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# Ripple Marks

The Story Behind the Story BY CHERYL LYN DYBAS

## LIFE IN ROUGH SEAS

### For Harlequin Ducks, Home is Churning Rapids and Pounding Surf

The sea has gone the color of old silver, its surface as smooth as a wave-worn shell. It's an hour before dawn on this  $-12^{\circ}\text{C}$  ( $10^{\circ}\text{F}$ ) day in January at Rhode Island's Beavertail State Park, a 153-acre rocky promontory shaped like a beaver's tail. Beavertail juts out from the southern end of Conanicut Island into Narragansett Bay and the Atlantic Ocean beyond.

Another hour passes; sunup is on the horizon. Fierce winds begin to blow, whipping the once-calm ocean below Beavertail's boulder-strewn cliffs into a froth. Stepping onto the park's steep—and today, ice-covered—path to the sea might feel like falling into gray oblivion. Indeed, local newspapers once hailed the area's vistas, but warned that “the drop to the Atlantic is an easy walk to eternity for those not sure of foot.”

Peering through tangled, seemingly lifeless briars along a barely there track, Peter Paton, an ornithologist at the University of Rhode Island (URI), begins his descent. Tough going awaits; the cliffs lie exposed to constant erosion from sea and storm. Covering his face with a scarf against the biting cold, he carefully makes his way around enormous boulders dropped by

long-ago glaciers, and picks his way down to the water's edge.

His quarry lies where rock meets ocean at jagged underwater ledges: the harlequin duck (*Histrionicus histrionicus*), one of North America's smallest and most beautiful sea ducks. Although scientists have solved several mysteries about the harlequin's unusual predilections for rough seas and a salmon-like lifestyle, others remain open.

#### DUCK OF WHITE WATERS

To find answers, Paton has come to count harlequins along Narragansett Bay's shoreline. In the 1800s, the ducks' numbers along the East Coast peaked at 5,000 to 10,000. Then, overhunting, as well as habitat loss and other factors, reduced them to about 1,000 before hunting along the Eastern Seaboard was banned in the late 1980s. With restrictions in place, East Coast harlequin numbers have rebounded to some 1,800 ducks.

Rhode Island's rocky coast—Beavertail in particular—is a winter haunt for these brave surfers. With adult males' dark blue heads, light blue bodies, and chestnut sides (adult females are a brownish-gray),

the ducks' common name comes from a likeness to the colorfully dressed character Harlequin in Commedia dell'arte. Their species name is derived from the Latin word *histrion*: actor.

The birds are also known as lords and ladies, offers Paton, lifting his binoculars into the stiff wind to search for “bobbers”—harlequins that dive down to snag a mussel or crab, then somehow manage to pop up again in the very same spot. White-eyed diver, blue streak, and rock duck are among the harlequin's other names, for good reason. “How these ducks can survive right at the crests of breaking waves is a marvel,” Paton says as he points to a harlequin that appears and disappears in roiling waters.

Harlequin ducks are split into two populations, Pacific and Eastern, according to *Ducks, Geese, and Swans of North America*. The Pacific is the larger, at about 200,000 birds. They breed from Alaska south to British Columbia and inland to the northern section of the Rocky Mountains.

Eastern harlequins, the smaller population, nest primarily in Quebec, Labrador, and Newfoundland. Satellite radio-tracking and genetic data show two sub-parts to

All photos courtesy of Ilya Raskin





this population: one in Greenland, the other along the US East Coast from Maine to southern New England.

In winter, birds in both populations head to rocky coasts, where they settle close to shore.

In summer, harlequins nest along fast-flowing inland rivers and streams. They're one of only four waterfowl species in the world with this whitewater affinity. The others are the blue duck of New Zealand, the aptly named torrent duck of the South American Andes, and the Salvadori's duck of New Guinea. Breeding harlequins flock to the headwaters of streams that flow into lakes with abundant black flies, a favorite summertime harlequin meal.

During their migration from coasts to interior rivers, the birds become salmon with feathers. To get to nesting sites, harlequins fly just above stream bends. "When passing up stream it zigzags and turns, to accommodate its line to every bend of the stream, however slight," wrote ornithologist Arthur Cleveland Bent in his monograph series published by the Smithsonian Institution from the 1920s through the 1950s.

"The harlequin never thinks of cutting off corners, and it would seem that it imagines that its lift depends on keeping exactly over the water, however much it bends or twists," Bent states. "I have seen harlequins fly religiously above a bend in a stream that formed almost a complete circle in its course, and yet the birds did not cut across it to shorten their route."

After the breeding season, harlequins return to ocean cobble-gravel or bed-rock-boulder substrates, small offshore islets, or shorelines

with attached or nearby reefs and islets. Their favorite locales are places with tidal rapids swooshing across boulder-covered bottoms. A perfect description of Beavertail.

"Watching harlequins frolic as waves crash into the rocks around them is an exciting experience," says Paton. "These ducks may seem like the epitome of resilience, but that's not always the case."

#### BELEAGUERED HARLEQUINS

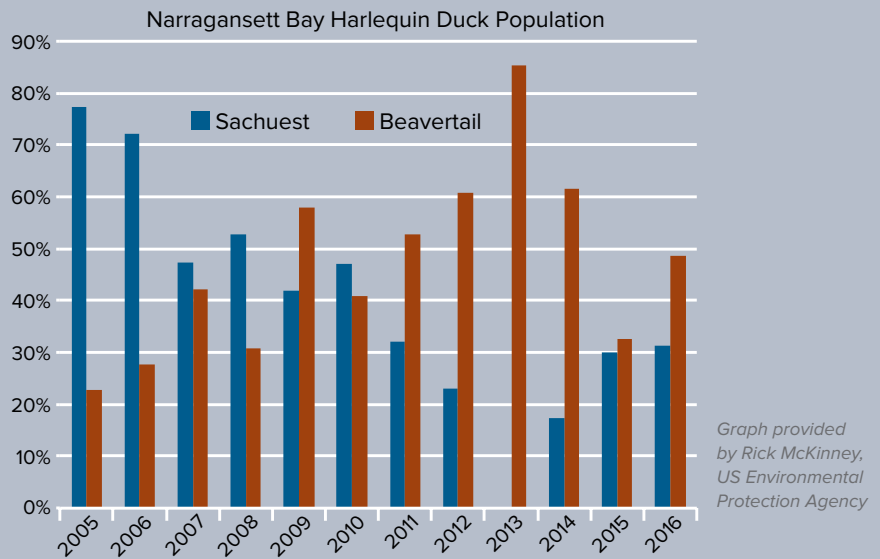
Silted-in streams from logging and other development runoff. Overhunting. Fast-flowing rivers slated for hydroelectric plants, such as the Torrent River in Newfoundland. Oil from the 1989 Exxon Valdez spill in Southeast Alaska and other pollutants along coasts, streams, and lakes. These and other factors have contributed to the harlequin's decline.

The Exxon Valdez spill alone killed or injured thousands of harlequins in the Pacific population. Studies

conducted from 2005 to 2009 show that all sex and age classes of harlequins in southeast Alaska were still being exposed to oil hidden in the intertidal zone—20 years after the spill. Research indicates that the recovery of the region's harlequins could take a quarter-century or longer from the time of the disaster. Elsewhere in the Pacific population, the rapid expansion of the aquaculture industry in coastal British Columbia is a concern due to competition for prime harlequin habitat.

Inland in Montana, Glacier National Park scientists have begun a study of harlequin ducks on Upper McDonald Creek. Harlequins occur on only a limited number of streams in Montana; more than 25% of all harlequin duck chicks produced in the state are raised along Upper McDonald Creek.

The researchers are using radio-telemetry and bird-banding to expand their knowledge of where harlequins nest and the factors affecting chick survival.



Harlequins are at high risk of local extinction due to their limited numbers, sensitivity to disturbance, narrow habitat preferences, and ongoing habitat loss or alteration. The effects of climate change and consequent differences in spring snowmelt runoff are also a threat to this species, park biologists have found.

A similar study is underway in Grand Teton National Park, Wyoming. Harlequin ducks in Wyoming breed exclusively in mountain streams and rivers in the northwestern portion of the state, says project director Lucas Savoy of the Biodiversity Research Institute. Wyoming's harlequin duck population is unique, representing the extreme southern and eastern extent of the western North American population. The harlequin duck is one of the rarest birds in the state of Wyoming; its current range is limited to the Jackson Hole area and the Teton Wilderness.

In the eastern population, past overharvesting in coastal wintering areas is the likely culprit in low numbers of the ducks. The fall-off led to the closure of harlequin hunting seasons in the Atlantic Flyway in 1989, and the listing of the species as endangered in eastern Canada in 1990. In the years following, the eastern population began to recover, with counts increasing in harlequin haunts such as Isle au Haut in Maine and Canada's Maritime Provinces. In 2001, Canada

delisted the eastern population, lowering its status from endangered to species of special concern.

#### GOOD NEWS ON THE HORIZON

In good news for the Pacific population, results of a study by Eric Ward of the National Oceanic and Atmospheric Administration show that harlequin ducks are faring well in the Puget Sound region of Washington. Biologists affiliated with the Puget Sound Seabird Survey used citizen-science data to identify local hotspots of seabird occurrence. The findings were reported in the journal *PeerJ* in January 2015.

A glimpse of the eastern population's future may lie in what's happening with Beavertail's wintering harlequins. The ducks feed on amphipods, crabs, mussels, and other invertebrates that cling to wave-pounded underwater rocks. Paton locates a bird that's just surfaced with a small crab in its beak. "It's a lucky sighting," he says. "We seldom catch a harlequin in the act of snagging its prey."

Blue mussels are among the harlequin's main food sources. "These mollusks grow in immense beds on shallow ledges and are easily obtained," wrote Bent. "Occasionally a large mussel has been known to trap the [harlequin] duck and cause its death by drowning."

All luck aside, Paton's research has

found good news for Rhode Island's wintering harlequins.

The biologist analyzed historical records and recent observations, and discovered that the ducks' numbers have increased by about 3% per year since 1975. In the mid-1970s, there were fewer than five wintering harlequins in Rhode Island waters, says Paton. Today there are more than 150.

To determine wintering harlequin numbers, Paton and Christine Caron, also of URI, performed 28 surveys between January and March at the two Rhode Island sites with the largest numbers of the ducks: Beavertail, and Sachuest National Wildlife Refuge (NWR), the latter on Aquidneck Island.

To look at the effects of tide and time of day, the scientists conducted counts at low tide in the morning, low tide in the afternoon, high tide in the morning, and high tide in the afternoon. Zones included areas within 50 m (164 ft) of the shoreline, those within 50 m of offshore rocks, and areas greater than 50 m from either shoreline or offshore rocks. The most harlequins were detected near shore at low tide. Paton and Caron published their results in the *Journal of Field Ornithology*.

The explanation for the pattern? The ducks may find it easier to snag intertidal zone prey that's exposed at low tide. Because of harlequins' small size, they must feed almost constantly during





daylight hours. “Close-to-shore rocky habitats support their preferred food items,” Paton says, “and foraging bouts are more energy-efficient in shallow water because dive and search times are reduced.”

Similarly, ecologist Rick McKinney of the US Environmental Protection Agency’s Atlantic Ecology Division in Narragansett found that harlequins south of Cape Cod winter along coasts with high mollusk and crustacean prey density. In choosing sites, the ducks avoid areas within 100 m (328 ft) of human development. “Harlequins may be especially vulnerable while concentrated on their wintering grounds,” says McKinney. “Even small, localized disturbances can affect substantial portions of the population.” He and colleagues published the results in the journal *Northeastern Naturalist*.

### HARLEQUIN MYSTERY

Along the way, the biologists discovered a curious trend. Sachuest NWR has been considered the hotspot for wintering harlequin ducks not only in Rhode Island, but in New England south of Maine. McKinney’s field research, however, turned up more harlequins at Beavertail than at Sachuest, a trend that’s continued through this winter (2015–2016).

The scientist has kept close track of what’s happening at the two sites, which are less than 10 miles apart by car and fewer than that as the harlequin duck flies. He runs the Narragansett Bay Winter Waterfowl Survey, begun in the winter of 2001–2002 as part of an effort to investigate the effects of habitat change on coastal wildlife. Each year in early January, a census is taken along Narragansett Bay’s coast for harlequins and other waterfowl such as common eiders. Plans are underway to add dates in November and March.

In 2005, 75% of Rhode Island’s wintering harlequin ducks were found at Sachuest; only a little more than 20% rode the surf off Beavertail. The switch happened in 2011, when 50% of Narragansett Bay’s harlequins were at Beavertail, and some 30% at Sachuest. By 2013, 85% had taken up winter residence at Beavertail, with none found at Sachuest. In 2016, the number fell to some 48.6% at Beavertail vs. 31.2% at Sachuest.

What’s going on? McKinney thinks it’s “most likely related to prey availability, which for some reason may be better



in most years at Beavertail. It remains a mystery, as the areas are similar in terms of habitat and human disturbance.” He hopes that with additional surveys, the reasons may become clear.

Among the possibilities is climate change. Narragansett Bay’s water temperature has increased 2°C (3.6°F) since the 1960s. The warming waters are leading to changes in species composition and dynamics. Blue mussels are particularly affected. Ocean acidification, a result of climate change, has turned the mussels’ byssal threads, which the shellfish use to attach to rocks, into flimsy fibers instead of taut tethers. Mussels may be tossed about by wind and waves, and eventually set adrift.

Will shifting food resources be the harlequin duck’s next challenge? “At this point, we really don’t know,” says McKinney.

The movements of common eiders (*Somateria mollissima*), seaducks that share rough winter waters with harlequins, may hold some answers. Common eiders

are currently Beavertail’s most abundant winter ducks. More than 750 were counted there last winter (January 2015). “Blue mussels are a preferred food of common eiders,” says McKinney. “Flocks may shift to other feeding locations if the mussels aren’t available.” Scientists don’t think that’s happened yet at Beavertail, but, McKinney says, “we’ve seen this occur elsewhere in southern New England coastal waters.”

### SUNSET OVER BEAVERTAIL’S HARLEQUINS

It’s well after noon, and Beavertail’s wintry light is beginning to fade. Paton stows his binoculars. The wind has grown stronger, threatening to carry him away. He turns on a path up the cliffs—to face the wildest seas of the day. Spindrift, wind-blown sea spray, clings to his hat like a net of icy pearls, and the ocean seems to pull him into darkening waters.

“You have to wonder,” Paton muses, “is this what it’s like to be a harlequin duck?”

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