



The New Maluku Horizontal Bamboo Flute: 9 Finger Holes

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Abstract

The horizontal bamboo flute which consists of 1 blowing hole and 6 finger holes is one of the traditional musical instruments in Maluku. This flute is usually produced clear pitch in one key, for instance F (F scale). However, when it is used to play other keys, like G, B, and C the produced pitch become unclear. This research applies action research method. It shows that new Maluku horizontal bamboo flute with 9 finger holes not only produce clear tones in F key but also in the key of G, B flat, and C. This flute is one of the distinctiveness of the Maluku culture in the art of music.

Keywords: *Horizontal bamboo flute 6 finger holes, tone F sharp – B – E flat, horizontal bamboo flute 9 finger holes, 4 keys.*

Introduction

The horizontal bamboo flute is one of Maluku traditional musical instruments. Usually, the construction consists of 1 blowing hole and 6 finger holes, 1 original hole of bamboo, and 1 hole that has been plugged with *gaba-gaba* (dried sago palm) (cf. Mokolensang, 1994; Picanussa, 2020)

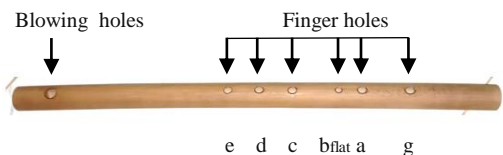


Fig. 1. Maluku horizontal bamboo flute 6 finger holes in F's key

The construction of this flute is it usually used to play clear in one scale, for instnce in the key of F. Furthermore, when we play other keys with this bamboo flute as G, B flat, or C we have to close or open about half on the special hole(s).



Fig. 2. Maluku horizontal bamboo flute 6 finger holes in F, and it is used to play G

When this flute is used to play B flat scale, we have to close or open about half on E hole.



Fig. 3. Maluku horizontal bamboo flute 6 finger holes in F's key (F scale) used to play B flat scale

Meanwhile, when we play C on flute in F we have to close or open about half on C hole.

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Fig. 4. Maluku horizontal bamboo flute 6 finger holes in F's key (F scale) used to play C scale

As the result, when this flute is used to play other keys such as G, B flat, C in F key flute the produced pitches are unclear. Therefore, this research wants to produce the new Maluku horizontal bamboo flute in the ke of F (F scale) which is used to play not only F scale, but also G, B flat, and C scales.

Methodology

This research applied the action research method. According to Alicia de Banffy-Hall (2020), action research is a method that needs to develop in musical research. The model used is Stringer Model. This model has three basic frameworks: looking, thinking, and acting in cycles to get the expected data (Yaumi & Damopolii, 2014; cf. Tampubolon, 2014, Sukardi, 2013; Picanussa, 2020).

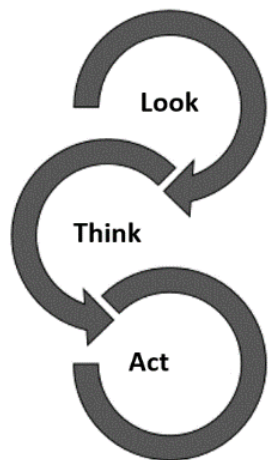


Fig. 5. Primary Framework of Action Research of Stringer's Model

The first step is *looking*. Looking is a step when the data is taken from observing and obtaining various information from various sources. This step also includes describing whether the research is obtained from looking

activities. *Thinking* is the second step. This activity includes the activity of explorations, and interpretation of the theories. Meanwhile, *acting* is an activity of the research planning, implementing, and evaluating (Yaumi & Damopolii, 2014; cf. Tampubolon, 2014, Sukardi, 2013; Picanussa, 2020).

Implementation of the model in this research are described as follows:

1. Cycle 1: Data and information related to Maluku horizontal bamboo flute is collected. The data also covers some essential information such as 6 finger holes construction of the flute in the key of F, the distance of holes, and fingering technique to produce chromatic tones, and how to play the flute in other keys like G, B flat, and C.

Cycle 2: After getting many information related to the flute, the researcher designs the flute especially the hole distance for the construction of a horizontal bamboo flute 9 finger holes. The researcher also produces horizontal bamboo flute 9 fingers by measuring the frequency of the notes produced from the construction of a horizontal bamboo flute 9 finger holes. Furthermore, this step will be continued until the expected result is achieved.

2. Thinking: Cycle 1: In this cycle, the researcher explores the horizontal bamboo flute 6 finger holes especially the construction of flute in the key of F (F scale). It is important to find the distance of holes to produce F sharp, B, and E flat.

Cycle 2: The researcher then explores and interprets the related data to calculate the distance of holes of horizontal bamboo flute 9 finger holes in the key of F to produce tones F sharp, B, and E flat.

3. Acting. Cycle 1: The researcher makes a horizontal bamboo flute with 6 finger holes in the key of F (F scale) based on Mark Shepard's formula and measuring the tones' frequency of the flute.

Cycle 2: The researcher makes horizontal bamboo flute 9 finger holes in the key of F (F scale), measuring the frequency of the

resulting notes using a digital tuner with a probability of -10 to +10 of the tone frequency for an equal tempered scale, A4 = 440 Hz (Mottola, 2020).

The Horizontal bamboo flute: 6 finger holes

One formula used as a guide for spacing holes on a horizontal bamboo flute had proposed by Mark Shepard (2002). Shepard provided a percentage formula for spacing of the blowing hole to the finger holes and the original hole.



Fig. 6. Shepard's percentage formula of holes distance

Regarding the space between the holes, Shepard examines that the distance between holes is measured from the center of the hole, not at the edge, and the tones of a flute are determined by the size and placement of the finger holes. Shepard also raises two very important rules for tuning. *First*, a hole will produce a very high note if placed very close to the blowing hole. On the other hand, a hole will produce a very low note if it is placed far from the blowing hole. *Second*, a hole will produce a high note if it is large. On the other hand, a hole will produce a low note if it is made very small (Shepard, 2002).

Based on the formula for spacing holes proposed by Shepard, the researcher made a horizontal bamboo flute in the key of F (F scale). The length of the horizontal bamboo flute is 49,7 cm; the diameter is 1,8 cm; the Outside diameter is 2,2 cm; the blowing hole is 9 mm; the Fingering hole is 8 mm; the distance from the blowing hole to the original hole (base hole) is 44.1 cm.

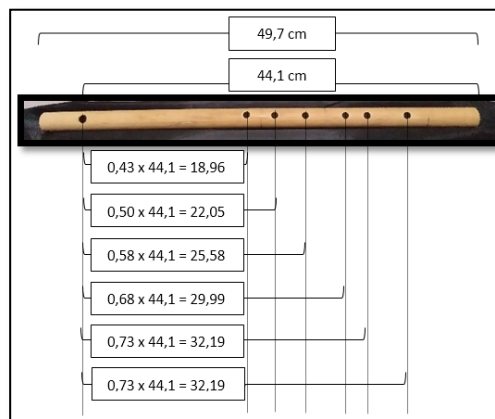


Fig.7. Horizontal bamboo flute 6 finger hole in the key of F (F scale) based on Shepard's Percentage formula

The frequency of the tones of horizontal bamboo flute 6 finger holes using a digital tuner as the following table.

F scale	Tones in movable do system	Frequency (Hz)	Equal Temprament
F4	1	349	-10 s.d. +10
G4	2	392	-10 s.d. +10
A4	3	440	-10 s.d. +10
Bb4	4	466	-10 s.d. +10
C5	5	523	-10 s.d. +10
D5	6	587	-10 s.d. +10
E5	7	659	-10 s.d. +10
F5	1'	698	-10 s.d. +10
G5	2'	783	-10 s.d. +10
A5	3'	880	-10 s.d. +10
Bb5	4'	932	-10 s.d. +10
C6	5'	1046	-10 s.d. +10
D6	6'	1174	-10 s.d. +10
E6	7'	1318	-10 s.d. +10
F6	1''	1396	-10 s.d. +10

Table 1. Measurement of the frequency of horizontal bambbo flute 6 finger hole in the key of F (F scale)

The fingering chart for this horizontal bamboo flute is as the following figure.

Tones in Movable do System	Fingering Chart
1	
2	
3	
4	
5	
6	
7	
1'	
2'	
3'	
4'	
5'	
6'	
7'	
1''	

Fig.8. Fingering chart of horizontal bamboo flute 6 finger hole in the key of F (F scale).

The New Maluku Horizontal Bamboo Flute: 9 finger holes

Horizontal bamboo flute 9 finger holes in the key of F (F scale) is made in two steps. *First*, making horizontal bamboo flute 6-finger holes according to Mark Shepard's spacing formula for six finger holes (43 %, 50 %, 58 %, 68 %, 73 %, 83 % from the center of the blowing hole). *Second*, adding three holes at a special place according to the percentage of the researcher is used to produce tones of F sharp, B, and E flat. The space percentage from the center of the blowing hole is 88% for F sharp, 63% for B, and 48% for E flat. The diameter of these holes is 6 mm.

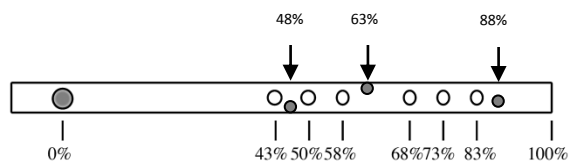


Fig.9. Plan of horizontal bamboo flute 9 finger holes

After making 6-finger holes of horizontal bamboo flute, the researcher makes sign to add three holes on the flute.



Fig. 10. Horizontal bamboo flute 6 finger holes that will add 3 holes to produce tones F sharp, B, and E flat

Making a sign to add 3 holes at horizontal bamboo flute 6-finger holes to produce tones of F sharp, B, and E flat.

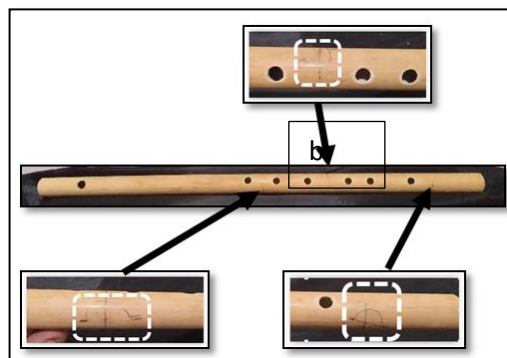


Fig. 9. Marking three holes to produce tones F sharp, B, and E flat.

The result is horizontal bamboo flute 9 finger holes as follows.



Fig. 10. Horizontal bambu flute 9 finger holes in the key of F (F scale)

Frequency of tones of horizontal bamboo flute 9 fingering holes in the key of F (F scale) is as follow.

F Scale	Tones in movable do system	Frequency (Hz)	Equal Temprament
F4	1	349	-10 s.d. +10
F4 [#]	1 [#]	369	-10 s.d. +10
G4	2	392	-10 s.d. +10
A4	3	440	-10 s.d. +10
B ^b 4	4	466	-10 s.d. +10
B4	4 [#]	493	-10 s.d. +10
C5	5	523	-10 s.d. +10

D5	6	587	-10 s.d. +10
E ^b 5	7 ^b	622	-10 s.d. +10
E5	7	659	-10 s.d. +10
F5	1 [˘]	698	-10 s.d. +10
F5 [#]	1 ^{#˘}	739	-10 s.d. +10
G5	2 [˘]	783	-10 s.d. +10
A5	3 [˘]	880	-10 s.d. +10
Bb5	4 [˘]	932	-10 s.d. +10
B5 [#]	4 ^{#˘}	987	-10 s.d. +10
C6	5 [˘]	1046	-10 s.d. +10
D6	6 [˘]	1174	-10 s.d. +10
E ^b 6	7 ^{b˘}	1244	-10 s.d. +10
E6	7 [˘]	1318	-10 s.d. +10
F6	1 ^{˘˘}	1396	-10 s.d. +10

Table 3. The frequency of the horizontal bamboo flute for 9 holes in the key of F (F scale)

The fingering chart for this horizontal bamboo flute when it's played in the key of F (F scale) is as follows.

Tone in movable do system	Fingering chart
1	
1 [#]	
2	
3	
4	
4 [#]	
5	
6	
7 ^b	
7	
1 [˘]	
1 ^{#˘}	
2 [˘]	
3 [˘]	
4 [˘]	
4 ^{#˘}	
5 [˘]	
6 [˘]	
7 ^{b˘}	
7 [˘]	
1 ^{˘˘}	
1 ^{˘˘˘}	

Table 4. Fingering chart for F scale.

The fingering chart for the horizontal bamboo flute in the key of F (F scale) when it's played in the key of G (G scale) is as follow.

The fingering chart for horizontal bamboo flute in the key of F (F scale) when it's played in the key of B flat (B flat scale) is as follow.

Tones in movable do system	Fingering chart
7 ^b	
7	
1	
2	
2 [#]	
3	
4	
4 [#]	
5	
5 [#]	
6	
7 ^b	
7	
1	
2	
2 [#]	
3	
4	
4 [#]	
5	
5 [#]	
6	
7 ^b	
7	
1	

Table 5. Fingering chart for G scale.

Tones in movable do system	Fingering chart
5	
5 [#]	
6	
7	
1	
1 [#]	
2	
3	
4	
4 [#]	
5	
5 [#]	
6	
7	
1	
1 [#]	
2	
3	
4	
4 [#]	
5	

Table 6. Fingering chart for B flat (B flat scale)

The fingering chart for horizontal bamboo flute in the key of F (F scale) when it's played in the key of C (C scale) is as follow.

Tones in movable do system	Fingering chart
4	
4#	
5	
6	
7b	
7	
1	
2	
2#	
3	
4	
4#	
5	
6	
7b	
7	
1	
2	
2#	
3	
4	

Table 7. Fingering chart for C scale.

The horizontal bamboo flute with 9 finger holes in the key of F (F scale) is not only used to play F scale, but also G, B flat, and C scales.

Conclusion

A horizontal bamboo flute with 6 finger holes is one of Maluku's traditional musical instruments. This flute can only plays one clear pitch key. When playing for other keys, like G, B flat, or C scales, the player has close or open half on the special hole(s).

This research found that the new Maluku horizontal bamboo flute with 9 finger holes could be used to play four keys. This flute in the key of F (F scale) is not only used to play F

scale, but also G, B flat, and C scales. This flute distinguishes the Maluku horizontal bamboo flute from the bamboo flute in Indonesia, and even the world.

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