Experimental use of the Gull Toxicant DRC 1339 at Machias Seal Island Bird Sanctuary in 1984

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INTRODUCTION

Machias Seal Island (M.S.I.) is located 18 km southwest of Grand Manan, New Brunswick. This small (10 ha.) but important Migratory Bird Sanctuary is administered by the Canadian Wildlife Service, Environment Canada. The island is a breeding site for five species of seabird; Arctic Tern (Sterna paradisaea), Common Tern (Sterna hirundo), Atlantic Puffin (Fratercula arctica), Razorbill (Alca torda) and leach's Storm-Petrel (Oceanodroma leucorhoa).

The tern numbers at this site and in adjacent New England waters have been declining since the 1940's (Drury 1973-74, Korschgen, 1979). Seabird researchers have attributed the decline, in part, to predation by gulls and to their out-competing the terns for available nest sites. The populations of the competitors, Herring Gull (Larus argentatus), and Great Black-backed Gull (Larus marinus) have increased substantially in recent decades.

Historically, populations of terns on M.S.I. were possibly as high as 5000 pair (Hawksley, 1950) and as low as 2000 pair (Brown, 1911). Historical data also indicate that terns once nested on Gull Rock, a small (1 ha) rocky islet off the North end of M.S.I. More recently, Parker, 1973 estimated the tern population at 2100 pair, and there is no recent evidence of terns nesting on Gull Rock.

During the summer of 1982 and 1983 scare tactics were used on M.S.I. in an attempt to curb predation of Arctic Tern eggs and chicks by gulls. Under the authority of a scientific scare and kill permit, a .22 caliber rifle was used to scare and when possible kill predating gulls. That method of gull control was deemed moderately successful, resulting in increased Arctic Tern fledging rates and a recolonization of the southern sections of M.S.I. where predation by gulls was intense in 1981. However, the scare and kill method is very time-consuming and cannot remove the large numbers (20) of marauding gulls present during the critical tern nesting and early rearing period. The number of incidents of gull attacks on Arctic Tern eggs or chicks during the past decade has caused a great deal of concern for sanctuary administrators.

In 1984 the Canadian Wildlife Service obtained a research permit to apply a toxicant to assist in the control of populations of Herring and Great Black-backed Gulls at Machias Seal Island. That permit (#51-RP-84), issued under the Pest Control Products Act, allowed the CWS use of a U.S. registered chemical, (3-chloro-4-methyl benzamine hydrochloride) known as DRC-1339, which was formulated in the early 1960's and originally tested by the U.S. Fish and Wildlife Service at the Denver Wildlife Research Centre on Starlings (Sturnus vulgaris). This report documents the handling, application and results of use of that toxicant, on gulls, during the period May - July 1984.

METHODS AND MATERIALS

The toxicant DRC-1339 was obtained from the U.S. Fish and Wildlife Service. This chemical is highly toxic to gulls, yet considerably less so to most mammals. However, safety precautions must be taken by those who are preparing the toxin for the target species.

SAFETY PRECAUTIONS

The following instructions were received from U.S. Fish and Wildlife Service. The person handling the DRC-1339 in its raw form and preparing it for mixing was required to wear a respirator, proper protective clothing, i.e., lab coat and rubber latex gloves. The respirator was only worn when the raw DRC-1339 was exposed. Once the toxin was mixed with a margarine base the respirator was no longer required. The preparation room was well-ventilated, and the preparation area was washed down with water following mixing. When dispersing the treated baits, latex gloves were worn.

DRC-1339 Mixing and Bait Preparation:

The anhydrous DRC-1339, 3-chloro-4-methyl benzamine hydrochloride, was mixed into a margarine base. The margarine was first heated until it was viscous, but not liquid, and the powdered toxin was then added. The proportions of base to toxin were 454 grams of margarine to 6 grams of the DRC-1339.

The two components were then mixed with a blender until a homogeneous mixture was attained. Mixing required 30 minutes and the blend was then allowed to cool for 15 minutes before spreading.

The baits were prepared by taking 10 milliliters (1 heaping tablespoon) of the margarine/DRC-1339 mixture and spreading it onto a piece of bread, then covering it with another piece of bread. The "sandwich" was then cut into nine equal pieces and placed in a plastic bag. Each cube contained approximately 22 mg of DRC-1339. To insure toxicity, bait preparation was done within 24 hours of the intended application at the site. All baits made in advance were refrigerated and kept away from direct light and heat until time of application, to retard the decomposition of the DRC-1339.

The application site was Gull Rock, a 1 ha barren rock approximately 300 meters northeast of Machias Seal Island, which is the main local roosting area for gulls. At the application site the baits were placed in groups of three, approximately two meters apart. The bait placement formed a grid over the application site. That insured that no matter where a gull landed it was exposed to the baits. All baits were placed above the high tide line, thus avoiding the loss of baits due to the tides. A few days prior to application, non-toxic baits were placed on the rock to get the gulls familiar with the sandwich-type baits (prebaiting). Following

application of the baits, the activities of the gulls on Gull Rock were monitored (from M.S.I.) at three-hour intervals. After 48 hours had elapsed since the first toxic baits were ingested,the Rock was revisited and dead gulls were removed. The carcasses were placed in weighted garbage bags, disposed of at sea on the return trip to M.S.I. Any regurgitated or rejected baits were collected and disposed of in the same manner.

RESULTS AND DISCUSSION

This project was initiated to monitor the effectiveness of the avicide, DRC-1339, in controlling a gull population, with the long-term prospect of re-establishing a tern population on a historical site (Gull Rock).

During the first prebaiting, in late May, there were 55 gulls were present and all 99 baits were readily accepted. By May 25th, Arctic Terns were just beginning to court and it was thought that if Gull Rock was devoid of gulls the terns might attempt to nest. A total of 252 toxin-laced baits was presented to 33 gulls on Gull Rock. All of the baits were ingested within five hours. Observations, by late afternoon, were discontinued due to fog. Observations were resumed 36 hours later, three dead gulls were noted. Weather conditions did not allow a landing on Gull Rock until May 28th, (elapsed time 67 hours). A total of 26 dead gulls was found in various locations over the rock. The demise of the seven other gulls

that ingested the toxin was unknown. However, it is possible that they died elsewhere. For the next three days, the island was free of gulls, except for three subadults that roosted there only at night. During this three-day period, a small number of terns (approx. 25 pair) were courting, copulating and nest scraping on Gull Rock. However, only 12-15 pairs appeared to stay for the night. By the end of the fourth day the gull population was back to 30 individuals.

The second application of the toxin was on June 6th and 28 gulls were present on Gull Rock. A total of 450 baits was placed on Gull Rock in the early afternoon. By late afternoon baits were being accepted by all individuals. However, by dusk unaccepted baits were still present. Dense fog then curtailed observations until the morning of June 10th, when inspection of the rock revealed that 123 baits were regurgitated and 64 were left untouched.

Two possible factors may have caused the regurgitation or bait rejections. Possibly the toxin was not mixed homogeneously. This could result in concentrations of the toxin large enough to be detected visually or possibly by taste. (Goetel U.S. Fish & Wildlife Service pers. comm.). Secondly, there may have been too many baits for the number of gulls, thus overdosing and possibly causing a physiological reaction that would cause the gull to vomit. If the reaction caused discomfort and bait association took place, this would account for the 64 untouched baits.

No carcasses were present. However, there were also no gulls. That suggests two possible scenarios. First,the gulls possibly may have experienced an unpleasant effect from short-term ingestion of the toxin and left the area, or the gulls may have ingested enough of the toxin to kill them, but were able to fly off the rock and died in another place.

Since there was some possibility that some gulls were still alive following the June 6th application and thus perhaps bait-shy, it was thought necessary to prebait the area once again. On June 17th, 1984 untreated baits were applied to Gull Rock, and all of the baits were readily accepted within 1 1/2 hours by the 126 gulls present.

In subsequent days the number of gulls were increasing dramatically. By June 24th there were 371 gulls (58% Great Black-backed) on Gull Rock and M.S.I. proper. A total of 297 treated baits were prepared and distributed over Gull Rock and all baits were accepted. However, before the 24-hour behavioural-observational period could be completed, gale-force winds caused the sea, at high tide, to wash over Gull Rock. Therefore no carcasses were found except for one, three days later, on M.S.I., but there was no way of determining the cause of death due to decomposition. For three days following the storm there were no gulls roosting in the area. However, the numbers of gulls gradually increased to 30-50 during the first week in July. During the following three weeks, the number of gulls increased dramatically to 700+ roosting individuals.

This was concurrently followed by a dramatic increase in gull attacks on the tern colony.

Conventional scare tactics were effective, but the scare/kill tactic could not always be used at the appropriate time owing to tourists being in the area. Consequently many mid-day marauding gulls could not be eliminated.

Therefore on July 25th, 396 treated baits were set out for 700+ gulls. Within an hour all baits were accepted. During the first observation period the next morning, the gull numbers had decreased dramatically to 425. At the end of the 48-hour observation period, the rock was revisited, but only four dead gulls were found.. There were no bait rejections and it was highly unlikely that these four individuals were the only ones to ingest the toxin. Since there was a substantial decrease in gull numbers within 12 hours of applications/ ingestions of the toxin, many individuals may have been experiencing the ill effects of the toxin, and left the area and died elsewhere. That is highly possible, because this population of gulls tends to be transitory. Therefore, this would help explain why so few carcasses were found. Also, during the 48-hour period following the 25 July Gull Rock application, there were unconfirmed reports (U.S. Fish and Wildlife Service) of dead Herring and Great Black-backed Gulls along the coast of Maine.

There were no further applications of the toxin because the number of gull attacks decreased and the majority of the tern chicks were large enough to fledge or had fledged.

Behaviour observed

Once the treated baits were ingested the behavioural and physiological effects on the affected individual were quite apparent, the former more so than the latter. The time of death in both the Herring and Great Black-backed Gull varied depending on how many baits were ingested. Those individuals receiving a lethal dose of the toxin usually died between 24 and 48 hours after ingestion. However, it was rare for an individual to die in less than 24 hours.

All affected individuals exhibited the same symptoms, yet the timing of each stage tended to progress at different rates depending on the individual and the amount of toxin ingested. During the first 5 to 8 hours the gulls exhibited normal behaviour. However, during this same period the physiological damage has commenced. The DRC-1339 acts as a kidney depressant. The toxin causes a great deal of vascular disruption in the kidneys and to a lesser extent in the liver. By the end of stage 1 the kidneys are no longer functioning. By 8-24 hours, stage two, the birds became very lethargic and remained in the upper portion of the rock above high tide. During this and subsequent stages the lethargic gulls did not eat, drink or fly. During this stage they remained listless

and inactive, with their feathers fluffed up as if they were cold. They showed little or no response to external stimuli. During this stage it is possible to distinguish the affected from the unaffected gulls.

By the end of stage 2 the toxic uric acid waste products have gradually accumulated in the bloodstream to a point where they are causing uremic poisoning (Mullen, 1984). This is followed by stage 3 wherein the bird becomes comatose and dies within 24-48 hours. From external appearances alone the gulls appeared to be asleep with their bills under folded wings. There were no cases where the gull showed signs of distress. The method is felt to be humane as it is so highly toxic to gulls. Once ingested, 80% of the DRC-1339 is metabolized into two non-toxic chemicals, CPT-C (4-acetylamino-2-chlorobenzoic acid) and CPI-D (4-amino-2 chlorobenzoic acid) within 2-4 hours. The remaining 20% of the DRC-1339 is excreted (approx. 10%) or remains in the body after death (Schafer, 1979).

Pathology

A number of affected birds were dissected and each individual exhibited varying degrees of internal organ damage, most noticeably to the kidneys and the liver. In each case the liver was mildly affected compared to the massive destruction of the kidney. Externally the liver appeared to be smaller with varying degrees of hemorrhaging and mottling. The

mottling was characterized by off-white oblate-spherical-lumps that occurred randomly throughout the liver. In more severe cases the mottling would be accompanied by massive swelling and hemorrhaging of blood vessels.

In all cases, the damage to the kidneys was most pronounced. Externally the kidneys were irregularly shaped with a large number of lesions, massive hemorrhaging and severely mottled. The disfigured kidney had small pools ofblood along the exterior cortex, probably induced from the hemorrhaging. Gross cross-sections of the kidney revealed the extent of internal damage. Most of the internal structures and blood vessels inside the kidney were ruptured.

Although the kidneys and liver showed the greatest degree of damage, in three cases there appeared to be blood vessel damage in the heart. There were varying degrees of hemorrhaging along the blood vessels extending from the exterior coronary artery. The reasons for this are unknown.

CONCLUSIONS

The avicide DRC-1339 was found to be very effective in removing a large number of gulls in a short time period. It is a very versatile tool in controlling gull numbers, because it is so highly toxic to gulls. Environmentally it is very safe to use because it decomposes rapidly into harmless products. Proper application results in virtually no chance of accidental poisoning of non-target species. Even if the dead birds were

eaten, the residual DRC-1339 left in the body would not be enough to cause any damage to the scavanger. Finally, the toxin causes a calm death from uremia, therefore non-affected gulls do not associate the baits with death. This allows successful repeating of the process.

This toxin would be most useful when dealing with nesting gulls, where the primary objective was to clear the island of adult gulls for another preferred species. The DRC-1339 toxin has clearly proven itself to be most effective in this respect.The U.S. Fish and Wildlife Service successfully carried out such a strategy on Petit Manan Island, Maine in 1984. There are potential areas for its use in the Atlantic Region.

RECOMMENDATIONS FOR GULL CONTROL ON MACHIAS SEAL ISLAND

DRC-1339 toxin was successful in killing large numbers of gulls. However, the uses for this toxin on Machias Seal Island are quite limited for the following reasons.

1. Elimination of the transient gull population on M.S.I. would be futile, impractical and very costly unless an extensive regional gull reduction program was implemented.
2. The majority of the transient gulls visiting M.S.I. or Gull Rock are not concentrating on attacking the Arctic Tern colony. On the contrary, collections of gull fecal and regurgitated pellet samples from both M.S.I. and Gull Rock

suggest that the majority are feeding mainly on intertidal invertebrates and fish remains (from the local fisherman in the area). The small minority of those gulls that specialize in marauding can be dealt with by using conventional scare/kill tactics (i.e. .22 cal rifle). Therefore, unless the mandate of C.W.S. administration of this land changes, (i.e. eliminate marauders vs. decreasing the gull population), the use of DRC-1339 on M.S.I. should be discontinued, because it cannot be targeted at specific individuals within the gull population.

3. Attempting to re-establish terns on Gull Rock would be quite impractical and in all probability a waste of time and resources. Besides the problem with the transient gull populations, there are environmental and geo-physical problems to contend with. The rock's morphology makes it vulnerable to waves breaking over it during heavy seas. Usually at least one major storm hits during the nesting period.

Gull Rock becoming awash will possibly occur more often in future, due to the mean sea level increasing over time. This problem would be further enhanced if any tidal projects were constructed in the Upper Bay of Fundy region.

The primary concern should be with M.S.I. proper. Gull removal alone does not guarantee the re-establishment of the tern colony.

RECOMMENDATIONS

The following conventional tactics should be used:

1. Conventional scare/kill tactics

   A. Eliminate marauding and problem gulls with a .22 cal. rifle, as authorized by a Scientific Scare & Kill Permit.

   B. Morning and evening harassment of gulls with a .22 cal. rifle (i.e. from the lighthouse tower, shoot onto the gull loafing areas).

Both tactics were found to be effective. The southern end on Machias Seal Island was recolonized by terns when this method of gull harassment was employed.

2. Periodically investigate Machias Seal Island and Gull Rock for gull nests. If gull nests are found they should be destroyed.

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