

HARLEQUIN DUCK MANAGEMENT SYSTEM

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INTRODUCTION

This document describes the system used by the Maine Department of Inland Fisheries and Wildlife (MDIFW) to make decisions concerning management and habitat protection for Harlequin Ducks. Management Goals and Objectives for Harlequin Ducks have been established through the species assessment process with input from a public working group and are documented in the Harlequin Duck Assessment (Wickett 1999).

The Harlequin Duck (hereafter Harlequin) is a small, diving sea duck with striking slate blue, white, black, and chestnut plumage. It is one of the more beautiful waterfowl species in the world. Harlequins are found in the northern hemisphere and winter in both the Atlantic and Pacific Oceans. The larger Pacific population breeds in Asia and western North America. The Atlantic population is estimated at fewer than 15,000 individuals and is comprised of three breeding subpopulations: Iceland, Greenland, and eastern North America. Harlequins that winter along the coast of eastern North America, including Maine, are reported to come from a breeding population of about 1,800 individuals in southeastern Canada (Quebec, Newfoundland, and Labrador). This population winters from Newfoundland south to Maryland, although the majority winter in the Gulf of Maine. Most recent data suggest that approximately 1,150 – 1,300 birds winter in Maine, primarily in outer Penobscot and Jericho Bays (Mittelhauser et al. 2002).

Concerned about a suspected decline of an already low population, the U. S. Fish and Wildlife Service and MDIFW closed the hunting season for Harlequins in 1989.

Effective in 1990-91, there were no open seasons on Harlequins in Ontario, Quebec, the Atlantic Provinces, and eastern United States. The Harlequin was listed as Threatened under Maine's Endangered Species Act in 1997 based on the small numbers wintering in Maine (which at that time, represented more than 50 percent of the total estimated eastern North American population) and more than 90 percent of Maine's winter population was located at fewer than 5 sites.

MANAGEMENT GOALS AND OBJECTIVES

Goals and Objectives for Harlequins were developed by a public working group and approved by the Commissioner and the Commissioner's Advisory Council as dictated by MDIFW's strategic planning process. Harlequin goals and objectives are:

GOAL: Increase the distribution and abundance of Harlequin Ducks wintering in Maine and increase the public's understanding and appreciation of Harlequins and their wintering requirements in Maine.

Population Objective: By 2016, increase the number of wintering Harlequins in Maine by 20% by working cooperatively with the Harlequin Recovery Team.

Assumptions:

- Concurrent Management in eastern Canada to increase nesting success and recruitment on the breeding grounds is needed to increase the Maine winter population of Harlequins.
- The Harlequin Recovery Team (a group of U. S. and Provincial biologists and scientists coordinated by the Canadian Wildlife Service) will reconvene and collaborate with the Department to support Harlequin research and recovery.
- Funding and personnel are available for Harlequin research and recovery.
- Collaborative efforts can increase the number of Harlequins wintering in Maine.
- There is sufficient functional habitat in Maine to support an increase in distribution and abundance of Harlequins.
- Hunting season closure can increase adult survival and the number of Harlequins wintering in Maine.

Research Objective: Determine the factors limiting over-wintering survival of Harlequin Ducks in Maine by 2010.

Assumptions:

- Population viability is maintained by high rates of adult survival
- There are factors limiting winter survival of Harlequins in Maine.
- All limiting factors (natural and anthropogenic) can be identified. Limiting factors are multi-relational and can have multiple influences especially to a depleted

population and thus various problems and resulting management strategies may arise.

- Identifying limiting factors in Maine may contribute to efforts to increase population abundance since multi-facet problems often cause declines even though they may not be the initial cause of a population reduction.
- MDIFW has the funding and personnel to determine factors limiting over-wintering survival.

Habitat Objective: Identify and map by 2002 and maintain through 2016 all-important Harlequin wintering habitats in Maine.

Assumptions:

- Harlequins need ice-free rock ledges and outcroppings with extensive *Mastocarpus - Chondrus* beds (short intertidal red seaweed) that support high densities of invertebrates.
- Important wintering habitats for Harlequins can be identified and maintained.
- Identifying and maintaining important wintering habitats for Harlequins in Maine is critical to the management of this species throughout eastern North America.
- Identifying and mapping Harlequin habitats will contribute to MDIFW's oil spill contingency plan and may influence coastal routes used by oil-bearing ships.
- MDIFW has adequate funding and personnel to identify, map, and maintain important Harlequin wintering habitats in Maine.

Public Outreach Objective: By 2003, develop and implement, in conjunction with partners, an outreach program to promote an understanding and appreciation of Harlequin Ducks and their wintering requirements in Maine.

Assumptions:

- An outreach program is warranted.
- Illegal take of Harlequins will decrease as outreach efforts focus on Harlequin identification and hunter education.
- Human disturbance of critical wintering habitat will decrease as people have increased understanding of Harlequin's wintering requirements.
- MDIFW has adequate funding and personnel to work with partners to develop and implement an outreach program.

MANAGEMENT DECISION-MAKING PROCESS

This document consists of the management system outlining the decision criteria and management actions needed to achieve established goals and objectives for Harlequin ducks wintering in Maine.

HARLEQUIN DUCK MANAGEMENT SYSTEM

This management system provides the framework for Harlequin management by MDIFW. The Department's goal for increasing distribution and abundance of Harlequin ducks wintering in Maine and increasing the public's understanding and awareness drives management decisions and actions. To achieve established Harlequin goals and objectives, Harlequin management in Maine primarily consists of three components: 1) population monitoring, 2) habitat protection, and 3) public outreach. Management decisions are outlined in a series of yes or no answers to questions related to Harlequin abundance and population trends. Responses to questions are based on evaluation of input criteria, and the decision matrix guides the manager to the appropriate management options (Figure 1).

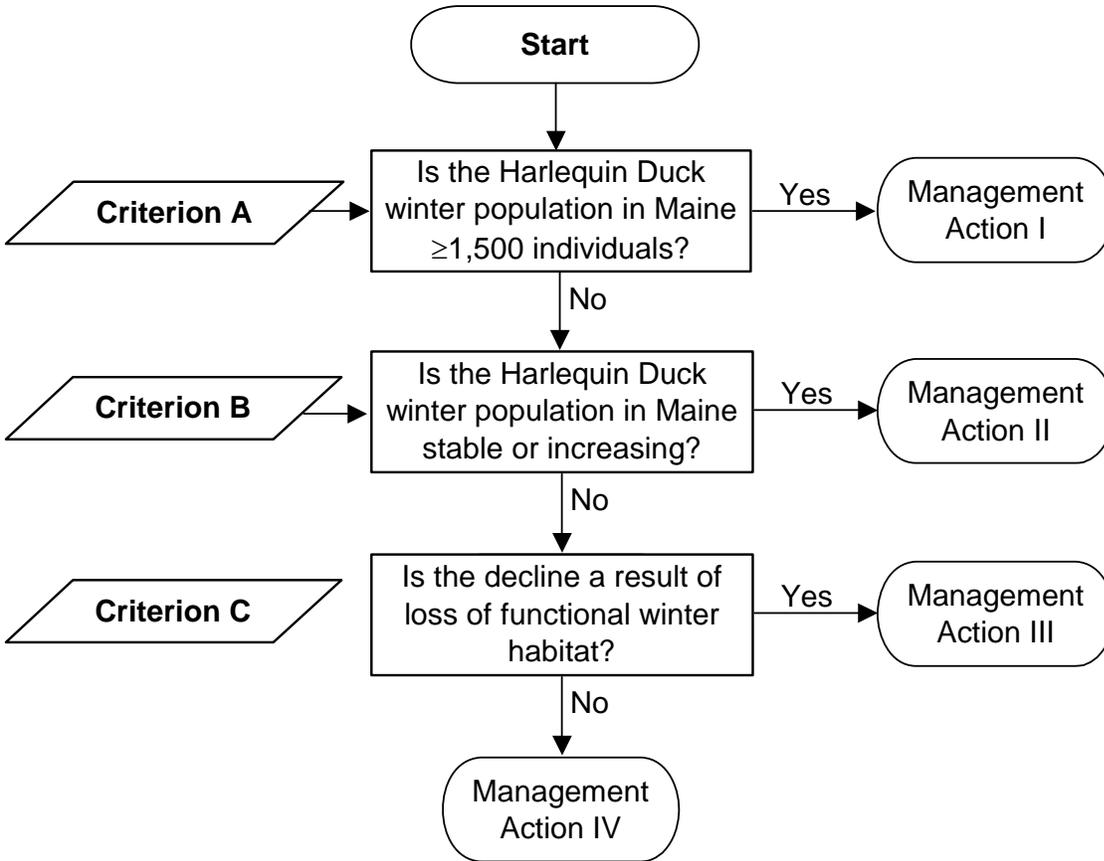


Figure 1. Flow diagram depicting decision criteria for Harlequin Duck Management System in Maine.

DECISION CRITERIA

The following criteria determine the recommended management options:

Criterion A

This criterion answers the question “is the Harlequin Duck winter population in Maine greater or equal to 1,500?”

Presently the Maine wintering Harlequin population is estimated between 1,150 to 1,300 individuals (Mittelhauser et al. 2002). The Harlequin winter population must increase by 20% by 2016, to satisfy the Working Group’s population objective. Data collected from intensive coast wide surveys will address this question.

Criterion B

This criterion answers the question “is the Harlequin Duck winter population in Maine stable or increasing?”

February counts from boat surveys using a designated survey route in outer Penobscot and Jericho Bays from 1997 – 2002 fluctuate between 700 and 900 individuals with the five year mean = 856. Both of the following rules of thumb must be met before the population is considered declining.

Rule of thumb: If the total number of Harlequins recorded in the most recent coast wide 5-year survey is >15% below 1,300 individuals, the Maine wintering population is below target. Optimal rates of recovery for Harlequins average 10-15% increase per year (Goudie et al 1994).

Rule of thumb: If the latest 5 years of annual outer Penobscot-Jericho Bay boat surveys has a significant declining population trend as determined by linear regression ($p < 0.10$), the Harlequin population is considered declining.

Criterion C

This criterion addresses the Working Group's Research Objective and asks the question "is the population decline a result of loss of functional winter habitat?"

Department biologists in collaboration with biologists in eastern North America, will be able to identify factors limiting population growth. If identified limiting factors are related to Maine winter survival, studies must be initiated to determine if limiting factors are related to loss of functional winter habitat. Winter habitat is restricted to traditionally used rocky shorelines or wave exposed ledges that are consistently ice free with extensive mastocarpus - chondrus beds supporting high densities of invertebrates. Functional winter habitats must be free from human-related disturbances and contamination. Review of MDIFW mapped Harlequin wintering sites will provide input needed to determine if there has been a significant loss of functional winter habitat.

Rule of thumb: Loss of functional winter habitat will be considered significant if one or more of the following alterations or degradations occur at one or more documented winter sites affecting 5% or more of the winter population as estimated in 2005:

Disturbance: Types of human related disturbance around Harlequin habitats include boat traffic associated with aquaculture and near shore commercial fishing or recreational fishing, and human traffic associated with coastal development. Although difficult to quantify disturbance, anecdotal information may be useful in determining disturbance effects on Harlequin sites.

Contaminants: Environmental contaminants are known to be present in most estuarine systems. Toxic contaminants affecting Maine's marine environment include heavy metals and organic compounds. Chemical contaminants that lower invertebrate densities or diversity would compromise the feeding area for Harlequins. Oil pollution may be the most widespread threat to Maine's coastal waters. Currently, approximately 110 million barrels of refined and unrefined oil are being transported in Maine's waters (MEPC 1999). A large spill could be devastating. A winter spill in outer Penobscot Bay could eliminate over 75% of the eastern North American Harlequin duck population.

Physical Alterations: Activities that may physically alter harlequin habitats include seaweed harvesting, inter tidal dragging or dredging, and aquaculture development.

MANAGEMENT SYSTEM OUTPUTS

The following management actions are recommended procedures for accomplishing Harlequin objectives. Specific management actions result from responses to decision criteria identified in Figure 1.

Management Action I

- 1) Continue current management (includes population monitoring, technical assistance for permit review, and habitat protection of all mapped Harlequin wintering sites).
- 2) Conduct annual February boat survey of outer Penobscot-Jericho Bays.
- 3) Conduct coast wide intensive survey in 2005, 2010, and 2015.
- 4) Assemble survey data into ACCESS database with geo-referenced locations in GIS layer. Update database and GIS layer as new data are collected annually and new location polygons defined.
- 5) Provide survey data to Habitat group for inclusion in Hmap and oil spill contingency plan.
- 6) Develop and implement, with partners, outreach programs.
- 7) Continue to collaborate with biologists in eastern North America.
- 8) In 2016, use the MDIFW planning process in conjunction with the public working group, to review and update the Harlequin Management Goals and

Objectives. The group may want to consider developing a new population objective as needed.

Management Action II

- 1) Continue with steps 1 – 6 from Management Action I.
- 2) Continue to collaborate with biologists in eastern North America and consider reestablishing the Harlequin Recovery Team. Cooperative efforts are needed to determine if Maine's winter population has not reached the population objective because of limitations on the nesting/molting habitats in Canada and Greenland.
- 3) In 2016, secure research funding and partners to determine why the Harlequin population has not reached the population objective set by the public working group in 2001.

Management Action III

- 1) Secure funding and partners to initiate studies to identify limiting factors within Maine.
- 2) Monitor threats and/or degradations from coastal development, aquaculture development, algae harvesting, chemical contamination, etc.
- 3) Quantify amount of functional habitat loss.
- 4) Reverse or mitigate habitat losses. This may include using both regulatory and non-regulatory approaches to reduce disturbance or alterations to winter Harlequin habitats.

- 5) Consider defining and mapping Harlequin winter sites as Essential Habitat (a 1988 amendment to the Maine Endangered Species Act of 1975) and/or significant wildlife habitat under the Natural Resource Protection Act (1988).
- 6) Continue steps 1 – 6 from Management Action I.

Management Action IV

- 1) Initiate cooperative efforts with biologists in eastern North America; consider reestablishing the Harlequin Recovery team to determine if population decline is a result of problems occurring in Maine or on the breeding/molting habitats in Canada and Greenland.
- 2) Initiate studies to determine causes of poor winter survival and associated mortality in Maine (predation, disease, illegal take, pelagic oil contamination, etc.).
- 3) Develop and implement management strategies to offset cumulative problems that may be escalating population declines, such as defining and mapping Harlequin winter sites as Essential Habitat (a 1988 amendment to the Maine Endangered Species Act of 1975) and/or Significant Wildlife Habitat under the Natural Resource Protection Act (1988).
- 4) Investigate illegal harvest during the waterfowl season.
- 5) Continue with steps 1 – 6 from Management Action I.

PART II: HARLEQUIN DUCK DATABASE

HARLEQUIN DUCK DATA COLLECTION SUMMARY

Population Monitoring

Data collected from two surveys will be used to determine wintering Harlequin Duck population trends. One survey is an intensive coast wide survey done every 5 years and the other is an annual boat survey of the core area of Harlequin winter habitat in outer Penobscot Bay and Jericho Bay.

Intensive Coast Wide Survey: This survey will be implemented every five years, with the survey of 2000 as the base year. The next scheduled survey will occur in 2005. Optimal timing of this survey should be in the middle of February. Traditional Harlequin sites from Kittery to Portland can be surveyed from the shoreline using spotting scopes. Harlequin sites in Blue Hill Bay, Frenchman's Bay, Jericho Bay, and Penobscot Bay, require a boat survey with the exception of Isle au Haut, which can be surveyed from shore. Surveys east of Schoodic Point require a combination of shore-based and boat surveys. Efforts to find new sites used by wintering Harlequins will be made depending on available personnel and funding. A list of traditional wintering Harlequin sites is available from the Harlequin Duck Access database in the Bird Group and the Habitat Group can generate associated maps.

Annual Boat Survey of outer Penobscot and Jericho Bays: This survey involves searching harlequin wintering sites around selected islands and ledges between Vinalhaven east to Swans Island including Isle au Haut. These sites have been annually surveyed from a boat since 1998. Pending available funding, this survey will continue to be an annual survey performed in February by boat. A list of the islands and ledges surveyed and a map of their locations are included in Appendix I.

Databases

All survey data collected will be entered into an Access database and will be connected to a geodatabase in the Habitat group for inclusion in oil spill contingency planning and Hmap.

LITERATURE CITED

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- Mittelhauser, G. H., J. B. Drury, and P. O. Corr. 2002. Harlequin Ducks (*Histrionicus histrionicus*) in Maine, 1950-1999. *Northeastern Naturalist* 9(2): 163-182.
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APPENDIX I

**Harlequin Duck winter sites surveyed in the annual outer Penobscot Bay –
Jericho Bay survey.**

Island/ledge	Township
<i>Penobscot Bay:</i>	
Aires Ledge	Vinalhaven
Channel Rock	Vinalhaven
Long Ledge	Vinalhaven
Little Roberts	Vinalhaven
Roberts	Vinalhaven
Otter	Vinalhaven
Yellow Rock	Vinalhaven
Buffaloes	Vinalhaven
Little Brimstone	Vinalhaven
Eastern Ledge	Vinalhaven
Holden Ledge	Vinalhaven
Brimstone Island	Vinalhaven
Shag Rock	Vinalhaven
Hay Island	Vinalhaven
Middle Ledge	Vinalhaven
Carvers Island	Vinalhaven
<i>Jericho Bay:</i>	
Black Horse Ledge	Isle au Haut
White Horse Ledge	Isle au Haut
Great Spoon Island	Isle au Haut
Great Spoon Dry Ledge	Isle au Haut
Little Spoon Island	Isle au Haut
Cow Pens	Isle au Haut
York Island	Isle au Haut
York Ledge	Isle au Haut
Rich's Ledge	Isle au Haut
White Ledge	Isle au Haut

Jericho Bay cont.:

Green Ledge	Isle au Haut
S. Popplestone Ledge	Isle au Haut
Fog Island	Isle au Haut
Fog Island Knob	Isle au Haut
N. Popplestone Ledge	Isle au Haut
Saddleback Island	Swans Island
Three Bush Island	Swans Island
Marshall Island	Swans Island
Boxam Ledge	Swans Island
Ring Town Ledge	Swans Island
Yellow Ledge	Swans Island
Brimstone Island	Swans Island
Brimstone Ledge	Swans Island
Heron Island	Swans Island
Mason Ledge	Swans Island
Black Ledge	Swans Island
Spirit Ledge	Swans Island
Drunkard Ledge	Isle au Haut
Seal Ledge	Isle au Haut
Turnip Yard	Isle au Haut
Southern Mark	Isle au Haut
Halfway Rock	Swans Island
Heron Island Ledge	Swans Island
Green Island	Swans Island
Scrag Island	Swans Island
Baker Island	Swans Island
Johns Island	Swans Island
Johns Island Dry Ledge	Swans Island
Long Island	Frenchboro
Drum Island	Frenchboro

Isle au Haut:

Horseman's Point	Isle au Haut
Seal Ledges	Isle au Haut
Ledge north of Boom	Isle au Haut
Boom Beach	Isle au Haut
Sheep Thief Gulch	Isle au Haut
Eastern Ear	Isle au Haut
Head Harbor	Isle au Haut
Barred Harbor	Isle au Haut
Squeaker Cove	Isle au Haut
Big Rock Ledge	Isle au Haut
Twin Ledges	Isle au Haut

Isle au Haut cont.:

Southern Cove
Western Ear
Big Brewster
Duck Harbor
North Brandie

Isle au Haut
Isle au Haut
Isle au Haut
Isle au Haut
Isle au Haut