Understanding the sheltered life: Forty years of turtle research in Algonquin Provincial Park

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Status of Ontario Turtles
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- **Not Assessed**
- **Special Concern**
- **Threatened**
- **Endangered**
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The Algonquin turtle project

Since 1972:

• 10,520 Painted Turtle records
• 4,100 Snapping Turtle records
• 75+ peer-reviewed publications
• 100+ undergraduate students and volunteers
• 25+ graduate students
"The legislative objectives for provincial parks is to enable scientific research and support the monitoring of ecological change on the broader landscape”

- Provincial Parks and Conservation Reserves Act, 2006

- Baseline to maintain biodiversity and support/restore ecological integrity
- Historical change ➔ understanding the present ➔ anticipating the future
- Environmental change and shifting ecological baselines
- Large-scale relevant for management
- Evidence-based policy and decision making
Lake Sasajewun

- Since 1972
- Main Snapping Turtle study site
- Algonquin Wildlife Research Station
- Otter mortality (1986-1989)
Arowhon population

- Since 1978
- Main Painted Turtle study site
- Metapopulation size: ~400
- High density
Life history

“A life history is a suite of coevolved characteristics that directly influence population parameters.”

(Congdon and Gibbons 1990)
Lessons from life history:

Understanding population biology and conservation in long-lived species
Challenges of being an **ectotherm** in the north

Limitation: The **cool Canadian climate** sets restrictions on population growth or recovery

1) Nest success is curtailed
2) Growth is slower
3) Maturity is even more delayed
4) Reproductive output is constrained

*Brrrr ...*
Incubation environment

Climate affects conservation

- Low temperatures:
  - ↓ hatching success
  - ↓ hatchling survival
  - ↓ post-hatching growth

- Hatchling quantity and quality?

- Implications for offspring survival and recruitment

Bobyn and Brooks 1993 Can J Zoo
Hatchling Survival

Survival vs. Days posthatching

Temp = 21.1, Temp = 26.5, Temp = 29.6
## Climate variation and reproductive success

<table>
<thead>
<tr>
<th>Year</th>
<th>Deviation from normal (1964-1980)</th>
<th>% nests emerged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>-0.9</td>
<td>0</td>
</tr>
<tr>
<td>1977</td>
<td>-0.1</td>
<td>8</td>
</tr>
<tr>
<td>1978</td>
<td>-0.3</td>
<td>33</td>
</tr>
<tr>
<td>1979</td>
<td>-0.4</td>
<td>7</td>
</tr>
<tr>
<td>1980</td>
<td>-1.1</td>
<td>0</td>
</tr>
<tr>
<td>1981</td>
<td>-1.9</td>
<td>0</td>
</tr>
<tr>
<td>1982</td>
<td>-3.2</td>
<td>0</td>
</tr>
<tr>
<td>1983</td>
<td>+4.2</td>
<td>100</td>
</tr>
<tr>
<td>1984</td>
<td>+0.8</td>
<td>0</td>
</tr>
<tr>
<td>1985</td>
<td>-0.8</td>
<td>0</td>
</tr>
<tr>
<td>1986</td>
<td>-2.8</td>
<td>0</td>
</tr>
<tr>
<td>1987</td>
<td>+3.0</td>
<td>100</td>
</tr>
<tr>
<td>1988</td>
<td>+5.1</td>
<td>80</td>
</tr>
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</table>
Sex-specific growth curves

- Similar male and female growth up to maturity (~24 cm), divergence in growth thereafter

- Maturity size-dependent rather than age

- Female age at maturity: 11-44 years

- Galbraith (1989): 17-19 years, known-age nesting at 16-19 years
"Note that up to 1400 eggs need to be laid by a snapping turtle before one offspring reaches maturity. This may not occur until year 50."

Note this chart does not take mortality into consideration.

This chart was developed by the OMNR Black Bear Technical Team in 2005 based on an original idea by George Kolenosky.

Snapping Turtle column was added by the Ontario Multi-Species Turtle Recovery Team in 2008.

Please note that up to 1400 eggs need to be laid by a snapping turtle before one offspring reaches maturity. This may not occur until year 50.

= young of the year
= sexually immature
= sexually mature
Growth of juvenile Snappers in one year
Lake Sasajewun mass mortality
Survivorship and Abundance
Nesting Female Snappers

apparent survivorship
population size
apparent survival
population size

Small Mammal Captures per trap-night in Algonquin Park: 1952-2007

Captures / trap-night

Year 1952:2007
Evaluating Management Tools
Evaluating Management Tools:

Aging from growth lines

- Accuracy? Precision? Repeatability?
- Known age validation
- Underestimates age (±17%)
- Errors in age estimates have marked effects on estimates of population demography

Fig. 2. The relationship between the length of the fourth vertebral scute and the age of female snapping turtles in Algonquin Provincial Park. The solid line is the mean regression equation from 18 individual polynomial regressions. The broken lines are the 95% confidence limits on all estimates generated by the 18 regression equations.

Galbraith and Brooks. J. Wildl. Manag 1989
Predator-exclusion cages

- Effectiveness
- Cost
- Hatchling fitness
- Caging did not influence:
  - Nest temperature
  - Hatching success
  - Hatchling deformity
  - Hatchling locomotor performance
Living the long life
**H16**, aka *Humungous Harry*
First caught 1978
Mass = 17.5 kg, CL = 40.8 cm
Same size 1978-2013

**X10**, aka *Babyface*
First caught 1977 (CL = 28.1 cm)
Most recent capture 2013 (CL = 37.5 cm)
26 captures

**Z11**, aka *Kevin*, 1976-2008 (RIP)
Mass = 15.5 kg, CL = 38 cm
No growth over 32 years of data.
Snapping turtle growth rates

![Graph showing growth rates of carapace length over years since first marked.](image)
Story of Snapping Turtle B07

- Large female SNTU when first captured in 1973
- In June ‘every’ year since, she has struck out from Amoya swamp
- Travels 18 km loop in 4 days!
Story of Snapping Turtle B07

Lonche and Obbard 1977 J Herp, Obbard and Brooks Herpetologica 1980
Story of Snapping Turtle B07

- $1973 \rightarrow 2013 = \sim 1500$ eggs

- **NOT one** (1, any, a singleton) of these hatchling naturally made it out of a nest. $N=0$ success.

- Cool temperatures and predators and have led to universal failure.

... but ...
B07’s daughter

- Two nests from B07 artificially incubated
- Release of ~80 hatchlings in 1987
- Only known survivor, female 782, the first known-age nester (17 yr in 2002).
Ontario Snapping Turtle Hunt

Game Amphibians and Reptiles

Frogs and Turtles

**NEW – Snapping Turtle Mandatory Harvest Reporting**

If you harvest a snapping turtle you must complete the mandatory questionnaire and submit it to the ministry by January 14th of the following calendar year. Copies of the questionnaire are available online at ontario.ca/harvestreporting.

About the Ministry of Natural Resources

**What we do**

As a ministry, we are working to promote healthy, sustainable ecosystems and conserve biodiversity (the variety of life on Earth). We **conduct scientific research and apply the findings to develop effective resource management policies**. The Ministry of Natural Resources also manages Ontario’s Crown land, promotes economic opportunities in the resource sector and enhances opportunities for outdoor recreation.
Snapping turtles are only game reptile:

- Kill of 2/day
- Possession limit of 5 individuals

“MNR’s management of the snapping turtle hunt and its harvest monitoring program are flawed. The results from the program’s first year indicate either that MNR is maintaining a recreational hunt of snapping turtles for only four people or compliance with the requirement to report harvest is incredibly low.”
“Clearly, exploitation of a population similar to that in Algonquin Park would quickly reduce numbers below any chance of recovery by reproduction within that population.”
Southern Ontario's Road Network

Only major roads (highways, concessions, sideroads, etc.) are displayed. Logging roads and small, private lanes are not included in this map. No point in southwestern Ontario is more than 1.5 km from a road.
Figure 2: Hotspots for turtle mortality on roads in southern Ontario, listed from most turtles observed on roads to least. A tiny fraction of turtles on roads are actually reported to turtle monitoring groups so many unknown road mortality hotspots likely exist.

1. County of Haliburton and northern City of Kawartha Lakes
2. Highway 7 from Norwood to Maberly
3. Highway 69/400 from Port Severn to Sudbury
4. Greater Golden Horseshoe
5. Highway 60, especially through Algonquin Provincial Park
6. Essex County, especially Pelee Island
7. Highway 17 west of Sudbury
8. Presqu’ile Provincial Park and surrounding area
<table>
<thead>
<tr>
<th></th>
<th>PATU</th>
<th>SNTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult female</td>
<td>75%</td>
<td>32.5%</td>
</tr>
<tr>
<td>Adult male</td>
<td>11%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Adult, unknown sex</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Juvenile</td>
<td>8%</td>
<td>61%</td>
</tr>
</tbody>
</table>
Long-term Algonquin turtle project

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- Environmental change and shifting ecological baselines
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Acknowledgements

Algonquin Wildlife Research Station

Ontario Parks, The Friends of Algonquin Park

Dozens of graduate students and hundreds of volunteers

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