TIPS, TRICKS & TECHNIQUES

Pokémon in the Midst: Collecting and Using Data from within the Pokémon GO Ecosystem to Facilitate Ecology and Wildlife Biology Education

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ABSTRACT

Teaching the techniques to collect and analyze data on wild populations presents many obstacles. Capturing, identifying, and collecting data from wildlife has many safety-related and logistical challenges. Pokémon GO, a relatively new, smartphone-based augmented reality game, provides a new landscape for simulating wildlife ecology research. The world of Pokémon GO is overlaid onto the physical world and is populated with a variety of species, each having biologically relevant characteristics. Each individual Pokémon also has unique morphometric data. These features of the game provide a platform for data collection and analysis that mimics real-world practices, while eliminating many logistical and safety-related constraints. Additionally, little to no training is involved to begin data collection, allowing more time to plan and execute simulated wildlife ecology projects and activities. The availability of this new virtual wildlife community provides a widely accessible, freely obtained resource for data collection that has directly relevant applications for wildlife ecology education.

Key Words: *ecology; wildlife; augmented reality; pokémon; population ecology; community ecology; virtual wildlife.*

Teaching wildlife ecology using hands-on techniques presents many challenges. Students often have limited access and/or limited abilities to gather real data. Even when potential study subjects are near and abundant, a large portion of the project and lab time may be spent on safety (for both student and subject), capture (techniques and practice), proper identification, and data recording. Special equipment may be necessary to collect data. This limits the time available for developing the project, analyzing data, and communicating results. Pokémon GO (hereafter referred to as PG), an augmented reality smartphone game, provides free access to a virtual wildlife community that can provide the data necessary to conduct wildlife ecology–based labs. Released in early July 2016, PG allows players, termed "Trainers," to capture fictional creatures called "Pokémon." (The

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app is free for Apple and Android smartphones, but requires GPS access.) The Pokémon types, or species, are abundant and diverse enough to provide data that can be gathered quickly and safely, but have enough individual variability and real-world tie-ins to generate meaningful questions, projects, and analyses. The capture and collection of Pokémon, coupled with basic field notes, can be the foundation for activities that are analogous to the work done by wildlife biologists.

Unlike wildlife, Pokémon do not migrate, hibernate, or otherwise disappear from your study area(s), so your Spring activity will work just as well in the Fall. However, the individual- and community-level variation is present to allow the experimental design process to mimic actual practices in biology. Students will have to consider questions such as these: What is my study area? How do I compare uneven sampling efforts? What constitutes a capture?" (There are more ways to acquire Pokémon other than collecting in the "wild.") As with any project, methodologies and assumptions will have to be clearly outlined and communicated. Fortunately, if/when mistakes are made, no real data has been lost, and data collection can be repeated. Outlined here is a set of basic methodologies that can be adapted to your student population, and logistical constraints to provide a reasonable proxy for real-world research.

○ Discovery Science

The most basic line of inquiry that can be addressed is, What is my local Pokémon community? This can be accomplished using the game and a few field notes. This activity doesn't necessitate the capture of Pokémon (one of the few aspects of the game that requires any amount of skill and practice). Preparation for this activity would only require outlining the study area and time constraints, and instructing your students to record field notes to supplement the data provided by the game. As students explore

the study area, Pokémon will appear on their devices; tapping on each individual gives the species type, which students can record to build a dataset. One smartphone would suffice for this activity, as Pokémon presented within the landscape are the same among all devices in that area. This activity can be easily expanded by including more study sites, allowing for comparisons of abundances and diversity between sites.

○ Hypothesis-Driven Science

Beyond species type, other data are available from the game providing for further inquiry. For every capture, PG provides the following data: Type (species), Combat Points, Health Points, Height, and Weight. Height and Weight provide morphometric data; Health Points and/or Combat Points could be proxies for age. (Other data are available, but not applicable to these methodologies.) These data are logged within the game, along with the date and town of the capture. (The exact time of capture is recorded in the Trainer's Journal, but only held in the game for ~12 days; all other data is stored as long as you "keep" the captured Pokémon.) The students' field notes would supplement game data and record additional information such as search times and search effort, habitat descriptions, general conditions, project members. Note that the students' Trainer Level should be recorded for each capture, as the Trainer Level has an effect on capture attributes (see below). From a single sampling event, students would be able to describe and analyze both population- and community-level characteristics of the Pokémon within the study area.

At the population level, activities can range from deriving descriptive statistics from a single sampling event to more inquiry-based activities. Students can address such questions as: Are there more individuals of species X at site A or at site B? Is body size of species X the same between sites A and B? Some Pokémon are nocturnal (most are diurnal or indifferent to daily rhythms), allowing for additional testable predictions (e.g., Is species X more common at night?). The game matches certain Pokémon to specific habitats (e.g., aquatic types are more commonly found near water), so students can look at correlations between a species and landscape features (e.g., Is the abundance of species X a function of distance from feature A?). Pokémon population densities differ between rural and urban areas, vary within those areas, and are affected by other variables that allow for multiple lines of inquiry.

At the community ecology level, many other hypotheses are testable using game data. Within one sample site, game data can be used to examine the community structure and generate diversity indices. Simply delineating two or more study areas would allow students to compare and contrast community structures between sample sites. At a basic level, species lists can be generated and compared between sites; going further, diversity indices and/or species accumulation curves can be generated and compared. Again, certain habitats are populated with "appropriate" species, allowing for more realistic inquiry. Students will be able to address directed questions regarding the community structures as they relate to landscape features. How does an urban community compare to a rural area? How does the community structure differ as a function of the distance to a body of water? Many of these inquiries will come naturally from the students after only a short exposure to the game environment. Be aware: where the game falls short is with

regard to trophic levels. Although some species may superficially resemble carnivores, others herbivores, etc., the game makes no attempt to structure the species in that respect. There are common and rare species, but these abundances have no obvious natural correlate.

The scale of analyses for any of these can easily match your individual needs and resources. A single student can describe a Pokémon population using descriptive statistics computed by hand and displayed by a graph drawn in pencil. More advanced students with more resources could perform any number of analyses with access to the data they can collect and the appropriate software (SAS, Systat, etc.). For many instructors, the data and Microsoft Office would be all you need to launch an enormous number of investigations. ANOVAS, *t*-tests, correlations, among others, can easily be performed using the Data Analysis add-on for MS Excel. Students can then practice graphing, tabling, and communicating their findings.

As mentioned earlier, there is inherent observer bias built into the game environment; the attributes of the organisms you capture grow as your Trainer "levels up." (As with many games, you obtain levels with associated changes in gameplay as you progress.) Specifically, the upper end of the Combat Point (CP) range increases as the player levels up. This is why Trainer Level at time of capture should be recorded. Health Points (HP) seem to be positively correlated with Trainer Level as well, but within a smaller range and are assumed to be the better age proxy. Height and Weight do not vary as a function of Trainer Level; experience suggests that the variation in morphometric data is random and restricted to a range for each Pokémon type.

The uneven distribution of Pokémon is advantageous as it mimics reality, but disadvantageous for more rural students—urban areas have more Pokémon. However, students in urban areas have less access to actual wildlife, allowing for opportunity where it is most needed. College campuses are hotspots for Pokémon communities, reducing logistical challenges for those students. As of October 2016, Niantic (the company that owns PG) began adding special events where abundances and distributions of certain Pokémon changed (e.g., during Halloween, ghost types of Pokémon were more abundant). These events may need to be addressed within your methodology. Fortunately, these changes can be used to reflect natural processes; the Halloween event could have viewed as a seasonal change or a migration event.

Although not perfect, PG provides an avenue for ecology and wildlife biology education that is free and accessible and relevant. The unique characteristics of each organism, coupled with the spatial distribution of the organisms and species, make this game a realistic proxy for wildlife. Data collection is easy, efficient, and familiar to many students (allowing you to leverage their existing interest and enthusiasm). PG-based projects can be varied, flexible, and scalable, and they include opportunities for project planning, data collection and analysis, and dissemination with a realism that may be unmatched outside of sampling wild populations. Gotta catch 'em all!

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