



EFFECTS OF RATTLESNAKE ROUNDUPS ON THE EASTERN DIAMONDBACK RATTLESNAKE (*CROTALUS ADAMANTEUS*)

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Abstract.—I analyzed the data on size and numbers of the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) for four rattlesnake roundups in the southeastern U.S. (Opp, Alabama, and Whigham, Fitzgerald, and Claxton, Georgia) spanning a period of 50 years (1959-2008). Both numbers of snakes and weights of the largest snakes that participants turned in annually declined in the last two decades. Statements by roundup officials and rattlesnake hunters support that roundup hunting has depleted local rattlesnake populations and forced hunters to travel further to collect snakes in recent years. Declining maximum size of snakes reflects possible age-class truncation, whereby collectors cull older, larger individuals of this long-lived species. Roundups perpetuate negative attitudes about venomous snakes and reduce their populations whose skins and flesh are subject to high commercial demand. Before the Eastern Diamondback Rattlesnake becomes threatened throughout its range, state wildlife agencies should either ban the taking of individuals or regulate their taking by developing bag limits and seasonal harvest guidelines. The Eastern Diamondback Rattlesnake would further benefit by refocusing extant roundups as wildlife festivals in which participants celebrate rattlesnakes and other wildlife rather than exploit them, or alternatively changing their theme entirely (such as one roundup that became a Wild Chicken Festival).

Key Words.—Claxton, *Crotalus adamanteus*; Eastern Diamondback Rattlesnake; Fitzgerald; Opp; roundup; Whigham

INTRODUCTION

Rattlesnake roundups are an icon of Americana. Originating west of the Mississippi River in 1939 in Okeene, Oklahoma, roundups subsequently arose in Texas, New Mexico, and other western states (Klauber 1972; Weir 1992). All of these roundups focused chiefly on the Western Diamondback Rattlesnake, *Crotalus atrox*, whose geographic range lies west of the Mississippi River (Campbell and Lamar 2004). The lands east of the Mississippi River in the Coastal Plain of North America harbor the world's largest and perhaps most dangerous rattlesnake, the Eastern Diamondback Rattlesnake, *C. adamanteus* (Martin and Means 2000).

Roundups for this species began in 1958 in Geneva, Alabama, following a newspaper article published in the *Dothan Eagle* (9 January 1958) describing a technique for evicting rattlesnakes from burrows of the Gopher Tortoise (*Gopherus polyphemus*) by blowing gasoline fumes into them. The article went out on the Associated Press wires and was picked up by newspapers in Florida, Georgia, and Alabama. The initial justification for these roundups was nothing more than adventure and excitement (*Dothan Eagle*, 9 January 1958). Geneva County coroner Dr. R. E. Howell, having read about the gassing technique, used his morning radio news program to incite interest in rounding up rattlesnakes. He

persuaded Geneva merchants to donate cash and prizes to be awarded to hunters turning in the most and largest rattlesnakes, and arranged for the snakes to be brought to a barn behind the Geneva County Courthouse (Robert E. Howell, pers. comm.; *Geneva Co. Reaper*, 13 February 1958). Howell toured civic organizations in southern Alabama, the Florida panhandle, and southern Georgia extolling the excitement of roundups and the gassing techniques for evicting rattlers from tortoise burrows. Roundups soon arose in 23 Southern towns but only three of these have survived into the 21st Century. Decades later, the motivation for hosting rattlesnake roundups extends beyond the adventure and excitement available to snake hunters: "Although roundups are promoted as a means of generating money for local civic causes, the organizers and corporate sponsors are generally the main beneficiaries" (Anonymous 1999). Organizers milk rattlesnakes for their venom and then kill them for their skins or sell the meat for food.

The Eastern Diamondback Rattlesnake, like many other animals whose pre-settlement habitat was mainly Longleaf Pine (*Pinus palustris*) ecosystems (Means 2006), is declining (Martin and Means 2000; Timmerman and Martin 2003). The northern boundary of its range has contracted southwards in the past century, and the rest of the range is now fragmented by agriculture, intensive pine tree farming, and urbanization

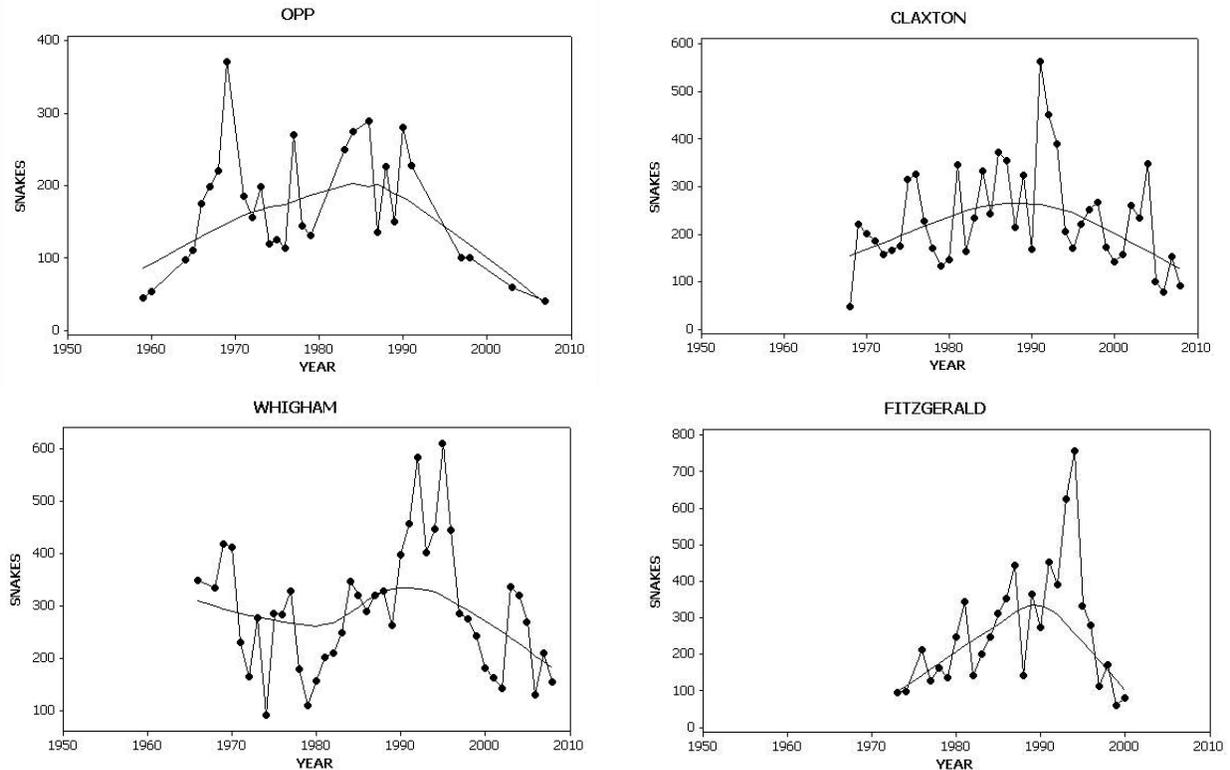


FIGURE 1. Numbers of Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) brought in to the four rattlesnake roundups in the southeastern U. S. over the 50-year period, 1959-2008.

(Martin and Means 2000). Much of the intact range with viable populations lies in northern Florida and southern Georgia, and Martin and Means (2000) considered the species to be endangered in the balance of its historical range. Former populations at the western edge of the species' range in Louisiana probably have been extirpated (Martin and Means 2000); the last known Louisiana specimen was seen in 1980 (Dundee and Rossman 1989). The Eastern Diamondback Rattlesnake in North Carolina is state-listed as endangered (Palmer 1977; Palmer and Braswell 1995), and the species has become uncommon in South Carolina, Alabama, and Mississippi (Bennett 1996; Martin and Means 2000; Means 2006; Means 2008a).

Economic motives are the driving force behind roundups today (Weir 1992; Fitzgerald and Painter 2000), but the original purpose of rattlesnake roundups was to eliminate the species locally or severely reduce its numbers (Klauber 1972; Adams and Thomas 2008). In this paper, I use data generated by the four longest running rattlesnake roundups (one now defunct) to examine trends in both the numbers of snakes turned in each year and the size/age class distributions of snakes winning the annual prize for largest individual. I then discuss what the trends mean and their possible causes.

MATERIALS AND METHODS

The four longest running roundups involving the Eastern Diamondback Rattlesnake are those held in Opp (Covington County since 1959), Alabama, USA, and Whigham (Grady County, 1961), Claxton (Evans County, 1968), and Fitzgerald (Ben Hill County, 1973-2000), Georgia, USA. All but Fitzgerald maintained operations in 2008 by the 50th anniversary of the first roundup held in Opp, Alabama. Data on rattlesnake harvest and hunting effort were erratically available from roundup officials as roundup officials did not record data carefully over the years and they were reluctant to provide information that might be used against the roundups. However, local newspapers regularly reported the number of rattlesnakes brought in and the size (body mass and weight) of the largest rattler. These data for the Whigham, Claxton, and Fitzgerald roundups were published rather faithfully on an annual basis with few gaps, but there were more gaps in the Opp Rodeo data.

In 1993, 2004, and 2008, I gathered information about roundups from roundup promotional literature and newspapers in Opp, Andalusia, and Dothan, Alabama; Crestview, Bonifay, Chipley, Tampa, St. Petersburg, and Crawfordville, Florida; and Albany, Bainbridge, Cairo, Thomasville, Fitzgerald, and Claxton, Georgia. Here I

Means.—Rattlesnake roundups in the southeastern United States.

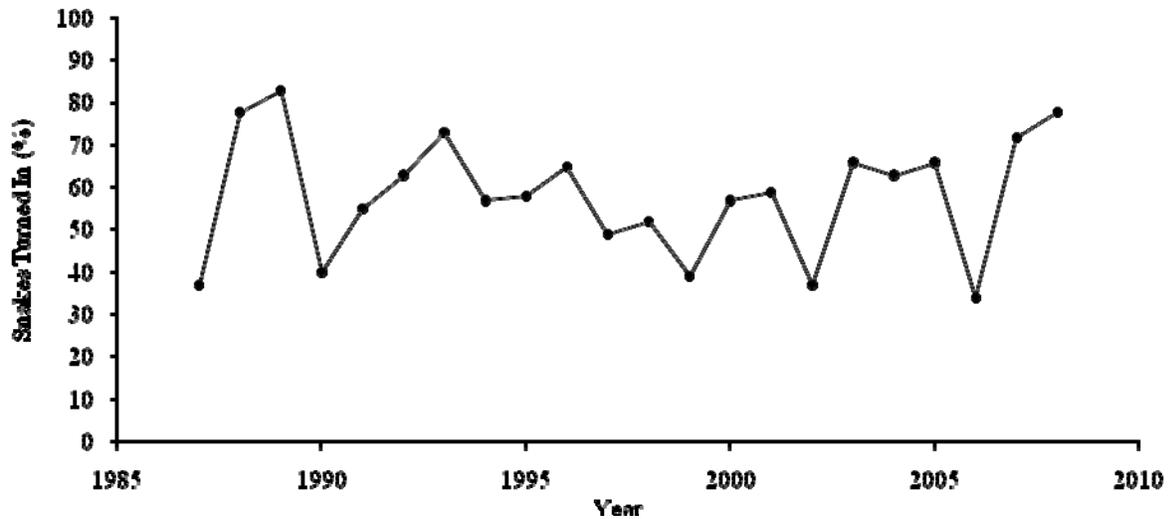


FIGURE 2. Percentage of total Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) turned in to the Whigham Roundup by three groups of hunters over the 22-year period, 1987-2008.

report trends in the total number of snakes brought in to roundups over a 50-year period (1959-2008) and the prize-winning weights of the largest snakes by year.

I constructed scatter plots of numbers of snakes and the sizes of snakes versus time, and I fitted Locally Weighted Scatterplot Smooth (LOWESS) lines to the data. LOWESS is a nonparametric method of fitting a curved line to data (Helsel and Hirsch 1992). At each data point, a predicted value is computed using a weighted linear regression. Predicted values are then connected to create a smoothed line. This approach is preferable to linear regression for determining nonlinear trends in data because a LOWESS line is helpful for identifying similarities and differences in trends between sites. The lines are especially useful for discerning trends from data with high scatter (Fenelon and Moreo 2002).

RESULTS

The numbers of Eastern Diamondback Rattlesnakes brought in over a 50-year period show generally similar trends in all four roundups (Fig. 1). Initially, numbers of rattlesnakes rose from early lows, reached a peak in about 1990, and then declined. The only roundup reporting annual number of rattlesnake hunters was the long-running Whigham Roundup, in which they revealed the top five winners of numbers of snakes. In the past 22 years (1987-2008) of the Whigham Roundup, three groups of hunters (Tommy Lancos, Cobb family, R & R Hunt Club) consistently won one of the top five prizes each year for most snakes and together averaged 58.2% (range 34–83%) of the totals brought in annually. Although their hunting effort may have varied somewhat among the years, their data provide some control on

hunting effort. Across the 22-yr period, although their snakes accounted for approximately the same percentage of roundup totals (Fig. 2), it is perhaps not a coincidence that the numbers of snakes brought in by these three groups also declined during the same period (Fig. 3).

Even more dramatically, since at least the mid-1980s, a steady decline is evident in all four roundups in the weights of Eastern Diamondbacks that won the annual prize for largest snake (Fig. 4). The size of the largest rattlesnake per roundup was higher in the first 20 years or so and then declined in the last 20 years (most dramatically in the Whigham and Claxton roundups). The size of largest snakes is probably correlated with sample size (number turned in), so declining snake size would be at least partly a natural consequence of the declining number of snakes turned in at roundups.

DISCUSSION

Population impacts.—The lows in the early years were probably due to fewer hunters who concentrated their efforts in the locality of the roundup, and the highs in the 1990s perhaps due to many hunters over greatly expanded, multiple-county and multiple-state hunting areas. The declines seen in all four roundups in later years could be due to reduced hunting effort or to an actual decline in repeatedly hunted rattlesnake populations. That the declines after 1990 (Figs. 1 & 4) are true declines and not artifacts of reduced hunting effort is supported by statements made by hunters and roundup officials. Published newspaper interviews of roundup hunters and officials clearly revealed that hunting pressure from all four roundups has had strong, negative effects on local rattlesnake populations. For example, J.P. Jones, founder of the Opp, Alabama,

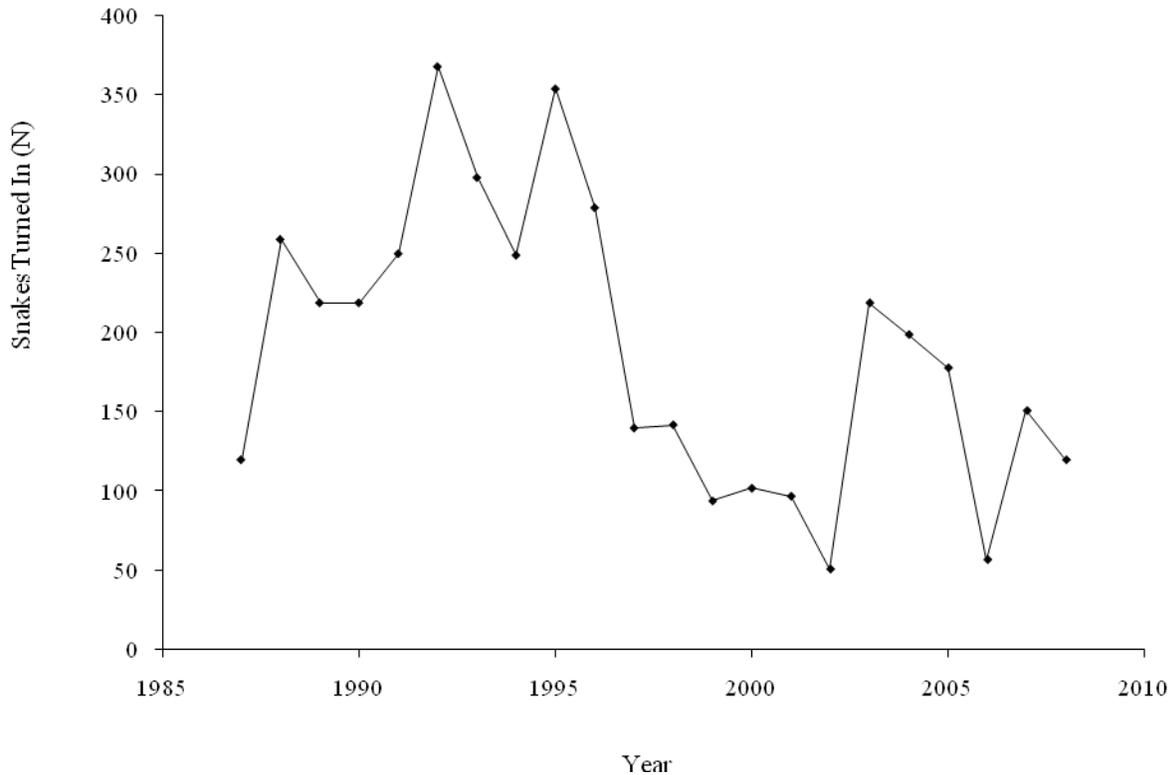


FIGURE 3. Numbers of Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) turned in to the Whigham Roundup over a 22-year period, 1987-2008, by Tommy Lancos, the Cobb Family, and R&R Hunt Club, all of whom won one of the top five prizes in the category of most rattlesnakes in every year.

Rattlesnake Rodeo, said, “We have to drive a hundred miles from here, ...They a lot scarcer now. When I started [in 1959] we just hunted in the woods here. We used to get fifteen a day. You won’t get none today.” (Williams 1990).

Reporters often quoted officials involved with the Whigham, Georgia, Roundup about the negative effects of rattlesnake hunting pressure on local populations. Three years after its inception: “Rattler hunters are saying that in Grady County over areas that have been hunted for the past four years the hunting is not as good as it used to be. It is the opinion of some that a majority of the rattlers caught during this roundup came from adjacent counties.” (*The Cairo Messenger*, 7 February 1964). “Wildlife Ranger Billy Lane said ...In the future a limit might be placed on the number that could be brought in because the snakes are becoming scarce.” (*The Cairo Messenger*, 3 February 1967). The next year, “Chairman Mobley revealed that the total number of rattlers captured, turned in and sold this year totaled 334, which was below the record total of 412 last year because the snakes are naturally less plentiful in the area,

even though the hunters worked harder and longer.” (*The Cairo Messenger*, 2 February 1968).

The rattlesnake population in Grady County had declined so severely by 1971, 10 years after the founding of the Whigham roundup, that “At the regular meeting Monday night following the roundup, a huge expansion of the annual hunt was discussed. The Whigham area has developed a large group of skilled hunters, but they said Monday night that the club seemed to be approaching its goal of reducing the snake population because many hard hours of hunting in this area proved that the rattler is getting scarce. Some of the most skilled hunters said they hunted for days sometimes without seeing a rattler. In view of this development, consideration is being given to expanding to adjacent counties. It has been no secret for some time that more than half of the big ones caught and brought in on roundup day came from Decatur, Thomas, Mitchell, and Gadsden [Florida] counties. Only about a half-dozen rattlers were caught all day by the best hunters around on roundup day.” (*The Cairo Messenger*, 5 February 1971).

Means.—Rattlesnake roundups in the southeastern United States.

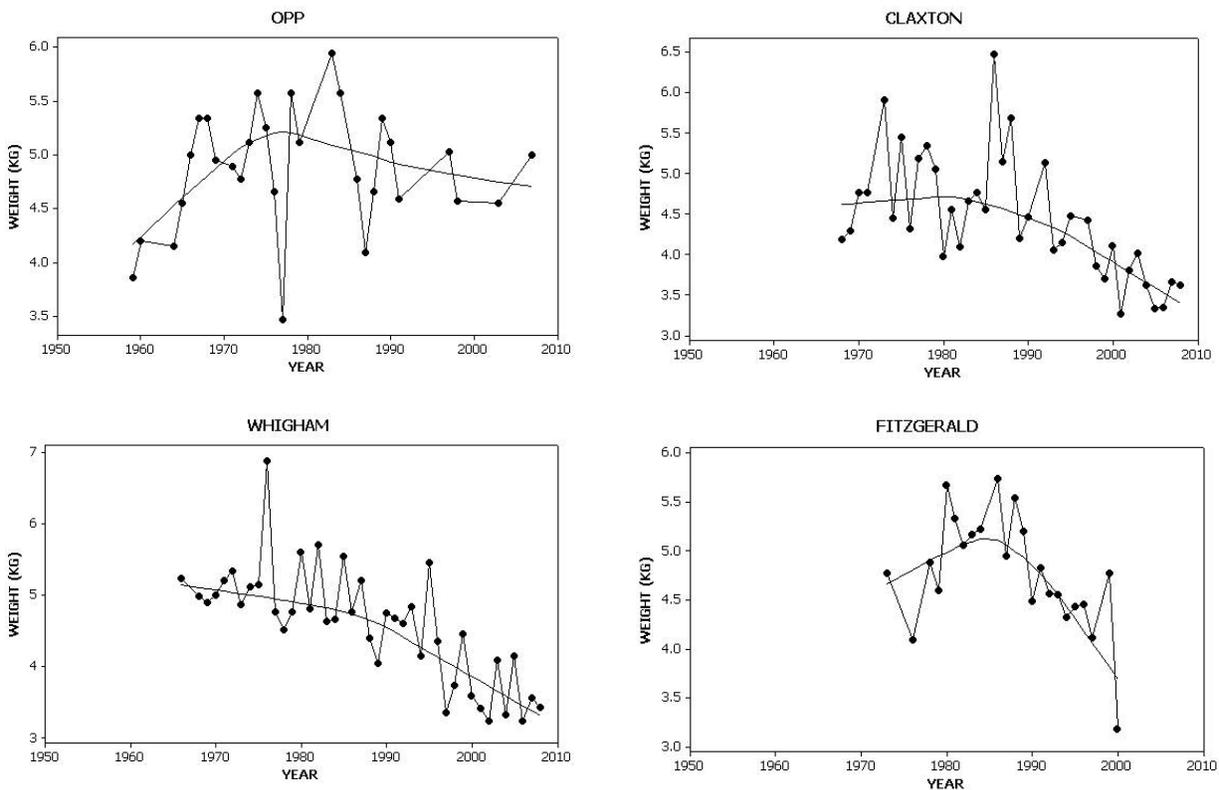


FIGURE 4. Largest Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) in kg, weighed-in at the four major rattlesnake roundups in the southeastern U. S. over the 50-year period, 1959-2008.

Likewise, rattlesnake hunting pressure on the local population forced hunters to go far afield from Evans County where the Claxton, Georgia, Roundup was held: "...hunters, as well as hunters from all over the state, brought in 221 snakes..." (*The Claxton Enterprise*, 9 March 1972). "One member of the Evans County Wildlife Club commented that this is an indication the rattlers are being thinned out during each year's Roundup" (*The Claxton Enterprise*, 16 March 1972). "Derrick Bailey from Douglas, who hunts snakes with his father all over southern Georgia, won the \$500 prize for most snakes with 75 [32% of roundup total]. He had also taken first place in 2002 with 79 snakes [30%]" (*The Claxton Enterprise*, 13 March 2003). "While little of the hunting took place in Evans County, snake hunters from surrounding counties and as far as Alabama and Florida helped bring in 349 snakes..." (*The Claxton Enterprise*, 18 March 2004).

The Sylvester Rattlesnake Roundup was inaugurated in 1962 in Sylvester, Worth Co., Georgia. The reasons for its discontinuance four years later were stated in *The Sylvester Local* (28 January 1965): "Rattlesnakes are thinning out in Worth County. They did not just leave, they have been caught and sold. Now, when the hunters go out in the woods, they discover that the snakes are hard to find. This is the information given Tuesday by

Grady Willis... Roundup Chairman. When this program was started four years ago, many more rattlers were brought in, more rapidly. Now, Mr. Willis says, they are thinning out to the degree that it requires some bit of hunting to find them." No roundups were held in Sylvester after 1965.

A paucity of local snakes was at least part of the reason that the Fitzgerald, Georgia, Roundup changed its theme in 2001 to a Wild Chicken Festival: "When the rattlers are measured and counted at Saturday's Rattlesnake Roundup, it will be for the last time," says Fitzgerald Jaycees President Brandy Peavey. "We have to recognize the impact we have on the environment," Peavey says of the decision to make this the last roundup...Peavey notes that the number of rattlers caught for the roundup in the last two years has dropped significantly from earlier years." (*The Herald-Leader*, 15 March 2000). The paucity of snakes turned-in at Fitzgerald may have been partly due to one hunter, Leroy Davis, of Odessa, Florida. Davis won the top prize for number of rattlesnakes in three of the years 1992-1995, accounting for 24, 28 and 31% of roundup totals (*The Herald-Leader*, 25 March 1992, 23 March 1994, 22 March 1995). I interviewed Davis at the Fitzgerald Roundup in 1994. He said that he collected most of his snakes from Florida, beginning around

TABLE 1. Size (by weight) of the largest Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) in four roundups comparing the average of the first half of years for each roundup with the average of the latter half. A decline in the size of the Opp Roundup rattlers has taken place more recently than the 14-year period used to calculate the average here (see Fig. 4).

Roundup	Mean Wt (kg)	SD	N	% change
Opp 1959-1976	4.73	0.60	15	
Opp 1977-2008	4.99	0.50	14	+5.5
Whigham 1966-1987	5.12	0.52	21	
Whigham 1988-2008	4.03	0.63	21	-21.3
Fitzgerald 1973-1988	5.08	0.47	12	
Fitzgerald 1989-2000	4.44	0.51	11	-12.6
Claxton 1968-1987	4.83	0.64	19	
Claxton 1988-2008	4.04	0.61	19	-16.4

Tampa. From 1996-2001, Davis switched roundups, entering his Florida snakes in the Claxton, Georgia, roundup rather than at Fitzgerald and placed in the top five at least five of six years, accounting for up to 21% of the Claxton annual take (*The Claxton Enterprise*, 14 March 1996, 13 March 1997, 19 March 1998, 18 March 1999, 16 March 2000, 15 March 2001).

Besides bringing in snakes from many counties all over Florida, Georgia, and Alabama, some, if not most, hunters did not confine their rattlesnake hunting activity to the winter months: “This year’s second place winner, Tommy Lancos of Moultrie, who hunts alone and all year long, also finished second last year with the same number of snakes—123. ‘I’m outdoors a lot and think hunting alone is the best way to do it,’ Lancos said. He first joined in the Whigham roundup competition about six years ago and hunts for rattlers in several counties.” (*The Cairo Messenger*, 29 January 1992). In the 22-year period between 1987 and 2008, Lancos placed in the top five for most snakes in every year with published data (20 of 22 years), and won first place in five of the last six years, 2003-2008 (Fig. 1). Lancos has been responsible for up to 49% of the annual number of rattlesnakes brought in to the Whigham Roundup in the past 22 years (Fig. 1).

During the summer of 1994, Mount (2003) interviewed about 30 long-term residents having knowledge of Eastern Diamondback Rattlesnake populations in southern Alabama, northern Florida, and southern Georgia about trends in rattlesnake populations. The overwhelming majority agreed that the species had undergone a serious decline in numbers dating from the late 1960s and early 1970s.

Impacts on size/age class structure.—As size is correlated with age, declining size means fewer larger/older snakes. Declining size, therefore, has potentially negative consequences for the reproductive success of local populations. The Eastern Diamondback Rattlesnake requires at least three years to reach sexual maturity in both sexes, and females give birth every two or three years after their first reproduction (Timmerman and Martin 2003; unpubl. data). Clutch size is correlated with the body size of the mother (Kardong 1996;

unpubl. data), and individuals have been observed to live at least eight years in the field (unpubl. data) and up to 26 years in captivity (Antonio 2003). Longevity is very important, therefore, in the population biology of the species.

The largest rattlesnakes turned in at roundups (except for Opp) declined in body weight by up to 21% over the 50 years of roundup operation (Table 1). The largest specimens probably were males (Diemer Berish 1998), but the 20-year decline in the largest snakes probably involved female size as well, although data on sex were not available. Fewer large, more fecund females in the hunted populations could have a greater negative effect on the annual recruitment of young in comparison with a half century ago.

Data from roundups involving the Western Diamondback Rattlesnake contrast strongly with those from the four roundups reported here involving the Eastern Diamondback Rattlesnake. The number of rattlers turned in over a 28-year period (1959-1986) at just one roundup, in Sweetwater, Texas, averaged 4,000, and one time exceeded 16,000 snakes in one year (Kilmon and Shelton 1981; Campbell et al. 1989). In their analysis of Sweetwater Roundup data, Campbell et al. (1989) found a significant increase in total number of snakes collected. However, they found that the number of registered snake hunters also increased and that there were no significant changes in snakes collected per hunter per year. They concluded that the increased number of Western Diamondback Rattlesnakes collected might have been primarily a function of increased number of registered hunters over the years for which hunter data were available (1978-1986).

The increase in rattlesnakes at the Sweetwater Roundup has been adduced as evidence that Western Diamondback Rattlesnake populations have not been seriously perturbed (Kilmon and Shelton 1981). On the other hand, as in the case presented here for Eastern Diamondback Rattlesnake roundups, hunters may have been collecting over ever-larger areas (Campbell et al. 1989). Summing the data for numbers of snakes turned in for all four roundups involving the Eastern Diamondback Rattlesnake over a 50-year period (1959-2008), the average annual take per roundup for 152

Means.—Rattlesnake roundups in the southeastern United States.

roundups was 239 ± 125 (range 40-759). This is an order of magnitude smaller than the average number of Western Diamondback Rattlesnakes turned in over a 28-year period (1959-1986) at 16 Sweetwater roundups: average 4423 ± 1759 (range 1900-9017; Kilmon and Shelton 1981).

This large difference in numbers of rattlesnakes caught annually between these two species may be explained in two ways. First, the number of hunters varied between areas at about the same order of magnitude of difference. Scattered data for Eastern Diamondback Rattlesnake roundups indicated that the usual number of rattlesnake hunters was about 20 to 35 hunters (*The Cairo Messenger* 3 February 1978, 3 February 1989, 29 January 1992, 31 January 2007). The numbers of hunters turning in rattlesnakes at the Sweetwater Roundup was between 300 and 600 annually (Campbell et al. 1989). The second explanation may have to do with the differences in the biology of the two rattlesnake species. The Western Diamondback Rattlesnake regularly congregates at specific sites to overwinter in communal dens of as many as 100-200 individuals (Ernst and Ernst 2003), whereas large numbers of rattlesnakes can easily be caught. The Eastern Diamondback does not den communally (Means, unpubl. data).

Snakes, as well as many other nongame wildlife species, are declining in the southeastern United States. For example, declines have been recorded in three large nonvenomous snakes that live in some of the same habitats as the Eastern Diamondback Rattlesnake. The Eastern Indigo Snake (*Drymarchon couperi*) became a federally listed threatened species in 1978 because of its severely reduced numbers (Lawler 1977). A dramatic decline in the population of Southern Hognose Snake (*Heterodon simus*) was reported by Tuberville et al. (2000), and the Common Kingsnake (*Lampropeltis getula*) has disappeared from many parts of its range

(Krysko and Smith 2005; Winne et al. 2007; Stapleton et al. 2008). The Gopher Tortoise, from whose burrows most Eastern Diamondback Rattlesnakes are retrieved for rattlesnake roundups, and which is very important in the biology of the Eastern Indigo Snake (Means 2008b), is a federally listed threatened species in the western part of its range in Louisiana, Mississippi, and western Alabama (U. S. Fish and Wildlife Service 1987). It is a state-listed threatened species in Florida (Rule 68A-27.005, F. A. C.) and Georgia (Birkhead and Tuberville 2008), and endangered in South Carolina (Bennett, S.H. and K.A. Buhlmann. 2005. Gopher Tortoise. Available from <http://www.dnr.sc.gov/cwcs/pdf/GopherTortoise.pdf> [Accessed 21 August 2009]).

Affirmations of rattlesnake hunters and the roundup data reported here corroborate the opinions of rattlesnake researchers that the Eastern Diamondback Rattlesnake is declining throughout its range (Martin and Means 2000; Timmerman and Martin 2003; Mount 2003). No doubt, habitat degradation, fragmentation, and outright loss from agriculture, intensive pine tree farming, and development have negative impacts on rattlesnake populations (Means 2006). This is increasingly true as human population continues to expand in the warm sunbelt of the southeastern United States, which includes the geographical range of the Eastern Diamondback Rattlesnake. However, the data presented here also incriminate roundups as an important cause of local declines.

While revenues generated by roundups are important to local rural economies, there are many negative aspects of rattlesnake roundups. One is the perpetuation of negative stereotypes about snakes. The unregulated exploitation of the Eastern Diamondback Rattlesnake demonstrated at roundups promotes the notion that snakes, especially venomous snakes, are loathsome creatures that ought to be removed from nature. Indeed, the poor reputation of venomous snakes is probably the



FIGURE 5. Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*) piled into a small cage at a rattlesnake roundup. Some snakes were asphyxiated in the bottom of the pile. Fitzgerald Rattlesnake Roundup 1994. (Photographed by D. Bruce Means)



FIGURE 6. Roundups often are physically abusive to Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*). Opp Rattlesnake Rodeo 1996. (Photographed by D. Bruce Means)

reason that the State of Georgia prohibits the taking of all snakes “except poisonous” ones, whose taking is entirely unregulated (Official Code of Georgia. Taking of nongame species, 27-1-28).

Another negative aspect of roundups is the inhumane treatment of animals during capture and in captivity (Figs. 5, 6). Initially, many rattlesnakes are gassed out of the burrows of the Gopher Tortoise and the fumes may be physiologically harmful to them. Speake and Mount (1973) ran tests on the effects of gasoline on the Eastern Diamondback Rattlesnake and found a high percentage of ill effects. Rattlesnakes captured for roundups are kept without food and water for months in close, often crowded quarters (Anonymous 1999).

A third negative aspect is the side effects of gasoline fumes on the many vertebrate and invertebrate inhabitants of burrows (Jackson and Miltrey 1989). Many other animals that depend upon Gopher Tortoise burrows for survival are killed by the noxious fumes of gasoline; as well as, often, the Eastern Diamondback Rattlesnake itself (Speake and Mount 1973). Also, Gopher Tortoise burrows are completely destroyed when rattlesnake hunters excavate them to extricate fume-dazed rattlers.

Direct impacts on the Eastern Diamondback Rattlesnake, such as population reduction and elimination, which are the stated intents of rattlesnake roundups, are adding to the overall decline of the species. Habitat loss, fragmentation, and direct mortality from automobiles and people may be the most important factors in the decline of the Eastern Diamondback Rattlesnake over its range, but as populations dwindle from these causes, roundups become more important and can clearly exacerbate the decline, especially in heavily hunted areas. Populations of the Eastern Diamondback Rattlesnake in the heartland of the species' range in north Florida and south Georgia, once contiguous and robust, are now, themselves, showing evidence of decline as seen through both the published statements of roundup hunters and officials and the declines in numbers and size/age class of the largest snakes brought in to rattlesnake roundups.

Officials operating the Fitzgerald Rattlesnake Roundup in south-central Georgia, responding to a severe decline of rattlesnakes turned in and to public pressure about the negative aspects of exploiting native wildlife, changed the emphasis of their annual activity in 2001 to a Wild Chicken festival. Festival organizer Barry Peavey said, “The festival committee is proud to say that the festival has experienced enormous success since the change in focus...” (*The Citizen*, 10 March 2008. Available at <http://www.thecitizen.com/~citizen0/node/26279> [Accessed 21 August 2009]).

Rather than changing the target species of an event, benefits can also accrue by changing emphasis from exploitation and killing to a theme of wildlife

appreciation and celebration. Instead of the spectacle of emptying garbage cans full of traumatized rattlesnakes into small wire-screened pens and sensationalizing their capture, milking, butchering, and sale, a more festival atmosphere might offer educational programs by experienced snake educators and display live snakes and other animals, explaining their ecology, and making appeals for the conservation of local and national biodiversity. The annual San Antonio Rattlesnake Festival held near Tampa, Florida, is a model for such a makeover. When it started in 1967, San Antonio Rattlesnake Festival officials emphasized conservation and celebration of rattlesnakes and other wildlife, rather than rounding up and exploiting these animals (Eddie Hermann, pers. comm.; *The Tampa Tribune* 18 August 1998).

State wildlife agencies should recognize that all snakes, including venomous species, are a valuable part of each state's native wildlife resources. A policy of treating venomous snakes with the same status as other nongame wildlife is urgently needed. In states where there is a demand for rattlesnake skins, meat, venom, and other commercial products, licenses should be required for the taking of venomous snakes and studies conducted to determine reasonable seasonal bag limits as is done for game animals such as deer, turkey, and quail.

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LITERATURE CITED

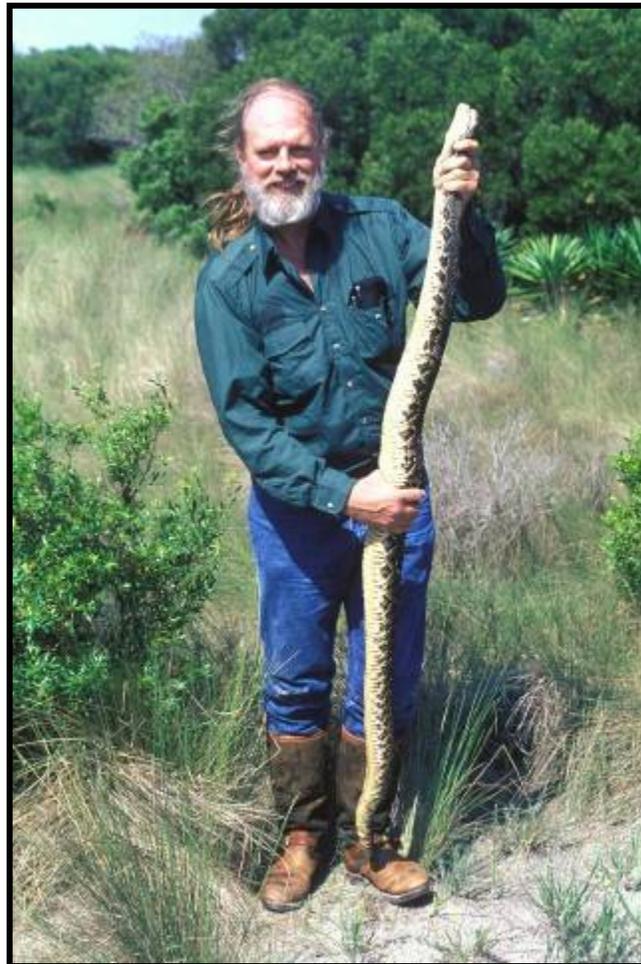
- Adams, C.E., and J.K. Thomas. 2008. Texas Rattlesnake Roundups. Texas A&M University Press, College Station, Texas, USA.
- Anonymous. 1999. The Truth Behind Rattlesnake Roundups. The Humane Society of the United States, Washington, D.C., USA.
- Antonio, F. 2003. Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) North American Regional Studbook, 3rd Edition. Central Florida Zoological Park, 1-109. Lake Monroe, Florida, USA.
- Bennett, S.H. 1996. Ecology and status of the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) in South Carolina. American Zoo and Aquarium Association, Regional Conference Proceedings 1996:225–229.
- Birkhead, R., and T.D. Tuberville. 2008. Gopher Tortoise, *Gopherus polyphemus*. Pages 514–516 In Amphibians and Reptiles of Georgia. Jensen, J.B.,

Means.—Rattlesnake roundups in the southeastern United States.

- C.D. Camp, J.W. Gibbons, and M.J. Elliott (Eds.). University of Georgia Press, Athens, Georgia, USA.
- Campbell, J.A., and W.W. Lamar. 2004. *The Venomous Reptiles of the Western Hemisphere*. Comstock Publishing Company, Ithaca, New York, USA.
- Campbell, J.A., D.R. Formanowicz, Jr., and E.D. Brodie, Jr. 1989. Potential impact of rattlesnake roundups on natural populations. *The Texas Journal of Science* 41:301–317.
- Diemer Berish, J.E. 1998. Characterization of rattlesnake harvest in Florida. *Journal of Herpetology* 32:551–557.
- Dundee, H.A., and D.A. Rossman. 1989. *The Amphibians and Reptiles of Louisiana*. Louisiana State University Press, Baton Rouge, Louisiana, USA.
- Ernst, C.H. and E.M. Ernst. 2003. *Snakes of the United States and Canada*. Smithsonian Books, Washington, D.C., USA.
- Fenelon, J.M., and M.T. Moreo. 2002. Trend analysis of ground-water levels and spring discharge in the Yucca Mountain Region, Nevada and California, 1960–2000. U.S. Geological Survey Water-Resources Investigations Report 02-4178. U.S. Department of the Interior, U.S. Geological Survey, Information Services, Carson City, Nevada, USA.
- Fitzgerald, L.A., and C.W. Painter. 2000. Rattlesnake commercialization: long-term trends, issues, and implications for conservation. *Wildlife Society Bulletin* 28:235–253.
- Helsel, D.R., and R.M. Hirsch. 1992. *Statistical Methods in Water Resources*. Elsevier, New York, New York, USA.
- Jackson, D.L., and E.G. Milstrey. 1989. The fauna of Gopher Tortoise burrows. Pages 86–98 *In* Proceedings of the Gopher Tortoise Relocation Symposium. Diemer, J.E., D.R. Jackson, J.L. Landers, J.N. Layne, and D.A. Woods (Eds.). Florida Game and Fresh Water Fish Commission Nongame Wildlife Program Tech. Report 5. Tallahassee, Florida, USA.
- Kardong, K.V. 1996. Evolution of aging: theoretical and practical implications from rattlesnakes. *Zoo Biology* 15:265–277.
- Kilmon, J., and H. Shelton. 1981. Rattlesnakes in America and a History of the Sweetwater Jaycees Rattlesnake Roundup. Shelton Press, Sweetwater, Texas, USA.
- Klauber, L.M. 1972. *Rattlesnakes, Their Habitats, Life Histories, and Influence on Mankind*, 2nd Edition. University of California Press, Berkeley, California, USA.
- Krysko, K.L., and D.J. Smith. 2005. The decline and extirpation of the kingsnake (*Lampropeltis getula*) in Florida. Pp. 132–141 *In* Status and Conservation of Florida Amphibians and Reptiles. Meshaka, W. and K. Babbitt (Eds.). University Press of Florida, Gainesville, Florida, USA.
- Lawler, H.E. 1977. The status of *Drymarchon corais couperi* (Holbrook), the Eastern Indigo Snake, in the southeastern USA. *Herpetological Review* 8:76–79.
- Martin, W.H., and D.B. Means. 2000. Geographic distribution and habitat relationships of the Eastern Diamondback Rattlesnake, *Crotalus adamanteus*. *Herpetological Natural History* 7:9–35.
- Means, D.B. 2006. Chapter 6. Vertebrate Faunal Diversity of Longleaf Pine Savannas. Pp. 155–213 *In* Longleaf Pine Ecosystems: Ecology, Management, and Restoration. Jose, S., E. Jokela, and D. Miller (Eds.). Springer, New York, USA.
- Means, D.B. 2008a. Eastern Diamondback Rattlesnake (*Crotalus adamanteus*). Pp. 430–432 *In* Amphibians and Reptiles of Georgia. Jensen, J.B., C. Camp, W. Gibbons, and M. Elliott (Eds.). University of Georgia Press, Athens, Georgia, USA.
- Means, D.B. 2008b. *Stalking the Plumed Serpent and Other Adventures in Herpetology*. Pineapple Press, Sarasota, Florida, USA.
- Mount, R.H. 2003. Eastern Diamondback Rattlesnake: Status and conservation strategies—Alabama, Florida and Georgia. Pp. 47–50 *In* Conservation Guide to the Eastern Diamondback Rattlesnake, *Crotalus adamanteus*. Timmerman, W.W., and W.H. Martin (Eds.). Society for the Study of Amphibians and Reptiles Herpetological Circular 32.
- Palmer, W.M. 1977. *Crotalus adamanteus* Beauvois. Pp. 308–310 *In* J Endangered and Threatened Plants and Animals of North Carolina. Cooper, E., S.S. Robinson, and J.B. Funderberg (Eds.). North Carolina State Museum of Natural History, Raleigh, North Carolina, USA.
- Palmer, W.M., and A.L. Braswell. 1995. *Reptiles of North Carolina*. University of North Carolina Press, Chapel Hill, North Carolina, USA.
- Speake, D.W., and R.H. Mount. 1973. Some possible effects of “Rattlesnake Roundups” in the southeastern Coastal Plain. Proceedings 27th Annual Conference of the Southeastern Association of Game and Fish Commissioners 1973:267–277.
- Stapleton, S.P., K.J. Sash, D.B. Means, W.E. Palmer, and J.P. Carroll. 2008. Eastern Kingsnake (*Lampropeltis g. getula*) population decline in northern Florida and southern Georgia. *Herpetological Review* 39(1):33–35.
- Timmerman, W.W., and W.H. Martin (Eds.). 2003. Conservation Guide to the Eastern Diamondback Rattlesnake, *Crotalus adamanteus*. Society for the Study of Amphibians and Reptiles Herpetological Circular 32. 55 p.
- Tuberville, T.D., J.R. Bodie, J.B. Jensen, L.V. LaClaire, and J.W. Gibbons. 2000. Apparent decline of the Southern Hognose Snake (*Heterodon simus*). *Journal of the Elisha Mitchell Scientific Society* 116:19–40.

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- U.S. Fish and Wildlife Service. 1987. Final rule: Threatened status for the Gopher Tortoise. 50 CFR, 52(129).
- Weir, J. 1992. The Sweetwater Rattlesnake Round-up: a case study in environmental ethics. *Conservation Biology* 6:116–127.
- Williams, T. 1990. Driving out the dread serpent. *Audubon*, September:26–32.
- Winne, C.T., J.D. Willson, B.D. Todd, K.M. Andrews, and J.W. Gibbons. 2007. Enigmatic decline of a protected population of Eastern Kingsnakes, *Lampropeltis getula*, in South Carolina. *Copeia* 2007:507–519.



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