

Rattlesnake collection drives—their implications for species and environmental conservation

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Every year large numbers of rattlesnakes (Crotalus spp. and Sistrurus spp.) are collected from the wild in several states in North America. Some of these are collected purely for commercial reasons while others are collected for the traditional, although now largely commercial, 'rattlesnake round-ups'. Together these activities may remove 300,000–500,000 snakes each year. The high level of hunting together with capture procedures that destroy habitat as well as snakes are damaging rattlesnake populations, other species, and habitat quality.

Large numbers of rattlesnakes (*Crotalus* spp. and *Sistrurus* spp.) are removed annually from the wild for two purposes. One is to supply 'rattlesnake round-ups'; at these events, which are usually held at weekends, snakes are incorporated into a wide variety of entertainments, and killed to produce fashion and curio items and food for human consumption, (Black, 1981). The other reason for collection is to supply the commercial skin and curio trade.

Round-ups were traditionally associated with local elimination of venomous snakes, which were regarded as threats to livestock, pets and humans (Lawler, 1975; Black, 1981). Rattlesnake hunts existed 300 years ago (Dodd, 1987), although early versions of today's organized round-ups seem to have commenced between 1930 and 1940 (Black, 1981). They have since become locally important, socially and economically; even moderate-sized round-ups attract 10,000 people and raise \$40,000. According to representatives of the Jaycees, who are often major sponsors of round-ups, these events are worth around \$4 million per year nationally (D. Barker, pers. comm.). Round-ups are most prevalent in Texas and Oklahoma and probably between 30 and 50 occur annually in these states (Barker, 1988; Seippel, 1988). However, round-ups occur in at least nine states (Figure 1), although it is probable that hunts occur in additional areas. Furthermore, hunting ranges may extend well beyond the boundaries of states known to have round-ups.

Hunters for round-ups may operate casually, part-time or full-time. Commercial hunters, however, operate largely full-time, supplying only specific purchasers (D. Barker, pers. comm.). Collection for round-ups often starts in September and increases in intensity in the weeks approaching the public events in spring. A few hunters, however, make year-round hunts for snakes.

The high-profile nature of round-ups has attracted a great deal of attention and criticism from biologists, environmentalists and those concerned with animal welfare, but there has been relatively little investigation into the implications for conservation and habitat protection.

Snake collection procedures

Three main methods are used to collect snakes: (1) 'gassing' of dens (particularly during hibernation), using petrol as a fumigant to drive snakes to the surface; (2) probing crevices and searching under rocks and fallen trees; (3) riding roads at night to gather snakes on an opportunistic basis. The use of fumigants has attracted considerable criticism due to the impact on fauna that may cohabit with rattlesnakes. While many snakes emerge as a result of gassing and are then captured, additional snakes and other animals rapidly succumb to the gas and do not emerge. The effects of gassing on selected vertebrate and

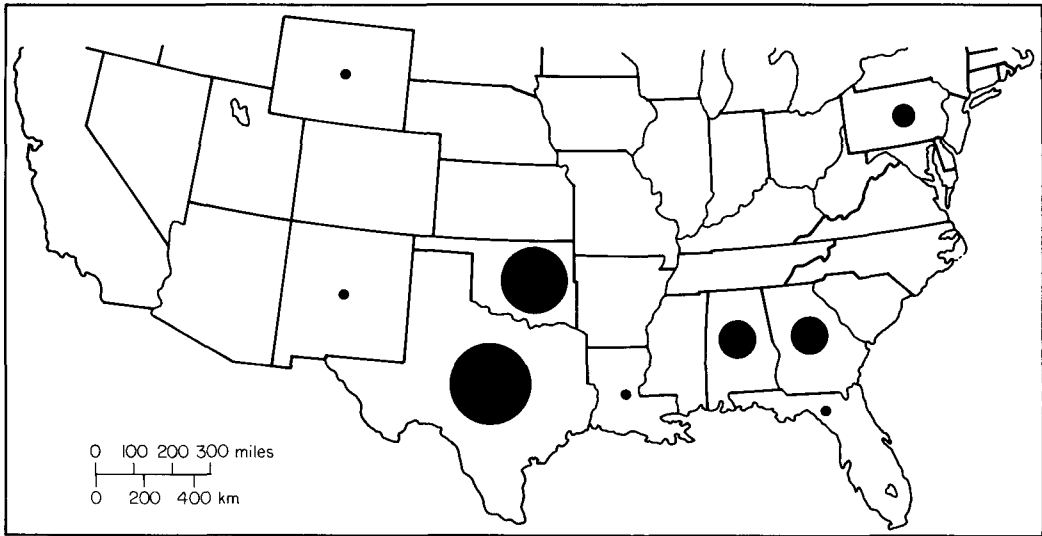


Figure 1. Areas where rattlesnake hunts are known to occur. Sizes of solid circles are intended to offer only an approximate indication of prevalence/proportion to each state.

invertebrate species in controlled experiments has revealed highly detrimental and fatal consequences (Speake and Mount, 1973; Speake and McGlincy, 1985; Campbell *et al.*, 1989). The susceptibility of species in these studies varied considerably, with some mortalities occurring within minutes and others after several weeks. Medium-term effects of toxic chemicals included sensory disorientation and lack of co-ordination, which resulted in reduced feeding ability and failure to locate shelter, followed by death from exposure to cold. These studies referred to short-term and medium-term assessments; longer-term studies may produce even greater mortality among animals exposed to petrol fumes. Gassed snakes later kept in captivity usually die within approximately a year (W. Stout, pers. comm.).

It has been reported that 30 species of vertebrate (Speake and McGlincy, 1985) and 32 species of invertebrate (Young and Goff, 1939) may utilize rattlesnake dens. Several cohabiting species are recognized as becoming increasingly rare. For example, the eastern indigo snake *Drymarchon corais couperi* is listed as threatened federally and in Mississippi as endangered, while Florida pine snake *Pituophis melanoleucus mugitus* is listed in Florida and Louisiana as being of special con-

cern (Speake and Mount, 1973; Speake, 1986).

Numbers of snakes collected

Although until around 1987 rattlesnake round-ups almost certainly took the greatest numbers of snakes, commercial processing plants may since have become major consumers (D. Barker, pers. comm.) Currently, rattlesnake round-ups are probably responsible for the removal of between 60,600 and 101,000 snakes a year (Warwick, unpubl.). These figures are conservative since they do not include the mortalities that result from collection and storage procedures. The size of these mortalities is largely unknown but over a 2-week period at one round-up (Waurika, Oklahoma) they were 4 per cent and storage may last 8 months (Warwick, 1990).

The extent of commercial processing operations is unknown but there are at least three large operations in Texas that use rattlesnakes. Of these one has a team of 28 snake collectors supplying approximately 60,000 snakes a year; the other two operations are of comparable size (D. Barker, pers. comm.). Hunters for these establishments collect widely, although little quantitative information is available on

the size of the hunting ranges. These hunts operate almost totally independently of round-ups. Round-up organizers report competition for snakes between the wholly commercial processors and their own events, claiming that recent (particularly 1989) harvests were lower than usual due to the additional hunting pressure. However, general overhunting and habitat destruction may also be responsible for reduced snake availability. It is probable that combined, round-ups and the commercial processors harvest at least 300,000 snakes a year.

Effects of hunting on populations of rattlesnakes and their habitat

Campbell *et al.* (1989) conducted the first detailed assessment of actual and potential consequences of collection on Texas populations of rattlesnakes and other community organisms. While their findings demonstrate the destructive results of snake collection by gassing, another highly important negative impact was revealed. Analysis of data on snake harvests at the Sweetwater, Texas, round-up (probably the largest individual hunt) accumulated over 28 years, showed that round-ups had serious implications for rattlesnake populations due to the cumulative loss of females and offspring. Campbell *et al.* (1989) evaluated data and claims of harvest sustainability attributed to repeated large stocks at round-up events and reported an increase in the number of hunters between 1978 and 1986, which could account for the apparent stability in annual harvest figures.

Results of field studies

As part of our study, interviews were held with hunters, and habitat was examined at five sites in the vicinity of Waurika, Oklahoma (Figure 2). Studies were carried out prior to and after the activities of professional and amateur hunters to determine the effects of hunting practices on the environment.

Numerous hunters reported dramatic



A snake hunter in Oklahoma displays his catch: a western diamondback rattlesnake *Crotalus atrox* (C. Warwick).

reductions in the availability of snakes from areas where they were previously abundant, and that in isolated locations collection was no longer viable. However, round-up organizers are keen to suggest that populations of rattlesnakes are not threatened since their annual events have consistently harvested large numbers of snakes. Comments from snake hunters and round-up organizers in Oklahoma, however, report an increase in the numbers of individuals collecting snakes for round-ups, which supports the conclusion by Campbell *et al.* (1989). Hunters in Oklahoma, who also operate in Texas, also commented that they are having to increase their hunting ranges in order to collect similar numbers of snakes. Several experienced snake hunters, however, reported sustainable yields particularly from deep crevices.

Research on collection procedures and environmental impacts in the five study sites revealed that rocks and fallen trees are over-



A small sample of the diverse products derived from rattlesnakes, along with items made from python skins and invertebrates (D. G. Barker).

turned in attempts to locate snakes and that habitat disturbance during searches for snakes is substantial, regardless of whether gas is used. Large rocks and crevices are more resilient to interference but nevertheless are subject to a certain amount of disruption.

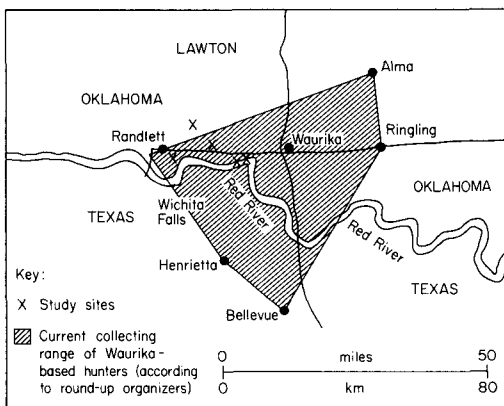


Figure 2. The study site around Waurika, Oklahoma.

Seventy-six per cent (combined average) of potential snake abodes were investigated by collectors. Of these, 92 per cent (combined average) were sufficiently misplaced so that they effectively lay flat on the ground and were thus unusable as snake abodes. While some disturbed items that previously lay flat on the ground were unintentionally replaced at angles and formed 'new' crevices, generally there is a considerable loss of habitat, particularly for adult snakes and other animals. In these studies, 8 per cent (combined average) of potential rattlesnake abodes consisted of immovable rocks or trees and deep crevices. Although these natural hiding places are the most resilient to human disturbance and effectively provide the last stronghold for snakes in exploited areas, they are frequently prime targets for experienced hunters. The long-term consequences of gassing on the quality, and thus suitability, of these crevices for future habitation by organisms is unknown.

It is probable that the general decrease in

usable habitat results in the concentration of rattlesnakes beneath immovable cover and in deep crevices, particularly for overwintering. In addition, an increasing number of people in at least Texas and Oklahoma are engaging in farming due to recent economic depressions in the oil market. Clearance of rocks and other ground cover from fields to offer greater land use, along with development generally, also decrease general habitat for snakes and conceivably may contribute towards the concentrations of refugee rattlesnakes occurring in the rocky low-lying hills.

It seems reasonable to assume, therefore, that while it may appear to some people that the harvest is sustainable because of repeated successful collections from dens, in reality the situation is probably one of concentrated and displaced populations of rattlesnakes, which offers an artificial impression of the species abundance in many locations.

Conclusions

The assessments of Campbell *et al.* (1989) and our findings in Oklahoma suggest that not only are numerous populations of rattlesnakes and their habitats under severe threat from hunting and land-use practices, but also that the potential for recovery of populations is substantially compromised. Previous assessments of rattlesnake populations have referred primarily to the numbers of snakes registered at organized round-ups and therefore represent minimum quantities. Although detailed data are lacking, mortalities in dens from gassing and during storage are clearly important additional losses.

Our findings regarding the loss of important habitat imply that regular large collections do not suggest unaffected populations but probably offer false impressions of snake abundance during declines. Further, concentrations of snakes in the resilient habitat leaves them vulnerable to targeted collection, and thus destruction of populations could occur relatively suddenly.

Clearly more research into rattlesnake populations would be desirable because there is

very little information on both past and current populations. However, such long-term studies appear of little value under the immediately demanding situation. Reports from hunters suggest that there is already sufficient information to warrant determined intervention by state and federal authorities, perhaps especially in the view of the non-essential nature of collection drives generally. Rattlesnakes are an important component of local communities, being major predators of small mammals and important prey for numerous mammals and birds. Detailed studies of effects of removal of rattlesnakes and habitat loss on local ecology are also needed.

Rattlesnake round-ups result largely from misguided perceptions concerning the need to control snakes, and from commercial incentives. The large independent processing plants exist for commercial gain only. Neither rattlesnake round-ups nor commercial collecting appear to be regulated in most states. In Texas it is illegal to use toxic chemicals to collect the snakes, and in Oklahoma at least seven statutes would appear to protect snakes, but they are not enforced. At federal level little protection can be afforded until rattlesnakes are listed as threatened or endangered. Interstate trade is, in principle, governed by the Lacey Act because rattlesnakes and their products that have been illegally acquired in one state are transported to another. Proper enforcement of federal and state laws would resolve many, if not most, of the problems endemic to round-ups.

Attitudes towards venomous snakes are often extremely negative and many individuals seek the total elimination of snakes from their own and surrounding land. This situation is aggravated at round-ups, where snakes are commonly described as vermin to be eradicated. The economic benefits derived from hunting appear to prevent political action on snake protection.

Rattlesnakes, their communities and habitats are probably under severe pressure. Round-ups and commercial harvesting probably represent the single most damaging exploitation of reptilian wildlife in the US and for economic and political reasons the situation remains

largely unchecked. If comparable exploitation of more popular animals were to occur it would almost certainly not be tolerated.

Acknowledgments

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