

2. Vowel Quality Inventories

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1. Introduction

This chapter discusses the number of vowel contrasts in the inventory of sounds in languages. It complements chapter 1 on consonant inventories, although in this chapter the number of elements concerned is counted in a slightly different way. **Vowels** are the kinds of sounds that typically occur as the essential centers of syllables; in many languages the shortest possible word consists of just one vowel, as in the French word *eau* 'water', pronounced as the single vowel sound /o/. As this example shows, an established spelling system often involves a very indirect connection between the letters used and the vowel sounds of the language. The set of vowels used must therefore be established in the same kind of way as was discussed for consonants, in this case by comparing sets of words in which only the vowel sound differs. The English words *seat, sit, sate, set, sat, sot, soot, suit* show that English has at least 8 different vowel sounds. By considering further sets of words with other consonants, the full set of English vowels can be established (which will vary depending on the variety of English being considered).

As with consonants, for many languages it is quite straightforward to decide how many vowels there are, but in other cases there are some difficult questions to resolve, particularly where there is a question of whether a given syllable center should be recognized as consisting of one or of two (or even more) parts. There are a number of types of cases which pose this problem, of which only three principal ones will be discussed rather briefly here. These concern **vowel length**, **vowel nasalization**, and **diphthongs**.

In many languages a vowel which is held for a longer time contrasts with a shorter version of the same vowel (or one similar enough to be considered basically equivalent). For example, in Tlingit (Na-Dene; Alaska), the word written *t'a* /t'a/ means 'king salmon', whereas *t'aa* /t'a: / means 'board, plank'. Such a long vowel might be considered to be two copies of the same vowel in succession, as the spelling suggests, or be thought of as a single unit. The considerations which would lead to making one choice or the other are often finely balanced and lead different scholars to different conclusions.

A nasalized vowel is one in which air is flowing out through the nose as well as through the mouth. In many languages pronunciations of the same word may vary in different contexts between saying a nasalized vowel and saying a vowel and a nasal consonant, as in the different pronunciations of French *bon* in *bon café* 'good coffee' and *bon ami* 'good friend', /bõ kafe/ versus /bõn ami/. Again different considerations might lead to different choices, either interpreting such a case as containing a unit which is a nasalized vowel or as consisting of two parts, namely a vowel accompanied by a nasal element.

Diphthongs, such as the kinds of sounds heard between the consonants in the English words *lied* /laid/ and *loud* /laud/, involve movement of vowels from a starting position to a different finishing position. Again it is possible to consider such cases as single sounds with an inherent movement or to view them as the result of saying two different vowels in succession.

According to the decisions which are made on issues such as these the number of vowels said to occur in a given language could vary considerably. A more consistent way to compare vowel inventories is to make the comparison at a somewhat more abstract level. Phoneticians recognize three properties which contribute to the most basic quality or "timbre" of a vowel sound. These are its **height** (roughly, how open the jaw needs to be to make the vowel), its **position in a front-to-back dimension**

(roughly, whether the tongue needs to be pushed forward, remain more or less in the position in which it rests during normal breathing, or be pulled toward the back of the mouth for that vowel), and the **lip position** (whether the lips are pushed forward and narrowed or not). There is much more agreement on how many vowel types differing along one or more of these basic dimensions occur in any given language. Long and short variants of the same vowel are always counted once, nasalized vowels do not add to the inventory as long as a non-nasalized counterpart occurs, and so on. For that reason, the number of basic vowel qualities in each language is what is examined in this chapter. Spanish is thus counted as having five vowels, which generally are represented quite straightforwardly by the letters *i, e, a, o, u* in Spanish orthography. The diphthongs which occur in words such as *puerta* ‘door’ or *siempre* ‘always’ can be resolved as combinations of two of these basic vowels occurring within a single syllable. For the five recognized vowel qualities in Spanish a simple phonetic categorization can be given in terms of the basic properties as follows: the two vowels represented by /i, u/ are high vowels, /e, o/ are mid vowels and /a/ is a low vowel. The vowels /i, e/ are front, /a/ is central, and /o, u/ are back; /o/ and /u/ are also rounded while the other three Spanish vowels are unrounded.

2. Establishing the values

When vowel qualities are counted in this way in the sample of languages surveyed for this chapter, the average number of vowels in a language is just fractionally below 6. The smallest vowel quality inventory recorded is 2 and the largest 14. There are 4 languages in the sample with only two contrasting vowel qualities; these are languages in which only the height of the vowel has any distinctive function according to at least one possible interpretation of their phonetic patterns. An example of this extreme is Yimas (Lower Sepik–Ramu; Papua New Guinea).

Only one language in the sample, German, uses 14 vowel qualities and only 2 make use of 13, namely the variety of British English included here and Bété (Kru, Niger–Congo; Côte d'Ivoire). Considerably more languages have an inventory of five vowels than any other number — 188 or just over one-third. The next most frequent inventory size is six vowel qualities, with 100 languages (or 17.8% of the sample). In plotting the data on the map, vowel quality inventories with 5 or 6 members have therefore been grouped together in the category of “average” while those with 4 or fewer are classified as “small” and those with 7 or more are classified as “large”. Languages with “average” vowel quality inventory size account for more than half the total sample (51.2%), about a third (32.5%) have “large” vowel quality inventories, and only 16.3% have “small” vowel quality inventories.

@	1. Small vowel inventory (2–4)	92
@	2. Average vowel inventory (5–6)	288
@	3. Large vowel inventory (7–14)	183
	total	563

3. Geographical distribution

There are strong areal patterns in the distribution of vowel quality inventories. Not surprisingly, languages with average inventory sizes are the most widely scattered. In just a few areas, southern Africa being one, they occur almost to the exclusion of the other two types. Small and large inventories on the other hand are markedly skewed in their geographical distributions. Languages with small inventories are frequent in the Americas. The indigenous languages of the Americas quite often have four vowels in a set similar to that of Spanish except for missing an /u/-like vowel. Examples of languages having this kind of system are Eastern Ojibwa (Algonquian; Ontario), Navajo (Athapaskan; southwestern United States), North Puebla

Nahuatl (Uto–Aztecan; Mexico), and Tacana (Tacanan; Bolivia). Others of these languages, such as Aymara, Cherokee, and Haida, have three–vowel systems, usually reported as having two high vowels /i, u/ and a low central vowel /a/. In Australia small vowel inventories dominate, this feature being just one of a number of properties which tend to give the languages native to this part of the world a special character from the point of view of their sound patterns. Small vowel inventories occur rarely in the remaining parts of the world, that is, in Africa, the entire Eurasian mainland and New Guinea and the Pacific Islands, although there are some specific small language groups, such as the Berber languages of North Africa and the Northwest Caucasian languages spoken near the border of Russia and Georgia, which may have this feature.

Africa is strikingly marked by a zone right across the "middle belt", roughly between the Equator and the Sahara, in which large vowel inventories predominate. This belt encompasses languages belonging to three major families, Niger–Congo, Nilo–Saharan and Afro–Asiatic. The relatively large number of vowels in these languages seems to be associated with the prevalence of patterns of **vowel harmony** in the same area. When a language is said to have vowel harmony this generally means that within a word, including any affixes, it is only possible to combine the members of certain subsets of the vowels together. Such restrictions are very common in both Niger–Congo and Nilo–Saharan languages within this area. Since its effect is to reduce the number of legitimate words that can be constructed from the set of sounds available, the presence of vowel harmony may make it easier to tolerate a larger than average number of different vowels in a language as it reduces the risk of mishearing and misidentifying a word. This is because in a language with vowel harmony a given vowel in a word does not have to be discriminated from among the set of all possible vowels, but only among those of a subset.

There are also concentrations of larger than average vowel inventories in interior Southeast Asia and southern China, in much of Europe and, on a smaller scale, in interior New Guinea. The European area also includes a number of languages with vowel harmony restrictions on the distribution of their vowels, such as Finnish and Hungarian, as well as Turkish and its relatives (which extend well into Central Asia and to western China). However, large vowel inventories in some of the other languages in this area came about (in part, at least) as a result of earlier distinctions between sets of long and short vowels being transmuted into contrasts of vowel quality. This occurred (subject to other influences as well) in English, German and Italian, amongst others.

4. Discussion

In the Asian area concerned a number of the languages are well-known for having undergone historical sound changes which shortened their words so that many of them became just one syllable long, and often at the same time reduced the number of distinctions between different consonants, especially at the ends of words. In some cases at least, these changes also resulted in increasing the number of distinct vowels. Such patterns of inter-related changes have sometimes been taken to suggest that languages maintain an overall balance in the complexity of their phonological systems. It is therefore interesting to examine whether a tendency to balance a small number of consonants with a larger number of vowels and conversely to balance a larger number of consonants with fewer vowel contrasts can be detected in the data of this survey. In a set of 559 languages for which the consonant inventory size and the vowel quality inventory size are both available, absolutely no correlation was found between the number of vowels and the number of consonants (for the statistically minded, the correlation coefficient between the two series of numbers is $-.004$). The

lack of any significant relationship between these properties is also evident when the broad size categories discussed in this chapter and chapter 1 are considered. For example, of the 169 languages with “moderately large” and “large” consonant inventories as defined in chapter 1, 33 have “small” vowel quality inventories and 50 have “large” vowel quality inventories, or 19.8% and 29.9% respectively. These proportions are very similar to the overall frequencies found in the entire sample. As a general principle it cannot therefore be said that the numbers of vowels and consonants in an inventory, as counted here, bear a relation to each other. There are many different possible balances between these two aspects of a language’s sound system which all serve to create a satisfactory tool for human use.

The relationship between vowel inventory size and consonant inventory size is further discussed from a different perspective in chapter 3, and the relationship between vowel systems and tone systems is discussed in chapter 13.