

FORWARD

An International Symposium and Workshop for the Conservation of the Eastern Massasauga Rattlesnake, *Sistrurus catenatus catenatus*, was convened at Metro Toronto Zoo May 8-9, 1992. These proceedings are the result of that two day meeting.

A sharing of resources and recovery strategies regardless of state, provincial or international boundaries is appropriate given recent concerns about the status of the eastern massasauga rattlesnake throughout its range in ten U.S. states and one Canadian province. Representatives from all jurisdictions shared data and conservation strategies. The lack of information on status throughout its range is one reason why the eastern massasauga rattlesnake is not federally listed in the U.S.A. Participants enthusiastically greeted an announcement by Craig Johnson, U.S. Fish and Wildlife Service (USFWS), that on the basis of information presented during the symposium and the fact that the eastern massasauga rattlesnake has been a candidate species for some time, the status of this species would be reviewed by the USFWS after state by state reports are forwarded for review and public comment. This follows a 1991 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designation as a Threatened species in Canada and the writing of a recovery plan scheduled for completion in 1993.

Insight into strategies for the conservation and recovery of a venomous snake may be had by comparing similar programs in other countries. Keynote speaker Keith Corbett presents information on the status and conservation of European viperids. Keith spoke highly of the U.S. Endangered Species Act and its importance in legislating protection. Keith stresses that management decisions should be based on habitat assessments. Such data is particularly important given the number of species inhabiting relatively small ranges separated by mountain barriers. Keith comments on the impact of managing threatened habitats, at the expense of other declining species dependent on the same habitat, and emphasizes the importance of ecosystem management rather than single species habitat management. In fact, he notes that the high species diversity of amphibians and reptiles, especially snakes, is likely to be a good indicator of undisturbed or pristine ecosystems. Appropriate to the audience of this workshop, Keith points out that the more endangered the taxa the more important it becomes to achieve an international framework for any conservation strategy. Unfortunately, the regional administrations having the largest populations of a threatened species often prefer to leave action to those whose populations are nearer extinction.

Francis Cook follows Keith's presentation with a biogeographical analysis of the distribution of Canadian herpetofauna, reflecting the importance of the Wisconsin glacial ice cap. The distribution of cold-adapted species in Canada places particular stress on remnant populations and Francis concludes with an appeal to preserve as many of these uniquely adapted taxa as possible.

In a paper ("Laboratory studies of growth and thermoregulation in eastern massasauga rattlesnakes") not included in these proceedings, Ralph Gibson, Cleveland State University, documents growth and temperature regulation by snakes of different age classes. Massasauga rattlesnakes are significantly more efficient in converting food energy into growth when compared to garter snakes. Physiological studies of populations at the northern limits of their range may contribute to our understanding of range contractions and expansions. Cold stressed species may be less able to respond to additional environmental stresses, declining in number and range at a greater rate than hardier sympatric species.

Ellin Beltz focusses Symposium participants on the distribution of the eastern massasauga rattlesnake throughout its range in ten U.S. states and one Canadian province. Ellin emphasizes the importance of dot locality data in providing a realistic picture of distribution. She illustrates the interrupted and discontinuous distribution of the eastern massasauga rattlesnake as compared to most range maps and was the first to express concern over the recent decline from former ranges and wide gaps in distribution between populations.

Wayne Weller and Michael Oldham present data which dramatically illustrates the decline in range of Ontario rattlesnake populations. Ontario has two small isolated populations in the area of Wainfleet bog and Ojibway Nature Centre in Windsor. The once continuous population which was distributed around the shoreline of Georgian Bay has recently been separated into two populations, one along the eastern shore of Georgian Bay and the other on the Bruce Peninsula. Habitat loss and specifically the elimination of wetlands is suggested as the primary cause of range reduction. It is interesting to note that few records of massasaugas occur in areas which

are characterized by less than 5% wetlands. Wayne's data highlights the importance of provincial and state species inventory systems in providing data on historic abundance with which the degree and speed of declines can be monitored.

Paul Pratt, Karen Cedar and Jo Batten describe massasaugas which inhabit a remnant tallgrass prairie habitat within the city limits of Windsor, Ontario. The Ojibway Nature Centre's wet prairie management options are unique in the province, but not dissimilar to prairie management techniques in the western U.S. states. The Ojibway Nature Centre is located in a heavily populated area, and public education is an important component of their management program. Throughout its range, habitat fragmentation remains a major threat to small, isolated rattlesnake populations. The Ojibway snakes are the closest Canadian population to those in the United States, which are found near Ann Arbor, 80 km away.

A contributed paper by John Middleton summarizes the management options for massasauga rattlesnakes in Wainfleet Bog (100 km from eastern massasauga rattlesnake population in Bergen Swamp, N.Y. State). Although once mined for peat extraction, Wainfleet Bog has been recognized for its importance as the most southerly bog of any size in southern Canada.

Doug Sweiger, Michel Villeneuve and Brian Hutchinson summarize data from mark-recapture and radio telemetry studies of snakes found within Bruce Peninsula and Georgian Bay Islands National Parks. Both upland and wet areas are documented as overwintering sites and some fidelity to these sites has been documented. Snakes hibernate individually, have an approximate range of one kilometer, and emerge from winter hibernation in late April. The description of critical habitat is essential in developing recovery strategies for threatened species. The techniques of mapping used by Brian Hutchinson, Caroline Duchesne and Henry Schryver can be used to delineate preferred habitat and seasonal use of habitat. As habitat profiles are developed for each region, in an accumulative way some degree of reliability may be attached to predicting the impact of logging, new roads, or hydro transmission corridors.

Public education is an important component in park conservation programs given the number of visitors and snake densities in these National Parks. Massasauga rattlesnakes have the highest priority for management in Georgian Bay Islands National Park due to its threatened status and potential threat to 100,000 annual park visitors. To the credit of the Canadian Parks Service, as early as 1978 a management strategy for this species was developed. This strategy focusses on reducing the hazard of visitor/snake encounters through visitor education. Identification of rattlesnake critical habitat is used to locate centres of activity away from these as part of the park planning process.

Glenn Johnson and Al Breisch describe the dramatic decline of eastern massasauga rattlesnakes in New York and emphasize the benefits of maintaining an early successional community by creating gaps in closed canopy areas. Without self regulating habitat mosaics that include canopy gaps, vegetation manipulation may be required to maintain or increase critical habitat. A variety of management techniques in Cicero Swamp, N.Y. are being explored on an experimental basis. It is apparent that we in Ontario are fortunate to be able to study preferred habitat as compared to describing habitats that are critical for continued survival or which require ongoing manipulation for the recovery of the species. Glenn Johnson and Kent Prior are currently collecting blood samples from all rattlesnake populations in Canada and the United States for DNA analysis to determine the degree of divergence of rattlesnake populations. This is important data in developing management guidelines for small, isolated populations.

Howard Reinert and Laretta Bushar discuss the ecology of eastern massasauga rattlesnakes in Pennsylvania, the most easterly populations in North America. Highway construction, damming wetlands, and the insidious natural succession of woody vegetation are the primary causes of decline in Pennsylvania. In fact, the one locality which has maintained stable habitat undergoes intensive management to control woody growth. The increase in woody vegetation at some sites has reduced opportunities for thermoregulation, but snakes adapted well to the rocky foundations of new roads as basking sites. In an insightful way, Howard outlines how barriers to dispersal increase the impact of isolation. Howard suggests that a minimum effective population size of 500 provides a realistic number as a recovery objective and also emphasizes the importance of addressing the impacts of habitat loss or fragmentation on genetic fitness. The mechanism of extinction for all small populations no matter how protected they may be. In discussion, Howard emphasized the importance of standardized methodology in assessing rattlesnake habitat which is incredibly variable across its range. Howard has elegantly

spoken of the need for a comprehensive action plan to ensure the survival and, where necessary, recovery of this declining species!

Although unable to attend the symposium, William Allen of the Pittsburgh Zoo wrote to share his concerns over the decline in Pennsylvania populations of the eastern massasauga rattlesnake. Fortunately, Bill has been asked to comment on permit applications for coal, gas, and oil exploration, which affects the wetland habitat of eastern massasauga rattlesnakes.

Terry Jaworski manages a reserve which has also undergone rapid habitat alteration around its borders. Cedar Bog preserves 20 of the original 2830 hectares of Ohio wetlands. As early as 1978 the importance of open grassland for rattlesnakes was recognized. Programs at the reserve focus on educating local landowners and in managing overgrown field basking sites by selective burning or herbicide spraying. Management techniques go so far as to include consideration of the rodent prey base.

Michigan was not represented by an invited speaker and Theresa Moran forwards a report for these proceedings. Many wetlands critical to the survival of massasauga rattlesnakes in Michigan are too small to qualify under wetland protection laws. As Theresa reports, it is fortunate that of all U.S. states, Michigan has healthy populations of massasauga rattlesnakes and will remain a safe stronghold for the species. In that sense, Michigan has most in common with the Ontario rattlesnake populations.

Ken Mierzwa discusses the importance of a habitat mosaic of woodlot openings, prairie, and wetlands as components of massasauga rattlesnake habitat in the Chicago area. As with many speakers, Ken shares a concern with the impact of woody growth invasion in prairie and fen rattlesnake habitats. He stresses the need for restoration of a sunlight/shade mosaic, once typical of pre-settlement flatwoods-prairie communities, but suggests that no more than one-third of a site should be burned to control woody growth at any one time. Tom Anton describes a population of massasaugas which are restricted to a 2.5 acre parking lot in a reserve surrounded by homes in a Chicago suburb. This intensive study includes data on diet, temperature regulation, reproduction and management options. Alan Resetar summarizes distribution in Indiana.

Gary Casper provides data from the Wisconsin Herp Atlas on the distribution of eastern massasaugas. Conservation of this species is dependent on ongoing quantitative studies which will be followed by management and recovery guidelines. Along with data on additional nonverified reports (pers. comm., Rich Baker, Minnesota Department of Natural Resources 1993) there is a renewed effort in Minnesota to assess data on habitat, distribution and density on the western edge of the species' range.

The discussion of current populations is concluded by Dennis Figg and Tom Johnson who examine the status of massasauga rattlesnakes in Missouri, the southernmost extent of the eastern massasauga rattlesnake's range. As with most populations, wetland loss has had an impact on species abundance. Tall grass and cattail growth is managed by cutting. The dependence of rattlesnakes on state or federal managed wetlands increases the importance of research on management options in these protected areas.

Public education goes hand in hand with habitat protection and management in the recovery of massasauga rattlesnake populations. Papers by Bob Johnson and Tom Mantil discuss programs which teach people to live with wildlife. To develop a trusting relationship, venomous snake public education programs must be based on sound background information. Kerstin Hedgecock's paper confirms that the eastern massasauga rattlesnake relies on a cryptic pattern to remain hidden. Of note is the reluctance of snakes in this study to strike unless stepped upon and the individual variation in willingness to rattle when disturbed. With the support of such data we can describe with confidence the likely outcome of most snake-human encounters.

During the workshop, individuals with an interest in specific aspects of eastern massasauga rattlesnake conservation volunteered to follow-up on management options, population survey techniques, standardized habitat assessment criteria, and public education. Based on Workshop discussions, Robert Hay provides, for these proceedings, a timely summary report on management options. That such a report was received so soon after the conclusion of the symposium is testament to the dedication of those committed to the survival of this species. To all Symposium and Workshop participants, and particularly those who shared data on distribution and management concerns, a heartfelt thank you! The conservation of species and their habitats has benefitted immeasurably from your willingness to get on with the task of conserving global biodiversity.