A Comparative Study of Interspecies Communications

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Project Number 124

The second observational research season of the project, a comparative study of interspecies communications in wild, freeranging ungulates was carried out without interruption during the 1964 summer and fall period. In contrast to previous research seasons in the same area we encountered in 1964 rather complex difficulties in the gathering of the observational data. The difficulties were caused mainly by disturbance of the game animals through the extensive tree-spraying program. The general disturbance in the end, however, provided to some extent information on some new aspects of our problem. This will be shown at a later point in this report.

Our particular focus of interest was aimed at the analysis of signal-chains which transmit a message between different species in the ecological web. The species selected were again the Wapiti elk (Cervus canadensis), the Wyoming moose (Alces alces) and the American bison (Bison bison). The main types of their communications are expressed by use of gesture, facial expression, vocalization and by olfactory means. To the well known types we added the "position effect" of group or individual. We are aware of the fact that in most situations not a single but two or more of these signal systems are involved in sending and receiving a message. The concept of redundancy providing alternate systems, as a device to safeguard message transmission in cases of failure or deficiency of one signal-type,was also explored.

In last year's research report we had stated that communications concerning the security complex provided a good source of information. This was corroborated in more detail by this year's observations. The species specific patterns caused by graded intensities of warning and alarm messages under various environmental conditions, revealed the presence of both major categories of communication types: The iconic and the arbitrary type (P. Marler, 1961, in Journal Theor. Biol., 1961, 1, 295-317).

The iconic signal-type, which represents a direct physical relation to the information conveyed, comprised a large part of the security signals we observed in transmission across the species line. The arbitrary type of message in which the signal and the reaction to the signal are clearly different and separable behaviors is relatively rare. But in both research periods we found in a number of cases reaction-chains transmitting the alert and alarm message across the species line three and four times. Each species did react in its own species pattern.

We found also that the high visual effectiveness of the herd-oriented elk featured far-reaching warning signals (gait changes), while the non herd-oriented moose after reading a message showed the warning in a closeup facial and posture expression. Most of the warning messages do not carry just a simple all or none character. They frequently provide also graded or scaled information about the intensity or gravity of the

danger. Thus a slightly alarmed moose, for example, will show the "alert" posture and facial expression which will, in turn, cause a group of elk in the same area to freeze and scan the environment. This would be a light reaction. A seriously disturbed moose in high alarm will cause an elk-group to execute their own full flight reaction involving the noisy, crashing breakaway characteristic of their species.

The transmission of messages containing negative character was observed to occur frequently within species groups as well as between different species. Thus we noticed that a predator (grizzly bear or a black bear) engaged in a non-hunting activity like foraging clover blossoms or berries, was not causing an alarm reaction in nearby grazing mule-deer and elk. The non-aggressive mood of the bear is "read" by the other species in his environment. Such a signal of security had only temporary character and was terminated when the bear showed changes in intention by gesture and gait. Another type of negative message was conveying non-hostile intentions, when two animals meet at close quarters. This consisted in "looking past" not looking straight at the other animal and in a slight deflection of the direction of walking.

Distinct seasonal fluctuations in sensitivity to message-transmissal within and between species were observed. Such findings led at first to seemingly conflicting results, but showed later on as more observations were made, a clear picture. During the breeding season, for instance, a decrease in response to messages from other species is manifest. This is particularly noticeable in the male for the strong olfactory and vocal signals which take on a ritual character in that period (example: bugling and wallowing in elk), and provide specialized information for the species members. In some cases, however, we found that a message of seasonal connotations like the bugling in elk can take on a deterring character for another species and induce avoidance.

In contrast to our previous research seasons in the Jackson Hole area the social dynamics of the elk and moose were severely affected by the pine-bark beetle spray program (April - August). While there had been limited area spray projects before, the impact of the now enlarged program was heavily felt, in particular since the carrier fluid of the active chemical ingredient was no longer a water base, but Diesel-oil. The strong smell and enduring character of the Diesel-oil pervaded the whole forest acreage far beyond the actual area of spray-application. The effects on behavior of the elk and moose in those areas of the pine-bark beetle spray project was obvious. Interrupting and obscuring the olfactory orientation, the elk groups and individuals showed a more erratic and less cohesive social pattern.

The activity and presence of the spray crews in otherwise remote areas caused additional effects of disturbance, which were particularly severe in the months after calving, when sensitivity to disturbances and intrusion is at its highest point in elk and moose populations. Our observations showed that the usual tendency of elk and moose to resort to an alternate habitat in case of disturbance in their first choice location, had been abandoned, since a simple, unilateral pressure was

not prevailing. The coming and going of the spray teams and their supply vehicles created multilateral and often concentric pressures, which caused prolonged excitation and displacement in the elk. In moose the disturbance was not quite as pronounced, since the areas of spraying only partly overlapped with moose home ranges.

The stepped up excitement and restlessness of both species (moose and elk) led to increased signal-sending and receiving. As the excitement became widespread the readiness to react was reinforced, the reaction itself intensified.

For us, as observers, this change in environmental situation provided a unique source of information. While the work of evaluation of these observations is still in progress, we can state at this point that possibly damaging results of the prolonged disturbance of the elk and moose may show in the months or years to come. The calf crop, the juveniles and the older animals will be likely to show the impact more than the adults in the prime years. These considerations concerning the impact of human disturbances will need much attention and further study, since also the increasing influx of tourists and roadbuilding activity will have to be dealt with.

A research seminar on problems of communications between species was presented by me at the Jackson Hole Research Station on July 2nd, 1964.

Among the many professionally interested visitors were Dr. Arne Peterson from St. Olafs College, Minnesota; Professor O. J. Harvey of the University of Colorado; Mrs. Olaus Murie, Moose; Mr. Bill Jackson from the U.S. Forest Service; Dr. David Love, University of Wyoming; and the director of the National Park Service, Mr. George Hartzog.

To the director of the Research Station, Professor L. F. Clarke, and Mrs. Clarke goes my sincere appreciation for their encouragement and hospitality. The interest and friendly cooperation of my colleagues at the Research Station and at the U.S. Forest Service and National Park Service is also highly appreciated.

Assisted by Kenneth Johnston, University of Colorado.
Supported by National Science Foundation, GB-946.