

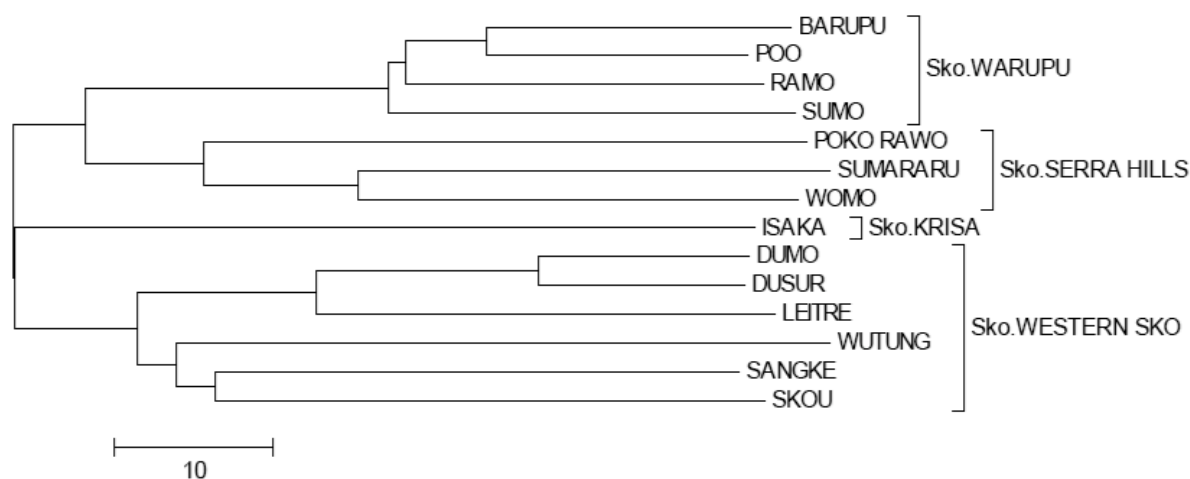
# Skou

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## 1. Introduction

The languages of the Skou family are spoken predominantly in north-western Papua New Guinea but with the westernmost languages found in north-eastern Indonesia. There have been claims made of the wider affiliations of these languages (eg., Laycock 1975 suggested a link with Burmese), but none have been conclusively demonstrated. The Skou languages form a single cluster in the ASJP World Language Tree of Lexical Similarity. The subset of the ASJP tree that contains the Skou languages is shown in Figure 1.<sup>1</sup>

Figure 1. ASJP Tree for Skou languages



The phylogeny of the Skou languages, as determined by comparative method approaches, is shown in Figures 2 and 3 (Donohue and San Roque 2004). Note that there is no clear subgrouping for Nouri, an extinct language of the south-eastern Serra Hills. The limited material available shows Nouri sharing some traits with the Serra Hills languages, and some with the Piore River languages.

<sup>1</sup> Note that in the world tree numerous extraneous languages intrude into this tree. This might in part reflect the phonologically highly divergent forms found across cognates in the Skou family, as exemplified in, eg., Table 2.

Figure 2. Comparative Method phylogeny of the Skou languages

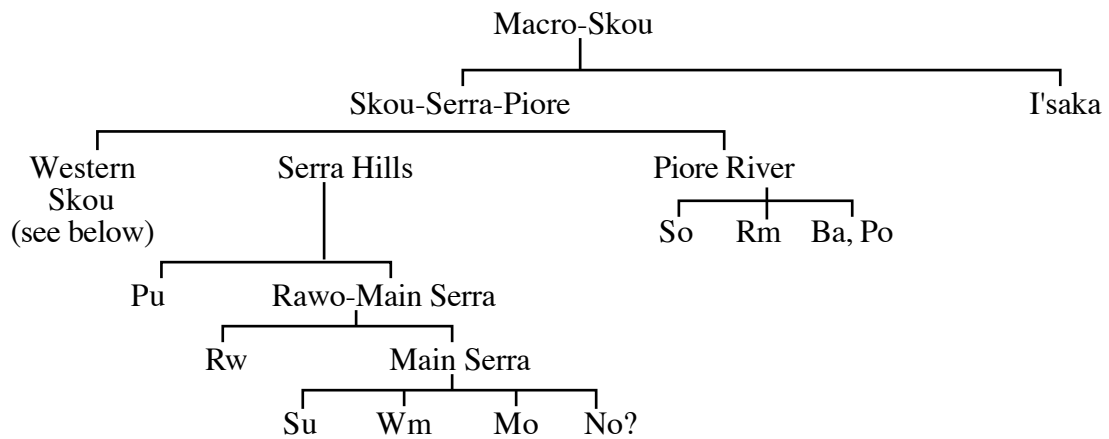
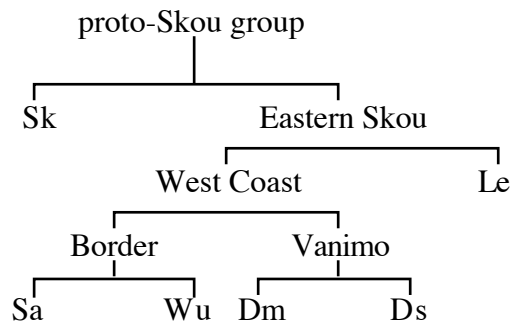


Figure 3. The Western Skou family

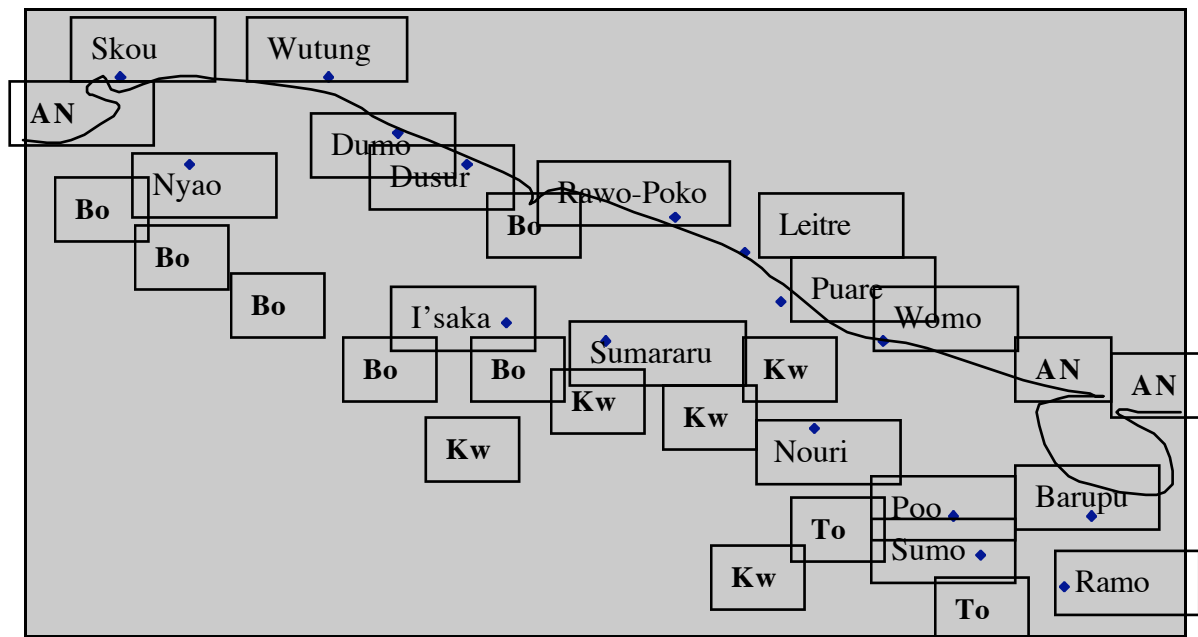


Language codes:

Ba	Barupu	Po	Poo	So	Sumo
Dm	Dumo	Pu	Puare	Su	Sumararu
Ds	Dusur	Rm	Ramo	Wm	Womo
Le	Leitre	Rw	(Poko-)Rawo		
Mo	Mori	Sa	Sangke	Wu	Wutung
No	Nouri	Sk	Skou		

Figure 4 shows the west-to-east dispersal of these languages across 100km of North New Guinea coast. The total extent of the family is approximately 100km. The languages form a continuous chain, except where the Pual river basin, occupied by speakers of Border Stock languages (Mbu and Ningera), separates the Oenake range to the west from the Serra Hills to the east. Leitre, a Western Skou language, is found in the midst of the Serra Hills group, but otherwise the arrangement of the subgroups matches the geography very closely.

Figure 4. Map of the Skou languages in North-Central New Guinea



Key: Skou family languages listed by name. Surrounding languages listed by family. AN: Austronesian; Bo: Border Stock; Kw: Kwomtari family; To: Torricelli family. North of the Skou languages is the Pacific Ocean.

We shall discuss the congruence of these two representations of the languages of the family after a brief excursion into some of the features of the Skou family that make them a challenge.

## 2. Features of the Skou languages

The Skou languages are challenging for attempts to classify them. They are a geographically close family, which has resulted in a significant amount of internal contact-induced change amongst the languages, in the form of lexicon, phonology, morphology and syntax.

A number of convergence zones can be identified in the range of the Skou languages. In the far west the Austronesian languages, Tobati and Kayupulau, the Sentani languages, Sentani and Nafri, the northern Border languages Awyi, Taikat and Elsen, and the two Skou family languages Skou and Nyao (= Sangke) share a number of phonological traits, perhaps most noticeably the presence of a contrastive rhotic phoneme, otherwise rare in this area. In the far east the Austronesian languages Sera and Sissano, the Northern One Torricelli language, and the Skou languages of the Piore River subgroup participate in an area characterised by, among other traits, the lack of an /s/ phoneme. In the centre Rawo and Sumararu share with the Kwomtari language Momu and the downstream Border languages Fakmo, Mbu and Ningera the presence of bilabial trill phonemes. These traits make the languages appear more distinct than they perhaps are.

There are a number of features that are common to the languages, such as the presence of lexical tone and the use of prefixal nominative agreement on verbs (an unusual feature in most of New Guinea). At the same time the languages show remarkable internal diversity. Table 1 shows the consonantal systems of the different languages. It is not hard to see how different subgroups have very different tendencies.

Table 1. Plosive patterns in the Skou languages

W	Skou	p b		t		j	k			
	Nyao	p b		t d	tʃ		k	k <sup>w</sup>		
	Wutung	p b		t d	tʃ	dʒ			? ? <sup>w</sup>	
	Dumo		b	t d					? ? <sup>w</sup>	
	Dusur	p b		t d			g			
	Leitre	p b		t d			k g	k <sup>w</sup>		
I	I'saka	p b		t d			k			
S	Rawo-Poko	p	mb	p <sup>w</sup>	mb <sup>w</sup>		nd	k	ŋg	
	Sumararu	p	mb	p <sup>w</sup>	mb <sup>w</sup>		nd	k	ŋg	ŋg <sup>w</sup>
	Puare	p	mb	p <sup>w</sup>	mb <sup>w</sup>	t	nd	k	ŋg	k <sup>w</sup> ŋg <sup>w</sup>
	Womo	p	mb			d		k	ŋg	
	Nouri	p b			t					
P	Barupu	p b			t			k		
	Ramo	p b			t			k		
	Sumo	p b			t			k		
	Poo	p b	mb		t			k		

The rest of the consonant inventories for each language are shown in the appendix. It is clear that prenasalisation is primarily the domain of the Serra Hills languages, voicing contrasts are associated with the Western Skou languages, and a reduced number of contrasts in the plosive inventory is a property of the Piore River languages.

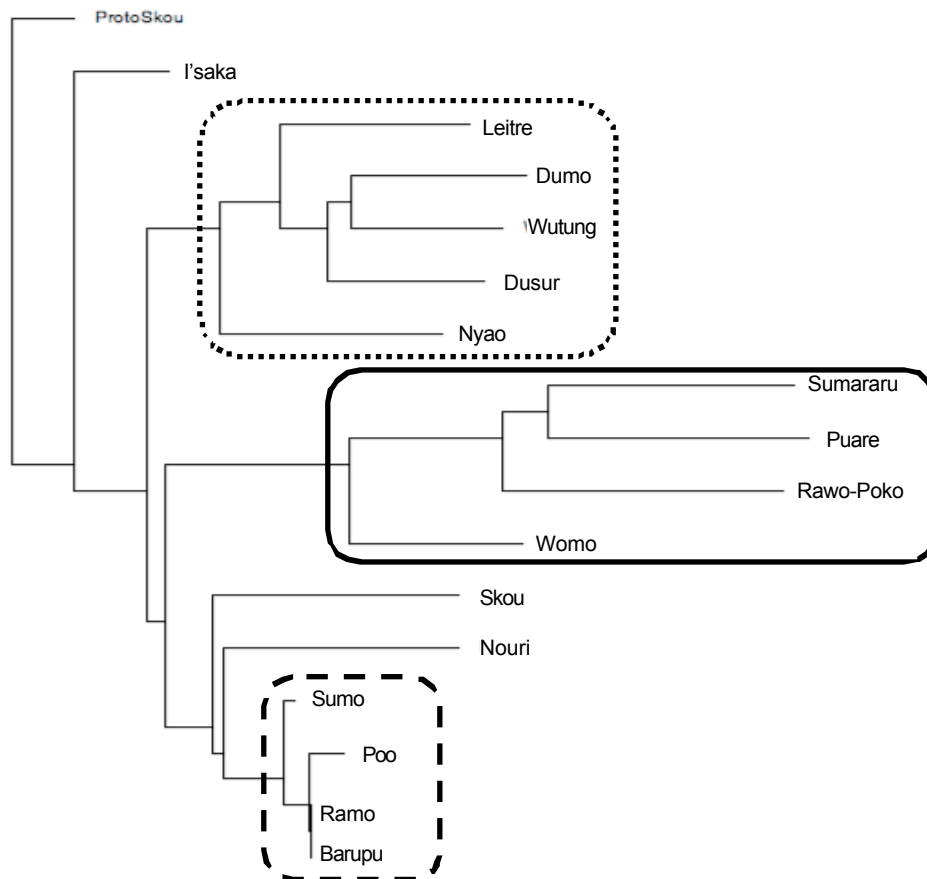
Perhaps even more challenging, given the constraints of segmental coding in the ASJP system, is the elaboration of vocalic systems. Rather than the seven vowel qualities considered by the ASJP program, eight vowels are not uncommon in languages of the Skou family, compounded with contrastive nasalisation, and universally-present word-tone systems of up to six contrastive melodies, and usually at least 4 or 5.

Table 2. Vowel systems in Skou languages

										Nasal vowels?
W	Skou	i	ɛ	a	ɔ	u	ɯ	∅		Y
	Nyao	i	e	ɛ	a	ɔ	o	u	ə	Y
	Wutung	i	e	ɛ	a	ɔ	o	u	ə	Y
	Dumo	i	e	ɛ	a	ɔ	o	u	ə	Y
	Dusur	i	e	ɛ	a	ɔ	o	u	ə	Y
	Leitre	i	e	ɛ	a	ɔ	o	u		Y
	I'saka	i	ɛ	a	ɔ	u				(Y)
S	Rawo-Poko	i	ɛ	æ	a	ɔ	u			Y
	Sumararu	i	ɛ	æ	a	ɑ	ɔ	u		
	Puare	i	ɛ	æ	a	ɑ	ɔ	u		
	Womo	i	ɛ		a	ɔ	u			
	Nouri	i	ɛ	æ	a	ɔ	u			
P	Barupu	i	e	ɛ	a	ɔ	o	u		
	Ramo	i	e	ɛ	a	ɔ	o	u		
	Sumo	i	e	ɛ	a	ɔ	o	u		
	Poo	i	e	ɛ	a	ɔ	o	u		

Figure 5 presents a clustering (implemented with SplitsTree – Huson and Bryant 2005) based on the raw segmental (consonant and vowel) inventories of the languages. The phonological distinctiveness of the different subgroups makes clustering into different groups relatively simple. We can see that I’saka is separated early, followed by an approximate equal split between the three major subgroups, Western Skou (dotted), Serra Hills (solid), and Piore River (dashed). Nouri is associated at a greater remove from the Piore River languages, and Skou is misplaced into this group.

Figure 5. Unrooted tree based on raw phonological segments



The modern phonologies represent the endpoints of rather dramatic phonological changes, resulting in some very unobvious cognate sets, such as shown in Table 2. Here, for instance, the reflex of \*ra-g<sup>w</sup>a varies in terms of whether the first syllable, a mammalian classifier, is retained, and in terms of the reflex of the second syllable, \*g<sup>w</sup>a. The classifier is found in I’saka, Womo and Puare in this list, reflected as *a-*, *ɔa-*, and *ʔ(i)-*, respectively. In Sumo and Barupu the vowel is rounded following the rounded consonant, which is then lenited, while other regular sound changes (Donohue 2002, Donohue and San Roque 2004) apply, resulting in *p*, *tʃ* or *b* (other languages attest *d* as reflexes of \*g<sup>w</sup>). Given the degree of phonetic variation between these known cognates showing regular sound correspondences, it is clear that a purely lexicon-based approach to classification will face serious problems unless cognate decisions are included. That said, it is also clear that the ASJP method does a good job of replication (as evaluated in section 3).

Table 2. Some non-transparent cognate sets

	‘pig’	‘fish’	‘stomach’
I’saka	ape	wε	jow
Skou	pale	m∅	hə
Wutung	tʃa	mu	hũə
Leitre	ba	mə	gu
Womo	ðæpe	<i>ini</i>	kie
Puare	ʒipi	<i>ni</i>	<i>auro</i>
Sumo	tau	ba	tə
Barupu	rau	ba	tə
Proto-Skou	*ra-g <sup>wa</sup>	*bẽ	*kiə

### 3. Assessing the ASJP tree

The family is very well replicated. The split into four first-order subgroups is sensible; there is very little evidence for the proposed Macro-Skou linkage, and a simple three- or four-way split is as good a way of representing the languages as any, as long as I’saka is not closely associated with any of the other languages, as is the case in the ASJP tree.

The grouping of the Serra Hills languages together with the Piore river (= Warapu) languages is not without precedent. A language not included in the ASJP tree, Nouri, appears from a phonological and morphological perspective to be liminal between these two categories, and may provide a link between these two major subgroups, though questions of its ‘best-fit’ affiliation in one or the other of these two groups remain uncertain.

The Western Skou subgroup is perfectly replicated in its entirety, and I’saka is situated as an isolate within the family. Trivially we can assess the degree to which these different higher subgroups are replicated; in all cases there is perfect recall (that is, no false negatives missing from the groups) and perfect precision (all groups are replicated with no false positives included) (van Rijsbergen 1979).

Table 3. Evaluating replication of the major subgroups of the Skou family

Group	# langs	# ASJP langs	tp	fp	fn	Precision	Recall	F <sub>1</sub>
Western	6	6	6	0	0	1.0	1.0	1.0
I’saka	1	1	1	0	0	1.0	1.0	1.0
Serra	4	3	3	0	0	1.0	1.0	1.0
Piore	4	4	4	0	0	1.0	1.0	1.0

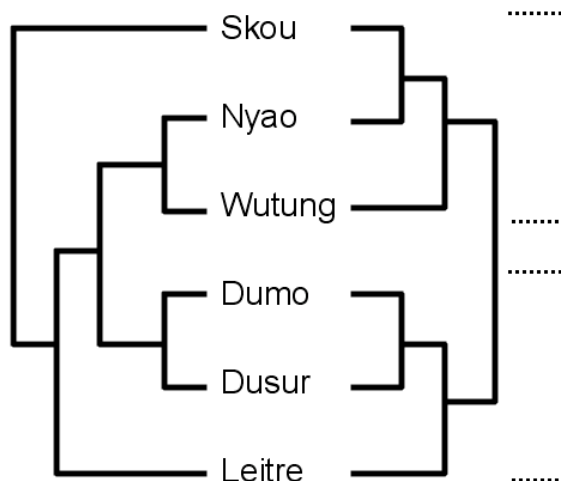
Key: tp = true positives; fp = false positives; fn = false negatives. F<sub>1</sub> = evenly weighted harmonic mean of Precision and Recall.

Within the eastern subgroup in the ASJP tree the Piore River and Serra Hills groups are separated, with internal structures that do not deviate dramatically from the consensus tree of the same subgroups.

The internal structure of the Western Skou languages, the best represented of the Skou family subgroups in the ASJP data and also the best understood of them, is less felicitous to the comparative-method tree, but even a significant amount of internal structure is very well

recovered. We can instructively examine the discrepancies; Figure 6 compares the ASJP tree and the comparative-method tree for the Western Skou languages.

Figure 6. Two trees representing the Western Skou languages: comparative method (left) and ASJP (right)



Dumo and Dusur have the same low-level grouping in both trees. While the comparative method tree groups Leitire with these languages, it also connects Nyao (= Sangke) and Wutung in this eastern group. The two most serious failures involve the Coastal subgroup, consisting of Nyao, Wutung, Dumo and Dusur. The ASJP tree disperses these languages across the whole Western Skou subgroup, meaning that a replication must either be low on recall, or low on precision. While Dumo and Dumo are linked together, Nyao and Wutung are not, except by the addition of Skou.

Table 4 shows the rates of precision, recall, and the evenly weighted harmonic mean of these two values for the different subgroups of Western Skou, the best understood of the Skou family subgroups. The columns detail the number of languages in each subgroup, and the number that the ASJP tree includes. The next columns show the number of true positives achieved by the ASJP clustering, as well as the false positives and false negatives. Following these are precision and recall values, and finally an evenly-weighted harmonic mean of precision and recall. The average of the harmonic means calculated is 0.87, indicating a high degree of replication.

Table 4. Evaluating replication of the Western Skou subgroup

Group	# langs	# ASJP langs	tp	fp	fn	Precision	Recall	F <sub>1</sub>
Skou	1	1	1	0	0	1.0	1.0	1.0
Eastern	5	5	5	1	0	0.83	1.0	0.91
			3	0	2	1.0	0.6	0.75
Leitire	1	1	1	0	0	1.0	1.0	1.0
Coast	4	4	2	0	2	1.0	0.5	0.67
			4	2	0	0.67	1.0	0.8
Border	2	2	2	1	0	0.67	1.0	0.8
Vanimo	2	2	2	0	0	1.0	1.0	1.0
Mean								0.87

While the overall ‘score’ for replication is high, it must be noted that the ASJP tree for Western Skou does not resemble the comparative method tree. Rather than Skou being a first-order branch, it is nested with the other westerly languages. Rather than the western Border languages, Nyao and Wutung, subgrouping with the more easterly Dumo and Dusur, these eastern languages are subgrouped together with the furthest east of the Western Skou languages, Leitre. In short, if we assumed a geographic clustering, splitting this subgroup into western and eastern parts, we would achieve the ASJP tree. The proximal Dumo and Dusur languages are subgrouped together, and eastern Leitre is grouped with them in preference to more distant languages. Proximal Skou and Nyao are grouped together, against more socially isolated Wutung. At this level of resolution, social and spatial distance better explains the ASJP tree than does linguistic phylogeny, reflecting the borrowing that must have occurred in the history of the languages, borrowing that resulted in the kind of diffusion of lexemes necessary to bring about the diffusion of sound changes that complicates the history of these languages (Donohue 2002). The ASJP tree has clarified, and quantified, lexical diffusion among the Western Skou languages and highlighted the fact that this process appears to have been more prominent in the Western Skou languages than in languages in other branches of the family.

We can similarly explain the grouping of the Piore River languages as following geography, though there is no articulated phylogeny for these languages that we can compare with. The ASJP tree of the Serra Hills languages matches with phylogeny better than geography, grouping Sumararu with Womo.

Nonetheless, I think we can declare success for the ASJP method in replicating the phylogeny of the Skou languages. While low-level detail has been confused by the signal generated by lexical borrowing between closely related languages, the method did achieve a separation into different subgroups. Leitre, for instance, was grouped as a Western Skou language, and not a Serra Hills language, despite being surrounded by languages of the Serra Hills family, and sharing detectable loans with them (see Figure 4).

Equally importantly, the ASJP tree faithfully replicates all of the major subgroups of the Skou family, while a typological tree, based on phonological segments, is less faithful, misplacing Skou and showing the effects of diffusion in the lower-level grouping (compare the topology of the Western Skou languages in the different trees). We can conclude that the ASJP tree is not immune to processes of diffusion between closely related and socio-geographically proximal languages, but that at a coarser level it provides an accurate assessment of phylogenetic relationships.

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## Appendix

For the sake of completeness, the other consonants found in the Skou languages are listed in Tables A1 and A2.

Table A1. Nasals, Glides, Rhotics, Laterals and Bilabial trill phonemes in Skou languages

W	Skou	m	n		w	j	r	l			
	Nyao	m	n	ɲ	w	j	r				
	Wutung	m	n	ɲ	w	j		l			
	Dumo	m	n	ɲ	w	j		l			
	Dusur	m	n	ɲ	ŋ	w	j		l		
	Leitre	m	n	ɲ	ŋ	ŋ <sup>w</sup>	w	j		l	
I	I'saka				w	j					
S	Rawo-Poko	m	n		ŋ	w	j	r	l	B B <sup>w</sup>	
	Sumararu	m	n		ŋ	w	j	ɥ	r	l	MB MB <sup>w</sup>
	Puare	m	n					r	l	ɸ	
	Womo	m	n			w	j	r	l	ʁ	
	Nouri	m	n			w	j	r			
P	Barupu	m	n			w	j	r			
	Ramo	m	n			w	j	r			
	Sumo	m	n			w	j	r			
	Poo	m	n			w	j	r			

Table A2. Fricative phonemes in the Skou languages

W	Skou			f					h
	Nyao			f	s				h
	Wutung			f	s				h
	Dumo	ϕ			s				
	Dusur				s				h h <sup>w</sup>
	Leitre			f	s				
I	I'saka				s				
S	Rawo-Poko	ϕ	ϕ <sup>w</sup>		s		ʃ		
	Sumararu				s				
	Puare				s	s <sup>w</sup>			fi
	Womo			ð	s		ʒ <sup>w</sup>		
	Nouri			β	s	s <sup>w</sup>		ɣ	
P	Barupu								
	Ramo								
	Sumo				s				
	Poo								