

Notes on the vocalizations of Narcissus Flycatcher (*Ficedula narcissina*)

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In the following we briefly analyze and compare voice of the different races of Narcissus Flycatcher (*Ficedula narcissina*). We also try to quantify the extent of any vocal differences using the criteria proposed by Tobias *et al.* (2010), as a support for taxonomic review. We have made use of sound recordings available on-line from Xeno Canto (XC).

Voice was analyzed in detail by Dong *et al.* (2015). The main discriminating sound parameters are said to be duration of song strophe, max./min. freq. and freq. range (bandwidth). As average values and standard deviation are given (here reproduced: Table 3):

Table 3. Song measurements in the *Ficedula narcissina*-*Ficedula zanthopygia* complex (mean \pm 1 SD).

	<i>F. zanthopygia</i>	<i>F. n. narcissina</i>	<i>F. n. owstoni</i>	<i>F. n. elisae</i>
DS	0.83 \pm 0.04	3.49 \pm 1.94	0.71 \pm 0.11	2.99 \pm 0.93
F_{max}	4.42 \pm 0.13	5.20 \pm 0.45	4.53 \pm 0.43	7.70 \pm 0.60
F_{min}	1.84 \pm 0.06	1.70 \pm 0.34	2.29 \pm 0.27	1.45 \pm 0.10
F_r	2.58 \pm 0.13	3.49 \pm 0.38	2.24 \pm 0.31	6.25 \pm 0.63

DS, duration of strophe (s); F_{max} , maximum frequency (kHz); F_{min} , minimum frequency (kHz); F_r , frequency range (kHz).

we can calculate effect size:

	<i>narcissana</i> <i>vs owstoni</i>	<i>narcissana</i> <i>vs elisae</i>	<i>owstoni</i> <i>vs elisae</i>
Duration song strophe	2.02	0.32	3.44
Max. freq.	1.52	4.71	6.07
Min. feq.	1.92	1.00	4.12
Freq. range	3.60	5.30	8.08

resulting in 'Tobias scores':

	<i>narcissana</i> <i>vs owstoni</i>	<i>narcissana</i> <i>vs elisae</i>	<i>owstoni</i> <i>vs elisae</i>
Duration song strophe	2	1	2
Max. freq.	1	2	3
Min. feq.	1	1	2
Freq. range	2	3	3

(We haven't included *zanthopygia* in the calculations, already treated as a species in HBW)

We can thus conclude that when applying Tobias criteria, total vocal scores between the 3 taxa range from 4 to 6 (assuming that bandwidth and max. freq. are independent parameters).

owstoni has the shortest song phrases and the narrowest freq. range

elisae has the highest max. freq. and largest freq. range

nominate is somewhat closer to *elisae*, but has a narrower freq. range and slightly lower max. freq.

The authors did not include the parameter 'number of notes in a song phrase', which is much lower in *owstoni* (score 3 vs other races).

This vocal analysis was based on songs of 14 individuals of race *narcissus*. Given the very high variability in song, this is quite a low number.

We have recently added some 20 recordings of race *narcissus* including song of at least 7 individuals, ranging from S to N Japan (see XC).

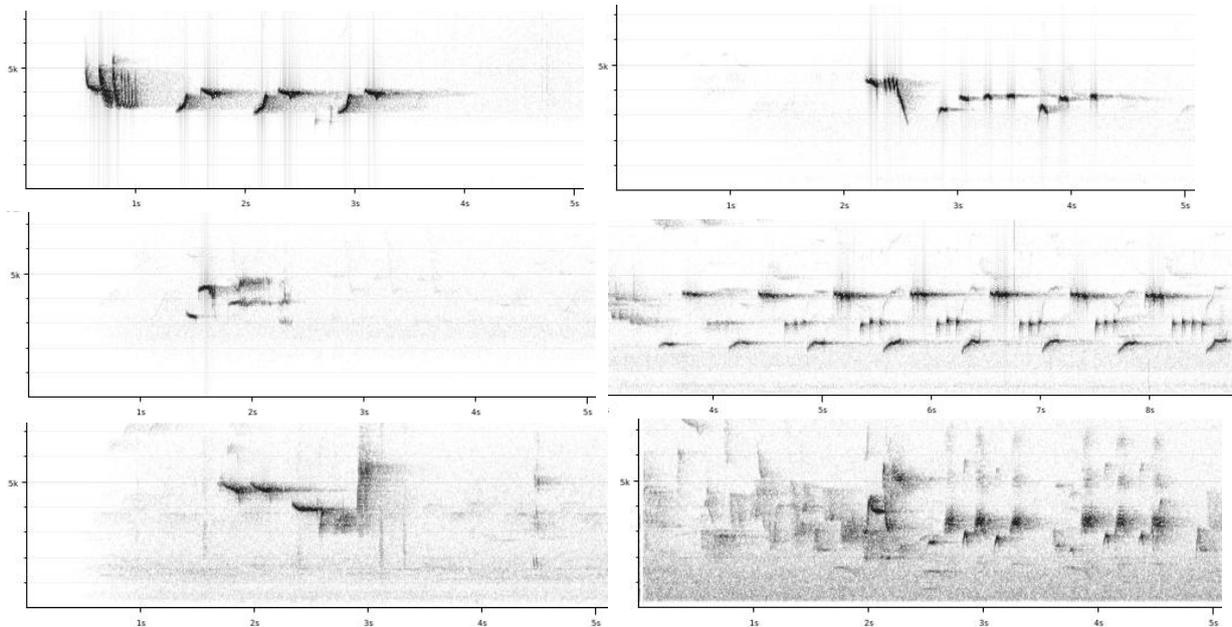
Without having done precise measurements, it would seem that these recordings greatly enlarge the min. freq. range, and to a lesser extent freq. range and max. freq.

The above-mentioned scores should thus be seen as really maximum scores.

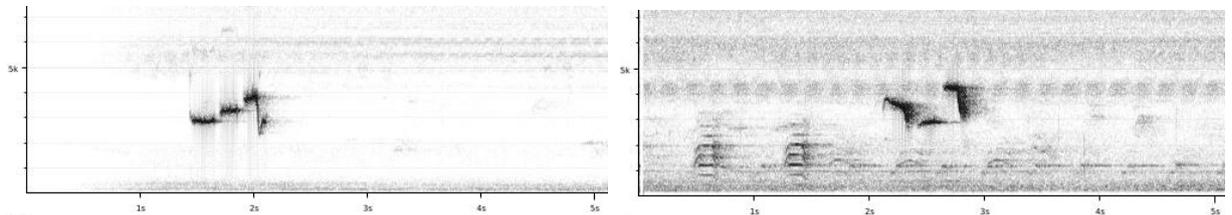
The overall conclusions however remain valid.

Some examples per race, illustrated with sonograms:

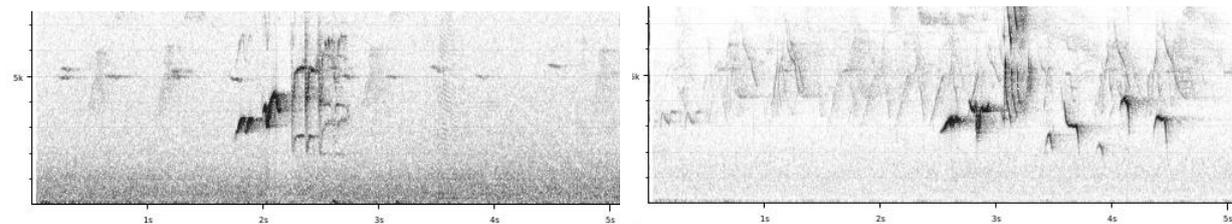
narcissana



owstoni



elisae



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References

Dong, L., Wei, M., Alström, P., Huang, X., Olsson, U., Shigeta, Y., Zhang, Y. & Zheng, G. (2015). Taxonomy of the Narcissus Flycatcher *Ficedula narcissina* complex: an integrative approach using morphological, bioacoustic and multilocus DNA data. *Ibis* 157(2): 312–325.

Tobias, J.A., Seddon, N., Spottiswoode, C.N., Pilgrim, J.D., Fishpool, L.D.C. & Collar, N.J. (2010). Quantitative criteria for species delimitation. *Ibis* 152(4): 724–746.

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