

Supplementary Materials

Title: DNA of Music: Identifying relationships among different versions of the composition Sadhukarn from Thailand, Laos and Cambodia using multivariate statistics

Sumetus Eambangyung ^{1,*}, Gretel Schwörer-Kohl¹ and Witoon Purahong²

¹ Institut für Musik, Medien- und Sprechwissenschaften (IMMS) Abteilung Musikwissenschaft, Martin—Luther—Universität Halle—Wittenberg, 06099 Halle (Saale), Germany;
sumetus.eambangyung@student.uni-halle.de (S.E.); gretel.schwoerer@musikwiss.uni-halle.de (G.S.-K)

² Department of Soil Ecology, UFZ-Helmholtz Centre for Environmental Research, D-06120 Halle (Saale), Germany; witoon.purahong@ufz.de (W.P.)

* Correspondence: sumetus.eambangyung@student.uni-halle.de (S.E.)

Appendix I: Information of the 26 versions of the Sadhukarn main melody

Table S1 Information of the 26 versions of the Sadhukarn main melody (reproduced and modified from Eambangyung et.al., 2022, Data, <https://www.mdpi.com/2306-5729/7/11/150>)

No	Name of version	Location	Geographical Co-Ordinate	Sources	Published/ Collected Year
1	Thai Fine Arts Department [TF]	Bangkok, Thailand	13.759778, 100.491639	Book (Western notation)	1950
2	Luang Bamrung Chit Chareon [TB]	Bangkok, Thailand	13.759778, 100.491639	fieldwork	2015
3	Samran Kerdphol I [TS1]	Ayutthaya, Thailand	14.42825, 100.482139	fieldwork	2015
4	Pinij Chaisuwan I [TP1]	Ayutthaya, Thailand	14.579583, 100.511917	fieldwork	2015
5	Thai music ensemble of Bangkok [TK]	Bangkok, Thailand	13.773298, 100.559729	Book (Thai Notation)	1989
6	Chub Sowat [TC]	Ayutthaya, Thailand	14.464167, 100.605556	thesis (Western notation)	1990
7	Chue Dontrirod [TD]	Ayutthaya, Thailand	14.458333, 100.37	thesis (Western notation)	1990
8	Tuen Phatayakul [TP]	Petchaburi, Thailand	13.111944, 99.943889	thesis (Western notation)	1990
9	Thawin Attakisna [TT]	Ayutthaya, Thailand	14.4625, 100.544722	thesis (Western notation)	1990
10	Pinij Chaisuwan II [TP2]	Ayutthaya, Thailand	14.579583, 100.511917	thesis (Western notation)	1990
11	Rasi Phumthongsuk [TR]	Bangkok, Thailand	13.725306, 100.466167	thesis (Western notation)	1990
12	Siri Nakdontri [TN]	Samut Songkhram, Thailand	13.424722, 99.957222	thesis (Western notation)	1990
13	Sangobsuek Thamviharn [TW]	Bangkok, Thailand	13.738358, 100.532097	thesis (Western notation)	1990
14	Samran Kerdphol II [TS2]	Ayutthaya, Thailand	13.739917, 100.491722	thesis (Western notation)	1990
15	Subin Chankeaw [TJ]	Sing Buri, Thailand	14.892222, 100.317222	thesis (Western notation)	1990
16	Sadhukarn Chan Dio [TTP]	Ayutthaya, Thailand	13.739917, 100.491722	Book (Western notation)	2015

No	Name of version	Location	Geographical Co-Ordinate	Sources	Published/ Collected Year
17	Keo Sonankavai I [KS1]	Phnom Penh, Cambodia	11.564944, 104.928111	fieldwork	2014
18	Keo Sonankavai II [KS2]	Phnom Penh, Cambodia	11.564944, 104.928111	fieldwork	2014
19	Royal University of Fine Arts [KR]	Phnom Penh, Cambodia	11.564944, 104.928111	fieldwork	2016
20	Ban Pang Lang [IP]	Sa Kaeo, Thailand	14.008111, 102.792194	fieldwork	2016
21	Ban Nong Sai [IN]	Buriram, Thailand	14.523544, 102.771032	thesis (Thai Notation)	2015
22	Boonthiang Sisackda I [LB1]	Vientiane, LAO	17.948722, 102.642167	fieldwork	2014
23	Boonthiang Sisackda II [LB2]	Vientiane, LAO	17.948722, 102.642167	fieldwork	2014
24	Boonthiang Sisackda III [LB3]	Vientiane, LAO	17.948722, 102.642167	modified	2014
25	Boonyadech Meunsanit [LY]	Luang Prabang, LAO	20.21, 102.62	fieldwork	2014
26	Wat Reach Bo Pinpeat ensemble [KW]	Siem Reap, Cambodia	13.35747124, 103.8620557	media	2023.

Data on different parameters (rhyme structure, pillar tone, rhythmic and melodic patterns, intervals, pitches, and combinations) of 25 different versions of Sathukarn main melodies from Thailand, Laos, and Cambodia can be derived from Western notation, Thai notation, and rhyme structure which were published and are freely available at <https://www.mdpi.com/2306-5729/7/11/150> (accessed on 31 October 2022). Western notation, Thai notation, and rhyme structure of Wat Reach Bo Pinpeat ensemble [KW] are presented below.

Western notation

Sathukar (សាធុការ)

for large gongs circle

Wat Reach Bo Pinpeat ensemble

Introduction

A tempo

7

11

15

19

23

27

31

35

39

43



47



51



55



59



63



67



71



75



79



83



87



This image displays ten staves of musical notation, each beginning with a measure number. The notation is written on a single treble clef staff. The notes are primarily eighth and sixteenth notes, often beamed together in groups. Various notes are highlighted with colored dots: blue, pink, orange, red, purple, and cyan. The staves are numbered 43, 47, 51, 55, 59, 63, 67, 71, 75, 79, and 83. The notation continues for three measures after the last numbered staff (83).

87

91

95

99

103

107

111

115

119

123

127

131

The musical score consists of ten staves, each containing four measures of music. The notes are primarily eighth and sixteenth notes, often beamed together. The key signature is one flat (B-flat). The score includes various musical notations such as slurs, ties, and dynamic markings. The notes are color-coded: green, purple, orange, blue, light green, and red. The score ends with a double bar line and a repeat sign.

Thai notation

Sathukar

Wat Reach Bo Pinpeat ensemble

Intro	- រ	រុំ	ឆត រុំ តា ឆរ	រុំ	រុំ	- ឆ - ឆ	- - - រុំ	- រុំ - រុំ	តា ឆ ឆ - - - រ	0
	ឆ	ឆ		រុំ	រុំ	ឆ ឆ	រ	រ រ	រុំ ឆ ឆ ឆ	ឆ
1.1	- - - រ	- ឆ -	រ រ -	រ រ - រ	- ឆ - រ	- ឆ -	រ រ រ	រ រ រ	រ រ រ	1
	រ	រ	រ	រ	រ	ឆ ឆ	ឆ ឆ	រ	រ	រ
	រ រ	រ រ	- - - រ	- ឆ - រ	- ឆ - រ	រ រ	រ រ	- ឆ - ឆ		2
	រ	រ	រ រ	ឆ ឆ	ឆ ឆ	រ រ	រ រ	រ រ	រ រ	រ
	- រ - រ	- រ -	រ រ រ	ឆ ឆ ឆ	- រ - ឆ	- ឆ - រ	- ឆ -	រ រ - ឆ		3
	រ រ	រ រ	ឆ ឆ	ឆ ឆ	ឆ ឆ	រ រ	រ រ	រ រ	ឆ ឆ	ឆ
	- - រ	- រ - រ	- រ រ	- ឆ - ឆ	- រ - រ	- រ -	រ រ រ	ឆ ឆ - រ		4
	រ	រ	រ រ	ឆ ឆ	រ រ	រ រ	រ រ	ឆ ឆ	រ រ	រ
2.1	- រ - ឆ	- - រ	- ឆ -	រ រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	5
	រ ឆ	រ	ឆ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ
	- រ - រ	- រ -	រ រ រ	ឆ ឆ ឆ	- រ រ	- រ រ	- រ រ	រ រ -	ឆ ឆ -	6
	រ រ	រ រ	ឆ ឆ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ
	- ឆ - រ	- រ -	រ រ រ	ឆ ឆ ឆ	រ រ រ	- រ - រ	- រ -	រ រ រ	ឆ ឆ ឆ	7
	រ	ឆ ឆ	ឆ ឆ	រ រ	រ រ	រ រ	រ រ	រ រ	ឆ ឆ	រ
	- - - រ	- រ - រ	- - រ	- រ - ឆ	- រ - រ	- រ -	រ រ រ	ឆ ឆ - រ		8
	ឆ ឆ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ
3.1	- រ -	ឆ ឆ - រ	- -	- រ - រ	- រ រ	- រ រ	- រ រ	- រ រ	- រ -	9
	រ ឆ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ រ	រ
	- រ - រ	- រ -	រ រ រ	ឆ ឆ ឆ	- រ - ឆ	- ឆ - រ	- ឆ -	រ រ - ឆ		10
	រ	រ រ	រ រ	ឆ ឆ	ឆ ឆ	រ រ	រ រ	រ រ	រ រ	រ
	- - រ	- រ - រ	- រ រ	- ឆ - ឆ	- រ - រ	- រ -	រ រ រ	ឆ ឆ - រ		11
	រ	រ	រ រ	ឆ ឆ	រ រ	រ រ	រ រ	ឆ ឆ	រ រ	រ

4.1	- ဖ ဖ	ဖ မ	- -	- ဝ - မ	- ဟ - ဝ	- ဇ - မ	မဝ	ဝမ	- ဇ - ဝ	12
	ဝ	ဝ ဟ	ဝ ဟ	ဝ ဟ	ဟ ဝ	ဇ ဟ	ဟ ဟ	ဟ ဟ	ဇ ဝ	
4.2	- ဟ - မ	- ဝ -	*ဟ ဟ ဟ	ဝ ဝ ဇ	- ဝ - ဇ	- ဝ - ဟ	- ဝ -	ဟ ဟ - ဝ	13	
	ဟ မ	ဝ ဟ	ဝ	ဇ	ဝ ဇ	ဝ ဟ	ဝ ဟ	ဝ		
4.3	- - မဝ	- မ - မ	- မဝ	- ဇ - ဝ	- ဟ - ဝ	- ဟ -	*ဝ ဝ ဝ	ဇ ဇ - မ	14	
	ဟ	ဟ	ဟ ဟ	ဇ ဝ	ဟ ဝ	ဟ ဝ	ဇ	ဟ		
4.4	- ဇ - မ	- - ဇ	- ဇ - ဝ	- ဇ ဇ	- မဝ	- ဇ - ဝ	- ဇ - ဖ	- မ - ဝ	15	
	ဇ ဟ	ဇ	ဇ ဝ	ဇ	ဟ ဟ	ဇ ဝ	ဇ ဝ	ဟ ဝ		
4.5	- ဝ ဝ	- ဟ - ဇ	- ဝ - ဟ	- ဝ - ဝ	- ဝ - မ	- ဝ -	*ဟ ဟ ဟ	ဝ ဝ -	16	
	ဝ	ဟ ဇ	ဝ ဟ	ဝ ဝ	ဝ မ	ဝ ဟ	ဝ	ဇ		
4.6	- ဇ - မ	- ဝ -	*ဇ ဇ ဇ	ဝ ဝ ဟ	- ဝ - မ	- ဝ -	*ဟ ဟ ဟ	ဝ ဝ ဇ	17	
	ဟ	ဝ ဇ	ဝ	ဟ	ဝ မ	ဝ ဟ	ဝ	ဇ		
4.7	- မဝ	ဝ ဟ ဝ	မဝ	ဖ မ	မဝ	ဖ မ		- ဝ - မ	18	
	ဝ ဝ	မ ဝ	ဝ ဝ	ဝ ဟ	ဝ မ	ဝ ဟ	- ဝ - ဟ	ဝ ဟ		
4.8	- - ဖမ	- မ -	- ဝ - ဝ	- - ဇ	- ဝ - ဟ	- ဝ -	*ဇ ဇ ဇ	ဝ ဝ ဟ	19	
	ဝ	ဝ	ဝ	ဇ	ဝ ဟ	ဝ ဇ	ဝ	ဟ		
4.9	ဟ ဝ	မဝ	- ဝ - မ	- မ - မ	- ဝ - ဟ	- ဟ - မ	- ဝ -	*ဟ ဟ ဟ	ဝ ဝ -	20
	ဇ ဇ	ဝ မ	ဇ မ	ဝ ဟ	ဟ မ	ဝ ဟ	ဝ	ဇ	ဇ	
4.10	- ဇ - ဇ	- ဇ ဇ	- ဝ - ဇ	- ဝ ဝ	- ဇ - ဝ	- ဟ - ဝ	- ဝ - ဝ	- ဟ - ဝ	21	
	ဝ	ဇ	ဝ ဇ	ဝ	ဇ ဝ	ဟ ဝ	ဝ ဝ	ဟ ဝ		
4.11	- - ဝ	- မ ဖ	ဝ ဟ ဝ	ဝ ဝ ဝ	- - ဖ မ	ဝ မ ဝ	- ဝ - မ	မဝ -	22	
	ဝ	ဝ	ဟ	မ ဝ		ဟ ဝ	ဝ ဟ	ဝ	ဇ	
4.12	- ဇ -	*ဝ ဝ ဝ	- ဟ - ဝ	- ဇ - မ	- မ ဝ	- မဝ	- ဝ -	- ဇ -	23	
	ဝ	ဝ	ဟ ဝ	ဇ ဝ	ဇ ဟ	ဟ ဟ	ဝ ဇ	ဇ	ဝ	

- ឆ -	៦ ក ក ក	- ក ក ក	- ឆ -	- ឡ - ឆ	- រ -	- ឡ -	ឆ ឆ - ក
ក	ក	ឆ រ ក	ឆ ឡ	ឡ ក	ឆ ឡ	ឡ ឆ	ឆ ក

24

3.2

-	n	-	a	a	-	n	-	a	-	n	-	r	-	m	-	(mn)	-	a	-	-	n	-	m	-	r	-
n	a		a		n		a		n		a		n		r	r		m								n

25

-	n	nā	a	a	-	-	r	-	m	a	-	n	-	a	-	m	m	r	26
		ṇ		m		r	ṛ		r		ṛ	ṇ		ṛ	ṇ		ṇ		

-	-	ด	-	ท	-	ช	-	ด	-	ท	-	ค	-	ว	-	ด	-	ท	-	ค	-	ว	-	ค	-	ท	-	ด	-	ท
ด	ด		ท	ช	ด	ท		ค	ว	ด	ท		ค	ว		ค	ท		ค	ท		ด	ค							

27

-	မလှ	- ခ - က	- ခံ - က	- ခ - လ	- ခ - က	- ခ -	*လှ လှ လှ	*မ မ	ရ
ရ ရ	ခု ဟု	ရ ဟု	ခု ဟု	ခု ဟု	ခု ဟု	ခု င	ဟု	ခု	

28

4.2

-	nl	a	nl	m	-	-	-	r	-	m	-	nn	-	a	-	-	nl	-	m	-	r	-
		m				r	nl		a		nl		a		nl		r					nl

 29

၁	၂	၃	၄	၅	၆	၇	၈	၉	၁၀	၁၁	၁၂	၁၃	၁၄	၁၅	၁၆	၁၇	၁၈	၁၉	၂၀	၂၁	၂၂	၂၃	၂၄	၂၅	၂၆	၂၇	၂၈	၂၉	၃၀
၁	၂	၃	၄	၅	၆	၇	၈	၉	၁၀	၁၁	၁၂	၁၃	၁၄	၁၅	၁၆	၁၇	၁၈	၁၉	၂၀	၂၁	၂၂	၂၃	၂၄	၂၅	၂၆	၂၇	၂၈	၂၉	၃၀

-	-	မိ	-	ဘီ	-	*က	က	က	-	ဇ	ဇ	ဗ	-	တံ	တံ	-	ဘီ	-	မိ	-	ဘီ	-	တံ	-	က	-	ဇ
	မ	မ		ဘီ	ဟု					ဇ		ဗ		တ			ဘီ	မ		ဘီ	တ		ဟု		ဇ		

31

-	-	-	၇	-	-	-	မ	-	-	-	-	စ	-	ဇ	-	မိ	၇	က	-	ဇ	-	ဖ	-	-	-	မ	မ	၇	-	၇	// 32
			ဇ				က				စ			မ	၇	က	၇				ဇ				က			မ	၇		

Rhyme structure

Wat Reach Bo Pinpeat ensemble (KW) : Rhyming Structure: Section A [Phrase (P) 0-16]

A - 0: Introduction (P0)

d⁴ e d e d e g⁸ a⁸ d⁸ e⁸ d⁸ b⁸ a⁸ g⁸ - d⁴

A - 1: Opening Phrase (P1) + Theme I (P2 - 4)

- b⁸ a⁸ d⁴ d e e f⁴ a⁸ b⁸ a⁸ f f e e d⁴ f e d b a b d⁴ e⁴ b⁸ a⁸ g⁸ e⁴ d e g⁸ A⁸
 b⁸ e⁸ d⁸ b b a a g d⁴ g⁸ a⁸ b⁸ a⁸ b b A⁸ - b e e d e g⁸ a⁸ b⁸ d⁸ b⁸ a a g g E⁴

A - 2: Theme II (P5 - 7)

b⁸ a⁸ b b a⁸ b b b a b d⁸ e⁸ d⁸ c⁸ b⁸ A⁸ b⁸ d⁸ b⁸ a a g g e⁴ d b d e a⁸ g g A⁸
 a e⁴ d⁴ g g a a b d⁸ e⁸ d⁸ b b a a G

A - 3: Theme III (P8 - 11)

c f⁴ e⁴ d⁴ b d⁴ e⁴ g⁸ d⁸ b⁸ a⁸ g g a a B⁸ b⁸ a a b⁸ a b d⁴ e⁴ e f a e f e d b
 b⁸ e⁸ d⁸ b b a a g d⁴ g⁸ a⁸ b⁸ a⁸ b b A⁸ - b e e d e g⁸ a⁸ b⁸ d⁸ b⁸ a a g g E⁴

A - 4: Theme I [Repetition] (P12 - 14)

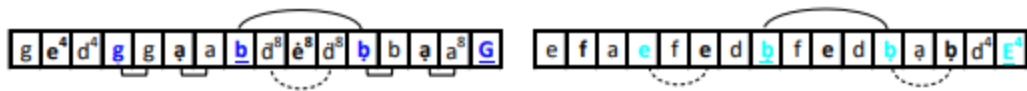
f e d b a b d⁴ e⁴ b⁸ a⁸ g⁸ e⁴ d e g⁸ A⁸ b⁸ e⁸ d⁸ b b a a g d⁴ g⁸ a⁸ b⁸ a⁸ b b A⁸
 - b e e d e g⁸ a⁸ b⁸ d⁸ b⁸ a a g g E⁴

A - 5: Ending of section A or Introduction of section B (P15 - 16)

g⁸ e⁴ g g g⁸ a⁸ g g d e g⁸ a⁸ g⁸ f⁴ e⁴ d⁴ a a b⁸ g⁸ a⁸ b⁸ c⁸ d⁸ e⁸ d⁸ b b a a G

Wat Reach Bo Pinpeat ensemble (KW) : Rhyming Structure: Section B [Phrase 17-32]

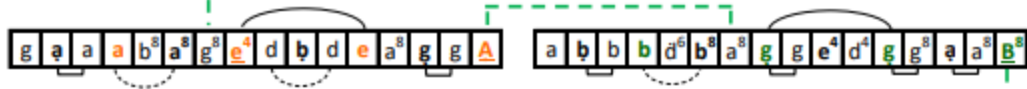
B - 1: Transition I (P17 - 18)



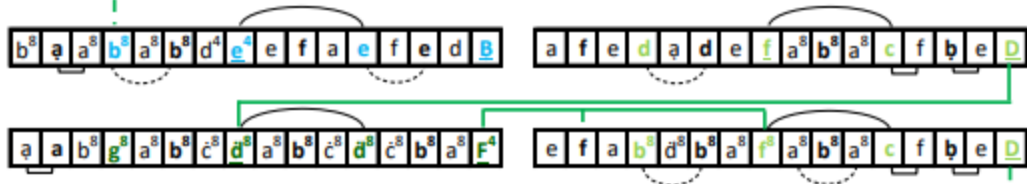
B - 2: Theme VI (P19 - 22)



B - 3: Transition II (P23 - 24)



B - 4: Theme V (P25 - 28)



B - 5: Ending of section B [Final Phrase] (P29 - 32)

