Table A1.1. Acoustic classification or recognition articles for a review of automated signal recognition assessment methods. Articles in bold were selected for detailed review because they used single species recognizers and assessed recognizer performance with a field recording test dataset.

Reference	Single or multi species recognizer	Test dataset type
Acevedo, M. A., C. J. Corrada-Bravo, H. Corrada-Bravo, L. J. Villanueva-Rivera, and T. M. Aide. 2009. Automated classification of bird and amphibian calls using machine learning: A comparison of methods. *Ecological Informatics* 4:206–214. http://dx.doi.org/10.1016/j.ecoinf.2009.06.005	Multi	Field recording
Agranat, I. 2009. *Automatically identifying animal species from their vocalizations*. Wildlife Acoustics, Concord, MA, USA. [online] URL: https://www.wildlifeacoustics.com/images/documentation/Automatically-Identifying-Animal-Species-from-their-Vocalizations.pdf	Single	Clip
Aide, T. M., C. Corrada-Bravo, M. Campos-Cerqueira, C. Milan, G. Vega, and R. Alvarez. 2013. Real-time bioacoustics monitoring and automated species identification. *PeerJ* 1:e103. http://dx.doi.org/10.7717/peerj.103	Multi	Field recording
Anderson, S. E., A. S. Dave, and D. Margoliash. 1996. Template-based automatic recognition of birdsong syllables from continuous recordings. *The Journal of the Acoustical Society of America* 100:1209–1219. http://dx.doi.org/10.1121/1.415968	Multi	Captive recording
Arencibia, J. J. N, C. M. Travieso, and D. Sánchez-Rodríguez. 2015. Automatic classification of frogs calls based on fusion of features and SVM. Pages 59-63 *in 2015 Eighth International Conference on Contemporary Computing (IC3)*. 20-22 August, Noida, India. http://dx.doi.org/10.1109/ic3.2015.7346653	Single	Clip
Armitage, D. W., and H. K. Ober. 2010. A comparison of supervised learning techniques in the classification of bat echolocation calls. *Ecological Informatics* 5:465–473. http://dx.doi.org/10.1016/j.ecoinf.2010.08.001	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Bang, A. V., and P. P. Rege. 2014. Classification of bird species based on bioacoustics. *International Journal of Image Processing Techniques* 1(1):6-10.	Multi	Clip
Bardeli, R., D. Wolff, F. Kurth, M. Koch, K.-H. Tauchert, and K.-H. Frommolt. 2010. Detecting bird sounds in a complex acoustic environment and application to bioacoustic monitoring. *Pattern Recognition Letters* 31(12):1524-1534. http://dx.doi.org/10.1016/j.patrec.2009.09.014	**Single**	**Field recording**
Bedoya, C., C. Isaza, J. M. Daza, and J. D. López. 2014. Automatic recognition of anuran species based on syllable identification. *Ecological Informatics* 24:1–11. http://dx.doi.org/10.1016/j.ecoinf.2014.08.009	Multi	Clip
Belyaeva, N. A., K. L. Yash-yee, K. M. Smartc, and E. Ribeirod. (n.d.). WhatFrog: A Comparison of Classification Algorithms for Automated Anuran Recognition. [online] URL: http://www.amalthea-reu.org/pubs/amalthea_tr_2014_02.pdf	Single	Clip
Brauer, C. L., T. M. Donovan, R. M. Mickey, J. Katz, and B. R. Mitchell. 2016. A comparison of acoustic monitoring methods for common anurans of the northeastern United States. *Wildlife Society Bulletin* 40(1):140-149. http://dx.doi.org/10.1002/wsb.619	**Single**	**Field recording**
Briggs, F., B. Lakshminarayanan, L. Neal, X. Z. Fern, R. Raich, S. J. K. Hadley, A. S. Hadley, and M. G. Betts. 2012. Acoustic classification of multiple simultaneous bird species: A multi-instance multi-label approach. *The Journal of the Acoustical Society of America* 131:4640–4650. http://dx.doi.org/10.1121/1.4707424	Multi	Clip
Cakir, E., S. Adavanne, G. Parascandolo, K. Drossos, and T. Virtanen. 2017. Convolutional recurrent neural networks for bird audio detection. Pages 1744-1748 *in 2017 25th European Signal Processing Conferences (EUPISCO)*. 28 August – 2 September, Kos Island, Greece. http://dx.doi.org/10.23919/EUSIPCO.2017.8081508	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Chesmore, E. D., and E. Ohya. 2007. Automated identification of field-recorded songs of four British grasshoppers using bioacoustic signal recognition. *Bulletin of Entomological Research* 94:1–13. http://dx.doi.org/10.1079/BER2004306	Multi	Clip
Chu, W., and D. T. Blumstein. 2011. Noise robust bird song detection using syllable pattern-based hidden Markov models. Pages 345–348 *in 2011 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. 22-27 May, Prague, Czech Republic. http://dx.doi.org/10.1109/ICASSP.2011.5946411	Single	Clip
Colbert, D. S., J. A. Ruttinger, M. Streich, M. Chamberlain, L. M. Conner, and R. J. Warren. 2015. Application of autonomous recording units to monitor gobbling activity by Wild Turkey. *Wildlife Society Bulletin* 39:757–763. http://dx.doi.org/10.1002/wsb.577	Single	Field recording: no benchmark
Colonna, J. G., M. Cristo, M. S. Júnior, and E. F. Nakamura. 2015. An incremental technique for real-time bioacoustic signal segmentation. *Expert Systems with Applications* 42:7367–7374. http://dx.doi.org/10.1016/j.eswa.2015.05.030	N/A	Field recording
Crump, P. S., and J. Houlahan. 2017. Designing better frog call recognition models. *Ecology and Evolution* 7:3087-3099. http://dx.doi.org/10.1002/ece3.2730	**Single**	**Field recording**
Digby, A., M. Towsey, B. D. Bell, and P. D. Teal. 2013. A practical comparison of manual and autonomous methods for acoustic monitoring. *Methods in Ecology and Evolution* 4(7):675-683. http://dx.doi.org/10.1111/2041-210X.12060	**Single**	**Field recording**
Doležel, P., M. Mariška, and I. Taufer. 2015. Possibilities of feedforward multilayer neural network classifier as a detector of pest birds in vineyards. *International Journal of Engineering Research in Africa* 18:184–191. http://dx.doi.org/10.4028/www.scientific.net/JERA.18.184	Multi	Clip
Dong, X., M. Towsey, A. Truskinger, M. Cottman-Fields, J. Zhang, and P. Roe. 2015. Similarity-based birdcall retrieval from environmental audio. *Ecological Informatics* 29:66–76. http://dx.doi.org/10.1016/j.ecoinf.2015.07.007	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Duan, S., J. Zhang, P. Roe, J. Wimmer, and X. Dong. 2013. Timed probabilistic automaton: a bridge between automatic species recognition. Pages 1519-1524 *in Proceedings of the Twenty-Fifth Innovative Applications of Artificial Intelligence Conference*. 14–18 July, Bellevue, Washington, USA. AAAI, Palo Alto, California, USA. [online] URL: https://www.aaai.org/ocs/index.php/IAAI/IAAI13/paper/view/6092/6429	**Single**	**Field recording**
Dufour, O., T. Artieres, H. Glotin, and P. Giraudet. 2014. Clusterized mel filter cepstral coefficients and support vector machines for bird song identification. Pages 83-95 *in Soundscape Semiotics - Localisation and Categorisation.* InTech, London, UK. http://dx.doi.org/10.5772/56872	Multi	Field recording
Ferroudj, M. 2015. Detection of rain in acoustic recordings of the environment using machine learning techniques. Master of Information Technology thesis, Queensland University of Technology, Queensland, Australia.	N/A	Clip
Ganchev, T. D., O. Jahn, M. I. Marques, J. M. de Figueiredo. 2007. Automatic acoustic identification of singing insects. *Bioacoustics* 16:281–328. http://dx.doi.org/10.1080/09524622.2007.9753582	Multi	Clip
Ganchev, T. D., O. Jahn, M. I. Marques, J. M. de Figueiredo, and K-L. Schuchmann. 2015. Automated acoustic detection of *Vanellus chilensis lampronotus*. *Expert Systems with Applications* 42(15-16):6098-6111. http://dx.doi.org/10.1016/j.eswa.2015.03.036	**Single**	**Field recording**
Gonzalez, R. 2010. Effects of compression and window size on remote acoustic identification using sensor networks. Pages 1-10 *in 2010 4th International Conference in Signal Processing and Communication Systems (ICSPCS).* 13-15 December, Gold Coast, Australia. http://dx.doi.org/10.1109/ICSPCS.2010.5709762	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Gradišek, A., G. Slapničar, J. Šorn, M. Luštrek, M. Gams, and J. Grad. 2016. Predicting species identity of bumblebees through analysis of flight buzzing sounds. *Bioacoustics* 26(1):63-76. http://dx.doi.org/10.1080/09524622.2016.1190946	Multi	Clip
Harma, A. 2003. Automatic identification of bird species based on sinusoidal modeling of syllables. Pages V-545–548 *in Proceedings of the 2003 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*. 6-10 April, Hong Kong. http://dx.doi.org/10.1109/ICASSP.2003.1200027	Multi	Clip
Heinicke, S., A. K. Kalan, O. J. J. Wagner, R. Mundry, H. Lukashevich, and H. S. Kühl. 2015. Assessing the performance of a semi-automated acoustic monitoring system for primates. *Methods in Ecology and Evolution* 6:753–763. http://dx.doi.org/10.1111/2041-210X.12384	Multi	Field recording
Hollowood, K., O. Kular, and E. Ribeiro. 2015. Classifying frog calls using gaussian mixture model and locality sensitive hashing. AMALTHEA REU Technical Report No. 2015-2. [online] URL: http://www.amathea-reu.org/	Multi	Clip
Holmes, S. B., K. A. McIlwrick, and L. A. Venier. 2014. Using automated sound recording and analysis to detect bird species-at-risk in southwestern Ontario woodlands. *Wildlife Society* Bulletin 38(3):591-598. http://dx.doi.org/10.1002/wsb.421	Single	Field recording: no benchmark
Huang, C.-J., Y.-J. Yang, D.-X. Yang, and Y.-J. Chen. 2009. Frog classification using machine learning techniques. *Expert Systems with Applications* 36:3737–3743. http://dx.doi.org/10.1016/j.eswa.2008.02.059	Multi	Clip
Jaafar, H., D. A. Ramli, and B. A. Rosdi. 2014. Comparative study on different classifiers for frog identification system based on bioacoustic signal analysis. Pages 172-176 *in Proceedings of the 2014 International Conference on Communications, Signal Processing and Computers.* 3-5 April in Melmaruvathur, India	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Jahn, O., T. D. Ganchev, M. I. Marques, and K-L. Schuchmann. 2017. Automated sound recognition provides insights into the behavioral ecology of a tropical bird. *PLoS ONE* 12:e0169041-29. http://dx.doi.org/10.1371/journal.pone.0169041	**Single**	**Field recording**
Jaiswara, R., D. Nandi, and R. Balakrishnan. 2013. Examining the effectiveness of discriminant function analysis and cluster analysis in species identification of male field crickets based on their calling songs. *PLoS ONE* 8:e75930–11. http://dx.doi.org/10.1371/journal.pone.0075930	Multi	Clip
Kaewtip, K., L. N. Tan, and A. Alwan. 2013. A robust automatic bird phrase classifier using dynamic time-warping with prominent region identification. Pages 768-772 in *2013 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).* 26-31 May in Vancouver, BC, Canada. http://dx.doi.org/10.1109/ICASSP.2013.6637752	Multi	Clip
Kasten, E. P., P. K. McKinley, and S. H. Gage. 2010. Ensemble extraction for classification and detection of bird species. *Ecological Informatics* 5:153–166. http://dx.doi.org/10.1016/j.ecoinf.2010.02.003	Multi	Clip, field recording
Katz, J., S. D. Hafner, and T. Donovan. 2016. Assessment of error rates in acoustic monitoring with the R package monitoR. *Bioacoustics* 25(2):177-196. http://dx.doi.org/10.1080/09524622.2015.1133320	**Single**	**Field recording**
Lee, C.-H., C.-H. Chou, C.-C. Han, and R.-Z. Huang. 2006. Automatic recognition of animal vocalizations using averaged MFCC and linear discriminant analysis. *Pattern Recognition* Letters 27:93–101. http://dx.doi.org/10.1016/j.patrec.2005.07.004	Multi	Clip
Mencıa, E. L., J. Nam, and D. H. Lee. 2013. Learning multi-labeled bioacoustic samples with an unsupervised feature learning approach. Pages 1-6 *in Proceedings of the International Symposium for Neural Information Scaled for Bioacoustics.* Dec in Nevada, USA.	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Nicholson, D. 2016. Comparison of machine learning methods applied to birdsong element classification. Pages 57-61 *in Proceedings of the 15th Python in Science Conference (SCIPY).* July 10-16, Austin, TX, USA. [online] URL: http://conference.scipy.org/proceedings/scipy2016/david_nicholson.html	Multi	Clip
Noda, J. J., C. M. Travieso, and D. Sánchez-Rodríguez. 2016a. Methodology for automatic bioacoustic classification of anurans based on feature fusion. *Expert Systems with Applications* 50:100–106. http://dx.doi.org/10.1016/j.eswa.2015.12.020	Multi	Clip
Noda, J., C. Travieso, and D. Sánchez-Rodríguez. 2016b. Automatic taxonomic classification of fish based on their acoustic signals. *Applied Sciences* 6:443–12. http://dx.doi.org/10.3390/app6120443	Multi	Clip
Potamitis, I. 2014. Automatic classification of a taxon-rich community recorded in the wild. *PLoS ONE* 9:e96936–11. http://dx.doi.org/10.1371/journal.pone.0096936	Multi	Clip
Potamitis, I., S. Ntalampiras, O. Jahn, and K. Riede. 2014. Automatic bird sound detection in long real-field recordings: applications and tools. *Applied Acoustics* 80:1-9. http://dx.doi.org/10.1016/j.apacoust.2014.01.001	**Single**	**Clip, field recording**
Ptacek, L., L. Machlica, P. Linhart, P. Jaska, and L. Muller. 2015. Automatic recognition of bird individuals on an open set using as-is recordings. *Bioacoustics* 25(1):55-73. http://dx.doi.org/10.1080/09524622.2015.1089524	Multi	Field recording
Qian, K., Z. Zhang, F. Ringeval, and B. Schuller. 2015. Bird sounds classification by large scale acoustic features and extreme learning machine. Pages 1317–1321 *in 2015 IEEE Global Conference on Signal and Information Processing (GlobalSIP).* 14-16 December, Orlando, FL, USA. http://dx.doi.org/10.1109/GlobalSIP.2015.7418412	Multi	Clip
Ranjard, L., and H. A. Ross. 2008. Unsupervised bird song syllable classification using evolving neural networks. *The Journal of the Acoustical Society of America* 123(6):4358–4368. http://dx.doi.org/10.1121/1.2903861	Multi	Clip

Reference	Single or multi species recognizer	Test dataset type
Ranjard, L., S. J. Withers, D. H. Brunton, H. A. Ross, and S. Parsons. 2015. Integration over song classification replicates: Song variant analysis in the hihi. *The Journal of the Acoustical Society of America* 137(5):2542–2551. http://dx.doi.org/10.1121/1.4919329	Multi	Clip
Ruiz-Muñoz, J. F., G. Castellanos-Dominguez, and M. Orozco-Alzate. 2016. Enhancing the dissimilarity-based classification of birdsong recordings. *Ecological Informatics* 33:75–84. http://dx.doi.org/10.1016/j.ecoinf.2016.04.001	Multi	Clip
Salamon, J., J. P. Bello, A. Farnsworth, M. Robbins, S. Keen, H. Klinck, and S. Kelling. 2016. Towards the automatic classification of avian flight calls for bioacoustic monitoring. *PLoS ONE* 11:e0166866–26. http://dx.doi.org/10.1371/journal.pone.0166866	Multi	Clip, field recording
Souza Filho, N. E., B. C. Oliveira, M. L. D. Silva, and J. Vielliard. 2014. Automatic classification of *Turdus rufiventris* song notes by spectrographic image template matching. *Ciência e Natura* 36:1–9. http://dx.doi.org/10.5902/2179460X11303	Multi	Clip
Stowell, D., and M. D. Plumbley. 2014. Automatic large-scale classification of bird sounds is strongly improved by unsupervised feature learning. *PeerJ* 2:e488–31. http://dx.doi.org/10.7717/peerj.488	Multi	Clip
Swiston, K. A., and D. J. Mennill. 2009. Comparison of manual and automated methods for identifying target sounds in audio recordings of Pileated, Pale-Billed, and putative Ivory-billed Woodpeckers. *Journal of Field Ornithology* 80(1):42-50. http://dx.doi.org/10.1111/j.1557-9263.2009.00204.x	**Single**	**Field recording**
Tachibana, R. O., N. Oosugi, and K. Okanoya. 2014. Semi-automatic classification of birdsong elements using a linear support vector machine. *PLoS ONE* 9:e92584. http://dx.doi.org/10.1371/journal.pone.0092584	Multi	Clip, field recording

Reference	Single or multi species recognizer	Test dataset type
Tan, L. N., A. Alwan, G. Kossan, M. L. Cody, and C. E. Taylor. 2015. Dynamic time warping and sparse representation classification for birdsong phrase classification using limited training data. *The Journal of the Acoustical Society of America* 137(3):1069–1080. http://dx.doi.org/10.1121/1.4906168	Multi	Clip
Tan, L. N., K. Kaewtip, M. L. Cody, C. E. Taylor, and A. Alwan. 2012. Evaluation of a sparse representation-based classifier for bird phrase classification under limited data conditions. *In Interspeech.* [online] URL: http://www.seas.ucla.edu/spapl/paper/Tan_Interspeech2012.pdf	Multi	Clip
Thakur, A., J. Jain, P. Rajan, and A. D. Dileep. 2017. Bird audio detection using probability sequence kernels. [online] URL: http://machine-listening.eecs.qmul.ac.uk/wp-content/uploads/sites/26/2017/02/badChallenge_iitMandi.pdf	Multi	Clip
Tsai, W. H., Y. Y. Xu, and W. C. Lin. 2014. Bird species identification based on timbre and pitch features of their vocalization. *Journal of Information Science and Engineering* 30:1927-1944.	Multi	Clip
Turesson, H. K., S. Ribeiro, D. R. Pereira, J. P. Papa, and V. H. C. de Albuquerque. 2016. Machine learning algorithms for automatic classification of marmoset vocalizations. *PLoS* ONE 11:e0163041–14. http://dx.doi.org/10.1371/journal.pone.0163041	Single	Clip
Ulloa, J. S., A. Gasc, P. Gaucher, T. Aubin, M. Réjou-Méchain, and J. Sueur. 2016. Screening large audio datasets to determine the time and space distribution of Screaming Piha birds in a tropical forest. *Ecological Informatics* 31:91-99. http://dx.doi.org/10.1016/j.ecoinf.2015.11.012	**Single**	**Field recording**
Vega, G., C. J. Corrada-Bravo, and T. M. Aide. 2016. Audio segmentation using Flattened Local Trimmed Range for ecological acoustic space analysis. *PeerJ Computer Science* 2:e70. http://dx.doi.org/10.7717/peerj-cs.70	N/A	Field recording

Reference	Single or multi species recognizer	Test dataset type
Ventura, T. M., A. G. de Oliveira, T. D. Ganchev, J. M. de Figueiredo, O. Jahn, M. I. Marques, and K.-L. Schuchmann. 2015. Audio parameterization with robust frame selection for improved bird identification. *Expert Systems with Applications* 42:8463–8471. http://dx.doi.org/10.1016/j.eswa.2015.07.002	Multi	Clip
Vignolo, L., J. A. Sarquis, E. León, and E. Albornoz. 2016. Furnariidae species recognition using speech-related features and machine learning. Pages 53-61 *in 17° Simposio Argentino de Inteligencia Artificial (ASAI)*. 5-9 September, Buenos Aires, Argentina. [online] URL: http://45jaiio.sadio.org.ar/sites/default/files/ASAI-15_0.pdf	Multi	Clip
Waddle, J. H., T. F. Thigpen, and B. M. Glorioso. 2009. Efficacy of automatic vocalization recognition software for anuran monitoring. *Herpetological Conservation and Biology* 4(3):384-388.	**Single**	**Field recording**
Walters, C. L., R. Freeman, A. Collen, C. Dietz, M. Brock Fenton, G. Jones, M. K. Obrist, S. J. Puechmaille, T. Sattler, B. M. Siemers, S. Parsons, and K. E. Jones. 2012. A continental-scale tool for acoustic identification of European bats. *Journal of Applied Ecology* 49:1064–1074. http://dx.doi.org/10.1111/j.1365-2664.2012.02182.x	Multi	Clip
Xie, J., J. Zhang, and P. Roe. 2016. Acoustic features for multi-level classification of Australian frogs. Pages 1-5 *in Proceedings of the 2015 International Conference on Information, Communications and Signal Processing (ICICS*). 2-4 April, Melmaruvathur, India. http://dx.doi.org/10.1109/ICICS.2015.7459891	Multi	Clip
Xie, J., M. Towsey, J. Zhang, and X. Dong. 2015. Application of image processing techniques for frog call classification. Pages 4190–4194 *in Proceedings of the 2015 International Conference on Image Processing (ICIP)*. 27-30 September, Québec City, QC, Canada. http://dx.doi.org/10.1109/icip.2015.7351595	Single	Clip