

**THE KHALÓ OR MAE RIM LAWÁ  
A REMNANT OF THE LAWÁ  
POPULATION OF NORTHERN THAILAND**

by  
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In northern Thailand there are several populations who are linguistically affiliated with the Mon-Khmer or austroasiatic group of languages. The most important of these groups are the *Lawa*, called *Lua*<sup>8</sup> in northern Thai, a group of several thousand people settling on the high plateau west of Hod<sup>8</sup> (Chiang Mai Province), the *Khamu* and *Tin* (Khatin) in Nan Province, and small groups of *Khamed* (Lamet) in Chiang Rai Province who are part of the large *Khamed* population in the Hua Khong Province of Laos. Due to the preservation of ancient cultural characteristics and linguistic relations with austroasiatic groups in Burma (*Wa*) the *Lawa* have received much attention<sup>2,4,5</sup>. In addition to the main group southwest of Chiang Mai there are a few *Lawa* villages<sup>5</sup> in the district of Viang Papao<sup>8</sup>. During a recent visit (1968) by the author no speakers of the *Lawa* language were found in these villages although they are still called *Lawa* villages ('Ban Lua') by the Thai population. It seems that their assimilation to the Thai community has been completed in the present generation.

In contrast to this, a group of people who call themselves *Khaló* or *Phaló*, and who are referred to as *Lua* by the Thai settling in adjacent villages, was discovered in the western part of Mae Rim<sup>8</sup> district (Chiang Mai Province) in 1968. No reference to this group was found in the literature and it seems that this isolated remnant of the *Lawa* population has escaped the attention of ethnographic research. In order to facilitate a more complete study of these people

the location, and the results of a preliminary survey of their language and of certain anthropogenetic characteristics will be described in this report.

### Discovery

The Doi Pui<sup>8</sup> massif west of Chiang Mai is mentioned as a stronghold of the Lawa in old chronicles<sup>6</sup>. This prompted us to ask people whether they had any knowledge of persons speaking the Lawa language during a survey of genetic traits in Tambol Pong Yaeng<sup>8</sup> (Mae Rim District). This subdistrict is located in the hills north of the Doi Pui range. In Village No. 5 (Ban Pong Kai<sup>8</sup>) information was received that a man described as 'Lua' had come to settle in this village. A language test showed that the native language of this man had a strong resemblance to the Lawa spoken in Bò Luang<sup>8</sup> (Hód District). He reported that in his own village, located beyond the mountain range north of Pong Yaeng, only Lawa was spoken and that there were two more villages with a substantial Lawa population. Questioned as to the name by which his people call themselves he stated that this was Khalò or Phalò. In view of the differences between Lawa and the language spoken in the Mae Rim villages (v.i.) the name Khalo, or the specifying term 'Mae Rim Lua' should probably be used for these people. In two excursions the three 'Lawa' villages were visited in August and September 1968.

### Geographic location

The three villages are Ban Pang Hai<sup>8</sup>, 98°50.1' E, 18°57, 7'N; Ban Ka<sup>8</sup>, 98°49, 3'E, 19°00, 7'N; and Ban Iak<sup>8</sup>, 98°48. 8 E, 19°02. 3'N. These villages are located in the mountain range extending north from the Doi Pui massif as shown on the accompanying map. Topographically, this area is characterized by small valleys breaking off in a step-like fashion into the Mae Ping valley. This break-off creates waterfalls and rapids at the site of the steep incline, e.g. the Mae Sa falls west of Mae Rim. The three Lawa villages are located in the valleys 300 to 500 metres above the base of the step-like rise from the Mae Ping valley floor. Probably, this location resulted in a relative

seclusion in which the ethnic character of the population was preserved until today. The village group of Pong Yaeng to the south of the Lawa villages has a similar location but is less isolated due to its connection with the road from Chiang Mai to Samoeng<sup>8</sup>. No autochthonous Lawa speakers are present in Pong Yaeng today.

### Linguistic examination

In order to determine the nature of the non-Thai language spoken in the three villages a word list was presented to three different persons from two villages. All three stated that they refer to their own language as Khaló or Phaló, and that they are called 'Lua' by the Thai in neighbouring villages. By questioning the village headmen it was determined that the population is predominantly Khaló in the villages Pang Hai and Man Ka. Only a few Thai who migrated from the valley reside in these villages. The population of the larger village, Ban Iak, consists mainly of people speaking northern Thai. 'Pure' Khaló are rare in this village but many people state that one of their parents was 'Lua'.

The result of the language tests is shown in Table 1. Originally, the list contained 200 words. The words for which no Khaló equivalent was known by the test persons, or for which a Thai word was used, and a number of words revealing no additional information (e.g. pork=pig meat) were omitted, leaving the list of 140 words in Table 1. The Khaló words are compared with four austroasiatic languages spoken in northern Thailand. Lawa (Bò Luang), Khamed and Khamu were transcribed from the word lists collected by Kraisri Nimmanaheminda<sup>3</sup>; Lawa (Umphai) equivalents were taken from the list reported by Sanidh Rangsit<sup>4</sup>. The Lawa (Bò Luang) given by K.N.<sup>3</sup> differs slightly from that collected by S.R.<sup>4</sup>; this may be due in part to the time difference of 25 years. In order to facilitate comparisons only one version of Lawa (Bò Luang) is shown.

A few conclusions emerge *prima facie* from an inspection of the word list. Khaló does not seem to be identical with either Bò Luang or Umpai Lawa or Khamed; but there is a great number of coincidences and similarities between these three languages. A calculation of

the percentage of coincident words shows that Khalò is intermediate between the Lawa and Khamed languages. The percentage of identical or very similar words in Khalò is 39.2% when compared with Lawa, and 37.5% when compared with Khamed. In contrast, there are only 17.2% similar words between Khalò and Khamu. With a coincidence of less than 40% of basic words it is not expected that Khalò is interintelligible with Lawa or Khamed, although much information could probably be exchanged between the speakers of the three languages in slow, grammatically simple conversation.

Several features deserve special mention : in Khalò, Lawa and Khamed there are a number of words exhibiting regular changes of vowels, similar to a German 'Ablautreihe'. Some of these are shown in Table 2. The upper part of the table seems to establish a regular relation  $\text{ó} : \text{ua} : \text{e}$  for Khalò : Lawa : Khamed. The other series,  $\text{ai} : \text{ia} : \text{ai}$ ,  $\text{a} : \text{úa} : \text{a}$ , and  $\text{ü} : \text{e} : \text{i}$ , are not as well documented. With respect to these series Khalò seems to be closer to Khamed than to Lawa. In contrast Khalò, as Lawa, lacks certain terminal consonants, especially 'l', that are present in Khamed, as shown in Table 3. It is interesting to note that the short vocabulary of Viang Papao Lawa given by Sanidh Rangsit<sup>4</sup> contains two words with terminal 'l', one of which has a similar form without the 'l' in Lawa and Khalò (sa nga : cha ngal). This suggests that Viang Papao Lawa may have been even closer to Khamed, at least in some phonemes, and that there may have been a continuous linguistic cline from Lawa (Bỏ Luang) to Khamed. Examples are 'sax'='wife', and 'jax'='shirt'. The consonant 'x' does not seem to occur in Lawa or Khamed. Another observation concerns consonant changes of the type 'r' : 'l' : '-', e.g. in the word for 'forest' where Khamu and Khamed retain the probably original form 'bri' or 'pri', whereas Khalò has 'pli' and Lawa 'pi'. This could be inherent linguistic developments or changes mediated by similar developments in or assimilation to the northern Thai language.

### **Anthropogenetic examinations**

Morphological measurements were not taken because it is not expected that they differ much from the northern Thai population who has presumably absorbed much of the preexistent Lawa after migrating to the area of northern Thailand. It was of interest, however, to determine the distribution of certain genetic traits, in particular blood groups and abnormal haemoglobins, because these traits show a characteristic distribution in many populations of Southeast Asia<sup>1</sup>. Table 4 shows the distribution of ABO blood groups in the Khaló people in comparison with Thai people from the same and adjacent villages, with Lawa from Bò Luang, and other populations of Thailand. In general, the distribution of blood groups in Southeast Asia is characterized by a preponderance of the blood group gene O, and a greater proportion of B than A. The distribution of ABO groups in the Khaló and in adjacent Thai villages is further evidence for the frequent local deviations from the general pattern. The relatively high proportion of group O in northern Thailand is exaggerated in the two village groups. There is evidence for selective forces acting on the blood group genes. In small groups chance effects play an additional role and may be decisive in groups numbering only a few hundred people. Only if it could be shown that the observed high proportion of group O is present generally in hill villages at the altitude of the Khaló villages, would this distribution of blood groups appear to be caused by selection in favour of group O rather than by chance ('genetic drift'). In general, the blood group distributions listed in Table 4 demonstrate the very limited usefulness of the ABO groups as markers of ethnic affiliation or race.

### **Haemoglobin Anomalies**

The findings concerning abnormal haemoglobins and beta-thalassaemia are listed in Table 5. Both anomalies are common in many tropical and subtropical countries. The most common abnormal haemoglobin in Southeast Asia is Haemoglobin E (HbE). The difference between the normal adult haemoglobin, HbA, and HbE is an exchange of two aminoacids per haemoglobin molecule (two out of a total of 572 aminoacids). This gives the abnormal haemoglobin

differing chemical and physical properties which facilitate its detection (e.g. by electrophoresis). Abnormal haemoglobins are usually produced at a rate lower than normal HbA. Therefore, anemia is often present, especially when a person carries two abnormal haemoglobin genes of a certain type (homozygotes). Thalassaemia is also characterized by an abnormally low haemoglobin production although no abnormal haemoglobin is formed in this condition. In view of the disadvantages (severe anaemia) conveyed by the abnormal haemoglobin genes it is surprising to find them in high proportions in many human populations. A selective advantage of the mildly affected heterozygotes, carriers of only one abnormal haemoglobin gene, has been mentioned as the most likely cause for these high gene frequencies.

Haemoglobin E may be considered as typical for Southeast Asians. There is an association between high frequencies of HbE and ethnic affiliation with the austroasiatic group<sup>1</sup>. In contrast, beta-thalassaemia is common in all populations of the tropical zone. There is no or only very little HbE in the different population groups of southern China whereas its frequency is high in Burma, Laos, Thailand and Cambodia with the exception of recent immigrant groups from southern China (e.g. Chinese, Thai Yong, Thai Ya and certain tribal groups in Thailand and Laos). It was, therefore, of interest to examine the haemoglobin types of the Khalò whose affiliation with the austroasiatic group is suggested by the language test, and compare the findings with those of Thai in adjacent villages and with the general population of northern Thailand. Table 5 shows a high incidence (16.2%) of carriers of HbE in the Khalò group. The Thai living in adjacent villages at the same altitude have only 5.2% HbE. In the Thai population of Chiang Mai and Lamphun 8.9% have HbE. The differences between the Khalò and the two Thai groups are statistically significant. The probability for a chance deviation as a cause of the difference is less than 1 in 1000 for the comparison Khalò : Thai in hill villages, and less than 1 in 100 for Khalò : Thai Chiang Mai/Lamphun. Because of the strong selective forces acting on the haemoglobin genes a 'drift' phenomenon, likely in case of the

blood groups, is improbable as a cause of the high frequency of the HbE gene among the Khalò. This is additional evidence in favour of the hypothesis that HbE was present in high proportion in the original austroasiatic population of northern Thailand and was acquired by the Thai, immigrating from the present southern China, by mixing with the local population. In order to demonstrate the association between HbE and austroasiatic language the following list of percentages of HbE carriers is shown:

<i>Austroasiatic groups:</i>		<i>Thai groups:</i>	
Khalò	16.2%	Thai, northern Thailand	5 to 9%
Lawa Bò Sali	12.8%	Thai, Chiang Tung	4 to 5%
Mòn Pasang	13.5%	Thai, Sipsong Panna	0 to 1%
Khamu Nan	17.2%		
Tin Nan	19.5%		

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- 8 Annotations concerning the transcription of Southeast Asian languages are contained in Table I. Transcription of geographical names with exception of the most common names (e.g. Chiang Mai) follow here :

Ban Iak	บ้าน เขียว	Lua	ลูะ
Ban Ka	บ้าน กะ	Mae Jaem	แม่ แจ่ม
Ban Pang Hai	บ้าน ปางไฮ	Mae Raem	แม่ แรม
Ban Pong Kai	บ้าน โป่งไค	Mae Rim	แม่ ริม
Bo Luang	บ่อ หลวง	Mae Sariang	แม่ สะเรียง
Doi Pui	ดอย ปุย	Pong Yaeng	โป่ง แยง
Hod	ฮอด	Samoeng	สะเมิง
		Viang Papao	เวียง ป่าเป้า

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**Table 2 List of words with regular vowel changes**

No.	Khalŏ	Lawa	Khamed	English
30	jŏng	juang	jeng	foot
31	yŏng	yuang	yeng	home
44	gŏng	(muan)	geng	pillow
55	kò	(kao)	üm ke	tree
93	hòk	huak	(hek)	to go up
97	ngòm	nguam	(ngöd)	to sit
99	kò	(yong king)	ke	to wake up
108	lòng	luang	leng	high
138	kò	kua	kel	ten
79	kha wai	a wia	kha wai	tiger
14	ba ngai	to ngia	ngai	eye
117	sa ngai	sa ngia	sa ngai	far
32	nya	nyüa	nya	house
103	(nyai)	nyüa	ka nya	to laugh
104	yām	nyüam	yām	to cry
72	lük	lek, leik	lik	pig
94	lü	le	(jü)	to go down

Words lacking vowel correspondence are set in parentheses  
The numbers refer to the list of 140 words.

**Table 3 Words with terminal '1' in Khamed**

No.	Khalo	Lawa	Khamed	English
26	ka tū	(wiak)	ka tül	abdomen
45	ō	—	öl	pot
60	ngō	ngō	ngöl	fire
91	hu	heo, hēu	höl	to walk
127	ngā	sa ngā	sa ngāl	green, blue
138	kò	kua	kel	ten

Words lacking correspondence are set in parentheses.  
The numbers refer to the list of 140 words

**Table 4. Distribution of ABO blood groups in several populations of northern Thailand**

Population	Number examined	Blood groups				Blood group gene frequencies <sup>3</sup>		
		A	B	AB	O	p	q	r
Khaló	156	27	39	3	87	0.1016	0.1456	0.7528
Thai in the same and in adjacent villages of the same altitude	244	55	41	12	136	0.1475	0.1147	0.7378
Lawa Bò Luang	134	31	45	16	42	0.1930	0.2584	0.5486
Northern Thai Chiang Mai and Lamphun <sup>1</sup>	3785	781	1047	195	1762	0.1384	0.1802	0.6814
Thai Bangkok <sup>2</sup>	421	75	148	42	156	0.1484	0.2566	0.5950

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<sup>1</sup> from FLATZ, G., and CH. SAENGUDOM, *Humangenetik* 3, 319-327, 1967.

<sup>2</sup> from PHANSOMBOON, S., *J. Siam Soc.* 45, 55-64, 1957.

<sup>3</sup> p, q, r stand for the frequency of "blood group genes A, B, O.

**Table 5. Distribution of Haemoglobin E and Beta-Thalassaemia**

Population	Number examined	Haemoglobin E Heterozygotes		Beta-Thalassaemia Heterozygotes*	
		Number	Percent	Number	Percent
Khalò	136	22	16.2	5	3.7
Thai in the same and in adjacent villages at the same altitude	289	15	5.2	25	8.7
Thai Chiang Mai and Lamphun provinces	995	89	8.9	68	6.8

\* identified by elevated haemoglobin A<sub>2</sub>

Statistical comparisons by the chi-square test :

Khalò with Thai in hill villages  $\chi^2 = 14.02$ , P smaller than 0.001

Khalò with Thai Chiang Mai/Lamphun  $\chi^2 = 7.06$ , P smaller than 0.01

Table 1. Comparative word list

No.	English	Khal̄ō (Mac Rim Lawa)	Lawa (Bò Luang)	Lawa (Umphai)	Khamed	Khamu
1	human	pui	pui	phui	a ī	khon*
2	man (male)	ta mā	pia mai	pa ra mi	a ui	jam rō̄
3	woman	ya bun	pia pōng	pa ra pōn	a nē	jam khūn
4	child	khan yom	kun dao	kuan do	khon ngal	khon nā
5	adult	pui tung	pī kuat	—	ī lā	ta
6	father	nyen	pō	phūa	ui	yong
7	mother	ma	ma	ma	nē	ma
8	elder sibling	i o	iak	iak	āk	tai
9	younger sibling	po	pu	phū	yo	hām
10	husband	pā nya	pia mai nyüang	pa ra mi	ka ma	kre
11	wife	sah	pia pōng nyüang	pa ra pōn	ka pōn	kam bra
12	grandfather	ī da	tā	ta	ui kūn	teng
13	grandmother	ī nya	yüa	yüa	yā	yā
14	eye	ba ngai	to ngia	ngai	ngai	mat
15	nose	jôt muan	mah	mā	muh	muh
16	mouth	muan	am pōm	ram bōm	mōn	ta nō̄
17	tooth	peng	piang	biang	kēn	rāng
18	ear	yōk	ha suak	suak	yō	ra mei
19	hair	hük	hāk	hāk	ki	krō
20	head	king	kain	kain	dò	kam pong

21	neck	ngòk	ngok	ngok	khǒ*	kan tuar
22	arm	di	dua	thū te	pōl tak ti	ti
23	hand	di	tai	te	ti	ka tǒ ti
24	finger	ma di	dua	roi	pōl kūl	jak kūl ti
25	breast	mem	neng	tal	pū	pū
26	abdomen	ka tū	wiak	wiak	ka tūl	lui
27	penis	kū	tǒi	—	lōk	lōk
28	vulva	kā	mī	—	ta kan	kā
29	leg	jǒng	jüang	ko chuang	sa lu	brang
30	foot	jǒng	juang	la chuang	jeng	jüang
31	home, settlement	yǒng	yuang	—	yeng	gāng
32	house, hut	nya	nyüa	nyüa	nya	gāng
33	stairs	bōng	pong	—	bōng	rōng
34	door	cha nya	a wüa	ra wüa	büng	pra long
35	fire place	hót ngò	tak ngò	—	ta wāng ngǒl	tüm bra lüa
36	paddy	kó	ngò	ngò	ngǒ gāng	ngò
37	rice	ngò	a ko	ra ko	ngǒ sin	rong ko
38	cooked rice	ǒp	āp	aup	—	ma
39	meat	ka nā	tao	ni	tu	a
40	vegetable	dö	phak*	—	tǒ la	phak*
41	shirt, jacket	jah	la pe	a phi	tǒng ti	wai tǎp
42	trousers	pā tǒi	wā	wā	tio*	tio*, song
43	blanket	po	pru	—	tǒng	trok
44	pillow	gǒng	muan	—	geng	kra nüas
45	pot	ǒ du	dāng	dǒng	ka ǒl	tra lõ
46	rice steamer	hǒng	huang	—	ang ko	rai ma

No.	English	Khalō (Mae Rim Lawa)	Lawa (Bò Luang)	Lawa (Umphai)	Khamed	Khamu
47	water jar	ō̄ ō̄m	ung la ō̄m	—	ō̄l uam	tra lò ō̄m
48	pounder	būk	bōk	—	kong lu	kual
49	axe	mui	mao	—	mui	mui
50	cross bow	āk	āk	āk	āk	mò
51	gun, rifle	si nāt	sa nāt	—	si nāt	sa nāt
52	hoe	kha bok*	khō bok	kri mō	khō bok	khō jok
53	forest	pli	pi dōk	pi rauk	di pri	brī
54	mountain	gòng	mō	mō	muit	mok
55	tree	kò	kao	kho	üm ke	tut sa ong
56	wind	phi	ka ò	kāl	ma	hün trei
57	water	ō̄m	aom	ra aum	ō̄m	ō̄m
58	earth	ka de	taik	te	ta	pa te
59	stone	ta mō	sa maok	sa mo	kha āng	klāng
60	fire	ngō	ngō	ngō	ngōl	pa lüa
61	path	kha	kai khra	kra	ka ting	—
62	sun	sa ngi	sa nge	sa ngi	a pri	mat pri
63	moon	khü	keik	khe	ke	mong
64	star	mun	sa böng	sa moin	kha muin	sil meng
65	rain	lä	raik	le	sa lä	kam ma
66	day	ngi	sa nge	sa ngi	kot	wan*
67	month	khü	keik	khe	ke	mong
68	year	num	nöm	neum	nüm	pi*
69	bird	sim	sain	saim	sīm	sīm
70	hen	yai	ā	ā kōn	ā	hi iar

71	dog	sò	sò	sò	sò	sò
72	pig	lük	lek	leik	lik	süang
73	rat	kāng	küang	kuang	ka ngā	ka nā
74	horse	mōng	brōng	brōng	bōng	brang
75	cow	muk	mök	mök kōn	bo	lam bo
76	buffalo	kāk	krāk	krāk	tāk	trāk
77	deer	jāk	jāk	jak	ka yak	ta yak
78	elephant	ka sāng	sāng	sāng	ka sāng	sa jāng
79	tiger	ka wai	a wia	ra wiajra	kha wai	ra wai
80	bear	kui	kre	kris	khri	hual
81	monkey	wa	fūa	fūa	wa	wa
82	mosquito	pung pang	yung*	yung*	pu sin	sang pok
83	bee	pī yai	hā	hā	pā	tra hai
84	landleech	prom	praom	—	prēm	prüam
85	earthworm	wēk	wak ngō	—	wak iar	wāk
86	fish	ka	ka	ka	ka	ka
87	crab	ka dam	tām	tām	ka tām	ka tām
88	mango	bū bī	pā	pā	la ngui	prā
89	banana	pu mōi	ā mōi	ra mōs	pōi tā	ta lōi
90	papaya	tam pò	kwei tēt	—	māk hung	ta lōi si but
91	to walk, go	hu	hēo	hēu	hōi	yò
92	to run	tün	tō	hēu	tang	tār
93	to go up	hòk	huak	—	hek	rō
94	to go down	lū	le	—	jū	jūi
95	to come	lòt	iang	ōin	tu	kai
96	to stand	ko	jong	chong	khi	tün

No.	English	Kha <sup>l</sup> ō ( Mae Rim Lawa )	Lawa (Bō Luang)	Lawa (Umphai)	Khamed	Khamu
97	to sit	ngòm	nguam	ngaum	ngöt	ten
98	to sleep	it	aik	ait	it	si
99	to wake up	kò	yong king	a pēu	ke	rö
100	to look	len	nian	yo	mōng	yäng
101	to hear	mōng	mōng	mōng	am	—
102	to speak	pong	krōng	krōng	kha lō	lōl
103	to laugh	nyai	nyüa	nyös	ka nya	kras
104	to cry	yām	yüam	nyüam	yām	yām
105	to fear	lāt	lāt	lat	lāt	ngò
106	to eat	sōm, pa	sōm	sōm	sōm	pö
107	to know	yong	yong	—	tōm	nōng
108	high	lóng	luang	laung	leng	jong
109	low	de	diam	thiam	tām	hön te
110	hot	kot pi	la ak	—	puk	wāl
111	cool	long	rong	—	tāp	ngal
112	cold	kuat pi	kuat	—	kat	kat
113	salty	ka	sang ki	ēum	jang	nyiap
114	big	tung	ra	ra	lä	nam
115	long	lāng	lüng	—	leng	wäng
116	near	dä	dai	sa di	da	le
117	far	sa ngai	sa ngia	sa ngai	sa ngai	ja
118	up	tòn le	ka luang	ka laung	dỏ leng	jong
119	down	si de	ka saik	ka se	dỏ tām	an te

120	broad	ngai	wūa	—	wó	wa
121	narrow	dī	khǎp*	—	ped	nā
122	sharp	lom	lom	—	lúp	o
123	small	păt	tǎo	tia	pet	nā
124	red	kak, krak	sa krak	sa khrāk	kāng	yim
125	black	lōng	lōng	lōng	lōng	hiang
126	white	phān	ping	pyain	pān	kruak
127	green, blue	ngā	sa ngā	sa ngā	sa ngāl	kio*
128	one	ti	te	thi	muei	muei
129	two	ā	la ā	la ā	la ā	pār
130	three	òi	la ui	la ua	la òi	pe
131	four	bon	pa ōng	paun	pon	si*
132	five	pün	phuan	phōn	phan	hā*
133	six	li	lä	läs	tól	hok*
134	seven	a li	a lä	a läs	pül	jet*
135	eight	dī	sa taik	sa te	tò	păt*
136	nine	dim	sa taing	sa taim	tīm	kao*
137	ten	kò	kua	kāu	kel	sip*
138	eleven	kò ti	kua la te	kāu ruh thi	kel muei	sip et*
139	twelve	kò ā	kua la ā	—	kel la ā	sip sōng*
140	twenty	ngai	ngā	ngā	la ā kel	sao*

Consonant and vowel equivalents :

p, t, k = ɸ, ʈ, ɳ ; ph, th, kh = ɸ, ʈ, ɳ ; j = ɟ ; ch ʃ ;

ng = ŋ ; ỏ = ɔ ; ă = ʌ ; ư = ɯ, ɯ̄ ; ơ = ɔ̄, ɔ̄̄ ; ơ = ɔ̄, ɔ̄̄

— indicates a long vowel; \* indicates a word which is identical or similar to the equivalent in Thai.

