



Notes from the Field

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Deer Season at Penn State



In spring 2002, the Pennsylvania Game Commission adopted a management strategy designed to reduce harvest of young male white-tailed deer. This new selective harvest strategy aimed to increase age structure of male deer (i.e., increase number of >1-year-old bucks relative to yearling bucks)

and, together with increased allocation of doe permits and doe hunting opportunities, increase the buck:doe ratio. Increased doe harvest was designed to outpace protection of bucks in order to reduce overall density of deer in the state. Implementation of these changes afforded a unique opportunity to use large-scale management as scientific experiment to examine the effects of altered herd demographics on dispersal, which is thought to be influenced by social structure. Basically, we allowed Pennsylvania's one million deer hunters to perform our experimental treatment.

Despite the importance of dispersal data for effective management, many questions regarding dispersal of large mammals remain unanswered. Landscape-structure and social-structure are both thought to influence mammalian dispersal patterns. Although deer population structure is being altered across the state, we have chosen two study areas to investigate effects of this demographic manipulation, and these two areas (Armstrong County in western PA and Centre County in central PA) represent a wide range of deer population density, landscape use, ownership (public vs. private), and topography.

To track the deer, though, we first have to catch the deer, which is the most enjoyable part of my research. We have used many different trapping techniques, including helicopter roundup, dart guns, walk-in box traps, drop nets, and (perhaps my favorite) rocket nets, which use solid rocket fuel to propel a net over a group of deer

feeding on a pile of bait. We trapped deer in the winter months of 2002, 2003, and 2004; we have handled over 2000 deer and have put radio-transmitters on 550 bucks. As previous studies have suggested, dispersal among young bucks is common. We have found that about 70% of bucks in Armstrong County and 45% of bucks in Centre County disperse (i.e., leave their natal range to establish an adult range elsewhere), though we are not sure why the percentage is different between the two areas. ~Eric Long, PhD Student

You can read about Eric's research in an upcoming publication: Long, E.S., D.R. Diefenbach, C.S. Rosenberry, B.D. Wallingford, and M.D. Grund. In press. Forest cover influences dispersal distance of white-tailed deer. *Journal of Mammalogy* 86(3).

Tussey Mountainback Results

Every autumn the leaves change, the temperature drops and, for the past five years, runners throughout central PA have looked forward to the Tussey Mountainback relay and ultramarathon.



The scenic 50-mile course winds its way through Rothrock State forest, encompassing both paved and gravel

roads. This was my first year running the relay and I had the pleasure of joining the Darwinian Demons ("natural selection at its finest") which included Ecology faculty running stars Dave Mortensen and Dale Holen (who drove all the way from the Worthington-Scranton branch campus the day of the race), grad students Randa Jabbour, and Carrie Schwarz and Ecology friend Greg Balazich, Jennifer Dean, Laura Warlow. Grad students Jenny Edwards and Joe Dauer also joined in the relay fun appearing on the Creepy Crawlers and the Quasarbeans, respectively. Participating in the relay was a fantastic way to spend a beautiful October day; I'm already looking forward to next year's race.

~Eileen Stocum, PhD Student

We're branching out! The next few newsletter issues will highlight the interests of faculty members on branch campuses.

Notes From Dale Holen Worthington Scranton Campus



My primary research interests have been in the role of protists in freshwater environments. Specifically, I'm interested in an unusual group of protists that are mixotrophic, a nutritional strategy in which the organism has the capability of using both particle ingestion (phagotrophy) and photosynthesis for growth. Protists such as *Poteroochromonas malhamensis*, an algal flagellate, are mixotrophic by virtue of having a chloroplast as well as being able to ingest prey. Others, such as the ciliate *Paramecium bursaria*, harbor algal endosymbionts in their cytoplasm. Still other ciliates exhibit kleptoplastidy, a phenomenon whereby chloroplasts are sequestered from algal prey. Because these "isolated" chloroplasts are functional for a relatively short period of time, these ciliates have to continually ingest algae to replenish the chloroplasts that reside in their cytoplasm. The ciliate *Strombidium viride* utilizes this type of strategy. Ecologically, mixotrophic protists can become a dominant part of the phytoplankton assemblage and contribute significantly to total photosynthesis, bacterial and algal mortality and nutrient regeneration.

One of my interests lies in this dual nutritional flexibility and its physiological constraints. For instance, *P. malhamensis* is an alga that is primarily phagotrophic as it grows optimally when grazing on bacteria. When cultured in inorganic media it exhibits minimal phototrophic growth. During rapid growth on bacteria, photosynthesis contributes progressively less to growth as the plastid becomes reduced in size with successive flagellate divisions. Is this reduction in chlorophyll a means of reducing the energetic costs of maintaining a plastid in this organism when bacteria are plentiful? Under what environmental conditions does photosynthesis or phagotrophy become the dominant mode of nutrition?

I am also investigating the seasonal and vertical distribution of the *S. viride* in lakes. I'm interested in the physical, biological and chemical factors that influence their distribution. Also, do they exhibit diurnal migration patterns? What are they eating and are they selective in ingesting specific algae from which the chloroplasts are derived?

Recently, I've been sampling a meromictic lake in New York that is permanently anoxic below 21 meters. This oxic/anoxic boundary layer is an extreme environment characterized by, among other things, little dissolved oxygen and relatively high hydrogen sulfide concentrations. Yet, sampling has revealed a relatively high concentration of zooplankton, primarily rotifers and crustaceans, at this depth. This may be the result of the high abundance of heterotrophic and photosynthetic bacteria, a potential food source but does not explain how these organisms tolerate this extreme environment. Further studies are planned to determine the transient nature of these zooplankton, their impact on the bacterial community and whether the zooplankton are transferring these nutrients to higher trophic levels in the overlying water column.

In regards to my teaching responsibilities, I typically teach Microbiology 106 and 107 twice per year. In addition, I'll offer either a Biological Science course (BI SC 001 or 002) or one of the 4 core courses for science majors, Biol 110, 220, 230 or 240. What I enjoy most, however, is offering one-credit seminars on topics of interest to students. For instance, in the past I've offered seminars on Symbioses, Evolutionary Biology, Biological Diversity and Infectious Diseases.

Introducing...



Eelke Jongejans joined the invasive thistles lab of Katriona Shea as a new post-doctoral fellow. He will compare the life history of *Carduus* thistles in their Eurasian home range with the life histories of conspecifics that have invaded different continents. Spatial spread through seed dispersal will be incorporated in population models in collaboration with Olav Skarpaas. The main topics of his PhD-thesis (Wageningen University, the Netherlands) were the spatiotemporal variation in the sexual reproduction and population dynamics of perennial herbs in rare nutrient-poor meadows, and the response of these plant populations to increased vegetation succession due to anthropogenic nutrient-enrichment. Eelke enjoys playing baseball or softball or any other game, as long as it is fun. He also loves hiking in beautiful nature areas.

Mini-Symposium 4:30 pm Dec 1st 118 ASI