Term Paper: Species Distributions and Phylogeographic Histories

Choose an animal species, genus or family, and describe the natural distribution (i.e., non-human altered), habitat use and phylogeny of its subgroups. You can focus your animal group on one of several taxonomic ranks. If you choose a species, the focus should be on subspecies (phylogroups, genetically distinct populations, or ecotypes). If you choose a genus, the focus can be on species within that genus. If you choose a family, the focus can be on genera within the family. Don't choose a taxonomic group with a higher rank than the family level, because it will be more challenging to gather specific distribution maps and phylogenetic information for families and orders.

Provide a comprehensive description of the geographic distributions of your animal groups, as well as more specific regional and local distributions (i.e., habitat use within the geographic range. In other words, describe the distribution of your groups at multiple spatial scales. In your description, identify any anomalies or curiosities in the distribution of subgroups. For example, for continental species, do any distributions of subgroups extend to islands? What is the elevational distribution of the subgroups, or how is the elevational distribution constrained? Do subgroups overlap in distribution or are they allopatric? What is the latitudinal extent of the distribution of subgroups? Use additional maps and figures as necessary.

Summarize the current understanding of the events (e.g., geological or climatic) and processes (e.g., adaptation or dispersal) that have resulted in the distribution of your taxon and its subgroups (i.e., summarize the hypothetical phylogeographic history). Your summary should include a discussion of the strength of evidence for the proposed phylogeographic history. Remember that all proposed phylogenetic relationships are hypotheses and are subject to critical evaluation.

Depending on the group you choose, it may be appropriate to include relevant information on anthropogenic impacts (e.g., human-mediated extinctions) that have affected the groups' distributions and conservation status, but do not make this the main focus your paper.

Your paper must include a minimum of two figures: 1) a map (or combination of maps) showing the distribution of your taxonomic group, including the location and distribution of subgroups, and 2) a phylogenetic tree for the relationships among the sub-groups within your taxon. You can create your own figures, or use those from the published literature, but in either case, be sure to appropriately cite and credit the source of any published images or figures in the text and/or figure legends.

Your paper should be no longer than **10 pages** of text (do not include a separate title page) double-spaced, 12-point font, with standard 1'' margins. Figures and literature cited can be in addition to the 10-page text limit. To conserve paper, you can use narrower line spacing, as small as 1.5 lines and double-sided printing.

Regional field guides (e.g., "Mammals of Southeast Asia") are good places to start for information on distributions and range maps, but also consult the "Zoological Record" (Online under UBC Library "Indexes and Databases" or in Woodward Reference Area) - a great source for all taxa.

** Note on websites and encyclopedias as references: there few instances when it's acceptable to use a website as a source of information. Also, an encyclopedia is not an acceptable source of information for a 4th year university assignment. Virtually all of your information should come from primary, peer-reviewed sources.*

Outline due February 10th (in class) – 10 points – NOTE EXTENDED DEADLINE

Final paper due April 10th – 100 points

Structuring your paper:

(1) Introduce your chosen group and each of the subgroups, including a description of the geographic extent of each subgroup. Your introduction should set the stage for the rest of the paper, outlining the major ideas that will be covered in the following sections. End your introduction with a 'thesis' statement that appropriately structures the rest of the paper.

(2) Provide a comprehensive description that compares and contrasts aspects of the distributions of your subgroups. Are the subgroups allopatric or overlapping in distribution? In which habitats are the subgroups distributed and how do those habitats differ? Are the distributions of some subgroups smaller or larger than others, cosmopolitan or highly isolated, restricted to particular habitats or islands? Refer to a figure that includes a map identifying the distributions of each of your subgroups. Use more than one map/figure if needed.

(3) Using published phylogenies that include your subgroups, and supporting literature, summarize the current understanding of the events (e.g., geological or climatic) and processes (e.g., adaptation or dispersal) that have resulted in the distribution of your group and its subgroups. In other words, what is the hypothesized phylogeographic history of your group and how is this shown in published phylogenetic trees? Include a discussion of the strength of the evidence for the proposed phylogeographic history. Are there any plausible alternatives? Remember that the phylogenetic relationships and phylogenetic trees are only hypotheses based on the data used to generate them, and they are subject to critical evaluation – consider this in your discussion.

(4) Conclude your paper with a summary of the main points. What did you uncover in your paper – what are the important points from each section? Include areas where future research should be directed.

General guidelines for presentation and tips for writing essays:

1. I'll be looking for concisely typewritten prose.
2. Include a title, but no separate title page.
3. Paragraphs should follow each other in logical order. Use topic sentences at the beginning of paragraphs. The rest of the paragraph should provide information that supports your topic sentence. Remember, you are trying to be convincing, so paragraphs need to be organized, logical, and "punchy".
4. Do not use too much jargon, but do not be vague. Using jargon can lose readers, and vagueness suggests that you do not fully understand your own points.
5. Avoid directly quoting passages from research articles to support your arguments.
6. Bad grammar, incorrect word usage, and poor spelling will cost you marks. Ask someone to proof-read your work if necessary.
7. Be concise! Marks are not awarded for overelaborate prose. Write enough to communicate your point.
8. Provide full, well-organized, and complete arguments. If you're clearly missing an important element, you'll lose marks (this may seem in contradiction to the previous point, but providing complete and concise arguments is the challenge you're being evaluated on).
9. Make sure figures have descriptive captions (labeled "figure 1", "figure 2", etc.) below the figure, and that the source of the figure is included in the caption. Figure legends should stand independently from the text.
10. Cite fully and properly. Don't include citations where they're not necessary, but make sure to include citations where needed. Don't list a reference if you don't cite it. See below for examples of how to cite and reference properly.
11. You must submit your original work and give credit to other peoples' ideas. Incidences of plagiarism and/or compromised academic integrity will result in a mark of zero for the assignment. http://learningcommons.ubc.ca/resource-guides/avoiding-plagiarism/

Examples for citing references, using different acceptable formats, in the text and literature cited:

Health specialists and agricultural engineers have developed methods to slow the rate of evolution of human and crop diseases (Palumbi 2001).

References cited

Palumbi, S. R. 2001. Humans as the world's greatest evolutionary force. *Science* 293: 1786-1790.

A 30-year study of finches on the Galapagos Islands revealed the important role of introgressive hybridization in the evolution of beak shape[1].

References cited

1. Grant, PR, and Grant, BR. 2002. Unpredictable evolution in a 30-year study of Darwin's finches. Science **296**: 707-711.

Wooton *et al.* (2002) used estimates of linkage disequilibrium in genomic regions close to a key chloroquine-resistant gene to reveal a history of directional selection for resistance in the human malaria parasite.

References cited

Wootton, J.C., Feng, X., Ferdig, M.T., Cooper, R.A., Mu, J., Baruch, D.I., Magill, A.J., & Su, X. 2002. Genetic diversity and chloroquine selective sweeps in *Plasmodium falciparum*. Nature 418: 320-323.

Examples for citing figures in the text and citing published work within the figure legend:

A recent study focusing on population divergence within gray wolves mapped haplotypes for different populations across the province of British Columbia (Figure 1; Muñoz-Fuentes *et al*. 2009). Five common haplotypes across sampled populations indicated strong genetic differentiation, particularly between adjacent coastal and inland populations. Muñoz-Fuentes *et al*. (2009) hypothesize that this genetic population divergence could also reflect important behavioural and dietary differences between coastal and inland gray wolf populations.

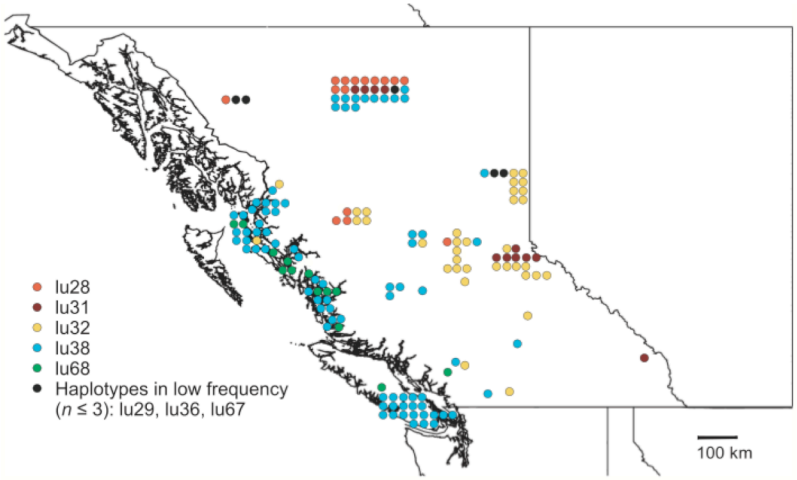

Figure 1. Colour-coded haplotypes for grey wolf (*Canis lupus*) populations and their distribution in British Columbia. Five common haplotypes show strong genetic differentiation between adjacent coastal and inland populations (from Muñoz-Fuentes *et al.* 2009).