Supplementary Information

Table of content:

Supplementary Note 1: Natural observations of the production of the "*alarm-huu+waa-bark*" combination

23.07.18

Caller: Heri (subadult female).

Party composition: Anna, Cyndi, Hadue, Harmoni, Harriet, Heri, Irene, Ishe, Kalema, Kaija, Kathy, Kefa, Kirabo, Klauce, Kwera, Kutu, Mbotella, Melissa, Muhumuza, Oakland, Ozzy, Sharlot, Upesi.

Event: On the 23rd of July 2018, M.L. and B.C. followed a party of 23 individuals feeding on a large Ficus tree (*Ficus mucoso*). At 11:56, Heri, resting in another tree approximately 50 meters away from the Ficus tree, started producing "*alarm-huu+waa-bark*" combinations while looking down towards the ground. At this moment, all 22 individuals remaining on the Ficus tree stopped feeding and started climbing down. All individuals joined Heri on the tree she was in or on nearby smaller trees. None of the individuals remained on the ground. The party left the location at 1240 hours. The snake was not directly observed by humans.

11.06.19

Caller: Pascal (adult male).

Party composition: Cyndi, Deli, Eve, Hawa, Irene, Ishe, Janie, Kato, Mbotella, Musa, Nambi, Pascal, Zed.

Event: On the 11th of June 2019, M.L. and B.C. followed a party of 13 individuals. At approximately 1400 hours, while individuals were resting over a dispersed area, M.L. and B.C. heard "*alarm-huu+waa-bark*" combinations produced by Pascal approximately 30 meters away. After the production of these call combinations, all individuals interrupted resting, stood up and joined Pascal. A pale green snake was seen moving away, suspected to be a Jameson mamba (*Dendroaspis jamesoni*). Subjects resumed resting after approximately 30 minutes.

Supplementary Figures and Tables

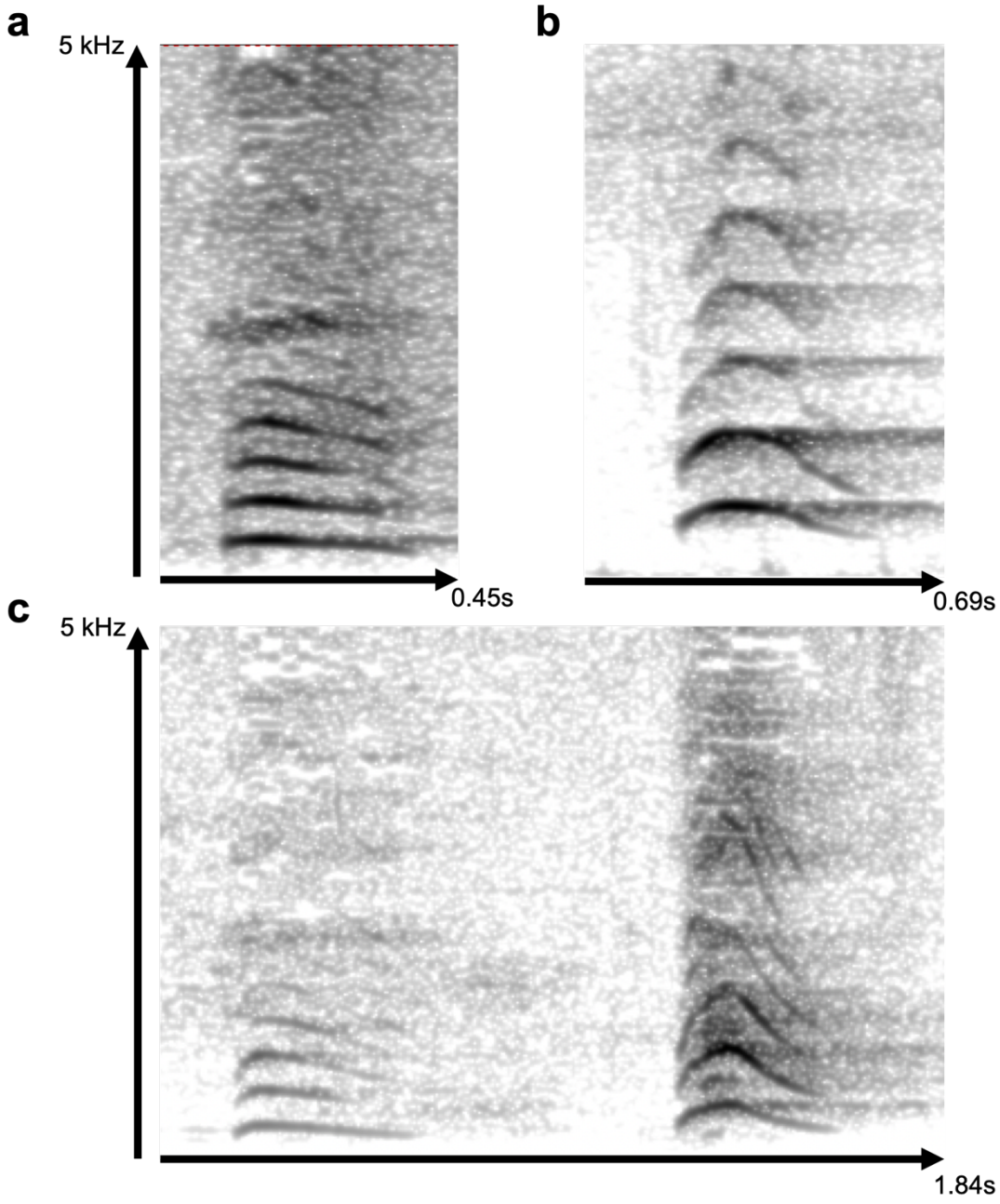

Fig. S1. Spectrograms of (a) an "*alarm-huu*", (b) a "*waa-bark*" and (c) an "*alarm-hoo+waa-bark*" combination, produced by an adult male.

Table S1. Bayesian analyses of looking duration. Bayesian analyses based on multiple imputation indicating the influence of playback condition on the looking duration towards the loudspeaker. AH: singly-occurring "alarm-huu"; WB: singly-occurring "waa-bark"; AH-WB: "alarm-huu+waa-bark" combination. Estimate: mean of the posterior distribution; Est.Error: standard deviation of the posterior distribution; l-95% CI: 95% credible interval, lower limit; u-95% CI: 95% credible interval, upper limit; Rhat: potential scale reduction statistic; Bulk_ESS: bulk effective sample size; Tail_ESS: tail effective sample size. Biological significance was attributed when credibility intervals did not include zero (bold).

	Estimate	Est.Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
AH / WB	-0.58	0.56	-1.68	0.54	1.17	764	1569
AH / AH-WB	-1.7	0.5	**-2.66**	**-0.69**	1.03	3911	9246
WB / AH-WB	-1.12	0.55	**-2.22**	**-0.04**	1.18	718	2007

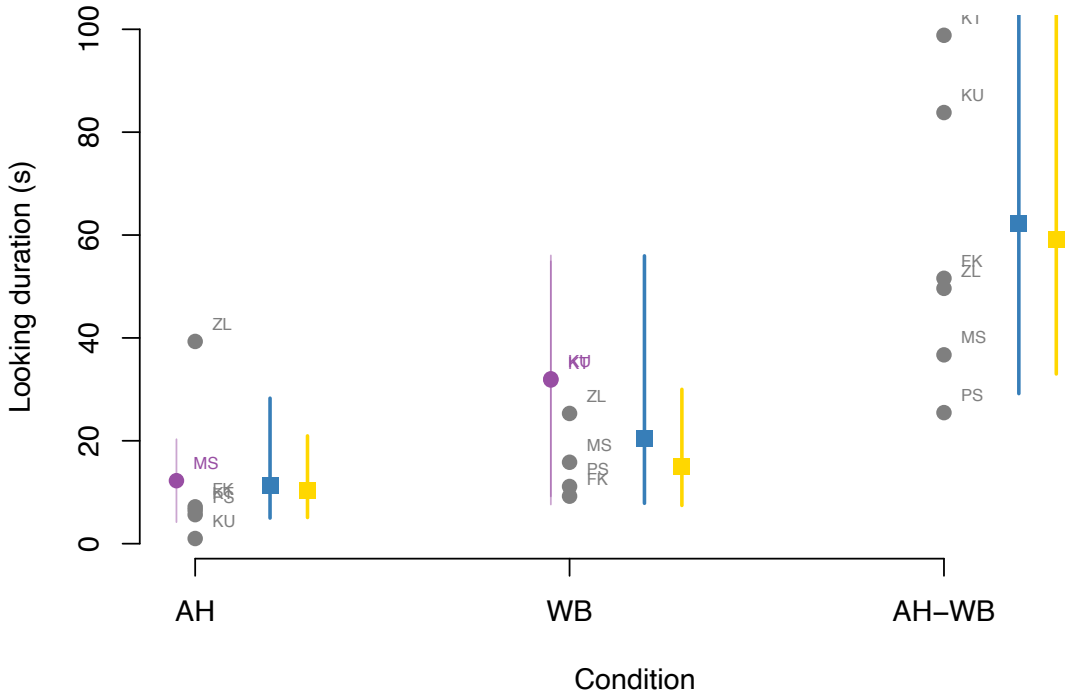

Fig. S2. Comparison between GLMM implemented under a Bayesian (blue) vs. frequentist (yellow) framework on the influence of playback condition on the overall looking duration towards the speaker. AH: singly-occurring "alarm-huu" (n=5); WB: singly-occurring "waa-bark" (n=4); AH-WB: "alarm-huu+waa-bark" combination (n=6). Grey dots indicate the raw data, purple dots and error bars indicate the multiple imputations for the three missing data points (mean ± standard deviation), blue squares and error bars indicate model estimates using a Bayesian approach (mean ± standard deviation), yellow squares and error bars represent model estimates presented in the main text (mean ± standard deviation) (frequentist approach).

Table S2. Bayesian analyses of latency to look. Bayesian analyses based on multiple imputation indicating the influence of playback condition on the latency to look towards the loudspeaker. AH: singly-occurring "alarm-huu"; WB: singly-occurring "waa-bark"; AH-WB: "alarm-huu+waa-bark" combination. Estimate: mean of the posterior distribution; Est.Error: standard deviation of the posterior distribution; l-95% CI: 95% credible interval, lower limit; u-95% CI: 95% credible interval, upper limit; Rhat: potential scale reduction statistic; Bulk_ESS: bulk effective sample size; Tail_ESS: tail effective sample size. Biological significance was attributed when credibility intervals did not include zero (bold).

	Estimate	Est.Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
AH / WB	2.37	1.03	**0.08**	**4.15**	1.27	536	1077
AH / AH-WB	2.95	0.85	**1.17**	**4.56**	1.07	1737	2994
WB / AH-WB	0.58	0.89	-1.01	2.56	1.15	823	1305

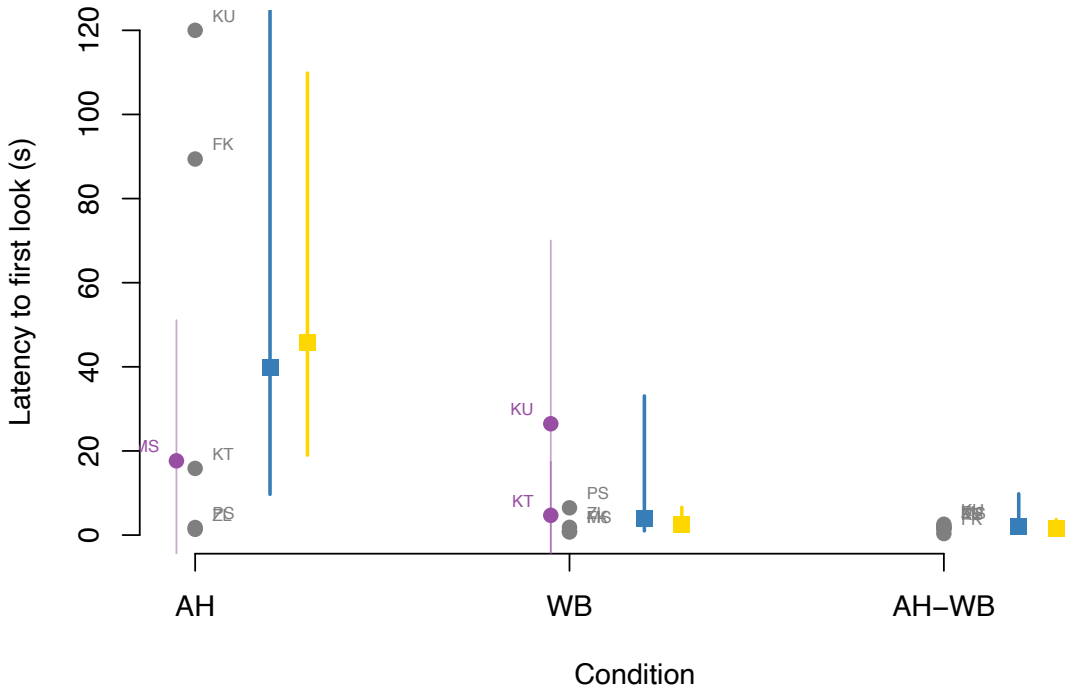

Fig. S3. Comparison between GLMM implemented under a Bayesian (blue) vs. frequentist (yellow) framework on the influence of playback condition on the latency to look at the speaker. AH: singly-occurring "alarm-huu" (n=5); WB: singly-occurring "waa-bark" (n=4); AH-WB: "alarm-huu+waa-bark" combination (n=6). Grey dots indicate the raw data, purple dots and error bars indicate the multiple imputations for the three missing data points (mean ± standard deviation), blue squares and error bars indicate model estimates using a Bayesian approach (mean ± standard deviation), yellow squares and error bars represent model estimates presented in the main text (mean ± standard deviation) (frequentist approach).

Table S3. Bayesian analyses of number of looks. Bayesian analyses based on multiple imputation indicating the influence of playback condition on the number of looks towards the loudspeaker. AH: singly-occurring "alarm-huu"; WB: singly-occurring "waa-bark"; AH-WB: "alarm-huu+waa-bark" combination. Estimate: mean of the posterior distribution; Est.Error: standard deviation of the posterior distribution; l-95% CI: 95% credible interval, lower limit; u-95% CI: 95% credible interval, upper limit; Rhat: potential scale reduction statistic; Bulk_ESS: bulk effective sample size; Tail_ESS: tail effective sample size.

	Estimate	Est.Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
AH / WB	-0.31	0.45	-1.21	0.57	1.14	893	4051
AH / AH-WB	-0.61	0.41	-1.42	0.18	1.06	1888	10017
WB / AH-WB	-0.29	0.39	-1.07	0.47	1.08	1501	5991

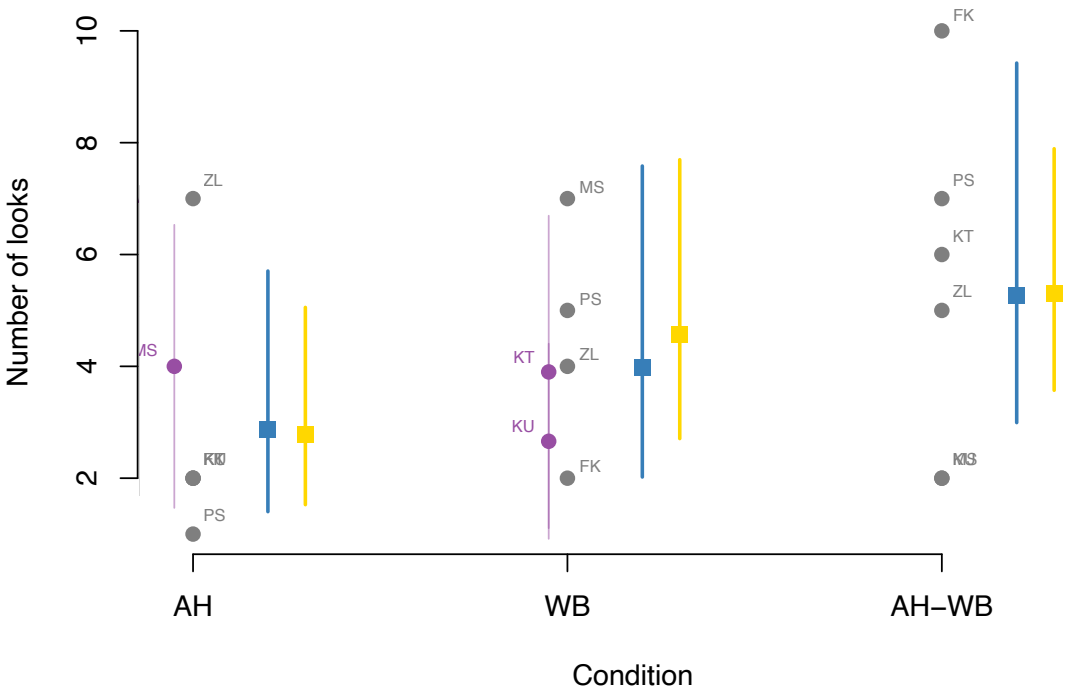

Fig. S4. Comparison between GLMM implemented under a Bayesian (blue) vs. frequentist (yellow) framework on the influence of playback condition on number of looks towards the speaker. AH: singly-occurring "alarm-huu" (n=5); WB: singly-occurring "waa-bark" (n=4); AH-WB: "alarm-huu+waa-bark" combination (n=6). Grey dots indicate the raw data, purple dots and bars indicate the multiple imputations for the three missing data points (mean ± standard deviation), blue squares and bars indicate model estimates using a Bayesian approach (mean ± standard deviation), yellow squares and bars represent model estimates presented in the main text (mean ± standard deviation) (frequentist approach).

Table S4. List of chimpanzees from the Sonso community.

Name ID	Sex	Age
Alice	Female	Infant
Anna	Female	Adult
Cyndi	Female	Adult
Deli	Female	Adult
Dembe	Female	Infant
Dora	Female	Adult
Eve	Female	Adult
Faida	Female	Subadult
Faith	Female	Juvenile
Flora	Female	Adult
Frank	Male	Adult
Geoffrey	Male	Juvenile
Gladys	Female	Adult
Goria	Female	Subadult
Hadue	Male	Infant
Harmoni	Female	Juvenile
Harriet	Female	Adult
Hawa	Male	Adult
Heri	Female	Subadult
Irene	Female	Adult
Ishe	Female	Infant
Jacintha	Female	Infant
Jacob	Male	Juvenile
James	Male	Subadult
Janie	Female	Adult
Juliet	Female	Adult
Kaija	Male	Juvenile
Kalema	Female	Adult
Kaqwa	Male	Infant
Kasigwa	Male	Adult
Kaspa	Female	Subadult
Kathy	Female	Subadult
Katia	Female	Adult
Kato	Male	Adult
Kavera	Male	Juvenile
Kefa	Male	Juvenile
Kewaya	Female	Adult
Kigere	Female	Adult
Kirabo	Male	Juvenile
Klauce	Male	Subadult
Kox	Female	Subadult
Kutu	Female	Adult
Kwera	Female	Adult
Kwezy$^{\Delta}$	Male	Adult
Linda	Female	Adult
Marion	Female	Adult
Mbotella	Male	Juvenile
Melissa	Female	Adult
Muhumuza	Male	Infant
Mukwano	Female	Adult
Musa	Male	Adult
Nambi	Female	Adult
Oakland	Female	Adult
Ozzie	Male	Juvenile
Pascal	Male	Adult
Rafia	Female	Subadult
Ramula	Female	Adult
Roman	Male	Infant
Rose	Female	Adult
Ruhara	Female	Adult
Sharlot	Female	Subadult
Simon	Male	Adult
Squibs$^{\Delta}$	Male	Adult
Tanja	Female	Adult
Twenty	Female	Subadult
Upesi	Female	Adult
Waseme	Female	Adult
Yuliyo	Female	Adult
Zalu	Male	Adult
Zambe	Female	Adult
Zed	Male	Adult
Zefa$^{\Delta}$	Male	Adult

Fig. S5. Snake model presented in between 2010 and 2011 for the snake presentation experiments (adapted from Schel et al., 2013).

Fig. S6. Snake model presented in 2019 to accrue a satisfactory number of playback stimuli.

Supplementary References

Schel, A. M. *et al.* Chimpanzee Alarm Call Production Meets Key Criteria for Intentionality. *PLoS One* **8**, e76674 (2013).