

REPORT TOPIC

Summary of two field trips (4-5 May and 17-19 August 1983) to investigate the occurrence of bats at the Potlatch plant at Cook.

INVESTIGATOR

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BACKGROUND INFORMATION

The Potlatch oxboard plant outside Cook, Minnesota, has been the site of major bat accumulations during the late summer-fall of 1982 and again this year. Based upon the reports of plant employees, the bats first appeared over a weekend in August, 1982. Several thousand bats formed huge clusters about the outside of the buildings, clung thickly along door edgings, and grouped in large aggregations inside on the upper corners of the walls and ceilings. Concerted efforts to eliminate them resulted in the destruction of considerable numbers of bats. "Piles" were raked up and burned, however, these apparently did not represent the majority of the bats present and new individuals continued to arrive for some time after the major influx. Clusters of bats were observed hanging outside through October and a few small clusters remained indoors until February, where they appeared to die one-by-one and drop from their roost sites. By March, 1983, when the plant began operation, no bats were present.

Once the plant initiated 24-hour operation in March, it was felt that the continuous generation of noise, activity, lights, and heat would discourage any returning bats or present unsuitable roosting sites for new bats arriving to the area this summer. However, at

approximately the same time this year, significant numbers of bats arrived at the plant. Although this year's influx was much less than the year before, the situation was more disrupting because of the greater number of employees at the plant, and thus more frequent worker-bat contacts. Individuals reported being hit by flying bats while working and one individual was supposedly bitten by a bat while I was there. The employee animosity toward the bats has already resulted in destruction of considerable numbers this year.

The oxboard plant is a huge complex of several large, interconnected, concrete and aluminum buildings surrounded by wood storage yards, sawdust piles, and fire suppression ponds. The adjacent land is forest and pasture. Plant construction spanned several years and by August, 1981, the building shells were completed, however, no bats utilized the buildings at that time. Plant construction was finished by June, 1982, and that following August, the first influx of bats occurred.

SUMMARY OF ACTIVITIES

The May trip was primarily exploratory, checking the region for indication of bat abundances and attempting to determine whether the 1982 bat influx was an isolated, chance event or whether it could be expected to occur again this year. The towns of Ely, Cook, Tower, Soudan, and Mt. Iron were reconnoitered for bat sign. Local residents and area resource personnel were questioned concerning any records of bats in the area and the presence of caves, mines, or buildings that could possibly house large numbers of bats. Certain sites were explored further. These were the Pioneer Mine at Ely (once reported to house

significant numbers of bats), the Tower-Soudan Mine at the Tower-Soudan State Park (bats are found in the mine year-round), the Minntac plant at Mt. Iron (nearest, long-established plant to Potlatch of comparable size and design), and the Potlatch plant at Cook. All four sites have had histories of bats and thus are potential sources of information which may help further our understanding of the bats in this region of the state. Key personnel were interviewed concerning their knowledge of bats in these areas and were alerted to our continued interest in this subject.

The August trip was made in response to the reoccurrence of bats at the Potlatch plant. Most of the work was concentrated at the plant site, however, the area surrounding the plant and the Tower-Soudan Mine were also investigated. Activities conducted at the plant are summarized below.

1. Spoke with many of the plant employees concerning their experiences with the bats at the plant and whether they felt any specific plant operations or area history might relate to the bat influx.

2. Conducted a detailed reconnaissance of the plant (including inside and outside the buildings and adjacent yards) a) to estimate the number of bats present and their distribution at the plant, b) to assess the number and types of suitable roost sites, and c) to determine any specific source of attraction to bat at the plant.

3. Examined a number of bats and recorded species, sex, weight, and forearm length. Notes were made on general health and behavior. One hundred-nineteen bats were banded from several areas at the plant to observe any immediate shifts and later, to learn more about their points of origin and eventual destination, and whether individuals return to

the plant site each year. Thirty-three bats were autopsied for information on fat deposition, food contents, and reproductive condition. Liver, spleen, and lung tissues were sent to the Centers for Disease Control, Atlanta, Georgia, to be analyzed for the presence of histoplasmosis.

4. Maintained bat nets across the fire suppression ponds and adjacent drainage ditches to determine the importance of these bodies of water and associated insects in concentrating the bats.

5. Observed the movements and behavior of the bats from 1700-0800 hrs a) to determine periods of activity and foraging, b) to monitor any influx or departure of individuals or groups, and c) to observe any shifts of bats within the plant.

In addition to the work conducted at the plant, residents in the area surrounding the plant were contacted concerning any bat accumulations on their property and recollections they had about bats in the area of Cook. Vacant buildings in the general vicinity were examined for evidence of bat use.

Don Potter, regional biologist for USFS, was contacted concerning the bats. Stationed out of Cook, he originally went out to the Potlatch site in August and again in October, 1982 and collected the 12 bats that we have from that year. We discussed his findings during the 1982 influx and the possibility of coordinating efforts to continually monitor the bats at Potlatch.

The Tower-Soudan Mine was visited for a few hours following the work at the Potlatch plant. Personnel at the mine were contacted concerning the bats residing at the mine and their recent behavior. One hundred forty-five bats were examined from level 12 in the mine. One hundred of these were banded. Information gathered at this time included species,

sex, weight, forearm length, and cluster size and composition. Surrounding structures were also examined for bat evidence.

DISCUSSION

A. General observations. The number of bats at the Potlatch plant during the second visit was estimated to exceed 3,000 individuals. This was undoubtedly an underestimation because of the many places in the plant that bats were known to roost unseen (eg. beneath corrugations of aluminum siding, under roofing ledges, behind high beams, and along cracks between concrete blocks and cement ceilings). The bats at this time were reportedly fewer in number than when they first appeared two weeks earlier, and much less than the preceding year. The bats were usually clustered in groups ranging in size from a few individuals to approximately 100. Between 100 and 150 bats appeared to be the upper limit in the size of the clusters.

Bats could be found throughout the plant, both inside and outside the buildings, among the stored wood products, in the empty railroad cars, and on the outlying buildings. Some were found roosting within reach in extremely exposed areas, in direct sunlight and very well-lit areas. However, the majority of individuals were found in the cooler, quieter portions of the plant (eg. behind beams in the loading area, in storage and grinding rooms, and behind roof-structures overhanging the outer doors).

Two species of bat were found at the plant. The most common was the little brown bat (Myotis lucifugus). Interspersed within the clusters of little brown bats were Keen's bats (M. keenii). Individuals

hanging singly were most often the Keen's bat. From the 154 bats examined, 9 were Keen's. However, this reflects a bias for those bats within reach, and the proportion of Keen's bats was undoubtedly higher.

B. Possible causes for the accumulation of bats at Potlatch. The information gathered from the two trips has shown that there is no obvious answer to why the bats are present at the Potlatch plant. Clearly, continued investigation is necessary before conclusions about the causes of the bat influx can be made with any degree of confidence. A description of working hypotheses under which the trips were executed may best summarize the information attained to date on this subject. These hypotheses and associated findings are the following.

1. The destruction of preexisting structures on the Potlatch site, or the destruction or closure of a nearby structure forced the bats to utilize the Potlatch buildings as an alternative roosting site.

After examination of the area and discussions with local residents, it appears that only a small house was destroyed on the Potlatch site and the majority of the land was originally forested. In an adjacent field, the foundation and remains of a house and barn were found, but they did not appear likely to have served as roosting sites for large numbers of bats. The neighbors could recall no particular bat problems in the vicinity, nor were any mines or large buildings destroyed in the recent past.

2. The Cook area is naturally a region of high bat density.

Among the five towns examined for evidence of bats, Cook clearly had the least indication of bats. The residents substantiated my observations, that there have been only occasional bat problems in

the area and then usually comprising only a few individuals. By contrast, bat sign was much more common in Ely, Tower, and Soudan. Ely's main street is a regular roosting area for bats during the summer. Residents consider it commonplace to see bats clinging along the eaves and under signs, and clustered under particular store overhangs. The outsides of many of the buildings in Tower and Soudan were heavily stained by bat droppings, and residents report it quite usual to see large numbers of bats foraging overhead at night during the summer.

Cook, on the otherhand, showed little indication of heavy bat use, although similar buildings exist there as are used by bats in Ely, Tower, and Soudan. For example, a vacant church within $\frac{1}{2}$ mile of the Potlatch plant had only a small amount of bat droppings and no bats were found roosting there.

3. Certain characteristics of the Potlatch plant make it suitable as a bat roosting site.

Although no specific quality of the plant could be identified as attracting bats, this idea cannot be ruled out. The size and easy access into the buildings, the great number of potential roosting sites, and the attraction of insects to the plant lights and fire suppression ponds could serve to draw bats into the plant. However, none of these attributes has yet been identified as the major factor involved in the bat accumulations. Circumstantial evidence points strongly to the existence of some factor that is attracting bats to the Potlatch plant, specifically. Interviews with residents surrounding the plant indicated that none of the several thousand bats accumulating at the plant were stopping at or using these nearby dwellings. Additional effort is

needed to monitor these and other characteristics of plant operations, and to identify what is responsible for concentrating these bats at Potlatch.

The Minntac plant at Mt. Iron was visited specifically to see whether the size or construction of industrial buildings are attracting bats in this region. The Minntac structures are quite similar to those of Potlatch and have been in operation for some time. The presence of bats at this facility would implicate the structures, themselves, as being important to bat concentrations. Unfortunately, I was not able to personally examine the building at the time of my visit and I received conflicting reports concerning the presence of bats from workers and management personnel at the plant. In spite of this, I feel this area is worthy of further pursuit for the potential comparative information this plant may provide.

C. Comments on the bats at the Potlatch plant and the Tower-Soudan mine.

An unexpected discovery at both Potlatch and Tower-Soudan were the numbers of Keen's bats present. At the Tower-Soudan Mine, 57 of 145 bats examined were Keen's. This represents a sizeable stronghold for a species thought to be very rare in the state. Monitoring the presence of this bat in the area would add immensely to our scanty knowledge of the species in Minnesota.

Based on other studies of the little brown and the Keen's bat, August should mark a period where maternity colonies break up and mixed groups of males and females with grown young reform prior to migration to their winter hibernation area. The sexual composition of

the bats examined at the Potlatch plant was equally represented by males and females (juveniles could not be distinguished with confidence at this time of year), which would suggest that this was an influx of migrating individuals. From what areas they originated and to what winter roosting sites they might eventually go can only be known through continued banding efforts. Clearly, many more individuals need to be banded before we can hope to learn where these bats travel.

Under the assumption that these bats were enroute to their overwintering areas, it seemed strange that no movement of individuals was observed during the night of observation, no additional influx of new individuals or departure of those bats present occurred, and no foraging was observed inspite of the presence of numerous moths about the plant lights. Autopsies of the 33 bats revealed little to no food in their stomachs and significant deposition of fat reserves. In addition, a sizeable proportion of the bats at the plant acted quite sluggish, flying into people or objects, or unable to fly at all after handling. Because these bats also appeared to roost in inappropriate areas and seemed unusually heavily infested with ectoparasites, I sent tissue samples to the CDC to determine whether these bats were carrying histoplasmosis. I hope in the future to have additional specimens examined for the presence of rabies. Although this would not necessarily rule out some other debilitating disease that may be affecting their behavior, it would determine whether there is any imminent health risk to the Potlatch employees. This question is cause for great concern among those that I spoke to at the plant.

An alternative explanation for their behavior, and one that I believe has important implications to the bats in northern Minnesota, was

brought to my attention while banding bats at the Tower-Soudan Mine. These bats were deeply torpid, requiring considerable time to arouse. They appeared to have already entered hibernation, which is very early when compared to dates in which these species enter hibernation in other portions of their ranges. It is quite possible that the bats at the Potlatch plant were utilizing the buildings as a winter hibernation area. The high temperatures and constant disturbance at the plant would prevent these bats from entering a deep torpor or remaining torpid for any length of time. Although this hypothesis might explain the lack of movement and foraging and the sluggish flying behavior among these bats, additional monitoring of the bats is necessary before any conclusion can be drawn. The important question of why these bats have chosen a seemingly inappropriate hibernating site still remains unanswered.

CONSIDERATIONS FOR FURTHER STUDY

The reappearance of the bats at the Potlatch plant lays to rest any doubts that this is a recurrent phenomenon. The specific reason why this is occurring has not yet been determined and should, I feel, be pursued further this fall and again next summer.

However, the bat accumulations at Potlatch are only a part of a larger question concerning the biology of bat populations in northern Minnesota. From the investigation conducted thus far, I feel that there is a wealth of untold adaptive stories concerning the state's northern bat populations. Current information on bats in this region is practically non-existent, and further study on this topic is warranted.

A central feature important to such considerations is the Tower-Soudan Mine. Admittedly an aberration by its presence in an area with no

naturally-formed caves, I believe that it plays an important role in the biology of at least two bat species, Myotis lucifugus and M. keenii. The more that 50 miles of passages within the mine and the nearly constant temperatures and high humidity make it an ideal hibernaculum for overwintering bats, and by its extent can potentially house tremendous numbers of bats year-round. The presence of this northern refugium eliminates the necessity of prolonged migration to southern caves and mines, thereby significantly reducing the expenditure of vital fat reserves and the exposure to predators enroute.

The enhanced survivorship, afforded by the presence of this mine in an otherwise inhospitable winter environment, may have important implications for bat species such as the Keen's bat, which has been found only sporadically throughout the state. The high numbers of the Keen's bat in the Tower-Soudan Mine and the early hibernation of the bats suggest that unique conditions exist in the mine and in the region that affect the natural history of the bat species that overwinter in this area. Additionally, the presence of ore dust on the wings of bats from Tower-Soudan and from the Potlatch plant suggest a close connection between these two sites, and further underline the need for study in this region.

Further investigation of the Potlatch bat influx should, I believe, be broadened to include the bats in this portion of the state, particularly those at the Tower-Soudan Mine. Understanding the causes of the Potlatch bat accumulations and assessing the proportion of the state's bat fauna affected by the presence of the plant, necessitates a regional approach to examination of the specific occurrence. I would strongly encourage the Nongame Program to give serious consideration to such a study.