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Memo to: Mike Armstrong, Andrew King and Robin Niver

From: Mark Ford *Mark*

Subject: Kaleidoscope 3.1 Modification

Contained are the results of the Kaleidoscope 3.1 (modification of the 3.0.0 from April's report) for the New York and West Virginia echolocation datasets. Per the request of the vendor, we ran this program only on the -1 "most sensitive" setting. Based on U.S. Fish and Wildlife standards set forth for testing on the simulated full community New York dataset and West Virginia dataset, the more sensitive -1 setting **passed** for northern long-eared bats (*Myotis septentrionalis*) and Indiana bats (*Myotis sodalis*; Tables 1-5). When the datasets were examined with northern long-eared bats and Indiana bats alternatively removed, performance was improved over the 3.0 version in that false negatives were eliminated. Still, for both datasets, with Indiana bats removed, version 3.1 still showed false positives of that species (Table 6).

cc: A. Silvis

Table 1. Post-identification per species confidence (p) from maximum likelihood estimator or surrogate (see program specifications for details) and total bat pass count for known echolocation pulses for Kaleidoscope 3.1 more sensitive setting (-1) for simulated New York and West Virginia datasets based on Ford et al. (2011, 2005). ND is total absence of probability of detection. Note: programs may identify echolocation pulses to a species without high confidence (> 0.1-0).

3.1	Kaleidoscope -1 New York			Kaleidoscope -1 West Virginia		
	ID	p	N	ID	p	N
	EPFU	0	28	EPFU	0	26
	LABO	0	51	LABO	0	58
	LACI	0	21	LACI	0	22
	LANO	1	9	LANO	0.9998451	6
	MYLE	0.0004554	7	MYLE	0.0127159	5
	MYLU	0	68	MYLU	0	54
	MYSE	0.0000256	14	MYSE	0	19
	MYSO	0	32	MYSO	0	31
	PESU	0.0015369	8	PESU	0.0000212	11
	UNKN		2	UNKN		1

Table 2. Per species echolocation pulse assignment and overall correct classification rate for Kaleidoscope 3.1 on more sensitive setting (-1) for simulated New York dataset based on Ford et al. (2011). Columns in bold are known echolocation pulse assignments. Rows in italics are Kaleidoscope assignment.

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<b>3.1</b>	<b>EPFU</b>	<b>LABO</b>	<b>LACI</b>	<b>LANO</b>	<b>MYLE</b>	<b>MYLU</b>	<b>MYSE</b>	<b>MYSO</b>	<b>PESU</b>	<b>MISC/ODD</b>
<i>EPFU</i>	24	0	0	4	0	0	0	0	0	0
<i>LABO</i>	0	22	0	0	3	20	1	2	2	1
<i>LACI</i>	0	0	21	0	0	0	0	0	0	0
<i>LANO</i>	2	0	1	6	0	0	0	0	0	0
<i>MYLE</i>	0	0	0	0	5	0	0	2	0	0
<i>MYLU</i>	0	0	0	0	0	60	1	4	0	3
<i>MYSE</i>	0	0	0	0	1	0	12	1	0	0
<i>MYSO</i>	0	0	0	0	0	11	3	18	0	0
<i>PESU</i>	0	0	0	0	0	0	0	0	8	0
<i>UNKN</i>	0	0	0	0	1	0	0	0	0	1

  

% correct	75.21
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Table 3. Per species echolocation pulse assignment and overall correct classification rate for Kaleidoscope 3.1 on more sensitive setting (-1) for simulated West Virginia dataset based on Ford et al. (2005). Columns in bold are known echolocation pulse assignments. Rows in italics are Kaleidoscope assignment.

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<b>3.1</b>	<b>EPFU</b>	<b>LABO</b>	<b>LACI</b>	<b>LANO</b>	<b>MYLE</b>	<b>MYLU</b>	<b>MYSE</b>	<b>MYSO</b>	<b>PESU</b>	<b>MISC/ODD</b>
<i>EPFU</i>	24	0	0	2	0	0	0	0	0	0
<i>LABO</i>	0	40	0	0	0	11	1	0	5	1
<i>LACI</i>	0	0	21	0	0	0	0	0	0	1
<i>LANO</i>	2	0	1	3	0	0	0	0	0	0
<i>MYLE</i>	0	0	0	0	2	0	0	3	0	0
<i>MYLU</i>	0	0	0	0	5	40	1	5	0	3
<i>MYSE</i>	0	0	0	0	1	0	18	0	0	0
<i>MYSO</i>	0	0	0	0	1	9	2	19	0	0
<i>PESU</i>	0	0	0	0	0	0	0	0	10	1
<i>UNKN</i>	0	0	0	0	0	0	1	0	0	0

%  
correct 81.94

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Table 4. Per species echolocation pulse assignment performance for Kaleidoscope 3.1 on more sensitive setting (-1) for simulated New York dataset based on Ford et al. (2011). Threshold is the proportional abundance of per species echolocation pulses. AUC is area under the curve. Omission is proportion of occurrences misidentified adjusted by the threshold value. Sensitivity is the proportion of true events assigned correctly (assessment of true positive). Specificity is the proportion of non-events assigned correctly (assessment of true negative). Kappa measures the proportion of correct classification after accounting for the probability of chance agreement.

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	<b>Threshold</b>	<b>AUC</b>	<b>Omission</b>	<b>Sensitivity</b>	<b>Specificity</b>	<b>Kappa</b>
EPFU	0.11	0.95	0.08	0.92	0.98	0.87
LABO	0.09	0.93	0.00	1.00	0.87	0.54
LACI	0.09	0.98	0.05	0.95	1.00	0.97
LANO	0.04	0.79	0.40	0.60	0.99	0.62
MYLE	0.04	0.75	0.50	0.50	0.99	0.57
MYLU	0.38	0.80	0.34	0.66	0.95	0.64
MYSE	0.07	0.85	0.29	0.71	0.99	0.76
MYSO	0.11	0.80	0.33	0.67	0.93	0.56
PESU	0.04	0.90	0.20	0.80	1.00	0.88

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Table 5. Per species echolocation pulse assignment performance for Kaleidoscope 3.1 on more sensitive setting (-1) for simulated West Virginia dataset based on Ford et al. (2005). Threshold is the proportional abundance of per species echolocation pulses. AUC is area under the curve. Omission is proportion of occurrences misidentified adjusted by the threshold value. Sensitivity is the proportion of true events assigned correctly (assessment of true positive). Specificity is the proportion of non-events assigned correctly (assessment of true negative). Kappa measures the proportion of correct classification after accounting for the probability of chance agreement.

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	<b>Threshold</b>	<b>AUC</b>	<b>Omission</b>	<b>Sensitivity</b>	<b>Specificity</b>	<b>Kappa</b>
EPFU	0.11	0.96	0.08	0.92	0.99	0.91
LABO	0.17	0.95	0.00	1.00	0.91	0.77
LACI	0.09	0.97	0.05	0.95	1.00	0.95
LANO	0.02	0.79	0.40	0.60	0.99	0.53
MYLE	0.04	0.60	0.78	0.22	0.99	0.27
MYLU	0.26	0.79	0.33	0.67	0.92	0.61
MYSE	0.10	0.89	0.22	0.78	1.00	0.84
MYSO	0.12	0.82	0.30	0.70	0.94	0.61
PESU	0.06	0.83	0.33	0.67	1.00	0.76

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Table 6. Post-identification per species confidence from maximum likelihood estimator or surrogate for known echolocation pulses for Kaleidoscope 3.1 on more sensitive setting (-1) for simulated New York and West Virginia datasets based on Ford et al. (2011, 2005) with Northern long-eared bat (*Myotis septentrionalis*; MYSE) and/or Indiana bat (*Myotis sodalis*; MYSO) alternatively removed or retained. High confidence of predicted presence indicated at  $p < 0.1$ . ND is total absence of probability of detection. False positives (bold), false negatives (italics) noted.

			Kaleidoscope -1
New York	No MYSE	MYSE presence	1
New York	No MYSE	MYSO presence	0
New York	No MYSO	MYSE presence	0.00004
New York	No MYSO	MYSO presence	<b>0.00007</b>
West Virginia	No MYSE	MYSE presence	1
West Virginia	No MYSE	MYSO presence	0
West Virginia	No MYSO	MYSE presence	0
West Virginia	No MYSO	MYSO presence	<b>0.000259</b>