

**BIRD USE OF THE QUATSE RIVER ESTUARY,
VANCOUVER ISLAND, BRITISH COLUMBIA
1990-1991**

Neil K. Dawe
Terri Martin
Tony Barnard
Debby Howard



TECHNICAL REPORT SERIES NO. 212

Pacific and Yukon Region 1995
Canadian Wildlife Service



Environment
Canada

Environnement
Canada

Canadian Wildlife
Service

Service Canadien
de la faune

Canada

TECHNICAL REPORT SERIES CANADIAN WILDLIFE SERVICE

This series of reports, established in 1986, contains technical and scientific information from projects of the Canadian Wildlife Service. The reports are intended to make available material that either is of interest to a limited audience or is too extensive to be accommodated in scientific journals or in existing CWS series.

Demand for these Technical Reports is usually confined to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities; they can be obtained only from the address given on the back of the title page. However, they are numbered nationally. The recommended citation appears on the title page.

Technical Reports are available in CWS libraries and are listed with the DOBIS system in major scientific libraries across Canada. They are printed in the official language chosen by the author to meet the language preference of the likely audience. **To determine whether there is significant demand for making the reports available in the second official language, CWS invites users to specify their official language preference. Requests for Technical Reports in the second official language should be sent to the address on the back of the title page.**

SÉRIE DE RAPPORTS TECHNIQUES DU SERVICE CANADIEN DE LA FAUNE

Cette série de rapports donnant des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF) a démarré en 1986. L'objet de ces rapports est de promouvoir la diffusion d'études s'adressant à un public restreint ou trop volumineuses pour paraître dans une revue scientifique ou l'une des séries du SCF.

Ordinairement, seuls les spécialistes des sujets traités demandent ces rapports techniques. Ces documents ne sont donc produits qu'à l'échelon régional et en quantités limitées; ils ne peuvent être obtenus qu'à l'adresse figurant au dos de la page titre. Cependant, leur numérotage est effectué à l'échelle nationale. La citation recommandée apparaît à la page titre.

Ces rapports se trouvent dans les bibliothèques du SCF et figurent aussi dans les listes du système de référence DOBIS utilisé dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé. **En vue de déterminer si la demande est suffisamment importante pour produire ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Il faut envoyer les demandes de rapports techniques dans la deuxième langue officielle à l'adresse indiquée au verso de la page titre.**

Cover illustration is by R.W. Butler and may not be used for any other purpose without the artist's written permission.

L'illustration de la couverture est une œuvre de R.W. Butler. Elle ne peut dans aucun cas être utilisée sans avoir obtenu préalablement la permission écrite de l'auteur.

BIRD USE OF THE QUATSE RIVER ESTUARY,
VANCOUVER ISLAND, BRITISH COLUMBIA
1990-1991

Neil K. Dawe,
Terri Martin,
Tony Barnard¹,
and Debby Howard².

Technical Report Series No. 212
Pacific and Yukon Region 1995
Canadian Wildlife Service

This series may be cited as:

Dawe, N.K., T. Martin, T. Barnard, and D. Howard. 1995
Bird Use of the Quatse River estuary,
Vancouver Island, British Columbia. 1990-1991.
Technical Report Series No. 212, Canadian
Wildlife Service, Pacific and Yukon Region,
British Columbia.

¹ Address: The Nature Trust of British Columbia, 2569 Kenworth Road, Nanaimo,
B.C. V9T 4P7

Present Address: Ministry of Environment, Lands and Parks, 10334-152-A
Street, Surrey, B.C. V3R 7P8

² Address: Box 2165, Port Hardy, B.C. V0N 2P0

Published by Authority of the
Minister of Environment
Canadian Wildlife Service

©Minister of Supply and Services Canada 1995
Catalogue No. CW69-5/212E
ISBN 0-662-22643-7
ISSN 0831-6481

Copies may be obtained from:
Canadian Wildlife Service,
Pacific and Yukon Region,
P.O. Box 340,
Delta, British Columbia,
Canada V4K 3Y3

Abstract

In 1977, a Map Reserve was established by the British Columbia Ministry of Environment (BCMOE) for fish and wildlife management purposes that covered the Quatse River estuarine system. Initial surveys of the management area by Tera Environmental Resources Analyst Limited (1978) and by BCMOE (1982) indicated that the estuary supported many species of migratory and resident birds as well as a diverse marsh flora.

In March 1994, a Section 13 (Designated Use) application was made to B.C. Lands for long-term protection of 134 ha including the intertidal foreshore of the lower Hardy Bay estuary that would transfer administrative authority of the previously designated Map Reserve from BC Lands to BC Environment for conservation purposes. The site, once transferred, will be managed by BCMOE for the proposed term of 60 years with the potential for renewal.

To assist in the management of this area, an inventory to determine bird use of the estuary was conducted weekly from 9 September 1990 through 20 October 1991.

A total of 92 species of birds were found using the Quatse River estuary during the 1990-1991 survey period. The estuary supported a minimum of 5,241 birds for at least some stage in their life history. The north intertidal marsh habitat had the highest bird use (50%), followed by the intertidal flats (31%) and the subtidal area (10%); $n=25,097$.

Spring 1991 bird use at the Quatse River estuary was dominated by shorebirds; waterfowl and passerines were also seen in significant proportions. Spring saw the third highest bird use over the survey period.

Gulls were the main user group during the summer of 1991. Shorebirds dropped to the second most abundant group with waterfowl and passerines following in roughly equal proportions.

Late autumn 1990 had the highest bird use of all the seasons with waterfowl accounting for just under half of the numbers; most of remaining bird use was by the gulls. Gulls dominated during the early autumn 1991 (which had the lowest bird use); shorebirds, waterfowl and passerines were also highly represented.

Winter 1990-1991 numbers were the second highest overall. This time waterfowl dominated followed by gulls and passerines.

An annotated species list discusses arrival and departure dates, high numbers, and habitat use by the 92 species of birds that were found using the estuary.

Concluding comments discuss possible solutions for minimizing impacts to birds using the estuary, particularly from direct disturbance, and suggest further studies of the avifauna that would complete the picture of bird use of the Quatse River estuary.

Résumé

En 1977, le ministère de l'Environnement de la Colombie-Britannique créait une réserve de gestion des espèces sauvages aquatiques et terrestres dans la zone estuarienne de la rivière Quatse, au fond de la baie Hardy. Les premiers relevés, effectués par la Tera Environmental Resources Analyst Limited (1978) et le ministère de l'Environnement de la Colombie-Britannique (1982), ont permis de constater la présence dans l'estuaire de nombreuses espèces d'oiseaux migrateurs et non migrateurs, ainsi que d'une riche flore palustre.

En mars 1994, en application de l'article 13 (utilisation désignée), une demande était présentée au ministère des Terres de la Colombie-Britannique en vue de la protection à long terme d'une zone de 134 hectares comprenant la basse plage intertidale de l'estuaire; en vertu des dispositions prévues, l'autorité administrative de la réserve doit être transférée du ministère des Terres au ministère de l'Environnement, à des fins de conservation. Une fois le transfert effectué, la gestion de cette zone sera assurée par le ministère de l'Environnement pour la durée du terme proposé (60 ans), avec possibilité de renouvellement.

En 1990, on a entrepris de recenser l'avifaune de l'estuaire : des relevés ont été effectués chaque semaine, du 9 septembre 1990 jusqu'au 20 octobre 1991.

Durant la période de recensement (1990-1991), on a observé en tout 93 espèces d'oiseaux dans l'estuaire. Un minimum de 5 241 oiseaux y sont venus pendant au moins une partie de leur cycle vital. D'après les effectifs observés, le marais intertidal de la partie nord est le secteur le plus fréquenté, suivi des battures et de la zone infratidale (50 %, 31 % et 10 %, respectivement, $n = 25\ 097$).

Au printemps de 1991, les oiseaux de rivage prédominaient dans l'estuaire; les anatidés et les passériformes étaient également présents en proportions notables. C'est au printemps que la population aviaire a atteint un troisième maximum durant le recensement.

Pendant l'été de 1991, les mouettes et les goélands ont prédominé; les oiseaux de rivage sont passés au second rang, suivis des anatidés et des passériformes, présents dans des proportions à peu près égales.

C'est vers la fin de l'automne de 1990 que la population aviaire a été la plus élevée durant le recensement : les anatidés représentaient un peu moins de la moitié des effectifs totaux, les mouettes et les goélands constituant la plus grande partie du reste de l'avifaune. Les mouettes et les goélands prédominaient durant la première partie de l'automne de 1991 (période où les effectifs totaux étaient au plus bas); les oiseaux de rivage, les anatidés et les passériformes étaient aussi très bien représentés.

Les effectifs totaux de l'hiver 1990-1991 étaient les deuxièmes en importance. Cette fois, les anatidés prédominaient, suivis des mouettes des goélands et des passériformes.

On a dressé une liste annotée des 92 espèces recensées dans l'estuaire avec les dates des arrivées et des départs, les effectifs importants et une description de l'utilisation de l'habitat.

Dans les observations présentées en conclusion, on traite des mesures qui pourraient être mises en oeuvre pour limiter le plus possible l'incidence de divers facteurs sur les oiseaux de l'estuaire, plus particulièrement des perturbations directes, et l'on décrit les études qui permettraient de donner une description complète de l'avifaune de l'estuaire de la rivière Quatse et de son utilisation de l'habitat.

Table of Contents

Abstract	iii
Résumé	iii
Table of Contents	vi
List of Tables	viii
List of Figures	ix
List of Appendices	xi
Acknowledgements	xii
 Introduction	 1
 The Study Area	 2
 Methods and Limitations	 4
 Results and Discussion	 5
Bird Use of the Estuary	5
Habitat Use	8
Seasonal Numbers	8
Species Composition	8
Loons	8
Grebes	11
Cormorants	11
Hérons	11
Swans	11
Geese	11
Dabbling Ducks	13
Diving Ducks	21
Raptors	24
Grouse	25
Rails	25
Cranes	26
Shorebirds	26
Gulls	29
Alcids	33
Doves	33
Swifts	33
Hummingbirds	33
Kingfishers	33
Woodpeckers	33
Passerines	35
<i>Swallows</i>	36
<i>Crows and Jays</i>	36
<i>Chickadees</i>	36
<i>Wrens</i>	36
<i>Kinglets and Robins</i>	36
<i>Pipits</i>	37
<i>Waxwings</i>	37
<i>Starlings</i>	37

Table of Contents (Cont'd)

<i>Warblers, Sparrows, Blackbirds and Finches</i>	37
Warblers	38
Sparrows	38
Blackbirds	38
Finches	39
Conclusions	39
Bird Use	39
Future Studies	40
Literature Cited	41
Appendices	45

List of Tables

Table 1.	<i>Habitat Units covered during the Quatse River estuary bird survey, 9 September 1990 through 20 October 1991 (see also Figure 2).</i>	4
Table 2.	<i>Estimated minimum numbers of birds dependent on the Quatse River estuary, 9 September 1990 through 20 October 1991, based on the minimum number of each species observed on migratory bird surveys. For species names, see Appendix II.</i>	7

List of Figures

Figure 1.	<i>Location of the Quatse River estuary study area (from Whately 1994).</i>	3
Figure 2.	<i>Air photograph of the Quatse River estuary showing the habitat units defined during the surveys. See Table 1 for habitat descriptions.</i>	6
Figure 3.	<i>Proportional bird species group use on the Quatse River estuary, Spring 1991.</i>	9
Figure 4.	<i>Proportional bird species group use on the Quatse River estuary, Summer 1991.</i>	9
Figure 5.	<i>Proportional bird species group use on the Quatse River estuary, Autumn 1990 and Autumn 1991.</i>	10
Figure 6.	<i>Proportional bird species group use on the Quatse River estuary, Winter 1990-1991.</i>	10
Figure 7.	<i>Seasonal fluctuations in Canada Goose numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	12
Figure 8.	<i>Seasonal habitat use by the Canada Goose on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	13
Figure 9.	<i>Seasonal fluctuations in Dabbling Duck numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	14
Figure 10.	<i>Seasonal habitat use by Dabbling Ducks on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	15
Figure 11.	<i>Seasonal fluctuations in Mallard numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	16
Figure 12.	<i>Seasonal habitat use by the Mallard on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	17
Figure 13.	<i>Seasonal habitat use by the American Wigeon on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	17
Figure 14.	<i>Seasonal fluctuations in American Wigeon numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	18
Figure 15.	<i>Seasonal fluctuations in Green-winged Teal numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	19

Figure 16.	<i>Seasonal habitat use by the Green-winged Teal on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	20
Figure 17.	<i>Seasonal fluctuations in Diving Duck numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	22
Figure 18.	<i>Seasonal habitat use by Diving Ducks on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	23
Figure 19.	<i>Seasonal habitat use by Shorebirds on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	26
Figure 20.	<i>Seasonal fluctuations in Shorebird numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	27
Figure 21.	<i>Seasonal fluctuations in Gull numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	30
Figure 22.	<i>Seasonal habitat use by Gulls on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	31
Figure 23.	<i>Seasonal fluctuations in Passerine numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.</i>	34
Figure 24.	<i>Seasonal habitat use by Passerines on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).</i>	35

List of Appendices

Appendix I.	<i>List of survey dates and surveyor's remarks for the Quatse River estuary.</i>	46
Appendix II.	<i>Quatse River estuary bird check-list.</i>	49
Appendix III.	<i>Quatse River estuary bird surveys: Seasonal bird numbers, September 1990 to October 1991</i>	53
Appendix IV.	<i>Quatse River estuary bird surveys: Seasonal bird use by habitat, September 1990 to September 1991</i>	65

Acknowledgements

Tim Clermont, B.C. Ministry of Environment, Lands and Parks, provided background information and aerial photographs.

Pamela Whitehead, Canadian Wildlife Service (CWS), assisted with the production of the report.

Michael Dunn, CWS, reviewed the manuscript.

Introduction

Estuaries along coastal British Columbia are important to a diverse wildlife fauna, particularly resident and migratory birds (Dawe 1976, 1980, Dawe and Lang 1980, Dawe et al. 1994, Butler and Cannings 1989, Butler et al. 1989, Vermeer et al. 1992, Butler and Vermeer 1994). This diverse fauna occurs as a result of two major factors: the variety of habitats that meet on these systems and the productivity of those habitats.

Habitats often associated with typical estuarine ecosystems include marine deep water areas, intertidal sand and gravel flats, cobble beaches, mudflats, spits, river and associated riparian habitats, brackish and saline estuarine marshes with their accompanying dendritic channels, and upland grass, forb, and shrub areas that grade to coastal forests.

This concentration of habitats with its accompanying edges and niches supports a tremendous diversity and abundance of wildlife. For example, inventories from the Little Qualicum River estuary, with an upland area of less than 40 ha, have reported minimums of 14 species of algae, 55 species of fungi, 22 species of bryophytes, 234 species of vascular plants, 29 species of molluscs, 62 orders of arthropods, 15 species of fishes, 4 species of amphibians, 4 species of reptiles, 220 species of birds, and 20 species of mammals (Dawe 1976, 1980, unpublished data).

Nutrients and sediments brought down from the watersheds by the rivers are deposited on the deltas providing rich substrates and growing conditions for estuarine marsh plants that, along with marine vegetation such as eelgrass (*Zostera* sp.) and algae, drive the detritus-based estuarine food web. Net primary production of these systems with their attendant marshes and algal beds rival, and in some cases exceed, the production of the tropical rain forests (Ricklefs 1979).

These estuarine ecosystems are important to the survival of both resident and migratory birds. Estuaries act as stepping stones to the millions of birds that migrate along the British Columbia coast each year providing areas where they can rest and feed during their northern and southern journeys.

In addition, British Columbia's estuaries support Canada's largest wintering populations of waterbirds. Estuaries, in concert with farmlands and freshwater wetlands, form part of a wetlands complex (Eamer 1985) that supports hundreds of thousands of wintering waterbirds. During periods of freezing, however, when farmlands and freshwater marshes are no longer accessible, estuaries become critical to the birds' survival (see Dawe 1980 and Eamer 1985). They are the only ice free areas that have enough food to support the birds over the freezing periods.

In British Columbia, most efforts to document bird-use of estuaries have focused on the larger systems such as the Fraser, Squamish, and Cowichan (Butler and Campbell 1987, Butler and Cannings 1989, Trethewey 1985, Blood et al. 1976); however, the importance of the smaller British Columbia estuaries should

not be overlooked (see Butler et al. 1989). Collectively, these smaller systems contribute significantly to the maintenance of our migratory and resident bird populations.

The Canadian Wildlife Service (CWS) has long recognized the importance of these areas and over the past 15 years has gathered data on the bird use of many of our smaller estuaries. This report documents bird use and numbers on the Quatse River estuary at Port Hardy, British Columbia over the period 9 September 1990 through 20 October 1991.

In addition, data collected by the British Columbia Ministry of Environment, Lands and Parks during preliminary inventories as well as observations by naturalists have been included in this report. The results will be of interest to both the wildlife manager and the birdwatching public who want to know more about the avifauna of the Quatse River estuary.

The Study Area

Quatse River estuary (50°43' N, 127°29' W) is situated on the northeast coast of Vancouver Island southeast of Port Hardy, British Columbia (Figure 1). The mean temperature at Port Hardy, B.C. is 8°C. The area has a mean annual precipitation of 1730 mm (Anonymous 1977).

Whately (1994) and Kennedy (1982) describe the major estuarine marsh vegetation zones on the estuary. Briefly, an estimated 75% of the area consists of intertidal mudflats and saltmarsh habitat. Several habitat features add to the complexity of this intertidal zone and are described as river, tidal channels, gravel bars, and rock platforms and reefs. The dominant vegetation in the lower portion of the saltmarsh includes halophytes such as *Salicornia virginica*, *Triglochin maritimum*, *Glaux maritima*, *Plantago maritima* and *Spergularia canadensis*. In the higher portions of the saltmarsh the dominant or codominant plant species include *Deschampsia cespitosa*, *Agrostis stolonifera*, *Potentilla anserina* and *Juncus articus*. Forest habitat occupies roughly 24% of the area. Coniferous stands are most common and are dominated by *Tsuga heterophylla* and *Pseudotsuga menziesii*.

The significance of the Quatse River estuary in terms of its environmental and social values and potential impacts to those values has been discussed by Tera Consultants Limited (1977), Tera Environmental Resources Analyst Limited (1978), M Wayne (1984) in her discussion paper on rehabilitation and enhancement options for the estuary, and by M Whately (1994) in a proposal for a Section 13 (Land Act) designated use area.

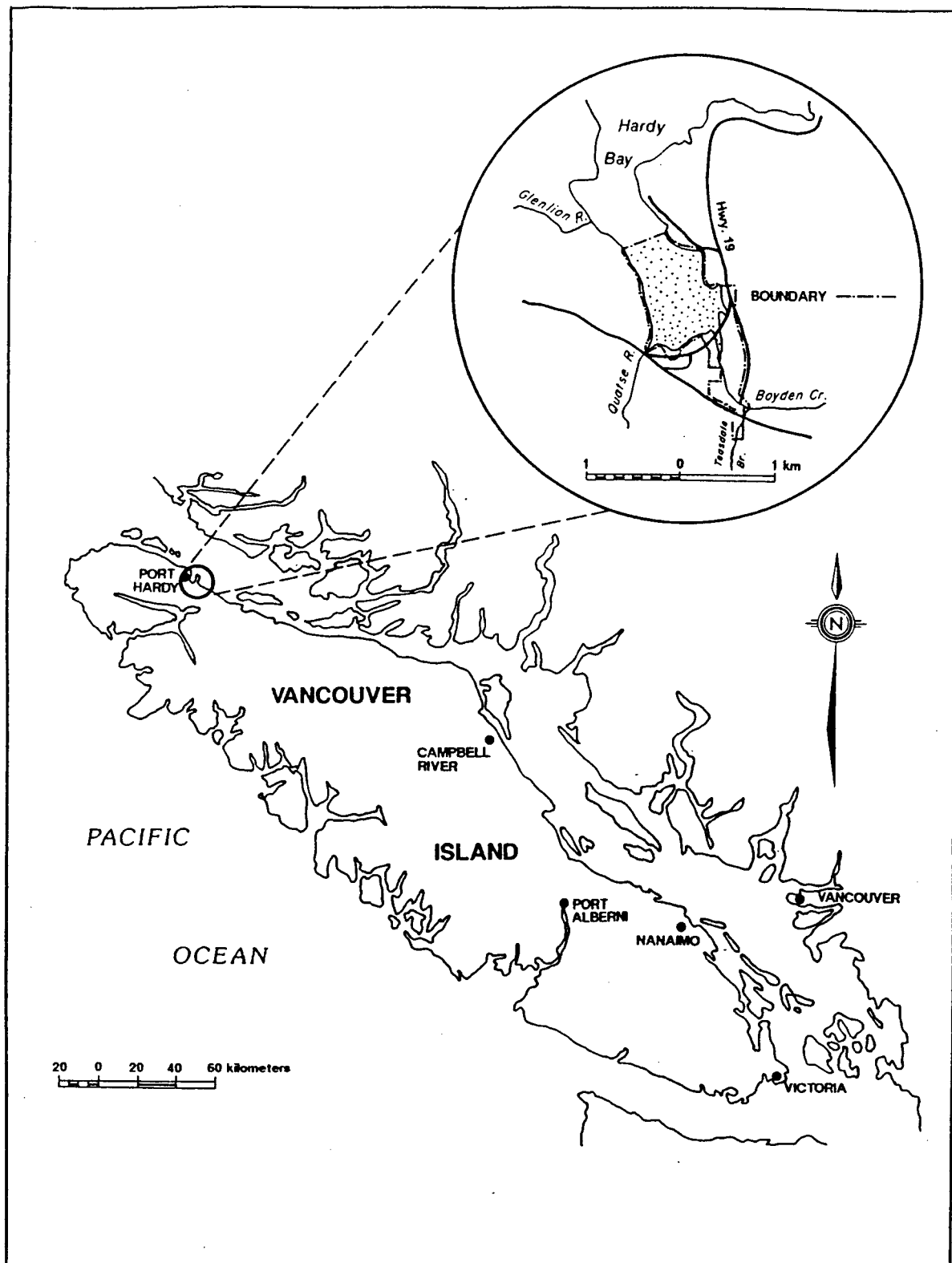


Figure 1. Location of the Quatse River estuary study area (from Whately 1994).

Methods and Limitations

Like many of our smaller estuaries on Vancouver Island, long term bird use inventories for Lower Hardy Bay and the Quatse River estuary were lacking. Up until this study, the total number of avian species using the area was only a best guess by Tera Environmental Resources Analyst Limited (1978). Bird surveys occurred infrequently and only in the autumn, winter and spring seasons. A more complete and long term survey was begun under the direction of Tony Barnard, The Nature Trust of British Columbia, to determine the distribution and abundance of birds using the estuary. Debby Howard, with her local knowledge of the area, agreed to survey the bird use of the estuary over a one year period and weekly surveys were conducted from 9 September 1990 through 20 October 1991. Howard acted as the surveyor under the direction of Tony Barnard and later the senior author. For a list of survey dates and surveyor's remarks see Appendix I).

Habitat Unit	Name	Habitat Description
1	Subtidal	Deep water marine areas.
2	Intertidal Flats	Flats occupy approximately 30% of the management area. <i>Enteromormpha</i> sp. is widely distributed over the area with <i>Fucus distichus</i> common in areas with gravelly substrate.
3	North Intertidal Marsh	Lower portion of the intertidal marsh. Vascular plant cover varies between 15% and 60% (Wayne 1981) with <i>Salicornia virginica</i> dominating.
4	Alienated Marsh A	Alienated upland and intertidal marsh.
5	Alienated Marsh B	Alienated upland and intertidal marsh.
6	South Intertidal Marsh	Higher portions of the intertidal marsh. Vascular plant cover varies between 80% and 100% (Wayne 1981). Dominant plant species include <i>Deschampsia cespitosa</i> , <i>Agrostis stolonifera</i> , <i>Potentilla anserina</i> and <i>Juncus articus</i> .
7	Forest	Approximately 24% of management area. Coniferous stands are dominated by <i>Tsuga heterophylla</i> and <i>Pseudotsuga menziesii</i> .

Table 1. *Habitat Units covered during the Lower Hardy Bay and Quatse River estuary bird survey, 9 September 1990 through 20 October 1991 (see also Figure 2).*

The study area was divided into 7 stations that reflected the major habitat units in order to determine areas of high bird use within the estuary. See Table 1 for a list of the habitat units and their descriptions. Figure 2 shows the location of the habitat units on the estuary. The surveyor covered the study area on foot, and using binoculars and a telescope, counted and recorded all birds observed from suggested viewing locations. In addition, the larger bird concentrations were marked directly on a copy of an air photo of the study area to determine the areas of highest bird use within each habitat type.

The numbers of birds recorded are considered to be generally accurate for the areas surveyed but are undoubtedly conservative due to inherent limitations (see Dawe 1982). Poor visibility due to weather, and birds underwater or shielded by vegetation during the period of observation would lead to an underestimation of the numbers of birds recorded. The data are based on observations at a particular point in time and do not necessarily reflect the total bird use of the area under observation. For example, birds dependent on the estuary only for a few days during spring and autumn migration could be missed altogether if observation periods occurred on either side of their arrival and departure. Also, data were not collected at night; however, low tides on the study area during the winter months occur mostly during the night. Thus, in winter, observations were not made when the intertidal areas and algal beds were exposed, i.e. at times when they would likely be used by birds such as dabbling ducks.

Survey data were summarized using BASIC programs written by Allan Keller, CWS, and modified for seasonal summaries and statistics by the senior author (see Appendices III and IV). The summarized data were analyzed and much of the first draft of the report written by Terri Martin under contract to the CWS. Her contribution was reviewed and edited by the senior author.

The annotated species list was assembled from the survey data as well as from data collected by Myke Chutter (MC) on 6 October 1982.

Results and Discussion

Bird Use of the Estuary

Over the study period, a total of 25,097 birds of 93 species were identified and recorded.

An estimate of the minimum number of birds dependent on the Quatse River estuary over the period of a year was obtained by summing the single-day maximum bird numbers for each species over the period 9 September 1990 through 20 October 1991 (Table 2). A minimum of over 5,200 birds depended on the habitat of the Quatse River estuary for at least a part of their life history.



Figure 2. *Air photograph of the Quatse River estuary showing the habitat units defined during the surveys. See Table 1 for habitat descriptions.*

Species	Number	Month	Species	Number	Month	Species	Number	Month
COLO	1	Aut 90	RTHA	1	Win 90	MODO	4	Aut 91
YBLO*	3	Aut 90	GOEA	1	Aut 90	BLSW	10	Sum 91
RNGR	3	Aut 91	PEFA	1	Spr 91	VASW	32	Sum 91
WEGR	8	Aut 91	RUGR	1	Spr 91	RUHU	2	Spr 91
CORM	2	Aut 90	AMCO	3	Aut 90	BEKI	4	Spr 91
GBHE	11	Sum 91	BBPL	5	Spr 91	NOFL	1	Aut 90
TRUS	1	Aut 90	SEPL	5	Aut 91	PIWO	1	Spr 91
GWFG	12	Aut 90	KILL	90	Sum 91	VGSW	10	Sum 91
BRAN	17	Win 90	GRYE	9	Spr 91	BASW	15	Sum 91
CAGO	158	Aut 90	LEYE	5	Spr 91	STJA	11	Spr 91
GWTE	323	Aut 90	WHIM	23	Sum 91	NOCR	57	Win 90
MALL	253	Aut 90	MAGO	2	Sum 91	CORA	9	Win 90
NOPI	28	Win 90	BLTU	100	Spr 91	CBCH	10	Spr 91
BWTE	2	Spr 91	SAND	50	Aut 90	WIWR	1	Spr 91
CITE*	10	Aut 90	SESA	33	Aut 91	GCKI	30	Aut 91
NOSL	6	Aut 90	WESA	1228	Spr 91	RCKI	2	Aut 90
GADW	17	Aut 90	LESA	33	Aut 91	HETH	2	Sum 91
EUWI	34	Aut 90	DUNL	60	Spr 91	AMRO	40	Aut 91
AMWI	465	Aut 90	DOWI	40	Spr 91	VATH	3	Win 90
CANV	1	Aut 90	LBDO	8	Sum 91	WAPI	20	Spr 91
SCAU	41	Aut 90	COSN	1	Aut 90	CEWA	6	Aut 90
SUSC	5	Aut 90	GULL	500	Aut 90	EUST	101	Sum 91
WWSC	1	Win 90	BOGU	70	Aut 90	OCWA	3	Sum 91
COGO	42	Aut 90	HMGU	1	Aut 90	YRWA	3	Aut 90
BUFF	68	Win 90	MEGU	209	Aut 90	SAVS	3	Spr 91
HOME	16	Win 90	RBGU	47	Aut 90	FOSP	3	Win 90
COME	43	Sum 91	CAGU	41	Aut 90	SOSP	3	Spr 91
RBME	41	Sum 91	HEGU	94	Aut 90	DEJU	10	Aut 90
OSPR	1	Sum 91	THGU	102	Aut 90	WEME	6	Aut 90
BAEA	17	Aut 90	GWGU	405	Aut 90	PUFI	3	Spr 91
NOHA	1	Aut 90	CATE	11	Sum 91	RECR	20	Win 90
SSHA	1	Aut 90	COMU	1	Aut 91			
						Total	5237	

Table 2. Estimated minimum numbers of birds dependent on Hardy Bay and the Quatse River estuary, 9 September 1990 through 20 October 1991, based on the minimum number of each species observed on migratory bird surveys. For species names, see Appendix II.

* Hypothetical

Habitat Use

Of the 7 habitat groups defined during the 1990-1991 survey period (see Table 1), the north intertidal marsh was used by 50% of all birds observed, followed by the intertidal flats (31%) and the subtidal area (10%).

Seasonal Numbers

Spring: Figure 3 shows the ratio of species group use of the estuary for the spring of 1991. Shorebirds comprised half of the total bird use during this season, followed by waterfowl and passerines. Spring had the third highest bird use during the survey.

Summer: Figure 4 shows the ratio of species group use of the estuary for the summer of 1991. Gulls were the dominant user group followed by shorebirds, then the waterfowl and passerines in roughly equal proportions.

Autumn: Figure 5 shows the ratio of species group use of the estuary for the late autumn of 1990 and the early autumn of 1991. More birds used the estuary during the autumn of 1990 than any other season. Waterfowl accounted for just under half of the bird use followed by gulls. Gulls were the main user group in 1991; the shorebirds were the next highest user group followed by the waterfowl and passerines. Autumn 1991 bird use was the lowest overall.

Winter: Figure 6 shows the ratio of species group use of the estuary for the winter of 1990-1991. Waterfowl were the dominant user group with gulls and passerines also seen in significant proportions. This season had the second highest bird use for the study period.

Species Composition

The following annotated species list is organized taxonomically according to bird families as shown in Figures 3, 4, 5, and 6. It includes summarized data from the survey period, as well as additional data from those sources noted in the methods. Within families, species are discussed in decreasing order of highest use of the estuary during the surveys, followed by those species for which we have additional information. A taxonomic checklist of the birds of Hardy Bay and the Quatse River estuary can be found in Appendix II.

Loons: Loons were seen infrequently with a total of only 9 birds tallied over the study period. The majority (7 birds) were identified as the Yellow-billed Loon; 1 bird remained unidentified and was recorded as loon species. The Yellow-billed Loon is the rarest of the loon species and prior to 1924 it was placed on the hypothetical list for British Columbia (Brooks and Swarth 1925). Campbell et al. (1990) discuss an expansion in the nonbreeding range of the Yellow-billed Loon; it can be found in all seasons along the outer and inner coasts. Six of these loons were recorded between 4 and 25 November 1990 (when the maximum of 3 birds were noted) corresponding with the autumn migration times. The remaining bird was seen on 13 January 1991 and was possibly overwintering. Most (86%) of the loons were using the subtidal area; 1 bird was seen on the intertidal flats. However, since it would be very unusual to find the Yellow-billed Loon outnumbering the Common Loon anywhere along the

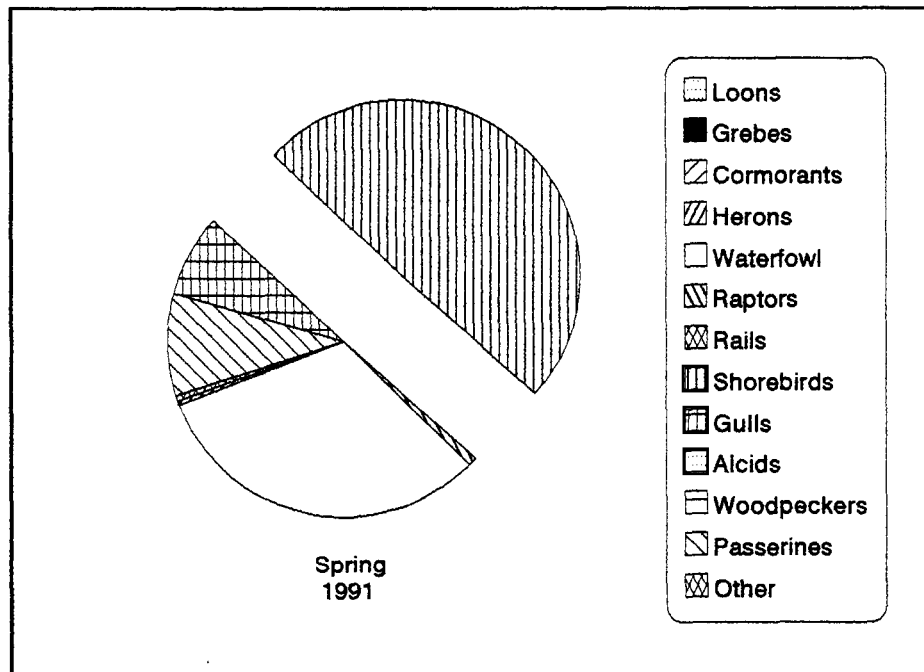


Figure 3. *Proportional bird species group use on the Quatse River estuary, Spring 1991.*

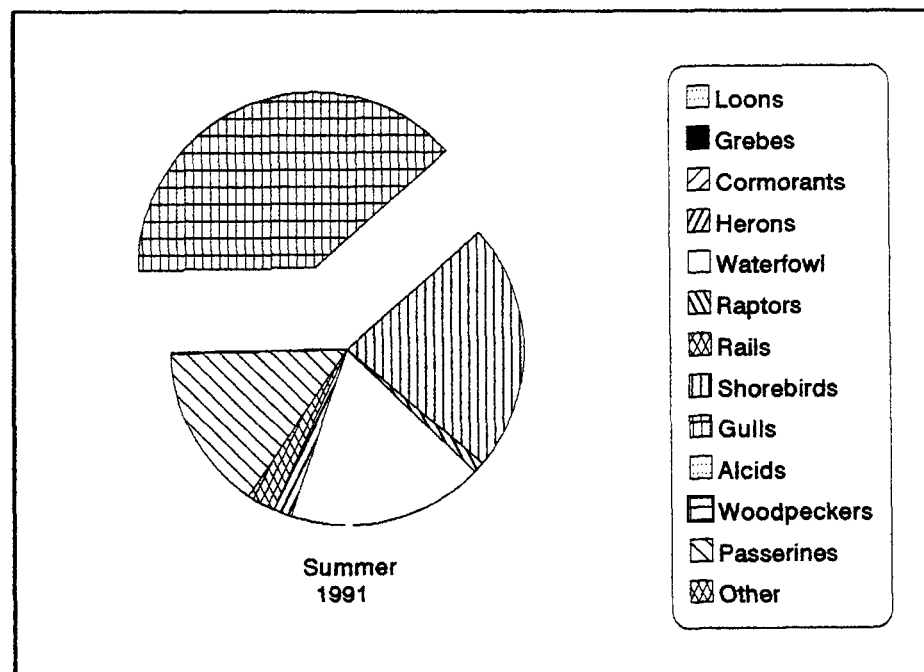


Figure 4. *Proportional bird species group use on the Quatse River estuary, Summer 1991.*

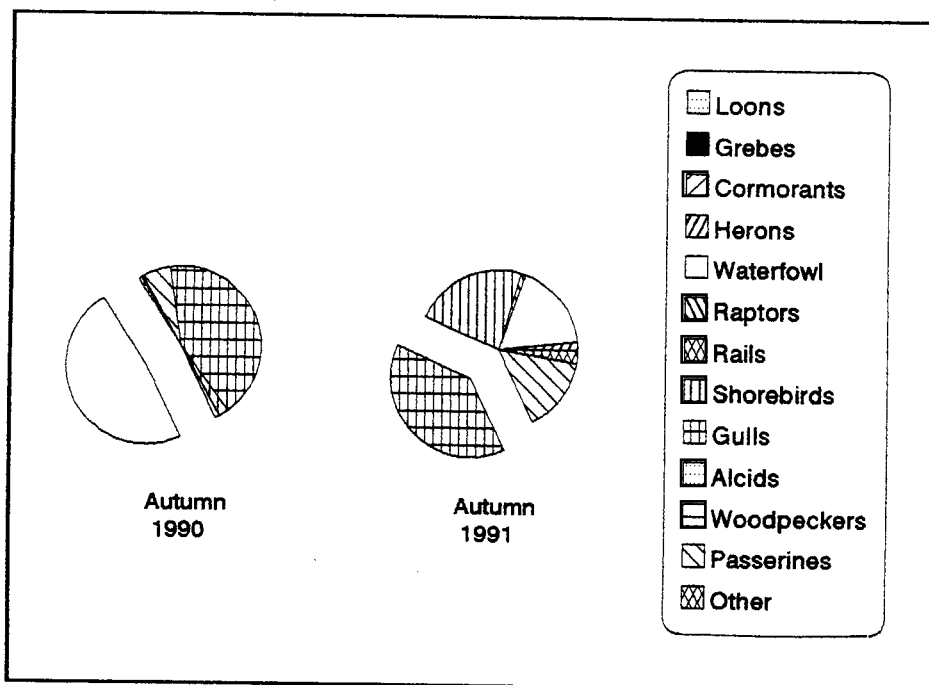


Figure 5. Proportional bird species group use on the Quatse River estuary, Autumn 1990 and Autumn 1991.

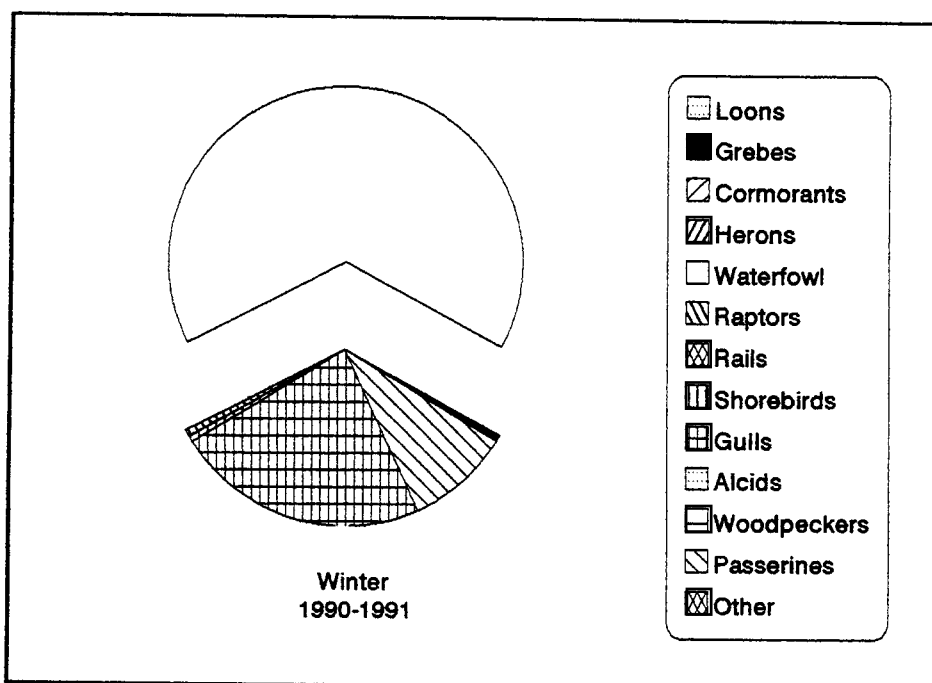


Figure 6. Proportional bird species group use on the Quatse River estuary, Winter 1990-1991.

coast, and since adequate field notes were not taken of these birds, we have considered this species hypothetical.

One Common Loon was observed in the subtidal area on 12 November 1990.

Grebes: Two species of grebes totalling 19 birds were seen during the survey period; 2 birds remained unidentified to species. There were 4 records of the Western Grebe totalling 14 birds. Most observations were from the autumn seasons; a peak of 8 Western Grebes was seen on 20 October 1991. There was 1 winter sighting of 2 birds on 13 January 1991. All of the Western Grebes were using the subtidal area.

Three Red-necked Grebes were seen in the subtidal area on 20 October 1991.

Cormorants: On 25 November 1990, 2 cormorants were seen in the subtidal area; they were not identified to species.

Hérons: The Great Blue Heron was recorded a total of 150 times throughout the survey period. Numbers were highest during the autumn of 1990 when 37% of the herons were seen, followed closely by summer (33%); a peak of 11 birds occurred on 27 July 1991. The probability of seeing a Great Blue Heron ranged from 67% during the spring to 100% in both of the autumn seasons. Overall, the heron's preferred habitat was the north intertidal marsh where 60% of the birds were seen; the intertidal flats and subtidal areas were also used in significant proportions during the summer months.

Swans: Swan use of Hardy Bay and the Quatse River estuary was minimal; only 2 swans were seen compared to 347 reported during a bird use survey for the same period at the Cluxewe River estuary, some 24 km southwest of Hardy Bay (Dawe et al. 1995). The first record was of 1 Trumpeter Swan using the north intertidal marsh near the river mouth on 25 November 1990. The second swan was not identified to species; it was seen on 6 January 1991 in the south intertidal marsh. However, during a BCMOE survey, 15 Trumpeter Swans were noted (exact location unknown) in January 1976 (Whately 1994). Local observers suggested that groups numbering 2-5 birds are more common.

Geese: Geese comprised 11.5% of the total birds seen ranking them as the fourth most abundant user group on the system. Although 3 species of geese were recorded using the estuary, the Canada Goose was by far the most abundant accounting for 99% of all the geese observed. Numbers were highest during the winter season when 39% of the total Canada Geese were noted; autumn 1990 levels were also high (27%). A peak of 158 birds occurred on 21 October 1990. For seasonal fluctuations in the numbers of Canada Geese see Figure 7. Overall, the north intertidal marsh was the preferred habitat accounting for 66% of the Canada Goose use; this area was used almost exclusively during the summer. The south intertidal marsh attracted the second highest numbers (23%). Seasonal habitat use is shown in Figure 8.

Brant were reported only twice: 6 January 1991-17 birds were seen in the south intertidal marsh and 24 June 1991-10 birds were observed using the

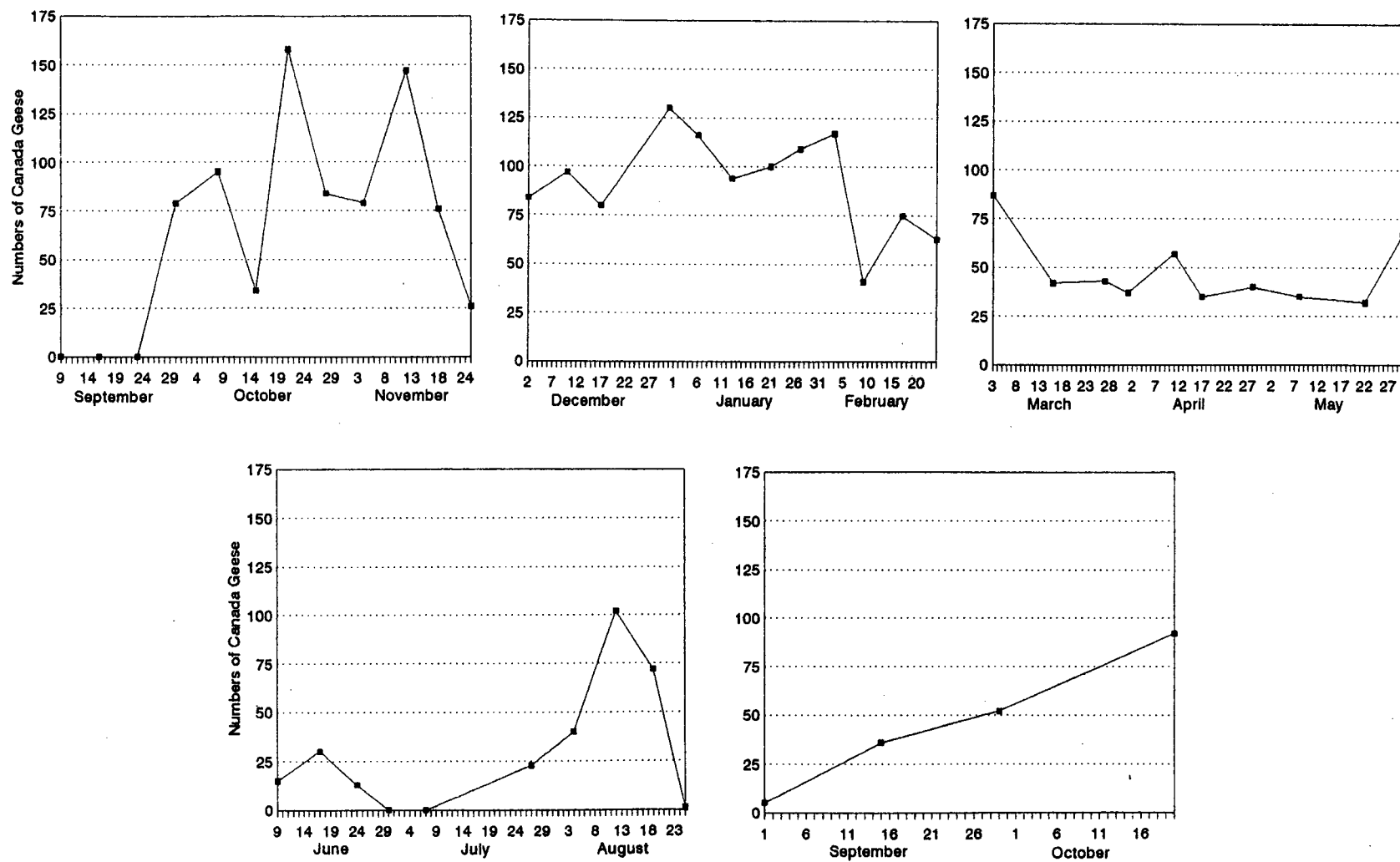


Figure 7. Seasonal fluctuations in Canada Goose numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

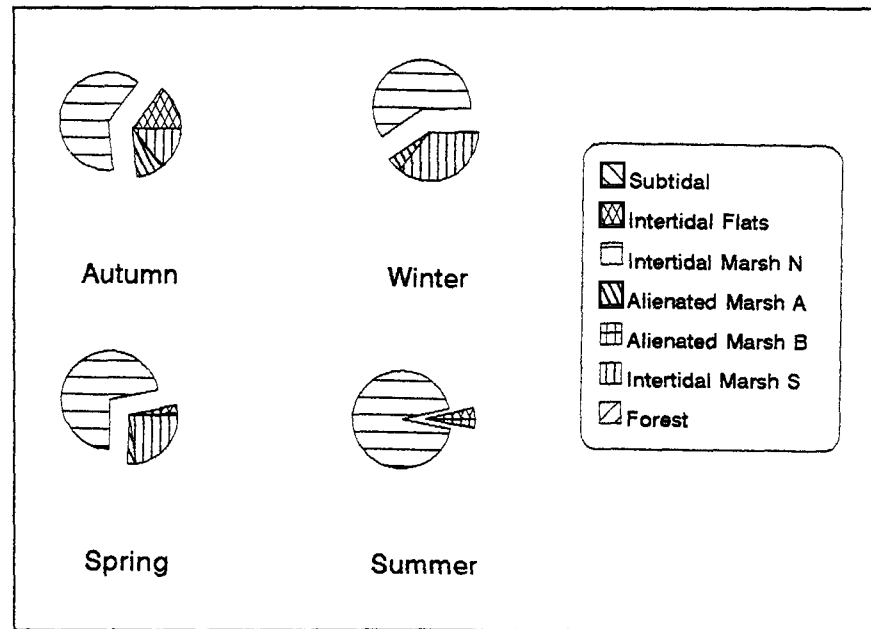


Figure 8. *Seasonal habitat use by the Canada Goose on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).*

intertidal flats close to the Quatse River mouth. The latter record corresponds with the tail end of the spring migration dates observed on the Cluxewe River estuary (Dawe et al. 1995). Brant use of the Cluxewe River estuarine system is substantially higher.

One flock of 12 Greater White-fronted Geese were seen on 9 September 1990 in the north intertidal marsh. Outside the survey period, 1 Greater White-fronted Goose was observed foraging and loafing on the intertidal marsh and flats along with 73 Canada Geese on 16 May 1990 (Whately 1994).

Dabbling Ducks: We recorded a total of 6,633 dabbling ducks of 9 species which ranked them as the second highest user group comprising 26% of the total birds seen. Mallards were by far the most abundant followed by American Wigeon and Green-winged Teal in roughly equal proportions. Just under 2% of the ducks were unidentified to species. Numbers peaked during the autumn of 1990 when 49% of the total dabblers were seen. Thereafter, levels steadily declined until the summer of 1991 when <1% of this species group were noted. For seasonal fluctuations in dabbling duck numbers see Figure 9. Overall, the north intertidal marsh and the intertidal flats were the preferred habitats, used almost exclusively by this group with 53% and 36% of the birds recorded there respectively. See Figure 10 for seasonal habitat use by dabbling ducks on the estuary.

The Mallard was the most abundant of the dabbling duck species with a total of 2,510 birds (38% of the dabblers). Although numbers were high in the autumn of 1990 (36% of the total Mallards) and the maximum of 253 occurred on 12 November 1991, Mallards did not reach their highest levels until the winter season when 40% of the total Mallard numbers were counted. Fall migrants began

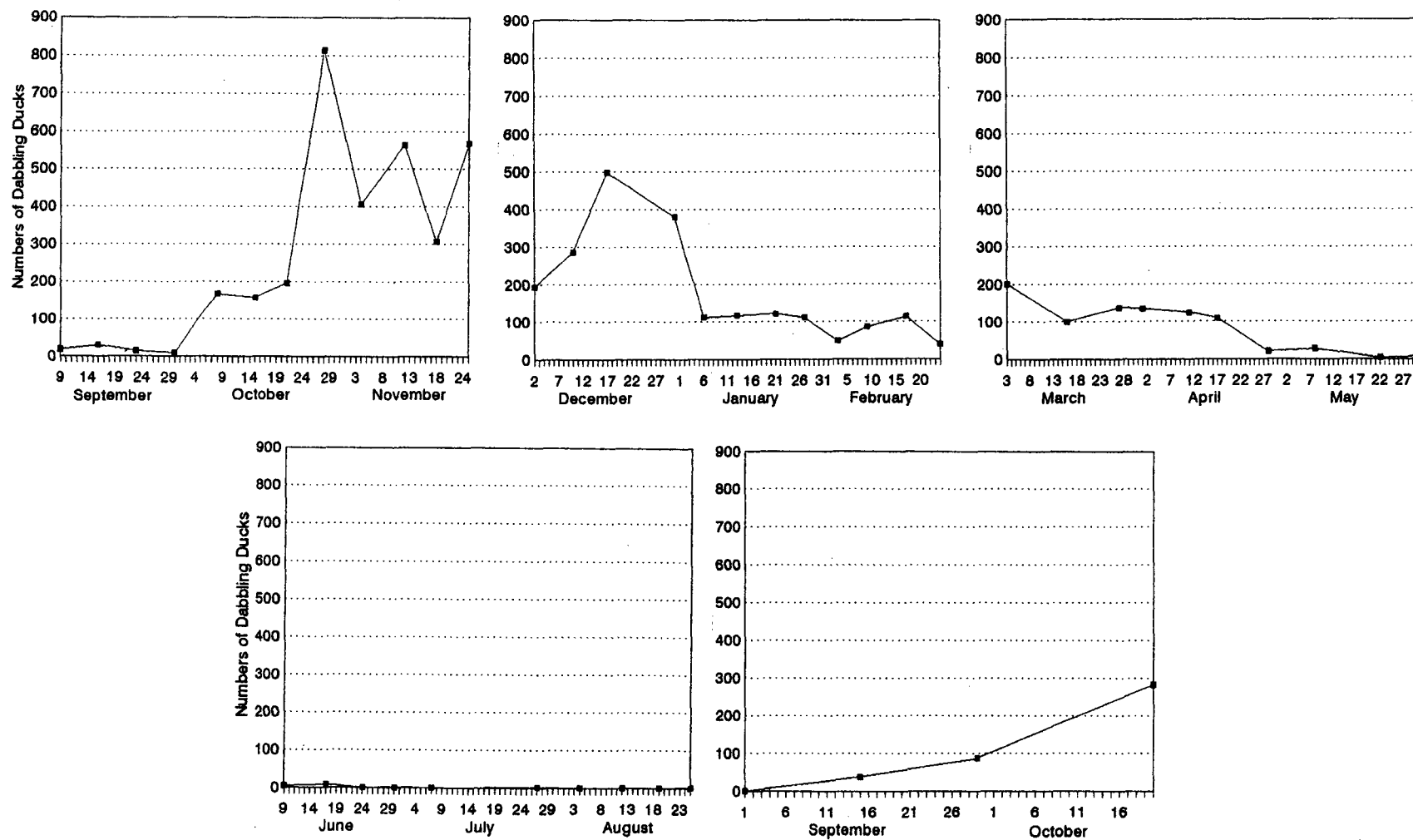


Figure 9. Seasonal fluctuations in Dabbling Duck numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

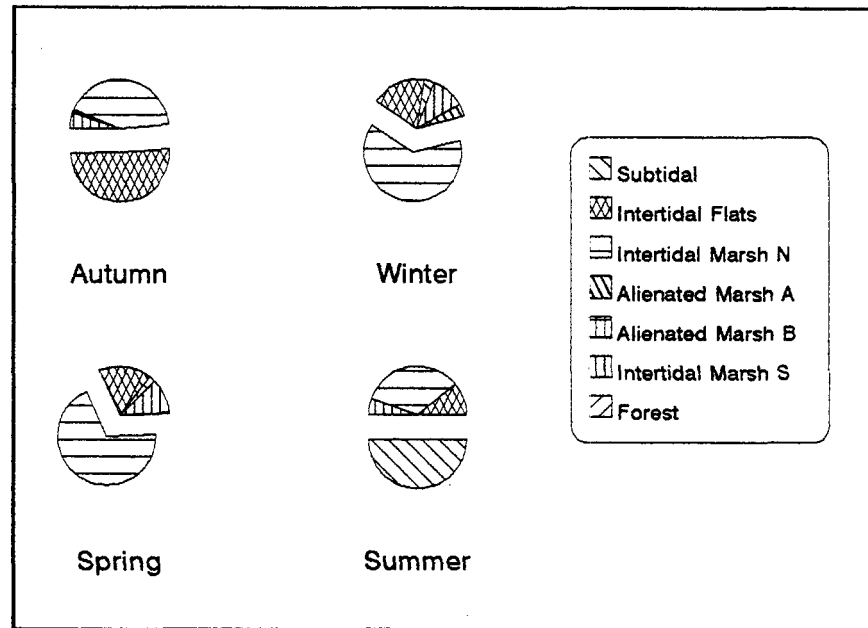


Figure 10. *Seasonal habitat use by Dabbling Ducks on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).*

to arrive around mid-September in both 1990 and 1991 and most of the Mallards had left the estuary after the first week in May. There were a few summer records suggesting that the Mallard may breed on the study area; however, broods were not reported. See Figure 11 for seasonal fluctuations in Mallard numbers. The north intertidal marsh was the preferred habitat, attracting 50% of the Mallards seen during the survey; this area was particularly favoured in the combined autumns and the summer months. The intertidal flats attracted 37% of the Mallard use followed by the north intertidal marsh. Figure 12 shows seasonal habitat preferences for the Mallard.

The American Wigeon was the second most abundant dabbler comprising 27% of the dabbling duck total. Trends in wigeon numbers were very different from those of the Mallard; 72% of all wigeons were noted during the autumn of 1990 followed by winter with 12%. A peak of 465 wigeon occurred on 28 October 1990. Earliest arrival was 15 September 1991 and most of the wigeons had departed by 1 April 1991 (2 birds were seen on 30 May 1991). Seasonal fluctuations in the numbers of American Wigeon are noted in Figure 14. The American Wigeon was found almost exclusively in 2 habitats: the intertidal flats were used by 56% of the birds (especially during the autumns) followed by the north intertidal marsh where 44% were seen. For seasonal habitat use by the American Wigeon, see Figure 13.

We recorded almost as many Green-winged Teal as wigeons with teal comprising 26% of the dabbling duck total. The highest numbers were seen during the autumn of 1990 (49% of the teal) when a peak of 323 birds was noted on 25 November 1990. Winter levels followed at 36%. The earliest fall arrivals were noted on 15 September 1991 and the latest spring departure occurred on 22 May 1991. We have 1 summer record: 9 June 1991-1 bird on the estuary. For

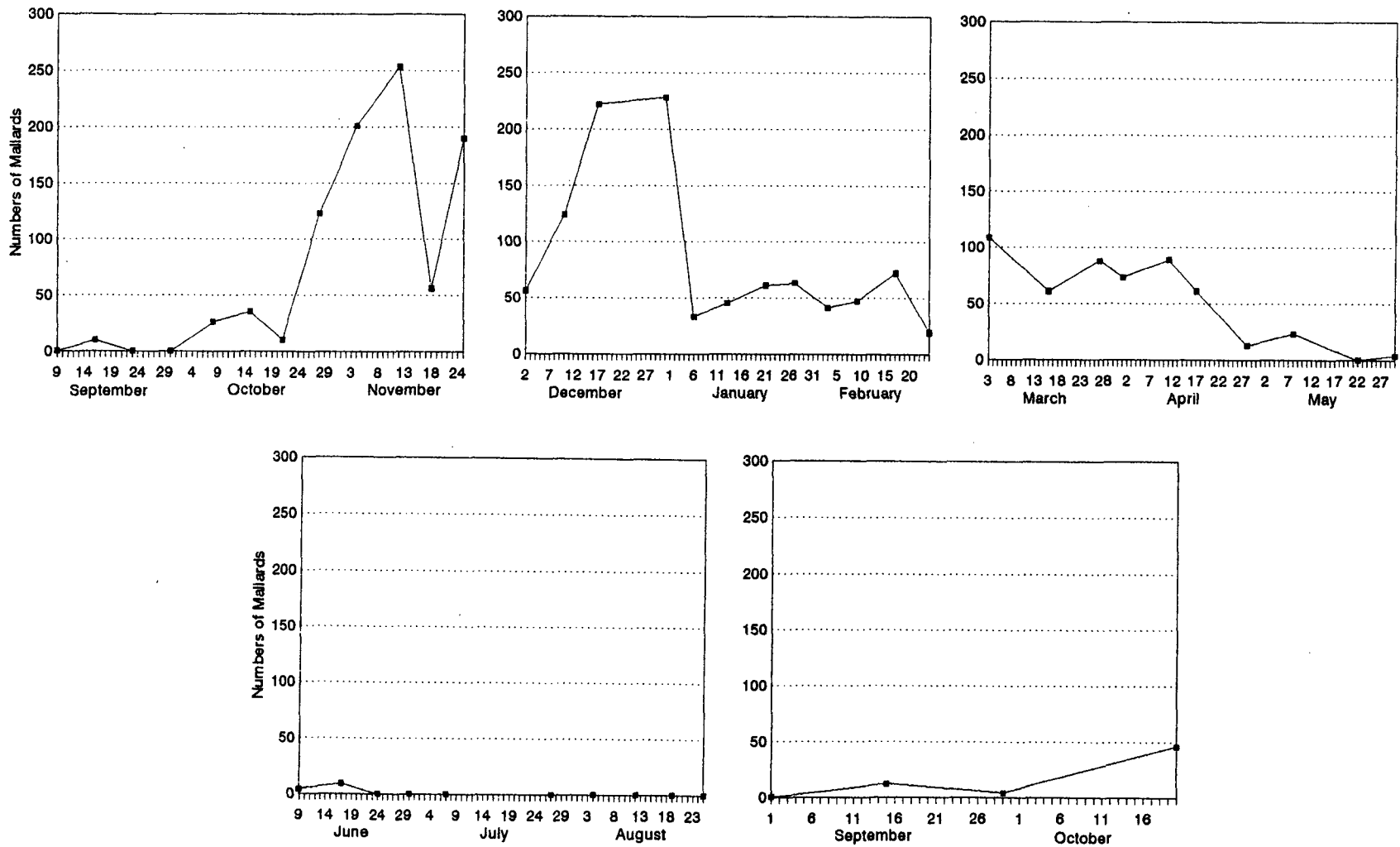


Figure 11. Seasonal fluctuations in Mallard numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

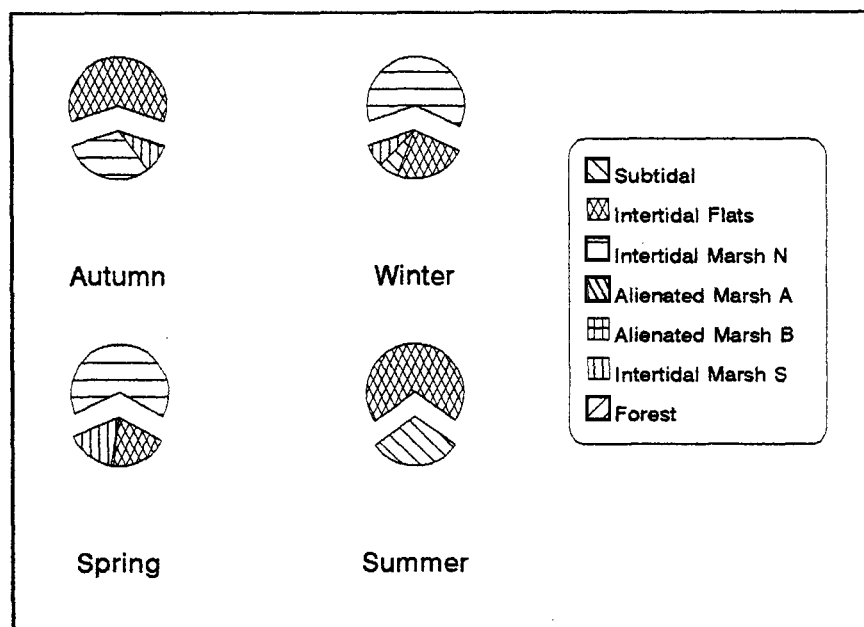


Figure 12. Seasonal habitat use by the Mallard on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).

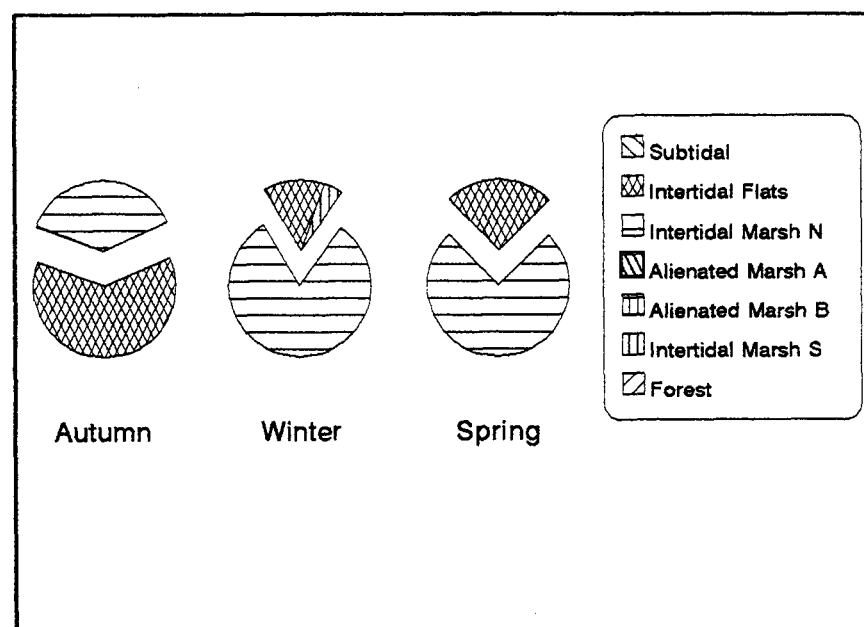


Figure 13. Seasonal habitat use by the American Wigeon on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).

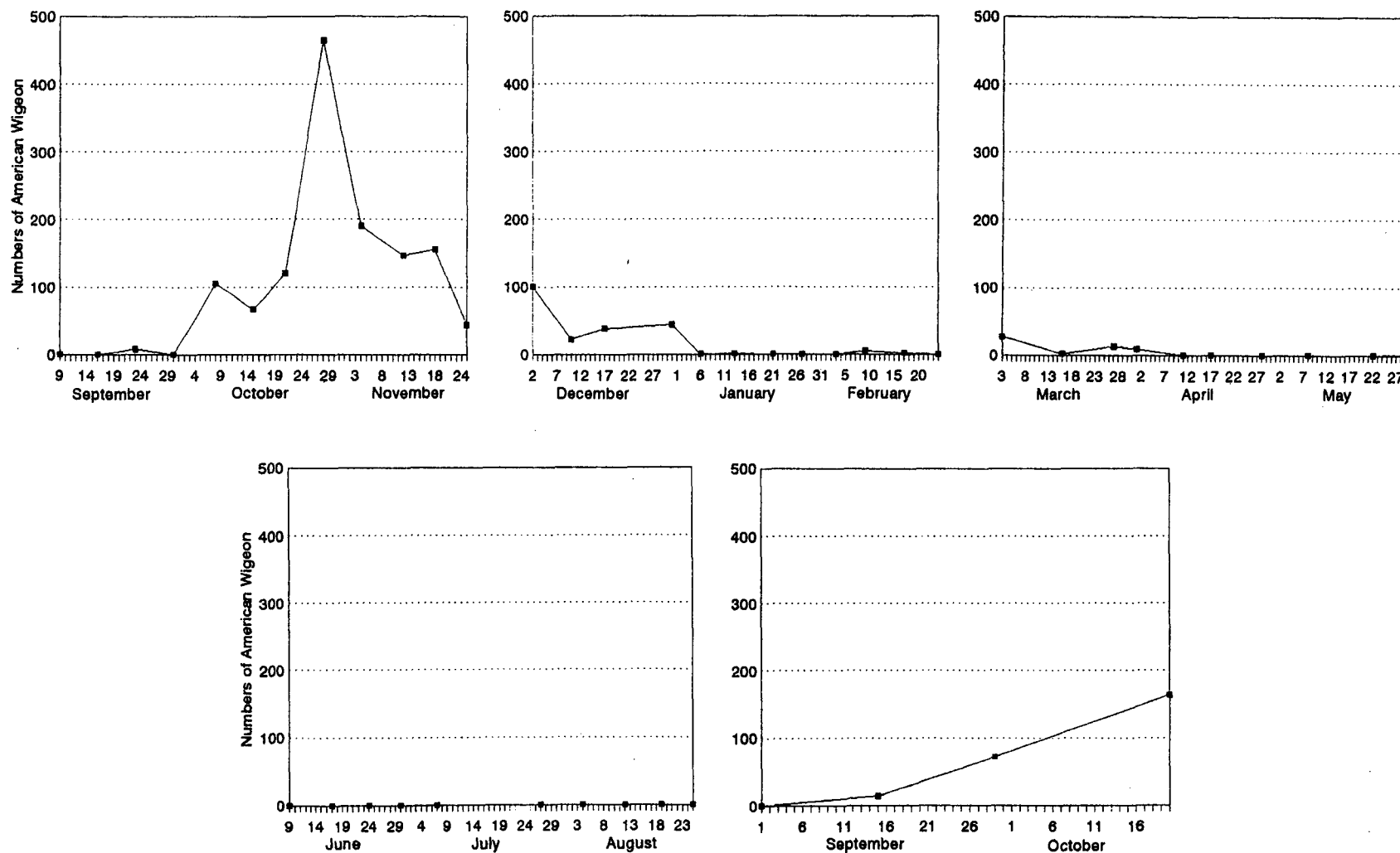


Figure 14. Seasonal fluctuations in American Wigeon numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

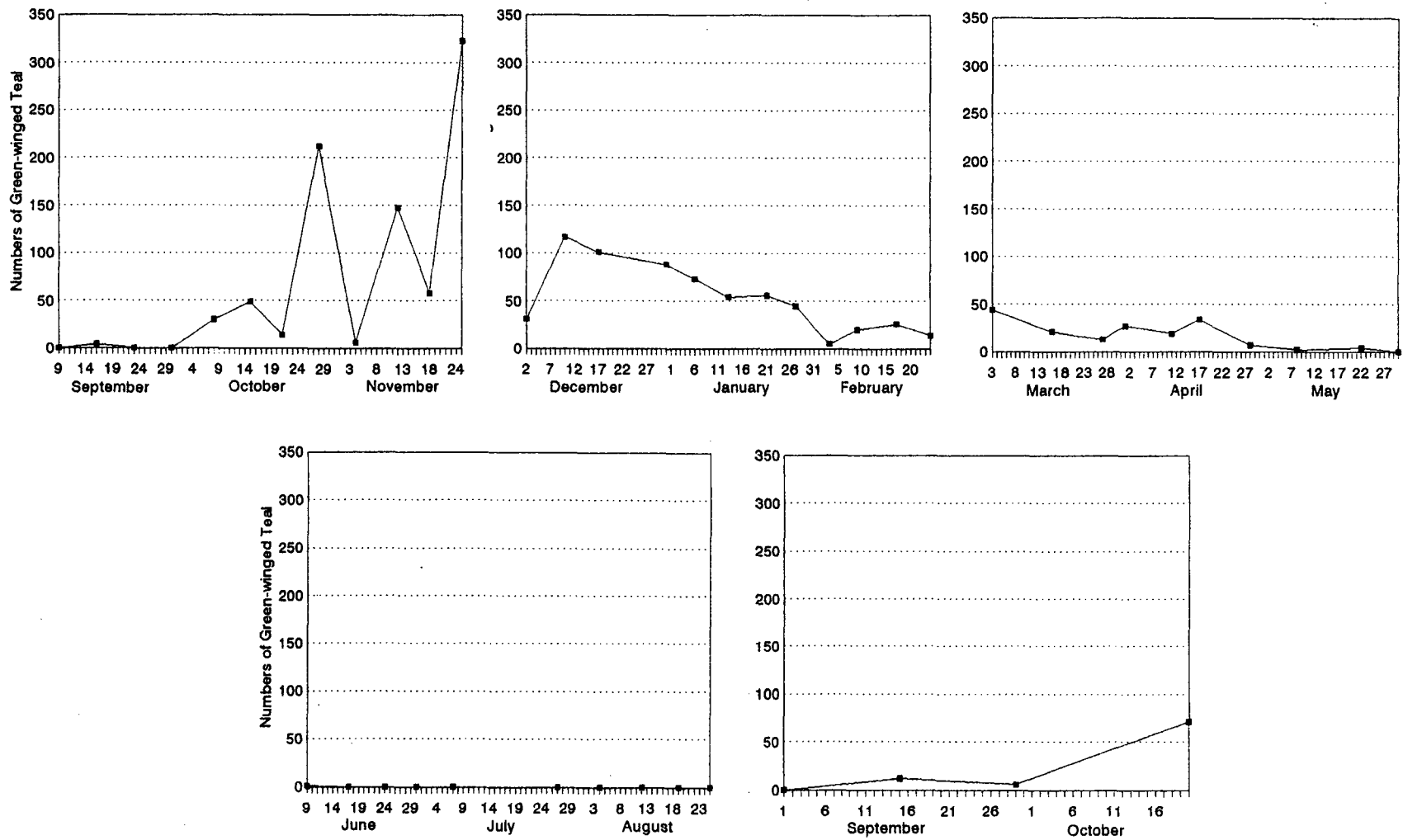


Figure 15. *Seasonal fluctuations in Green-winged Teal numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.*

seasonal fluctuations in Green-winged Teal numbers see Figure 15. Although teal were recorded using 5 habitat types, 3 in particular were favoured: 65% of the birds were recorded in the north intertidal marsh followed by the intertidal flats (22%) and the south intertidal marsh (11%). Seasonally, the north intertidal marsh was used proportionally higher from the autumn through spring (Figure 16).

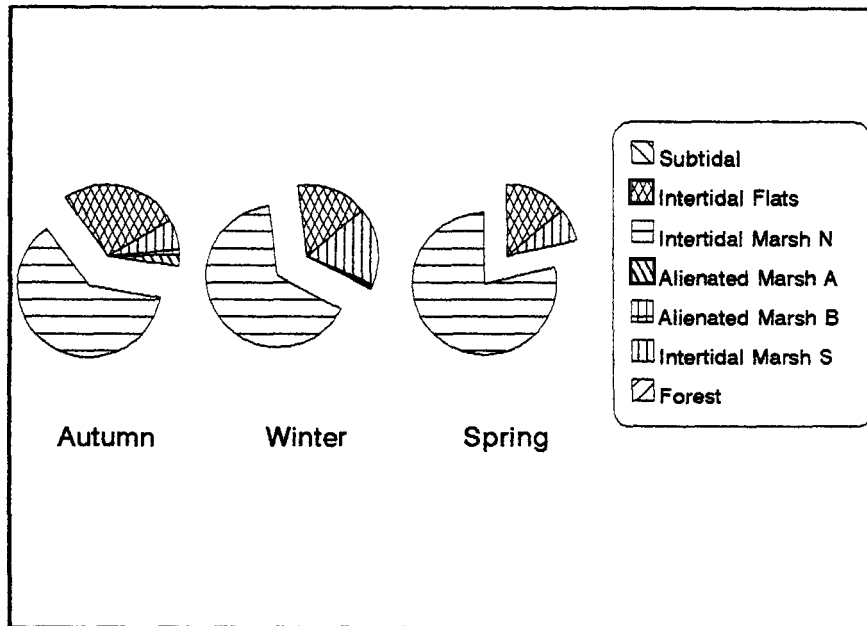


Figure 16. *Seasonal habitat use by the Green-winged Teal on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).*

Two hundred seventy-two Northern Pintail were recorded, representing 4% of the dabbling duck total. Earliest arrival date for the Northern Pintail was 16 September 1990 and their latest spring departure occurred on 17 April 1991. We have 3 records of the Northern Pintail using the estuary over the summer of 1991: 30 June-1 bird, 27 July-2 birds and 25 August-1 bird. Unlike the other dabblers, the pintail was seen in roughly equal numbers over the autumn of 1990 (34% of the total birds), the winter of 1990-1991 (32%; when a peak of 28 birds was observed on 17 December 1990), and the spring of 1991 (31%). Outside of the survey, 57 Northern Pintail were observed on 6 October 1982 feeding on the mud flats and along the channels (MC). The preferred habitat for the pintail was the north intertidal marsh where we tallied 71% of the birds, followed by the intertidal flats (17%).

One hundred and eighteen Gadwall were seen between 28 October 1990 and 17 April 1991. Numbers were highest during the winter when 47% of the total Gadwall were noted; their frequency of occurrence in winter was 83%. However, the maximum number was recorded during the autumn: 17 birds occurred on 18 November 1990. The south intertidal marsh was the Gadwall's preferred habitat where 56% of these birds were recorded; the remaining birds were noted in the north intertidal marsh and intertidal flats in roughly equal proportions.

The Eurasian Wigeon was seen a total of 36 times during the autumn of 1990; however 1 flock of 30 birds noted using the intertidal flats along with 120 American Wigeon on 21 October 1990 were likely recorded incorrectly. Campbell et al. (1990) note that Eurasian Wigeon are generally found in small numbers within larger flocks of American Wigeon. This number of Eurasian Wigeon anywhere in British Columbia would be extraordinary, particularly in the company of so few American Wigeon. It exceeds the single largest group documented in the province: 22 male Eurasian Wigeon counted in a flock of 2,000 American Wigeon at Reifel Island (Campbell et al. 1990). As a comparison, during a bird survey on the Englishman River estuary in Parksville, Vancouver Island (see Dawe et al. 1994), the American Wigeon was the most abundant dabbling duck with over 12,300 birds observed and only 47 Eurasian Wigeon were reported over the course of the survey. The maximum daily total there was 7 birds. Since adequate field notes were not taken, we have considered the record of 30 Eurasian Wigeon hypothetical. There were 2 other records for Eurasian Wigeon using the estuary: 4 birds were noted using the north intertidal marsh on 21 October 1990 and 2 birds were viewed in the same habitat on 4 November 1991. Outside of the survey period, 1 Eurasian Wigeon was observed feeding with American Wigeon along flooded channel edges on 6 October 1982 (MC).

Seventeen Northern Shovelers were reported during the survey. Shovelers arrived on 16 September 1990 (when the maximum of 6 birds was noted) and were seen occasionally until 17 February 1991. The following autumn, 3 birds arrived on 29 September 1991. The Northern Shoveler was noted using 2 of the habitat units: 65% of the birds were found using the north intertidal marsh with the remainder in the alienated marsh A.

We have 2 records of the Cinnamon Teal, both noted in the north intertidal marsh: 9 September 1990-10 birds and 15 October 1990-1 bird. This is a very rare bird for northern Vancouver Island (see Campbell et al. 1990). Since adequate field notes are not available, we consider this record hypothetical.

During the survey, the Blue-winged Teal was the least abundant of the dabbling ducks. On 8 May 1991, 2 birds were noted in the south intertidal marsh.

Diving Ducks: Eight species of diving ducks comprised 7% of the total birds reported during the study period. Collectively, mergansers were the most abundant group of the diving ducks and the Bufflehead was a close second; the goldeneyes ranked a distant third. Three percent of the diving duck total remained unidentified and those birds were recorded primarily as duck species. Numbers peaked during the autumn of 1990 when 34% of the diving ducks were seen, then levels steadily declined through the remainder of the study. For seasonal fluctuations in diving duck numbers, see Figure 17. Overall, diving ducks preferred the intertidal flats which was used by 41% of the birds. The subtidal and north intertidal marsh habitats followed with roughly one quarter of the diving duck use in each of the areas. For seasonal habitat use by the diving ducks see Figure 18.

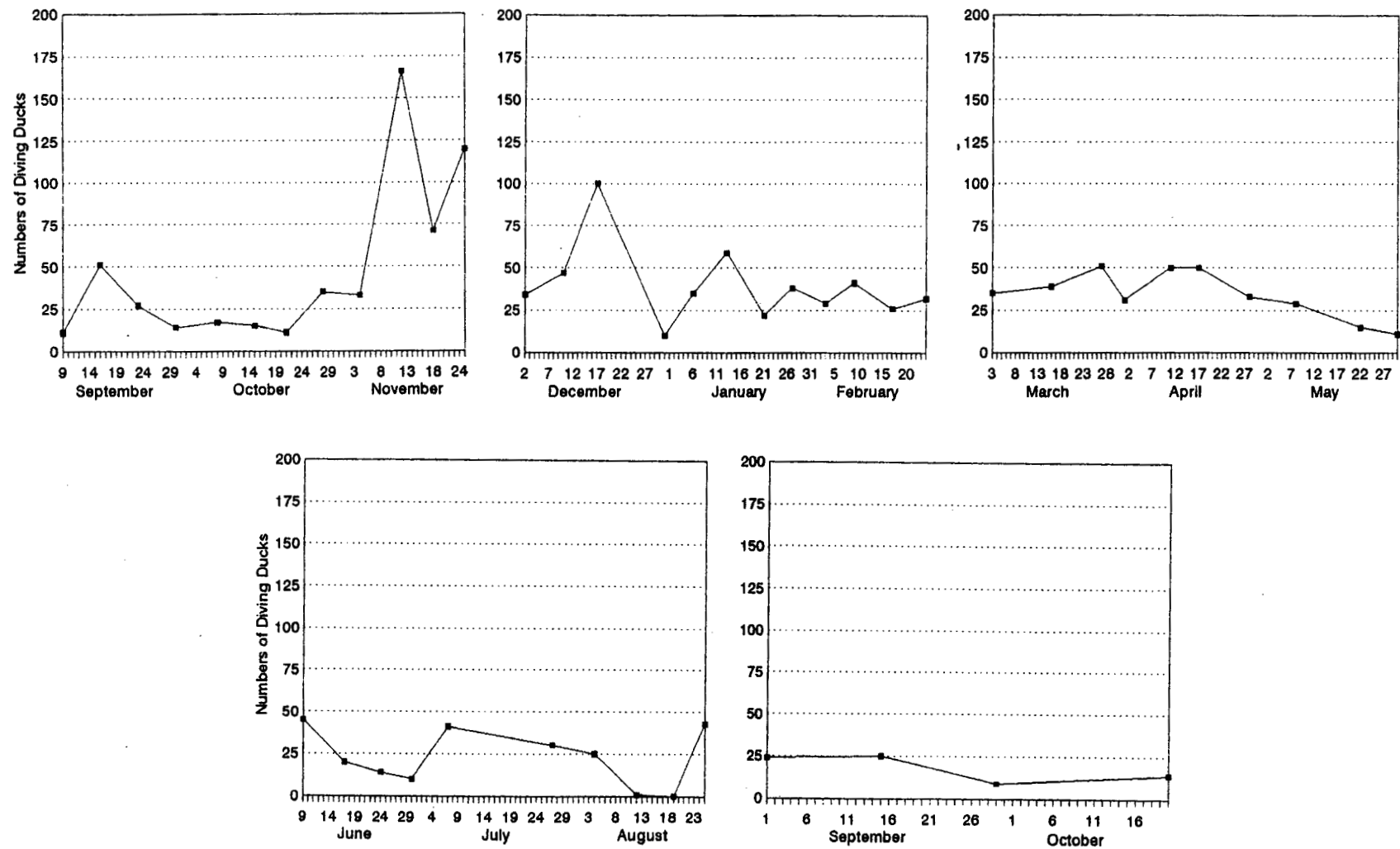


Figure 17. *Seasonal fluctuations in Diving Duck numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.*

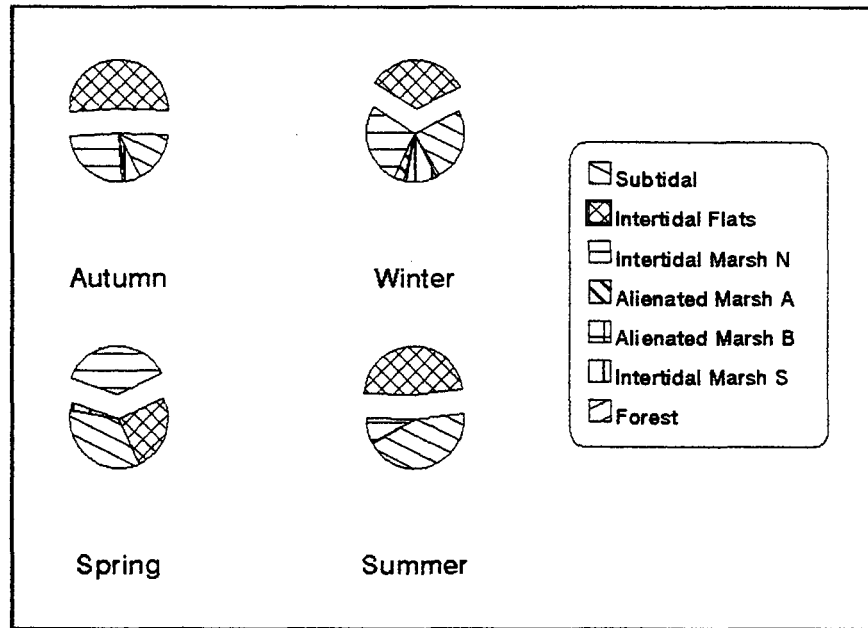


Figure 18. Seasonal habitat use by Diving Ducks on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).

The mergansers (Common, Hooded and Red-breasted) were the most abundant group with a combined total of 42% of the diving ducks. The Common Merganser was the most frequently seen of the 3 species accounting for 63% of all merganser records. A year 'round resident, the Common Merganser was seen in its highest numbers during the autumn of 1990 (33%) followed by the summer of 1991 (30%). Its frequency of occurrence during the summer was 70%, the lowest over the study period; however, the maximum number was observed during the summer; 25 August 1991-43 birds. Young were observed twice using the intertidal flats: 2 young with 1 adult on 17 June 1991 and 9 young with 1 adult on 30 June 1991. Common Mergansers preferred the north intertidal marsh and the intertidal flats where we saw 44% and 41% of the birds respectively. Subtidal use by this species was low at 14%.

We recorded 220 Hooded Mergansers during the survey. Autumn 1990 and winter 1990-1991 levels were similar with 41% and 40% of the total respectively. Earliest arrival date for the Hooded Merganser was 9 September 1990; the latest departure date was 28 April 1991. We have 1 summer record of 1 bird on 12 August 1991. Once again, the intertidal flats and the north intertidal marsh (both with 28% of the Hooded Mergansers noted) were the preferred habitats used by this merganser. They were also recorded in the subtidal areas (21%) and in the south intertidal marsh (17%).

The Red-breasted Merganser was the least frequently seen of the mergansers with only 2 records: 17 April 1991-1 bird and 7 July 1991-41 birds. All of the birds used the intertidal flats. Campbell et al. (1990) state that summer records are numerous along the coast and include occasional non-

migrants, perhaps nonbreeding subadults and males moving from breeding areas to moulting areas, as well as post-breeding birds.

A total of 641 Bufflehead was recorded during the survey period comprising 38% of the diving duck total; they ranked second most abundant. Overwintering Bufflehead arrived on 4 November 1990 and their frequency of occurrence was 100% until they left for interior breeding grounds on 30 May 1991. We observed peak numbers during the winter when 44% of the birds were noted; the maximum of 68 birds occurred on 17 December 1990. Autumn 1990 and spring 1991 levels were 22% and 34% respectively. The Bufflehead used 5 of the 7 habitat units with the majority (44%) seen on the intertidal flats; north intertidal marsh (24%) and subtidal area (23%).

The goldeneyes comprised 10% (159 birds) of the diving duck total; most were identified as Common Goldeneye while the remainder went unidentified to species and were recorded as goldeneyes. Earliest arrival for goldeneyes was 4 November 1990 and the latest departure date was 17 April 1991. A peak of 42 Common Goldeneye occurred on 25 November 1990; autumn numbers were the highest (53% of the total) and numbers declined thereafter. The intertidal flats were the Common Goldeneye's preferred habitat (63% were noted in this area) followed by the subtidal (31%); a few birds were seen in the north and south intertidal marshes respectively.

Scaup accounted for 7% (114 birds) of the diving duck total. Unfortunately, none was identified to species. Two of the records occurred during the autumn of 1990 (12 and 25 November-41 and 21 birds respectively) and there were 3 records for the summer of 1991 (9, 17 and 24 June-34, 12 and 6 birds respectively). The subtidal area was used by 79% of the birds while the remainder were seen on the intertidal flats.

We recorded only 6 scoters: 5 Surf Scoters were observed in the north intertidal marsh on 23 September 1990 and 1 White-winged Scoter was noted in the subtidal area on 10 December 1990. All of the subtidal areas located within the study area are most likely too restricted for use by scoters.

One Canvasback was seen on 25 November 1990 using the intertidal flats. This bird could have been a late fall migrant. Canvasbacks start arriving on the coast by early September with numbers building until they peak in November (Campbell et al. 1990). Migrant and wintering populations of the Canvasback have been in a 30-year decline (Bellrose 1976, Tate and Tate 1982). Tate and Tate (1982) caution that we must reverse the loss of quantity and quality of wetlands for the sake of the Canvasback and, indeed, all wetlands species.

Raptors: Seven species of raptors totalling 212 birds were seen during the survey representing <1% of all birds seen. The Bald Eagle was by far the most abundant of the birds of prey comprising 94% of the raptor total. Bald Eagles were reported in every season with numbers reaching their highest levels during the autumn of 1990 (43%) as birds concentrated to take advantage of pink, coho and chum salmon carcasses as they became available. A peak of 17 eagles was recorded on 28 October 1990. The frequency of occurrence for this species was 100% throughout the survey period except during the summer

of 1991 when the probability of seeing a eagle dropped to 80%. The north intertidal marsh had the highest Bald Eagle use (56%).

Bald Eagle concentrations and trends that we observed on the Quatse River/Lower Hardy Bay estuarine system were very similar to those observed during the same period on a bird use survey of the Cluxewe River estuary near Port McNeill (see Dawe et al. 1995). Both studies had similar eagle use and numbers peaked on the same day, most likely a result of their proximity to one another and coinciding levels of spawning salmon. Pink salmon account for the majority of the fall spawners on the estuary, especially during large, even-year runs. The autumn of 1990 was such a year with pink escapement numbering 32,000 fish; 150 sockeye, 600 coho and 200 chum were also counted. Numbers of returning pinks have ranged from 0 (in 1977, 1979 and 1981) to 150,000 fish recorded in 1966 (Department of Fisheries and Oceans, Port Hardy, pers. comm.). Since 1983, a salmonid enhancement program has been enhancing the natural production in the Quatse River through annual release of fry and smolts from the Quatse River Hatchery. These efforts have resulted in boosting the off-year pink salmon escapement from 50 to between 3,000 and 5,000 adults. Hatchery releases are also credited with maintaining coho and chum salmon runs at existing levels after an extended period of decline (Whately 1994).

The Peregrine Falcon was observed on 4 occasions at the estuary: 1 bird was seen on 8, 22 and 30 May 1991 using the north and south intertidal marshes and the forest habitats respectively (these 3 sightings were most likely of the same bird); 1 bird was noted on 1 September 1991 in the north intertidal marsh.

We have 2 records of the Sharp-shinned Hawk: 1 bird was seen in the north intertidal marsh on 21 October 1990 and the following autumn, 1 bird was seen in the south intertidal marsh on 20 October 1991.

The Red-tailed Hawk was also seen twice: 24 February 1991 in the forest and again on 27 March 1991 using the south intertidal marsh.

The remaining raptors had only 1 record of 1 bird each: an Osprey was seen using the intertidal flats on 19 August 1991, a Northern Harrier was seen in the north intertidal marsh on 28 October 1990 and a Golden Eagle was identified on 25 November 1990 in the south intertidal marsh. Currently, the Golden Eagle has been expanding its range and now breeds on southern Vancouver Island (Campbell et al. 1990).

Grouse: We have only 1 record for grouse on the estuary: 1 Ruffed Grouse was noted in the forest on 3 March 1991.

Rails: The American Coot was reported 12 times. Coots were first seen at the estuary on 4 November 1990 and occurred on each survey until 10 December 1990; 1 bird was noted 13 January 1991. The number of coots encountered ranged from 1 to 3 birds with the maximum of 3 birds seen on both 12 and 25 November 1990. Campbell et al. (1990) note that coots frequent wetland areas where aquatic vegetation provides cover and a food source. We found coots using the more sheltered alienated marshes (75% of the birds preferred marsh A, 8% marsh B) and the north intertidal marsh (17%).

Cranes: A flock of approximately 50 Sandhill Cranes was seen flying over Hardy Bay on 18 April 1991 (Tex Lyon, pers. comm.) and reported to the survey leader (this was not a scheduled survey date). Campbell et al. (1990) identify 3 migration routes in British Columbia and this record is consistent with data for the coastal route. Early migrants may appear in February and early March but the main passage occurs in early April.

Shorebirds: A total of 3,667 shorebirds accounted for almost 15% of all birds seen ranking them as the third most abundant user group. Of the 15 species that used the study area for some part of their life history, the Western Sandpiper was seen in the largest numbers by far with Black Turnstones and Killdeer ranking a distant second and third respectively. Just under 50% of the shorebirds remained unidentified to species and were recorded simply as shorebirds; however these unidentified birds were observed over the same period that Western Sandpipers were migrating through and it is likely these shorebirds were peeps: a mixture of mostly Western and Least Sandpipers. Numbers of shorebirds were highest during the spring of 1991 when 72% of the birds were seen followed by summer 1991 (19%). For seasonal fluctuations in the numbers of shorebirds see Figure 20. Overall, the preferred habitats for this group of birds were the intertidal flats and the north intertidal marsh used by 50% and 42% of the birds respectively. For seasonal habitat preferences of shorebirds see Figure 19.

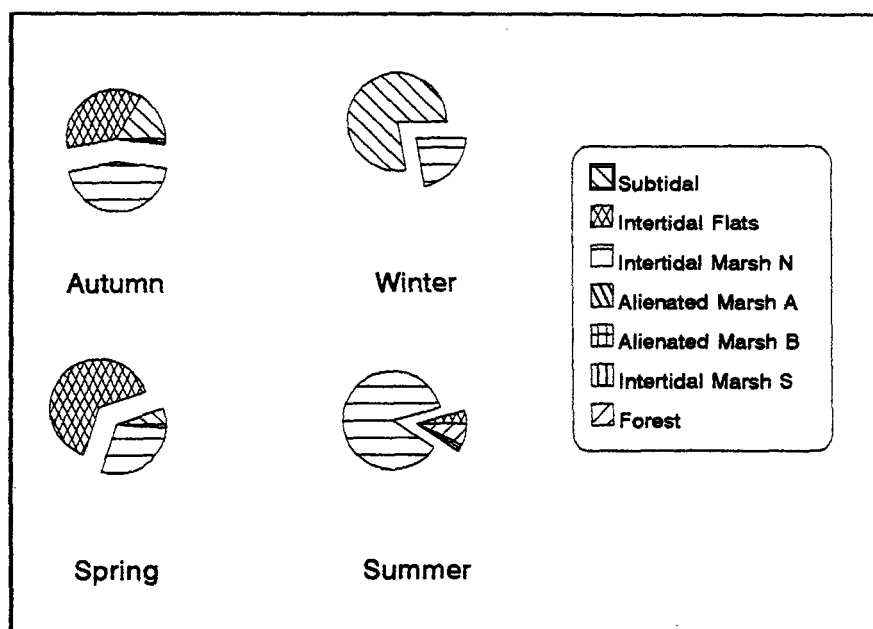


Figure 19. Seasonal habitat use by Shorebirds on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).

The Western Sandpiper comprised 33% of all shorebirds seen with a total of 1,201 birds, ranking them as the most abundant species in this group. Most (72%) of the Western Sandpipers were seen on 2 days during their spring migration: 28 April 1991-550 birds and 8 May 1991-317 birds. Also on 8 May 1991,

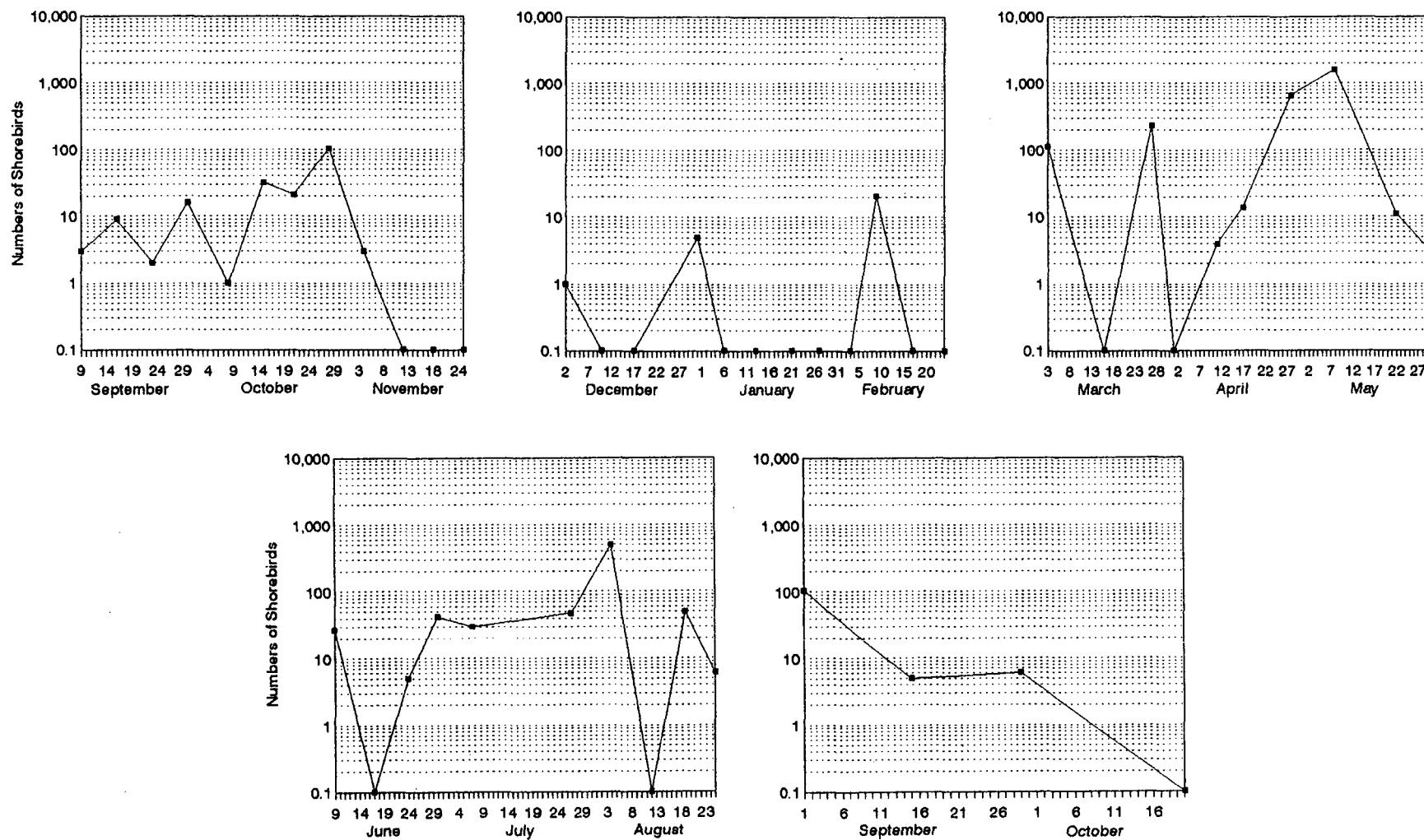


Figure 20. Seasonal fluctuations in Shorebird numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

1270 shorebirds were reported, the surveyor estimating a Western Sandpiper:Dunlin ratio of 30:1 which would bring the Western Sandpiper total for that day to 1545 birds (see Appendix I). Autumn migration records are as follows: 4 August 1991-300 birds, 1 September 1991-33 birds, 9 September 1990-1 injured bird. The intertidal flats were the preferred habitat where 79% of the Western Sandpipers occurred; the remainder of these peeps used the north intertidal marsh.

We recorded 212 Black Turnstones which ranked them as the second most abundant shorebird. Earliest arrival date for turnstones was 15 September 1991 and the latest departure date was 27 March 1991. Paulson (1993) identifies this bird a common overwintering species; however, we noted turnstones primarily during spring migration when 90% of them were seen. A peak of 100 birds occurred on 3 March 1991. Only 1 Black Turnstone was seen over the winter months. A bird use survey on the Cluxewe River estuary (see Dawe et al. 1995) found this species to be the most abundant shorebird over the same time period; but there, the birds favoured spit and beach berm habitats. These habitat types are lacking at Hardy Bay, thus, Black Turnstones are likely just passing through on their way to more suitable areas. The subtidal habitat attracted 54% of the turnstones observed followed by the intertidal flats (40%) and the north intertidal marsh (6%).

The Killdeer was seen infrequently in every season. Their frequency of occurrence ranged from 8% (winter 1990-1991) to 25% (autumn 1991). A total of 112 birds ranked the Killdeer as the third most abundant shorebird; however, 90 of those birds were seen on 1 day: 4 August 1991. Both Paulson (1993) and Campbell et al. (1990) identify Killdeer as only semi-gregarious during the nonbreeding season, but aggregations of 100+ birds may occur by August as small flocks of fledglings and post-breeding adults begin to gather on good foraging grounds during the autumn movement. The intertidal flats were used almost exclusively; 1 bird was noted in the south intertidal marsh.

Dowitcher numbers totalled 69; 36% were identified as Long-billed while the remaining birds were recorded as dowitcher species. Dowitchers were first noted at the estuary on 28 April 1991 and those identified as Long-billed were only recorded on 22 and 30 May 1991 straggling behind the mid-May date noted as the end of spring migration by Paulson (1993). Long-billed Dowitchers started to arrive on 30 June 1991 when a peak of 8 birds was seen; the latest departure date was 28 October 1990. Dowitchers display differential migration with adults arriving in early July and staying into mid-September, while juveniles start to show up in mid August and remain common through October. Three habitats were frequented by dowitchers: the north intertidal marsh was by most of the birds (40% of the Long-billed and 100% of the dowitcher species were noted there), followed by the south intertidal marsh (32%) and alienated marsh A (28%).

A total of 67 Dunlin was seen during the spring of 1991: 28 April 1991-60 birds and 8 May 1991-7 birds. Most (96%) were noted using the north intertidal marsh while the remainder were seen on the intertidal flats.

We have only 1 record of the Sanderling: 50 birds were seen in the north intertidal marsh on 28 October 1990.

In total, 38 yellowlegs were recorded; 68% were Greater, 16% Lesser and the remaining 16% remained unidentified to species. Yellowlegs were noted as early as 9 June 1991 and occurred through 25 August 1991. Earliest spring arrival for the Greater Yellowlegs was 11 April 1991 with the latest departure date 28 April 1991 (a maximum of 9 birds occurred on 17 April 1991); autumn migration extended from 9 September 1990 to 4 November 1990. The south intertidal marsh was the Greater Yellowlegs' preferred habitat with 65% of the birds recorded there followed by the intertidal flats (31%); 1 bird was found in alienated marsh B.

There were 2 records for the Lesser Yellowlegs: during spring migration 5 birds were seen on 17 April 1991 and in autumn, 1 bird was seen on 21 October 1990. All of the Lesser Yellowlegs used the south intertidal marsh.

A total of 34 Whimbrels was seen over the survey period. The earliest arrival date was 9 June 1991 when the maximum of 23 Whimbrels was noted; the latest departure date was 4 August 1991. This species is known to frequent a variety of habitats but are found most often on mud flats. In our survey, all of the Whimbrels were observed using the intertidal flats.

One flock of 33 Semipalmated Sandpipers was reported using the intertidal flats on 1 September 1991 with equal numbers of Western and Least Sandpipers. As adult Semipalmated Sandpipers have normally left the coast by early August, this flock likely consisted of juveniles. Richardson (1971) noted up to 40 birds per day at Grant Bay on the northwest coast of the island.

The 33 Least Sandpipers noted in the above mixed flock of sandpipers on 1 September 1991 is the only record we have for this species on the estuary. All of the Least Sandpipers were noted using the intertidal flats.

We have records of 7 Black-bellied Plovers: 5 birds were noted using the intertidal flats on 8 May 1991 and 2 birds (most likely immatures because of the late date) were seen in the north intertidal marsh on 9 June 1991.

There was 1 record of the Semipalmated Plover: 5 birds were seen on the intertidal flats on 1 September 1991. This species is more abundant on the outer coast and its estuaries and is less common in protected waters (Paulson 1993).

The Marbled Godwit also had only 1 record of 2 birds on 4 August 1991; they were using the north intertidal marsh. Like the Semipalmated Plover, the Marbled Godwit is usually found on the outer coast preferring mudflats and protected estuaries there. They are also known to seek out the company of Whimbrels when roosting and during migration, and the 2 species were seen using the Quatse River estuary on the same day.

One Common Snipe was seen in the north intertidal marsh on 4 November 1990. Outside of the survey period 14 Common Snipes were flushed from a variety of vegetated sites on the estuary on 6 October 1982 (MC).

Gulls: Nine species of gulls accounted for 29% of all birds seen on the Lower Hardy Bay/Quatse River estuarine system, ranking them as the most abundant group of birds using the system. Glaucous-winged and Mew Gulls were

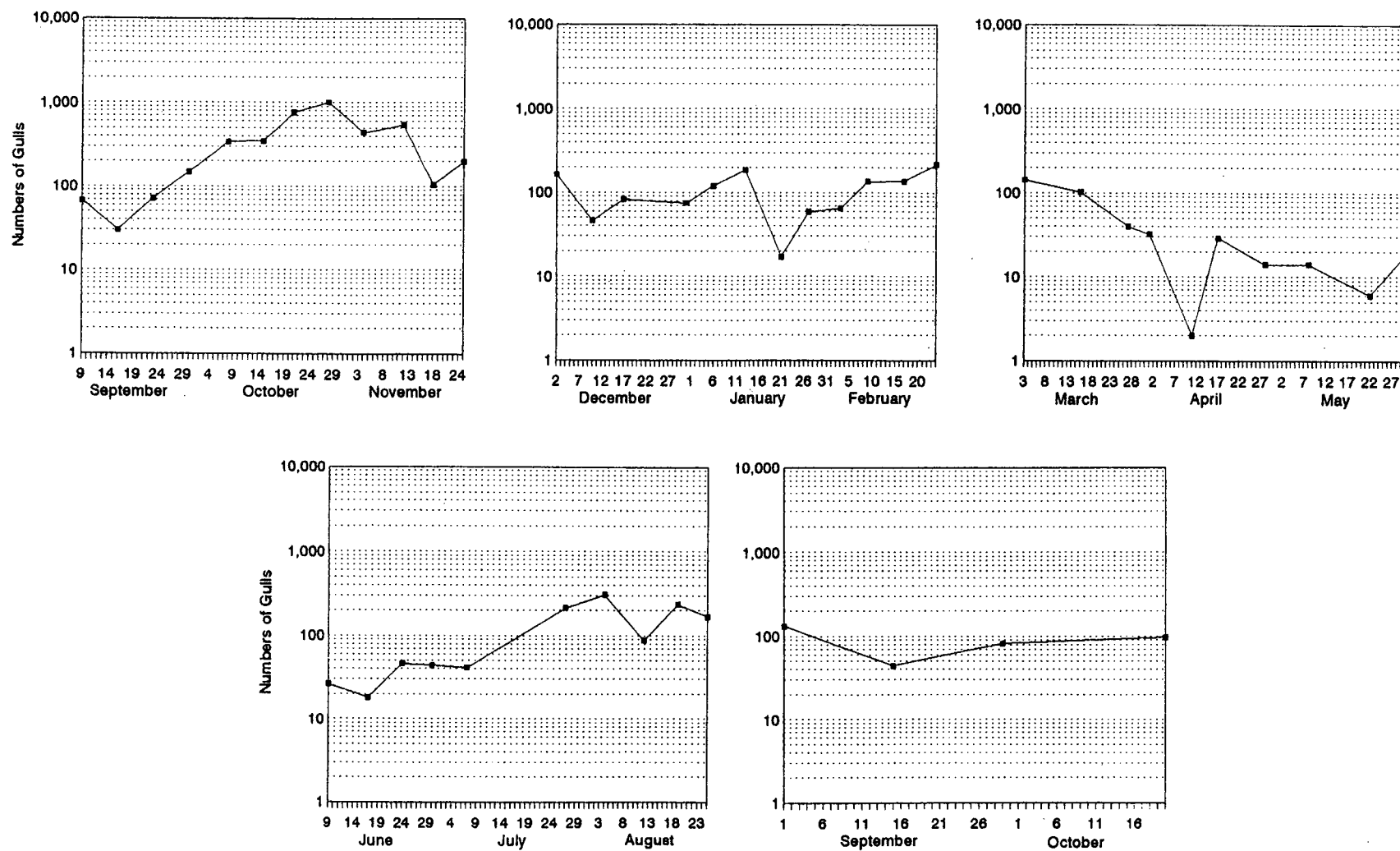


Figure 21. *Seasonal fluctuations in Gull numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.*

the most abundant while 34% of the gulls observed remained unidentified to species, recorded simply as gull species. Numbers were highest during the autumn of 1990 when 56% of all gulls were observed, no doubt drawn by the large numbers of spawning pink salmon. Similar to the Cluxewe River estuary bird use survey of 1990-1991 (see Dawe et al. 1995), gulls were found to peak on the same day, 28 October 1991 even though pink salmon were not visible in the river; there were, however, some decomposing on the flats. Gull numbers dropped to 18% of the gull total over the winter of 1990-1991 and reached their lowest levels in the spring and autumn of 1991 (5%). Figure 21 shows the seasonal fluctuations in the numbers of gulls. More gulls used the north intertidal marsh than any other habitat (47%); it was the preferred habitat in every season except during the summer of 1991. The intertidal flats were preferred second overall (30% of the gulls) in every season, while the subtidal area ranked third (23%). Seasonal habitat use by gulls is shown in Figure 22.

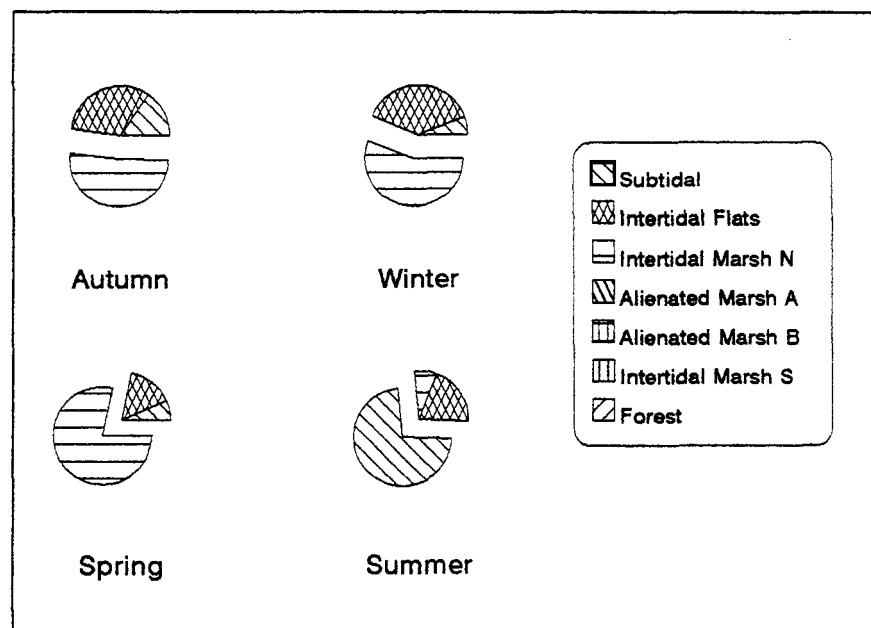


Figure 22. *Seasonal habitat use by Gulls on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).*

The Glaucous-winged Gull accounted for 31% of all the gulls seen, ranking them as the most abundant species of this group. Glaucous-winged Gulls are the "sea gull" of the coast according to Campbell et al. (1990) and can be seen at any time of the year. We found autumn 1990 levels to be the highest when 69% of the total Glaucous-winged Gulls were seen; numbers continued to drop thereafter reaching only 7% of the total by spring 1991. Glaucous-winged Gulls were not recorded over the summer of 1991; however, it is likely that some of the 992 unidentified gulls during that period were this species. Their preferred habitat was the north intertidal marsh where 71% were seen, followed by the intertidal flats (27%) and the subtidal area (2%).

The Mew Gull ranked as the second most abundant of the gulls comprising 26% of the total. They were seen throughout the year with numbers peaking during the autumn of 1990 as fall migrants congregated to take advantage of the salmon spawn. At that time, 41% of the birds were noted; the maximum of 209 Mew Gulls occurred on 21 October 1990. Winter 1990-1991 levels dropped to 31%; the spring, summer, and autumn of 1991 seasons each had about 10% of the total Mew Gulls. Like the Glaucous-winged Gull, the Mew Gull was noted most frequently in the north intertidal marsh (64%); the intertidal flats were used by 32% of the birds and the subtidal area was used by 4%.

A total of 198 Ring-billed Gulls was seen during the survey. Numbers were highest during both autumn seasons: 65% of the total Ring-billed were seen in the autumn of 1990 (the maximum of 47 birds was on 12 November) and 26% were seen in the autumn of 1991. Winter 1990-1991 and summer 1991 levels were low with 3% and 8% of the birds respectively. All Ring-billed Gulls had left by 9 February and they were not recorded again until 7 July. Campbell et al. (1990) found that movements of this gull are not well known. Generally, it is far less numerous in spring than in autumn migration which is reflected by our findings. Furthermore, summering and wintering Ring-billed Gulls tend to obscure migration times. This species preferred the intertidal flats where 62% of the birds were recorded, followed by the north intertidal marsh (37%); 2 birds were seen in the subtidal area.

We recorded a total of 139 Bonaparte's Gulls. Autumn migrants accounted for most of the numbers; 91% of the gulls were seen between 8 October and 12 November 1990; 4% were seen on 20 October 1991. The remaining 6 birds were seen on 9 and 17 June and were likely non-breeders. Most (90%) of the birds were tallied using the north intertidal marsh, followed by the subtidal habitat (8%); 3 birds were noted on the intertidal flats.

One hundred and twenty-two California Gulls were recorded during the survey with autumn migrants again comprising most of the numbers. Between 30 September 1990 (when the maximum of 41 birds occurred) through 15 October 1990, 64% of all the California Gulls were noted. There were 2 winter records: 17 December 1990-32 birds and 24 February-3 birds and 1 summer record on 19 August 1991-3 birds. This species also preferred the north intertidal marsh where 90% were seen, 8% used the intertidal flats and 1 bird each was noted using the subtidal and south intertidal marsh respectively.

We have 4 records of the Thayer's Gull totalling 117 birds. Three of those records were from the autumn of 1990: 8 October-102 birds, 15 October-9 birds and 28 October-6 birds. The only other record was for 1 Thayer's Gull on 9 February 1991. Once again the north intertidal marsh was the preferred habitat with 77% of the Thayer's Gulls recorded there while the remainder were seen using the intertidal flats.

The Herring Gull was seen infrequently with 4 records totalling 106 birds. We have 2 dates from the autumn migration: 12 November 1990 when the maximum of 94 Herring Gulls were seen and 20 October 1991-1 bird. There were also 2 records from spring migration: 1 bird was seen on 27 March and 8 May 1991. Nine overwintering birds occurred on 31 December 1990. Seventy-six percent of the Herring Gulls were noted on the intertidal flats while the north intertidal

marsh ranked as the second preferred habitat (22%) and 2 birds were seen in the subtidal area.

A total of 28 Caspian Terns was noted between 28 April 1991 and 4 August 1991 with the maximum of 11 birds occurring on 7 July. These dates correspond nicely with those reported by Campbell et al. (1990): 77% of their records (n=713) are from May through July. They also note that in the southern Strait of Georgia both the number of records and the size of flocks has increased dramatically since 1980 and during that time there has also been an expansion in their range to the north coast and the Queen Charlotte Islands. Roughly equal numbers were noted using the north intertidal marsh and intertidal flats respectively. They are known to use mudflat areas where they forage over shallow water.

One Heerman's Gull was seen in the north intertidal marsh on 18 November 1990.

Alcids: One Common Murre was noted in the subtidal area on 20 October 1991.

Doves: Four Mourning Doves were seen on 29 September 1991; 2 birds were in the north intertidal marsh and 2 in alienated marsh A. These birds were likely autumn migrants in transit to southern wintering areas.

Swifts: We have 2 records for swifts on the estuary, both occurred on 25 August 1991 above the north intertidal marsh. On that day a flock of 10 Black Swifts and another flock of 32 Vaux's Swifts were noted.

Hummingbirds: A total of 10 Rufous Hummingbirds was recorded during the survey. Earliest arrival date was 11 April 1991 and the latest departure date was 24 June 1991; the maximum of 2 birds occurred on both the first day and on 8 May. Seven of the hummingbirds were seen in the north intertidal marsh, 2 were noted in the forest and the remaining bird was observed in the subtidal area. This species breeds in coniferous forests, thickets and on brushy slopes, foraging in adjacent meadows and likely nests on the study area.

Kingfishers: The Belted Kingfisher, a resident, was seen a total of 70 times over the course of the survey. Numbers peaked during the autumn of 1990 when 30% of the kingfishers were seen, with spring 1991 levels the next highest (23%). The maximum of 4 birds occurred on 2 days: 1 April 1991 and 29 September 1991 and the probability of seeing a kingfisher on the estuary ranged between 60% during the summer of 1991 to 100% in both of the autumn seasons. All of the habitat units except the subtidal area were used by the Belted Kingfisher; the south intertidal marsh was preferred, where 37% of the birds were noted, followed by the intertidal flats (29%) and north intertidal marsh (21%).

Woodpeckers: Only 2 woodpeckers were noted during the survey: a single Northern Flicker was seen in the forest on 30 June 1991 and 1 Pileated Woodpecker was also observed in the forest on 8 May 1991.

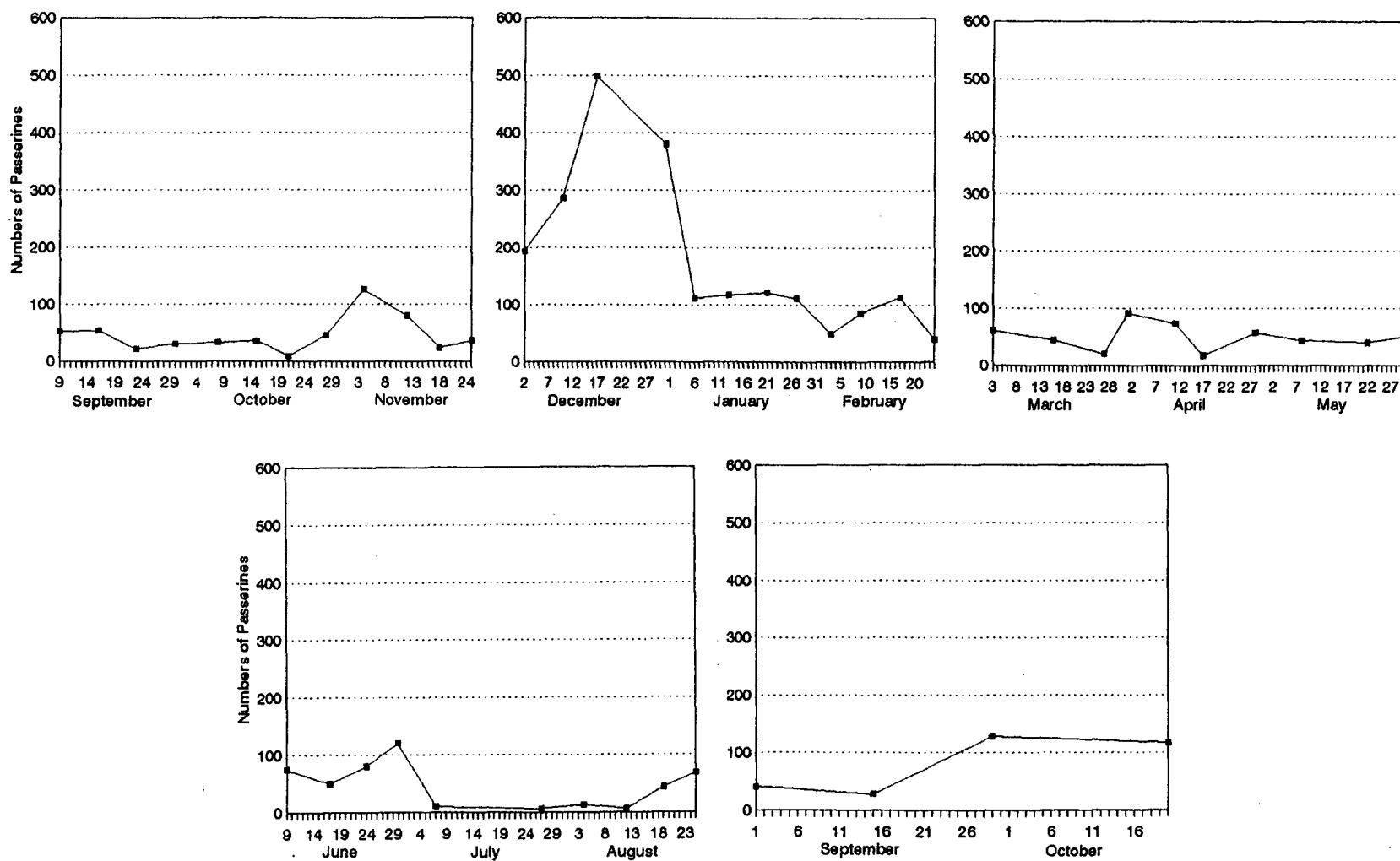


Figure 23. Seasonal fluctuations in Passerine numbers on the Quatse River estuary, Autumn 1990 to Autumn 1991.

Passerines: Although portions of the forested sections on the Quatse River estuary were surveyed, the focus of the study was primarily to determine waterbird use. Over the course of the study, songbird numbers were low with many of the family groups scantily represented or missing entirely from the species list (especially the flycatchers, warblers and vireos that tend to dominate the summer scene at other locations along the coast). Consequently, information on the passerines is limited. Unlike the Englishman River estuary study (see Dawe et al. 1994), there were few other sources from which to draw passerine data; further study in this area would help to complete the picture of passerine use of the estuary.

Nine families, 24 species and 2,360 birds were tallied (3% remained unidentified and were recorded as passerine species). Numbers remained relatively constant over the study period ranging between 13% in the autumn of 1991 to 23% in both the autumn of 1990 and the winter of 1990-1991. For seasonal fluctuations in passerine numbers see Figure 23. Overall, and in every season, the north intertidal marsh was the passerines' preferred habitat where 58% of the birds were recorded, followed by the intertidal flats (13%), south intertidal marsh (12%) and forest (11%). Seasonal habitat preferences by the passerines are shown in Figure 24. The crows and jays were the most abundant passerine family with the starlings not far behind, which undoubtedly skews the habitat preferences. They were followed by the kinglets and thrushes and the diverse emberizidae family representing the wood warblers, sparrows and blackbirds.

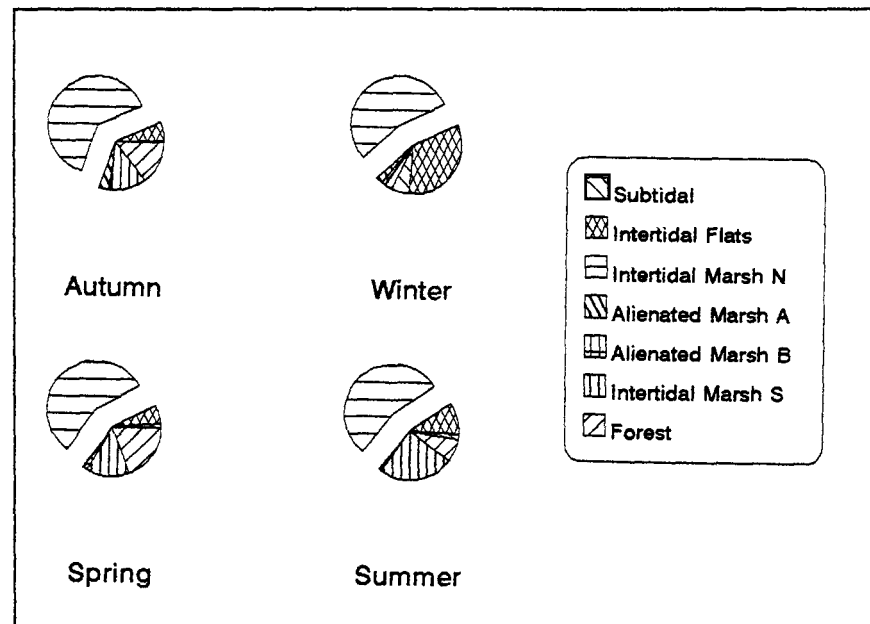


Figure 24. Seasonal habitat use by Passerines on the Quatse River estuary (Autumn 1990 and Autumn 1991 are combined).

Swallows: Two species of swallows totalling 77 birds were seen, representing 3% of the total passerine birds. The Barn Swallow was the most abundant accounting for 68% of the swallow numbers. Earliest spring arrival date was 22 May 1991 and the latest departure date was 12 August 1991; a maximum of 15 Barn Swallows occurred on 9 June of that period. All of the records for this species were from the north intertidal marsh.

The remaining 32% were Violet-green Swallows. Like the Barn Swallow, they were first noted on 22 May 1991 but the last record was on 4 August 1991 when a maximum of 10 Violet-green Swallows occurred. Again, all of the records were from the north intertidal marsh.

Crows and Jays: Three species of corvids accounted for 39% of the passerine total, ranking them as the most abundant family. Not surprisingly, the Northwestern Crow was seen in the highest numbers (87% of the corvid total). Crows were recorded in every season with numbers peaking during the winter of 1990-1991 (38%); a maximum of 57 crows occurred on 3 February 1991. The probability of seeing crows on the estuary was 100% in every season except during the autumn of 1990 when it was 83%. All of the habitat units were used by this species: the north intertidal marsh was preferred by 50% of the birds, followed by the intertidal flats (37%).

The Steller's Jay was seen a total of 82 times. Levels were similar over the autumn 1990 (37% of the jays), winter 1990-1991 (27%) and spring 1991 (30%); only 5 jays were seen during the remaining study period. A maximum of 11 birds occurred on 11 April 1991. This species frequented all of the habitat units except the subtidal area; however, the forest (where 55% of the Steller's Jays were seen) and the intertidal flats (37%) were preferred.

We saw a total of 39 Common Ravens during the survey. Most (51%) of the ravens were noted in the winter of 1990-1991 when a maximum of 9 birds occurred on 10 December; autumn 1990 levels followed (31%). Ravens were not recorded after 28 April 1991. Although ravens were noted using 5 of 7 habitat units, most of the birds were recorded in the north intertidal marsh (56%) and the forest (28%).

Chickadees: The Chestnut-backed Chickadee was seen infrequently with 34 birds in total. Numbers were highest during the spring and autumn of 1991 when 29% and 32% were seen respectively; chickadees were not recorded during the winter season. A peak of 10 birds occurred on 11 April 1991 and the frequency of occurrence was never higher than 50% (autumn 1991). Chickadees preferred the forest where 88% of the birds were seen; the remaining birds were using the north intertidal marsh.

Wrens: We have 3 records for the Winter Wren, each one is of a single bird noted in the forest: 11 April 1991, 17 June 1991 and 15 September 1991.

Kinglets and Robins: The muscicapid family ranked as the third most abundant passerine family and was represented by 5 species with a cumulative total of 235 birds (10% of all the passerines). The American Robin was

the most frequently seen member of this group (65%). A total of 153 robins was recorded with the highest concentrations occurring during the spring of 1991 when 38% of the birds were seen; however, the maximum of 40 birds was reported on 29 September 1991. All of the American Robins had left the study area by 15 October 1990 (except for 1 winter record of 1 bird on 10 December 1990) and returned the following spring on 3 March 1991. Although this species was noted in all 7 of the habitat units, the north intertidal marsh and forest areas were preferred with 64% and 22% of the birds seen there respectively.

The Golden-crowned Kinglet was reported a total of 68 times throughout the study period. Numbers were highest during the winter of 1990-1991 (67%), followed by autumn 1990 and 1991 (both 50%). A peak of 30 Golden-crowned Kinglets occurred on 20 October 1991. The forest was the preferred habitat for this species where 78% of the kinglets were recorded; a few birds were also noted using the north intertidal marsh and alienated marsh B habitats respectively.

We tallied a total of 7 Varied Thrushes between 31 December 1990 (when the maximum of 3 birds was noted) and 28 April 1991. Two birds were recorded in each of the forest, north intertidal marsh and intertidal flats areas and 1 bird was seen using the south intertidal marsh.

There are 3 records for the Hermit Thrush on the study area: 17 June 1991-1 bird was noted in the forest, 24 June 1991-2 birds, 1 each in the forest and the north intertidal marsh and 30 June 1991-1 bird in alienated marsh B.

The Ruby-crowned Kinglet was seen the least frequently with only 3 records: 18 November 1990-2 birds, 1 bird each using the forest and north intertidal marsh and 20 October 1991-1 bird was seen in the forest.

Pipits: We have 2 records of the Water Pipit during their spring migration: 2 birds were seen on 17 April 1991 on the intertidal flats and on the next survey date, 28 April 1991, a flock of 20 pipits were observed in the north intertidal marsh.

Waxwings: Over the survey period a total of 14 Cedar Waxwings were seen, all of them observed using the north intertidal marsh: 30 September 1990-6 birds, 30 June 1991-2 birds, 19 August-3 birds and 1 September 1991-3 birds.

Starlings: The gregarious European Starling was the second most abundant passerine with 826 birds seen comprising 35% of the passerine total. Flocks of starlings can be seen at any time of the year on the estuary; numbers were relatively constant ranging from 12% of the total during the autumn of 1991 to 25% in the spring of 1991. A peak of 101 birds occurred on 30 June 1991. Virtually all of the starlings were recorded using the north and south intertidal marshes with 68% and 29% of their numbers respectively.

Warblers, Sparrows, Blackbirds and Finches: The emberizid family was represented by 2 species of warblers, 4 species of sparrows, 1 blackbird species and 2 finch species for a collective total of 166 birds ranking

them as the fourth most abundant passerine group (7%). Sparrows, especially the Dark-eyed Junco, accounted for the largest proportion of this group (61%). Habitat and seasonal use vary widely, see individual species accounts.

Warblers: Two species of warblers were noted during the survey for a total of 17 birds. The Orange-crowned Warbler was the most abundant accounting for 59% of the total; 1 warbler was not identified to species. Orange-crowned Warblers were noted on the estuary between 28 April 1991 and 30 June 1991 with a maximum of 3 occurring on 9 June of that period. Five of the different habitat units were used by this species with the forest area preferred by 60% of the birds. This wide use of habitat types by the Orange-crowned Warbler was also found during a bird survey on the Englishman River estuary (see Dawe et al. 1994); shrubby areas and edges were favoured.

The 2 records we have for the Yellow-rumped Warbler on the estuary occur during autumn migration: 3 birds were seen on 30 September 1990 in the north intertidal marsh and 1 year later on 29 September 1991 3 birds were seen using alienated marsh A.

Sparrows: Of the 4 species of sparrows totalling 102 birds, the Dark-eyed Junco was the most abundant (54%); 2 birds remained unidentified to species and were recorded as sparrow species. A total of 55 Dark-eyed Juncos was seen on the estuary between 30 September 1990 and 3 March 1991 with a peak of 10 juncos occurring on both 18 November 1990 and 17 December 1990. Two habitat types were preferred: the north intertidal marsh had the highest numbers (65%), followed by alienated marsh A (22%).

The Song Sparrow was the second most abundant of the sparrows and was seen a total of 31 times. Numbers were highest during the autumn of 1990 when 35% were seen. Song Sparrows were not noted over the winter of 1990-1991 but it is likely that they were just missed; Dawe et al. (1994a) recorded 8 overwintering sparrows on the Cluxewe River estuary on 23 January 1980. This species is known to be quite a habitat generalist and we recorded them in 5 of the habitat units; the south and north intertidal marshes and the forest areas were preferred (39%, 35% and 19% respectively).

We tallied a total of 11 Savannah Sparrows in 4 sightings: 28 April 1991-3 birds, 30 May 1991-2 birds, 15 September 1991-3 birds and 20 October 1991-3 birds. As viewing was limited to 6 specific locations and along the roadways, any birds amongst the vegetation in the saltmarsh would have been missed. Eleven Savannah Sparrows were flushed over the vegetated parts of the estuary on 6 October 1982 (MC). We found this species spread widely over the estuary with records from alienated marsh A, south and north intertidal marshes and the intertidal flats.

There was only 1 record for the Fox Sparrow: 3 birds were spotted using alienated marsh A on 31 December 1990.

Blackbirds: The only blackbird seen during the survey was the Western Meadowlark. We have a total of 3 records for this species; 2 from the survey period. Six birds were seen on 4 November 1990 and 2 birds were noted on 31 December 1990; all were seen using the north intertidal marsh.

Meadowlarks are another species that can be easily missed; often they are low in the vegetation and would be overlooked without walking through the saltmarsh. Outside of the study times, 1 Western Meadowlark was seen at south end of the estuary by the forestry road on 6 October 1982, and later that same day 2 birds were perched in some dead shrubs in a flooded area south of the forestry access road (MC).

Finches: Two flocks of Red Crossbills were seen over the survey period: 1 flock of 20 birds occurred on 9 February 1991 in the north intertidal marsh and the other flock of 15 birds was seen on 30 May 1991 in the forest. Crossbill sightings are highly variable as these birds depend heavily on coniferous cone crop levels (Ehrlich 1988).

A total of 4 Purple Finches was seen, all of the birds were using the north intertidal marsh. Three finches were seen on 11 April 1991 and 1 bird was noted on 15 September 1991.

Conclusions

Bird Use

The Quatse River estuary is an important area for migratory and resident birds; this estuarine system is ranked as one of the top 10 estuaries on Vancouver Island (Whately 1994). Although this site does not experience the same disturbances noted on the Cluxewe River estuary (see Dawe et al. 1995), varying levels of industrial activity along its boundaries are likely preventing the area from reaching its full potential in terms of supporting numbers of birds.

For example, the surveyor noted very loud noises that carried across the bay from sandblasting activities (September 1990) and periodic explosions coming from a barge burning old float houses (February 1991). Also, waterbird activity has decreased after a log sort was started in recent years (D Howard pers. comm.). Virtually the entire perimeter of the proposed management area is zoned for light and marine industry, residential and tourist-commercial uses and, the associated human-related traffic continue to increase. These activities appear to be having some effect on the bird use of the estuary.

The primary management goal identified by the MOELP for the proposed Quatse River management area is to sustain and, where possible, enhance the natural resources of the Hardy Bay estuary while providing for compatible recreational opportunities (Whately 1994). However, activities outside of the proposed management area's boundaries are harder to control. A cooperative program involving adjacent commercial and industrial businesses and MOELP to reduce or eliminate those activities which negatively affect waterbirds during high use periods may be worth considering. A small educational program could also be instigated for local residents to inform them of the importance of the area to wildlife and demonstrate how they and commercial or industrial enterprises can minimize the impacts of their land-use activities.

Future Studies

As this survey was primarily concerned with waterbirds, another survey specifically to document songbird use of the proposed management area over at least 1 full year would round out the picture of migratory and resident bird use of the Quatse River estuary.

Literature Cited

- Anonymous. 1977. Climate of British Columbia. British Columbia Ministry of Agriculture, Victoria, B.C.
- Bellrose, F.C. 1976. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, Pennsylvania. 540 pp.
- Blood, D.A., J. Comer, and J. Polson. 1976. Migratory bird use of the Duncan-Cowichan Bay area in 1975. Unpubl. Rept., Can. Wildl. Serv., Delta, B.C.
- Brooks, A. and H.S. Swarth. 1925. A distributional list of the birds of British Columbia. Pacific Coast Avifauna No. 17, Berkeley, California. 158 pp.
- Butler, R.W. and R.W. Campbell. 1987. The birds of the Fraser River delta: populations, ecology and international significance. Can. Wild. Serv. Occas. Paper No. 65, Ottawa.
- Butler, R.W., N.K. Dawe, and D.E.C. Trethewey. 1989. The Birds of estuaries and beaches in the Strait of Georgia. In Vermeer, K., and R.W. Butler (editors). The ecology and status of marine and shoreline birds in the Strait of Georgia, British Columbia. Spec. Publ. Can. Wildl. Serv. Ottawa.
- Butler, R.W. and R.J. Cannings. 1989. Distribution of birds in the intertidal portion of the Fraser River delta, British Columbia. Technical Report No. 93. Canadian Wildlife Service, Pacific & Yukon Region, British Columbia
- Butler, R.W. and R.W. Mckelvey. 1989. In Butler, R.W. (Editor), 1992. Abundance, Distribution and Conservation of Birds in the Vicinity of Boundary Bay, British Columbia. Technical Report Series No. 155. Canadian Wildlife Service, Pacific and Yukon Region, British Columbia. Contribution to Wildlife Working Report WR-52, Wildlife Program, MOELP, Surrey, B.C.
- Butler, R.W. and K. Vermeer (editors). 1994. The abundance and distribution of estuarine birds in the Strait of Georgia, British Columbia. Occ. Paper No. 83, Canadian Wildlife Service, Ottawa.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser and M.C.E. McNall. 1990. The Birds of British Columbia. Volume One. Nonpasserines. Introduction, Loons through Waterfowl. Royal British Columbia Museum. Victoria, B.C.
- . 1990. The Birds of British Columbia. Volume Two. Nonpasserines. Diurnal Birds of Prey through Woodpeckers. Royal British Columbia Museum. Victoria, B.C.
- Dawe, N.K. 1976. Flora and Fauna of the Marshall-Stevenson Wildlife Area. Canadian Wildlife Service Report. Qualicum Beach, B.C.

- . 1980. Flora and Fauna of the Qualicum National Wildlife Area, Marshall-Stevenson Unit (Update to 30 June 1979). Canadian Wildlife Service Report, Qualicum Beach, B.C.
- . 1982. Use of Shoal Harbour Bird Sanctuary by migratory birds. Unpubl. Can. Wildl. Serv. Rept., Qualicum Beach, B.C.
- Dawe, N.K. and S.D. Lang. 1980. Ecological inventories of National Wildlife Areas in British Columbia. Flora and Fauna of the Nanoose Unit, Qualicum National Wildlife Area. Canadian Wildlife Service, Qualicum Beach, B.C.
- Dawe, N.K., T. Martin, T. Barnard, and A. Koch. 1995. Bird use of the Cluxewe River estuary, Vancouver Island, British Columbia, 1990-1991. Technical Report Series No. 209, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.
- Dawe, N.K., T. Martin, and D.E.C. Trethewey. 1994. Bird Use of the Englishman River estuary, Vancouver Island, British Columbia, 1979-1980 and 1988-1989. Technical Report Series No. 208, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.
- Eamer, J. 1985. Winter Habitat for Dabbling Ducks on Southeastern Vancouver Island, British Columbia. MSc Thesis. Department of Zoology, University of British Columbia. Vancouver, B.C.
- Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The Birder's Handbook. A Field Guide to the Natural History of North American Birds. Simon & Schuster Inc., New York.
- Kennedy, K.A. 1982. Plant Communities and Their Standing Crops on Estuaries of the East Coast of Vancouver Island. A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in The Faculty of Graduate Studies (Department of Plant Science). The University of British Columbia.
- Paulson, D. 1993. Shorebirds of the Pacific Northwest. UBC Press, University of British Columbia.
- Richardson, F. 1971. Birds of Grant Bay and Browning Inlet, northwest Vancouver Island, British Columbia: a years phenology. Murrelet 52:29-40.
- Ricklefs, R.E. 1979. Ecology. Second Edition. Chiron Press, New York.
- Tate, J. and D.J. Tate. 1982. The blue list for 1982. American Birds 36:126-135.
- Tera Consultants Limited. 1977. Social and Environmental Location Design Alternative Studies for a Port Facility at Hardy Bay, B.C. Prepared for B.C. Development Corporation.

- Tera Environmental Resources Analyst Limited. 1978. Social and Environmental Impact Assessment of a Ferry Terminal and Other Industrial Facilities at Hardy Bay, B.C. Vol. I Main Report, and Vol II. Prepared for B.C. Development Corporation and B.C. Ferries Corporation.
- Trethewey, D.E.C. 1985. Bird use of the Squamish River estuary. Unpubl. rept., Can. Wildl. Serv., Delta, B.C.
- Vermeer, K., R.W. Butler and K.H. Morgan. 1992. The ecology, status, and conservation of marine and shoreline birds on the west coast of Vancouver Island. Occasional paper, number 75, Canadian Wildlife Service. Ottawa.
- Wayne, M.M. 1984. Hardy Bay/Quatse River Estuary - Rehabilitation and Enhancement Options: A Discussion Paper. S.H.I.P. Project.
- Whately, M. 1994. Proposal for a Section 13 (Land Act) Designated Use Area for the Hardy Bay Estuary, Vancouver Island B.C. Prepared by BC Environment, Vancouver Island Region.

Appendices

Appendix I. *List of survey dates and surveyor's remarks for the Quatse River estuary.*

Remarks - Autumn 1990

9 September	Today did 10 stations as noted on map. In future I will not do station 1 (tourist). Pinks in bay.
16 September	Sand blasting at industrial site - very loud noise carried across bay. Pinks concentrated in bay.
23 September	Pinks concentrated in bay area with some moving up river.
30 September	Pinks still in bay, some moving up river. Dead pinks showing on flats.
8 October	Pinks moving up Quatse River and creek through habitat unit #6 (south intertidal marsh).
15 October	[No remarks].
21 October	Major southeast storm on 20 October. Still pinks in river, most dying or dead. Note - many ducks landing into and taking off from grass, assume many hidden from view.
28 October	No pinks visible in river. Some decomposing on flats. Eagles scattered across flats, some (3) on driftwood in water.
4 November	Few dying pinks still visible. Tide flooded up to the edge of the road.
12 November	Very high flow in river resulting from week of heavy rain. Heavy feeding in channel out on flats.
18 November	[No remarks].
25 November	Some ice on water in habitat units 4,5 and 6 (alienated marsh A and B, and south intertidal marsh respectively).

Winter 1990-1991

2 December	Visibility very poor, spotting scope vibrating due to wind.
10 December	[No remarks].

17 December	Heavy flow from Quatse River due to heavy rain. Poor visibility, dark and misty. A lot of active feeding in the river channel.
31 December	Habitat units 4,5 and 6 partially frozen (alienated marsh A and B, and south intertidal marsh respectively). Heavy snow 30 December (about 1 foot).
6 January	Frozen snow on ground. Habitat units 4,5 and 6 (alienated marsh A and B, and south intertidal marsh respectively) partially covered with ice.
13 January	High rains last 2 days resulting in high water levels in Quatse River.
21 January	Some ice on flats, habitat units 4, 5 and 6 (alienated marsh A and B, and south intertidal marsh respectively).
27 January	Some ice on flats, habitat units 4, 5 and 6 (alienated marsh A and B, and south intertidal marsh respectively).
3 February	Poor visibility. Not too much out there lately. The last few times I've been out at low tide. I think there are probably quite a few birds on the other side of the bay that I simply can't see, especially at low tide.
9 February	[No remarks].
17 February	Barge at viewing station #9 blocks view of marina area of habitat unit 1 (subtidal).
24 February	Barge noted 17 February still there - burning old float houses with periodic explosions.

Spring 1991

3 March	High tide covering most of grassy area on the north and south intertidal marshes.
16 March	[No remarks].
27 March	Herring spawning attracting huge numbers of BAEA, gulls and diving ducks in spawning areas.
1 April	Herring spawning over past week brought in large numbers of BAEA. At Stories Beach on 27 February, I counted over 200 BAEA. Very few in that area today.
11 April	Glare on water reduced visibility at times.

17 April	Tex Lyons reported seeing a flock of about 50 Sandhill Cranes on 18 April 1991 flying over the bay.
28 April	[No remarks].
8 May	Flock of 1,270 shorebirds is a rough estimate of 2 large groups far out on the intertidal flats. The flocks that I could see appeared to be mainly WESA with DUNL (about 30:1).
22 May	Aside from COME and a few teal, there isn't a duck to be seen.
30 May	[No remarks].

Summer 1991

9 June	[No remarks].
17 June	[No remarks].
24 June	[No remarks].
30 June	[No remarks].
7 July	Unidentified gulls probably Mew and Glaucous-winged and unidentified shorebirds probably WESA.
27 July	Unidentified gulls probably Mew and Glaucous-winged and unidentified shorebirds are sandpipers.
24 August	Unidentified shorebirds are sandpipers.
12 August	[No remarks].
19 August	[No remarks].
25 August	Unidentified gulls probably Mew, California and Glaucous-winged and unidentified shorebirds are sandpipers.

Autumn 1991

1 September	[No remarks].
15 September	[No remarks].
29 September	[No remarks].
20 October	[No remarks].

Appendix II. Lower Hardy Bay and Quatse River estuary bird check-list.

Species Code	Species Name	Scientific Name
COLO	Common Loon	<i>Gavia immer</i>
YBLO*	Yellow-billed Loon	<i>Gavia adamsii</i>
RNGR	Red-necked Grebe	<i>Podiceps grisegena</i>
WEGR	Western Grebe	<i>Aechmophorus occidentalis</i>
GBHE	Great Blue Heron	<i>Ardea herodias</i>
TRUS	Trumpeter Swan	<i>Cygnus buccinator</i>
GWFG	Greater White-fronted Goose	<i>Anser albifrons</i>
BRAN	Brant	<i>Branta bernicula</i>
CAGO	Canada Goose	<i>Branta canadensis</i>
GWTE	Green-winged Teal	<i>Anas crecca</i>
MALL	Mallard	<i>Anas platyrhynchos</i>
NOPI	Northern Pintail	<i>Anas acuta</i>
BWTE	Blue-winged Teal	<i>Anas discors</i>
CITE*	Cinnamon Teal	<i>Anas cyanoptera</i>
NOSL	Northern Shoveler	<i>Anas clypeata</i>
GADW	Gadwall	<i>Anas strepera</i>
EUWI	Eurasian Wigeon	<i>Anas penelope</i>
AMWI	American Wigeon	<i>Anas americana</i>
CANV	Canvasback	<i>Aythya valisineria</i>
SUSC	Surf Scoter	<i>Melanitta perspicillata</i>
WWSC	White-winged Scoter	<i>Melanitta fusca</i>
COGO	Common Goldeneye	<i>Bucephala clangula</i>
BUFF	Bufflehead	<i>Bucephala albeola</i>
HOME	Hooded Merganser	<i>Lophodytes cucullatus</i>
COME	Common Merganser	<i>Mergus merganser</i>
RBME	Red-breasted Merganser	<i>Mergus serrator</i>
OSPR	Osprey	<i>Pandion haliaetus</i>
BAEA	Bald Eagle	<i>Haliaeetus leucocephalus</i>
NOHA	Northern Harrier	<i>Circus cyaneus</i>
SSHA	Sharp-shinned Hawk	<i>Accipiter striatus</i>
RTHA	Red-tailed Hawk	<i>Buteo jamaicensis</i>
GOEA	Golden Eagle	<i>Aquila chrysaetos</i>
PEFA	Peregrine Falcon	<i>Falco peregrinus</i>
RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>
AMCO	American Coot	<i>Fulica americana</i>
SACR	Sandhill Crane	<i>Grus canadensis</i>
BBPL	Black-bellied Plover	<i>Pluvialis squatarola</i>
SEPL	Semipalmated Plover	<i>Charadrius semipalmatus</i>
KILL	Killdeer	<i>Charadrius vociferus</i>
GRYE	Greater Yellowlegs	<i>Tringa melanoleuca</i>
LEYE	Lesser Yellowlegs	<i>Tringa flavipes</i>
WHIM	Whimbrel	<i>Numenius phaeopus</i>
MAGO	Marbled Godwit	<i>Limosa fedoa</i>
BLTU	Black Turnstone	<i>Arenaria melanocephala</i>

Lower Hardy Bay and Quatse River estuary bird check-list (Cont'd).

Species Code	Species Name	Scientific Name
SAND	Sanderling	<i>Calidris alba</i>
SESA	Semipalmated Sandpiper	<i>Calidris pusilla</i>
WESA	Western Sandpiper	<i>Calidris mauri</i>
LESA	Least Sandpiper	<i>Calidris minutilla</i>
DUNL	Dunlin	<i>Calidris alpina</i>
LBDO	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
COSN	Common Snipe	<i>Gallinago gallinago</i>
BOGU	Bonaparte's Gull	<i>Larus philadelphia</i>
HEEG	Heermann's Gull	<i>Larus heermanni</i>
MEGU	Mew Gull	<i>Larus canus</i>
RBGU	Ring-billed Gull	<i>Larus delawarensis</i>
CAGU	California Gull	<i>Larus californicus</i>
HEGU	Herring Gull	<i>Larus argentatus</i>
THGU	Thayer's Gull	<i>Larus thayeri</i>
GWGU	Glaucous-winged Gull	<i>Larus glaucescens</i>
CATE	Caspian Tern	<i>Sterna caspia</i>
COMU	Common Murre	<i>Uria aalge</i>
MODO	Mourning Dove	<i>Zenaida macroura</i>
BLSW	Black Swift	<i>Cypseloides niger</i>
VASW	Vaux's Swift	<i>Chaetura vauxi</i>
RUHU	Rufous Hummingbird	<i>Selasphorus rufous</i>
BEKI	Belted Kingfisher	<i>Ceryle alcyon</i>
NOFL	Northern Flicker	<i>Colaptes auratus</i>
PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>
VGSW	Violet-green Swallow	<i>Tachycineta thalassina</i>
BASW	Barn Swallow	<i>Hirundo rustica</i>
STJA	Steller's Jay	<i>Cyanocitta stelleri</i>
NOCR	Northwestern Crow	<i>Corvus caurinus</i>
CORA	Common Raven	<i>Corvus corax</i>
CBCH	Chestnut-backed Chickadee	<i>Parus rufescens</i>
WIWR	Winter Wren	<i>Troglodytes troglodytes</i>
GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>
RCKI	Ruby-crowned Kinglet	<i>Regulus calendula</i>
HETH	Hermit Thrush	<i>Catharus guttatus</i>
AMRO	American Robin	<i>Turdus migratorius</i>
VATH	Varied Thrush	<i>Ixoreus naevius</i>
WAPI	Water Pipit	<i>Anthus spinoletta</i>
CEWA	Cedar Waxwing	<i>Bombycilla cedrorum</i>
EUST	European Starling	<i>Sturnus vulgaris</i>
OCWA	Orange-crowned Warbler	<i>Vermivora celata</i>
YRWA	Yellow-rumped Warbler	<i>Dendroica nigrescens</i>

Lower Hardy Bay and Quatse River estuary bird check-list (Cont'd).

Species Code	Species Name	Scientific Name
SAVS	Savannah Sparrow	<i>Passerculus sandwichensis</i>
FOSP	Fox Sparrow	<i>Passerella iliaca</i>
SOSP	Song Sparrow	<i>Melospiza melodia</i>
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>
WEME	Western Meadowlark	<i>Sturnella neglecta</i>
PUFI	Purple Finch	<i>Carpodacus purpureus</i>
RECR	Red Crossbill	<i>Loxia curvirostra</i>

* Hypothetical

Appendix III

*Quatse River estuary bird surveys:
Seasonal bird numbers, September 1990 to October 1991*

Note: In this Appendix, the mean has been calculated as the total number of birds of species-x counted over the season, divided by the total number of counts where species-x occurred. Counts of zero have not been included in the total number of counts nor are they included as minimum values. Thus the last 6 columns in the Appendix summarize the species occurrence on the estuary. For example, the probability of seeing a Canada Goose in Autumn on the Quatse River estuary is about 75%. If you see the species, you are likely to see an average of about 86 birds; less than 26 and more than 158 would be exceptional.

Bird use of the Quatse River estuary - Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#LOO	0	0	0	0	0	0	0	0	1	3	0	3	7	3	1	2.3	1.2	25.0	3.0
COLO	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
YBLO	0	0	0	0	0	0	0	0	1	2	0	3	6	3	1	2.0	1.0	25.0	2.0
#GRE	0	0	0	0	3	0	1	0	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
WEGR	0	0	0	0	3	0	1	0	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
#COR	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
CORM	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
#HER	2	2	2	2	5	6	10	8	5	8	4	1	55	10	1	4.6	2.9	100.0	4.5
GBHE	2	2	2	2	5	6	10	8	5	8	4	1	55	10	1	4.6	2.9	100.0	4.5
#SWA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
TRUS	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#GEE	12	0	0	79	95	34	158	84	79	147	76	26	790	158	12	79.0	47.7	83.3	79.0
GWFG	12	0	0	0	0	0	0	0	0	0	0	0	12	12	12	12.0	-	8.3	12.0
CAGO	0	0	0	79	95	34	158	84	79	147	76	26	778	158	26	86.4	44.0	75.0	79.0
#DAB	18	30	14	9	167	156	196	814	406	564	306	567	3247	814	9	270.6	265.3	100.0	181.5
DABL	8	0	0	4	0	0	3	0	0	0	0	0	15	8	3	5.0	2.6	25.0	4.0
GWTE	0	4	0	0	30	49	14	212	6	148	58	323	844	323	4	93.8	111.2	75.0	49.0
MALL	0	10	0	0	26	35	10	123	201	253	56	190	904	253	10	100.4	93.6	75.0	56.0
NOPI	0	10	6	5	6	4	15	13	4	9	20	0	92	20	4	9.2	5.3	83.3	7.5
CITE	10	0	0	0	0	1	0	0	0	0	0	0	11	10	1	5.5	6.4	16.7	5.5
NOSL	0	6	0	0	0	0	0	0	3	0	0	0	9	6	3	4.5	2.1	16.7	4.5
GADW	0	0	0	0	0	0	0	1	0	8	17	10	36	17	1	9.0	6.6	33.3	9.0
EUWI	0	0	0	0	0	0	34	0	2	0	0	0	36	34	2	18.0	22.6	16.7	18.0
AMWI	0	0	8	0	105	67	120	465	190	146	155	44	1300	465	8	144.4	133.1	75.0	120.0
#DIV	11	51	27	14	17	15	11	35	33	166	71	120	571	166	11	47.6	49.0	100.0	30.0
CANV	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
SCAU	0	0	0	0	0	0	0	0	0	41	0	21	62	41	21	31.0	14.1	16.7	31.0
SUSC	0	0	5	0	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
COGO	0	0	0	0	0	0	0	0	2	21	12	42	77	42	2	19.3	17.0	33.3	16.5
BUFF	0	0	0	0	0	0	0	0	16	66	22	37	141	66	16	35.3	22.3	33.3	29.5
HOME	5	8	5	4	8	5	7	10	8	8	7	15	90	15	4	7.5	2.9	100.0	7.5
COME	6	33	12	10	9	10	4	25	7	30	0	4	150	33	4	13.6	10.5	91.7	10.0
DUCK	0	10	5	0	0	0	0	0	0	0	30	0	45	30	5	15.0	13.2	25.0	10.0
#RAP	2	3	1	4	3	14	9	18	1	17	4	13	89	18	1	7.4	6.4	100.0	4.0
BAEA	2	3	1	4	3	14	8	17	1	17	4	12	86	17	1	7.2	6.2	100.0	4.0
NOHA	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
SSHA	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GOEA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#RAI	0	0	0	0	0	0	0	0	1	3	2	3	9	3	1	2.3	1.0	33.3	2.5
AMCO	0	0	0	0	0	0	0	0	1	3	2	3	9	3	1	2.3	1.0	33.3	2.5

Bird use of the Quatse River estuary - Autumn 90 (Cont'd)

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#SHO	3	9	2	16	1	32	21	105	3	0	0	0	192	105	1	21.3	33.1	75.0	9.0
KILL	0	0	0	2	0	12	0	0	0	0	0	0	14	12	2	7.0	7.1	16.7	7.0
GRYE	2	2	2	2	0	0	0	0	2	0	0	0	10	2	2	2.0	-	41.7	2.0
LEYE	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BLTU	0	0	0	10	0	0	0	2	0	0	0	0	12	10	2	6.0	5.7	16.7	6.0
SAND	0	0	0	0	0	0	0	50	0	0	0	0	50	50	50	50.0	-	8.3	50.0
WESA	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
DOWI	0	0	0	0	1	0	0	3	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
LBDO	0	0	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
COSN	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
SHOR	0	7	0	0	0	20	20	50	0	0	0	0	97	50	7	24.3	18.2	33.3	20.0
#GUL	68	30	72	147	340	347	764	1004	441	540	105	199	4057	1004	30	338.1	305.3	100.0	269.5
GULL	65	8	40	11	21	6	200	500	350	0	7	0	1208	500	6	120.8	174.2	83.3	30.5
BOGU	0	0	0	0	1	1	2	53	0	70	0	0	127	70	1	25.4	33.5	41.7	2.0
HMGU	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
MEGU	1	18	1	35	98	34	209	39	17	141	56	115	764	209	1	63.7	64.2	100.0	37.0
RBGU	0	0	6	40	13	3	4	1	8	47	6	0	128	47	1	14.2	17.0	75.0	6.0
CAGU	0	0	0	41	25	12	0	0	0	0	0	0	78	41	12	26.0	14.5	25.0	25.0
HEGU	0	0	0	0	0	0	0	0	0	94	0	0	94	94	94	94.0	-	8.3	94.0
THGU	0	0	0	0	102	9	0	6	0	0	0	0	117	102	6	39.0	54.6	25.0	9.0
GWGU	2	4	25	20	80	282	349	405	66	188	35	84	1540	405	2	128.3	142.4	100.0	73.0
BEKI	2	3	1	1	1	2	2	3	3	1	2	0	21	3	1	1.9	0.8	91.7	2.0
#WOO	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
NOFL	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
#PAS	52	53	21	30	32	35	8	45	126	80	23	36	541	126	8	45.1	31.5	100.0	35.5
STJA	5	5	9	1	4	2	1	0	2	0	1	0	30	9	1	3.3	2.7	75.0	2.0
NOCR	28	20	0	16	1	0	4	25	18	22	9	28	171	28	1	17.1	9.6	83.3	19.0
CORA	1	1	7	0	1	0	1	0	0	0	0	1	12	7	1	2.0	2.4	50.0	1.0
CBCH	1	0	0	0	0	0	0	4	0	0	0	0	5	4	1	2.5	2.1	16.7	2.5
GCKI	0	2	1	0	1	0	0	13	0	1	0	1	19	13	1	3.2	4.8	50.0	1.0
RCKI	0	0	0	0	0	0	0	0	0	0	2	0	2	2	2	2.0	-	8.3	2.0
AMRO	15	3	3	0	0	2	0	0	0	0	0	0	23	15	2	5.8	6.2	33.3	3.0
CEWA	0	0	0	6	0	0	0	0	0	0	0	0	6	6	6	6.0	-	8.3	6.0
EUST	0	0	0	1	21	30	0	0	100	50	0	0	202	100	1	40.4	37.7	41.7	30.0
YRWA	0	0	0	3	0	0	0	0	0	0	0	0	3	3	3	3.0	-	8.3	3.0
SPAR	0	0	0	0	0	0	2	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
SOSP	2	2	1	2	1	1	0	1	0	0	1	0	11	2	1	1.4	0.5	66.7	1.0
DEJU	0	0	0	1	3	0	0	2	0	7	10	6	29	10	1	4.8	3.4	50.0	4.5
WEME	0	0	0	0	0	0	0	0	6	0	0	0	6	6	6	6.0	-	8.3	6.0
PASS	0	20	0	0	0	0	0	0	0	0	0	0	20	20	20	20.0	-	8.3	20.0
#TOT	170	181	140	302	664	641	1180	2116	1099	1530	593	971	9587	2116	140	798.9	608.9	100.0	652.5

Bird use of the Quatse River estuary - Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#LOO	0	0	1	0	0	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
LOON	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
YBLO	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GRE	0	0	0	0	0	2	0	0	0	0	0	1	3	2	1	1.5	0.7	16.7	1.5
GREB	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
WEGR	0	0	0	0	0	2	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
#HER	3	0	3	1	0	2	2	3	0	2	0	1	17	3	1	2.1	0.8	66.7	2.0
GBHE	3	0	3	1	0	2	2	3	0	2	0	1	17	3	1	2.1	0.8	66.7	2.0
#SWA	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
SWAN	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GEE	84	97	80	130	133	94	100	109	117	41	75	63	1123	133	41	93.6	27.0	100.0	95.5
BRAN	0	0	0	0	17	0	0	0	0	0	0	0	17	17	17	17.0	-	8.3	17.0
CAGO	84	97	80	130	116	94	100	109	117	41	75	63	1106	130	41	92.2	25.2	100.0	95.5
#DAB	193	286	498	380	111	117	121	111	48	85	113	39	2102	498	39	175.2	141.4	100.0	115.0
DABL	0	0	100	0	0	1	0	0	0	0	0	0	101	100	1	50.5	70.0	16.7	50.5
GWTE	31	117	101	88	73	54	56	45	5	20	26	14	630	117	5	52.5	36.0	100.0	49.5
MALL	56	124	222	228	33	45	61	63	41	47	72	19	1011	228	19	84.3	70.6	100.0	58.5
NOPI	1	9	28	14	0	6	2	1	1	7	12	6	87	28	1	7.9	8.0	91.7	6.0
NOSL	0	0	0	0	2	0	0	0	0	2	1	0	5	2	1	1.7	0.6	25.0	2.0
GADW	5	14	9	6	3	10	2	2	1	4	0	0	56	14	1	5.6	4.2	83.3	4.5
AMWI	100	22	38	44	0	1	0	0	0	5	2	0	212	100	1	30.3	35.3	58.3	22.0
#DIV	34	47	100	10	35	59	22	38	29	41	26	32	473	100	10	39.4	22.7	100.0	34.5
WWSC	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GOLD	0	0	5	0	0	0	0	0	2	0	0	0	7	5	2	3.5	2.1	16.7	3.5
COGO	0	3	3	2	6	2	4	4	0	5	10	4	43	10	2	4.3	2.4	83.3	4.0
BUFF	15	19	68	7	19	39	12	20	20	26	10	26	281	68	7	23.4	16.4	100.0	19.5
HOME	7	11	9	1	10	16	4	13	6	7	3	1	88	16	1	7.3	4.7	100.0	7.0
COME	12	13	15	0	0	2	2	1	1	3	3	1	53	15	1	5.3	5.6	83.3	2.5
#RAP	3	3	4	2	5	2	1	2	2	5	2	3	34	5	1	2.8	1.3	100.0	2.5
HAWK	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BAEA	3	3	4	2	4	2	1	2	2	5	2	2	32	5	1	2.7	1.2	100.0	2.0
RTHA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#RAI	1	1	0	0	0	1	0	0	0	0	0	0	3	1	1	1.0	-	25.0	1.0
AMCO	1	1	0	0	0	1	0	0	0	0	0	0	3	1	1	1.0	-	25.0	1.0
#SHO	1	0	0	5	0	0	0	0	0	21	0	0	27	21	1	9.0	10.6	25.0	5.0
KILL	0	0	0	5	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
BLTU	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
SHOR	0	0	0	0	0	0	0	0	0	21	0	0	21	21	21	21.0	-	8.3	21.0
#GUL	162	46	83	75	120	188	17	59	65	136	137	217	1305	217	17	108.8	61.1	100.0	101.5
GULL	8	2	1	0	0	15	11	0	64	4	6	33	144	64	1	16.0	20.5	75.0	8.0
MEGU	85	40	0	8	50	95	5	34	1	35	91	143	587	143	1	53.4	45.0	91.7	40.0
RBCU	2	1	0	0	0	0	0	0	0	2	0	0	5	2	1	1.7	0.6	25.0	2.0
CAGU	0	0	32	0	0	0	0	0	0	0	0	3	35	32	3	17.5	20.5	16.7	17.5
HEGU	0	0	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	8.3	9.0
THGU	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
GWGU	67	3	50	58	70	78	1	25	0	94	40	38	524	94	1	47.6	29.8	91.7	50.0
BEKI	0	2	0	1	1	1	1	1	0	1	0	2	10	2	1	1.3	0.5	66.7	1.0

Bird use of the Quatse River estuary - Winter 90 (Cont'd)

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#PAS	25	24	48	28	13	35	70	55	60	67	42	77	544	77	13	45.3	20.7	100.0	45.0
STJA	0	5	1	1	6	1	5	2	0	1	0	0	22	6	1	2.8	2.2	66.7	1.5
NOCR	18	4	35	4	3	31	45	50	57	12	19	25	303	57	3	25.3	18.6	100.0	22.0
CORA	0	9	1	0	2	0	0	0	2	3	2	1	20	9	1	2.9	2.8	58.3	2.0
GCKI	1	3	1	0	0	1	5	1	0	0	1	1	14	5	1	1.8	1.5	66.7	1.0
AMRO	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
VATH	0	0	0	3	2	0	0	1	0	0	0	0	6	3	1	2.0	1.0	25.0	2.0
EUST	0	1	0	15	0	0	10	0	1	31	20	50	128	50	1	18.3	17.5	58.3	15.0
FOSP	0	0	0	3	0	0	0	0	0	0	0	0	3	3	3	3.0	-	8.3	3.0
DEJU	6	1	10	0	0	2	5	1	0	0	0	0	25	10	1	4.2	3.5	50.0	3.5
WEME	0	0	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
RECR	0	0	0	0	0	0	0	0	0	20	0	0	20	20	20	20.0	-	8.3	20.0
#TOT	506	506	817	632	419	502	334	378	321	399	395	435	5644	817	321	470.3	139.5	100.0	427.0

Bird use of the Quatse River estuary - Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#GRE	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GREB	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#HER	3	1	1	0	0	0	3	3	2	5	18	5	1	2.6	1.4	70.0	3.0
GBHE	3	1	1	0	0	0	3	3	2	5	18	5	1	2.6	1.4	70.0	3.0
#GEE	87	42	43	37	57	35	40	35	32	67	475	87	32	47.5	17.6	100.0	41.0
CAGO	87	42	43	37	57	35	40	35	32	67	475	87	32	47.5	17.6	100.0	41.0
#DAB	201	99	136	134	123	108	20	27	4	6	858	201	4	85.8	67.5	100.0	103.5
DABL	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GWTE	44	21	13	27	19	34	7	2	4	0	171	44	2	19.0	14.2	90.0	19.0
MALL	108	61	88	73	89	61	13	23	0	4	520	108	4	57.8	36.7	90.0	61.0
NOPI	15	15	14	19	14	8	0	0	0	0	85	19	8	14.2	3.5	60.0	14.5
BWTE	0	0	0	0	0	0	0	2	0	0	2	2	2	2.0	-	10.0	2.0
GADW	7	0	8	6	0	5	0	0	0	0	26	8	5	6.5	1.3	40.0	6.5
AMWI	27	2	13	9	0	0	0	0	0	2	53	27	2	10.6	10.3	50.0	9.0
#DIV	35	39	51	31	50	50	33	29	15	11	344	51	11	34.4	13.9	100.0	34.0
GOLD	3	0	0	0	0	0	0	5	0	0	8	5	3	4.0	1.4	20.0	4.0
COGO	0	11	7	4	1	1	0	0	0	0	24	11	1	4.8	4.3	50.0	4.0
BUFF	16	24	43	14	45	37	23	17	0	0	219	45	14	27.4	12.5	80.0	23.5
HOME	15	4	1	0	2	1	2	0	0	0	25	15	1	4.2	5.4	60.0	2.0
COME	1	0	0	2	2	10	8	7	15	11	56	15	1	7.0	5.0	80.0	7.5
RBME	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	10.0	1.0
DUCK	0	0	0	11	0	0	0	0	0	0	11	11	11	11.0	-	10.0	11.0
#RAP	4	5	2	16	2	1	2	2	3	2	39	16	1	3.9	4.4	100.0	2.0
BAEA	4	5	1	16	2	1	2	1	2	1	35	16	1	3.5	4.6	100.0	2.0
RTHA	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
PEFA	0	0	0	0	0	0	0	1	1	1	3	1	1	1.0	-	30.0	1.0
RUGR	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#SHO	112	0	235	0	4	14	653	1599	11	3	2631	1599	3	328.9	558.8	80.0	63.0
BBPL	0	0	0	0	0	0	0	5	0	0	5	5	5	5.0	-	10.0	5.0
KILL	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
GRYE	0	0	0	0	4	9	2	0	0	0	15	9	2	5.0	3.6	30.0	4.0
LEYE	0	0	0	0	0	5	0	0	0	0	5	5	5	5.0	-	10.0	5.0
BLTU	100	0	90	0	0	0	0	0	0	0	190	100	90	95.0	7.1	20.0	95.0
WESA	0	0	0	0	0	0	550	317	0	0	867	550	317	433.5	164.8	20.0	433.5
DUNL	0	0	0	0	0	0	60	7	0	0	67	60	7	33.5	37.5	20.0	33.5
DOWI	0	0	0	0	0	0	40	0	0	0	40	40	40	40.0	-	10.0	40.0
LBDO	0	0	0	0	0	0	0	0	5	3	8	5	3	4.0	1.4	20.0	4.0
SHOR	10	0	145	0	0	0	1	1270	6	0	1432	1270	1	286.4	553.2	50.0	10.0
#GUL	144	102	40	32	2	29	14	14	6	18	401	144	2	40.1	46.3	100.0	23.5
GULL	2	0	5	20	0	6	0	0	0	18	51	20	2	10.2	8.2	50.0	6.0
MEGU	47	95	23	5	1	3	10	7	6	0	197	95	1	21.9	31.0	90.0	7.0
HEGU	0	0	1	0	0	0	0	1	0	0	2	1	1	1.0	-	20.0	1.0
GWGU	95	7	11	7	1	20	4	6	0	0	151	95	1	18.9	31.3	80.0	7.0
CATE	0	0	0	0	0	0	1	2	3	0	6	3	1	2.0	1.0	30.0	2.0
RUHU	0	0	0	0	2	1	1	2	1	1	8	2	1	1.3	0.5	60.0	1.0
BEKI	2	2	0	4	2	1	1	1	1	2	16	4	1	1.8	1.0	90.0	2.0
#WOO	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
PIWO	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0

Bird use of the Quatse River estuary - Spring 91 (Cont'd)

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#PAS	60	44	20	91	73	17	57	43	39	50	494	91	17	49.4	22.5	100.0	47.0
VGSW	0	0	0	0	0	0	0	0	1	1	2	1	1	1.0	-	20.0	1.0
BASW	0	0	0	0	0	0	0	0	2	2	4	2	2	2.0	-	20.0	2.0
STJA	1	0	0	3	11	0	1	1	4	4	25	11	1	3.6	3.6	70.0	3.0
NOCR	16	14	15	18	7	6	5	5	13	18	117	18	5	11.7	5.4	100.0	13.5
CORA	0	0	0	2	1	0	4	0	0	0	7	4	1	2.3	1.5	30.0	2.0
CBCH	0	0	0	0	10	0	0	0	0	0	10	10	10	10.0	-	10.0	10.0
WIWR	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GCKI	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
AMRO	1	0	5	17	16	4	5	1	5	4	58	17	1	6.4	5.9	90.0	5.0
VATH	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	10.0	1.0
WAPI	0	0	0	0	0	2	20	0	0	0	22	20	2	11.0	12.7	20.0	11.0
EUST	40	30	0	50	22	3	17	36	12	0	210	50	3	26.3	15.6	80.0	26.0
OCWA	0	0	0	0	0	0	1	0	1	1	3	1	1	1.0	-	30.0	1.0
SAVS	0	0	0	0	0	0	3	0	0	2	5	3	2	2.5	0.7	20.0	2.5
SOSP	0	0	0	1	2	2	0	0	1	3	9	3	1	1.8	0.8	50.0	2.0
DEJU	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
PUFI	0	0	0	0	3	0	0	0	0	0	3	3	3	3.0	-	10.0	3.0
RECR	0	0	0	0	0	0	0	0	0	15	15	15	15	15.0	-	10.0	15.0
#TOT	649	334	529	345	315	256	825	1758	117	165	5293	1758	117	529.3	483.8	100.0	339.5

Bird use of the Quatse River estuary - Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	7	8	3	3	0	11	0	5	5	8	50	11	3	6.3	2.8	80.0	6.0
GBHE	7	8	3	3	0	11	0	5	5	8	50	11	3	6.3	2.8	80.0	6.0
#GEE	15	30	23	0	0	23	40	102	72	1	306	102	1	38.3	33.1	80.0	26.5
BRAN	0	0	10	0	0	0	0	0	0	0	10	10	10	10.0	-	10.0	10.0
CAGO	15	30	13	0	0	23	40	102	72	1	296	102	1	37.0	33.9	80.0	26.5
#DAB	5	9	0	1	0	2	0	0	0	1	18	9	1	3.6	3.4	50.0	2.0
GWTE	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
MALL	4	9	0	0	0	0	0	0	0	0	13	9	4	6.5	3.5	20.0	6.5
NOPI	0	0	0	1	0	2	0	0	0	1	4	2	1	1.3	0.6	30.0	1.0
#DIV	45	20	14	10	41	30	25	1	0	43	229	45	1	25.4	15.6	90.0	25.0
SCAU	34	12	6	0	0	0	0	0	0	0	52	34	6	17.3	14.7	30.0	12.0
HOME	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
COME	11	8	8	10	0	30	25	0	0	43	135	43	8	19.3	13.7	70.0	11.0
RBME	0	0	0	0	41	0	0	0	0	0	41	41	41	41.0	-	10.0	41.0
#RAP	9	0	3	3	2	2	3	3	1	4	30	9	1	3.3	2.3	90.0	3.0
OSPR	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	10.0	1.0
BAEA	9	0	3	3	2	2	3	3	0	4	29	9	2	3.6	2.3	80.0	3.0
#SHO	27	0	5	42	30	48	494	0	50	6	702	494	5	87.8	165.1	80.0	36.0
BBPL	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
KILL	0	0	0	0	0	0	90	0	0	0	90	90	90	90.0	-	10.0	90.0
YELL	2	0	0	0	0	1	0	0	0	3	6	3	1	2.0	1.0	30.0	2.0
WHIM	23	0	5	4	0	0	2	0	0	0	34	23	2	8.5	9.7	40.0	4.5
MAGO	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	10.0	2.0
WESA	0	0	0	0	0	0	300	0	0	0	300	300	300	300.0	-	10.0	300.0
LBDO	0	0	0	8	0	7	0	0	0	0	15	8	7	7.5	0.7	20.0	7.5
SHOR	0	0	0	30	30	40	100	0	50	3	253	100	3	42.2	32.4	60.0	35.0
#GUL	26	18	46	44	41	213	306	88	236	168	1186	306	18	118.6	103.7	100.0	67.0
GULL	0	14	6	25	39	200	290	65	200	153	992	290	6	110.2	102.9	90.0	65.0
BOGU	2	4	0	0	0	0	0	0	0	0	6	4	2	3.0	1.4	20.0	3.0
MEGU	24	0	40	19	0	13	12	16	32	15	171	40	12	21.4	10.0	80.0	17.5
RBGU	0	0	0	0	2	0	4	7	1	0	14	7	1	3.5	2.6	40.0	3.0
CAGU	0	0	0	0	0	0	0	0	3	0	3	3	3	3.0	-	10.0	3.0
CATE	0	0	2	8	11	0	1	0	0	0	22	11	1	5.5	4.8	40.0	5.0
BLSW	0	0	0	0	0	0	0	0	0	10	10	10	10	10.0	-	10.0	10.0
VASW	0	0	0	0	0	0	0	0	0	32	32	32	32	32.0	-	10.0	32.0
RUHU	1	0	1	0	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
BEKI	1	0	0	0	0	2	2	3	2	3	13	3	1	2.2	0.8	60.0	2.0
#WOO	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
NOFL	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0

Bird use of the Quatse River estuary - Summer 91 (Cont'd)

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#PAS	74	49	80	120	10	6	13	6	43	68	469	120	6	46.9	38.7	100.0	46.0
VGSW	8	0	5	0	0	0	10	0	0	0	23	10	5	7.7	2.5	30.0	8.0
BASW	15	13	8	3	3	1	2	3	0	0	48	15	1	6.0	5.4	80.0	3.0
STJA	2	0	0	1	0	0	0	1	0	0	4	2	1	1.3	0.6	30.0	1.0
NOCR	5	17	13	5	2	4	1	2	33	30	112	33	1	11.2	11.9	100.0	5.0
CBCH	0	0	4	1	0	0	0	0	0	3	8	4	1	2.7	1.5	30.0	3.0
WIWR	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GCKI	1	1	0	0	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
HETH	0	1	2	1	0	0	0	0	0	0	4	2	1	1.3	0.6	30.0	1.0
AMRO	3	0	1	2	0	1	0	0	7	15	29	15	1	4.8	5.5	60.0	2.5
CEWA	0	0	0	2	0	0	0	0	3	0	5	3	2	2.5	0.7	20.0	2.5
EUST	6	14	45	101	5	0	0	0	0	20	191	101	5	31.8	36.9	60.0	17.0
WARB	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
OCWA	3	2	1	1	0	0	0	0	0	0	7	3	1	1.8	1.0	40.0	1.5
SOSP	1	0	1	2	0	0	0	0	0	0	4	2	1	1.3	0.6	30.0	1.0
PASS	30	0	0	0	0	0	0	0	0	0	30	30	30	30.0	-	10.0	30.0
#TOT	210	134	177	232	135	337	884	208	409	344	3070	884	134	307.0	222.8	100.0	221.0

Bird use of the Quatse River estuary - Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#GRE	0	0	0	11	11	11	11	11.0	-	25.0	11.0
RNGR	0	0	0	3	3	3	3	3.0	-	25.0	3.0
WEGR	0	0	0	8	8	8	8	8.0	-	25.0	8.0
#HER	1	3	3	3	10	3	1	2.5	1.0	100.0	3.0
GBHE	1	3	3	3	10	3	1	2.5	1.0	100.0	3.0
#GEE	5	36	52	92	185	92	5	46.3	36.2	100.0	44.0
CAGO	5	36	52	92	185	92	5	46.3	36.2	100.0	44.0
#DAB	0	38	87	283	408	283	38	136.0	129.6	75.0	87.0
GWTE	0	12	6	71	89	71	6	29.7	35.9	75.0	12.0
MALL	0	12	4	46	62	46	4	20.7	22.3	75.0	12.0
NOPI	0	0	2	2	4	2	2	2.0	-	50.0	2.0
NOSL	0	0	3	0	3	3	3	3.0	-	25.0	3.0
AMWI	0	14	72	164	250	164	14	83.3	75.6	75.0	72.0
#DIV	24	25	9	14	72	25	9	18.0	7.8	100.0	19.0
HOME	0	4	9	3	16	9	3	5.3	3.2	75.0	4.0
COME	24	21	0	11	56	24	11	18.7	6.8	75.0	21.0
#RAP	9	1	2	8	20	9	1	5.0	4.1	100.0	5.0
BAEA	8	1	2	7	18	8	1	4.5	3.5	100.0	4.5
SSHA	0	0	0	1	1	1	1	1.0	-	25.0	1.0
PEFA	1	0	0	0	1	1	1	1.0	-	25.0	1.0
#SHO	104	5	6	0	115	104	5	38.3	56.9	75.0	6.0
SEPL	5	0	0	0	5	5	5	5.0	-	25.0	5.0
KILL	0	0	1	0	1	1	1	1.0	-	25.0	1.0
GRYE	0	1	0	0	1	1	1	1.0	-	25.0	1.0
BLTU	0	4	5	0	9	5	4	4.5	0.7	50.0	4.5
SESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
WESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
LESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
#GUL	132	44	82	97	355	132	44	88.8	36.5	100.0	89.5
GULL	103	1	10	0	114	103	1	38.0	56.5	75.0	10.0
BOGU	0	0	0	6	6	6	6	6.0	-	25.0	6.0
MEGU	26	0	60	77	163	77	26	54.3	26.0	75.0	60.0
RBGU	1	40	7	3	51	40	1	12.8	18.3	100.0	5.0
CAGU	1	3	2	0	6	3	1	2.0	1.0	75.0	2.0
HEGU	0	0	0	1	1	1	1	1.0	-	25.0	1.0
GWGU	1	0	3	10	14	10	1	4.7	4.7	75.0	3.0
#ALC	0	0	0	1	1	1	1	1.0	-	25.0	1.0
COMU	0	0	0	1	1	1	1	1.0	-	25.0	1.0
MODO	0	0	4	0	4	4	4	4.0	-	25.0	4.0
BEKI	2	3	4	1	10	4	1	2.5	1.3	100.0	2.5

Bird use of the Quatse River estuary - Autumn 91 (Cont'd)

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#PAS	40	27	128	117	312	128	27	78.0	51.9	100.0	78.5
STJA	0	1	0	0	1	1	1	1.0	-	25.0	1.0
NOCR	15	10	50	20	95	50	10	23.8	18.0	100.0	17.5
CBCH	6	0	0	5	11	6	5	5.5	0.7	50.0	5.5
WIWR	0	1	0	0	1	1	1	1.0	-	25.0	1.0
GCKI	0	2	0	30	32	30	2	16.0	19.8	50.0	16.0
RCKI	0	0	0	1	1	1	1	1.0	-	25.0	1.0
AMRO	0	1	40	1	42	40	1	14.0	22.5	75.0	1.0
CEWA	3	0	0	0	3	3	3	3.0	-	25.0	3.0
EUST	0	5	30	60	95	60	5	31.7	27.5	75.0	30.0
YRWA	0	0	3	0	3	3	3	3.0	-	25.0	3.0
SAVS	0	3	3	0	6	3	3	3.0	-	50.0	3.0
SOSP	2	3	2	0	7	3	2	2.3	0.6	75.0	2.0
PUFI	0	1	0	0	1	1	1	1.0	-	25.0	1.0
PASS	14	0	0	0	14	14	14	14.0	-	25.0	14.0
#TOT	317	182	377	627	1503	627	182	375.8	186.3	100.0	347.0

Appendix IV

Quatse River estuary bird surveys: Seasonal bird use by habitat, September 1990 to September 1991

Note: In this Appendix, the mean has been calculated as the total number of birds of species-x counted over the season, divided by the total number of counts where species-x occurred. Counts of zero have not been included in the total number of counts nor are they included as minimum values. Thus the last 6 columns in the Appendix summarize the species occurrence on the estuary. For example, the probability of seeing a Bald Eagle in Autumn in the Forest habitat adjacent to the Quatse River estuary is about 25%. If you see the species, you are likely to see an average of about 3 birds; more than 5 would be exceptional.

Bird use of Forest Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#RAP	0	0	0	1	0	0	5	2	0	0	0	0	8	5	1	2.7	2.1	25.0	2.0
BAEA	0	0	0	1	0	0	5	2	0	0	0	0	8	5	1	2.7	2.1	25.0	2.0
#PAS	21	7	11	2	6	3	0	19	0	1	1	2	73	21	1	7.3	7.4	83.3	4.5
STJA	4	5	8	1	3	1	0	0	0	0	0	0	22	8	1	3.7	2.7	50.0	3.5
CORA	1	1	0	0	0	0	0	0	0	0	0	1	3	1	1	1.0	-	25.0	1.0
CBCH	1	0	0	0	0	0	0	4	0	0	0	0	5	4	1	2.5	2.1	16.7	2.5
GCKI	0	1	1	0	1	0	0	13	0	1	0	1	18	13	1	3.0	4.9	50.0	1.0
RCKI	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
AMRO	15	0	2	0	0	2	0	0	0	0	0	0	19	15	2	6.3	7.5	25.0	2.0
SOSP	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
DEJU	0	0	0	0	2	0	0	2	0	0	0	0	4	2	2	2.0	-	16.7	2.0
#TOT	21	7	11	3	6	3	5	21	0	1	1	2	81	21	1	7.4	7.4	91.7	5.0

Bird use of Forest Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#DIV	0	5	0	0	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
COME	0	5	0	0	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
#RAP	0	0	2	2	0	0	0	0	0	1	0	3	8	3	1	2.0	0.8	33.3	2.0
BAEA	0	0	2	2	0	0	0	0	0	1	0	2	7	2	1	1.8	0.5	33.3	2.0
RTHA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#PAS	1	0	2	0	4	0	2	2	0	1	2	0	14	4	1	2.0	1.0	58.3	2.0
STJA	0	0	0	0	3	0	1	0	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
CORA	0	0	1	0	1	0	0	0	0	0	2	0	4	2	1	1.3	0.6	25.0	1.0
GCKI	1	0	0	0	0	0	1	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
VATH	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
EUST	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
DEJU	0	0	1	0	0	0	0	1	0	0	0	0	2	1	1	1.0	-	16.7	1.0
#TOT	1	5	4	2	4	1	2	2	0	2	2	3	28	5	1	2.5	1.3	91.7	2.0

Bird use of Forest Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#RAP	3	0	0	7	1	0	0	0	0	1	12	7	1	3.0	2.8	40.0	2.0
BAEA	3	0	0	7	1	0	0	0	0	0	11	7	1	3.7	3.1	30.0	3.0
PEFA	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	10.0	1.0
RUGR	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
RUHU	0	0	0	0	1	1	0	0	0	0	2	1	1	1.0	-	20.0	1.0
#WOO	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
PIWO	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
#PAS	11	0	0	2	44	2	8	1	6	20	94	44	1	11.8	14.4	80.0	7.0
STJA	1	0	0	1	10	0	0	0	1	3	16	10	1	3.2	3.9	50.0	1.0
NOCR	9	0	0	0	1	0	0	0	2	0	12	9	1	4.0	4.4	30.0	2.0
CORA	0	0	0	0	0	0	4	0	0	0	4	4	4	4.0	-	10.0	4.0
CBCH	0	0	0	0	10	0	0	0	0	0	10	10	10	10.0	-	10.0	10.0
WIWR	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GCKI	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
AMRO	0	0	0	1	0	1	2	1	1	0	6	2	1	1.2	0.4	50.0	1.0
VATH	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	10.0	1.0
EUST	0	0	0	0	21	0	0	0	0	0	21	21	21	21.0	-	10.0	21.0
OCWA	0	0	0	0	0	0	1	0	1	1	3	1	1	1.0	-	30.0	1.0
SOSP	0	0	0	0	1	1	0	0	1	1	4	1	1	1.0	-	40.0	1.0
RECR	0	0	0	0	0	0	0	0	0	15	15	15	15	15.0	-	10.0	15.0
#TOT	15	0	0	9	46	3	8	2	6	21	110	46	2	13.8	14.5	80.0	8.5

Bird use of Forest Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#RAP	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
BAEA	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#SHO	0	0	0	0	0	0	0	0	50	0	50	50	50	50.0	-	10.0	50.0
SHOR	0	0	0	0	0	0	0	0	50	0	50	50	50	50.0	-	10.0	50.0
#WOO	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
NOFL	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#PAS	5	4	13	3	0	2	0	3	5	0	35	13	2	5.0	3.7	70.0	4.0
VGSW	0	0	3	0	0	0	0	0	0	0	3	3	3	3.0	-	10.0	3.0
BASW	0	0	4	0	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
STJA	1	0	0	1	0	0	0	1	0	0	3	1	1	1.0	-	30.0	1.0
NOCR	0	0	0	0	0	1	0	2	0	0	3	2	1	1.5	0.7	20.0	1.5
CBCH	0	0	4	0	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
WIWR	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GCKI	1	1	0	0	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
HETH	0	1	1	0	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
AMRO	2	0	0	1	0	1	0	0	5	0	9	5	1	2.3	1.9	40.0	1.5
OCWA	0	1	1	1	0	0	0	0	0	0	3	1	1	1.0	-	30.0	1.0
SOSP	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	6	4	13	4	0	2	0	3	55	0	87	55	2	12.4	19.1	70.0	4.0

Bird use of Forest Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#RAP	1	0	0	0	1	1	1	1.0	-	25.0	1.0
BAEA	1	0	0	0	1	1	1	1.0	-	25.0	1.0
BEKI	1	0	0	0	1	1	1	1.0	-	25.0	1.0
#PAS	13	1	0	36	50	36	1	16.7	17.8	75.0	13.0
NOCR	7	0	0	0	7	7	7	7.0	-	25.0	7.0
CBCH	6	0	0	5	11	6	5	5.5	0.7	50.0	5.5
WIWR	0	1	0	0	1	1	1	1.0	-	25.0	1.0
GCKI	0	0	0	30	30	30	30	30.0	-	25.0	30.0
RCKI	0	0	0	1	1	1	1	1.0	-	25.0	1.0
#TOT	15	1	0	36	52	36	1	17.3	17.6	75.0	15.0

Bird use of South Intertidal Marsh Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
GBHE	0	0	1	0	1	0	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
#GEE	0	0	0	0	3	7	0	40	16	19	32	0	117	40	3	19.5	14.3	50.0	17.5
CAGO	0	0	0	0	3	7	0	40	16	19	32	0	117	40	3	19.5	14.3	50.0	17.5
#DAB	0	0	0	0	15	2	3	3	93	37	10	24	187	93	2	23.4	30.6	66.7	12.5
GWTE	0	0	0	0	15	1	3	3	4	29	0	8	63	29	1	9.0	10.0	58.3	4.0
MALL	0	0	0	0	0	0	0	0	89	0	0	0	89	89	89	89.0	-	8.3	89.0
NOPI	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GADW	0	0	0	0	0	0	0	0	0	8	10	10	28	10	8	9.3	1.2	25.0	10.0
AMWI	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6	6.0	-	8.3	6.0
#DIV	5	3	0	0	1	3	4	4	3	5	3	1	32	5	1	3.2	1.4	83.3	3.0
BUFF	0	0	0	0	0	0	0	0	2	3	2	1	8	3	1	2.0	0.8	33.3	2.0
HOME	5	3	0	0	1	3	4	4	0	2	1	0	23	5	1	2.9	1.5	66.7	3.0
COME	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#RAP	0	0	1	0	0	0	0	0	0	0	0	1	2	1	1	1.0	-	16.7	1.0
BAEA	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GOEA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#SHO	0	0	0	0	0	1	1	0	2	0	0	0	4	2	1	1.3	0.6	25.0	1.0
KILL	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GRYE	0	0	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	8.3	2.0
LEYE	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GUL	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
CAGU	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BEKI	1	2	0	0	1	1	0	2	2	1	0	0	10	2	1	1.4	0.5	58.3	1.0
#WOO	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
NOFL	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
#PAS	2	2	1	1	2	30	0	0	0	50	0	0	88	50	1	12.6	19.6	58.3	2.0
STJA	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
EUST	0	0	0	0	0	30	0	0	0	50	0	0	80	50	30	40.0	14.1	16.7	40.0
SOSP	2	2	1	1	1	0	0	0	0	0	0	0	7	2	1	1.4	0.5	41.7	1.0
#TOT	8	7	3	1	24	44	8	49	116	113	45	26	444	116	1	37.0	40.0	100.0	25.0

Bird use of South Intertidal Marsh Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#SWA	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
SWAN	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GEE	10	3	0	70	80	33	45	65	8	15	32	47	408	80	3	37.1	26.7	91.7	33.0
BRAN	0	0	0	0	17	0	0	0	0	0	0	0	17	17	17	17.0	-	8.3	17.0
CAGO	10	3	0	70	63	33	45	65	8	15	32	47	391	70	3	35.5	24.4	91.7	33.0
#DAB	11	58	12	74	11	20	0	12	5	8	26	6	243	74	5	22.1	22.8	91.7	12.0
GWTE	6	5	3	64	3	9	0	2	1	5	9	5	112	64	1	10.2	18.0	91.7	5.0
MALL	0	38	0	4	7	0	0	7	2	0	17	0	75	38	2	12.5	13.5	50.0	7.0
NOPI	0	0	0	1	0	4	0	1	1	1	0	1	9	4	1	1.5	1.2	50.0	1.0
GADW	5	9	9	2	1	7	0	2	1	2	0	0	38	9	1	4.2	3.3	75.0	2.0
AMWI	0	6	0	3	0	0	0	0	0	0	0	0	9	6	3	4.5	2.1	16.7	4.5
#DIV	5	3	4	2	10	10	0	3	4	4	2	2	49	10	2	4.5	2.9	91.7	4.0
COGO	0	0	0	2	0	0	0	0	0	1	1	0	4	2	1	1.3	0.6	25.0	1.0
BUFF	2	2	3	0	6	8	0	3	4	3	0	2	33	8	2	3.7	2.1	75.0	3.0
HOME	3	1	1	0	4	2	0	0	0	0	0	0	11	4	1	2.2	1.3	41.7	2.0
COME	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
BEKI	0	0	0	0	1	1	0	1	0	0	0	1	4	1	1	1.0	-	33.3	1.0
#PAS	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
VATH	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#TOT	26	64	16	147	103	65	45	81	17	27	60	56	707	147	16	58.9	38.3	100.0	58.0

Bird use of South Intertidal Marsh Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	10.0	2.0
GBHE	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	10.0	2.0
#GEE	39	8	26	7	10	0	2	2	13	0	107	39	2	13.4	12.9	80.0	9.0
CAGO	39	8	26	7	10	0	2	2	13	0	107	39	2	13.4	12.9	80.0	9.0
#DAB	73	3	4	12	4	0	3	2	0	0	101	73	2	14.4	26.0	70.0	4.0
GWTE	7	0	0	3	0	0	3	0	0	0	13	7	3	4.3	2.3	30.0	3.0
MALL	65	0	4	9	4	0	0	0	0	0	82	65	4	20.5	29.8	40.0	6.5
NOPI	1	3	0	0	0	0	0	0	0	0	4	3	1	2.0	1.4	20.0	2.0
BWTE	0	0	0	0	0	0	0	2	0	0	2	2	2	2.0	-	10.0	2.0
#DIV	5	0	0	0	4	0	0	0	0	0	9	5	4	4.5	0.7	20.0	4.5
BUFF	2	0	0	0	4	0	0	0	0	0	6	4	2	3.0	1.4	20.0	3.0
HOME	3	0	0	0	0	0	0	0	0	0	3	3	3	3.0	-	10.0	3.0
#RAP	0	0	1	0	0	0	0	0	1	0	2	1	1	1.0	-	20.0	1.0
RTHA	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
PEFA	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	10.0	1.0
#SHO	0	0	0	0	4	14	2	0	0	0	20	14	2	6.7	6.4	30.0	4.0
GRYE	0	0	0	0	4	9	2	0	0	0	15	9	2	5.0	3.6	30.0	4.0
LEYE	0	0	0	0	0	5	0	0	0	0	5	5	5	5.0	-	10.0	5.0
BEKI	0	1	0	0	1	1	0	0	1	0	4	1	1	1.0	-	40.0	1.0
#PAS	0	30	12	2	3	6	13	2	0	2	70	30	2	8.8	9.7	80.0	4.5
NOCR	0	0	10	2	3	0	0	0	0	0	15	10	2	5.0	4.4	30.0	3.0
AMRO	0	0	2	0	0	2	0	0	0	0	4	2	2	2.0	-	20.0	2.0
EUST	0	30	0	0	0	3	13	2	0	0	48	30	2	12.0	13.0	40.0	8.0
SOSP	0	0	0	0	0	1	0	0	0	2	3	2	1	1.5	0.7	20.0	1.5
#TOT	117	42	43	21	26	21	22	6	15	2	315	117	2	31.5	32.8	100.0	21.5

Bird use of South Intertidal Marsh Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	1	0	0	1	0	0	0	3	0	0	5	3	1	1.7	1.2	30.0	1.0
GBHE	1	0	0	1	0	0	0	3	0	0	5	3	1	1.7	1.2	30.0	1.0
#GEE	0	0	0	0	0	0	0	0	8	0	8	8	8	8.0	-	10.0	8.0
CAGO	0	0	0	0	0	0	0	0	8	0	8	8	8	8.0	-	10.0	8.0
#DAB	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	10.0	1.0
NOPI	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	10.0	1.0
#DIV	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
COME	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#RAP	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	10.0	1.0
BAEA	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#SHO	1	0	0	8	0	0	0	0	0	0	9	8	1	4.5	4.9	20.0	4.5
YELL	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
LBDO	0	0	0	8	0	0	0	0	0	0	8	8	8	8.0	-	10.0	8.0
BEKI	0	0	0	0	0	1	0	2	0	0	3	2	1	1.5	0.7	20.0	1.5
#PAS	2	11	2	101	0	0	0	0	0	0	116	101	2	29.0	48.2	40.0	6.5
NOCR	1	3	1	0	0	0	0	0	0	0	5	3	1	1.7	1.2	30.0	1.0
AMRO	0	0	1	1	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
EUST	0	8	0	100	0	0	0	0	0	0	108	100	8	54.0	65.1	20.0	54.0
OCWA	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	5	11	2	110	0	2	0	5	8	1	144	110	1	18.0	37.3	80.0	5.0

Bird use of South Intertidal Marsh Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#HER	1	0	0	0	1	1	1	1.0	-	25.0	1.0
GBHE	1	0	0	0	1	1	1	1.0	-	25.0	1.0
#GEE	0	8	0	9	17	9	8	8.5	0.7	50.0	8.5
CAGO	0	8	0	9	17	9	8	8.5	0.7	50.0	8.5
#DAB	0	0	0	2	2	2	2	2.0	-	25.0	2.0
GWTE	0	0	0	2	2	2	2	2.0	-	25.0	2.0
#RAP	0	0	0	1	1	1	1	1.0	-	25.0	1.0
SSHA	0	0	0	1	1	1	1	1.0	-	25.0	1.0
BEKI	0	2	3	0	5	3	2	2.5	0.7	50.0	2.5
#PAS	12	3	0	0	15	12	3	7.5	6.4	50.0	7.5
SAVS	0	3	0	0	3	3	3	3.0	-	25.0	3.0
SOSP	2	0	0	0	2	2	2	2.0	-	25.0	2.0
PASS	10	0	0	0	10	10	10	10.0	-	25.0	10.0
#TOT	13	13	3	12	41	13	3	10.3	4.9	100.0	12.5

Bird use of Alienated Marsh B Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	1	0	0	0	0	0	0	0	0	1	0	2	1	1	1.0	-	16.7	1.0
GBHE	0	1	0	0	0	0	0	0	0	0	1	0	2	1	1	1.0	-	16.7	1.0
#GEE	0	0	0	0	0	0	0	0	6	0	0	0	6	6	6	6.0	-	8.3	6.0
CAGO	0	0	0	0	0	0	0	0	6	0	0	0	6	6	6	6.0	-	8.3	6.0
#DAB	0	0	0	0	4	0	0	0	0	5	0	0	9	5	4	4.5	0.7	16.7	4.5
GWTE	0	0	0	0	4	0	0	0	0	5	0	0	9	5	4	4.5	0.7	16.7	4.5
#RAI	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
AMCO	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
#SHO	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GRYE	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#PAS	0	1	2	0	0	0	0	0	0	0	0	0	3	2	1	1.5	0.7	16.7	1.5
STJA	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GCKI	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
AMRO	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#TOT	0	2	2	1	4	0	0	0	6	6	1	0	22	6	1	3.1	2.2	58.3	2.0

Bird use of Alienated Marsh B Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
#DAB	0	0	0	0	0	0	0	0	1	0	2	0	3	2	1	1.5	0.7	16.7	1.5
GWTE	0	0	0	0	0	0	0	0	1	0	2	0	3	2	1	1.5	0.7	16.7	1.5
#DIV	0	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
HOME	0	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
BEKI	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#PAS	0	3	0	0	0	1	0	0	0	0	1	1	6	3	1	1.5	1.0	33.3	1.0
CORA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
GCKI	0	3	0	0	0	0	0	0	0	0	1	0	4	3	1	2.0	1.4	16.7	2.0
DEJU	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#TOT	0	5	0	1	0	1	0	0	1	1	3	1	13	5	1	1.9	1.6	58.3	1.0

Bird use of Alienated Marsh B Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#HER	1	0	0	0	0	0	1	0	0	0	2	1	1	1.0	-	20.0	1.0
GBHE	1	0	0	0	0	0	1	0	0	0	2	1	1	1.0	-	20.0	1.0
#PAS	0	0	0	4	2	0	0	0	0	0	6	4	2	3.0	1.4	20.0	3.0
STJA	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
NOCR	0	0	0	2	1	0	0	0	0	0	3	2	1	1.5	0.7	20.0	1.5
AMRO	0	0	0	2	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
#TOT	1	0	0	4	2	0	1	0	0	0	8	4	1	2.0	1.4	40.0	1.5

Bird use of Alienated Marsh B Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
GBHE	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
#PAS	1	0	0	1	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
HETH	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
OCWA	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	1	0	0	1	0	0	0	1	0	0	3	1	1	1.0	-	30.0	1.0

Bird use of Alienated Marsh B Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#DAB	0	1	0	0	1	1	1	1.0	-	25.0	1.0
GWTE	0	1	0	0	1	1	1	1.0	-	25.0	1.0
#TOT	0	1	0	0	1	1	1	1.0	-	25.0	1.0

Bird use of Alienated Marsh A Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
#GEE	0	0	0	0	0	0	0	17	0	31	21	0	69	31	17	23.0	7.2	25.0	21.0
CAGO	0	0	0	0	0	0	0	17	0	31	21	0	69	31	17	23.0	7.2	25.0	21.0
#DAB	0	0	0	0	3	0	0	4	0	4	12	4	27	12	3	5.4	3.7	41.7	4.0
GWTE	0	0	0	0	2	0	0	4	0	4	12	4	26	12	2	5.2	3.9	41.7	4.0
MALL	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#DIV	0	0	0	0	1	0	0	0	2	2	1	0	6	2	1	1.5	0.6	33.3	1.5
BUFF	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
HOME	0	0	0	0	1	0	0	0	2	2	0	0	5	2	1	1.7	0.6	25.0	2.0
#RAP	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BAEA	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#RAI	0	0	0	0	0	0	0	0	0	2	2	3	7	3	2	2.3	0.6	25.0	2.0
AMCO	0	0	0	0	0	0	0	0	0	2	2	3	7	3	2	2.3	0.6	25.0	2.0
#SHO	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
WESA	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#PAS	3	0	0	0	2	0	1	0	8	0	0	6	20	8	1	4.0	2.9	41.7	3.0
NOCR	3	0	0	0	1	0	0	0	8	0	0	0	12	8	1	4.0	3.6	25.0	3.0
CORA	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
EUST	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
DEJU	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6	6.0	-	8.3	6.0
#TOT	4	0	0	0	6	0	1	22	10	39	37	13	132	39	1	16.5	14.7	66.7	11.5

Bird use of Alienated Marsh A Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GEE	7	8	8	0	0	0	0	9	0	20	0	0	52	20	7	10.4	5.4	41.7	8.0
CAGO	7	8	8	0	0	0	0	9	0	20	0	0	52	20	7	10.4	5.4	41.7	8.0
#DAB	2	0	1	1	2	0	0	0	0	0	3	0	9	3	1	1.8	0.8	41.7	2.0
GWTE	2	0	1	0	0	0	0	0	0	0	0	0	3	2	1	1.5	0.7	16.7	1.5
NOPI	0	0	0	1	0	0	0	0	0	0	2	0	3	2	1	1.5	0.7	16.7	1.5
NOSL	0	0	0	0	2	0	0	0	0	0	1	0	3	2	1	1.5	0.7	16.7	1.5
#DIV	1	1	1	6	3	4	0	0	0	1	0	0	17	6	1	2.4	2.0	58.3	1.0
BUFF	0	1	0	6	3	2	0	0	0	1	0	0	13	6	1	2.6	2.1	41.7	2.0
HOME	1	0	1	0	0	2	0	0	0	0	0	0	4	2	1	1.3	0.6	25.0	1.0
#RAP	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BAEA	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#RAI	1	0	0	0	0	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
AMCO	1	0	0	0	0	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
#PAS	0	4	0	4	0	0	5	0	0	0	0	0	13	5	4	4.3	0.6	25.0	4.0
STJA	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
NOCR	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
AMRO	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
EUST	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
FOSP	0	0	0	3	0	0	0	0	0	0	0	0	3	3	3	3.0	-	8.3	3.0
DEJU	0	1	0	0	0	0	5	0	0	0	0	0	6	5	1	3.0	2.8	16.7	3.0
#TOT	11	14	11	11	5	5	5	9	0	21	3	0	95	21	3	9.5	5.4	83.3	10.0

Bird use of Alienated Marsh A Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GBHE	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#GEE	0	0	0	6	7	0	0	0	0	0	13	7	6	6.5	0.7	20.0	6.5
CAGO	0	0	0	6	7	0	0	0	0	0	13	7	6	6.5	0.7	20.0	6.5
#DAB	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
NOPI	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
BEKI	0	0	0	2	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
#PAS	0	0	0	1	0	1	0	0	0	0	2	1	1	1.0	-	20.0	1.0
STJA	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
AMRO	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	2	0	1	9	7	1	0	0	0	0	20	9	1	4.0	3.7	50.0	2.0

Bird use of Alienated Marsh A Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
GBHE	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
#RAP	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
BAEA	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
#SHO	0	0	0	0	0	7	0	0	0	0	7	7	7	7.0	-	10.0	7.0
LBDO	0	0	0	0	0	7	0	0	0	0	7	7	7	7.0	-	10.0	7.0
BEKI	0	0	0	0	0	0	1	1	0	2	4	2	1	1.3	0.6	30.0	1.0
#PAS	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
OCWA	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	3	0	0	0	0	7	1	2	0	2	15	7	1	3.0	2.3	50.0	2.0

Bird use of Alienated Marsh A Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#GEE	0	0	0	15	15	15	15	15.0	-	25.0	15.0
CAGO	0	0	0	15	15	15	15	15.0	-	25.0	15.0
#DAB	0	0	3	0	3	3	3	3.0	-	25.0	3.0
NOSL	0	0	3	0	3	3	3	3.0	-	25.0	3.0
#DIV	0	0	0	1	1	1	1	1.0	-	25.0	1.0
HOME	0	0	0	1	1	1	1	1.0	-	25.0	1.0
MODO	0	0	2	0	2	2	2	2.0	-	25.0	2.0
BEKI	0	0	0	1	1	1	1	1.0	-	25.0	1.0
#PAS	0	1	6	1	8	6	1	2.7	2.9	75.0	1.0
AMRO	0	1	0	1	2	1	1	1.0	-	50.0	1.0
YRWA	0	0	3	0	3	3	3	3.0	-	25.0	3.0
SAVS	0	0	3	0	3	3	3	3.0	-	25.0	3.0
#TOT	0	1	11	18	30	18	1	10.0	8.5	75.0	11.0

Bird use of North Intertidal Marsh Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#HER	2	1	1	2	4	6	10	8	3	8	2	1	48	10	1	4.0	3.2	100.0	2.5
GBHE	2	1	1	2	4	6	10	8	3	8	2	1	48	10	1	4.0	3.2	100.0	2.5
#SWA	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
TRUS	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
#GEE	12	0	0	79	0	27	158	27	57	97	23	26	506	158	12	56.2	47.7	75.0	27.0
GWFG	12	0	0	0	0	0	0	0	0	0	0	0	12	12	12	12.0	-	8.3	12.0
CAGO	0	0	0	79	0	27	158	27	57	97	23	26	494	158	23	61.8	47.8	66.7	42.0
#DAB	18	30	14	9	7	154	43	251	313	112	199	110	1260	313	7	105.0	104.5	100.0	76.5
DABL	8	0	0	4	0	0	3	0	0	0	0	0	15	8	3	5.0	2.6	25.0	4.0
GWTE	0	4	0	0	7	48	11	185	2	102	46	97	502	185	2	55.8	61.9	75.0	46.0
MALL	0	10	0	0	0	35	10	0	112	10	56	10	243	112	10	34.7	38.4	58.3	10.0
NOPI	0	10	6	5	0	3	15	0	4	0	17	0	60	17	3	8.6	5.6	58.3	6.0
CITE	10	0	0	0	0	1	0	0	0	0	0	0	11	10	1	5.5	6.4	16.7	5.5
NOSL	0	6	0	0	0	0	0	0	3	0	0	0	9	6	3	4.5	2.1	16.7	4.5
CADW	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
EUWI	0	0	0	0	0	0	4	0	2	0	0	0	6	4	2	3.0	1.4	16.7	3.0
AMWI	0	0	8	0	0	67	0	65	190	0	80	3	413	190	3	68.8	67.6	50.0	66.0
#DIV	6	48	27	10	11	0	5	5	4	16	20	5	157	48	4	14.3	13.4	91.7	10.0
SUSC	0	0	5	0	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
COGO	0	0	0	0	0	0	0	0	0	0	2	0	2	2	2	2.0	-	8.3	2.0
BUFF	0	0	0	0	0	0	0	0	0	0	14	2	16	14	2	8.0	8.5	16.7	8.0
HOME	0	5	5	0	2	0	1	1	0	0	4	0	18	5	1	3.0	1.9	50.0	3.0
COME	6	33	12	10	9	0	4	4	4	16	0	3	101	33	3	10.1	9.1	83.3	7.5
DUCK	0	10	5	0	0	0	0	0	0	0	0	0	15	10	5	7.5	3.5	16.7	7.5
#RAP	2	3	0	3	0	12	4	11	1	8	4	5	53	12	1	5.3	3.8	83.3	4.0
BAEA	2	3	0	3	0	12	3	10	1	8	4	5	51	12	1	5.1	3.7	83.3	3.5
NOHA	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	8.3	1.0
SSHA	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#RAI	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
AMCO	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#SHO	2	9	2	15	1	31	20	55	1	0	0	0	136	55	1	15.1	18.2	75.0	9.0
KILL	0	0	0	2	0	11	0	0	0	0	0	0	13	11	2	6.5	6.4	16.7	6.5
GRYE	2	2	2	1	0	0	0	0	0	0	0	0	7	2	1	1.8	0.5	33.3	2.0
BLTU	0	0	0	10	0	0	0	2	0	0	0	0	12	10	2	6.0	5.7	16.7	6.0
SAND	0	0	0	0	0	0	0	50	0	0	0	0	50	50	50	50.0	-	8.3	50.0
DOWI	0	0	0	0	1	0	0	3	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
LBDO	0	0	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
COSN	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
SHOR	0	7	0	0	0	20	20	0	0	0	0	0	47	20	7	15.7	7.5	25.0	20.0
#GUL	68	30	30	135	213	241	550	446	84	140	97	95	2129	550	30	177.4	164.3	100.0	116.0
GULL	65	8	0	0	0	0	0	0	0	0	0	0	73	65	8	36.5	40.3	16.7	36.5
BOGU	0	0	0	0	0	1	2	50	0	70	0	0	123	70	1	30.8	34.8	33.3	26.0
HMGU	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
MEGU	1	18	1	35	52	32	209	37	16	21	56	95	573	209	1	47.8	57.1	100.0	33.5
RBGU	0	0	6	39	6	0	0	1	2	7	6	0	67	39	1	9.6	13.2	58.3	6.0
CAGU	0	0	0	41	23	12	0	0	0	0	0	0	76	41	12	25.3	14.6	25.0	23.0
HEGU	0	0	0	0	0	0	0	0	0	14	0	0	14	14	14	14.0	-	8.3	14.0
THGU	0	0	0	0	82	3	0	5	0	0	0	0	90	82	3	30.0	45.0	25.0	5.0
GWGU	2	4	23	20	50	193	339	353	66	28	34	0	1112	353	2	101.1	132.0	91.7	34.0
BEKI	1	1	1	1	0	1	2	0	0	0	0	0	7	2	1	1.2	0.4	50.0	1.0

Bird use of North Intertidal Marsh Habitat for Autumn 90 (Cont'd)

#PAS	26	43	7	27	22	2	7	26	118	14	22	21	335	118	2	27.9	30.5	100.0	22.0
STJA	1	0	0	0	0	1	1	0	2	0	1	0	6	2	1	1.2	0.4	41.7	1.0
NOCR	25	20	0	16	0	0	4	25	10	7	9	21	137	25	4	15.2	8.0	75.0	16.0
CORA	0	0	7	0	1	0	0	0	0	0	0	0	8	7	1	4.0	4.2	16.7	4.0
RCKI	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
AMRO	0	3	0	0	0	0	0	0	0	0	0	0	3	3	3	3.0	-	8.3	3.0
CEWA	0	0	0	6	0	0	0	0	0	0	0	0	6	6	6	6.0	-	8.3	6.0
EUST	0	0	0	1	20	0	0	0	100	0	0	0	121	100	1	40.3	52.5	25.0	20.0
YRWA	0	0	0	3	0	0	0	0	0	0	0	0	3	3	3	3.0	-	8.3	3.0
SPAR	0	0	0	0	0	0	2	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
SOSP	0	0	0	0	0	1	0	1	0	0	1	0	3	1	1	1.0	-	25.0	1.0
DEJU	0	0	0	1	1	0	0	0	0	7	10	0	19	10	1	4.8	4.5	33.3	4.0
WEME	0	0	0	0	0	0	0	0	6	0	0	0	6	6	6	6.0	-	8.3	6.0
PASS	0	20	0	0	0	0	0	0	0	0	0	0	20	20	20	20.0	-	8.3	20.0
#TOT	137	165	82	281	258	474	799	829	582	395	367	264	4633	829	82	386.1	244.8	100.0	324.0

Bird use of North Intertidal Marsh Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	3	0	2	0	0	0	0	0	0	1	0	0	6	3	1	2.0	1.0	25.0	2.0
GBHE	3	0	2	0	0	0	0	0	0	1	0	0	6	3	1	2.0	1.0	25.0	2.0
#GEE	67	86	72	60	53	61	55	35	109	6	43	14	661	109	6	55.1	28.6	100.0	57.5
CAGO	67	86	72	60	53	61	55	35	109	6	43	14	661	109	6	55.1	28.6	100.0	57.5
#DAB	177	156	375	305	72	29	71	39	3	68	80	11	1386	375	3	115.5	117.9	100.0	71.5
DABL	0	0	100	0	0	0	0	0	0	0	0	0	100	100	100	100.0	-	8.3	100.0
GWTE	20	78	64	24	70	29	56	37	0	10	15	9	412	78	9	37.5	25.3	91.7	29.0
MALL	56	69	163	224	2	0	11	2	3	43	53	0	626	224	2	62.6	74.7	83.3	48.0
NOPI	1	9	23	12	0	0	2	0	0	6	10	2	65	23	1	8.1	7.3	66.7	7.5
NOSL	0	0	0	0	0	0	0	0	0	2	0	0	2	2	2	2.0	-	8.3	2.0
GADW	0	0	0	4	0	0	2	0	0	2	0	0	8	4	2	2.7	1.2	25.0	2.0
AMWI	100	0	25	41	0	0	0	0	0	5	2	0	173	100	2	34.6	39.8	41.7	25.0
#DIV	23	17	18	0	8	1	12	12	7	14	9	7	128	23	1	11.6	6.2	91.7	12.0
COGO	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	8.3	1.0
BUFF	8	6	16	0	6	0	6	3	0	11	7	6	69	16	3	7.7	3.8	75.0	6.0
HOME	3	5	2	0	2	1	4	8	6	0	1	0	32	8	1	3.6	2.4	75.0	3.0
COME	12	6	0	0	0	0	2	1	1	3	0	1	26	12	1	3.7	4.1	58.3	2.0
#RAP	3	2	2	0	4	0	1	2	2	4	2	0	22	4	1	2.4	1.0	75.0	2.0
HAWK	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BAEA	3	2	2	0	3	0	1	2	2	4	2	0	21	4	1	2.3	0.9	75.0	2.0
#RAI	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
AMCO	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#SHO	1	0	0	5	0	0	0	0	0	0	0	0	6	5	1	3.0	2.8	16.7	3.0
KILL	0	0	0	5	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
BLTU	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GUL	154	36	82	17	0	85	5	0	50	134	131	33	727	154	5	72.7	52.8	83.3	66.0
GULL	0	0	0	0	0	7	5	0	50	4	0	33	99	50	4	19.8	20.7	41.7	7.0
MEGU	85	36	0	8	0	0	0	0	0	34	91	0	254	91	8	50.8	35.8	41.7	36.0
RBGU	2	0	0	0	0	0	0	0	0	2	0	0	4	2	2	2.0	-	16.7	2.0
CAGU	0	0	32	0	0	0	0	0	0	0	0	0	32	32	32	32.0	-	8.3	32.0
HEGU	0	0	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	8.3	9.0
THGU	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
GWGU	67	0	50	0	0	78	0	0	0	93	40	0	328	93	40	65.6	21.2	41.7	67.0
BEKI	0	2	0	0	0	0	0	0	0	1	0	0	3	2	1	1.5	0.7	16.7	1.5
#PAS	21	14	14	22	2	3	18	3	23	66	39	74	299	74	2	24.9	23.5	100.0	19.5
STJA	0	4	1	0	2	1	4	2	0	1	0	0	15	4	1	2.1	1.3	58.3	2.0
NOCR	15	1	3	3	0	0	0	0	21	12	19	23	97	23	1	12.1	8.8	66.7	13.5
CORA	0	9	0	0	0	0	0	0	2	3	0	0	14	9	2	4.7	3.8	25.0	3.0
GCKI	0	0	1	0	0	1	4	1	0	0	0	1	8	4	1	1.6	1.3	41.7	1.0
VATH	0	0	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
EUST	0	0	0	15	0	0	10	0	0	30	20	50	125	50	10	25.0	15.8	41.7	20.0
DEJU	6	0	9	0	0	1	0	0	0	0	0	0	16	9	1	5.3	4.0	25.0	6.0
WEME	0	0	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
RECR	0	0	0	0	0	0	0	0	0	20	0	0	20	20	20	20.0	-	8.3	20.0
#TOT	449	314	565	409	139	179	162	91	194	294	304	139	3239	565	91	269.9	145.9	100.0	244.0

Bird use of North Intertidal Marsh Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#HER	2	1	0	0	0	0	0	2	2	5	12	5	1	2.4	1.5	50.0	2.0
GBHE	2	1	0	0	0	0	0	2	2	5	12	5	1	2.4	1.5	50.0	2.0
#GEE	48	32	12	18	38	35	36	33	19	67	338	67	12	33.8	15.9	100.0	34.0
CAGO	48	32	12	18	38	35	36	33	19	67	338	67	12	33.8	15.9	100.0	34.0
#DAB	124	63	60	109	94	108	17	6	4	6	591	124	4	59.1	48.0	100.0	61.5
GWTE	37	21	4	11	19	34	4	0	4	0	134	37	4	16.8	13.4	80.0	15.0
MALL	41	28	56	64	61	61	13	6	0	4	334	64	4	37.1	24.9	90.0	41.0
NOPI	12	12	0	19	14	8	0	0	0	0	65	19	8	13.0	4.0	50.0	12.0
GADW	7	0	0	6	0	5	0	0	0	0	18	7	5	6.0	1.0	30.0	6.0
AMWI	27	2	0	9	0	0	0	0	0	2	40	27	2	10.0	11.8	40.0	5.5
#DIV	16	3	0	10	15	44	10	5	15	11	129	44	3	14.3	12.0	90.0	11.0
GOLD	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
COGO	0	2	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
BUFF	8	1	0	10	12	35	0	0	0	0	66	35	1	13.2	12.9	50.0	10.0
HOME	5	0	0	0	1	1	2	0	0	0	9	5	1	2.3	1.9	40.0	1.5
COME	1	0	0	0	2	8	8	5	15	11	50	15	1	7.1	4.9	70.0	8.0
#RAP	0	4	0	8	1	0	2	1	2	0	18	8	1	3.0	2.7	60.0	2.0
BAEA	0	4	0	8	1	0	2	0	2	0	17	8	1	3.4	2.8	50.0	2.0
PEFA	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
#SHO	2	0	0	0	0	0	651	104	11	3	771	651	2	154.2	281.0	50.0	11.0
KILL	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
WESA	0	0	0	0	0	0	550	100	0	0	650	550	100	325.0	318.2	20.0	325.0
DUNL	0	0	0	0	0	0	60	4	0	0	64	60	4	32.0	39.6	20.0	32.0
DOWI	0	0	0	0	0	0	40	0	0	0	40	40	40	40.0	-	10.0	40.0
LBDO	0	0	0	0	0	0	0	0	5	3	8	5	3	4.0	1.4	20.0	4.0
SHOR	0	0	0	0	0	0	1	0	6	0	7	6	1	3.5	3.5	20.0	3.5
#GUL	143	95	0	32	1	25	13	2	3	0	314	143	1	39.3	52.1	80.0	19.0
GULL	1	0	0	20	0	2	0	0	0	0	23	20	1	7.7	10.7	30.0	2.0
MEGU	47	90	0	5	0	3	9	0	3	0	157	90	3	26.2	35.6	60.0	7.0
GWGU	95	5	0	7	1	20	4	2	0	0	134	95	1	19.1	34.0	70.0	5.0
CATE	0	0	0	0	0	0	1	0	3	0	4	3	1	2.0	1.4	20.0	2.0
RUHU	0	0	0	0	0	0	1	2	1	1	5	2	1	1.3	0.5	40.0	1.0
BEKI	2	0	0	0	0	0	0	0	0	1	3	2	1	1.5	0.7	20.0	1.5
#PAS	49	9	8	78	12	4	36	38	33	16	283	78	4	28.3	23.3	100.0	24.5
VGSW	0	0	0	0	0	0	0	0	1	1	2	1	1	1.0	-	20.0	1.0
BASW	0	0	0	0	0	0	0	0	2	2	4	2	2	2.0	-	20.0	2.0
STJA	0	0	0	1	0	0	1	1	3	1	7	3	1	1.4	0.9	50.0	1.0
NOCR	7	9	5	13	0	4	5	3	11	7	64	13	3	7.1	3.3	90.0	7.0
AMRO	1	0	3	14	8	0	3	0	4	4	37	14	1	5.3	4.4	70.0	4.0
WAPI	0	0	0	0	0	0	20	0	0	0	20	20	20	20.0	-	10.0	20.0
EUST	40	0	0	50	1	0	4	34	12	0	141	50	1	23.5	20.5	60.0	23.0
SAVS	0	0	0	0	0	0	3	0	0	1	4	3	1	2.0	1.4	20.0	2.0
DEJU	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
PUPI	0	0	0	0	3	0	0	0	0	0	3	3	3	3.0	-	10.0	3.0
#TOT	386	207	80	255	161	216	767	193	93	110	2468	767	80	246.8	203.6	100.0	200.0

Bird use of North Intertidal Marsh Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	6	3	3	1	0	0	0	0	2	1	16	6	1	2.7	1.9	60.0	2.5
GBHE	6	3	3	1	0	0	0	0	2	1	16	6	1	2.7	1.9	60.0	2.5
#GEE	15	30	13	0	0	23	40	102	52	1	276	102	1	34.5	31.6	80.0	26.5
CAGO	15	30	13	0	0	23	40	102	52	1	276	102	1	34.5	31.6	80.0	26.5
#DAB	5	0	0	1	0	0	0	0	0	0	6	5	1	3.0	2.8	20.0	3.0
GWTE	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
MALL	4	0	0	0	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
NOPI	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#DIV	10	0	8	0	0	0	0	1	0	0	19	10	1	6.3	4.7	30.0	8.0
HOME	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
COME	10	0	8	0	0	0	0	0	0	0	18	10	8	9.0	1.4	20.0	9.0
#RAP	3	0	3	2	0	0	0	3	0	1	12	3	1	2.4	0.9	50.0	3.0
BAEA	3	0	3	2	0	0	0	3	0	1	12	3	1	2.4	0.9	50.0	3.0
#SHO	26	0	5	34	0	41	494	0	0	6	606	494	5	101.0	193.1	60.0	30.0
BBPL	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
KILL	0	0	0	0	0	0	90	0	0	0	90	90	90	90.0	-	10.0	90.0
YELL	1	0	0	0	0	1	0	0	0	3	5	3	1	1.7	1.2	30.0	1.0
WHIM	23	0	5	4	0	0	2	0	0	0	34	23	2	8.5	9.7	40.0	4.5
MAGO	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	10.0	2.0
WESA	0	0	0	0	0	0	300	0	0	0	300	300	300	300.0	-	10.0	300.0
SHOR	0	0	0	30	0	40	100	0	0	3	173	100	3	43.3	40.9	40.0	35.0
#GUL	26	0	40	19	0	0	0	0	0	0	85	40	19	28.3	10.7	30.0	26.0
BOGU	2	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
MEGU	24	0	40	19	0	0	0	0	0	0	83	40	19	27.7	11.0	30.0	24.0
CATE	0	0	2	7	0	0	1	0	0	0	10	7	1	3.3	3.2	30.0	2.0
BSLW	0	0	0	0	0	0	0	0	0	10	10	10	10	10.0	-	10.0	10.0
VASW	0	0	0	0	0	0	0	0	0	32	32	32	32	32.0	-	10.0	32.0
RUHU	1	0	1	0	0	0	0	0	0	0	2	1	1	1.0	-	20.0	1.0
BEKI	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	10.0	1.0
#PAS	65	20	65	14	8	4	12	3	28	38	257	65	3	25.7	23.3	100.0	17.0
VGSW	8	0	2	0	0	0	10	0	0	0	20	10	2	6.7	4.2	30.0	8.0
BASW	15	13	4	3	3	1	2	3	0	0	44	15	1	5.5	5.3	80.0	3.0
STJA	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
NOCR	4	0	12	5	0	3	0	0	23	0	47	23	3	9.4	8.4	50.0	5.0
CBCH	0	0	0	1	0	0	0	0	0	3	4	3	1	2.0	1.4	20.0	2.0
HETH	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
AMRO	1	0	0	0	0	0	0	0	2	15	18	15	1	6.0	7.8	30.0	2.0
CEWA	0	0	0	2	0	0	0	0	3	0	5	3	2	2.5	0.7	20.0	2.5
EUST	6	6	45	0	5	0	0	0	0	20	82	45	5	16.4	17.2	50.0	6.0
WARB	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
OCWA	0	1	0	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
SOSP	0	0	1	2	0	0	0	0	0	0	3	2	1	1.5	0.7	20.0	1.5
PASS	30	0	0	0	0	0	0	0	0	0	30	30	30	30.0	-	10.0	30.0
#TOT	157	53	140	78	8	68	547	109	83	89	1332	547	8	133.2	151.4	100.0	86.0

Bird use of North Intertidal Marsh Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	3	2	3	8	3	2	2.7	0.6	75.0	3.0
GBHE	0	3	2	3	8	3	2	2.7	0.6	75.0	3.0
#GEE	5	28	17	51	101	51	5	25.3	19.6	100.0	22.5
CAGO	5	28	17	51	101	51	5	25.3	19.6	100.0	22.5
#DAB	0	11	0	281	292	281	11	146.0	190.9	50.0	146.0
GWTE	0	11	0	69	80	69	11	40.0	41.0	50.0	40.0
MALL	0	0	0	46	46	46	46	46.0	-	25.0	46.0
NOPI	0	0	0	2	2	2	2	2.0	-	25.0	2.0
AMWI	0	0	0	164	164	164	164	164.0	-	25.0	164.0
#DIV	0	0	1	1	2	1	1	1.0	-	50.0	1.0
HOME	0	0	1	0	1	1	1	1.0	-	25.0	1.0
COME	0	0	0	1	1	1	1	1.0	-	25.0	1.0
#RAP	1	1	2	7	11	7	1	2.8	2.9	100.0	1.5
BAEA	0	1	2	7	10	7	1	3.3	3.2	75.0	2.0
PEFA	1	0	0	0	1	1	1	1.0	-	25.0	1.0
#SHO	0	1	1	0	2	1	1	1.0	-	50.0	1.0
KILL	0	0	1	0	1	1	1	1.0	-	25.0	1.0
GRYE	0	1	0	0	1	1	1	1.0	-	25.0	1.0
#GUL	22	0	61	76	159	76	22	53.0	27.9	75.0	61.0
MEGU	22	0	56	67	145	67	22	48.3	23.5	75.0	56.0
RBCU	0	0	0	3	3	3	3	3.0	-	25.0	3.0
CAGU	0	0	2	0	2	2	2	2.0	-	25.0	2.0
GWGU	0	0	3	6	9	6	3	4.5	2.1	50.0	4.5
MODO	0	0	2	0	2	2	2	2.0	-	25.0	2.0
BEKI	0	1	0	0	1	1	1	1.0	-	25.0	1.0
#PAS	7	20	97	80	204	97	7	51.0	44.2	100.0	50.0
STJA	0	1	0	0	1	1	1	1.0	-	25.0	1.0
NOCR	0	8	25	20	53	25	8	17.7	8.7	75.0	20.0
GCKI	0	2	0	0	2	2	2	2.0	-	25.0	2.0
AMRO	0	0	40	0	40	40	40	40.0	-	25.0	40.0
CEWA	3	0	0	0	3	3	3	3.0	-	25.0	3.0
EUST	0	5	30	60	95	60	5	31.7	27.5	75.0	30.0
SOSP	0	3	2	0	5	3	2	2.5	0.7	50.0	2.5
PURI	0	1	0	0	1	1	1	1.0	-	25.0	1.0
PASS	4	0	0	0	4	4	4	4.0	-	25.0	4.0
#TOT	35	65	183	499	782	499	35	195.5	212.2	100.0	124.0

Bird use of Intertidal Flats Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#LOO	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
YBLO	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#HER	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#GEE	0	0	0	0	92	0	0	0	0	0	0	0	92	92	92	92.0	-	8.3	92.0
CAGO	0	0	0	0	92	0	0	0	0	0	0	0	92	92	92	92.0	-	8.3	92.0
#DAB	0	0	0	0	138	0	150	556	0	406	85	425	1760	556	85	293.3	193.4	50.0	278.0
GWTE	0	0	0	0	2	0	0	20	0	8	0	214	244	214	2	61.0	102.3	33.3	14.0
MALL	0	0	0	0	25	0	0	123	0	243	0	176	567	243	25	141.8	92.0	33.3	149.5
NOPI	0	0	0	0	6	0	0	13	0	9	3	0	31	13	3	7.8	4.3	33.3	7.5
GADW	0	0	0	0	0	0	0	0	0	0	7	0	7	7	7	7.0	-	8.3	7.0
EUWI	0	0	0	0	0	0	30	0	0	0	0	0	30	30	30	30.0	-	8.3	30.0
AMWI	0	0	0	0	105	0	120	400	0	146	75	35	881	400	35	146.8	129.8	50.0	112.5
#DIV	0	0	0	4	4	12	2	26	24	99	16	89	276	99	2	30.7	37.0	75.0	16.0
CANV	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
SCAU	0	0	0	0	0	0	0	0	0	4	0	20	24	20	4	12.0	11.3	16.7	12.0
COGO	0	0	0	0	0	0	0	0	2	21	10	32	65	32	2	16.3	13.1	33.3	15.5
BUFF	0	0	0	0	0	0	0	0	14	58	4	26	102	58	4	25.5	23.5	33.3	20.0
HOME	0	0	0	4	4	2	2	5	6	2	2	9	36	9	2	4.0	2.4	75.0	4.0
COME	0	0	0	0	0	10	0	21	2	14	0	1	48	21	1	9.6	8.4	41.7	10.0
#RAP	0	0	0	0	3	2	0	4	0	9	0	7	25	9	2	5.0	2.9	41.7	4.0
BAEA	0	0	0	0	3	2	0	4	0	9	0	7	25	9	2	5.0	2.9	41.7	4.0
#GUL	0	0	2	5	101	80	14	557	57	400	1	102	1319	557	1	131.9	190.5	83.3	68.5
GULL	0	0	0	4	0	0	0	500	50	0	0	0	554	500	4	184.7	274.1	25.0	50.0
BOGU	0	0	0	0	0	0	0	3	0	0	0	0	3	3	3	3.0	-	8.3	3.0
MEGU	0	0	0	0	45	0	0	2	1	120	0	20	188	120	1	37.6	49.4	41.7	20.0
RBGU	0	0	0	1	6	3	4	0	6	40	0	0	60	40	1	10.0	14.8	50.0	5.0
HEGU	0	0	0	0	0	0	0	0	0	80	0	0	80	80	80	80.0	-	8.3	80.0
THGU	0	0	0	0	20	6	0	1	0	0	0	0	27	20	1	9.0	9.8	25.0	6.0
GWGU	0	0	2	0	30	71	10	51	0	160	1	82	407	160	1	50.9	53.8	66.7	40.5
BEKI	0	0	0	0	0	0	0	1	1	0	2	0	4	2	1	1.3	0.6	25.0	1.0
#PAS	0	0	0	0	0	0	0	0	0	15	0	7	22	15	7	11.0	5.7	16.7	11.0
NOCR	0	0	0	0	0	0	0	0	0	15	0	7	22	15	7	11.0	5.7	16.7	11.0
#TOT	0	0	2	9	338	94	166	1144	84	929	104	630	3500	1144	2	350.0	409.9	83.3	135.0

Bird use of Intertidal Flats Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	1	0	0	1	1	0	0	0	1	4	1	1	1.0	-	33.3	1.0
GBHE	0	0	0	1	0	0	1	1	0	0	0	1	4	1	1	1.0	-	33.3	1.0
#GEE	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
CAGO	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
#DAB	3	68	110	0	26	58	40	17	39	9	2	21	393	110	2	35.7	32.7	91.7	26.0
DABL	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GWTE	3	34	33	0	0	16	0	6	3	5	0	0	100	34	3	14.3	13.9	58.3	6.0
MALL	0	13	59	0	24	35	40	11	36	4	2	18	242	59	2	24.2	18.1	83.3	21.0
NOPI	0	0	5	0	0	2	0	0	0	0	0	3	10	5	2	3.3	1.5	25.0	3.0
GADW	0	5	0	0	2	3	0	0	0	0	0	0	10	5	2	3.3	1.5	25.0	3.0
AMWI	0	16	13	0	0	1	0	0	0	0	0	0	30	16	1	10.0	7.9	25.0	13.0
#DIV	0	11	73	0	6	28	1	0	16	2	15	6	158	73	1	17.6	22.4	75.0	11.0
GOLD	0	0	5	0	0	0	0	0	0	0	0	0	5	5	5	5.0	-	8.3	5.0
COGO	0	3	0	0	6	2	0	0	0	2	8	0	21	8	2	4.2	2.7	41.7	3.0
BUFF	0	6	49	0	0	23	1	0	16	0	3	6	104	49	1	14.9	16.9	58.3	6.0
HOME	0	2	4	0	0	1	0	0	0	0	2	0	9	4	1	2.3	1.3	33.3	2.0
COME	0	0	15	0	0	2	0	0	0	0	2	0	19	15	2	6.3	7.5	25.0	2.0
#RAP	0	0	0	0	1	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
BAEA	0	0	0	0	1	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
#GUL	0	10	0	58	120	95	0	22	14	0	6	179	504	179	6	63.0	63.1	66.7	40.0
GULL	0	2	0	0	0	0	0	0	14	0	6	0	22	14	2	7.3	6.1	25.0	6.0
MEGU	0	4	0	0	50	95	0	5	0	0	0	141	295	141	4	59.0	59.2	41.7	50.0
RBGU	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
CAGU	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3.0	-	8.3	3.0
GWGU	0	3	0	58	70	0	0	17	0	0	0	35	183	70	3	36.6	27.8	41.7	35.0
BEKI	0	0	0	0	0	0	1	0	0	0	0	1	2	1	1	1.0	-	16.7	1.0
#PAS	2	3	2	0	7	31	45	50	37	0	0	2	179	50	2	19.9	20.5	75.0	7.0
STJA	0	1	0	0	1	0	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
NOCR	2	2	2	0	3	31	45	50	36	0	0	2	173	50	2	19.2	20.9	75.0	3.0
CORA	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
VATH	0	0	0	0	2	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
EUST	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#TOT	5	92	185	59	160	213	88	90	106	11	23	212	1244	213	5	103.7	74.4	100.0	91.0

Bird use of Intertidal Flats Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
GBHE	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
#GEE	0	2	5	2	2	0	2	0	0	0	13	5	2	2.6	1.3	50.0	2.0
CAGO	0	2	5	2	2	0	2	0	0	0	13	5	2	2.6	1.3	50.0	2.0
#DAB	0	31	58	13	25	0	0	19	0	0	146	58	13	29.2	17.4	50.0	25.0
DABL	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GWTE	0	0	9	13	0	0	0	2	0	0	24	13	2	8.0	5.6	30.0	9.0
MALL	0	31	28	0	24	0	0	17	0	0	100	31	17	25.0	6.1	40.0	26.0
GADW	0	0	8	0	0	0	0	0	0	0	8	8	8	8.0	-	10.0	8.0
AMWI	0	0	13	0	0	0	0	0	0	0	13	13	13	13.0	-	10.0	13.0
#DIV	7	6	16	11	23	3	19	2	0	0	87	23	2	10.9	7.7	80.0	9.0
COGO	0	0	0	4	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
BUFF	5	6	15	4	23	2	19	0	0	0	74	23	2	10.6	8.3	70.0	6.0
HOME	2	0	1	0	0	0	0	0	0	0	3	2	1	1.5	0.7	20.0	1.5
COME	0	0	0	2	0	0	0	2	0	0	4	2	2	2.0	-	20.0	2.0
RBME	0	0	0	0	0	1	0	0	0	0	1	1	1	1.0	-	10.0	1.0
DUCK	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#RAP	0	1	0	0	0	0	0	1	0	0	2	1	1	1.0	-	20.0	1.0
BAEA	0	1	0	0	0	0	0	1	0	0	2	1	1	1.0	-	20.0	1.0
#SHO	0	0	200	0	0	0	0	1495	0	0	1695	1495	200	847.5	915.7	20.0	847.5
BBPL	0	0	0	0	0	0	0	5	0	0	5	5	5	5.0	-	10.0	5.0
BLTU	0	0	75	0	0	0	0	0	0	0	75	75	75	75.0	-	10.0	75.0
WESA	0	0	0	0	0	0	0	217	0	0	217	217	217	217.0	-	10.0	217.0
DUNL	0	0	0	0	0	0	0	3	0	0	3	3	3	3.0	-	10.0	3.0
SHOR	0	0	125	0	0	0	0	1270	0	0	1395	1270	125	697.5	809.6	20.0	697.5
#GUL	0	7	36	0	1	0	1	12	3	0	60	36	1	10.0	13.4	60.0	5.0
GULL	0	0	5	0	0	0	0	0	0	0	5	5	5	5.0	-	10.0	5.0
MEGU	0	5	21	0	1	0	1	7	3	0	38	21	1	6.3	7.6	60.0	4.0
HEGU	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	10.0	1.0
GWGU	0	2	10	0	0	0	0	4	0	0	16	10	2	5.3	4.2	30.0	4.0
CATE	0	0	0	0	0	0	0	2	0	0	2	2	2	2.0	-	10.0	2.0
RUHU	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
BEKI	0	1	0	2	1	0	1	1	0	1	7	2	1	1.2	0.4	60.0	1.0
#PAS	0	5	0	3	10	2	0	2	0	10	32	10	2	5.3	3.8	60.0	4.0
NOCR	0	5	0	0	2	0	0	2	0	9	18	9	2	4.5	3.3	40.0	3.5
CORA	0	0	0	2	1	0	0	0	0	0	3	2	1	1.5	0.7	20.0	1.5
AMRO	0	0	0	0	7	0	0	0	0	0	7	7	7	7.0	-	10.0	7.0
WAPI	0	0	0	0	0	2	0	0	0	0	2	2	2	2.0	-	10.0	2.0
SAVS	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	10.0	1.0
SOSP	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	7	53	315	31	63	5	23	1535	3	11	2046	1535	3	204.6	476.7	100.0	27.0

Bird use of Intertidal Flats Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	0	1	0	11	0	0	1	0	13	11	1	4.3	5.8	30.0	1.0
GBHE	0	0	0	1	0	11	0	0	1	0	13	11	1	4.3	5.8	30.0	1.0
#GEE	0	0	10	0	0	0	0	0	12	0	22	12	10	11.0	1.4	20.0	11.0
BRAN	0	0	10	0	0	0	0	0	0	0	10	10	10	10.0	-	10.0	10.0
CAGO	0	0	0	0	0	0	0	0	12	0	12	12	12	12.0	-	10.0	12.0
#DAB	0	0	0	0	0	2	0	0	0	0	2	2	2	2.0	-	10.0	2.0
NOPI	0	0	0	0	0	2	0	0	0	0	2	2	2	2.0	-	10.0	2.0
#DIV	0	3	0	10	41	30	25	0	0	0	109	41	3	21.8	15.3	50.0	25.0
COME	0	3	0	10	0	30	25	0	0	0	68	30	3	17.0	12.6	40.0	17.5
RBME	0	0	0	0	41	0	0	0	0	0	41	41	41	41.0	-	10.0	41.0
#RAP	2	0	0	1	0	1	1	0	0	3	8	3	1	1.6	0.9	50.0	1.0
BAEA	2	0	0	1	0	1	1	0	0	3	8	3	1	1.6	0.9	50.0	1.0
#SHO	0	0	0	0	30	0	0	0	0	0	30	30	30	30.0	-	10.0	30.0
SHOR	0	0	0	0	30	0	0	0	0	0	30	30	30	30.0	-	10.0	30.0
#GUL	0	0	6	0	11	13	16	29	36	124	235	124	6	33.6	41.2	70.0	16.0
GULL	0	0	6	0	9	0	0	6	0	124	145	124	6	36.3	58.5	40.0	7.5
MEGU	0	0	0	0	0	13	12	16	32	0	73	32	12	18.3	9.3	40.0	14.5
RBGU	0	0	0	0	2	0	4	7	1	0	14	7	1	3.5	2.6	40.0	3.0
CAGU	0	0	0	0	0	0	0	0	3	0	3	3	3	3.0	-	10.0	3.0
CATE	0	0	0	0	11	0	0	0	0	0	11	11	11	11.0	-	10.0	11.0
BEKI	1	0	0	0	0	1	1	0	1	1	5	1	1	1.0	-	50.0	1.0
#PAS	0	5	0	1	2	0	1	0	10	30	49	30	1	8.2	11.2	60.0	3.5
NOCR	0	5	0	0	2	0	1	0	10	30	48	30	1	9.6	11.9	50.0	5.0
EUST	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	3	8	16	13	95	58	44	29	60	158	484	158	3	48.4	48.1	100.0	36.5

Bird use of Intertidal Flats Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	0	1	0	1	1	1	1.0	-	25.0	1.0
GBHE	0	0	1	0	1	1	1	1.0	-	25.0	1.0
#GEE	0	0	35	17	52	35	17	26.0	12.7	50.0	26.0
CAGO	0	0	35	17	52	35	17	26.0	12.7	50.0	26.0
#DAB	0	26	84	0	110	84	26	55.0	41.0	50.0	55.0
GWTE	0	0	6	0	6	6	6	6.0	-	25.0	6.0
MALL	0	12	4	0	16	12	4	8.0	5.7	50.0	8.0
NOPI	0	0	2	0	2	2	2	2.0	-	25.0	2.0
AMWI	0	14	72	0	86	72	14	43.0	41.0	50.0	43.0
#DIV	24	25	8	2	59	25	2	14.8	11.5	100.0	16.0
HOME	0	4	8	2	14	8	2	4.7	3.1	75.0	4.0
COME	24	21	0	0	45	24	21	22.5	2.1	50.0	22.5
#RAP	6	0	0	0	6	6	6	6.0	-	25.0	6.0
BAEA	6	0	0	0	6	6	6	6.0	-	25.0	6.0
#SHO	104	4	5	0	113	104	4	37.7	57.4	75.0	5.0
SEPL	5	0	0	0	5	5	5	5.0	-	25.0	5.0
BLTU	0	4	5	0	9	5	4	4.5	0.7	50.0	4.5
SESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
WESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
LESA	33	0	0	0	33	33	33	33.0	-	25.0	33.0
#GUL	57	42	19	0	118	57	19	39.3	19.1	75.0	42.0
GULL	50	0	10	0	60	50	10	30.0	28.3	50.0	30.0
MEGU	4	0	2	0	6	4	2	3.0	1.4	50.0	3.0
RBCU	1	39	7	0	47	39	1	15.7	20.4	75.0	7.0
CAGU	1	3	0	0	4	3	1	2.0	1.4	50.0	2.0
GWGU	1	0	0	0	1	1	1	1.0	-	25.0	1.0
BEKI	1	0	1	0	2	1	1	1.0	-	50.0	1.0
#PAS	8	0	25	0	33	25	8	16.5	12.0	50.0	16.5
NOCR	8	0	25	0	33	25	8	16.5	12.0	50.0	16.5
#TOT	200	97	178	19	494	200	19	123.5	82.6	100.0	137.5

Bird use of Subtidal Habitat for Autumn 90

Date	09Sep	16Sep	23Sep	30Sep	08Oct	15Oct	21Oct	28Oct	04Nov	12Nov	18Nov	25Nov	Total	Max	Min	Mean	SD	%Freq	Median
#LOO	0	0	0	0	0	0	0	0	0	3	0	3	6	3	3	3.0	-	16.7	3.0
COLO	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1.0	-	8.3	1.0
YBLO	0	0	0	0	0	0	0	0	0	2	0	3	5	3	2	2.5	0.7	16.7	2.5
#GRE	0	0	0	0	3	0	1	0	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
WEGR	0	0	0	0	3	0	1	0	0	0	0	0	4	3	1	2.0	1.4	16.7	2.0
#COR	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
CORM	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2.0	-	8.3	2.0
#HER	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
GBHE	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1.0	-	8.3	1.0
#DAB	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4.0	-	8.3	4.0
MALL	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4.0	-	8.3	4.0
#DIV	0	0	0	0	0	0	0	0	0	44	31	25	100	44	25	33.3	9.7	25.0	31.0
SCAU	0	0	0	0	0	0	0	0	0	37	0	1	38	37	1	19.0	25.5	16.7	19.0
COGO	0	0	0	0	0	0	0	0	0	0	0	10	10	10	10	10.0	-	8.3	10.0
BUFF	0	0	0	0	0	0	0	0	0	5	1	8	14	8	1	4.7	3.5	25.0	5.0
HOME	0	0	0	0	0	0	0	0	0	2	0	6	8	6	2	4.0	2.8	16.7	4.0
DUCK	0	0	0	0	0	0	0	0	0	0	30	0	30	30	30	30.0	-	8.3	30.0
#SHO	0	0	0	0	0	0	0	50	0	0	0	0	50	50	50	50.0	-	8.3	50.0
SHOR	0	0	0	0	0	0	0	50	0	0	0	0	50	50	50	50.0	-	8.3	50.0
#GUL	0	0	40	7	25	26	200	1	300	0	7	2	608	300	1	67.6	107.2	75.0	25.0
GULL	0	0	40	7	21	6	200	0	300	0	7	0	581	300	6	83.0	118.3	58.3	21.0
BOGU	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
MEGU	0	0	0	0	1	2	0	0	0	0	0	0	3	2	1	1.5	0.7	16.7	1.5
RBCU	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
CAGU	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GWGU	0	0	0	0	0	18	0	1	0	0	0	2	21	18	1	7.0	9.5	25.0	2.0
#TOT	0	0	40	7	28	26	201	51	301	47	38	36	775	301	7	77.5	95.2	83.3	39.0

Bird use of Subtidal Habitat for Winter 90

Date	02Dec	10Dec	17Dec	31Dec	06Jan	13Jan	21Jan	27Jan	03Feb	09Feb	17Feb	24Feb	Total	Max	Min	Mean	SD	%Freq	Median
#LOO	0	0	1	0	0	1	0	0	0	0	0	0	2	1	1	1.0	-	16.7	1.0
LOON	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
YBLO	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#GRE	0	0	0	0	0	2	0	0	0	0	0	1	3	2	1	1.5	0.7	16.7	1.5
GREB	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1.0	-	8.3	1.0
WEGR	0	0	0	0	0	2	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
#HER	0	0	0	0	0	0	1	2	0	0	0	0	3	2	1	1.5	0.7	16.7	1.5
GBHE	0	0	0	0	0	0	1	2	0	0	0	0	3	2	1	1.5	0.7	16.7	1.5
#DAB	0	4	0	0	0	10	10	43	0	0	0	1	68	43	1	13.6	16.9	41.7	10.0
MALL	0	4	0	0	0	10	10	43	0	0	0	1	68	43	1	13.6	16.9	41.7	10.0
#DIV	5	8	4	2	8	16	9	23	2	20	0	17	114	23	2	10.4	7.4	91.7	8.0
WWSO	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
GOLD	0	0	0	0	0	0	0	0	2	0	0	0	2	2	2	2.0	-	8.3	2.0
COGO	0	0	3	0	0	0	4	4	0	2	0	4	17	4	2	3.4	0.9	41.7	4.0
BUFF	5	4	0	1	4	6	5	14	0	11	0	12	62	14	1	6.9	4.4	75.0	5.0
HOME	0	1	1	1	4	10	0	5	0	7	0	1	30	10	1	3.8	3.4	66.7	2.5
COME	0	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2.0	-	8.3	2.0
#RAP	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
BAEA	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	8.3	1.0
#SHO	0	0	0	0	0	0	0	0	0	21	0	0	21	21	21	21.0	-	8.3	21.0
SHOR	0	0	0	0	0	0	0	0	0	21	0	0	21	21	21	21.0	-	8.3	21.0
#GUL	8	0	1	0	0	8	12	37	1	2	0	5	74	37	1	9.3	11.9	66.7	6.5
GULL	8	0	1	0	0	8	6	0	0	0	0	0	23	8	1	5.8	3.3	33.3	7.0
MEGU	0	0	0	0	0	0	5	29	1	1	0	2	38	29	1	7.6	12.1	41.7	2.0
GWGU	0	0	0	0	0	0	1	8	0	1	0	3	13	8	1	3.3	3.3	33.3	2.0
#PAS	1	0	30	1	0	0	0	0	0	0	0	0	32	30	1	10.7	16.7	25.0	1.0
NOCR	1	0	30	1	0	0	0	0	0	0	0	0	32	30	1	10.7	16.7	25.0	1.0
#TOT	14	12	36	3	8	38	32	105	3	43	0	24	318	105	3	28.9	29.1	91.7	24.0

Bird Use of Subtidal Habitat for Spring 91

Date	03Mar	16Mar	27Mar	01Apr	11Apr	17Apr	28Apr	08May	22May	30May	Total	Max	Min	Mean	SD	%Freq	Median
#GRE	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GREB	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#GEE	0	0	0	4	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
CAGO	0	0	0	4	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
#DAB	2	2	14	0	0	0	0	0	0	0	18	14	2	6.0	6.9	30.0	2.0
MALL	2	2	0	0	0	0	0	0	0	0	4	2	2	2.0	-	20.0	2.0
NOPI	0	0	14	0	0	0	0	0	0	0	14	14	14	14.0	-	10.0	14.0
#DIV	7	30	35	10	8	3	4	22	0	0	119	35	3	14.9	12.4	80.0	9.0
GOLD	1	0	0	0	0	0	0	5	0	0	6	5	1	3.0	2.8	20.0	3.0
COGO	0	9	7	0	1	1	0	0	0	0	18	9	1	4.5	4.1	40.0	4.0
BUFF	1	17	28	0	6	0	4	17	0	0	73	28	1	12.2	10.3	60.0	11.5
HOME	5	4	0	0	1	0	0	0	0	0	10	5	1	3.3	2.1	30.0	4.0
COME	0	0	0	0	0	2	0	0	0	0	2	2	2	2.0	-	10.0	2.0
DUCK	0	0	0	10	0	0	0	0	0	0	10	10	10	10.0	-	10.0	10.0
#RAP	1	0	1	1	0	1	0	0	0	1	5	1	1	1.0	-	50.0	1.0
BAEA	1	0	1	1	0	1	0	0	0	1	5	1	1	1.0	-	50.0	1.0
#SHO	110	0	35	0	0	0	0	0	0	0	145	110	35	72.5	53.0	20.0	72.5
BLTU	100	0	15	0	0	0	0	0	0	0	115	100	15	57.5	60.1	20.0	57.5
SHOR	10	0	20	0	0	0	0	0	0	0	30	20	10	15.0	7.1	20.0	15.0
#GUL	1	0	4	0	0	4	0	0	0	18	27	18	1	6.8	7.6	40.0	4.0
GULL	1	0	0	0	0	4	0	0	0	18	23	18	1	7.7	9.1	30.0	4.0
MEGU	0	0	2	0	0	0	0	0	0	0	2	2	2	2.0	-	10.0	2.0
HEGU	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
GWGU	0	0	1	0	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#PAS	0	0	0	1	2	2	0	0	0	2	7	2	1	1.8	0.5	40.0	2.0
NOCR	0	0	0	1	0	2	0	0	0	2	5	2	1	1.7	0.6	30.0	2.0
AMRO	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
SOSP	0	0	0	0	1	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#TOT	121	32	90	16	10	10	4	22	0	21	326	121	4	36.2	40.9	90.0	21.0

Bird use of Subtidal Habitat for Summer 91

Date	09Jun	17Jun	24Jun	30Jun	07Jul	27Jul	04Aug	12Aug	19Aug	25Aug	Total	Max	Min	Mean	SD	%Freq	Median
#HER	0	5	0	0	0	0	0	0	2	7	14	7	2	4.7	2.5	30.0	5.0
GBHE	0	5	0	0	0	0	0	0	2	7	14	7	2	4.7	2.5	30.0	5.0
#DAB	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	10.0	9.0
MALL	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	10.0	9.0
#DIV	34	17	6	0	0	0	0	0	0	43	100	43	6	25.0	16.6	40.0	25.5
SCAU	34	12	6	0	0	0	0	0	0	0	52	34	6	17.3	14.7	30.0	12.0
COME	0	5	0	0	0	0	0	0	0	43	48	43	5	24.0	26.9	20.0	24.0
#RAP	1	0	0	0	2	0	2	0	1	0	6	2	1	1.5	0.6	40.0	1.5
OSPR	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	-	10.0	1.0
BAEA	1	0	0	0	2	0	2	0	0	0	5	2	1	1.7	0.6	30.0	2.0
#GUL	0	18	0	25	30	200	290	59	200	44	866	290	18	108.3	105.3	80.0	51.5
GULL	0	14	0	25	30	200	290	59	200	29	847	290	14	105.9	107.2	80.0	44.5
BOGU	0	4	0	0	0	0	0	0	0	0	4	4	4	4.0	-	10.0	4.0
MEGU	0	0	0	0	0	0	0	0	0	15	15	15	15	15.0	-	10.0	15.0
CATE	0	0	0	1	0	0	0	0	0	0	1	1	1	1.0	-	10.0	1.0
#PAS	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	10.0	9.0
NOCR	0	9	0	0	0	0	0	0	0	0	9	9	9	9.0	-	10.0	9.0
#TOT	35	58	6	26	32	200	292	59	203	94	1005	292	6	100.5	96.7	100.0	58.5

Bird use of Subtidal Habitat for Autumn 91

Date	01Sep	15Sep	29Sep	20Oct	Total	Max	Min	Mean	SD	%Freq	Median
#GRE	0	0	0	11	11	11	11	11.0	-	25.0	11.0
RNGR	0	0	0	3	3	3	3	3.0	-	25.0	3.0
WEGR	0	0	0	8	8	8	8	8.0	-	25.0	8.0
#DIV	0	0	0	10	10	10	10	10.0	-	25.0	10.0
COME	0	0	0	10	10	10	10	10.0	-	25.0	10.0
#RAP	1	0	0	0	1	1	1	1.0	-	25.0	1.0
BAEA	1	0	0	0	1	1	1	1.0	-	25.0	1.0
#GUL	53	2	2	21	78	53	2	19.5	24.1	100.0	11.5
GULL	53	1	0	0	54	53	1	27.0	36.8	50.0	27.0
BOGU	0	0	0	6	6	6	6	6.0	-	25.0	6.0
MEGU	0	0	2	10	12	10	2	6.0	5.7	50.0	6.0
RBGU	0	1	0	0	1	1	1	1.0	-	25.0	1.0
HEGU	0	0	0	1	1	1	1	1.0	-	25.0	1.0
GWGU	0	0	0	4	4	4	4	4.0	-	25.0	4.0
#ALC	0	0	0	1	1	1	1	1.0	-	25.0	1.0
COMU	0	0	0	1	1	1	1	1.0	-	25.0	1.0
#PAS	0	2	0	0	2	2	2	2.0	-	25.0	2.0
NOCR	0	2	0	0	2	2	2	2.0	-	25.0	2.0
#TOT	54	4	2	43	103	54	2	25.8	26.7	100.0	23.5