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THE PROBLEM OF PIKA CONTROL IN BALUCHISTAN, PAKISTAN

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ABSTRACT: The collared pika, Ochotona rufescens has been recorded as a serious pest in apple orchards in the uplands valley of Ziarat in Baluchistan. In the winter, when the natural vegetation is lacking, the pikas debark the apple tree trunks or branches resulting in the killing of the tree and reduced fruit production. In summer, damage to wheat, corn and potatoes is also very severe. It is estimated that pikas cause hundreds of thousands of dollars (US) in annual apple production losses. The apple production in Baluchistan accounts for about 35 percent of the total provincial income through food production. During the six years (1974-1979), the winter of 1973-74 was noted for heavy damage to apple trees and thereafter it declined steadily. The control measures evaluated were of various kinds among which repellent "Ostico" was very effective in protecting the trees. Poison baiting with brodifacoum (0.005%), Vacor (1%) and thallium sulphate (1%) were also effective in reducing the pika population. To alleviate damage caused by pikas, the farmers also practice some traditional protective methods which in some cases are quite effective but very laborious.

INTRODUCTION

The pikas, often called, "the piping hare", are little known as pests, generally confined to alpine rocky areas, often unsuitable for agricultural use. There are 15 species of the genus Ochotona, one in the new world and 14 in the old world (Walker, Mammals of the World, John Hopkins Press, 1964). Ochotona princeps of the North American species has been relatively well studied (Johnson 1967, Millar and Zwickel 1972a, 1972b, Markham and Wicker 1972, Mac Arthur and Wang 1973, Lutton 1975, Kawamichi 1976), while detailed information is lacking about the old world forms. Recently Orr (1977) reviewed the ecological information of the North American species in much detail as well as some Asiatic ones, 0. rufescens, which is found in the Western Baluchistan (Pakistan), Iran, Afghanistan and Uzbeckistan province of Russia, has been recently recorded as a serious pest in apple orchards and juniper nurseries in the Ziarat valley of Baluchistan. (O. rufescens is also known as collared pika or Afghan pika and Russian name for it is Reddish pika. Two other species, 0. rovlei and O. macrotis, occurring in Gilgit and Baltistan of the Pakistan territory, (360m and higher) cannot be considered of any economic importance as they feed on wide variety of natural vegetation (Roberts 1977). The Japanese pika, 0. hyperborea vesoensis, another old world species, causes damage to larch and spruce plantations in Japan when snow is on the ground and winter plants are scarce (Tomeda 1956, Haga 1957).

At the conference where this paper was presented, a conversation with Dr. Gauditz indicated that Ochotona princeps damages forest seedlings in higher elevations in the state of Washington. Except for some observations confined to the natural history of 0. rufescens from Baluchistan (Roberts 1974, 1977, Fulk 1976), there have been no previous studies on the prevention of damage and the extent of damage done by this species to apple trees. However, Khokhar and Fulk (1976) reported as high as 20 percent of the trees attacked by pikas in certain areas of the Ziarat valley during the winter of 1975-76. The problem of pika damage to apple trees is not only serious, but it seems to be unique to this region. Collared pikas also damage corn, wheat, potatoes, garden vegetables and cherry trees that are intercropped within the apple orchards.

All three species of pikas, which have been recorded from Pakistan, are closely similar in external appearance and size. The collared pika has very soft, silky fur with dark blue-grey under -fur. There is a pale sandy-buff collar of cinnamon-red hairs just behind the neck, a distinctive feature of this pika and from which it derives its name. Collared pikas excavate burrows often under juniper tree roots and bushes of Artemesia, wormwood, but the majority inhabit crevices between rocks and stones. They bite off green vegetation like other members of the genus and carry it into their burrows. 0. rufescens also makes hay piles, and this activity reaches the high level by the start of fal1. Mentha longifolia, Sophora millis, Artemesia scoparia, Perowskia abrotanoides and Peganum harmala are some of the forbs which the pikas collect and drag inside the burrows. In Baluchistan, the collared pikas are associated with mountain steppe forest at elevations above 1200m and even up to 3600m. It also inhabits the comparatively arid mountain slopes where steppe forest no longer exists such as in the Chiltan and Bolan (Roberts 1977, Siddiqi 1961). The pikas have not been recorded from the extreme southern part of Baluchistan or from anywhere in the Mekran area. The study area, Ziarat, altitude 2450m, is in Sibi district, in the northwestern part of Baluchistan. There the juniper (Juniperus macropoda) trees form a dry open forest which is believed to be of very ancient origin. The trees grow on extremely stony soil, often in rock fissures.

PROBLEM IN PERSPECTIVE

The environment of the pika in Ziarat has in recent times been increasingly utilized by man and his domestic stock. In the past, only nomadic tribes were using the higher mountains for the summer grazing of their flocks. But as time passed, the number of these nomadic tribes has increased dramatically, and some have taken to farming the narrow mountain valleys, raising subsistence crops like barley, wheat, potatoes and fodder plants. Often these farms are in the environment favored by the Pikas. As the human population pressure increased, higher and higher valleys were brought under cultivation, which were in prime pika habitat. Then it was found that very fine quality apples could be raised in such locations and produce a very lucrative cash crop. The government has encouraged the

spread of apple orchards which bring money into a very backward, economically depressed area. To do this, 40,000 apple trees are distributed each year. The apple production in the province accounts for about 35% of the total provincial income gained through food production.

The problem is further compounded by the construction of retaining walls to form level fields for the orchards. These are dry-laid stone walls, a perfect pika habitat. Rock piles are left after clearing fields; other walls are made to prevent the fields from being damaged by flash-flood waters; still other walls control such floods to irrigate the orchards. The original orchards were irrigated by springs or streams, later ones by wells dug in valley sediments; and the recent high-altitude orchards by diverting flash flood waters. All these walls have created an ideal habitat to draw pikas into close association with orchards. The farmers also grow subsistence crops between the apple trees. Pikas have learned to feed upon such crops for they are green fodder feeders. Often, such crops near pika-infested rock walls appear "thin" due to pika harvesting. A further fact compounds the pika damage problem. All farmers have flocks of goats and sheep that constantly glean anything edible from the whole environment of the pika.

The pika cuts, dries, and stores forbs and grasses for winter use. With the overgrazing by domestic stock, the pika is hard put to lay in a winter's supply of food. In the winter, the sheep and goats are gone, for the winter weather is dry and very cold with sparse, intermittent snow cover. The pika does not hibernate so it has to feed in the winter. With no supply of vegetation, either stored or available in fields, the pika forage in the orchard areas if they are associated with them.

During the winter months (December through March) when native vegetation is lacking, foraging pikas will feed on apple tree trunks and branches. Their gnawing produces at times complete debarking around the tree trunk and even up to 25 to 40 cm above ground level. Higher level damage results when the animals travel over snow to feed. This damage often kills trees or, in the case of incomplete girdling, reduced production. It is interesting to note that the pika damages smaller trees rather than large ones (Khokhar and Fulk 1976). It is estimated that damage losses per year caused by pikas in the apple orchards of Ziarat valley run into hundreds of thousands of dollars (US).

During the years 1977 to 1979, damage surveys were made and control methods were investigated to alleviate damage caused by pikas to apple trees. These surveys and control measures were conducted in various locations in and around Ziarat in the province of Baluchistan, Pakistan. These observations and results are described in this paper.

DAMAGE SURVEYS

These surveys are summarized in Table 1. This table indicates a steady decline in the occurrence of damage to apple trees since the first damage reports were made in 1974 (Roberts 1974). At that time, in one orchard, 89.9% of 3 to 4 year old trees suffered severe overwinter due to pikas debarking the trunks and branches. This forced the farmer to replant his orchard with new saplings.

Table 1. Occurrence of damage in apple orchards by the collared pika in Ziarat Valley.

Year	No. Orchards	No. trees examined	% trees damaged: Partial damage	% trees damaged: Complete debarking	% trees killed	Reference
1974 Spring	1	54	-	-	88.9	Roberts, 1974
1975 Summer	1	248	42.34	8.87	4.43	Khokhar & Fulk, 1976
1976 Spring	6	2497	13.82	-	4.4	Khokhar & Fulk, 1976
1977 Fall	8	398	47.09	3.85	5.13	Present study
1978 Spring	6	487	43.39	-	3.49	"
1978 Fall	3	235	11.91	2.12	-	"
1979 Spring	9	1507	1.46	0.99	0.13	"
1979 Fall	7	1112	Nil.	Nil.	Nil.	"

During the six years that damage information was obtained, the winter of 1973-74 was noted for its heavy snowfall. Since then, snowfall and annual precipitation have declined.

The decline in pika population and subsequent damage to apple trees may be caused by two factors: (1) the decline in precipitation, and (2) a cyclic crash in the pika population. It is not known if the reduction in precipitation had any effect in the pika's numbers. But it is well known that lagomorphs exhibit cyclic population fluctuations, particularly those in arctic or alpine environments. Continued observations on population of pikas will be necessary to clarify this point. Fulk (1976) reported that the reduction in the incidence of damage was due to decreased spring reproduction and winter survival. Damage was higher when the winter survival was better.

The pattern of damage in relation to orchard layout is also noteworthy. Those trees near stone walls, rock piles or stony areas suffer much more damage than in-field trees. Often, field-edge trees have to be replanted 2 or 3 times before they reach commercial bearing size.

It was also noted that during the summer when local vegetation is sparse, some pikas will feed on apple tree bark at that time. The presence of orchards in pika habitat has been too short to predict if this type of summer damage will spread due to learned behavior by the pikas.

The subsistence crops growing between the apple trees like wheat, barley, fodder, maize and potatoes are fed upon by the pikas. The green portions of these crops are cut and dried as pika's hay piles, or directly consumed.

CONTROL METHODS

Methods Evaluated

Several methods were tried to discourage pikas from feeding on the apple tree bark. The first was synthetic emulsion paints containing poisons that were then painted on the apple tree trunks. Two such formulas were tried. One was 5% strychnine mixed with paint; the other was a paint containing 0.5% thallium sulfate, the object being to poison the pikas that consume apple bark. The paints were colored red for the strychnine, blue for the thallium sulphate, to act as warning and marking signs. The paints were applied to the tree trunks up to a meter high, including major branches. The application was done after the fruit harvest. With a few exceptions, the poison-paint treatments provided some measure of protection to the trees.

Another kind of repellent coating was applied to the apple tree trunks. This was a commercial compound called "Ostico" made by I.C.I, in England. It is a very sticky, non-toxic compound like rat glue. Its original use is to prevent harmful insects from crawling up tree trunks. This is done by banding the tree trunks with this compound. It was found that pikas would not damage apple trees so coated, apparently due to the animals' dislike of getting all gummed up with a compound that can't be licked off. The effect was similar to that observed by the second author when his children fed marsh-mallows to chipmunks near Lake Tahoe, California. The animals were soon a mass of leaves, twigs and dirt. But these animals could clean themselves, but then had an aversion to toasted marshmallows thereafter.

The "Ostico" was applied in the late summer or early winter on the apple tree trunks and major branches up to one meter high.

These experiments were applied to orchards in different locations surrounding Ziarat to encompass the several micro habitats where apples are grown, the differences mainly being in elevation, or in relation to surrounding terrain, wide valleys to narrow ravines. The enumeration of these coating trials are listed in Table 2.

Table 2. Some trials to prevent pika damage to apple trees.

Year	Treatment	No. Orchards	No. trees treated	% damage before treatment	Observations made after treatment
1977 Fall	Thallium Sulphate	1	98	33.67	One tree was gnawed three days after treatment. No further damage recorded in the spring of 1978 and 1979.
		2	110	34.54	Two trees had fresh scars in the spring of 1978 and 1979.
	Strychnine paint 5.0%	1	50	-	One tree gnawed in the spring of 1978.
		2	54	12.96	No damage recorded in the spring of 1978 and 1979.
1978 Spring	"Ostico" Band	1	110	-	Treatment was made by the farmer. No damage in the spring of 1978 and 1979.
1978 Fall	"	4	109	-	No damage in the spring and fall of 1979.
1979 Spring	"	5	500*	-	Five trees were damaged. Farmer made the band.
	"	1	32	-	No damage recorded in winter of 1979.

*The farmer added kerosene oil to make Ostico thin with the intention to band more trees. Also the damaged trees were not banded completely and the coating was too thin.

In summary, poison paints were found to be too expensive, and the necessary toxicants are not widely available on the local market. However, "Ostico" is available at subsidized rates, and, one application is good for 2 to 3 years.

Poison Baiting Trials

Pikas, being forbs and grass feeders, don't accept grain baits well, with one exception. Fresh green bait like lucerne (Alfalfa) was not too effective. Then a series of baits using different toxic compounds were tried. All trials were field trials, as pikas are very difficult to catch and transport to the Centre in Karachi. They are quite sensitive to shock and changes in temperature and elevation.

Five different rodenticides were evaluated for their effectiveness against pikas. Baiting trials using brodifacoum (0.005%) with rolled oats; zinc phosphide (2%) with fresh apple pieces; Vacor (1%) with fresh apple pieces; and thallium sulphate (1%) as Zelio grains (a commercial preparation using wheat) were conducted in the autumn of 1978. Pre- and post-treatment census baiting indicated 95%, 33%, 61.52% and 100% reduction in the pikas population, respectively. Poisoning, as a means of control of pikas, was done in such a way that humans and domestic stock and other forms of wildlife were not endangered. The poisoned grain bait was placed in small piles of 10-15g. inside the crevices of rocks on the resting places but still quite visible for observation and recording. All bait exposure was done in the late afternoon or early evening to minimize disturbances by people or domestic stock.

In the past anticoagulant-treated baits against rabbits have been used with reports of varying degree of success and considered economically unfeasible. In the present studies, the use of brodifacoum (0.005%) oats bait reduced the pika population to a significant level without much cost involved. It may be mentioned that preliminary trials with brodifacoum (0.005%) using lucerne and sorghum chips did not give encouraging results.

The results of these trials indicated that brodifacoum (0.005%) with crushed oats as bait, Vacor (1%) and thallium sulphate (1% Zelio grains) if used carefully, are effective in reducing the pika population in the apple orchards. The use of "Ostico" showed encouraging results in repelling the pikas when applied on tree trunks. Studies using sticky products formulated from the indigenous materials, like pine rosin, are in progress which will be described in some other reports. For protecting crops of potatoes, corn and winter wheat in the upland valley of Ziarat, we believe that baiting with zinc phosphide (0.75%), Vacor (1%) and brodifacoum (0.005%) would be effective in checking the economic losses.

TRADITIONAL PREVENTIVE METHODS

The farmers in the upland valleys of Ziarat are well aware of the pika damage problem and have developed some traditional methods to protect the trees, some of which though effective are very laborious. Common practices are wrapping the trees with juniper tree bark and twigs of a local shrub.

Protective Wrapping of Juniper Bark

In the higher elevation areas, those in or near the juniper forests, the fiberous bark of the tree is pulled off in long strips, and laboriously wrapped around the trunk of the tree up to one meter high or less. The apple tree hark so protected is safe, but if the snowfall is deeper than the bark wrapping, damage may ensue to branches, because these pikas climb reasonably well. There are some disadvantages to this kind of wrapping, possible damage to stripped juniper trees, wrapping of multiple apple tree trunks is very laborious, and the wrapping must be removed in the spring each year to avoid choking the trees. One farmer with 300 apple trees estimated that it took him eight weeks to wrap all his trees with strips of bark.

Use of Twig Bundles

Twigs of a local shrub, wormwood (*Artemesia scoparia*) are tied in a bundle around the trees. This shrub is widely available in the area and easy to tie onto the tree. Being compressable, the bundles do not choke the trees and do not need to be removed in the spring. The disadvantages are that bundles decay and must be replaced every few years, protection is only to the height of the bundle (about 2/3 of a meter), and, as mentioned before, pikas can climb.

There are other methods which farmers use to a lesser extent, either being ineffective, injurious, or lacking in the desired benefits. Such practices include wrapping of the trees with cement paper bags, empty fertilizer bags, or jute sacking, the use of pruned apple tree twigs around the orchard, and hunting the pikas with shot guns.

However, they can easily be trapped in the summer, using rat snap traps baited with apple pieces. But to be effective, trapping must be done regularly throughout the summer and fall.

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