

## Exercise - Proper Use of Distribution Terms

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Compare the first 5 citations regarding the use of the word **endemic**; How is this term used? What are the differences, if any? Then look at the last citation and determine how it differs from the first 5 references.

1. "Florida sand pine scrub is a community type found on well-drained ridges and dunes. Some of these uplands escaped the periodic flooding of the Florida Peninsula. Organisms of Florida scrub are adapted to sterile sand, drought, and fire. Some species appear to be relicts. An annotated list identified 46 species of scrub **endemic** arthropods. Species are concentrated on the central ridges, especially the Lakes Wales Ridge. There appear to be cases of divergent evolution on different scrub islands. The high proportion of flightless species in the list may not reflect adaptation for island life. Detailed studies of biogeography of scrub **endemic** arthropods may be thwarted by rapid eradication of many scrub sites." (Deyrup 1989)

2. "Epidemiologic studies indicate that human T-cell lymphotropic virus type I (HTLV-I), the causative agent of most cases of adult T-cell leukemia/lymphoma (ATLL) in Southeast Japan and the Caribbean islands and the probable cause of a progressive neurological disorder often referred to as tropical spastic paraparesis, occurs with unusual geographic clustering. The current large-scale serosurvey was undertaken to improve our understanding of HTLV-I prevalence in different parts of the world. We analyzed 43,445 serum samples collected from various geographic locales worldwide; 76% of these sera came from clinically healthy donors. Samples were initially screened by an enzyme-linked immunosorbent assay (ELISA) and 4,353 were further evaluated by means of competition assays. In this study, which did not include sera from **endemic** areas of Japan, a high prevalence of infection was observed in several countries in the Caribbean basin. A significant age-sex difference was observed between populations in the Caribbean and non-**endemic** regions of Japan. The reason for the male excess in non-**endemic** areas of Japan will require further study, while the female excess in the Caribbean basin is compatible with the previously described pattern for other HTLV-I-**endemic** areas. A newly recognized area of possible **endemicity** was southern Florida, where evidence of infection with HTLV-I or a related virus was found in a group of native Americans whose sera were collected in 1968. In certain parts of the world, particularly sub-Saharan Africa, important problems in determining specificity of reactivity occurred, probably because of cross-reacting antibodies. No pattern was detected that could explain the cross-reactivity solely on the basis of geographic areas, specific patterns of non-viral parasitic infection, or methods of handling the specimens. It is possible that these cross-reactivities are antibodies to proteins from HTLV-I-related retroviruses yet to be discovered." (Levine and others 1988)

3. "The Florida scrub lizard, *Sceloporus woodi*, is **endemic** to scrub habitat patches along the central portion of the Florida peninsula and xeric coastal regions. Scrub ecosystems are the patchily distributed remnants of previously widespread habitats formed during the Pleiocene and early Pleistocene. Scrub lizards appear to have limited dispersal capabilities due to high habitat specificity and low mobility. To assess the population structure and phylogeography of *S. woodi*, 135 samples were collected from 16 patches on five major ridges in Florida, USA. Analysis of 273 bp of mitochondrial DNA (mtDNA) cytochrome b reveals a very strong geographic distribution of genetic diversity. Haplotype frequencies are significantly different in 63 of 66 comparisons between patches. With one exception, samples from the five major ridges are characterized by fixed differences in haplotype distribution and deep evolutionary separations (3-10%). Fixed genetic differences were also observed between northern and southern segments of several ridges. Analysis of molecular variance (AMOVA) shows an estimated 10.4% total genetic variation within patches, 17.5% among patches (within ridges), and 72.1% among ridges. This strong population structure among patches within ridges indicates that the distribution of *S. woodi* is tightly linked to sandy scrub habitat and that the discontinuous distribution of scrub habitats significantly inhibits dispersal and gene flow. Phylogeographic analyses indicate a pattern of

dispersal down the Florida peninsula during the late Pliocene-early Pleistocene, followed by habitat fragmentation and vicariant isolation events. Therefore, the deep genetic structuring among scrub lizard populations on separate ridges is attributed to ancient isolation events induced by a shift from dry (xeric) to wet (mesic) conditions on the Florida peninsula. These findings indicate that some scrub lizard populations have persisted in isolation for time frames in excess of 1 Myr, providing a case history on the genetic consequences of habitat fragmentation." (Clark and others 1999)

4. "Fourteen strains of eastern equine encephalitis (EEE) virus were isolated from *Aedes albopictus* mosquitoes collected in Polk County, Florida. These are the first isolations of an arbovirus of proven public health and veterinary importance from naturally infected *Ae. albopictus* in the United States since established populations of this introduced mosquito were first discovered in 1985. The widespread distribution of *Ae. albopictus* in Florida and in other areas of the United States where EEE is **endemic** raises concern that this species may become an epizootic and **epidemic** vector of EEE virus." (Mitchell and others 1992)

5. "Vaccination at 6 months of age followed by routine revaccination is recommended when exposure of infants to measles is likely. Dade County, Florida, began this early two-dose schedule during a large **epidemic** in 1986-1987 (i.e., 22% of cases occurred in infants aged 6-11 months). This schedule was continued routinely in high-risk areas. The effect of an early two-dose schedule on measles prevention in the county was examined by comparing measles vaccination coverage and epidemiology before (1985-1987) and after (1988-1996) the schedule became routine. To assess serologic response, seroprevalence of measles antibody among children aged 4-6 years in 1995 was examined. To evaluate vaccine effectiveness, a case-control study was conducted among preschool-aged children. Among those aged 2 years, vaccination coverage with gtoreq1 dose increased from 75% to 94% in 1996. The number of annual cases declined, and **endemic** measles transmission reportedly ended after 1993. Seroprevalence of plaque reduction neutralization antibody (titer > 1:120) among those receiving vaccination according to an early two-dose schedule and a single dose at age gtoreq12 months was 94% (95% confidence interval: 89, 98) and 98% (95% confidence interval: 95, 100). In these groups, vaccine effectiveness was comparably high. Early two-dose measles vaccination is associated with improved coverage and a comparably high level of humoral immunity and clinical protection as a single dose at age gtoreq12 months. This strategy can be useful in areas at high risk for measles among infants." (Hutchins and others 2001)

### ***Compare them with this:***

"The number of insect species now occurring in Florida is estimated at about 12,500. Statements from specialists in 28 insect taxa (at the level of family or higher), representing some 40% of the fauna, suggest that about 12% of the total fauna (13% of the **indigenous** fauna, with range 0-43% among taxa) is **precinctive**. **Immigrants** form less than 8% of the total fauna. Only 42 (0.3%) species are known to have been introduced deliberately, for purposes of biological control. The proportions of **immigrants** and of **precinctive species** are far lower than in the Hawaiian insect fauna, but the proportion of immigrants exceeds that of the fauna of the contiguous United States as a whole." (Frank and McCoy 1995)

from <http://biocontrol.ifas.ufl.edu/glossary.htm>

**"2. Adventive:** arrived in the area specified from somewhere else by any means (adjective); not native (non-indigenous) to the area in which it has been found. Various authors have used expressions **alien** and **exotic** in this sense, but these are inadequate because they do not imply that the organism in question has arrived in an area previously unoccupied by it. Other authors erroneously use the word **introduced**, but that word implies an action by people. The word **adventive** was first used by Bacon (1605), and more recently by Pemberton (1964). It is the

exact complement of the word **native**. There is nothing controversial about this word, but many writers are simply unaware of it.

5. There are two main uses of the word **endemic**. The first use (meaning occurring constantly but generally at low population levels), almost 300 years old (Lodge 1603), is still correct. It is used by ecologists, epidemiologists, and the popular press. The second use (by zoogeographers, to mean native to an area and occurring nowhere else) is a misinterpretation of the original meaning made about 250 years later, by no less an author than Charles Darwin (1872). Darwin's misinterpretation was exposed and corrected 28 years later by David Sharp (1900). Sharp was too late and published in too obscure a work: the great mass of writers paid no attention, and a stampede is hard to stop. So we are now faced with two meanings of the word, one correct, and one (the zoogeographical meaning, Darwin's meaning) incorrect but with the valid alternative **precinctive**. Darwin's further use of the word in other places and without definition, led to yet another misinterpretation, and this third meaning (as a synonym of **native**) is echoed by Ehrlich and Roughgarden (1987) and in various Merriam-Webster's dictionaries. Finally, there is a fourth meaning (Wallner 1987), which deems species that occur continuously at low population levels to be endemic, but which seems not to have been adopted by subsequent writers. These definitions are explored in greater detail by Frank and McCoy (1990).

Here, we recognize two major origins of organisms in an area: those that are **native** and those that are **adventive** (came from somewhere else, regardless of method of arrival). Among the **native** organisms are those that are **precinctive** (exist nowhere else), and those that have a more widespread distribution. Among the **adventive** species are those that were **introduced** deliberately by people (this restriction in word usage follows Zimmerman 1948) and those that arrived by any other means, called here **immigrant** (see Frank and McCoy 1990, 1995, following textbooks on ecology and Sailer 1978).

A. **Native** (= indigenous)

- Precinctive (native and occurring only here)
- Native but not precinctive (native and occurring elsewhere, too)

B. **Adventive** (= "non-indigenous", arrived from somewhere else)<sup>2</sup>

- Immigrant (arrived uninvited).<sup>8</sup>
- Introduced (introduced deliberately by people).<sup>10</sup>

Why is the distinction between immigrant and introduced important? Because Zimmerman (1948) blamed the demise or declining populations of 27 species of native Lepidoptera in Hawaii on introduced biological control agents. Later examination showed that only one of the blamed "biological control agents" had been introduced, in 1895 -- the others were immigrants, which had not been imported deliberately to Hawaii. Even labeling these others "accidentally introduced", when nobody knows their real means of arrival (they might have

arrived on high-altitude winds), still allows the charge that "introduced" species caused problems for the native Lepidoptera; it is preferable to label all that arrived without documentation as immigrants, and thus to reserve the term "introduced" for those that were deliberately introduced.

**8.** The expression **immigrant** was established first in the 18th century and applied only to humans. It was used in the 20th century in all or almost all ecology textbooks for all organisms, and then (Sailer 1978) specifically for insects. It must be obvious to biologists that (for example) Hawaii's native fauna was established by immigration (an entirely natural process) of animals from elsewhere because the Hawaiian Islands arose by volcanic action from the sea floor. This expression is here extended to all other situations in which organisms arrived in a previously-unoccupied area without deliberate help from people. For example, the [lovebug](#) (*Plecia nearctica*) and cattle egret (*Bubulcus ibis*) arrived in Florida by flight from other areas; they are **immigrants**, and were not "introduced" (nobody introduced them).

**9.** The expression **indigenous** is a valid alternative to **native**. The complement of **indigenous** (in the sense of being present but not being **indigenous**) is **non-indigenous** (a cumbersome expression). The equivalent complement of **native** is **adventive**. The expressions **alien** and **exotic** do not give the sense of being present here. The expressions **indigenous** and **native** imply that the clade (species, subspecies, etc.) evolved here or jointly here and in neighboring areas, or at least that some level of differentiation from non-native progenitors occurred here. This may perhaps be the same rule that is applied by United States law to declare Amerindians (an infrasubspecific category) to be native Americans. See the concept of **naturalization**, which must at some level be applied to plants and animals.<sup>11</sup>

**10.** The term **introduced** has been used in three senses. Here, for practical reasons, it is restricted to those organisms that were introduced deliberately by people, following Zimmerman (1948). Thus, the expression "accidentally introduced" is not accepted. Propagules arrive either by **immigration** [of their own volition, whether or not they were hitchhikers in cargoes moved by humans] or by **introduction** (i.e., deliberate introduction by humans). In this scheme, there is no such thing as accidental introduction. The practical reason for the decision not to use this expression is that it is often difficult to determine how an insect arrived in a new area. For example, when [citrus leafminer](#) (*Phyllocnistis citrella*) was first detected in Florida, there was speculation about how it arrived: some people speculated that it had arrived on the winds of Hurricane Andrew, whereas others thought it arrived as a hitchhiker in citrus planting stock; there is no proof either way, and the most practical solution is to label it an immigrant (which merely indicates that it was not introduced deliberately)."

## Cited References

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