WORKSHOP ON EIDER MANAGEMENT / ATELIER SUR LA GESTION DE L'EIDER

REPORT / RAPPORT

held in Québec City / tenu à Québec
January / Janvier 12-13, 1988

Compiled and edited by
Rédigé et revu par

C.-A. Drolet
Canadian Wildlife Service
Service canadien de la faune
Québec

March / Mars 1989

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REPORT ON THE WORKSHOP ON EIDER MANAGEMENT

INTRODUCTION

Following the publication in 1986 of the CWS Report Series "Eider Ducks in Canada" by A. Reed and contributors, the question of a coordinated action plan to meet the concerns identified in the report remained unaddressed.

Declining local populations, increased hunting effort and harvest, and a serious lack of information to allow understanding of the biological significance of these changes were of particular concern.

The distribution of the three sub-species of Somateria mollissima in eastern North America spans no fewer than nine distinct administrative entities - 3 states and 5 provinces and 1 territory - that Eiders utilize to satisfy their needs in different time of the year. Eiders are a favorite game species for many hunters of these coastal regions, from the Inuit hunter of Ungava Bay and Hudson Strait to the residents of Newfoundland and Labrador, and the sport hunters of Québec, Nova Scotia or the coasts of Maine and Massachussetts. The need for concerted effort on such a widespread species of considerable importance led to the setting up of this workshop. The objectives were to:

- Bring the participants up to date on some of the most recent developments in research and management.

- Define the status and trends of the various sub-populations of eiders, identify management problems, and determine actions to solve these problems.

- Arrive at a consensus on a list of actions to be undertaken, jointly or in a coordinated way by the various administrations involved, to address the management issues.

This report presents the results of the workshop. It deals first with the summary of the discussions and the recommendations, followed by the abstracts of the papers that were presented. Some papers had already been published in "Eider duck in Canada", and are so identified in this report.

WORKSHOP SUMMARY

The status of the sub-populations of eiders and a discussion of the most pressing problems and lack of knowledge were presented by various participants for each of the following regions: Arctic, Labrador and Newfoundland, gulf and estuary of the St. Lawrence, the Maritimes, and the north-eastern US coastal area.

In the Arctic, the lack of knowledge pertaining to all aspects of the biology of eiders were identified as concerns. Our inability to identify the moulting and wintering areas of known nesting populations was emphasized. The trends in colonies sizes, and the impact of the various forms of native exploitation of eider are not known.

Further south, the Labrador and Northern Newfoundland nesting population has been decreasing for a number of years. Enforcement has been lacking and some long established sanctuaries had to be cancelled for lack of role. Illegal spring shooting by local residents is wide-spread. Expansion of gull populations and predation are of concern. Reintroduction is considered along with the use of nesting boxes as management tools to help restore populations. Poor kill statistics may create a false sense of security: serious underestimations of the real kill level of northern populations could mask the excessive exploitation of some segments of population. Some loss of birds through accidental fishing net entanglement is known to occur. Increased contact with users and public involvement in conservation actions will be essential for correcting the situation.

The situation on the north shore of the gulf of St. Lawrence is very similar, except that a recent increase in enforcement efforts and in public awareness could soon start making a difference. Little is known about the migratory movements of these populations, but it appears that these birds are being increasingly harvested by U.S. sport hunters.

The eider situation in the St. Lawrence estuary presents a brighter perspective. The nesting population has been increasing steadily there even with occasional out-breaks of cholera. These birds seem to contribute substantially to hunting in Maine and Massachussetts.

The maritime situation is stable, but the recent expansion of the blue mussel fishing industry is starting to create conflicts and problems. Fishermen specialized in that form of aquaculture are increasingly considering eiders as pests. Conversely, the impact of this industry on the wintering eiders are of concern. Gull-eider interactions need to be evaluated and understood.

The eider nesting populations on the numerous islands of coastal Maine have been steadily increasing in the seventies and eighties. The kill by sport hunting has also increased substantially. Reduced bag limits on Black ducks have apparently has contributed to the eider's increased popularity with hunters. Fowl cholera is endemic on some nesting islands, expansion of mussel harvesting is creating conflicts, and impacts of gull predation need additional study.

RECOMMENDATIONS

The most urgent problems to be addressed jointly by the administrations involved are:

1 - Seasonal distribution, population delineation and sub-population definition. More needs to be known about the relative contributions of various breeding groups to the harvest in Atlantic Canada and Northern New England. We especially lack knowledge on the harvest

areas for the Lower North Shore and the Low Arctic breeding populations. In certain cases, one or two band returns constitute the basis of knowledge on movement patterns. The relationship of brood-rearing, moulting and wintering areas need to be established for most of the known nesting areas: the Lower North Shore, northern Newfoundland and Labrador, and Low Arctic eider situation is of particular concern.

A concerted summer banding program is to be planned. In addition to standard bands, visible markers and radio telemetry are being considered. Publicity and the use of local band return addresses are proposed to enhance reporting rates. Widespread aerial surveys to locate birds in wintering areas are to be conducted in winter.

2 - Surveys to establish status and trends of various nesting populations. Establish baseline nesting numbers (especially in the Arctic) and repeat surveys where this baseline data exists (e.g. Ungava bay).

3 - Enforcement action to protect against illegal spring harvest nesting of eggs and birds. Emphasis is required in Newfoundland, the Maritimes and the Lower North Shore.

4 - Improve understanding of the impact of harvesting on the regulation of eider numbers. Eiders are long-lived, have a low reproductive rate and have delayed sexual maturity, which makes them more sensitive to exploitation than other duck species. Substantial harvests (legal and illegal) of eiders and eggs occur in many areas. Further research is required to evaluate the impact of that harvesting.

5 - In Nova Scotia and Maine, better information is needed on eider-mussel relationships, including the effect of commercial harvest of mussels on eider populations and the effects of eiders on commercially raised mussels.

6 - Improve estimates of size and composition of harvest. Both US and Canadian harvest surveys are designed for common species. For various reasons, estimates of the kill of eiders are grossly underestimated. To improve estimates of sport harvest of eiders the national harvest survey will have to be adapted to accomodate the temporal (late seasons), spatial (specific coastal areas), and social (e.g. fishermen in isolated communities) characteristics of the harvest. Divide NHS into regional components, adapt the questionnaire to the regions, ensure closer involvement and communication with local hunters.

7 - Official Collaboration. A mechanism to ensure coordination and collaboration was suggested by the attendees. Create a working group on eiders to include representatives of industry, governments (US and Greenland), universities, NGO's, native groups, and propose a Joint Venture under the North American Waterfowl Plan. Work in close collaboration with the Atlantic Flyway Council diving duck committee. Actions will be taken to implement this suggestion with the Eastern Wildlife Advisory Committee and the Atlantic Flyway Council.

8 - Encourage local management initiatives. The development of local conservation measures - re-introduction of eiders, nest boxes - is a powerful means of obtaining public's interest and support.

9 - Better information on predator/prey relationship - mainly gull throughout the eiders range but especially in the Maritimes and Maine.

10 - At local scale, studies on habitat use, brood survival, brood ecology, impact of disturbance on nesting colonies, moulting habitat.

ATELIER SUR LA GESTION DE L'EIDER

INTRODUCTION

Après la publication, en 1986, de la Série de rapports n° 47 du SCF "Les eiders au Canada" par A. Reed et collaborateurs, la question d'un plan d'action coordonné pour régler les problèmes relevés dans le rapport n'a toujours pas été abordée.

La diminution des populations locales, l'augmentation de la chasse et des prises et un manque connsidérable de données qui permettraient de comprendre l'importance biologique de ces changements ont particulièrement retenu l'attention.

La distribution des trois sous-espèces de Somateria mollissima dans l'est de l'Amérique du Nord ne comprend pas moins de neuf entités administratives - trois États, cinq provinces et un territoire - que les eiders utilisent pour répondre à leurs besoins à différents moments de l'année. Les eiders sont une espèce de gibier recherchée par de nombreux chasseurs de ces régions côtières, depuis le chasseur inuit de la baie d'Ungava et du détroit d'Hudson jusqu'aux habitants de Terre-Neuve et du Labrador, en passant par les chasseurs sportifs du Québec, de la Nouvelle-Écosse ou des côtes du Maine et du Massachussetts. La nécessité d'un plan concerté pour une espèce aussi répandue, d'une importance considérable, a donné lieu à la tenue de cet atelier. Les objectifs étaient les suivants:

- Informer les participants au sujet des plus récents développements dans les domaines de la recherche et de la gestion.

- Décrire la situation et les tendances des diverses sous-populations d'eiders; définir les problèmes de gestion et déterminer les mesures à prendre pour résoudre ces problèmes.

- Faire l'unanimité sur une série de mesures que devront prendre, conjointement ou de façon coordonnée, les diverses administrations en cause, pour faire face à ces problèmes de gestion.

Le présent rapport contient les résultats de l'atelier. Vous y trouverez le sommaire des discussions et les recommandations, puis, le résumé des documents qui ont été présentés. Dans le cas de certains documents qui avaient déjà été publiés dans la Série de rapports n° 47 "Les eiders au Canada", le résumé utilisé se fonde sur celui de la publication.

SOMMAIRE DES DISCUSSIONS

Divers participants ont traité de la situation des sous-populations d'eiders, des problèmes les plus urgents et du manque de données en ce qui a trait à chacune des régions suivantes: l'Arctique, le Labrador et Terre-Neuve, le golfe et l'estuaire du Saint-Laurent, les Maritimes et la côte nord-est des États-Unis.

Dans l'Arctique, le manque de connaissances relatives à tous les aspects de la biologie des eiders a été relevé comme étant un problème. Notre incapacité à déterminer les aires de mue et d'hivernage quant à la taille des colonies et les répercussions des diverses formes d'exploitation par les autochtones ne sont pas connues.

Un peu plus au sud, la population nicheuse du Labrador et du nord de Terre-Neuve diminue depuis un certain nombre d'années. L'application de la loi fait défaut et certains refuges de longue date ont dû être abandonnés parce qu'ils n'avaient plus de vocation.

Le braconnage printanier par les résidents locaux est répandu. L'accroissement des populations de goélands et la prédation sont une préoccupation. La réintroduction et, parallèlement, l'utilisation de nichoirs, sont envisagées comme outils de gestion pour favoriser le rétablissement des populations. Les statistiques peu élevées sur les oiseaux abattus peuvent, à tort, nous rassurer: l'importante sous-estimation du taux véritable de prises chez les populations nordiques pourrait voiler l'exploitation excessive dont sont victimes certains segments de la population. On sait que des oiseaux meurent emprisonnés accidentellement dans les filets des pêcheurs. Pour rectifier la situation, il faudra multiplier les contacts avec les utilisateurs et faire participer le public aux mesures de conservation.

La situation sur la côte nord du golfe du Saint-Laurent est fort semblable si ce n'est que la multiplication des efforts en matière d'application de la loi et de sensibilisation du public pourrait sous peu faire une différence. On sait peu de choses sur les mouvements migratoires de ces populations dont on craint qu'elles ne soient de plus en plus la cible des chasseurs sportifs de la côte américaine.

La situation de l'Eider dans l'estuaire du Saint-Laurent offre une meilleure perspective. La population de nicheurs a constamment augmenté à cet endroit en dépit des vagues de choléra occasionnelles. Ces oiseaux semblent contribuer fortement au succès de la chasse dans le Maine et au Massachussetts.

Dans les Maritimes, la situation est stable mais l'essor récent de l'industrie de la pêche aux moules commence à poser des problèmes. Les pêcheurs qui se spécialisent dans ce type d'aquaculture considèrent de plus en plus les eiders comme des animaux nuisibles. En contrepartie, l'impact de cette industrie sur les eiders hivernants est inquiétante. Les interactions goélands-eiders doivent être évaluées et comprises.

Les populations nicheuses d'eiders sur les nombreuses îles de la côte du Maine ont constamment augmenté dans les années soixante-dix et quatre-vingts. Les prises attribuables à la chasse sportive se sont aussi accrues considérablement. La réduction de la limite de prises de canards noirs a accru la popularité des eiders auprès des chasseurs. Le choléra est une maladie endémique sur certaines îles où nichent ces oiseaux.

RECOMMANDATIONS

Voici une liste des problèmes les plus urgents auxquels doivent conjointement s'attaquer les administrateurs en cause:

1 - Accroître les connaissances sur la distribution saisonnière, la description des populations et la définition des sous-populations. Il faudrait en savoir davantage sur les contributions relatives des diverses populations reproductrices aux prises dans l'Atlantique et

en Nouvelle-Angleterre. Le manque de données se fait particulièrement sentir dans le cas des secteurs de prises d'oiseaux nicheurs de la basse Côte-Nord et du Bas-Arctique. Dans certains cas, nos connaissances sur les modèles de déplacements se fondent sur une ou deux recaptures d'oiseaux bagués. Il importe d'établir le rapport entre les aires d'élevage, de mue et d'hivernage de la plupart des zones de nidification connues: la situation de l'Eider sur la basse Côte-Nord, au nord de Terre-Neuve et au Labrador et dans le Bas-Arctique est particulièrement inquiétante.

Un programme concerté de baguage estival doit être planifié en 1988, mis en oeuvre en 1989 et se poursuivre jusqu'en 1991. Outre le baguage courant, on songe à recourir à des marques visibles et à la radiotélémétrie. Il est proposé de faire de la publicité et d'utiliser des adresses locales pour le retour des bagues, afin d'améliorer les taux de retour. D'importants survols aériens pour situer les oiseaux dans les aires d'hivernage doivent être faits à l'hiver 1989-1990.

2 - Faire des inventaires pour établir la situation et les tendances des diverses populations nicheuses. Établir des données de base sur les populations (particulièrement dans l'Arctique) et répéter les inventaires lorsque ces données existent déjà (par ex. baie d'Ungava).

3 - Prévoir des mesures d'application de la loi pour protéger les eiders contre la récolte printanière illégale des oeufs et des oiseaux. Il faut mettre l'accent sur Terre-Neuve, les Maritimes et la basse Côte-Nord.

4 - Accroître la compréhension des conséquences des prises sur la régulation du nombre d'eiders. Les eiders vivent longtemps; leur taux de reproduction est faible et leur maturité sexuelle est tardive, ce qui les rend plus vulnérables à l'exploitation que les autres espèces de canards. À de nombreux endroits, les prises d'eiders et d'oeufs (légales ou illégales) sont considérables. Des recherches supplémentaires s'imposent pour évaluer l'impact de ces prises.

5 - En Nouvelle-Écosse et dans le Maine, il faut améliorer les données concernant les rapports eiders-moules, y compris les conséquences des prises commerciales de moules sur les populations d'eiders.

6 - Améliorer les évaluations de la taille et de la composition des prises. Les inventaires de prises faits par les États-Unis et le Canada visent les espèces communes. Pour diverses raisons, les évaluations d'eiders abattus sont généralement sous-estimées. Pour mieux évaluer le nombre d'eiders abattus par des chasseurs, l'Inventaire national des prises devra être adapté de manière à tenir compte des caractéristiques temporelles (saisons tardives), spatiales (régions côtières particulières) et sociales (par ex. pêcheurs des collectivités isolées) des prises. Diviser l'Inventaire national en composantes régionales, adapter le questionnaire aux régions, assurer une participation plus forte et une communication plus grande avec les chasseurs locaux.

7 - Rendre la collaboration officielle. Les participants ont proposé un mécanisme destiné à assurer la coordination et la collaboration. Il s'agirait de former un groupe de travail sur les eiders composé de représentants de l'industrie, des gouvernements (États-Unis et Groenland), d'universités, d'organismes non gouvernementaux et de groupements autochtones et de proposer une opération en participation en vertu du Plan nord-américain de gestion de la sauvagine. Le travail se ferait en étroite collaboration avec le comité sur les canards plongeurs de l'Atlantic Flyway Council. Des mesures seront prises pour mettre en oeuvre cette suggestion avec le Comité consultatif pour la faune de l'est canadien et l'Atlantic Flyway Council.

8 - Encourager les initiatives de gestion locales. L'établissement de mesures de conservation locales - réintroduction des eiders, nichoirs - est un excellent moyen de susciter l'intérêt et l'appui du public.

9 - Rassembler davantage d'information sur les rapports prédateur-proie, principalement le goéland.

10 - À l'échelle locale, mener des études sur l'utilisation des habitats, la survie des couvées, l'écologie des couvées, l'incidence des perturbations sur les colonies nicheuses et les lieux de mue.

LIST OF PARTICIPANTS / LISTE DES PARTICIPANTS

Workshop on Eider Mamagement /

Atelier sur la gestion de l'Eider

Bédard, Jean) Guillemette, Magella) Rochette, Gaétan)	Département de Biologie Faculté des Sciences Université Laval Cité Universitaire Sainte-Foy, Qc G1K 7P4
Fiset, Denis) Lebel, Jean-Pierre - Rimouski) Lepage, Michel) Moore, Alain)	Ministère du Loisir, de la Chasse et de la Pêche Service faune terrestre 150, St-Cyrille est, 5e étage Québec, Qc G1R 4Y1
Harvey, Bruno-Pierre	Conseil Attikamek-Montagnais 360, boul. Charest est Québec, Qc G1K 3H4
Filion, Bernard	Canards Illimités 710, rue Bouvier - Suite 260 Québec, Qc G2J 1A7
Vandal, Denis	9530, rue de la Faune Charlesbourg, Qc G1G 5H9
Nadon, Roch	5662, avenue Royale Boischatel, Qc G0A 1H0
Bourget, André) Brousseau, Pierre) Chapdelaine, Gilles) Cinq-Mars, Jean) Drolet, Charles A.) Dupuis, Pierre) Lehoux, Denis) Reed, Austin)	CWS - Québec Region 1141, route de l'Église P.O. Box 10100, 9th floor Sainte-Foy (Qc) G1V 4H5
Dzubin, Alex	Research Scientist CWS - Western & Northern Region Environment Canada 115, Perimeter Road Saskatoon, Sask. X1A 2N5
Hicklin, Peter W.	Wildlife Biologist CWS - Atlantic Region Environment Canada P.O. Box 1590 Sackville, NB E0A 3C0

LIST OF PARTICIPANTS / LISTE DES PARTICIPANTS
(followed) / (suite)

Workshop on Eider Mamagement

Atelier sur la gestion de l'Eider

Nakashima, Douglas	Makivik Corporation 4898, de Maisonneuve ouest Montréal, Qc H3Z 1M8
Savard, Jean-Pierre	CWS - Pacific & Yukon Region Environment Canada P.O. Box 340 Delta, B.C. V4K 3Y3
Blanchard, Kathleen	Quebec Labrador Foundation 39 South Main Street Ipswich, Mas. 01938-2321
Corr, Patrick O.	Department of Inland Fisheries and Wildlife P.O. Box 1298 Bangor, ME 04401-1298
Palmer, Ralph S.	Box 74 - Tenants, Maine 04860
Krohn, William B.	U.S. Fish and Wildlife Service Maine Coop. Fish and Wildlife Research Unit 240 Nutting Hall University of Maine Orono, ME 04469
Wendt, J. Steve	Chief, Populations and Surveys Division Migratory Bird Branch Canadian Wildlife Service Ottawa, Ont. K1A 0H3
Goudie, Ian R.	Wildlife Biologist CWS - Atlantic Region Environment Canada P.O. Box 9158, Pleasantville St. John's, NFLD A1A 2X9
Haas, George	Regional Migratory Bird Coordinator U.S. Fish & Wildlife Service One Gateway Center, Suite 700 Newton Corner, MA 02158
Van Dijk, Bert	Biologiste - auditeur libre

WORKSHOP ON EIDER MANAGEMENT

Wandlyn Inns
2955, blvd Laurier, Sainte-Foy, Qc

January 12 and 13, 1988

AGENDA

Tuesday, January 12

09:00 a.m.

Opening remarks	J. Cinq-Mars, CWS-Québec
Workshop objectives and organization	C.A. Drolet, CWS-Québec

09:20 a.m.

Recent advances in Research and management:

- Winter ecology of Eider on the Québec Lower North Shore	M. Guillemette, Laval Univ.
- Eider and Gull predation in New Brunswick: a question of demography	P. Hicklin, CWS-Atlantic
- Habitat management at Ile Blanche following an outbreak of avian cholera	J. Bédard, Laval Univ. & B. Filion, Ducks Unlimited
- Eider capture and marking techniques	I. Goudie, CWS-Atlantic & D. Nakashima, Makivik Corp.

01:30 p.m.

Eider populations status and trends:

- Eastern Arctic	A. Reed, CWS-Québec and A. Dzubin, CWS-Western & Northern
- Southern Québec	A. Bourget, CWS-Québec
- Newfoundland and Labrador	I. Goudie, CWS-Atlantique
- Maritime situation	P. Hicklin, SCF-Atlantique
- U.S. Eastern Coastal area with special reference to Coastal Maine	P.O. Corr & W. Krohn, Maine Dept. of Inl. Fish & Wildl. and U.S. Fish & Wildl. Serv. - Bangor
- Migration pattern	A. Reed, CWS-Québec
- The National Harvest Survey and Eiders	S. Wendt, SCF-Ottawa

Wednesday, January 13

09:00 a.m.

Identification and priorisation of areas of concern: where and on which sub-populations should our action focus?

- Status of breeding stocks
- Status of wintering populations
- Migration patterns
- Harvest data and kill statistics
- Other research

01:30 p.m.

Action plan:

- Research, monitoring and marking
- Managing the kill (seasons, bag limits, harvest surveys)
- Public support: how to build public involvement — K. Blanchard, Québec-Labrador Foundation
- Enforcement actions
- Rehabilitation programs

04:00 p.m.

Scheduled end of workshop.

ATELIER SUR LA GESTION DE L'EIDER

Hotel/Motel Wandlyn
2955, boul. Laurier, Sainte-Foy, Qc

les 12 et 13 janvier 1988

PROGRAMME

Mardi, le 12 janvier

09:00 -

Note d'ouverture	J. Cinq-Mars, SCF-Québec
Objectifs et organisation de l'atelier	C.A. Drolet, SCF-Québec

09:20 -

Projets récents dans les domaines de la recherche et de l'aménagement:

- Écologie de l'Eider en hiver sur la Basse-Côte-Nord	M. Guillemette, Univ. Laval
- Eider et prédation par le Goéland au Nouveau-Brunswick: une question de démographie	P. Hicklin, SCF-Atlantique
- Aménagement de l'habitat à l'île Blanche suite à une épidémie de choléra avien	J. Bédard, Univ. Laval B. Filion, Canards Illimités
- Techniques de capture et de marquage de l'Eider	I. Goudie, SCF - Atlantique D. Nakashima, Corp. Makivik

13:30 -

Statut et tendance des populations d'Eider:

- Arctique de l'Est	A. Reed, SCF-Québec A. Dzubin, SCF-Ouest et Nord
- Situation au sud du Québec	A. Bourget, SCF-Québec
- Situation à Terre-Neuve et au Labrador	I. Goudie, SCF-Atlantique
- Situation dans les Maritimes	P. Hicklin, SCF-Atlantique
- Côte est des É.U. et particulièrement côte du Maine	P.O. Corr & W. Krohn, Maine Coop. Fish & Wildl. Res. Unit. - Bangor
- Patrons migratoires	A. Reed, SCF-Québec
- Les enquêtes nationale et l'Eider: statistiques de récolte	S. Wendt, SCF-Ottawa

Mercredi, le 13 janvier

09:00 -
Discussion

Identification des besoins de connaissance et priorisation: où et sur quelle sous-population devons-nous faire porter notre action?

- statut des populations nicheuses

- statut des populations hivernantes

- mouvements migratoires

- données de récolte

- autres recherches

01:30 -
Plan d'action:

- Recherche, inventaire et marquage

- Gestion de la récolte (saison, limites de prises, enquêtes)

- Soutien du public: comment développer l'implication de la population — K. Blanchard, Fondation Québec-Labrador

- Mise en force de la loi

- Programmes de réhabilitation

16:00 -
Fin de l'Atelier.

HABITAT SELECTION AND FOOD CHOICE OF EIDER DUCKS WINTERING IN THE GULF OF ST. LAWRENCE

Magella Guillemette
Université Laval

The Common Eider (Somateria mollissima) is circumpolar in its distribution and can be found almost everywhere in the marine habitats of the Northern hemisphere. It is the largest duck of this part of the world and is the most marine in its habits, coming ashore for reproduction.

The Common Eider is a benthic predator. It can dive easily to reach water depth of thirty meters or dabble in water a few cm deep. Eiders are mussel specialists. Reports of wintering eiders eating blue mussels date from the XIX^{e} century. This is probably the most important predator, on an individual basis, in the littoral zone. Theoritical estimations indicate that an eider can eat approximately 2 kg of blue mussels a days (fresh weight). Eiders are also opportunistic, eating every kind of prey smaller than ten centimeters in size such as seastars, urchins, crabs, gastropods, clams, and scallops. Eiders are therefore non-obligatory specialists of mussels and could probably face shortages of that prey.

Common Eiders wintering in the northern part of their range live in a rigorous and harsh climate. This study was designed to determine whether ice formation affect mussel availability for eiders in winter. The study area was located on the Mingan Islands on the north shore of the Gulf of St. Lawrence. The distribution and density of prey was determined using equidistant transects perpendicular to the coast reaching a depth of $\leq$ 20m. On each transect we recorded, at intervals of 20m, the depth, nature of the substrate and type of benthic community. Twelve km of transects and 600 stations were recovered by SCUBA diving. From the surveys we derived the distribution of the different communities and the frequency of occurrence for each type. Abundance and frequency of prey species in each type of community was measured in randomly distributed 0.25 m^2 quadrats in each type of community.

Results indicate a low proportion of kelp zone colonised by brown algae Laminaria digitata and Alaria esculenta. Kelp zones are localized on reefs where current and water turbulence is high, keeping brown algae in retreat in shallow water, and away from grazing pressure of green sea urchins. Mussels form dense beds in the kelp zone and are not found outside. The most important community is the urchin barrens which covers almost 40% of the habitat. This community results from intensive grazing by green sea-urchins, the key species of this ecosystem. The next zone in importance is the Agarum zone dominated by the brown algae Agarum cribrosum which is resistant to grazing. This community is followed by the Ptilota zone covering almost 20% of the habitat.

The urchin barrens were distributed throughout the study area. The Agarum zone is distributed mostly from depth of 3-12m, followed by a deeper loca- lized community dominated by the algae Ptilota serrata which is resistant to grazing. Kelp zone is found only in shallow waters.

Mussels were observed at greater density than any other prey. Urchins were abundant and widespread in the habitat. Crabs were found only in the Agarum zone while the gastropod Buccinum was found in greater density in Ptilota and Agarum zones.

From our data on frequency of occurrence of different species in a community and the frequency of occurrence of each type of community, I calculated the availability of a potential prey in the habitat. I compared this result with the frequency at which we found a prey in the stomachs of eiders shot on the study site. The results show that the selection on mussels is high. We note also that the selection for urchins is low even if the frequency in the diet is somewhat lower than for mussels. Crabs are highly selected, their abundance being low in the habitat.

The relative importance of each prey in the stomachs of eiders indicate that the mussels, urchins and crabs form the bulk of their diet in winter. Based on the information on prey distribution and stomach analyses, we could make some inference about habitat utilization. An important shift

in mussel abundance in the diet suggests strongly that eiders where feeding in deeper waters in March than in January and February. An accompanying increase in the abundance of welks in the diet supports this idea.

It would be interesting, at this point, to evaluate the influence of ice cover on habitat selection. We found a positive correlation between ice cover and the number of eiders on the study site ($r_s = 0.42$, $p < 0.001$), suggesting that the study site was used principally when the conditions were most severe. This can be explained by the fact that current velocity and turbulence ensures ice-free water around one of the many reefs present on the study site even in the worst conditions, because it also means that the available ice-free water around those reefs corresponds to the favorite feeding habitat, the kelp zone.

We measured the reef zone habitat utilization in the course of winter. The reef zone corresponds here to the kelp zones and adjacent urchin barrens. We mapped reef zones from black and white photographs and radial transects by SCUBA diving. We localized every feeding and non-feeding raft of eiders regularly on the study site by triangulation with theodoliths. The results indicate a decreasing utilization of the reef zone over the course of the winter. Eiders used reef zones 86% of the time from mid-December to mid-February. It is also interesting to note that the diminution of reef zone utilization ($p < 0.001$) and hence, the kelp and mussel zone, corresponds to the decrease of mussels in the diet. Eiders used the 12 reef differentially. The frequency of ice-free water at each site and the intensity of utilization by eiders was significantly correlated, suggesting that, inside the reef zone, eiders select sites where ice-free water is more frequent. This selection could have important consequences on the energy budget of this bird, because flight is a high cost activity.

EIDERS AND GULL PREDATION IN NEW BRUNSWICK

Peter W. Hicklin
Canadian Wildlife Service
Sackville, N.B.

Abstract

Black-backed Gull populations in the Maritimes have been increasing at the rate of about 6% per year over the last two decades. This species is the main predator of eider ducklings in southwestern N.B. From a total breeding population of approximately 7,500 pairs, 1,250 eider ducklings fledged in 1987. With hatching success at 80% to 90%, this represents 4.4 to 4.9% survivorship to fledging. The high mortality of ducklings is due primarily to predation by Black-backed Gulls which feed ducklings to their young in the absence of other prey until the return of herring and the sardine fishery some 4 to 6 weeks later. In order to measure the impact of gull predation on the eider population, I calculated the survivorship of the 1987 fledged and adult cohorts through three hunting seasons (the major source of mortality after fledging) to see if sufficient numbers of the fledged young survived to their first breeding season in 1990 to replace the estimated numbers of adults lost. This simple and Outrageously Speculative Model (OSM) does not pretend to provide anything but a "ballpark" estimation of what effect gull predation may play on the recruitment potential of the population. Over the three-year period, I calculated a total reduction from hunting of 1,240 adults which would in turn be replaced by 653 young birds originally hatched in 1987. I had expected a considerably larger difference. Assuming that fledging success in the Quoddy region and Grand Manan archipelago varies between years as that shown in Mendenhall and Milne (1985; 0.5 to 55.1% for an annual average of 10.4%), the population is most likely stable or growing.

If Black-backed Gulls continue to expand in numbers and extent in the Maritimes as they have over the last 15-20 years, gull controls at some of the larger colonies may be necessary to help boost the numbers of eider fledglings. However, prior to such actions, better and more

reliable data on the dynamics of eider populations must be obtained. Monitoring the numbers of fledged young and a clearer understanding of the harvest is essential. Furthermore, experimental gull control may be warranted to find out if these actions indeed provide the expected results (i.e. more eider ducklings fledged).

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EPIDEMICS INVOLVING THE COMMON EIDER (*Somateria mollissima*) AT ÎLE BLANCHE, QUÉBEC

Bernard Filion, Canards Illimités Canada
Jean Bédard, Société Duvetnor

Abstract

Île Blanche, a 4.5 ha island in the St. Lawrence estuary, harboured until 1984 the second largest Eider duck colony in the region with 4,800 nests. Heavy mortality due to fowl cholera in that year and in the following one brought the population down to about 2,100 nests. As this island had been known for recurring outbreaks over the previous decades, it was decided to remedy the situation permanently by:

- removing (logging and burning) the degraded forest cover and especially the thick underbrush of red-berried elder;

- draining the numerous, shallow water pools presumed to have a role in the spread of the disease;

- scarifying the surface and seeding a mixture of brome-grass and reed-grass to outcompete the red-berried elder;

- installing 450 artificial nest shelders to protect the nesting eiders until the plant cover returned.

No sign of disease were noted in 1986 and 1987, and the colony is expected to grow back to previous levels over the next few years. The following agencies took an active part in this project: The Canadian Wildlife Service (owner), Ducks Unlimited (who support the entire cost of the project) and Société Duvetnor Ltée (in charge of censuses and follow-up studies). Dr. G. Wobeser acted as a consultant and diagnosed the disease.

AMÉNAGEMENT DE L'HABITAT DE L'ÎLE BLANCHE POUR CONTRER L'ACTION SPORADIQUE D'ÉPIDÉMIE DE CHOLÉRA AVIEN

Bernard Filion, Canards Illimités Canada
Jean Bédard, Société Duvetnor

L'île Blanche se trouve dans le prolongement est de l'arête schisteuse de l'île aux Lièvres. Cette petite île de 4,5 hectares, située en face de Rivière-du-Loup, est à peine visible de la côte.

Les résultats d'inventaires, effectués durant les trente dernières années, indiquent que l'île Blanche regroupe la seconde colonie en importance de l'Eider à duvet dans l'estuaire du Saint-Laurent. En 1984, on y dénombrait près de vingt-cinq (25) pourcent (> 4 800 nids) de la population nicheuse de cette région.

À la fin des années 50, la végétation de l'île Blanche était composée d'une forêt mixte mature d'épinette blanche (Picea glauca) et de peuplier faux-tremble (Populus tremuloides). Un groupement dense de sureau pubescent (Sambucus pubens) constituait la strate intermédiaire. Au pourtour, ceinturant l'ensemble de l'île, un groupement dense dominé par l'élyme des sables (Elymus arenarius).

Au cours des trois dernières décennies, le couvert végétal a été considérablement modifié. L'action conjugée du Cormoran à aigrettes (Phalacrocorax auritus) et de la tordeuse des bourgeons de l'épinette (Choristoneura fumiferana) a détruit toute la forêt mature, à l'exception d'une strate arbustive dense dominée par le sureau pubescent et le cornouiller stolonifère (Cornus stolonifera).

Un bref rappel historique sur l'évaluation de la population nicheuse d'Eider utilisant l'île Blanche nous indique que cette île est touchée sporadiquement par des épidémies de peste avienne, causant la mort de centaines de femelles eiders. Reed et Cousineau (1967) rapportent qu'en 1964 et 1966 sont mortes respectivement 1 000 et 800 femelles sur l'île Blanche. Récemment, des mortalités de l'ordre de 700 et 2 000 femelles

furent rapportées au printemps 1984 et 1985. Nous ne possédons par d'informations relatives au développement d'épidémies entre 1966 et 1984, cependant, un creux dans les résultats d'inventaires pendant les années 70 nous permet de spéculer que la peste avienne est en cause.

La dernière épidémie amena l'intervention concertée de plusieurs organismes: le Service canadien de la faune (propriétaire), la société Canards Illimités Canada, la société Duvetnor et un spécialiste du Département de médecine vétérinaire de l'Université de la Saskatchewan, le docteur Gary Wobeser. Les experts ont analysé la situation de façon à déterminer l'agent pathogène et à élaborer un plan d'action pour éviter qu'une telle épidémie ne se produise de nouveau.

L'agent en cause, Pasteurelle multocida, identifié par bio-essais, est responsable de la peste avienne. Les conditions physiques sur l'île et, en particulier, sa forme concave favorisant l'accumulation de l'eau, le mauvais drainage maintenant la nappe phréatique près de la surface, l'accumulation d'une importante couche de matière organique, la présence d'une strate arbustive dense qui réduit considérablement la ventilation et l'action du soleil, ce sont tous des facteurs qui favorisent le développement et la propagation des bactéries pouvant causer des mortalités.

D'un commun accord, un plan d'intervention sur les constituantes environnementales fut mis au point pour contrer la réapparition d'épidémies. Les travaux suivants ont été réalisés au mois d'août et septembre 1985, après la période d'utilisation de l'île par les oiseaux nicheurs:

1. coupe et brûlage du couvert forestier et arbustif pour favoriser la ventilation de l'île et l'irradiation des bactéries par les rayons ultra-violets;

2. drainage des cuvettes naturelles pour éliminer les principaux foyers d'infestation;

3. récolte et incinération de toutes les carcasses d'oiseaux;

4. ensemencement d'herbacées pour étouffer la repousse de sureau pubescent et fournir un couvert de nidification de qualité;

5. plantation d'épinettes blanches et de groseillers hérissés (Ribes hirtellum) pour développer un paysage végétal s'apparentant à celui d'habitats similaires;

6. installation de quatre cent cinquante (450) abris artificiels pour suppléer au manque de couvert de nidification et pour accroître la protection des nichées contre la prédation.

Dès 1966, un programme de suivi des aménagements a débuté pour déterminer l'impact du projet sur les diverses populations nicheuses et pour suivre le développement du couvert végétal ensemencé et naturel. L'ensemble des informations du programmes de suivi est pris à partir d'une division arbitraire de l'ensemble de l'habitat de nidification.

En 1986 et 1987, on dénombra respectivement 2 154 et 2 232 nids d'Eiders. Aucune épidémie de peste avienne ne fut décelée pendant ces deux saisons. Les abris furent utilisés massivement, puisqu'on dénombra, pour ces deux années, une moyenne de 700 nids sous les abris (1,6 nid par abri), soit le tiers ($^1/3$) de la population nicheuse de l'île.

La disparition du couvert forestier amena une utilisation accrue de l'île comme habitat de nidification par le Goéland argenté (Larus argentatus) et le Goéland à bec cerclé (Larus delawarensis).

En 1987, la couverture végétale est dominée par une graminée ensemencée en 1985, le Phalaris roseau (Phalaris arundinacea). Cette plante réduit efficacement la repousse arbustive. En 1988, il sera intéressant de connaître l'utilisation de ce type de formation végétale comme habitat de nidifcation pour le Canard eider.

Les conditions qui prévalent à l'île Blanche laissent entrevoir un avenir meilleur pour l'ensemble des utilisateurs. Le contrôle des épidémies et le développement d'une couverture végétale de qualité assurera un taux de succès reproducteur de l'Eider plus élevé à long terme, ce qui ne pourra que réjouir tous les groupes soucieux de la conservation de cette ressource.

A NEW METHOD FOR LIVE-CAPTURING COMMON EIDERS

R. Ian Goudie
Canadian Wildlife Service
St. John's, Newfoundland

Abstract

In June 1985, a new technique was developed for live-capturing Common Eiders. The method involved the use of conduit poles and nets, and was successful at intercepting potential breeding pairs of eiders as they conducted their daily courtship and prospecting flights over the coastal island study site.

Introduction

Common Eiders (Somateria mollissima) congregate to breed on coastal marine islands. Suitable live-capturing techniques for color-marking, banding, or measuring these readily accessible individuals have received little attention. Weller (1957) described a nest box trap for capturing incubating waterfowl and several authors have used this method to capture adult female Common Eiders (e.g. Mendall 1981). Major drawbacks to this approach are that capture per effort is low, and there is considerable disturbance in the colony during the sensitive incubation period. On islands lacking appreciable nest cover, females eiders may abandon the nest rather than enter the nest box (A.R. Lock, CWS, pers. commun.) On islands with substantial tree and shrub cover, retriever dogs can be successfully employed during the incubation period, although disturbance is considerable.

The method we report here proved successful for both males and females (222 individuals in 1985), and offers researchers the potential to color-mark and measure individuals prior to nesting.

Methods

We constructed 2,100x8 m monofilament gill nets by joining 100x4 m nets lon- gitudinally using standard nylon netting twine. We then suspend the completed nets, fully overlapped, from 6 m steel conduit poles spaced at 10 m intervals. About 30% to 40% of the colliding eiders did not tangle in the nets; instead they dropped or rolled to the ground, and generally escaped by taking flight in the opposite direction. We erected a separate 100x3 m back-up net, raised 1.5 m above the ground on 2 m steel rode, 3-4 m from the base of the main net (fig. 1). Escaping individuals tangled in this net, resulting in capture of 90% of the birds intercepted.

We erected the net on a small isthmus of land (10-15 m wide) separating a 0.5 ha freshwater pond from a saltwater cove with a cobble and boulder beach. We had noted that the local topography tended to "funnel" flying pairs and individuals toward this small pond, which they also frequently used for roosting, preening/cleaning, and courting. We found that a few eider decoys placed on the water close to the net helped to lure flying individuals to approach lower to the water, and not detect the net. Very few individuals approached the net from the ocean side, and those that did appeared frequently to detect the net.

Result and discussion

From 17 June to 1 July 1985, we successfully captured 222 Common Eiders on Mason's Island, Groswater Bay, Labrador, using the above described "mist net". Of these, only 1 adult male was recaptured; of 8 casualties, 6 (2 adult males, 4 adult females) died from heat prostration, and 2 adult suffered broken necks (mortality rate = 3.2%). An additional 57 adult female eiders (8 recaptured, 1 casualty) were secured using retriever dogs and dip nets, mostly on other islands in the area.

Initially our capturing efforts were frustrated by eiders breaking through the net. We doubled the net on the fifth day of operation and found this to be very effective because the counter-action of the back-up net was not erected until the fourth days of operation, after approximately 200 individuals escaped. Our initial success rate was as low as

10% of collisions. There were mor flights of eiders during this first week, and individuals that had collided with the net appeared to avoid the site, judging by the negligible recapture rate (1 individual, which actually was recaptured in a different location).

The technique described has considerable potential, especially for behavioural studies requiring color-marked individuals. We captured both members of a number of pairs, which could easily have been color-marked and released. Whether or not the trauma associated with capture, measuring, and marking caused breakdown of marked pairs is unknown. Pairs and individuals released during our study appeared to settle down within 50-100 m of the net site.

As mentioned previously, individuals appeared to avoid the mist nets after initial capture, i.e., there were no recaptures in the same location. As well, we noted that most ducks were caught when approaching from the landward side. This was, in part, due to their flight patterns but, as well, the monofilament net may have been more difficult for the eiders to distinguish against a water back ground. We noted that the best results occurred on calm days when the possibility of manoeuvering to avoid the net was less. Individuals were particularly adept at avoiding the nets when there were strong head winds. The noise associated with the wind passing through the net during strong winds may have enhanced their ability to detect it.

COMMON EIDER BANDING PROJECT IN EAST UNGAVA BAY:

EXPERIMENTAL CAPTURE BY NET

Douglas Nakashima
Makivik Corporation - Research Department

The objectives of this research project were two fold: first, to experiment with and refine a monofilament net-capture technique for Common Eiders which can be used in the North; and second, to capture and band Ungava Bay eiders in order to obtain more information on the location of their southern wintering grounds. The research was carried out along the eastern coast of Ungava Bay between June 24 and July 11, 1987. The field crew consisted of: Johnny George Annanack, David Annanack, Ajiki Annanack and George Don Annanack of Kangiqsualujjuaq; Marc Carrier of Kangirsuk; Allen Gordon of Kuujjuaq, and the author.

During eight days, 53.3 hours of netting were conducted. A total of 110 Common Eiders were captured by net, banded and released. Two additional eiders, caught by hand and by snare, were also banded and released. Finally one net-captured male adult died of unkown causes while being banded. The latter male was the only casualty of the banding effort. Of the total of 113 captured eiders, 83 were females and 30 were males.

The crew experimented with heavy and light-weight net sets, the latter being judged superior. The recommended netting equipment is as follows:

1. end poles - two 22 foot lengths of $1^1/2$" diameter steel pipe, each cut in half, threaded and rejoinable with threaded steel couplings;

2. net suspension system - 400 feet of $^3/16$" diameter aircraft cable, strung through single snatch blocks attached to the tops of the end poles and raised and lowered by 1,200 lb. test winches;

3. net - two 100 fathom X 25 meshes deep monofilament nets attached top of bottom, $7^1/2$" mesh, olive-colored and no. 14 monofilament;

4. pole support system - 1/4" steel cable guys from the pole tops to the ground.

The 22' high end pole were set 300 feet apart and the 3/16" aircraft cable was stretched taut between them, using the winches. The monofilament nets were hung in a single layer from the taut cable. A low back-up net (4 ft by 300 ft) was set about 15 feet to one side and parallel to the main net. The above equipment can be deployed in a variety of configurations adapted to the local topography.

Net placement relative to eider flight paths and local topographic features was a critical factor in netting success. Accentuated local topography could be exploited to advantage. Season, wind and tide were also found to affect netting success and must be taken into consideration.

EIDER SITUATION IN SOUTHERN QUEBEC

A. Bourget
Canadian Wildlife Service, Québec

Abstract

Nesting eiders are found in two main regions in southern Québec: in the St. Lawrence estuary, approximately 18,500 pairs that nest mainly on five islands; this population increased substantially over the last 50 years, and has become stabilized in the last 15 years. The second location is the Gulf of St. Lawrence where birds are found in the islands bordering the north shore with 80% of the birds found between Natashquan and Harrington Harbour. The population level is of approximately 5,400 pairs, far below the estuary population. Illegal harvest has reduced this population to a fraction of that recorded earlier in the century.

The north shore of the Gulf of St. Lawrence is also used by wintering eiders migrating from the eastern arctic. The Mingan Islands and the north coast of Anticosti Island support approximately 31% of the wintering eider population of the eastern coastal area.

SITUATION DE L'EIDER DANS LE SUD DU QUÉBEC

André Bourget
Service canadien de la faune

Résumé:

Dans le sud du Québec, il existe deux régions qui supportent des populations d'eiders. La première est localisée dans l'estuaire du Saint-Laurent héberge en période de reproduction environ 18 500 paires, dont plus des 3/4 se retrouvent dans cinq îles seulement. La population de l'estuaire a augmenté de façon significative depuis 50 ans, mais elle s'est stabilisée au cours des 15 dernières années. C'est ici qu'on enregistre les densités les plus élevées de nid d'eiders en Amérique du Nord et on considère cette population en bonne santé.

Dans le cas de la population qui se retrouve dans le golfe, la quasi totalité des reproducteurs utilisent les îles échelonnées tout le long de la Côte Nord, avec près de 80% des oiseaux dans le seul secteur localisé entre Nataskquan et Harrington. Les effectifs de la Côte sont cependant de loin inférieurs à ceux de l'estuaire, puisqu'on estime à 5 400 paires seulement cette population utilisant un immense territoire. Les oiseaux étaient cependant de trois à quatre fois plus nombreux auparavant et leur nombre a considérablement diminué au cours des trois dernières décennies principalement à cause du braconnage.

Par ailleurs, le golfe du Saint-Laurent représente un site important d'hivernage pour les populations d'eiders en provenance des régions arctiques. Ainsi, deux sites moyens regroupent la totalité des hivernants, soit l'archipel de Mingan sur la moyenne Côte Nord et la rive sud de l'île Anticosti. Ce complexe supporte environ 31% des effectifs d'eider qui hivernent tout le long de la côte et du continent nord-américain.

THE COMMON EIDER SITUATION

IN NEWFOUNDLAND AND LABRADOR

R. Ian Goudie
Canadian Wildlife Service, Newfoundland
presented at the eider technical meeting
Quebec 12-13 Jan 88

Abstract

There has been historical and continuing declines in eiders breeding in Nfld and Labrador although the trend is most pronounced in insular Newfoundland and southern Labrador south of 53 degrees lat.

For insular Newfoundland, there are historical (1700's) references to immense numbers breeding in Hare Bay, declines since the works of Peters and Burleigh (1930'3-40's), and declines since the works of Les Tuck.

For southern Labrador, there have been declines since 1940 at least. For example, St. Peters Bay, a former M.B. Sanctuary but revoked in 1979 because only 50 nests remained there, was estimated to support at least 500 nests in 1942 (from the files of the NFLD Rangers). The population is apparently still declining there (Prov. Wildlife E. Ryan, Pers. Comm.).

For northern Labrador, there are historical references to very large #'s, i.e., thousands breeding on the Metik Island (Galvano Islands). Less than 1 000 nests were present there in 1981. Provincial Wildlife officials report declines in a local colony in Hebron fiord in recent years.

The native harvest of coastal Labrador is estimated at more than 30 000 eiders. I infer that the status of eiders in northern Labrador is questionnable, and unlikely to be stable or improving as implied in the 1986 eider compendium.

Research on nesting and fledging success of eiders suggests major reduction in nesting success due to predation by large gulls. We are presently

involved with encouraging the participation of non governmental groups to become involved in enhancement of populations through intensive management involving nest shelter programs, gull controls, and duckling transplantation. It is important to demonstrate an obvious return to the public in as short a time as possible.

Increased public/hunter education programs will ultimately be critical to the success of any eider enhancement program for Newfoundland, especially when the relatively large numbers of migrants of the northern race give the impression of large numbers in spring.

Increased enforcement has to be strongly emphasized, especially because existing (since 1949) regulations on hunting are probably sufficient to ensure a recovery of stocks. In reality there has been no enforcement (and hence little compliance) to hunting regulations up to 1985 at least.

Further research into migration and wintering areas and harvest rates will require increased banding of southern stock, and there is a serious need to conduct extensive banding on the northern stocks. There is an urgent need to refine techniques for estimating harvest. Further research on the age & sex ratios of the kill is very important.

The harvest of eider ducks in NFLD & LAB is of a large magnitude, and is almost totally dependent on the northern race stock because only a handful of southern birds remain to augment wintering populations. NHS/SCS are in place & provide data on population trends harvest/unit effort (hunter day) which assumes that as population changes there is corresponding change in the rate of success by hunters. This is a conservative measure because effort in many cases is improving (e.g. improved access), and declining numbers of hunters tends to result in improved harvest per effort for remaining hunters.

If we have a major decline in harvest/effort then it is probably a very serious decline, and this would appear to be the case for Newfoundland, i.e., major decline in harvest/effort in NFLD for eiders. It is my contention that the northern race population is in serious trouble, at least

those areas that supply eiders to the wintering stock in Newfoundland. This view contradicts the scenario put forth in the compendium because harvest levels may be greater than those used there.

The regulations governing sea duck hunting are extremely liberal maybe because of historical subsistence use or perhaps the lack of interest in "fishy" sea ducks. Sea ducks are very K-selected so can not support a very large annual harvest of adults, i.e., < 15-20%, and hunting is unlikely to be compensatory to other forms of mortality because of low natural mortality rates.

Harvest of sea ducks for NFLD & LAB (& Maritimes) has been grossly underestimated by the NHS/SCS because:

a) NHS only goes to January;
b) NHS is partitioned by SCS which has a very small sample;
c) SCS biased to early part of the season, hence poorly represented by sea ducks and over represents the migrant sea ducks, esp. scoters;
d) second mailing of envelopes more than doubled the estimate of eiders harvested.

Tallyman survey for Labrador alone estimated 30 000-35 000 harvested there annually, and a special survey in NFLD in 1986-87 compared mailout questionnaire results to tallyman results. Tallyman results were two-fold higher than questionnaire results. The inference is that special questionnaire results were even underestimating the true harvest. Furthermore, all surveys estimate only the legal kill, and there is still substantial illegal kill in spring.

THE EIDER SITUATION IN THE MARITIMES

Peter W. Hicklin
Canadian Wildlife Service
Sackville, N.B.

Abstract

The status of eiders in the Maritime Provinces is best described by Erskine and Smith (1986) in the "Eider Ducks in Canada", CWS publication. The situation has changed little since those authors put together their status report and described breeding populations of 7 000 pairs in south-western New Brunswick and 8 000 pairs along the Eastern Shore of Nova Scotia.

A major change since the time of Erskine and Smith's (1986) compilation has been the rapid development of the Blue Mussel aquaculture industry along the Eastern Shore of Nova Scotia. There, eider ducks and aquaculture appear to be heading on a collision course. Since eider are Blue Mussels specialists, the thinner-shelled and easily available cultured mussel has become, in some areas, an important food source for eiders. Many aquaculturalists are reporting considerable losses from feeding eider ducks in their areas. The result has been an increased demand for kill permits and some action by governments to respond to the problem. The CWS, Atlantic Region, has kept in close contact with the Nova Scotia Aquaculture Association and plans are in the works to develop some research in aquaculture techniques, which would result in minimizing losses to eiders and at the same time protect eider ducks from indiscriminant shooting by cultivators protecting their valuable crops.

STATUS OF EIDER DUCKS IN THE EASTERN UNITED STATES WITH SPECIAL REFERENCE TO COASTAL MAINE[1]

Patrick O. Corr
Maine Department of Inland Fisheries and Wildlife
P.O. Box 1298, Bangor, ME. 04401

Alan E. Hutchinson
Maine Department of Inland Fisheries and Wildlife
P.O. Box 1298, Bangor, ME. 04401

William B. Krohn
Maine Cooporative Fish and Wildlife Research Unit
240 Nutting Hall, University of Maine
Orono, ME. 04469

The number of American Eiders (Somateria mollissima dresseri) breeding in coastal Maine has increased rapidly from a few pairs in the early 1900s to more than 20,000 in the 1970s; in the mid-1980s, the number of breeders was approximately 26,000 pairs (fig. 1). Of the more than 3,500 coastal islands and ledges in Maine, nesting eiders used 240 islands in 1977 (colony size X - 93.3, range = 1-1,500) and 319 islands in 1986 (X = 81.5, range = 1-1,500). Only a few pairs nest in other New England states, specifically on islands off of New Hampshire and Massachusetts (the latter probably a result of an introduction). Location and size of breeding colonies are relatively stable, but the number of birds per colony can fluctuate due to variation in weather, predation, disturbance, and disease (i.e., Table 1). There is growing concern regarding the impact of gull predation on eider ducklings, but impacts have not been quantified; brood ecology, recruitment, and survival in general are poorly understood.

Studies by the Maine Department of Inland Fisheries and Wildlife indicate a molt migration of Maine eiders during August and September. A few Maine

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[1] Presented at the Morkshop on Eider Management, Ste-Foy, Québec, Canada. January 12-13, 1988.

sites annually have flocks, predominantly males, in excess of 10,000 molters. Little is known about molting habitats and the extent of molt migrations in Maine eiders.

Almost all eiders killed in the U.S.A., as measured by the U.S. Fish and Wildlife Service's harvest survey, are taken in the Atlantic Flyway (Alaska appears poorly sampled relative to eiders). The estimated harvest of eiders in the Atlantic Flyway increased steadily from 3,000 in the early 1960s to 24,200 in the early 1980s (1986 = 31,900). Essentially all of the U.S. Atlantic Flyway eider kill occurs in Maine and Massachusetts, with the harvest roughly divided evenly bet- ween the two states (note that the Federal estimates are based on small sample sizes) (Fig. 2). In Maine and Massachusetts there is growing interest in sea duck hunting, especially eiders, as inland duck regula- tions continue to be restrictive. The percentage of eider in the Maine waterfowl harvest has increased from 3-4% in mid-1960s to over 20% in the mid-1980s (where as black ducks during this same period went from over 50% to less than 20%) (Fig. 3). American eiders are a relatively long- lived species with a low reproductive rate, and therefore the point at which hunting mortality becomes additive to natural mortality will be lower than in species with a higher population turnover. Thus, there is a need for more reliable harvest and survival data.

Eider ducks wintering in northern New England are an international resource. Eiders wintering in the eastern U.S. include local birds as well as eiders from New Brunswick, Nova Scotia, and the St. Lawrence portion of Quebec (S. m. dresseri); Labrador and Newfoundland (S. m. dresseri and S. m. borealis); and even a trace possibly from Greenland and/or the eastern Canadian arctic (King Eider, S. spectabilis).

Counts of eiders wintering in the U.S. portion of the Atlantic Flyway increased from a yearly average of approximately 74,000 in the mid-1960s to almost 110,000 in the mid-1980s. In the eastern U.S., the majority of eiders winter from Maine to Massachusetts (approx. 50% each in Me. and Mass. during the 1980s) with a few hundred occasionally off of Rhode Island and a trace of birds from coastal Connecticut to Virginia (Fig. 4).

Unfortunately, the reliability of winter counts is unknown, and while the increasing trend indicated for the 1960s-1980s may be real, we have little confidence in the actual numbers since not all areas are censused annually and complete counts for Maine, 1980-1983, showed that the area normally covered during winter surveys (Fig. 5) contained less than half the total number of eiders wintering off the Maine coast (X = 44%, Table 2).

While breeding and wintering eider populations in the eastern U.S. seem healthy in numeric terms, major changes are occuring which could negatively affect eiders in the near future. Specific concerns are: (1) large scale commercial harvesting of the eider's main food, blue mussels (Fig. 6; competition between lobstermen and mussel harvesters in Maine has grown to the extent that state legislation is being considered to regulate the mussel harvest); (2) increased residential, recreational, and industrial development in coastal habitats; (3) poor understanding of potential impacts of expanding breeding cormorant and gull populations on nesting eiders; (4) continued outbreaks of avian cholera among nesting eiders; (5) incomplete knowledge of the ecology of molt migrations; and (6) impacts of steadily increased sport hunting.

In summary, given increasing human and natural pressures, the eider's status in northern New England could abruptly change. Thus, it would be prudent to collect more reliable population and habitat data upon which to gauge the health of breeding, molting, and wintering birds.

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Table 1. OCCURRENCE OF AVIAN CHOLERA IN MAINE BREEDING EIDER COLONIES.

DATE	LOCATION	NUMBER OF DEATHS
1963	Islesboro	116 nesting females
1970	Penobscot Bay: Muscel Ridge - 1 island	43 (98 % females)
	Muscongus Bay: Offshore - 8 islands	513
1972	Penobscot Bay: Isleboro - 2 islands	24
1974	Penobscot Bay: Muscle Ridge - 3 islands	53 (96 % females)
1976	Penobscot Bay: Muscel Ridge	1 female
1980	Blue Hill Bay: 14 islands	1,917 (62 % females)
1981	Blue Hill Bay: 15 islands	300 - 500
1982	Blue Hill Bay:	100
1984	Muscongus Bay: 1 island	1,000 - 1,500 (60 - 70 % females)
	Penobscot Bay: 1 island	11 females
1985	Muscongus Bay and Penobscot Bay:	less than 200
1987	Casco Bay:	800 + (60-70 % females)

Table 2. PERCENTAGE OF WINTERING EIDERS INVENTORIED IN COASTAL MAINE, 1980-1983.

Year	Complete Coverage (Entire Coast)	Normal Coverage (Units 1-8)	Population Counted with Normal Coverage
1980	81,200	36,209	45 percent
1981	78,300	32,461	41 percent
1982	82,900	28,266	34 percent
1983	60,600	37,347	62 percent
Mean	75,750	33,571	44.3 percent

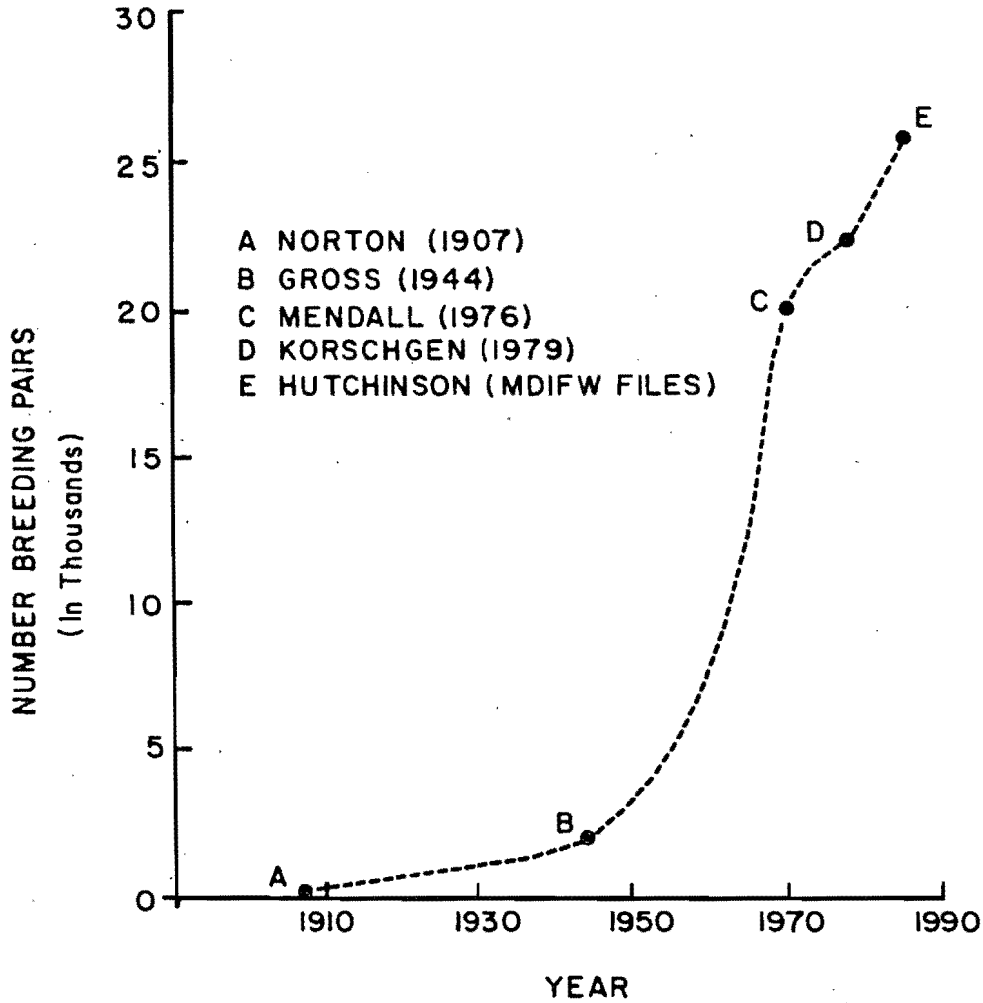

FIG. 1. ESTIMATES OF BREEDING EIDER POPULATIONS IN MAINE, 1907-1986.

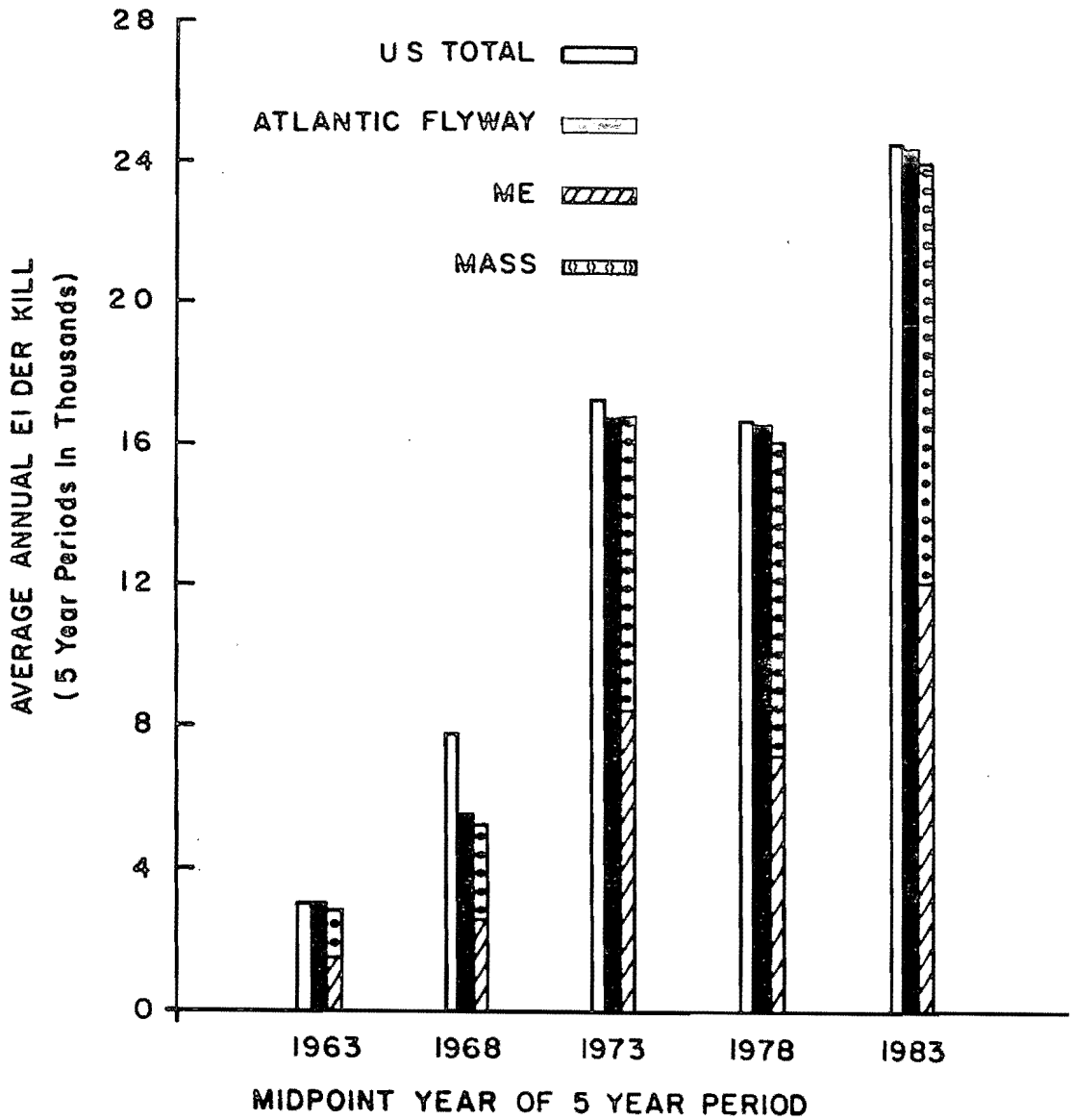

FIG. 2. TREND IN AVERAGE ANNUAL EIDER HARVEST IN THE UNITED STATES, ATLANTIC FLYWAY, MAINE AND MASSACHUSETTS (FROM U.S. FISH AND WILDLIFE SERVICE).

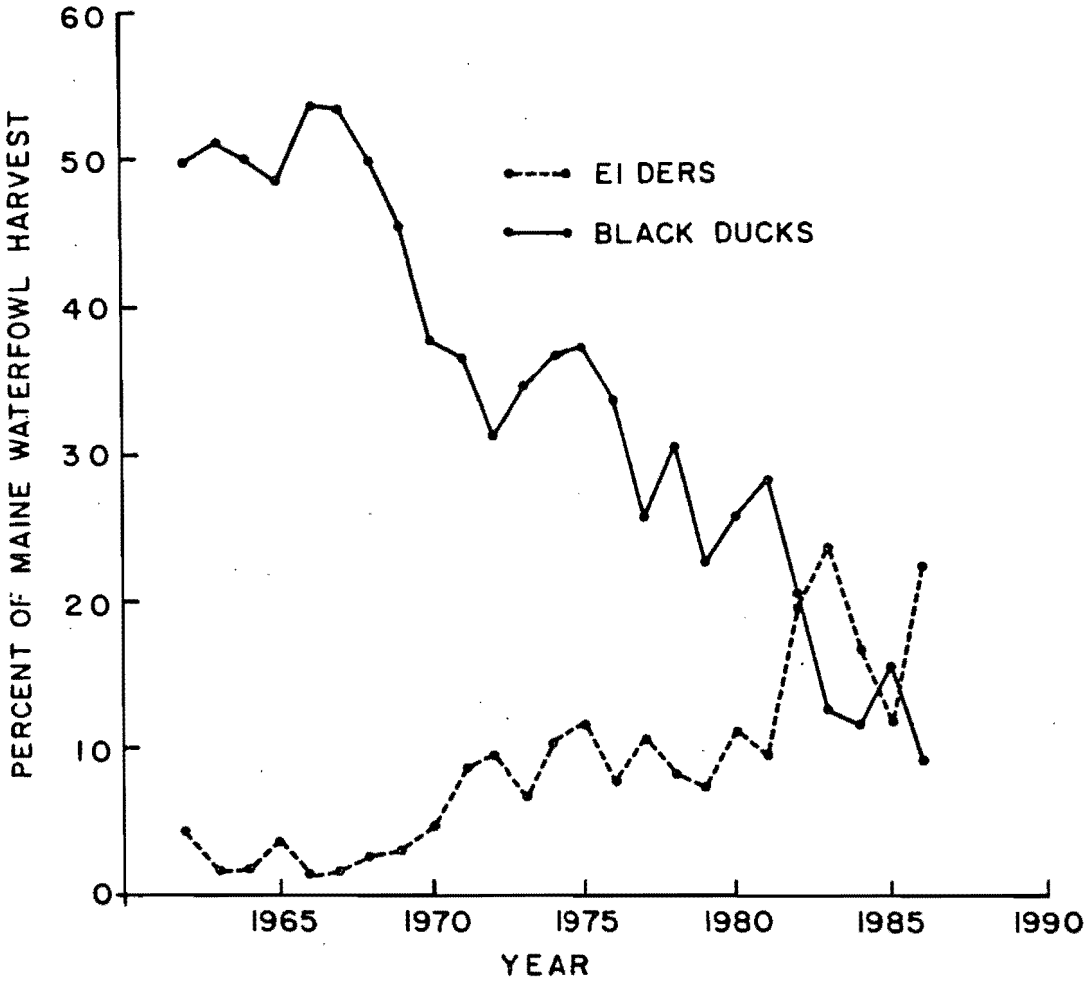

FIG. 3. TREND IN PERCENTAGE OF TOTAL MAINE WATERFOWL HARVEST CONSISTING OF EIDERS AND BLACK DUCKS, 1963-1986 (FROM U.S. FISH AND WILDLIFE SERVICE).

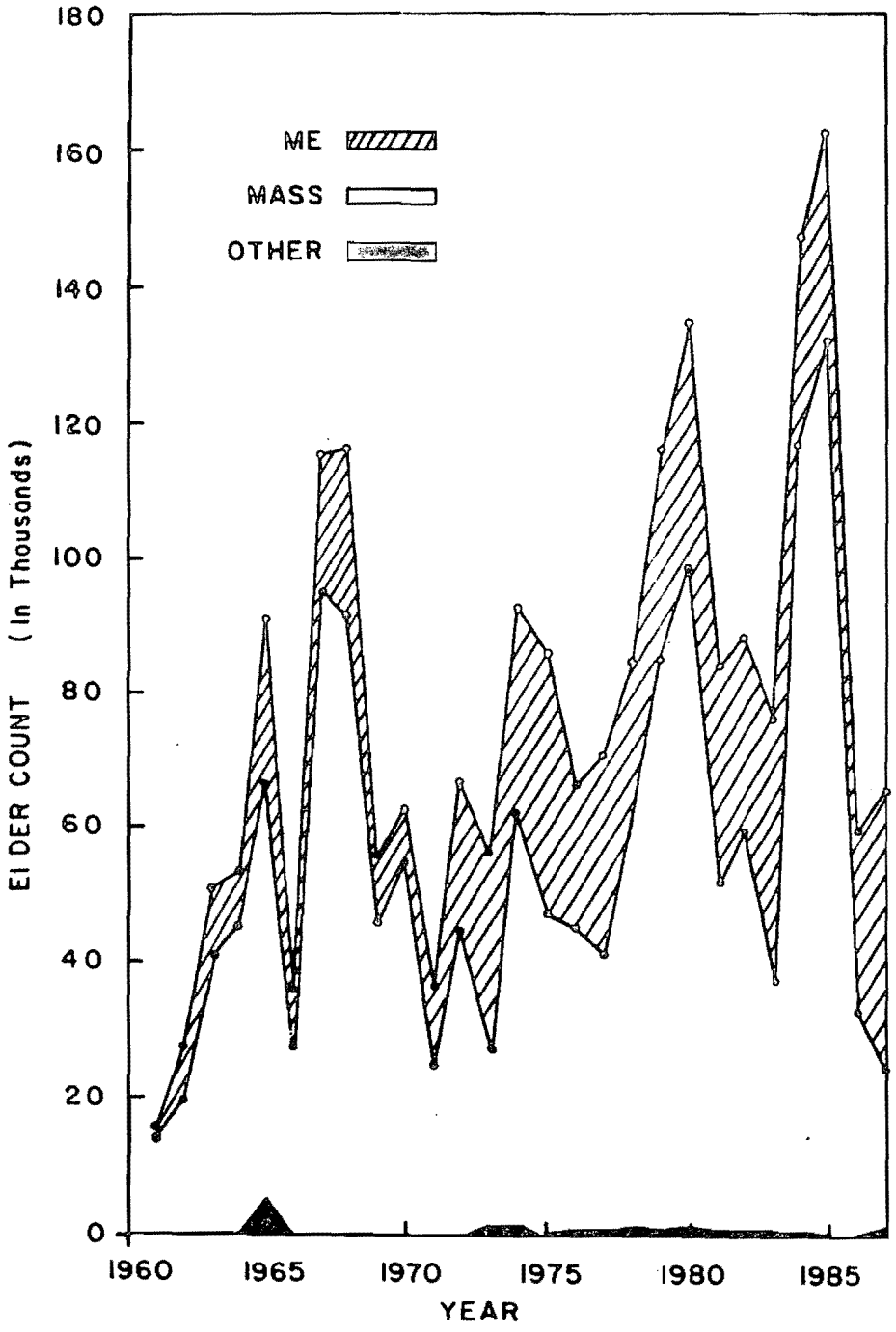

FIG. 4. WINTER COUNTS OF EIDERS IN THE U.S. ATLANTIC FLYWAY, 1961-1987 (FROM MAINE DEPT. OF INLAND FISHERIES AND WILDLIFE AND U.S. FISH AND WILDLIFE SERVICE).

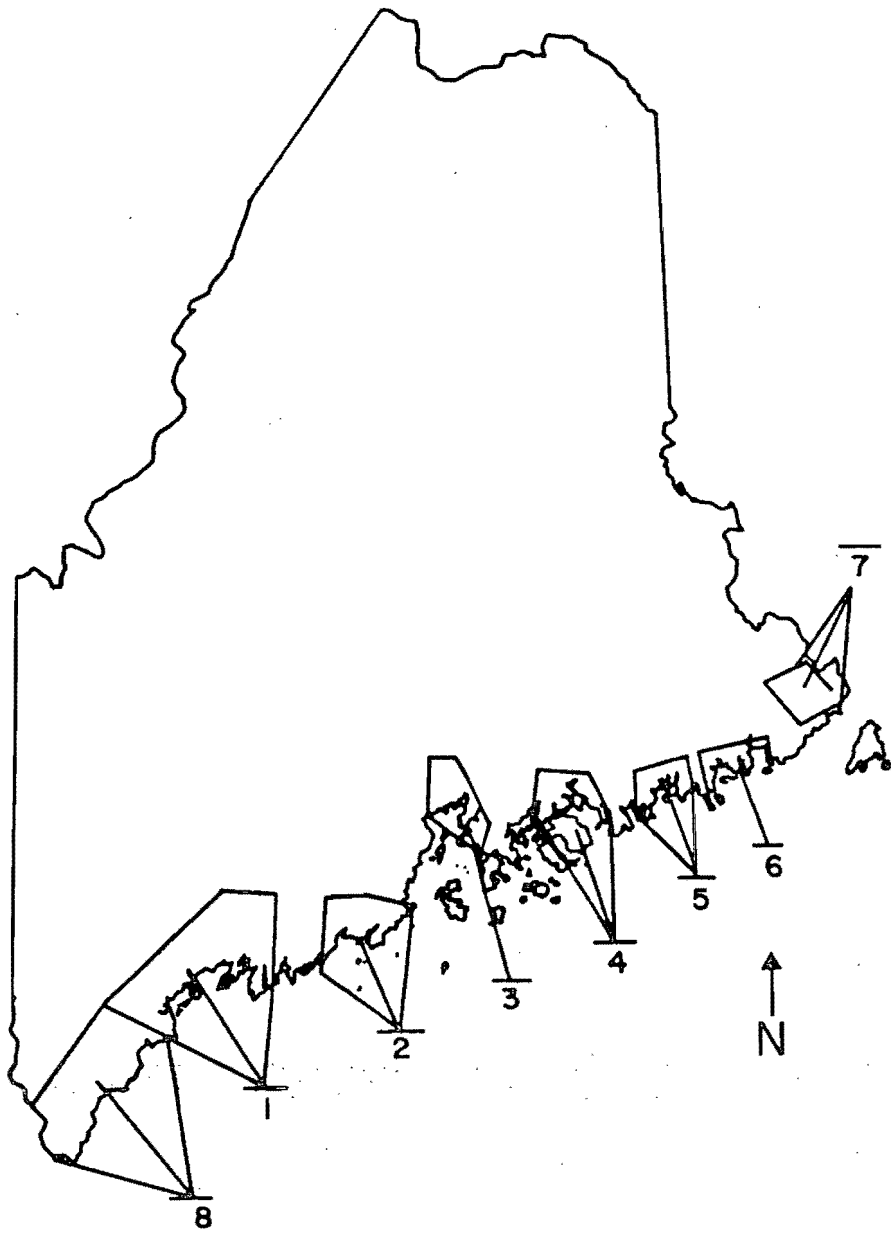

FIG. 5. MAINE WINTER WATERFOWL INVENTORY UNITS (FROM MAINE DEPT. OF INLAND FISHERIES AND WILDLIFE).

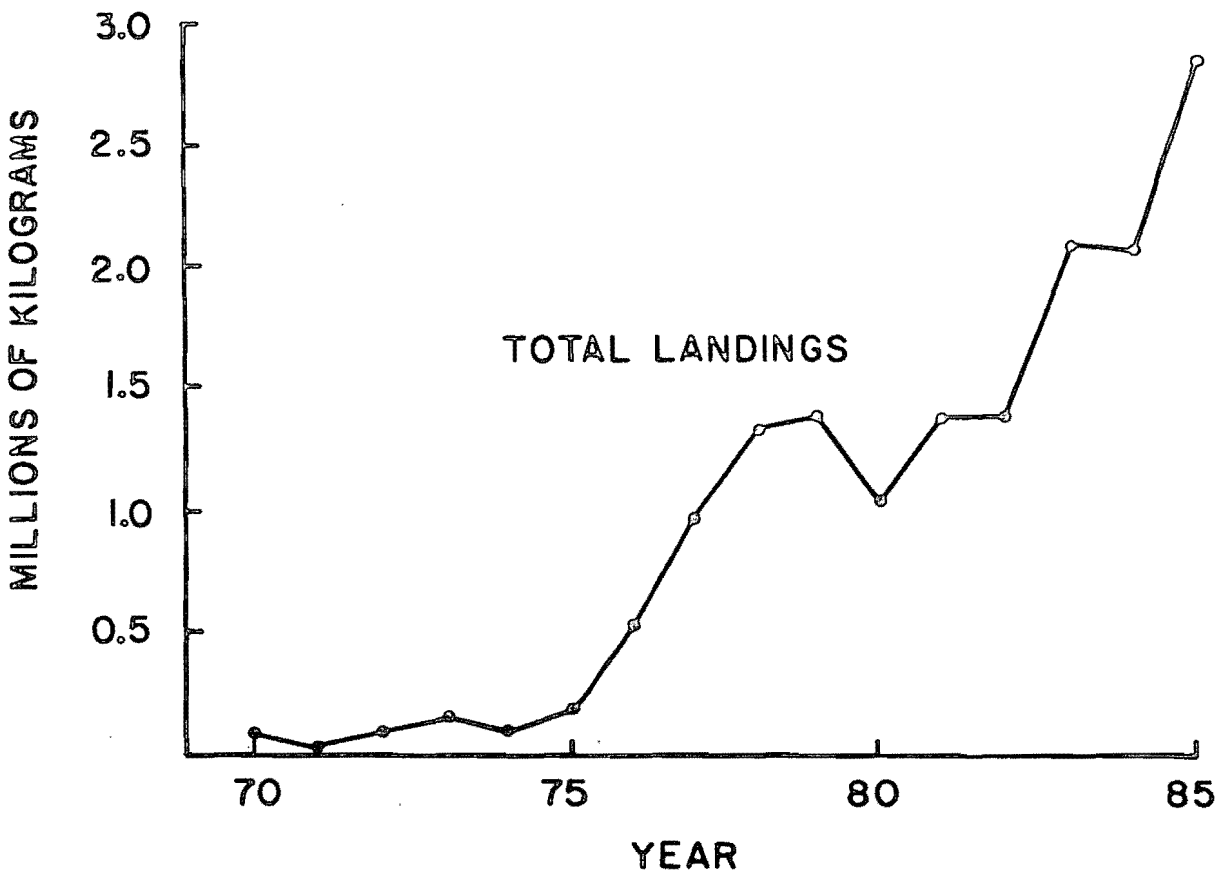

FIG. 6. TRENDS IN COMMERCIAL LANDINGS OF BLUE MUSSELS IN MAINE (FROM CATURANO ET AL., IN PRESS).

SUBPOPULATIONS OF COMMON EIDERS IN EASTERN NORTH AMERICA: THEIR STATUS AND MIGRATION PATTERNS

Austin REED
Canadian Wildlife Service, Québec Region

In an earlier study (Reed & Erskine 1986) six subpopulations of Common Eiders were recognized for eastern North America. That same breakdown is used here. The migratory movements of each subpopulation are described below, summarizing information published by Abraham and Finney (1986) and Reed and Erskine (1986). Tentative evaluations of subpopulation status are offered, based on Reed and Erskine's (1986) preliminary population model; although based on the best available information, the evaluations should be interpreted with caution because the model relies on some unverified assumptions and because some data sets were incomplete.

1) Hudson Bay subpopulation:

This includes the entire stock of the subspecies Somateria mollissima sedentaria which breeds within Hudson and James Bay. Recent surveys (Nakashima, Murray, Fleming, Reed unpublished) suggest a breeding population in excess of 40,000 pairs, mostly in eastern Hudson Bay. All evidence indicates that they overwinter within Hudson and James Bay. When the new survey results are used in Reed and Erskine's (1986) model, the population appears to be healthy and could be increasing.

2) High Arctic subpopulation

A number of small colonies bordering Lancaster Sound and the islands to the north form the core of a population which is geographically separated from the main concentrations of the same subspecies (S. m. borealis) near Hudson Strait and along the west coast of Greenland. In the fall birds from this group migrate eastwards through Jones and Lancaster Sounds and southwards through Smith Sound. Some individuals

from this group join the large concentration of birds wintering off the southwest coast of Greenland. Probably others from the High Arctic group move down the east coast of Baffin Island to winter near the entrance to Hudson Strait. The data are inadequate to evaluate the status of this small stock; hunting pressure within its Canadian range does not appear great, but it may be more important for the component that migrates to Greenland, where heavy hunting occurs.

3) Low Arctic subpopulation

The group is made up of the very large breeding populations of S. m. borealis on both shores of Hudson Strait as well as the smaller ones in northern Labrador and near Southampton Island. The scattered populations elsewhere on Baffin Island and in Foxe Basin are included in this group. Further research will probably indicate the need to subdivide this group. On fall migration some birds move southeasterly down the east coast of Baffin Island and others go easterly through Hudson Strait. Recoveries of adult females banded mear Cape Dorset have been obtained as far south as the Gulf of St. Lawrence (one recovery) and eastern Newfoundland (two), but some eiders remain near the eastern entrance to Hudson Strait all winter. The relatively small number of birds of this subspecies which overwinter off the coast of New England probably come from this group.

This model suggests a more-or-less stable population, but some local declines have been reported (Reed and Erskine 1986, Cooch 1986). The very large size of the stock (> 90,000 breeding pairs) and its great importance to inuit hunters in northern Québec and the Baffin Region, as well as to Newfoundland hunters during winter, justify additional research and monitoring (See also Goudie: "The Common Eider Situation in Newfoundland and Labrador", presented earlier in this report).

4) Gulf of St. Lawrence subpopulation

In addition to the eiders of the gulf proper (S. m. dresseri), this group includes the coast of Labrador south of approximately 54°30'N,

as well as all of the island of Newfoundland. The breeding population is estimated at about 9,000 pairs. Birds from this group move south to wintering areas off Nova Scotia and New England, although some remain as far north as southern Newfoundland. The model suggests a declining population. The north shore and Newfoundland components of this group have been struggling against abusive hunting for many decades (See Goudie, above).

5) St. Lawrence Estuary subpopulation

This group comprises the eiders (S. m. dresseri) nesting in the estuary. Almost all overwinter off southwestern Nova Scotia or off New England, migrating by a coastal route through the gulf, or across the Chignecto Isthmus, or directly overland. The breeding population is estimated at about 18,500 pairs. The model showed an increasing population which is in agreement with field data which show it to be flourishing.

6) Atlantic subpopulation

This group is made up of eiders (S. m. dresseri) nesting on the Atlantic coast of Nova Scotia, in the Bay of Fundy, and on the coast of Maine. Band recoveries reveal that the Nova Scotia eiders move only a short distance southwestwards along the coast, or cross to the nearby shores of Maine and Massachusetts to winter. The New Brunswick and Maine birds are more or less sedentary, their winter range differing fron the breeding area only by a slight southward extension to include the coast of Massachusetts. The model suggests a stable population which is estimated to be at about 37,500 breeding pairs.

Summary and conclusions

For conservation and management purposes, attention should be focused primarily on the very large populations bordering on Hudson Strait (part of the low Arctic group), and in eastern Hudson Bay (part of Hudson Bay group). Both groups are large and subjected to heavy hunting pressure.

In the case of the Hudson Strait population three research requirements stand out:

1) an adequate baseline survey of breeding numbers along the south coast of Baffin Island;

2) a re-survey of at least some of the Ungava Bay archipelago to appraise trends since the baseline survey of 1980 (Chapdelaine et al. 1986), and

3) banding to determine harvest areas and their relative importance.

For the east Hudson Bay population, additional surveys are required to complete baseline population levels for part of the Belcher Islands and other archipelago such as the King George, Ottawa and Salikuit Islands.

For both areas, it would be very useful to repeat some of the harvest surveys conducted among subsistence hunters during the late 1970's and early 1980's.

The remoteness of the area and its small breeding populations make it inappropriate to divert important resources to surveys and research on the High Arctic population. Nevertheless, opportunities should be sought to piggyback further surveys and research on other projects whenever possible. Opportunities should also be sought to establish contacts with Greenland authorities in order to facilitate exchange of information on this shared population.

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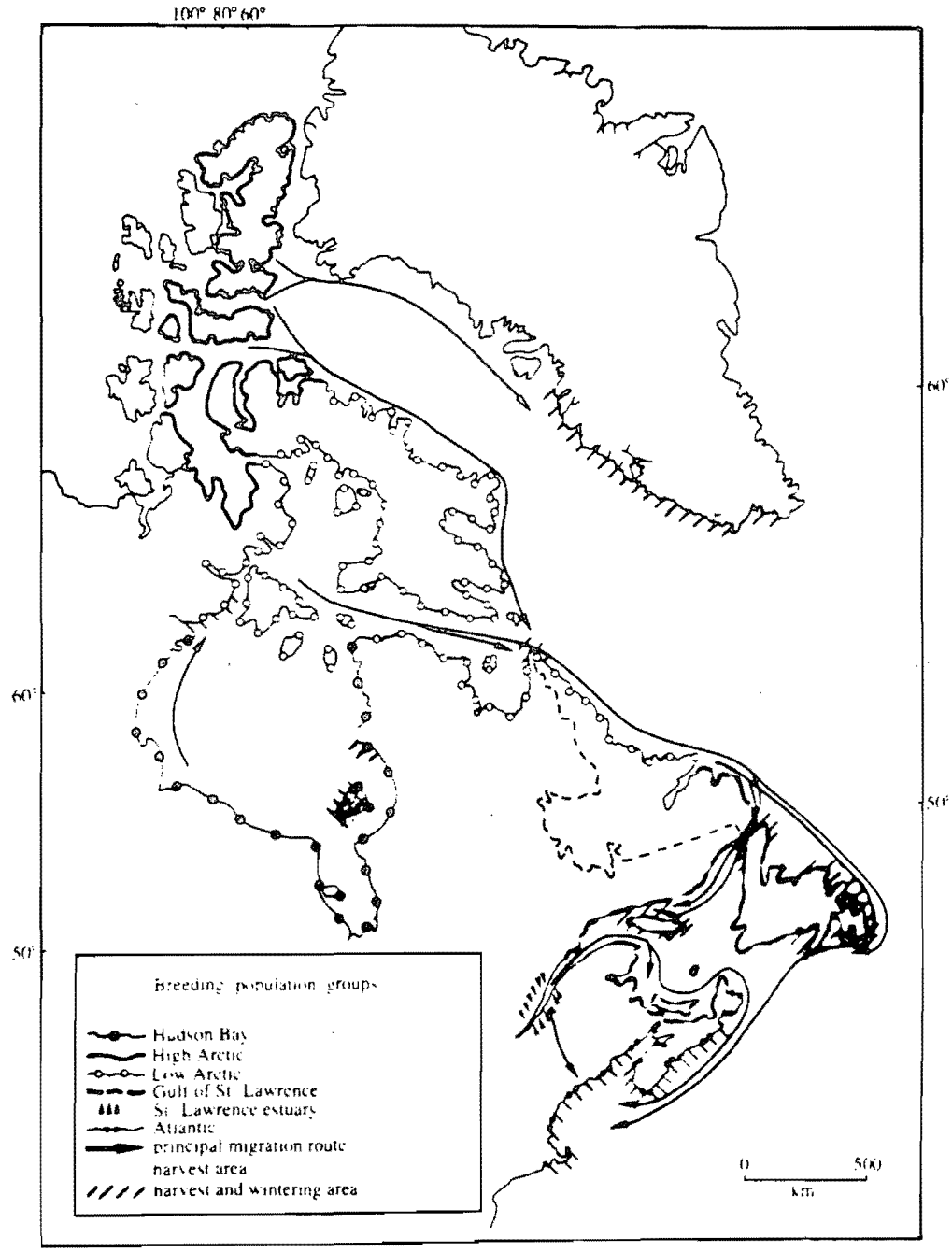
Figure 1
Breeding population groups, harvest areas, and wintering areas of Common Eiders in eastern North America



THE ESTIMATION OF EIDER HARVEST

Steve Wendt, Canadian Wildlife Service
Ottawa, Ontario K1A 0H3

Introduction

We study the harvest of eiders to understand the importance of eiders to people, and the importance of people to eiders. Since 1969 estimates of eider harvest in Canada have been available from the national harvest surveys, which are run by the Canadian Wildlife Service to measure the kill of waterfowl throughout the country. Some additional surveys, focussed on the eider kill in Newfoundland, have shown that the national surveys are imperfect in their representation of sea duck hunting there. In this presentation, I will discuss how the national surveys work, how the Newfoundland surveys compare with the national results, and how the national surveys might be improved to deal with sea duck kill more accurately. Throughout the presentation I will consider the question of what we need from harvest surveys, accurate estimates of the true level of kill, or consistent estimates that can be used to study trends and provide comparisons.

The national surveys of waterfowl kill

The national harvest surveys are used to measure the kill of ducks and geese (and other migratory game bird species) across Canada. There are three main components:

- Migratory Game Bird Hunting Permit.

- NHS - The national harvest questionnaire survey carried out December to February to estimate the kill of ducks and geese. Results are provided on date and location of kill, and on hunter days, and success rates.

- SCS - The species composition survey, in which participating hunters send wings (and goose tails) from the birds they have shot. The wings and tails, once identified, are used to determine the makeup of the kill of ducks and geese, by species, age and sex.

More details on the national surveys can be found in Cooch et al., 1978.

Harvest as a component of the population balance sheet

Many methods are used to estimate population size, recruitment, survival, and individual components of mortality. If we could estimate only breeding populations, for example, this could provide a reliable monitoring tool in its own right. But an estimate of harvest, no matter how accurate, can not establish the status of population. Harvest must be used in the context of other biological factors (recruitment, other mortality factors...), or in a context in which hunting is interpreted as a means for sampling wildlife population numbers (for which the hunter's success rates are needed, and the total measure of kill is not relevant).

Although harvest statistics must be interpreted in a wider context accurate estimates of other parameters before they become useful for modelling population levels, they are directly applicable to other questions. Hunting survey indicate economic activity by hunters, and so are useful to those concerned about tourism and the management of hunting areas. The regulations set to control hunting deal with the dates, places, number of birds killed, and the time of day for hunting; all of this information is gathered in the hunting surveys to indicate present practices. Harvest statistics are used in interjurisdictional discussions to demonstrate how shared stocks of migratory birds are being exploited in those places where they occur during the hunting season.

By relating kill estimates to the number of days hunters reported afield, an index to population size can be made. This methodology, borrowed from fisheries studies, is called Catch per Unit Effort. In practice, there are serious objections to the use of waterfowl harvest estimates to make

indices of population, primarily in the uncontrolled factors that undetermine the implicit model assumption that:

The probability that a hunter will kill a bird in a day of hunting is directly proportional to the population size of that species.

Some confounding factors are:

- uncertainty about the times the hunter was active in a day;
- inhomogeneous activity by birds during the perios of one day;
- variation in efficiency of hunter;
- variation in vulnerability of birds, according to age, species, location, weather, and time of year;
- variation in migration timing and path so that birds do not encounter the same hunting pattern from one year to the next;
- competition among hunters for the same stock;
- selectivity of hunters for certain species;
- variation in hunting regulations;
- sampling error.

With the above list of warnings against the use of Catch per Unit Effort models, the fact remains that for many species (such as scoters and greater scaup) almost no reliable indices to population are available, so the Catch per Unit Effort becomes our key source of information.

A common use of hunting surveys is to portray the distribution of hunting, and the distribution of the kill of each species.

When we consider the various uses for survey data, it is clear that for some we want an absolute measure of the kill (impact on economy, comparison with other absolute measures such as counts of colonial birds) while for others we want a relative measure, trends in kill, catch-per-unit-effort, location and timing of kill, comparison with other relative measures). It is clear that harvest surveys are subject to many sources of bias (some of which are discussed later in this presentation). If we can assume that the bias sources operate as constant factors, then the survey results can be used for the sorts of analyses that require relative measures even in those cases where they are suspect as absolute measures.

Comparing mail-administered surveys with other studies of hunted bird populations, low cost per unit of information is an obvious feature.

The kill of Eiders as measured by the national surveys

Recent estimates of the kill of Common Eider in Canada, as determined by the national surveys, are:

1983	1984	1985	1986
52,650	34,151	26,799	28,317

Estimates are given for the kill in each province in Dickson and Metras, 1987.

A special survey of sea duck harvest in Newfoundland

For three hunting seasons, 1977 to 1979, we conducted a special survey of sea duck kill in Newfoundland. This was carried out in conjunction with a survey of murre harvest. We believe for several reasons that the special survey was more reliable than the national survey in its estimate of sea duck kill (see Wendt and Silieff, 1986). The comparison of results is as follows:

Survey	Species	1977-78	1978-79	1979-80
National survey	Common Eider	15,710	14,565	12,668
	Oldsquaw	666	0	0
	Black Scoter	6,465	395	1,862
	W.W. Scoter	0	514	1,202
	Surf Scoter	1,373	739	808
	Total sea ducks	24,214	16,213	16,540
Special survey	Total sea ducks	114,767	114,486	100,673

The special survey produced substantially higher results for sea duck kill. With two results so different, which is right? This question can be approached in two ways, first by a careful review of survey methodology to determine assessment of the true value. We have insufficient information to complete either approach from data that was gathered in 1977-79 or since, but several factors indicate that the higher result from the special survey is to be preferred:

1. An examination of the likely sources of error in the two results was included in Wendt and Silieff, 1986. There it was decided that the special survey methodology was better suited to the Newfoundland sea duck hunt than was the national survey. (See below for an enumeration of sources of error in the national surveys).

2. The large kill estimate for sea ducks was matched in the special survey by an unexpectedly large estimate for the kill of murres in Newfoundland. Subsequent studies of the murre hunt (Richard Elliot, pers. comm. and A.J. Gaston, pers. comm.) indicated that the large kill estimates were in fact reasonable both from the point of view of population dynamics, and from studies of hunting in selected communities.

3. Field studies by Ian Goudie in Newfoundland (presented at this workshop) suggest a kill much in excess of that calculated in the national survey.

<u>Why do the national survey results differ from the true value of harvest?</u>

In the questionnaire survey, the following sources of error operate:

- Non-response bias, meaning that the characteristics of those hunters who responds to the survey do not match those of hunters who do not respond.

- Sampling error, which occurs when, by chance, our sample differs in average behaviour than the overall population of hunters.

- Memory error, causing hunters to report the wrong dates or kill because time has elapsed between when they hunted and when they received the questionnaire.

- Reluctance of hunters to report large (possibly illegal) bags, or desire of hunters to exaggerate their success.

- Intentional reporting of wrong information by hunters who wish to mislead government. Some people may wish to overstate the kill of

birds to establish a substantial traditional use of waterfowl, others may wish to minimize the kill to avoid drawing attention to cases of over-exploitation.

- The definition of a day's hunt can be ambiguous, especially when a hunter hunts in a group with other people and may not be able to clearly delineate which birds to count in his bag.

In the species composition survey, some particular error sources that could work against an accurate representation of sea ducks are:

- The survey timing, according to which participant kits are sent to hunters before the hunting season, reduces response from hunters who may kill sea ducks until March, over 4 months after the kits are received. An attempt is made to correct for this error (see Cooch et al. 1978), and, for Newfoundland, a second mailing of kits is sent out in December, but problems remain. In particular, it is necessary to ignore envelopes received after early March to allow analysis of the national results to proceed.

- Non-response bias may be systematic, for example it may be that interior hunters respond to the survey at a higher rate than sea duck hunters.

- The response burden is often greater for sea duck hunters than for interior duck hunters. This results from the quantity of birds killed, the size of oiliness of sea duck carcasses, the wish to keep the wings from birds meant for roasting, and most importantly from the long length of the sea duck hunting season.

How can we correct harvest surveys for absolute measures of kill?

The first step in correction of results is to ensure that the analysis methodology does what it can to compensate for errors. In the case of the national surveys, the temporal adjustment referred to in Cooch et al. (ibid.) tries to reduce bias caused by declining reporting rates in the

species composition survey as the season progresses. Sometimes an extrapolation is performed to estimate the behaviour of the non-response class based on characteristics of respondents after subsequent mailings of a mail survey, but this is not done in the national surveys.

To further correct survey results, for other studies, we generally attempt to establish a model of the form:

(True value of kill) = K (measured value of kill).

We must recognize that the proportionality factor, K, is not a constant, but varies by time and place. To correct the results, i.e. to evaluate K, means that we need an independent assessment of kill that removes substantial biases. In addition the evaluation of K must be done over a time period and geographic coverage that match the scope of the survey results that we are trying to correct.

An important question is, how accurately must the correction factor K be determined? This question is related to the use of the survey data. If we want a relative-type measure it is enough to know how K varies across geographic zones, or time (depending on the type of analysis); that is we do not need an absolute determination of K. On the other hand, if we need to know the absolute level of kill, we must establish bounds for K (confidence intervals) in the times and places of interest.

To summarize these points, if we use the survey estimates for comparisons or for the determination of trend, we need only establish (or assume) that the effect of biases is constant, or negligibly variable. If, however, we need to use absolute levels of kill, we must first set the degree of precision[1] required, and design a study to estimate harvest to that level of precision, with the desired accuracy. Such a study which improves substantially on accuracy will likely be much more expensive than mail surveys.

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[1] Precision refers to the variance of estimates, irrespective of bias. Accuracy refers to the degree of bias - how much we are off target.

We can say something now about the bound on a correction factor, K, that would apply to the harvest of eider ducks in Newfoundland. Consideration of error sources suggest that K > 1. The special survey described above, and field work by Ian Goudie indicate a possible range of K from 1.5 to 4. Newfoundland sea ducks provide what is arguably the most extreme case of underestimation that occurs in the national surveys.

Where are we heading with the national surveys?

There are very good reasons for us to be conservative in planning changes to the national surveys:

- comparability with past results
- comparability with U.S. results
- the cost of change

None of these reasons, however, is enough to require that we never change the national surveys even in the face of serious shortcomings, but only that change be well-planned, and infrequent.

A meeting will be[1] held on January 18 to begin discussion within CWS on changes that could be made to the national survey program in 1990. Some of the proposals to be discussed that are relevant to the measurement of eider harvest are:

1. Division of the NHS and SCS into regional components. The components would allow for difference in survey mailing dates and analysis dates do encompass long sea duck hunting seasons. With regionally oriented questionnaires it would be possible to add specific questions such as the kill of murres and eiders in Newfoundland, and it would be possible to get specific information on sea duck hunting effort, without which catch per unit effort studies on sea ducks are highly suspect.

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[1] Note: the meeting was held.

2. Procedures in Canadian wing bees may be specified in a Canadian wing key. The excellent key developed by Sam Carney of the U.S. Fish and Wildlife Service has, unfortunately, particular deficiencies in its treatment of sea ducks. For eider, we would like a key that provides reliable aging of 3 age classes, and despite the present lack of method, it would be good to be able to separate the subspecies borsalis and dresseri from examination of wings.

3. Banding and harvest surveys should not be viewed independently. The use of banding to relate kill to breeding stocks, and to provide information for use in improved wing keys, is indispensable. It should also be noted that age ratios from eider wing samples in the survey will not be reliably useful without the support of much more banding recovery data than are now available.

Postscript:

Discussion after the presentation

After the presentation there was a discussion of harvest surveys among the workshop participants, in which the following recommendations were made to be carried on to the January 18 meeting of CWS survey biologists:

- support the concept of regionalized surveys;

- provide regionally oriented feedback to survey respondents (badges, etc. could be provided through regional survey contacts). Feedback should show how results are being used to benefit birds/hunters (such as the black duck situation in eastern Canada);

- annual surveys should be maintained;

- rewards should be provided for the return of sea duck bird bands.

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BUILDING PUBLIC SUPPORT FOR THE CONSERVATION OF WILDLIFE

Kathleen Blanchard, Ph.D.
Quebec-Labrador Foundation

Populations of seabirds nesting along the North Shore of the Gulf of St. Lawrence experienced dramatic declines between 1955 and 1978 due in part to an illegal harvest of birds and eggs. A survey of heads-of-households along the Quebec Lower North Shore showed that 94 percent of respondents believed it was acceptable to hunt seabirds and seaducks for food needs and that an estimated 98,000 birds were harvested on an annual basis. Sixty-five percent of respondents did not know that murres were protected; 81 percent believed they should be allowed to hunt them. Ninety percent believed the Common Eider (Somateria mollissima) was an important species. Althought 82 percent knew the legal status for eiders, illegal spring shooting was a common practice.

The Quebec-Labrador Foundation initated a conservation and education program in 1978 to:

(1) help residents recognize the problem and the need to conserve their birds;

(2) teach practical seabird biology and conservation principles;

(3) encourage the development of a conservation ethic;

(4) train residents in conservation leadership, and

(5) build public support for wildlife policies and regulations. Strategies included summer youth programs, school activities, distribution of informational materials, and leadership training for teenagers. A local wildlife society for adults was established; members chose the eider as the society's logo.

Results of these strategies, plus those of the Canadian Wildlife Service, include increased public knowledge and concern for wildlife, greater collaboration among the public, wildlife agencies, and private conservation, organizations, and recent increases in populations of puffins and murres. Recommendations include the implementation of educational programs having special attention on eiders, the encouragement of projects that foster greater trust between wildlife agencies and the public, and the inclusion of conservation education into long-term comprehensive management planning. Building support for conservation of wildlife results in greater likelihood that management objectives will be achieved because the public develops and understanding of and personal commitment to the conservation goals.