"PLACE OF ARTICULATION" IN AUSTRALIAN LANGUAGES

Andrew Butcher

Department of Linguistics (Arts)
The Australian National University

ABSTRACT - Most Australian languages contrast either five or six orders of stops (in both oral and nasal series), distinguished in terms of what is traditionally known as "place of articulation". This study examines the articulatory and acoustic correlates of the four coronal categories in a number of languages, using acoustic and palatographic evidence.

INTRODUCTION

The consonant systems of Australian languages typically have a comparatively small number of contrasting series: one each of oral stops, nasals, laterals, rhotics and glides. On the other hand, these languages are relatively rich in place-of-articulation contrasts. As well as *bilabial* and *velar* orders, there are also as many as four coronal orders represented in the stop series, the nasal series, and often in the lateral series too. Two of these categories are usually labelled as *apicals*, as the active articulator is thought to be the tongue tip. One of these sounds is said to be *alveolar* and one *post-alveolar*. The other two categories are referred to as *laminals*, as the active articulator is said to be the blade of the tongue. One of these categories is labelled *dental* and the other *palatal*. Very little instrumental work has been done on the phonetic realisation of these phonological categories in the 150 or so surviving Australian languages.

METHOD

As part of a larger project on the phonetics of Australian languages, acoustic, aerodynamic and palatographic data have been recorded from a large number of speakers of over 20 different languages. The findings summarised in this paper are based on data from speakers of Eastern Arrernte, Warlpiri, the Western Desert Language (Ngaanyatjarra), Gupapuyngu, Guugu Yimidhirr, Nyangumarta and the Western Torres Strait Language (Kalaw Kawaw Ya). Most of the material recorded has been in the form of phonologically balanced word lists. Audio recordings were made in the field using a Sony TCM-5000 cassette recorder and in the studio with a Revox A-77 tape recorder. These recordings were subsequently analysed using the ILS (pc/dos version 6.2) signal processing package. Static palatography was carried out with the aid of the Polaroid CU-5 dental system and dynamic palatography with the Reading University EPG-2 Electropalatograph.

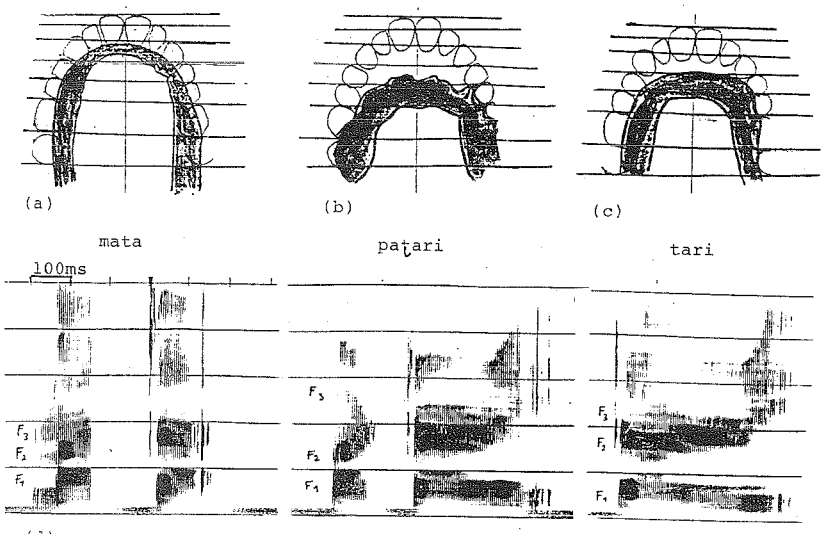
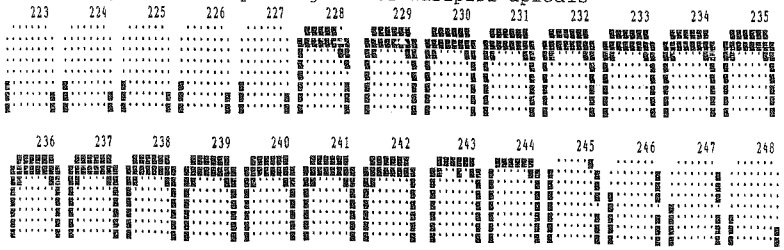
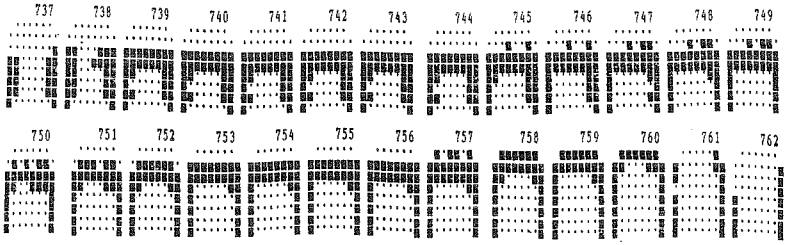


Fig 1: Static palatograms and spectrograms of Warlpiri apicals

Fig 2: Electropalatograms of Warlpiri apicals



(a) mata



(b) miṯa

THE APICAL CATEGORIES

The *apical alveolar* sounds are very similar amongst all the languages so far studied. Fig 1a illustrates the way these sounds are produced by a speaker of Warlpiri and Fig 3a by a speaker of Eastern Arrente. They invariably involve a narrow band of contact, as little as 2 mm across, at the alveolar ridge immediately behind the upper front teeth. This contact extends around the rim of the tongue, broadening out to cover the teeth at the sides. Linguagrams indicate that the active articulator is indeed the apex of the tongue (Fig 3f). For the *post-alveolar* sounds static palatograms show contact in a broad band, 5-12 mm wide, centred at least as far back as the first pre-molars, and thus in the post-alveolar or pre-palatal zone (Figs 1b and 3b). Palatograms of successive repetitions in which the upper and lower surfaces the tongue is each in turn coated with contrast medium, clearly show that the active articulator is almost always the underside of the tongue blade (Figs 1b and 3b). Whilst this description is valid for the careful pronunciation of isolated words, it is quite possible that in spontaneous connected speech the tongue tip is more often used. So-called *pre-palatalised post-alveolars* in Arrernte do not always have sublaminal articulation. On the other hand *alveolars* may be articulated with the underside of the blade (Fig 3c). Thus the crucial distinction appears to be made in terms of the passive articulator. Acoustically, *post-alveolars* are distinguished in the approach phase by a more sharply rising F2 and a falling F3 (Figs 1d,e and 3d,e). The release burst of the *alveolar* stop may show energy at higher frequencies, but differences in formant transitions at the release are minimal. Electropalatographic data suggest why this may be so. Fig 2 shows that the tongue normally rolls forward during the articulation of *post-alveolars*, beginning in a broad band in the post-alveolar region and ending in a narrow band behind the front teeth, such that the contact configuration immediately prior to release is very similar to that for the *alveolars*.

Perhaps at least partly for this reason, these two sounds rarely contrast in initial position. Fig 1c,f shows the articulation of an initial *apical* stop in Warlpiri, which is said to be realised as the *post-alveolar* member of the opposition. Clearly the formant transitions are more similar to the latter sound and the contact is in the postalveolar region. However, contact does not extend as far back as in word-medial *post-alveolars*, and there are no examples in the data of sublaminal articulations in initial position. These articulations could thus be said to be phonetically in-between the usual realisations of the two members of the opposition. In languages with only one *apical* sound a similar articulation seems to be used. Fig 5a shows the EPG record of an *apical* stop produced by a Western Torres Strait Language speaker, with a wide band of contact beginning behind the front teeth and extending into the post-alveolar zone. Static palatography shows that these articulations may often be sub-laminal.

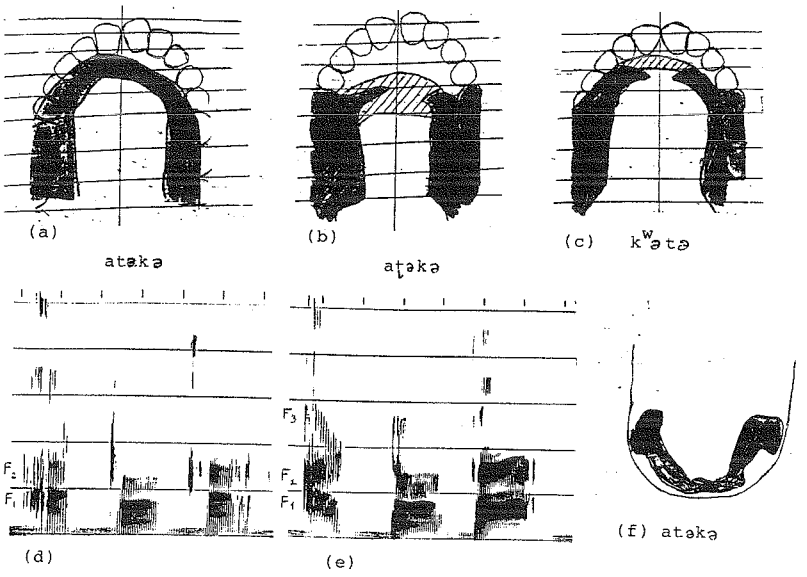
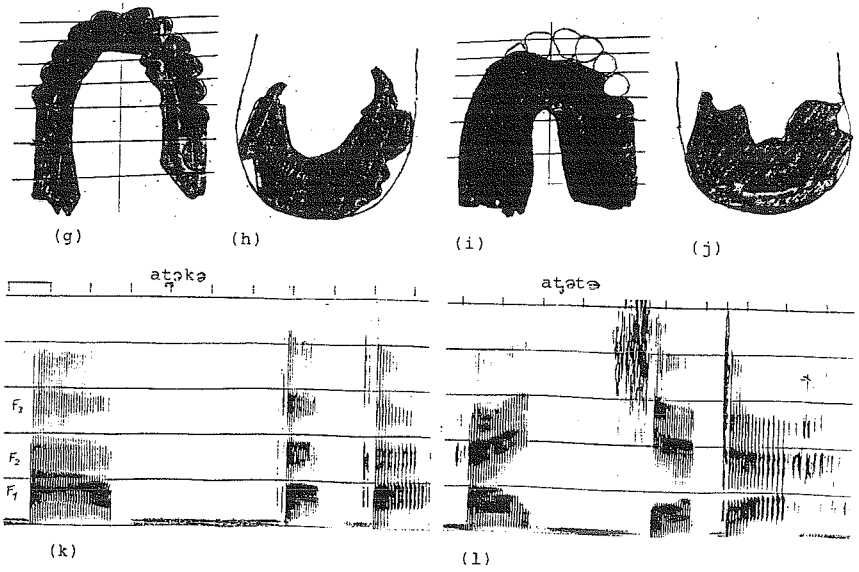


Fig 3: Static palatograms, linguagrams and spectrograms of Arrernte apicals and laminals



THE LAMINAL CATEGORIES

The so-called *laminal* sounds appear to be made using an area of the tongue which extends considerably further back than the blade, in the case of some *palatal* realisations up to 30 mm on to the anterodorsal area of the tongue (Fig 3h,j). In many languages the preferred articulation of both sounds appears to be with the tongue tip behind the lower incisors. *Dental* articulations usually involve contact of the blade of the tongue at the very edges of the upper incisors, extending back to the alveolar ridge, and in some cases as far as the first pre-molars (Figs 3g and 4a,d). They could be described as palatalised laminal dentialveolars. *Palatals* have contact at the back of the upper front teeth, often extending back in the mid line as far as the first molars and with full contact in both right and left lateral zones (Figs 3i and 4b,e). They are perhaps best described as palatalised laminal palatoalveolars. Acoustically the *palatals* are distinguished by rapidly lowering F1 and rising F2 and F3 in the approach phase. *Palatal* stops have a higher frequency burst than any of the other sounds, often followed by a short period of friction. *Dental* release bursts, on the other hand, are usually of lower frequency than the other categories (Fig 3k,l).

The *laminal* contrast is also neutralised in certain contexts and in many languages is absent altogether. Younger speakers of Guugu Yimidhirr have the contrast only in word-medial position. The sound occurring word-initially is illustrated in Fig 4c,f. Articulatarily it has some of the characteristics of both *dental* and *palatal* sounds. There is clearly dental contact, but this extends further back than for contrastive *dental* sounds, whilst the shape of the tongue body appears to be similar to that for contrastive *palatal* sounds. In languages with only one *laminal* category, this usually tends to be either mainly palatal in character (e.g. Warlpiri) or mainly dental (Ngaanyatjarra and W. Torres Strait), but in the former case less forward and in the latter less back than in corresponding articulations in languages with a *laminal* contrast (see Fig 5b).

Thus we might divide the [+coronal] sounds of Australian languages into a [+apical] category, realised phonetically as either apical or sublaminal sounds, and a [-apical] category, realised as laminal articulations with raised and fronted dorsum. Within each category a distinction may be made between a [+ anterior] and a [-anterior] sound. In the case of the *apicals* this is realised as alveolar vs. post-alveolar, and in the case of the *non-apicals* as dentialveolar versus palatoalveolar.

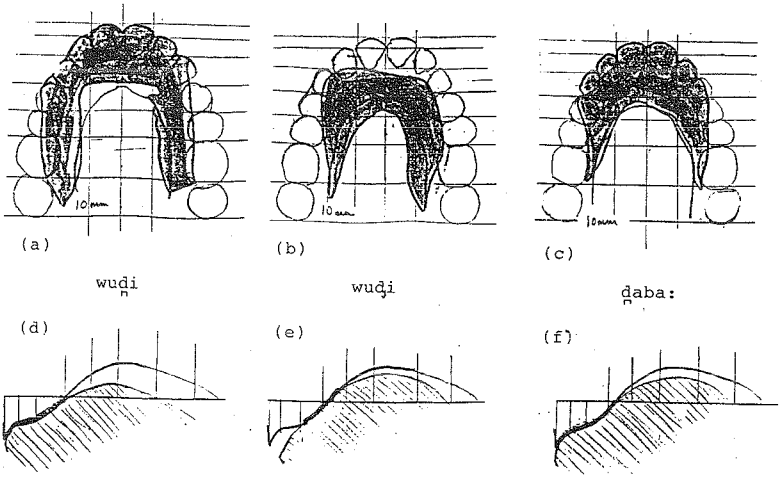


Fig 4: Static palatograms of Guugu Yimidhirr laminals with corresponding mid-sagittal sections.

Fig 5: Electropalatograms of apicals and laminals in Western Torres Strait Language