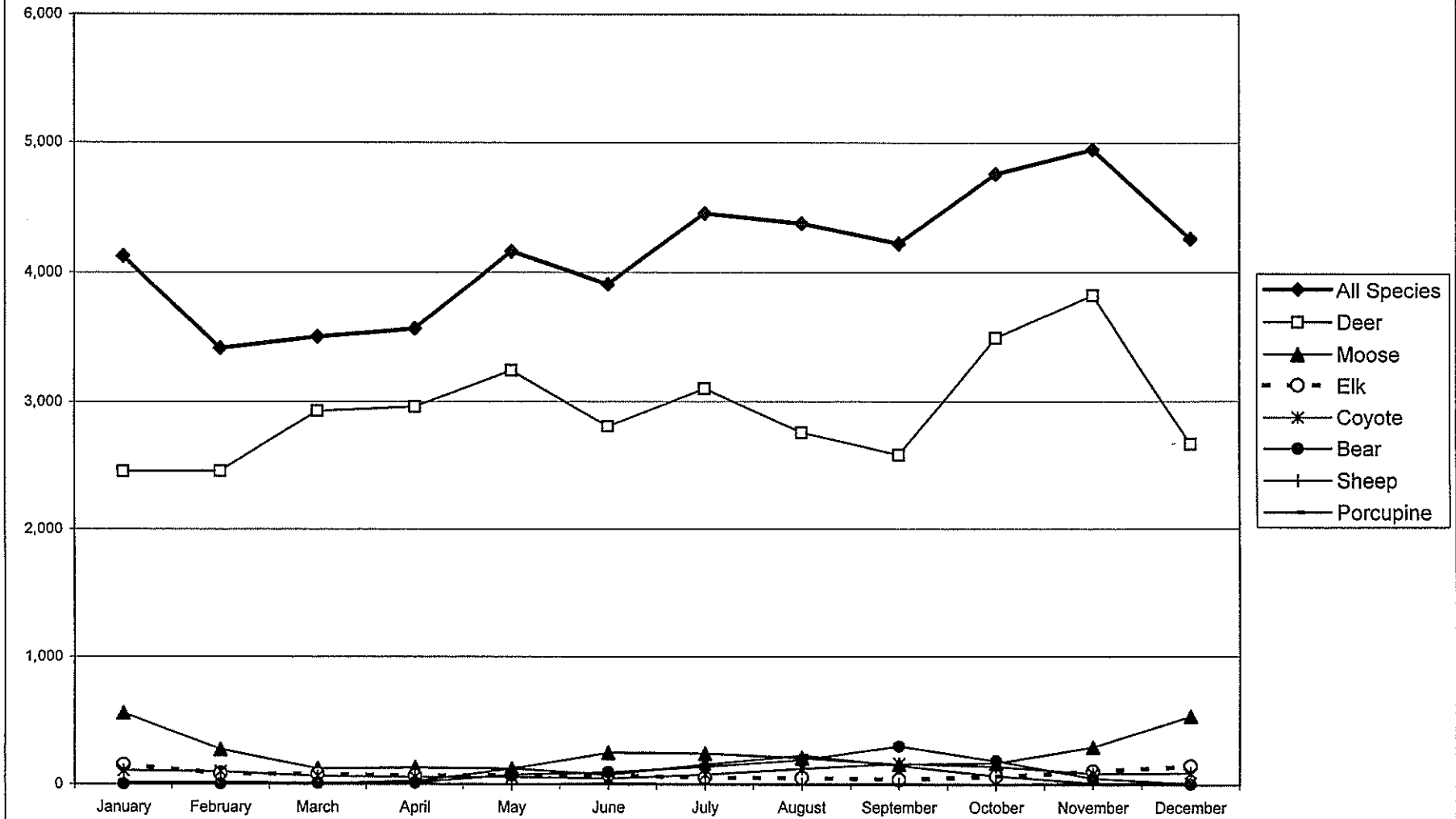
**Table 11. Total Annual Number of Animals Killed by Known Species (1991 to 2000)**

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
<b>all species</b>	<b>3,305</b>	<b>3,174</b>	<b>4,798</b>	<b>5,335</b>	<b>4,764</b>	<b>3,853</b>	<b>3,650</b>	<b>4,559</b>	<b>4,845</b>	<b>4,707</b>	<b>42,990</b>
badger	0	0	0	1	0	0	0	1	2	2	6
bear	56	71	112	109	108	104	88	139	166	101	1,054
beaver	4	4	11	9	13	7	13	9	9	19	98
bobcat	7	6	7	1	5	5	0	1	2	4	38
buffalo	0	0	1	0	0	0	0	0	0	0	1
caribou	6	8	0	0	9	4	2	3	0	3	35
cougar	0	1	2	7	1	3	2	0	4	2	22
coyote	48	119	165	134	129	97	90	134	89	105	1,110
deer	2,745	2,585	3,992	4,375	3,917	3,148	3,017	3,683	3,896	3,836	35,194
eagle	0	0	1	0	0	0	0	1	1	1	4
elk	59	63	75	120	93	104	77	103	127	167	988
fox	8	0	4	5	3	5	6	5	12	14	62
horned owl	0	0	1	3	0	0	1	3	4	2	14
lynx	0	0	0	0	1	0	0	0	0	1	2
marmot	0	0	0	0	2	0	0	0	0	0	2
marten	0	0	0	0	3	1	0	0	0	0	4
moose	183	196	271	405	367	283	250	361	411	323	3,050
muskrat	0	0	1	2	0	1	2	1	1	3	11
otter	1	0	0	0	1	0	0	0	2	2	6
porcupine	174	108	123	103	76	33	67	61	59	40	844
possum	0	0	0	25	5	3	0	0	0	0	33
rabbit	0	0	0	0	3	0	4	2	2	6	16
raccoon	7	3	10	8	5	40	21	36	46	51	227
sheep	5	8	14	22	10	10	6	13	9	15	112
skunk	0	1	6	5	8	3	1	1	0	10	35
wolf	2	1	2	1	5	2	3	2	3	0	21

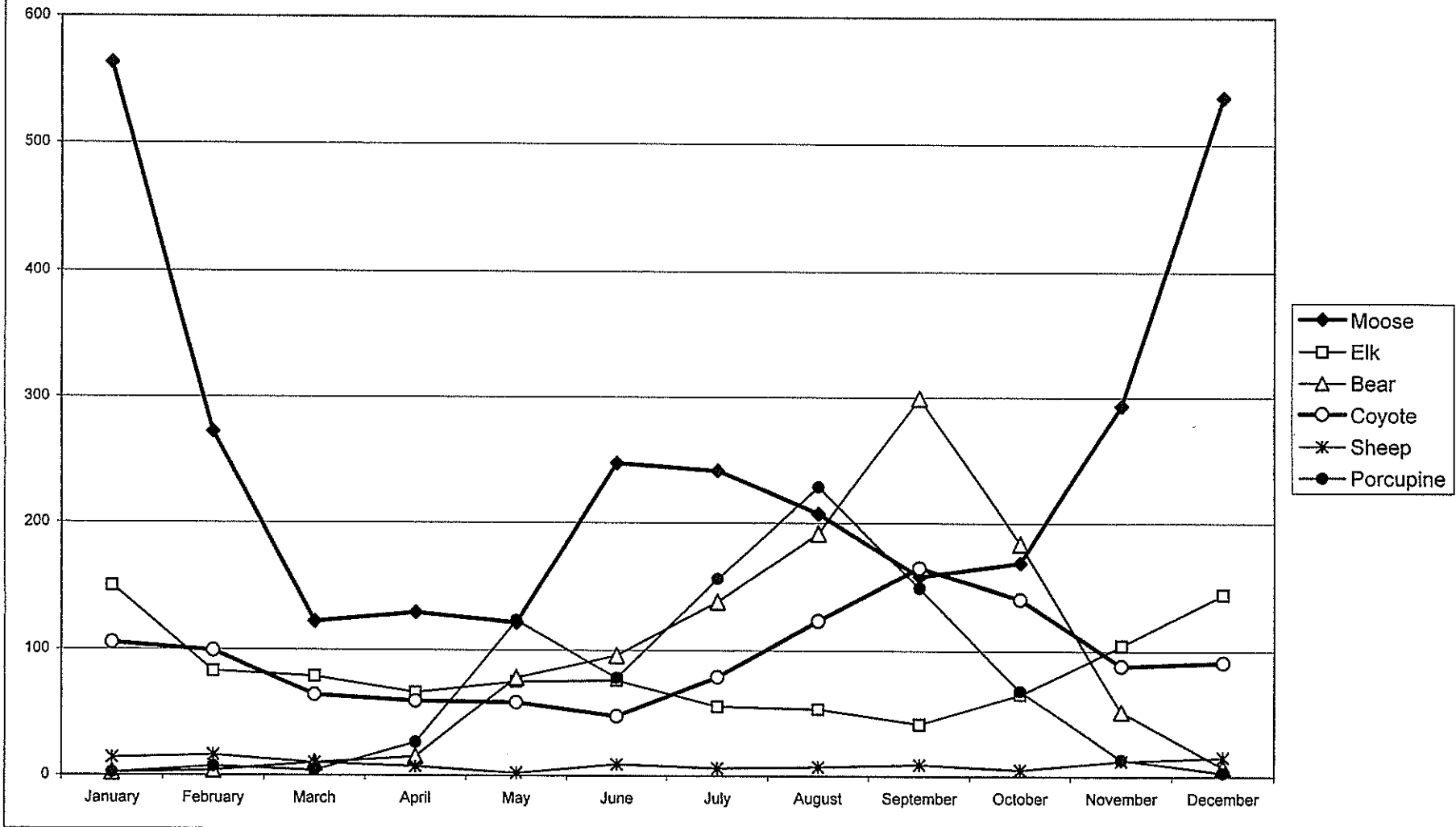
**Table 12. Total Monthly Distribution of Wildlife Accidents by Known Species (1991 to 2000)**

Species	January	February	March	April	May	June	July	August	September	October	November	December	Totals
<b>all species</b>	3,338	2,983	3,257	3,240	3,784	3,409	3,849	3,636	3,469	4,228	4,454	3,511	<b>43,158</b>
badger	0	0	0	0	1	0	2	0	1	0	1	0	5
bear	2	4	10	15	78	96	138	192	299	184	51	7	1,076
beaver	4	4	8	13	20	11	8	12	11	10	2	1	104
bobcat	13	4	1	4	4	0	3	2	2	2	2	1	38
caribou	5	1	1	0	5	2	1	1	4	6	11	5	42
cougar	1	1	4	1	2	2	2	0	0	1	5	1	20
coyote	105	99	64	59	58	47	79	123	165	140	88	91	1,118
deer	2,451	2,454	2,926	2,961	3,244	2,804	3,101	2,752	2,576	3,494	3,822	2,661	35,246
eagle	1	2	0	0	0	0	0	0	0	1	0	0	4
elk	150	83	79	0	75	76	55	53	41	65	104	144	925
fox	2	10	6	1	3	3	3	6	3	11	9	5	62
lynx	0	0	1	1	0	0	0	0	0	0	0	0	2
marmot	0	0	0	0	0	0	2	0	0	0	0	0	2
marten	0	0	0	2	0	2	0	0	0	0	0	0	4
moose	563	272	122	129	121	247	241	207	158	169	293	537	3,059
muskrat	2	3	3	2	0	0	1	0	0	0	0	0	11
otter	1	1	0	0	1	0	0	1	1	0	0	1	6
horned owl	0	0	0	2	0	0	0	5	1	1	1	1	11
porcupine	2	7	4	26	123	78	156	228	149	68	13	3	857
possum	2	1	1	1	11	6	3	1	0	4	1	2	33
rabbit	2	1	0	1	5	2	5	0	0	0	0	2	18
raccoon	10	10	6	3	21	16	20	25	28	48	26	19	232
sheep	14	16	10	7	2	9	6	7	9	5	12	15	112
skunk	0	1	1	3	1	5	6	5	9	3	0	1	35
wolf	0	3	2	2	0	1	1	0	2	3	2	5	21
other	8	6	8	7	9	2	16	16	10	13	11	9	115

**Figure 3. Total Monthly Wildlife Accidents by Species**  
(1991 - 2000)



**Figure 4. Total Monthly Accidents**  
**Moose, Elk, Bear, Coyote, Sheep and Porcupine**  
 (1991 - 2000)



When the accident patterns for deer, moose, elk, bear, coyote, sheep, and porcupine are examined, it is apparent the monthly accident distributions vary by species.

When deer accidents are evaluated by season and sex, female deer are involved in most accidents and these occur between March and May, and between October and November (Figure 5). The majority of bucks are killed between May and July and in November. The fall peak for both does and bucks is most likely related to the rutting season. When deer accidents are evaluated by age, adult deer are involved in most accidents (Figure 6). Young deer are mostly killed between May and November. This may be related to natural reproduction and cohort survival rates and the fact adult deer vastly outnumber young deer at all times.

The majority of moose are killed between October and March (Figures 7 and 8). This coincides with times of high snowfall in Regions 2, 3 and 4, when moose are found alongside highways that are actively kept cleared of snow. An accident peak is also observed in June, this may be due to pregnant cows moving to calving grounds in the early summer or licking salt on or along the highway.

Lesser numbers of elk are reported. The pattern for elk-related motor vehicle accidents is less established, however a small peak occurs between October and March (Figures 9 and 10). Elk appear to be influenced by the same snow conditions which affect moose.

Bear-related motor vehicle accidents occur more frequently in September (Figures 11 and 12). This peak coincides with the end of summer and the depletion of the bears' natural food sources in more remote locations.<sup>1</sup> At this time, bears appear to migrate toward food sources located near human settlements. Consequently, the number of bear-motor vehicle accidents increases at the same time bear-human conflicts also increase. Although common belief suggests all bears hibernate uninterrupted during the winter months, WARS data shows a small number of bears are killed between November and March. Apparently, on warmer winter days, some larger male bears awake from hibernation and roam about.

Sheep accidents exhibit peaks in February, June and September, with the largest peak occurring in February (Figures 13 and 14). In late winter, as snow levels at higher elevations increase, sheep migrate to valley bottoms where highways are typically located.<sup>2</sup> In early summer, sheep begin moving out of the valleys, feeding near highways, on their way to higher elevations for lambing. In late summer, they begin moving back in preparation for the rutting season, which usually occurs in October or November.

Coyote accidents peak at about the same time bear accidents do (Figures 15 and 16). Coyotes may be following bears onto roads in order to benefit from the remains of the animals bears kill or the remains bears find on the road or in the road right-of-way.<sup>1</sup>

<sup>1</sup> Austin, M., 1999, Personal Communication, Large Carnivore Specialist, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Branch, Research and Conservation Section, Victoria, British Columbia

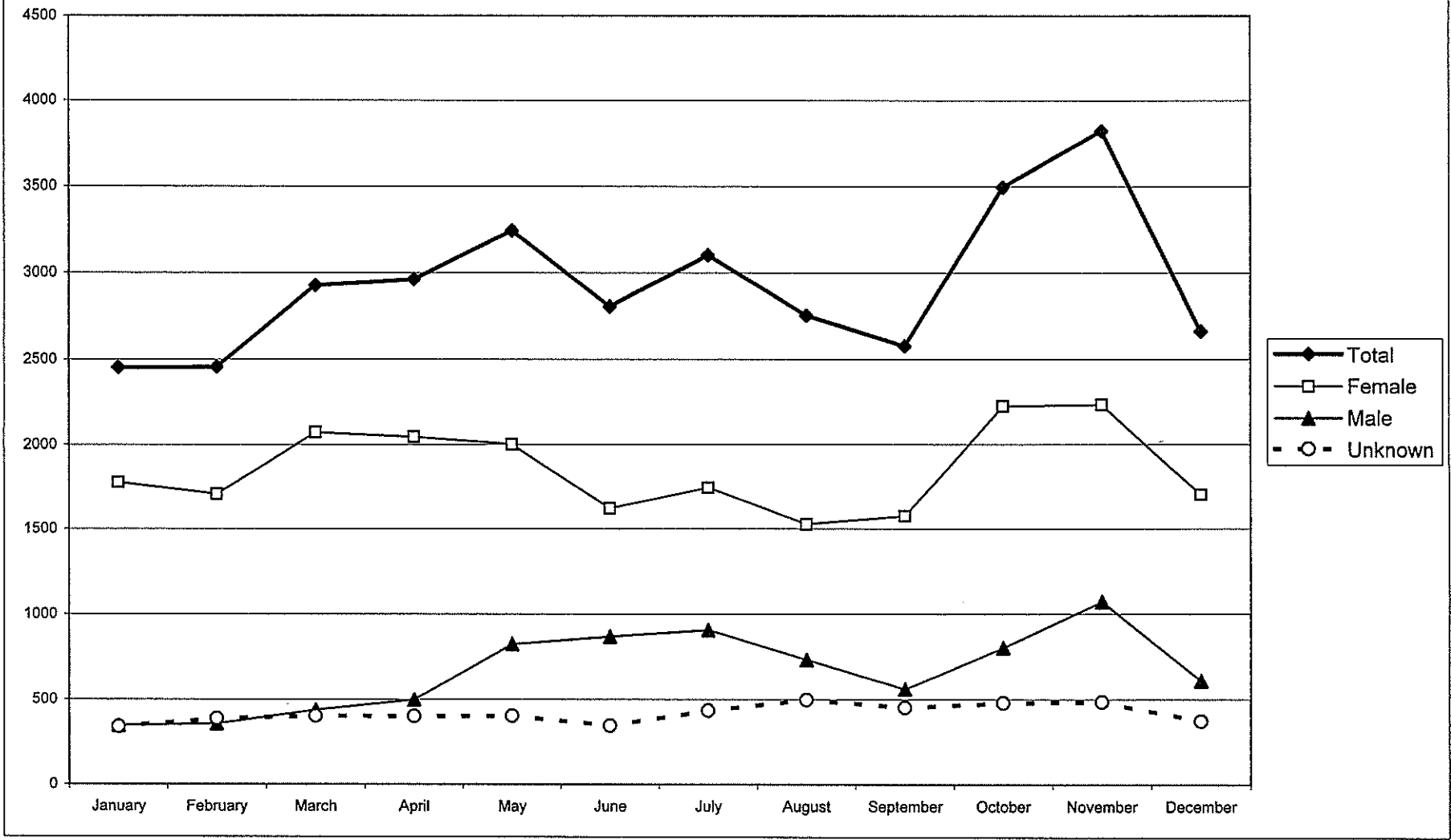
<sup>2</sup> Ashworth, D., 2001, Personal Communication, Conservation Officer, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Conservation Officer Service, Cranbrook, British Columbia

Porcupine accidents exhibit two peaks, the first, a small peak in May, followed by a large peak in August (Figures 17 and 18). Although porcupines are not the largest animals found on provincial highways, they constitute a safety hazard as their quills can puncture motor vehicle tires and increase the severity of an accident.<sup>3</sup>

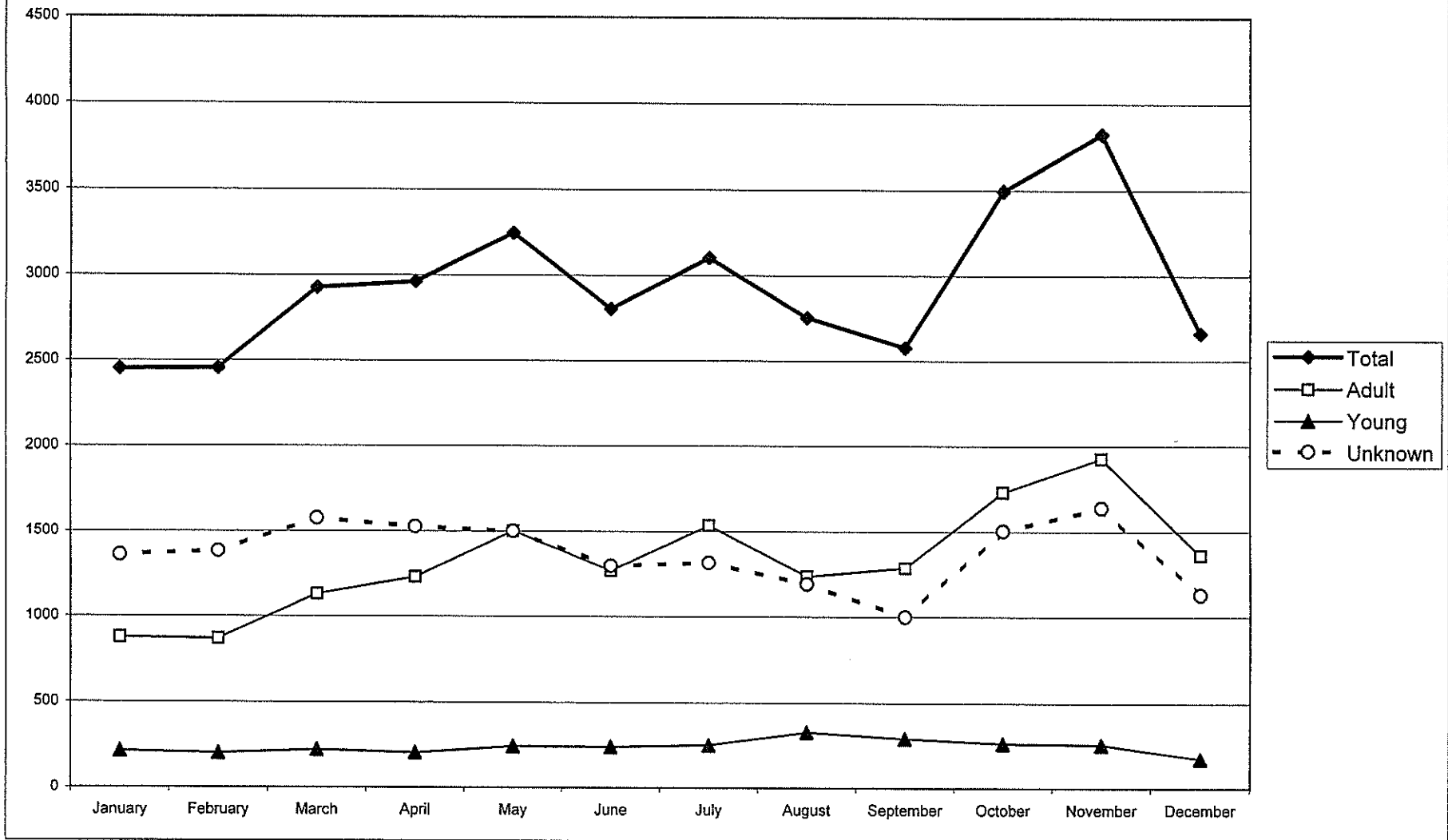
---

<sup>3</sup> Zacharias, C., 1999, Personal Communication, Environmental Management Coordinator, British Columbia Ministry of Transportation (MoT), Engineering Branch, Environmental Management Section, Victoria, British Columbia

**Figure 5. Total Monthly Deer Accidents by Sex**  
(1991 - 2000)

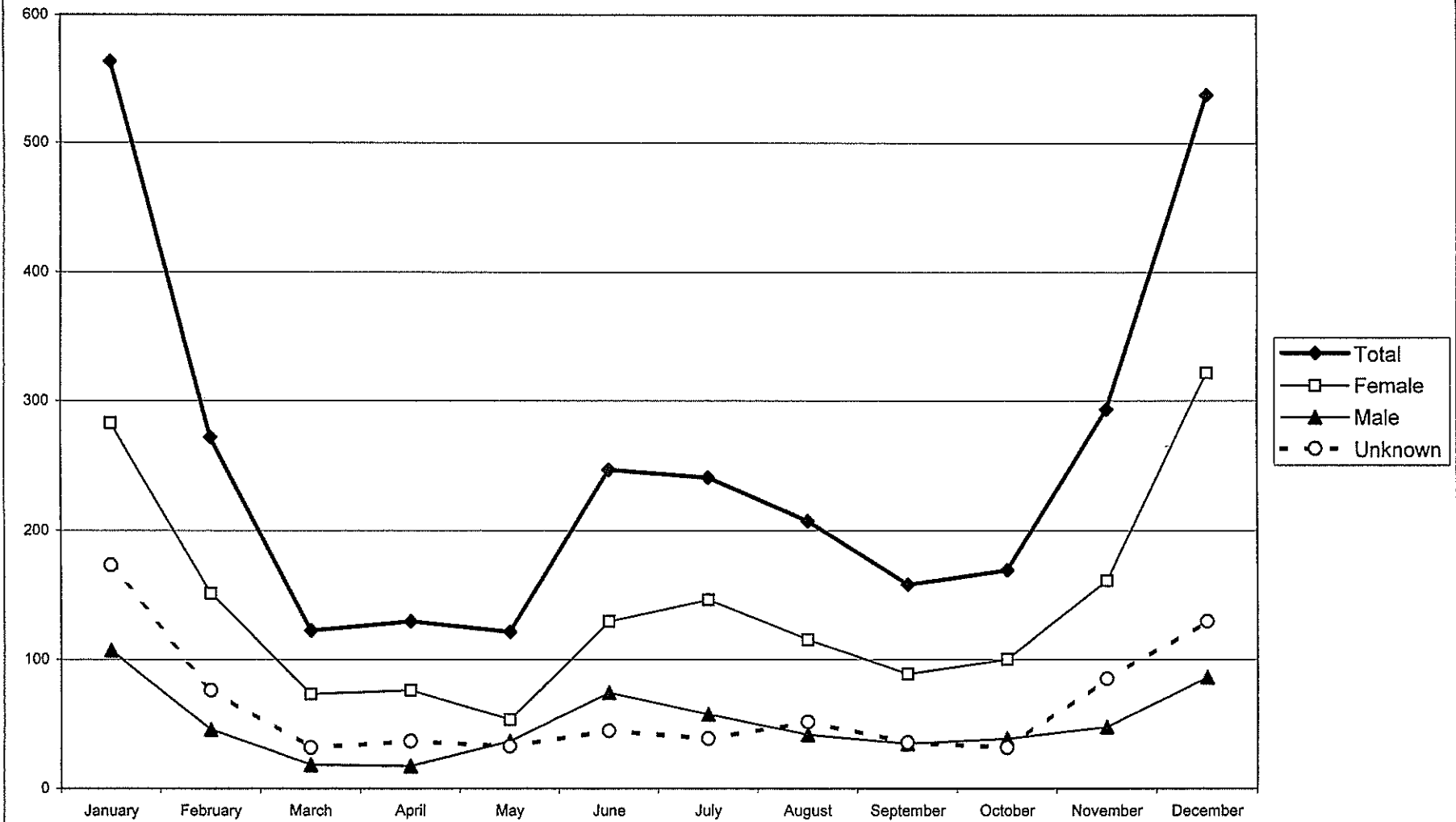


**Figure 6. Total Monthly Deer Accidents by Age  
(1991 - 2000)**

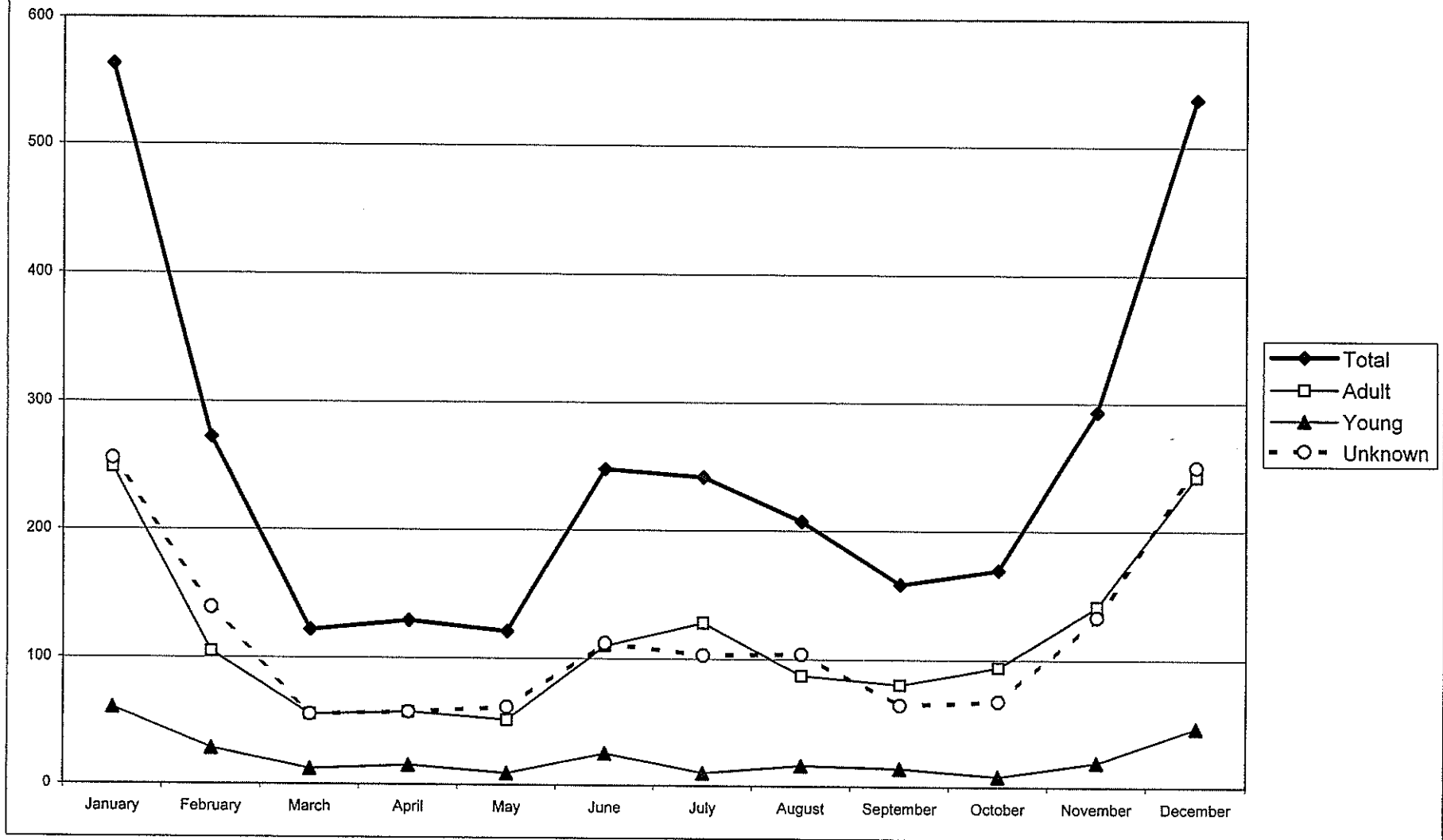




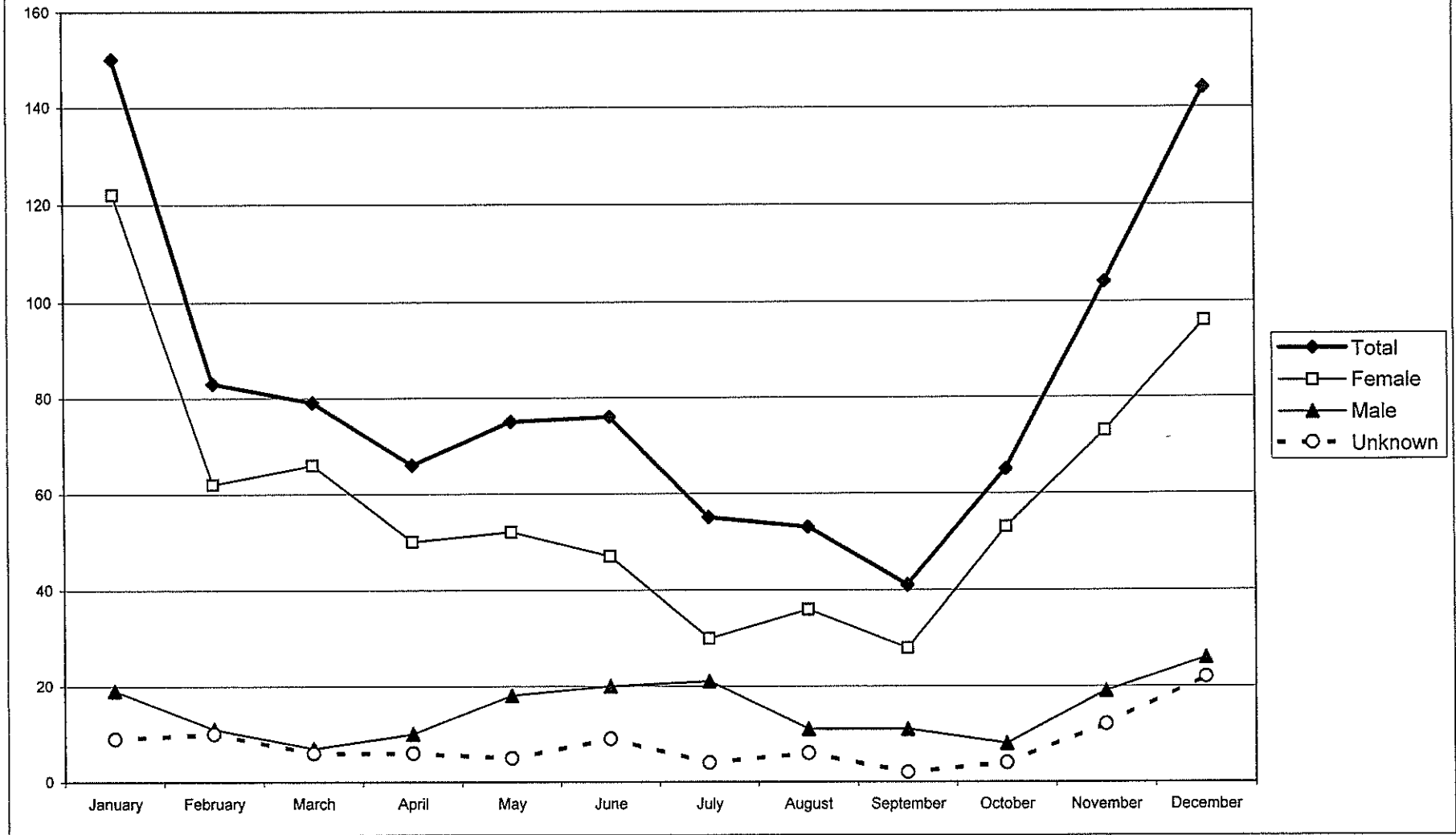
**Figure 7. Total Monthly Moose Accidents by Sex**  
(1991 - 2000)



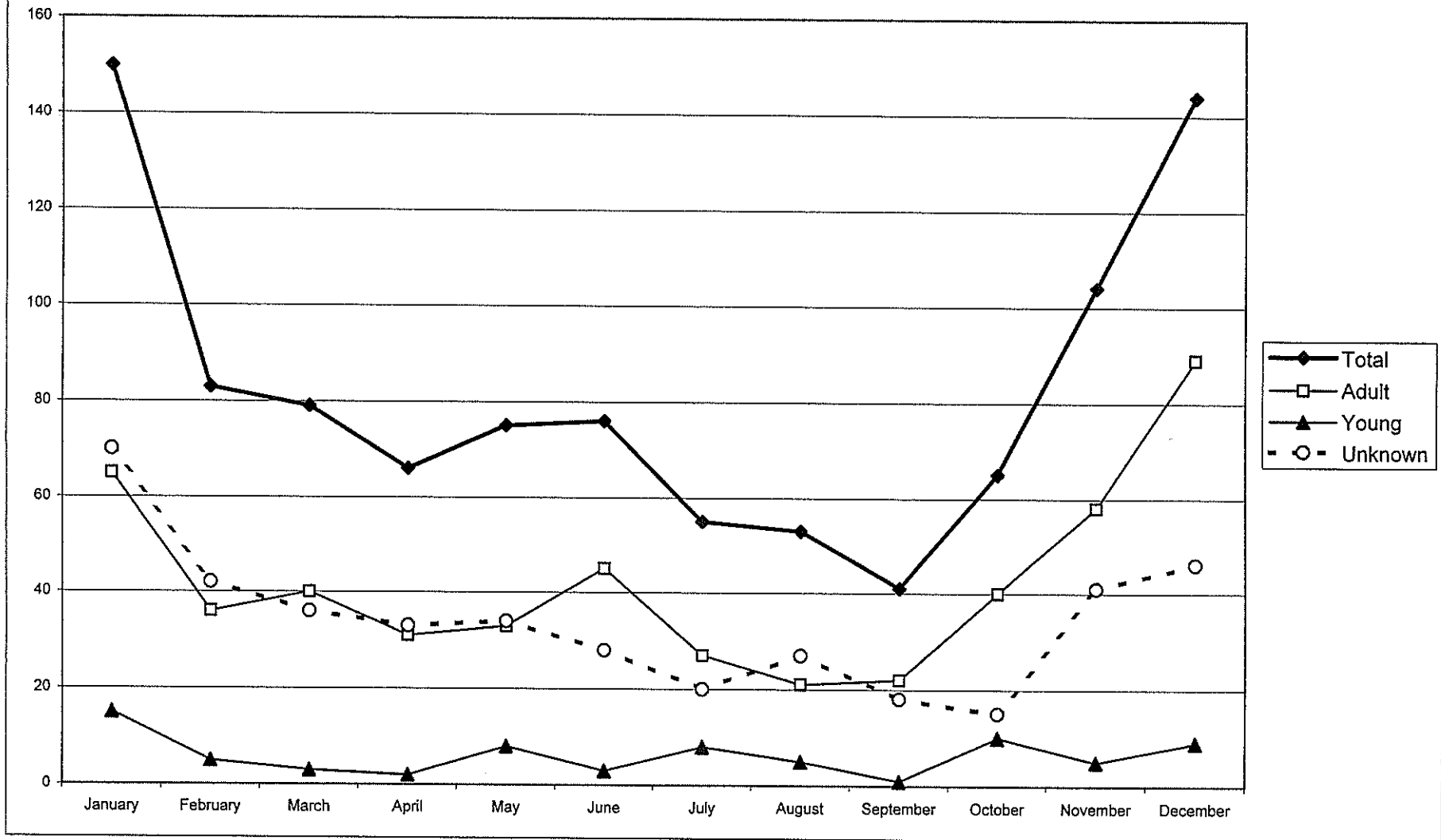
**Figure 8. Total Monthly Moose Accidents by Age**  
(1991 - 2000)



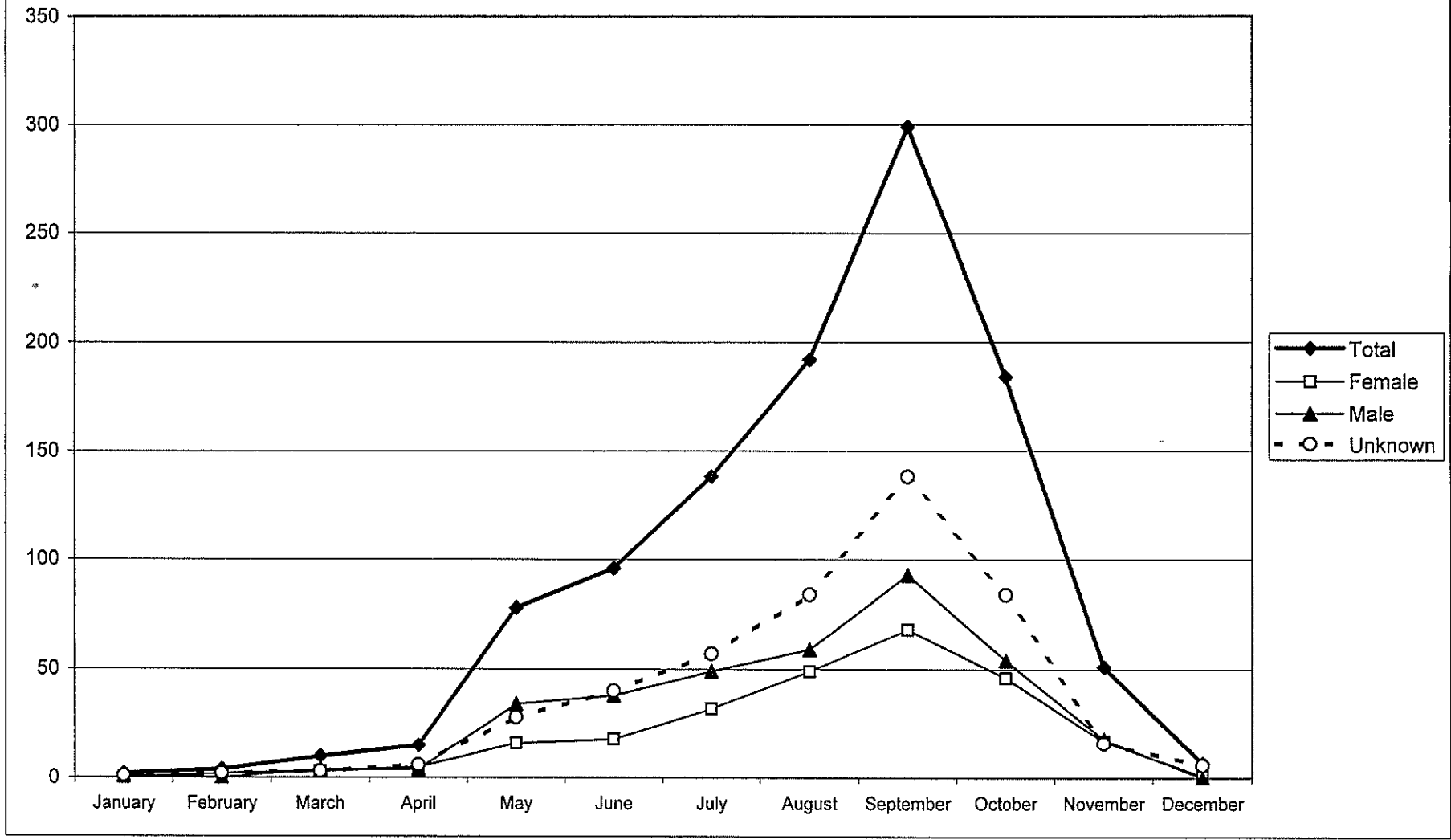
**Figure 9. Total Monthly Elk Accidents by Sex  
(1991 - 2000)**



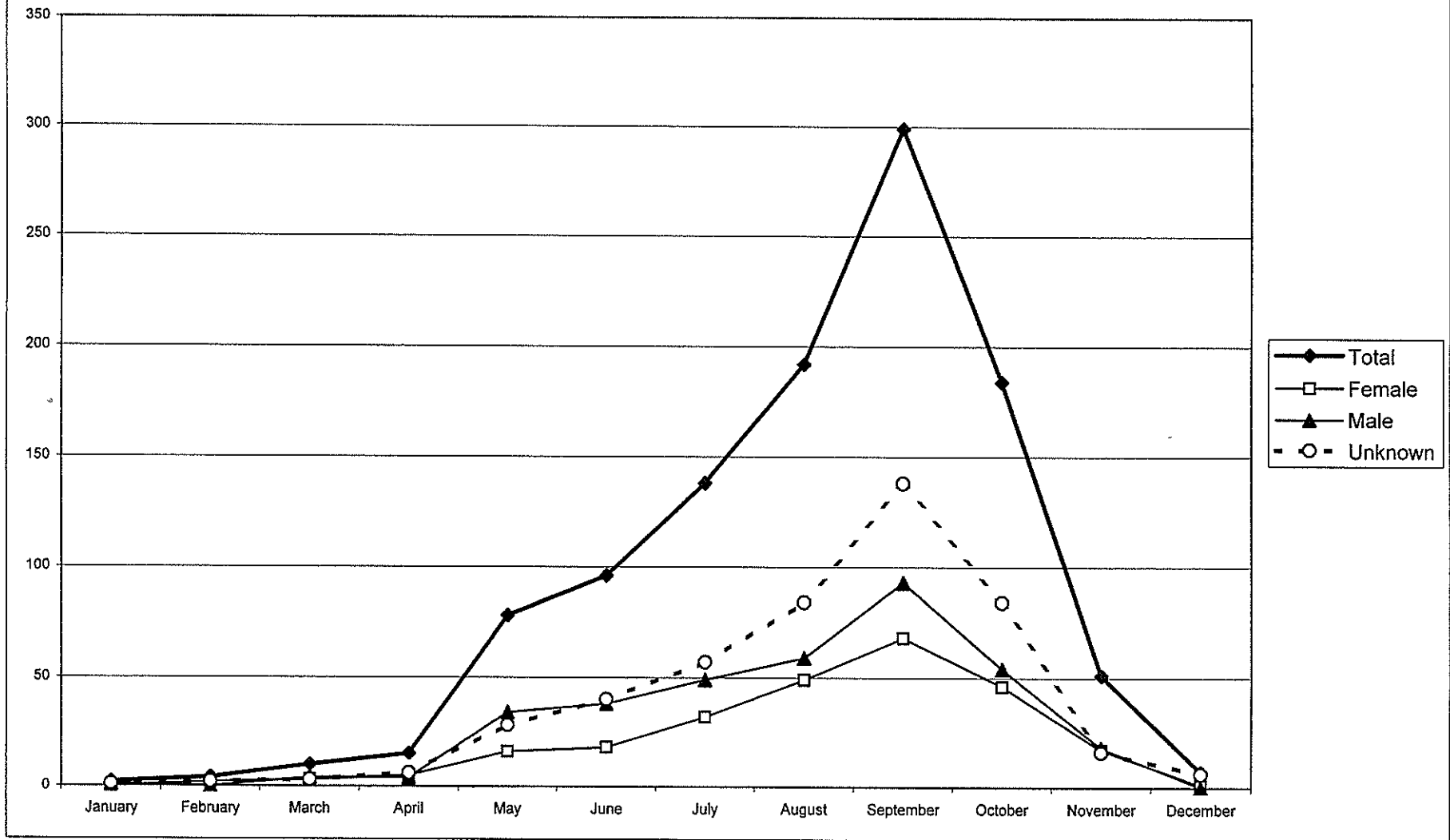
**Figure 10. Total Monthly Elk Accidents by Age  
(1991 - 2000)**



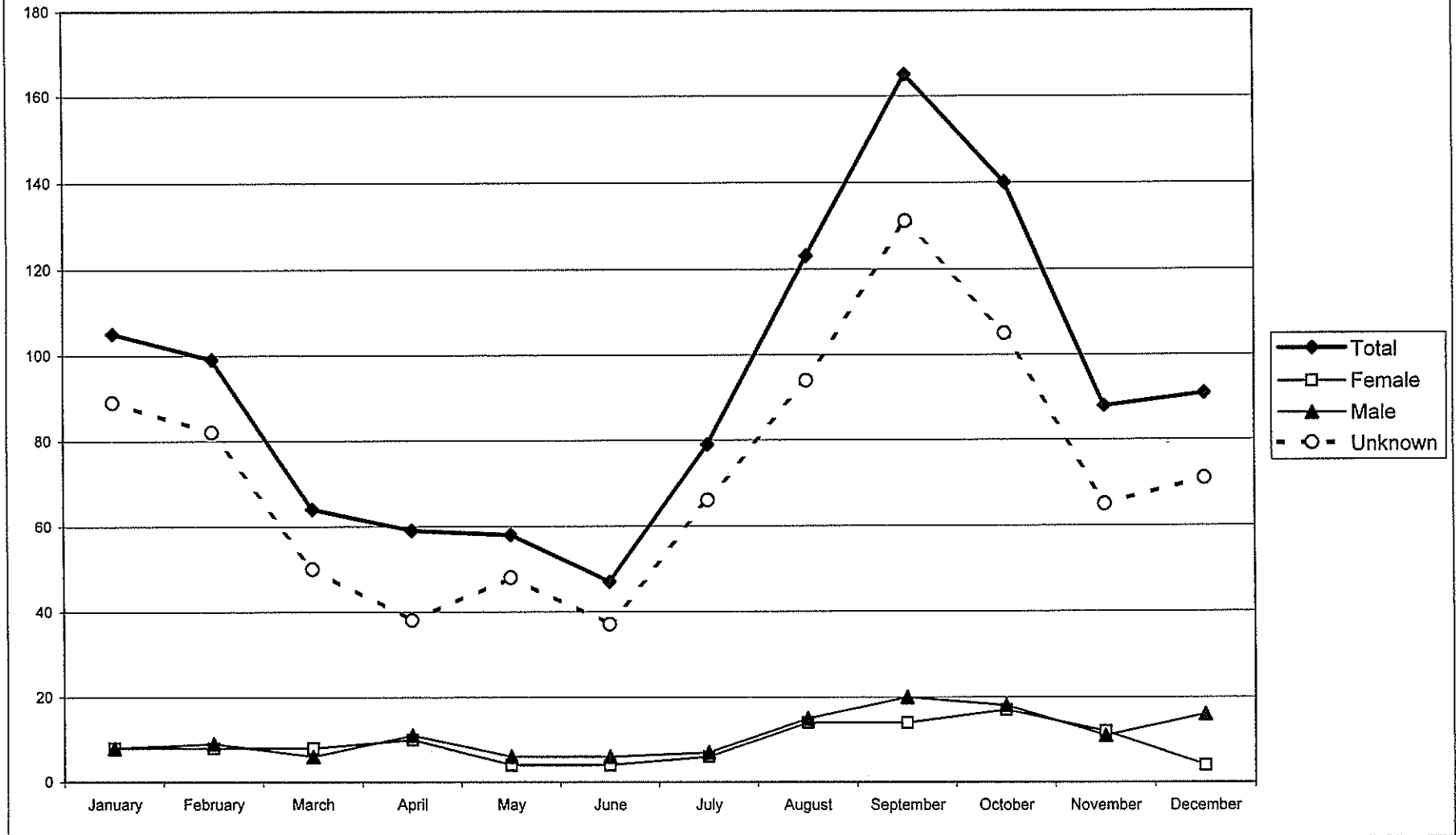
**Figure 11. Total Monthly Bear Accidents by Sex  
(1991 - 2000)**



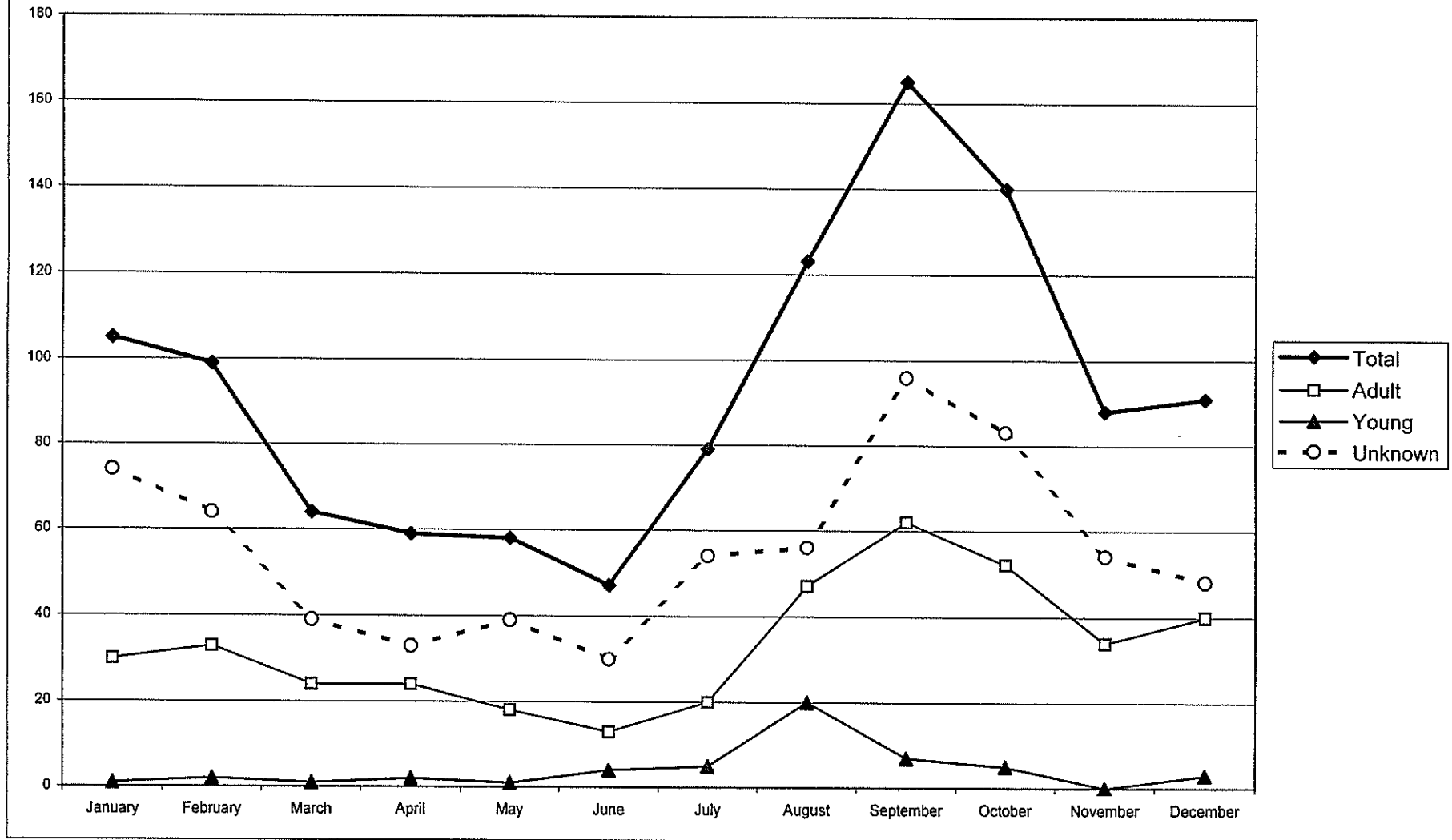
**Figure 12. Total Monthly Bear Accidents by Sex**  
(1991 - 2000)



**Figure 13. Total Monthly Coyote Accidents by Sex  
(1991 - 2000)**

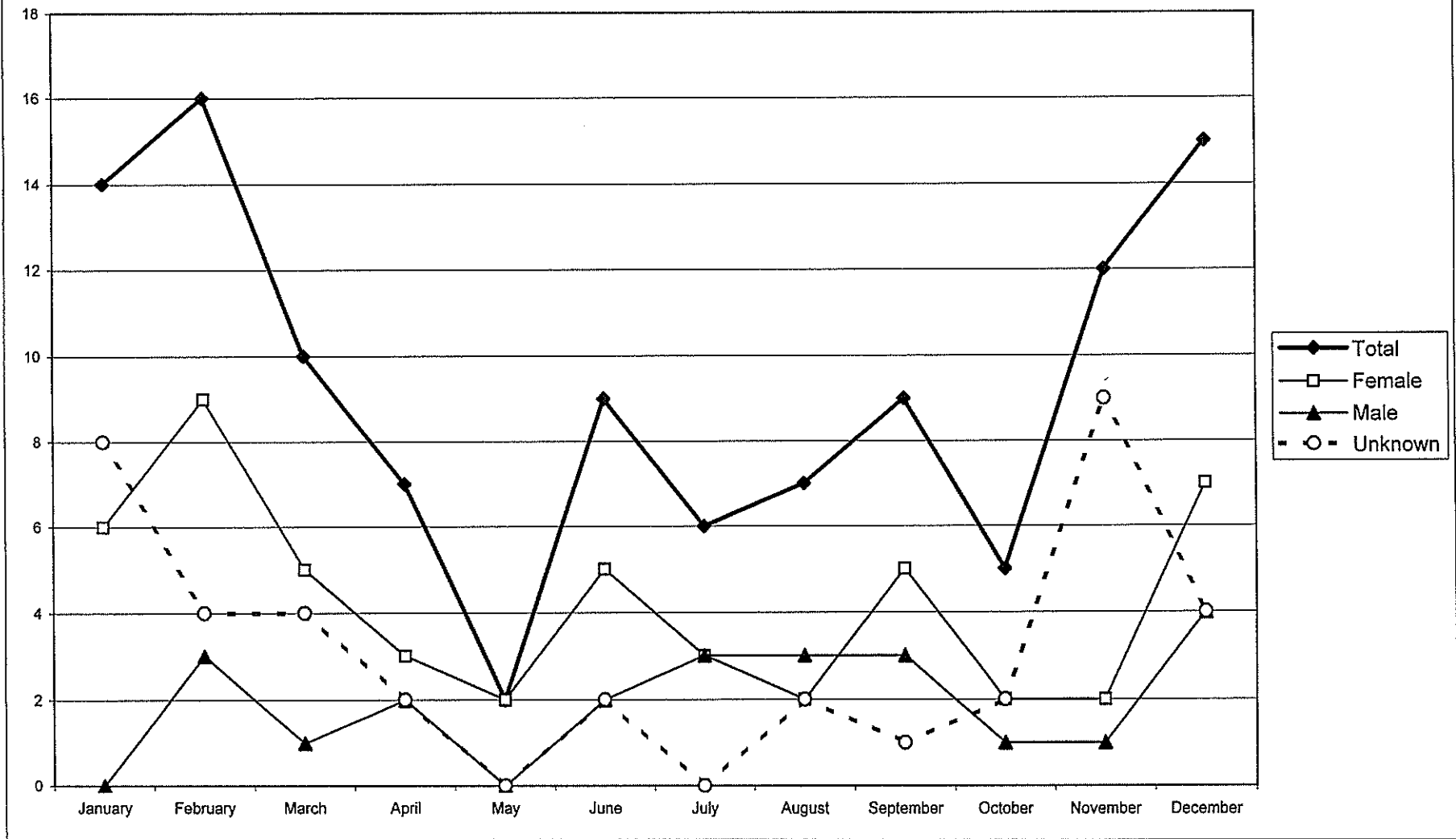


**Figure 14. Total Monthly Coyote Accidents by Age**  
(1991 - 2000)

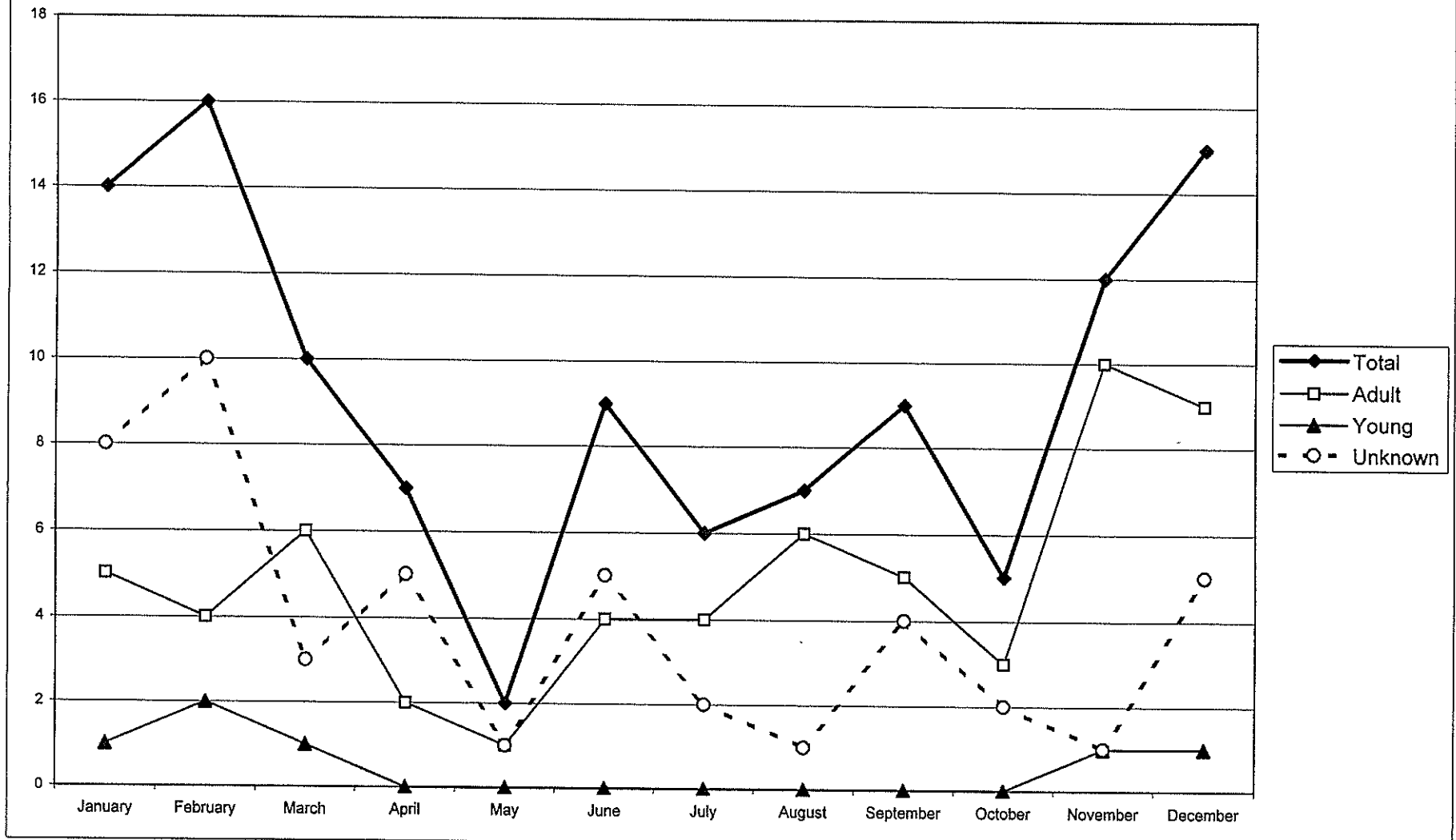




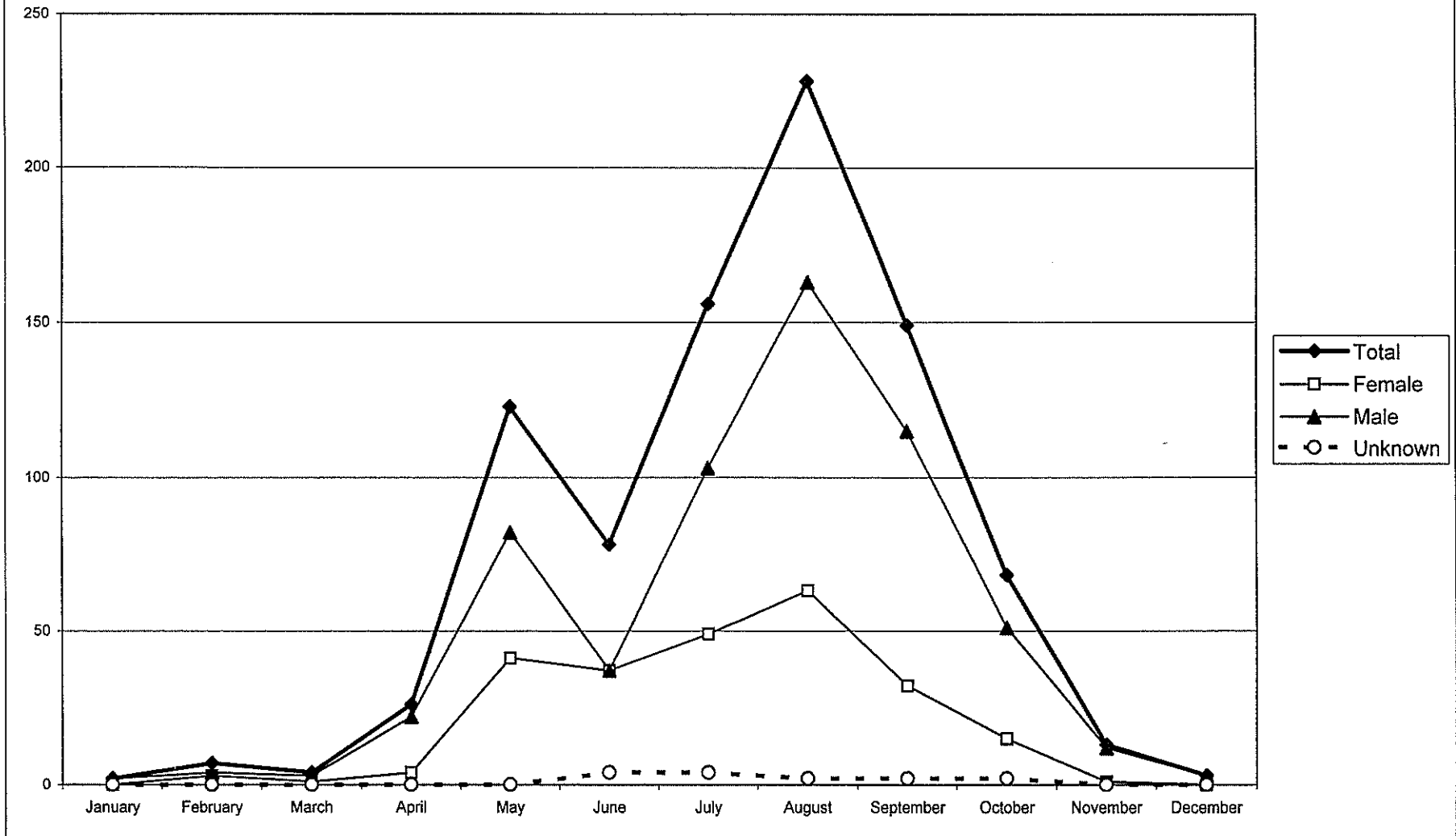
**Figure 15. Total Monthly Sheep Accidents by Sex  
(1991 - 2000)**



**Figure 16. Total Monthly Sheep Accidents by Age**  
(1991 - 2000)



**Figure 17. Total Monthly Porcupine Accidents by Sex  
(1991 - 2000)**



**Figure 18. Total Monthly Porcupine Accidents by Age**  
(1991 - 2000)

