

## Summary of data sets for WRL 2014

Below is a summary table outlining each data set included in the WRL 2014, with a brief description of the exercise and the analysis required, and an indication of the level of difficulty involved. This table is designed to allow teachers to select the most appropriate data set for a particular subject or lesson plan, or to identify suitable data sets for a particular ability range.

If you are using the WRL 2014 DEMO version and would like to have access to the additional data sets described below, please contact [wrl@opwall.com](mailto:wrl@opwall.com) for more details.

Module	Data-set Code	Title and summary
M01	D01	<b>The effect of light on coral morphology in the Caribbean.</b>
		<p>This task looks at the effect of light/depth on the morphology of a named coral species. Analysis is via photographs (it could be an individual or group activity) and the data is plotted and analyzed using a spreadsheet – full instructions are provided. The statistics can be approached at a number of levels, from plotting graphs to an introduction to regression analysis. The task is supported by a number of PowerPoint presentations etc.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 5/10</b>  <b>Research Q2 - 8/10 for advanced statistics</b></p>
M01	D02	<b>Variation in habitat quality between two Indonesian coral reefs.</b>
		<p>Two Indonesian coral reefs are compared using video footage taken along 6 transects. Keen students can do the full analysis of the raw data although data sheets are provided with the analysis completed. Video clips are provided for realism. The footage is then looked at for evidence of possible human activity. The analysis can be set at a number of different levels and includes plotting graphs, calculation of standard deviation and error and error bars. A 'walk-through' method on how research scientists actual analyze large sets of complex data is also provided and will appeal to the more able students who might be keen to carry out research as a career or at University.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 7/10 (lots of data to process)</b>  <b>Research Q2 - 9/10</b></p>
M01	D03	<b>Temperature tolerance of lionfish in Indonesia</b>
		<p>This research looks at how lionfish adapt to different sea-water temperatures. This physiological experiment compares how 20 lionfish adapt to increasing water temperatures by being placed in specially designed water tanks. The data can be plotted simply or be treated in more complex manner using statistical tests. Lionfish are also significant predators on coral reefs and they are expanding their range by their ability to adapt to rising sea</p>

		<p>water temperatures. They could pose a real threat by being significant invasive species.</p> <p>Advanced statistics include standard deviation, regression and coefficient of variation.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 5/10</b>  <b>Research Q2 - 9/10</b></p>
<b>M01</b>	<b>D04</b>	<p><b>Interspecific variation in anemonefish (clownfish) calls</b></p> <p>Clownfish or anemonefish live together on coral reef anemones and fish of the same species communicate with each other by 'popping sounding' calls. Often there are 2 species of clownfish on the same anemone so you would expect the calls to differ between species. This study looks at how the calls differ and think about how and why this might be achieved. The first research question involves plotting data collected by divers, calculating means and utilizing error bars, standard deviation and t-tests for analysis although not everything needs to be completed to make sense of the research question.</p> <p>Research Question2 is far more involved and should only be attempted by students who are confident with the manipulation of figures e.g. scatter plots, natural logs and regression analysis.</p> <p>This data set is particularly useful in linking together ideas about evolution.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 6/10</b>  <b>Research Q2 - 10/10</b></p>
<b>M02</b>	<b>D01</b>	<p><b>Population estimates of Hog Island Boa Constrictors</b></p> <p>The population of Hog Island Boa Constrictors (located in the Caribbean Sea) are estimated using mark-recapture techniques. The data is analysed using two different methods and the differing results compared and discussed. This study is an excellent example of how populations of animals can be estimated. It also allows a discussion to develop about the impacts of humans on island populations of animals and how scientific data can support conservation management programmes.</p> <p><b>Difficulty:</b>  <b>Research Q1 - Lincoln Peterson method 6/10</b>  <b>Research Q2 - Comparing methods (Schnabel method) 8/10</b></p>
<b>M02</b>	<b>D02</b>	<p><b>Assessing bird point counts from a Honduran cloud forest</b></p> <p>The forests of Mesoamerica are a biodiversity 'hotspot' and this study describes how the populations of birds are assessed. The field site is in the cloud forests of Honduras and involve data collected using a 'point count' method. The study looks at species richness, proportion of endemic species and how altitude affects the populations of birds in Mesoamerica. The exercise involves constructing scatter plots with trend lines.</p>

		<b>Difficulty: 6/10 (overall)</b>
<b>M02</b>	<b>D03</b>	<b>Comparison of bird survey techniques</b>
		<p>This exercise focuses on how scientists in a national park (Cloud forest) in Honduras can determine which is the best method to use for sampling forest birds. There are two potential methods (mist nets and point counts) and comparative data from each is analysed to compare efficiency and their ability to capture different species of birds: recommendations are made based on these findings. This study also gives an insight into the methods used by scientists to measure biodiversity and then use this to help put in place robust conservation management programmes. Graphs are plotted and trend lines compared.</p> <p><b>Difficulty:</b> <b>Overall: 5/10</b></p>
<b>M02</b>	<b>D04</b>	<b>Camera trapping to assess large mammal populations in Amazonia</b>
		<p>Camera traps are used to assess the populations of red brocket deer and ocelot over a 2 year period in the Pacaya Samiria Nature Reserve in Peru and relate any observed changes to the unprecedented changes in flood levels. The first part of the study analyzes data for these two animals using the chi-squared statistical test to see if there has been any significant changes in population. Bar charts are also drawn. The second part of the investigation relates these significant changes to the possible effects of the floods on habitat and prey availability. This could also be widened to discuss the possible effects of climate change on animal populations.</p> <p>The data set also has some great camera trap photos which illustrate the wide biodiversity in these forests.</p> <p><b>Difficulty:</b> <b>Research Q1 - chis-squared.: 6/10</b> <b>Research Q2 - possible cause and effects discussion : 6/10</b></p>
<b>M03</b>	<b>D01</b>	<b>Bull elephant dominance relationships after contraception</b>
		<p>This study investigates the effect of vasectomies on the behaviour of young bull elephants in a small herd in Pongola Game Reserve in South Africa. After a number of the elephants were vasectomized, behaviour studies were used to determine dominance hierarchies in the bulls under study. The data from these studies were used to produce a rank order for dominance amongst the bull elephants.</p> <p>The first exercise gets students to identify the 8 bull elephants from identification sheets and photographs. The second part of the study constructs a 'dyadic dominance matrix' (pairs of competing individuals) from collected data and then plotting the results in a scatter plot . Reasons and consequences of the study are considered and related to the population control and management of elephants in fenced reserves.</p>

		<p><b>Difficulty:</b>  <b>Research Q1 (identification): 4/10</b>  <b>Research Q2 (Dyad matrix and scatter plot): 7/10</b></p>
<b>M03</b>	<b>D02</b>	<p><b>Interspecific differences in fiddler crab feeding rates</b></p> <p>Fiddler crabs feed at low tide on mudflats in Indonesia and they eat detritus, bacteria and algae. There are often quite a few species feeding together and there is clear niche separation due to their feeding behaviour and morphology. This study compares 3 different species feeding at 2 different heights above the low tide line. The results are analyzed using column charts, means, standard deviation and error bars. There are 2 research questions looking at feeding rates between species and how rates might differ for the same species living at different tidal heights.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 6/10</b>  <b>Research Q2 - 7/10</b></p>
<b>M03</b>	<b>D03</b>	<p><b>Howler Monkey vocalisation</b></p> <p>This primate population of Howler monkeys is located in a forest near Rancho Manacal in Honduras. Howler monkeys have high infanticide levels (64%) due to incoming males systematically killing infants in the group. Howler monkeys are well known for their vocalisations which serve a number of purposes from territory defining to an assessment by bachelor male groups of the competition from other males when attempting to take over an existing group. Females with infants are said to be very sensitive to these male calls!</p> <p>This study analyses vocal data to assess the number of males making the calls. Data from long-term observations of 'non-mother' and 'mothers with young' behaviour are looked at to show evidence that females with young are more vigilant when listening to calls from male groups. Graphs are plotted after processing the behavioural data.</p> <p><b>Difficulty:</b>  <b>Research Q1 - 6/10</b>  <b>Research Q 2 - plotting graphs and discussion 8/10</b></p>
<b>M03</b>	<b>D04</b>	<p><b>Surgeonfish feeding behaviour on coral reefs</b></p> <p>On a healthy coral reef, seaweed/algae growth is kept low due to lack of nutrients and the grazing behaviour of herbivores such as surgeonfish. Different species of surgeonfish use different feeding strategies to, as far as is possible, avoid interspecific competition. This study compares two feeding strategies (focused and diffuse feeding) for two different species of surgeonfish on two separate reefs. The method involved a SCUBA diver observing five individual fish for 20 minutes. The results are analysed and help biologists to understand how different species are able to co-exist on a coral reef. The study might also be used to predict how the reef community might react to environmental change due to human activities e.g.</p>

		<p>pollution.</p> <p><b>Difficulty:</b>  <b>Research Q1 and Q2 - Plotting and analysis 6/10</b></p>
<b>M04</b>	<b>D01</b>	<p><b>Prevalence of chytrid in two critically endangered species of tree frog</b></p> <p>This data set investigates the prevalence of infections chytrid fungus amongst amphibian populations in Cusuco National Park, Honduras. Individuals of two tree frog species were collected from various sites throughout the forest, and swab samples taken for genetic analysis to identify which individuals were infected. The exercise involves analysing the data and then plotting two simple bar charts to show differences between species and between locations.</p> <p><b>Difficulty: 6/10</b></p>
<b>M04</b>	<b>D02</b>	<p><b>Quantifying forest disturbance in cloud forest</b></p> <p>In 2013 120 20mx20m cloud rainforest plots were surveyed by students and scientists in Honduras. The survey will take place every year and the data used to quantify forest disturbance in Cusuco National Park. The datasets being produced are very large and this investigation looks at ways to analyze, compare and present the data. There are 4 tasks in which step-by-step instructions produce a wide spectrum of graphs and tables. There are also many opportunities to use the data for a discussion on the possible causes of any disturbance and threats to rainforest. It is also an opportunity for students to learn and experience how to handle large sets of data. The level of difficulty will depend on which examples and how much data students choose to analyze. Many of the data sets can be used to demonstrate statistical tests such as chi-squared and the t-test.</p> <p><b>Research Objectives 1 and 2: 7/10</b></p>
<b>M04</b>	<b>D03</b>	<p><b>Dung beetle community structure in cloud forest</b></p> <p>Dung beetles are important organisms in rainforest habitat maintenance and they can also be used as sensitive biological indicators of disturbance and biodiversity change. In 2013 there was an extensive survey of dung beetle communities in the Cloud Rainforest of Cusuco National Park in Honduras. 123 sites were sampled for dung beetles using baited pitfall traps: 14363 beetles were captured, identified and their distribution and number related to a large number of variables, in particular elevation/altitude (Abundance and species richness). This data set looks at how you identify dung beetles using a dichotomous key, investigates the relationship between dung beetles and altitude and then a wider consideration of numerous other factors which might affect their community structure.</p> <p><b>Research objectives 1 (keys) – Difficulty 6/10</b>  <b>Research objective 2 – Difficulty 7/10</b>  <b>Research Objective 3 – Difficulty 8/10</b></p>

M04	D04	<p><b>Abundance of bat feeding guilds in the Iwokrama Forest, Guyana</b></p> <p>Iwokrama Forest is located in Guyana and composed of lowland rainforest not far from the equator. The forest has a very high biodiversity with one of the greatest number of bat species recorded in South American rainforest ecosystems.</p> <p>This data set looks at how the varying 'feeding guilds' of bats are distributed within the research area and relates this to local habitat type. It also considers the role that bats play in helping to maintain a healthy ecosystem.</p> <p>The raw data is sorted using Excel and then transferred into a summary table and graphs drawn to support the TWO research questions. It is a relatively simple task but a good introduction into data handling and sorting. It is also a good introduction into the biology and importance of bats in the rainforest.</p> <p><b>Difficulty: 5/10</b></p>
M05	D01	<p><b>Identifying overfishing on Indonesian coral reefs</b></p> <p>In Asia many people rely on coral reef fish as a source of protein and a rapidly growing population has placed heavy demands on this already threatened ecosystem. This WRL study examines the evidence for over-fishing by looking at data collected from traditional Indonesian fish fences around Kalepuda island.</p> <p>Graphs are plotted, standard error calculated and a paired t-test applied to see if there have been any significant changes in the numbers of fish that were caught in 2005 and 2011. This evidence is then used to consider the sustainability of coral reef fisheries in this area of Indonesia.</p> <p><b>Difficulty: Graphs and Statistics – 8/10 Discussion 6/10</b></p>
M05	D02	<p><b>Monitoring agricultural land use in Transylvania.</b></p> <p>An EU (European Union) Natura 2000 conservation area was recently set-up in Transylvania and managed by a local NGO (Fundatia Adept). The role of Opwall scientists was to assist in the monitoring of Biodiversity within this area with particular reference to farming practice. This data set looks at how different habitat types are assessed and monitored using GIS technology. Habitat data is analyzed from GIS maps and some simple conclusions drawn. The analysis includes estimating the % area for a particular habitat type and then representing the data graphically.</p> <p>This type of data will be collected every year and used to monitor change: this information can then be used to 'under-pin' other important scientific data that are being collected and which will help to produce practical conservation management plans for the future (Farming practice versus Biological diversity).</p> <p><b>Difficulty: 6/10</b></p>
M05	D03	<p><b>Quantifying the effects of fishing on Amazonian fish</b></p>

		<p>A study carried out on a tributary of the Amazon River which looked at fish stocks for 2 species of fish (an Oscar and a Piranha) over a five year period. The study looks for evidence of change in population number and structure and relates these to the fishing activities of local communities and the possible effects of a severe drought in 2010.</p> <p>Analysis uses class interval or bin widths to compare the fish populations. The study provides a good opportunity to discuss sustainability of fish stocks in delicate ecosystems such as the Amazon river and provoke further thoughts about current threats such as climate disruption/change. For those keen to practice statistics, the data would be very suitable for further statistical treatment in order to determine degrees of significance over time.</p> <p><b>Research Objectives 1 and 2: 6/10</b></p>
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