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“What’s the Deal With...” - Final Write-up

Herpetofauna which consist of reptiles, amphibians are largely neglected when it comes to conservation and management. Since they are much smaller organisms on average and occupy specific more hidden niches it is difficult to accurately assess herp abundances anywhere in which they are found. In particular, me and my group focused more on herp management and what the NY-DEC is doing to manage these species.

According to the DEC there are believed to be 34 amphibian species and 38 reptile species present in New York State (DEC₁). This further breaks down approximately 18 species of salamanders, 16 species of frogs and toads, 17 species of turtles, and 6 species of snakes (DEC₁). Over 90% of the species listed are unprotected by federal law with 7 being classified as endangered, 4 classified as threatened and 12 classified as special concern as classified by the state (DEC₁). Despite many of these species being classified as under duress in some capacity, there is little to no management practices being put into place, so why is that?

The overarching problem that is preventing the DEC from taking the actions necessary to ensure the sustainable proliferation of these herps within the state has to do with funding and lack of public involvement. Proper funds would allow for expert assessments to be made; it is simply too expensive and there is not enough of a push for monitoring of herps as compared to charismatic megafauna (Gibbs, 2022). An example of the large impact public volunteership has on understanding the population dynamics of herps in NY state can be seen from the effects of the Herp Atlas Project. The Herp Atlas Project was a ten year survey (1990-1999) that was designed to document the distribution of New York State’s herps (DEC₂). Orchestrated projects

that have a straightforward focus is crucial in assessing herp populations properly. The Herp Atlas Project did exactly that, it has since become outdated however, more projects like the Herp Atlas Project need to be systematically implemented so general population dynamics are always known for herp species across NYS. Unfortunately, as already previously stated people don't care as much for herps as other animals and that neglect contributes to their demise.

Additionally, according to Dr. Gibbs, although public involvement in the form of apps such as iNaturalist is important it quite simply just does not generate enough traction or interest for any truly useful data to be created (Gibbs, 2022).

Projects for assessing proper population dynamics would not even be all that difficult to carry out given proper funding. One factor having a large effect on herp populations is road mortality when they are moving between vernal pools with a road in between. "Studies from different continents have proved amphibians to be the most frequently killed vertebrates on roads (Puky 2003). A previous study is able to conclude that it is possible to predict migration hot spots for herps when planning to build road systems (Langen et al. 2009). Additionally, the DEC states species such as the Spotted salamander, Jefferson-blue spotted salamander, and wood frogs emerge from winter hibernation on rainy nights in March and early April (DEC₃). There is a lot of predictability in tracking the general movement of amphibians; or at the very least, locate hotspot areas that would be more beneficial to allocate more resources towards conservation efforts.

Another study coincides with the other previous study mentioned regarding the relative ease and predictability surrounding tracking herp movement. This second previous study states, "Our results indicate that it is possible to design a valid, efficient methodology for locating hotspots of reptile and amphibian road-mortality along a road network and, thus, pinpoint

priority sites for mitigation. (Langen et al. 2007).” This experiment used walking and driving surveys which have potential cause for errors, as does any experiment. Detection failure is a big factor to consider for certain taxa (Langen et al. 2007). Certain taxa could have better camouflage or could be smaller and harder to detect with the human eye while constantly on the move also. Despite the potential errors, it is still doing something and anything is needed at the moment because herps could be at serious risk.

Everything that has been done surrounding assisting in herp road crossings further attests to the influence the general public has on the propagation of these projects. There is a project known as the Amphibian Migrations and Road Crossings (AM&RC) Project. This project, “...enlists volunteers to find locations where migrations cross roads; document weather and traffic conditions; record migrating amphibians; and help them across the road (DEC₃).” “Since the project started in 2009, more than 850 volunteers have counted at least 46,000 amphibians and observed 20 species (DEC₃).” If more volunteers contributed their time collectively to this cause our understanding of herp populations would increase exponentially. Unfortunately, the common denominator is once again this problem with volunteership and funding.

In regards to decreasing road crossing mortality of herps, certain ideas were formed to solve this problem. One of the proposed solutions that has been attempted is the creation of undercrossing which act as habitat corridors for migrating herp species. These seem like a good idea on paper, however, according to Dr. Gibbs it can be quite expensive. He states that our road systems are repaired often due to naturally occurring cracks that form for example; meaning that paying for the upkeep of these tunnel systems would be very expensive (Gibbs, 2022). Hypothetically, if proper funds were provided for maintenance of these migrational tunnels they may prove useful. There was a study which placed certain frog and turtle species through a series

of behavioral choice experiments that examined individual preference to take a road crossing structure based on its: aperture diameter, substrate type, length and light permeability (Woltz et al. 2008).” So if proper funds were received, there are already studies that have been done which would maximize cost efficiency as only the models that the species in question preferred most would be implemented for an increased success rate of the migration tunnels. Plenty of information has been said on this one main point because people do not realize how large of an effect it truly is having on herp populations everywhere. There was a previous study which found that even an annual risk of greater than 10% mortality associated with roads can lead to local extirpations of spotted salamander species based on the projections of a created life table for the species (Gibbs and Shriver 2005). This further attests to the importance of road mortality as it applies to herp decline. With even such a seemingly small percentage of deaths being associated with road mortality it can still lead species to extirpation or even extinction in the worst cases.

One factor many may not expect to affect herp species as much as it does is hunting. When there is any mention of hunting people automatically imagine megafauna or large game species. I’m sure many people would be surprised to find out there are actual hunting seasons put in place for herps. Frogs are open season from June 15th - September 30th with no bag limit or specified hours (DEC₄). Turtle hunting season is open from July 15th - September 30th with a bag limit of 5 (DEC₄). Although it does have a bag limit it can still be dangerous to allow any hunting to occur at all when populations of species are not accurately known (Gibbs, 2022). Frogs are especially at risk when it comes to this because they do not have a bag limit. People are able to fill buckets full of frogs inconsequentially (Gibbs, 2022). These people do not realize how at risk some species may be and we could end up accidentally, driving many herp species to extinction/extirpation.

Another factor that is often neglected as a large contributor is declines due to disease. In this case, specifically a fungal disease known as chytridiomycosis. “The infectious disease chytridiomycosis is considered one of the major drivers of global amphibian population decline and extinction and is thought to be caused by a single species of aquatic fungus, *Batrachochytrium dendrobatidis* (Martel et al. 2013).” This shows how even just one species causing a fungal disease can have such a massively widespread impact. “...fungal chytridiomycosis has been identified as one of the major infectious diseases involved, resulting in the extirpation of >40% of amphibian species in areas in Central America and widespread losses across Europe, Australia, and North America (Martel et al. 2013).” Since this is only generally associated with one species of fungus that may make it easier to control. This attempt at control may not even be possible without proper funding, which is the recurring issue associated with all problems concerning conservation for the most part.

Despite having such a widespread effect on amphibian populations, a study shows that these same amphibians have some immune defenses associated with dealing with the chytrid fungus that is running rampant. Chytridiomycosis is a skin infection making defenses associated with the skin particularly effective (Rollins-Smith et al. 2011). Upon first contact the infectious zoospores or bacteria landing in the skin mucus must first overcome chemical defenses, including antimicrobial peptides, lysozyme, secreted antibodies, and bacterial metabolites (Rollins-Smith et al. 2011). If the zoospores penetrate further past this defense and make it to the organisms epidermal cells then it is most likely too late. Although there are some natural immune defenses being adapted, these amphibians can not persist on their own without human interference. The problem still remains though, not enough humans are interested in or are even informed of the massive threat all herps alike are under.

As has been obviously stated already time and time again, the problem is that more people must see the problems at hand for meaningful action to subsequently be taken. The only significant action that has been taken regarding wildlife conservation for the most part has been for the benefit of charismatic megafauna. This is not necessarily a bad thing as species are still being helped, however, this same assistance needs to be applied to all wildlife species around the globe. The average person needs to realize why maintaining biodiversity is so important as a concept. When it directly starts affecting their personal lives to a degree that is noticeable throughout their everyday lives, then and only then will the average person be seriously committed to preserving biodiversity. The obvious problem with this solution is that it is cutting it too close and by the time everyone collectively comes to that realization too much damage would have already been done; the effects irreversible.

The reason people don't care about herps as much is because they're not charismatic as previously mentioned. They don't stick out and hold certain intrinsic value to an average person. With this in mind, a different approach needs to be taken in terms of inspiring more volunteership towards herp conservation. One effective tactic may be to release certain advertisements for the purpose of raising awareness. If the DEC or some other organization could allocate a small amount of expenses towards creating an advertisement potentially showing how specifically these amphibians are suffering more people will be inclined to help. I believe creating a commercial similar to that of the ones the American Society for the Prevention of Cruelty to Animals (ASPCA) makes. These types of commercials are crafted for the intention of leveraging your emotion and making you feel bad for these animals which leads to guilt and then finally, an increased potential for said person to experience a change of heart and help out. Even if that is not enough these species still have the potential to hold holistic value. Many people

currently may not trust practices such as these but one source claims that certain species were used to cure joint pain, muscle stretching and pain, backbone pain, paralysis, and psoriasis (Adil et al. 2022).” History shows that species of any kind whether it be plant or animal can have benefits that we aren’t even aware of. Even if you don’t like animals or say you don’t care about them, all the species in the world hold too much potential for benefit even if it’s for selfish reasons. Because of this, even the most evil people can surely agree that preserving biodiversity is of utmost importance whether it’s regarding herps or any other wild organism.

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