LETTERS

RONALD MAXWELL SAVAGE – AN APPEAL FOR INFORMATION

I am hoping to write a short tribute to R. Maxwell Savage, a pioneering British herpetologist who carried out groundbreaking work on Common Frog ecology in the 1930s. I would be delighted to hear from anyone who knew him, and especially to learn about any surviving relatives (he died in the 1980s). At present I have very little biographical information.

If you can help, please contact Trevor Beebee by:

Tel.	01273 606755 (work)
	01273 305634 (home)
Email:	t.j.c.beebee@sussex.ac.uk
Letter:	434 Falmer Rd,
	Woodingdean,
	Brighton,
	BN2 6LG.

Thanks in anticipation.

RESEARCH ABSTRACTS

HERPETOFAUNAL MORTALITY ON ROADS.

In this study 145 points throughout a 353-km highway network were surveyed in New York State, USA, for road kill of reptiles and amphibians. Land cover, wetland configuration and traffic volume data were used to identify features that best predicted hot spots of herpetofauna road mortality. Forty points were resampled over four times over four years to evaluate temporal repeatability. Both amphibian and reptile road mortality was spatially clustered and road kill hot spots of the two taxa overlapped. One survey provided a valid snapshot of spatial patterns of road mortality and spatial patterns remained stable across time. Road kill hot spots were located where wetlands approached within 100 m of the road and the best predictor was a causeway configuration of wetlands (wetlands on both sides of the road).

Causeways proved to be predictors of road mortality by surveying 180 causeways and 180 random points across five regions (17,823 km^2) of northeastern New York. Causeways were three times more likely than random locations to have amphibian and 12 times more likely to have reptile mortality. Causeways had four times as much total number of amphibian road kill and nine times as much reptile roadkill than randomly sampled points. The study clearly concluded that it is possible to identify hot spots of amphibian and reptile road mortality. This is useful when planning for roads to locate priority areas for mitigation.

Langen, T.A., Ogden, K.M. & Schwarting, L.L. (2009). Predicting hot spots of herpetofauna road mortality along highway networks. *J. Wildlife Man.* **73** (1), 104-114.

POPULAR HERBICIDE (ATRAZINE) AFFECTS SEXUAL DEVELOPMENT IN FROGS.

The controversy surrounding the unintended effects of herbicide and pesticide use has intensified as researchers from the University of Ottawa's Department of Biology have identified that atrazine, a heavily-used herbicide, alters sexual development in frogs. There have been numerous scientific and journalistic reports on the detrimental effects of herbicides, including atrazine, yet investigations by other research teams report minimal adverse effects of the popular herbicide.

In an attempt to help resolve differences between the various reports, Dr. Vance Trudeau and his team at the University of Ottawa's Centre for Advanced Research in Environmental Genomics developed a system to evaluate the effects of a commercial formulation of atrazine. Specifically, Ph.D. student Valérie Langlois applied it to outdoor tanks where tadpoles of leopard frogs were kept for an entire spring and summer. Under these semi-natural conditions (in mesocosms), the levels of atrazine were low and comparable to those measured in the Canadian environment. At the end of the summer, the results showed that atrazine levels in the tanks were at levels within currently acceptable guidelines. However, researchers also found that the herbicide reduced the number of tadpoles reaching the froglet stage. Also noteworthy was that atrazine had a feminizing effect on the frogs, resulting in sex ratios favouring females, with a reduced number of males.

This study raises important questions about the level of atrazine in the environment, and its negative effects on animal development. Atrazine is one of the top selling herbicides used worldwide. It was designed to inhibit weed growth in cornfields. It is so widely used that it can be detected in many rivers, streams and in some water supplies. This has raised the alarm among many conservationists about the possibility of other serious detrimental effects to habitats and their species.

Langlois, V.S., Carew, A.C., Pauli, B.D., Wade, M.G., Cooke, G.M. & Trudeau, V.L. (2009). Low levels of the herbicide atrazine alters sex ratios and reduces metamorphic success in *Rana pipiens* tadpoles raised in outdoor mesocosms. *Environ. Health Perspect.* doi:10.1289/ehp.0901418.

HOW DO SALAMANDERS GROW A NEW LEG? PROTEIN MECHANISMS BEHIND LIMB REGENERATION.

The most comprehensive study to date of the proteins in a species of salamander that can regrow appendages have provided important clues to how similar regeneration could be induced in humans. Researchers at the School of Science at Indiana University-Purdue University Indianapolis and colleagues investigated over three hundred proteins in the amputated limbs of Axolotls (*Ambystoma mexicanum*) with the hope that this knowledge will contribute to a better understanding of the mechanisms that allow limbs to regenerate.

Comparisons of fish proteins with those expressed in amphibian limbs is shedding light on the mechanisms involved. Limb regeneration in the axolotl occurs when undifferentiated cells accumulate under the wound epidermis at the amputation site, a process known as the establishment of a blastema. These cells are derived by the reprogramming of differentiated cells to a less specialized state, and from resident stem cells. Proteins were found that pointed to several areas that need to be studied. Investigating the proteins found in the axolotl limb, the study noted three findings that appear to have significance in reprogramming cells to grow new limbs:

1.Quantities of enzymes involved in metabolism decreased significantly during regeneration.

2.There were many proteins that helped cells avoid cell death. Because amputation is very traumatic, this is critical.

3.A protein which appears to keep cells from dividing until they are fully dedifferentiated and reprogrammed to begin forming a new limb was expressed at high levels throughout blastema formation.

Rao, N., Jhamb, D., Milner, D.J., Li, B., Song, F., Wang, M., Voss, S.R., Palakal, M., King, M.W., Saranjami, B., Nye, H.L.D., Cameron, J.A. & Stocum, D.L. (2009). Proteomic analysis of blastema formation in regenerating Axolotl limbs. *BMC Biology* **7**, 83, doi:10.1186/1741-7007-7-83.

GENETIC ANALYSIS OF THE IMPACT OF ROAD-BASED HABITAT FRAGMENTATION ON EASTERN BOX TURTLES.

Historically, the Eastern Box Turtle (*Terrapene c. carolina*) has been found in 31 counties in Michigan's Lower Peninsula, USA, although it has been extirpated from 13 of these in the last ten years. One possible cause of the decline is habitat fragmentation by roads with resulting demographic and genetic consequences. Accurately identifying population structure of the turtles is necessary to determine conservation priorities and aid in the recovery of *Terrapene c. carolina*. In this study

163 turtles were genetically marked at eight microsatellite loci from three locations in southwestern Michigan covering 360 km^2.

The study found high levels of genetic variation (H = 0.83; A = 16) and low levels of genetic differentiation (FST = 0.006) in the system. The three areas studied exist as a single population and there was a low rate (11%) of misassignment across the sites. There was initial evidence of a genetic bottleneck in two of the three study areas and the system as a whole. However, additional analysis failed to find a mode-shift in allele frequencies and did not detect any further evidence of a bottleneck in any of the populations.

The study concluded that the conflicting genetic indication of a bottleneck, despite the geographic evidence, is most likely due to the long generation time of *Terrapene c. carolina*. The study also suggested that the retention of genetic variation, despite population declines, may allow managers flexibility in dealing with the conservation of such a long-lived species.

Marsack, K. & Swanson, B.J. (2009). A genetic analysis of the impact of generation time and road-based habitat fragmentation on Eastern Box Turtles (*Terrapene c. carolina*). *Copeia* **2009** (4), 647-652.

ECOLOGY OF THE PEAKS OF OTTER SALAMANDER (*PLETHODON HUBRICHTI*).

The Peaks of Otter Salamander, *Plethodon hubrichti*, is found along a 19 km length of the Blue Ridge Mountains, Virginia, USA, often in sympatry with the Eastern Red-backed Salamander, *P. cinereus*. This study was conducted in an area where both species occurred in Bedford County, Virginia. A mark-recapture study was conducted on a 10 × 10 m site.

The results showed that surface densities of salamanders decreased as the number of days without precipitation prior to a collection event increased. This suggested that vertical movements performed by salamanders were in response to surface moisture. When salamanders returned to the surface after rain, individuals appeared to "shuffle" between rocks and likely, leaf litter. The surveyors found they were more likely to find a different individual beneath a particular rock rather than the previous resident during sequential collection periods. There was no significant difference in the results between the species in microhabitat use by adults; adults were primarily found under rocks. However, neonate and young-of-the-year *P. hubrichti* were found beneath rocks more frequently than *P. cinereus*.

Linear movements, home ranges, growth rates and adult survival rates were similar for both species. The densities of *P. hubrichti* in sympatry with *P. cinereus* was 0.6/m^2, which is lower than previously recorded for *P. hubrichti* in allopatry with another salamander (1.6–3.3/m^2). The cumulative ratios of the number of the two species were stable over nine collection events but showed the least change (≤ 2%) after the third collection. The study also recommended using ratios of the two species at a series of sympatric sites as one measure to determine whether *P. cinereus* may encroach upon the distribution of *P. hubrichti*.

Kniowski, A. & Reichenbach, N. (2009). The ecology of the Peaks of Otter Salamander (*Plethodon hubrichti*) in sympatry with the Eastern Red-backed Salamander (*Plethodon cinereus*). *Herpetol. Cons. Biol.* **4** (3), 285-294.