



# Unmatched vocal and morphological ontogenesis in the piebald shrew (*Diplomesodon pulchellum*)



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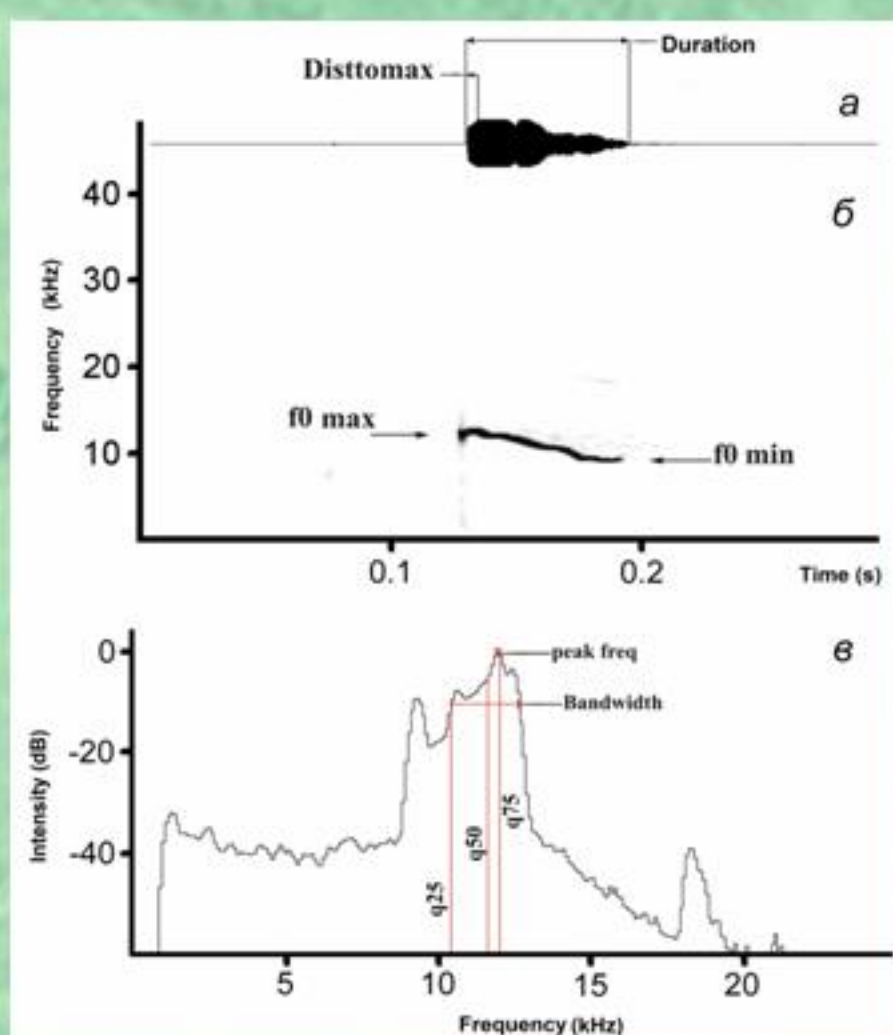
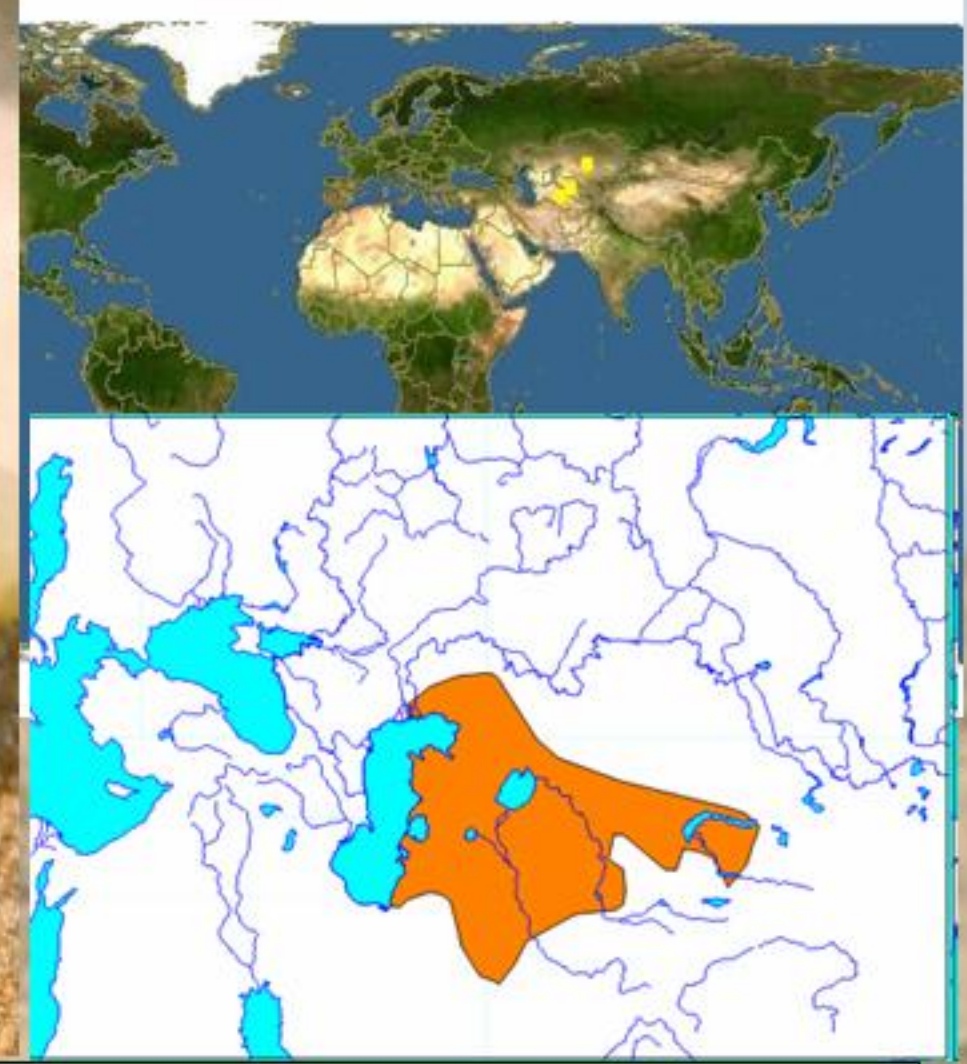
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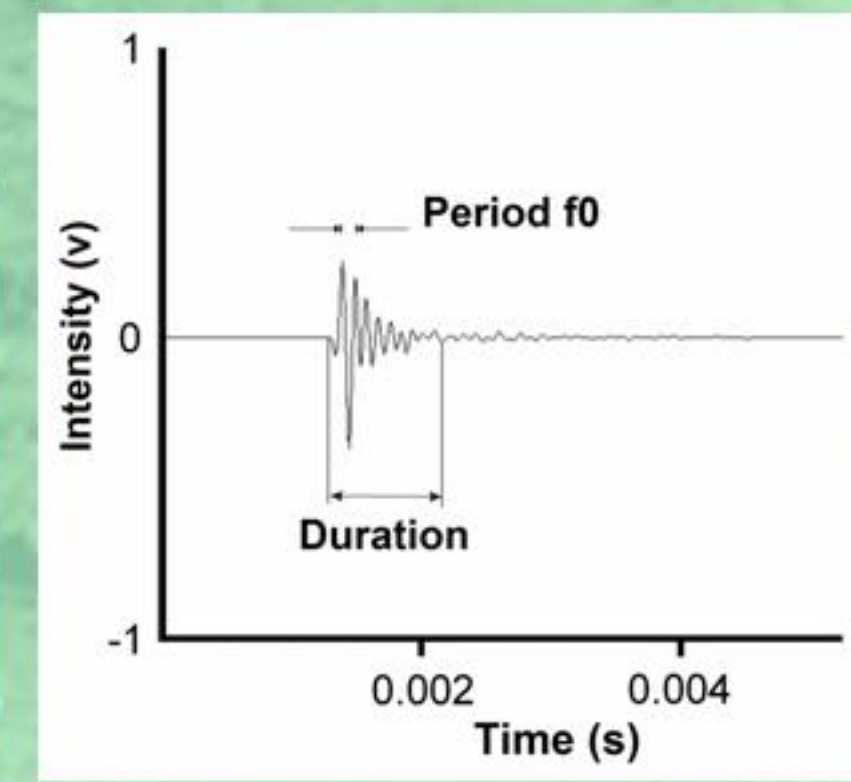
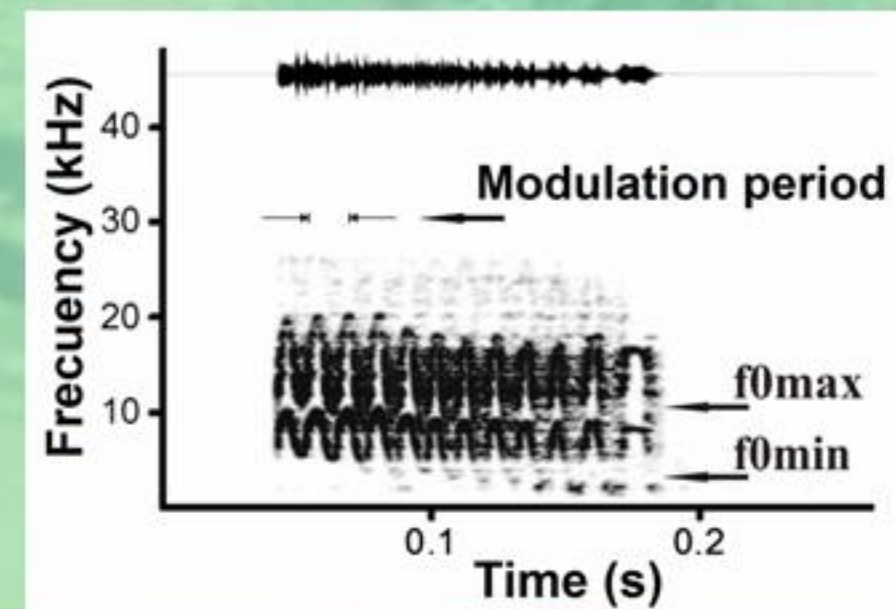


**Introduction.** In most mammals, the ontogenetic growth of sound-producing structures results in lower-frequency calls of adults compared to juveniles. Shrews represent a convenient object for studying the vocal ontogenesis due to their fast development.

**Aim.** To study the ontogeny of vocal behavior in relation to age and to morphological development in the piebald shrew in captivity.



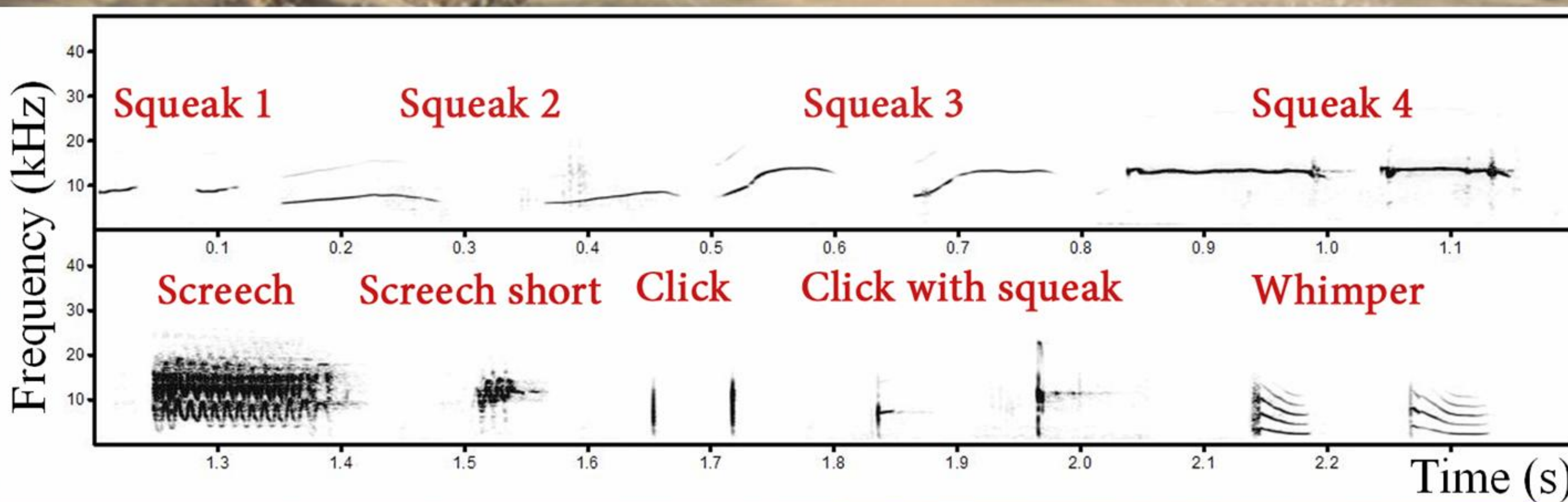
FFT-length 1024; frame 50%, overlap 96.87%, Hamming window



## Methods

Weighing and measuring each 2<sup>nd</sup> day (up to age 21-23 days), each 4<sup>th</sup> day (between 21-23 and 40 days)

**Juveniles:** 39 piebald shrews in 11 litters. 3689 calls  
**Adults:** 25 adults (in ♀♀, ♀♂, ♂♂ interactions), 640 calls

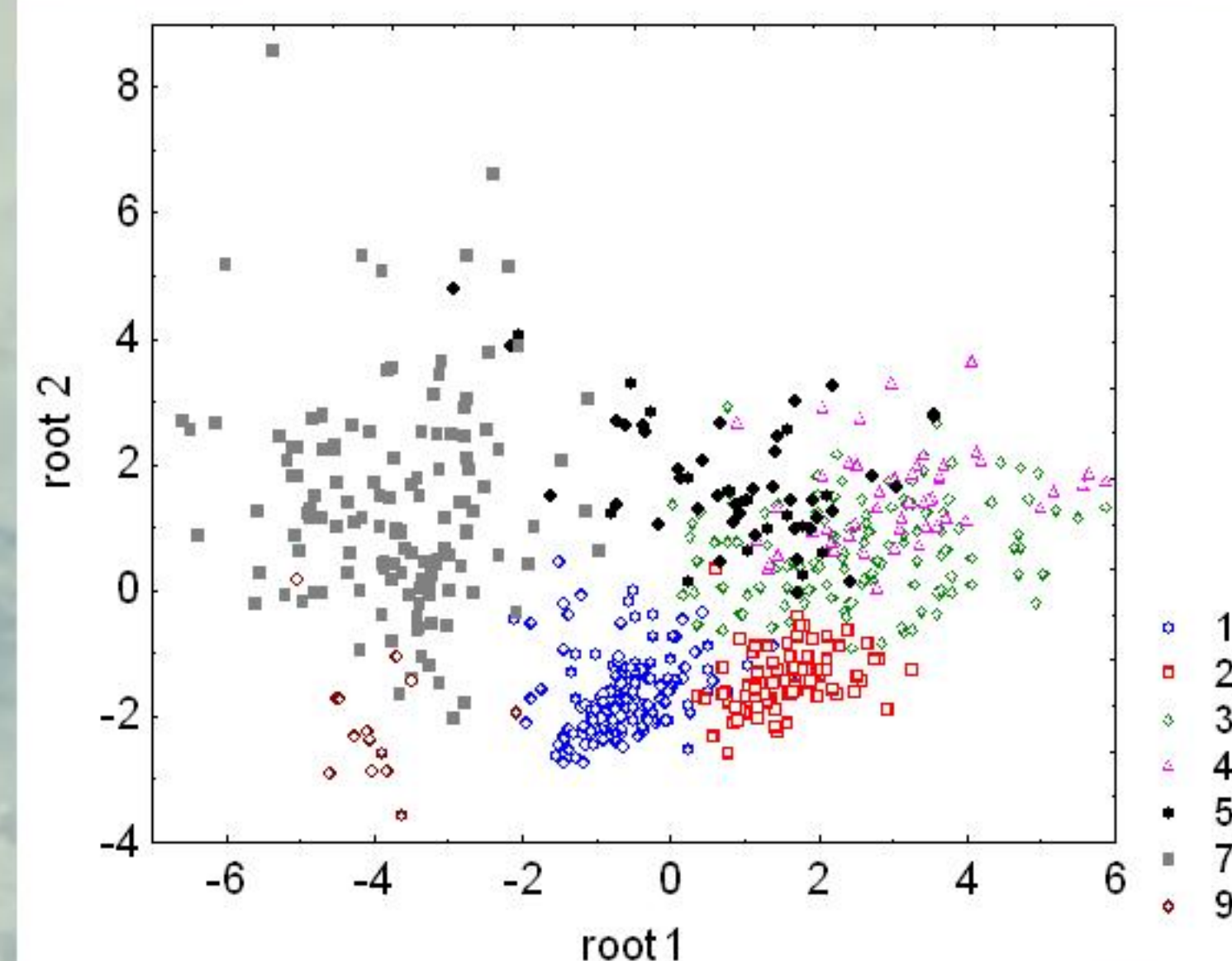
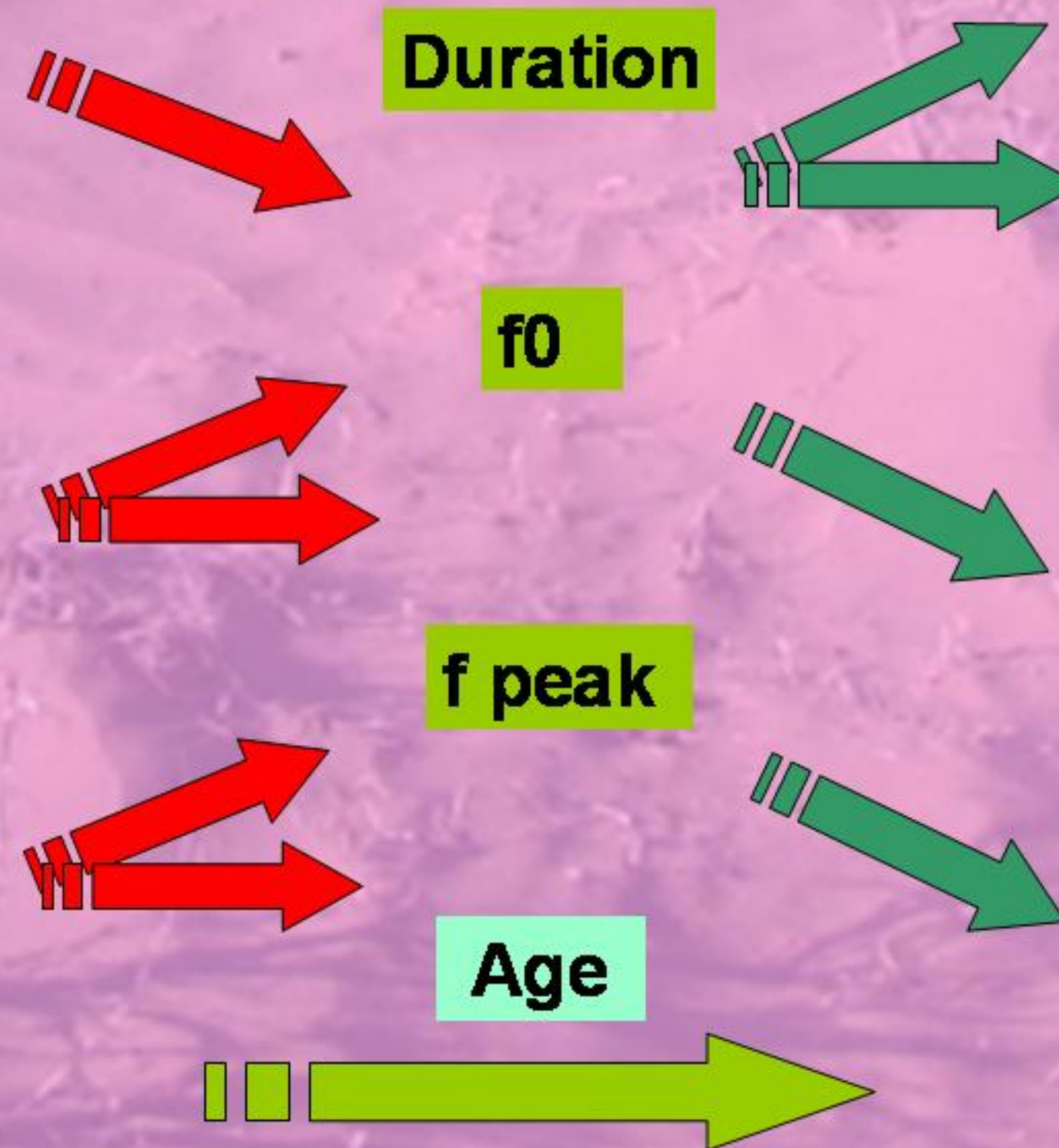
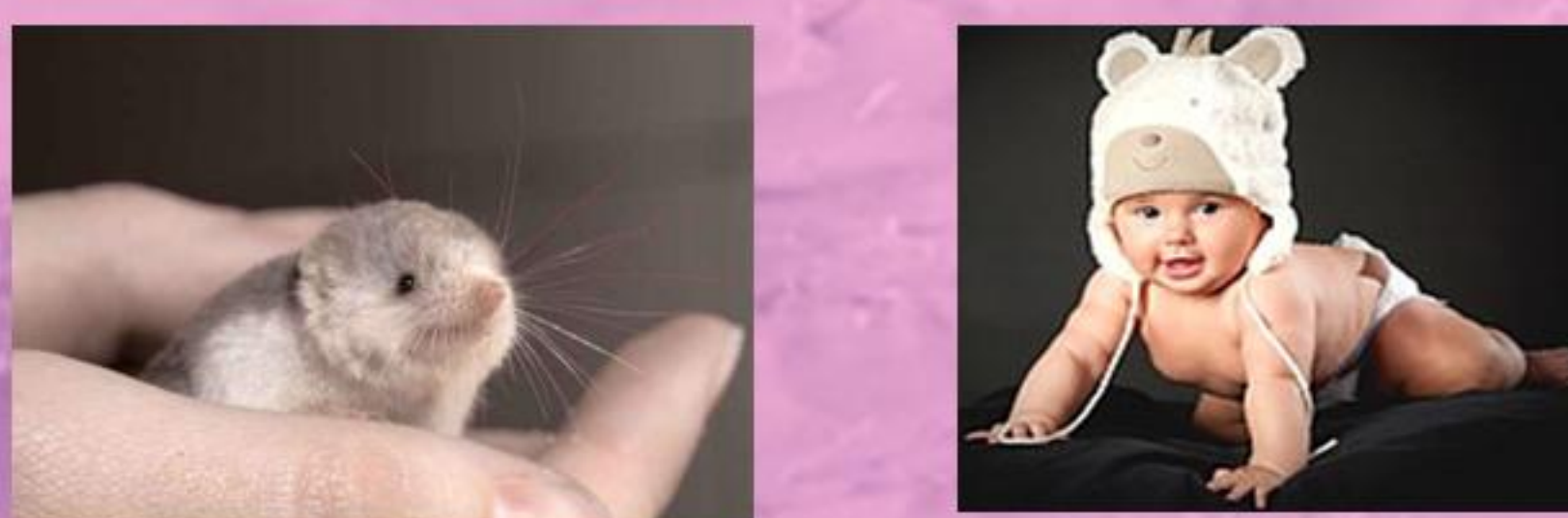


## Results

Vocal repertoire comprised the same 9 types of sound in young and in adults. All calls were audible; no ultrasonic clicks was found. Audible location clicks, not exceeding 15 kHz, were usual in young and very rare in adults.

Sound type	N calls	f0 max (kHz)	f0 min (kHz)	Duration (s)	f peak (kHz)
Squeak 1	169	7,57±0,94	6,4±0,70	0,03±0,02	6,91±0,8
Squeak 2	80	8,14±0,77	6,10±0,54	0,12±0,02	7,29±0,79
Squeak 3	124	12,18±1,34	7,24±1,21	0,11±0,04	10,23±2,21
Squeak 4	50	13,99±1,32	11,34±1,64	0,08±0,04	13,28±1,41
Screech	44	10,82±1,27	4,62±1,11	0,12±0,04	10,35±1,86
Screech short	13	11,67±1,47	6,09±1,53	0,07±0,02	10,60±1,66
Click	128	8,43±2,29	8,43±2,29	0,004±0,001	7,63±2,82
Click with squeak	7	7,00±3,16	5,22±2,22	0,01±0,01	6,34±3,05
Whimper	14	3,07±0,73	1,81±0,47	0,03±0,02	2,28±0,57

## Vocal development

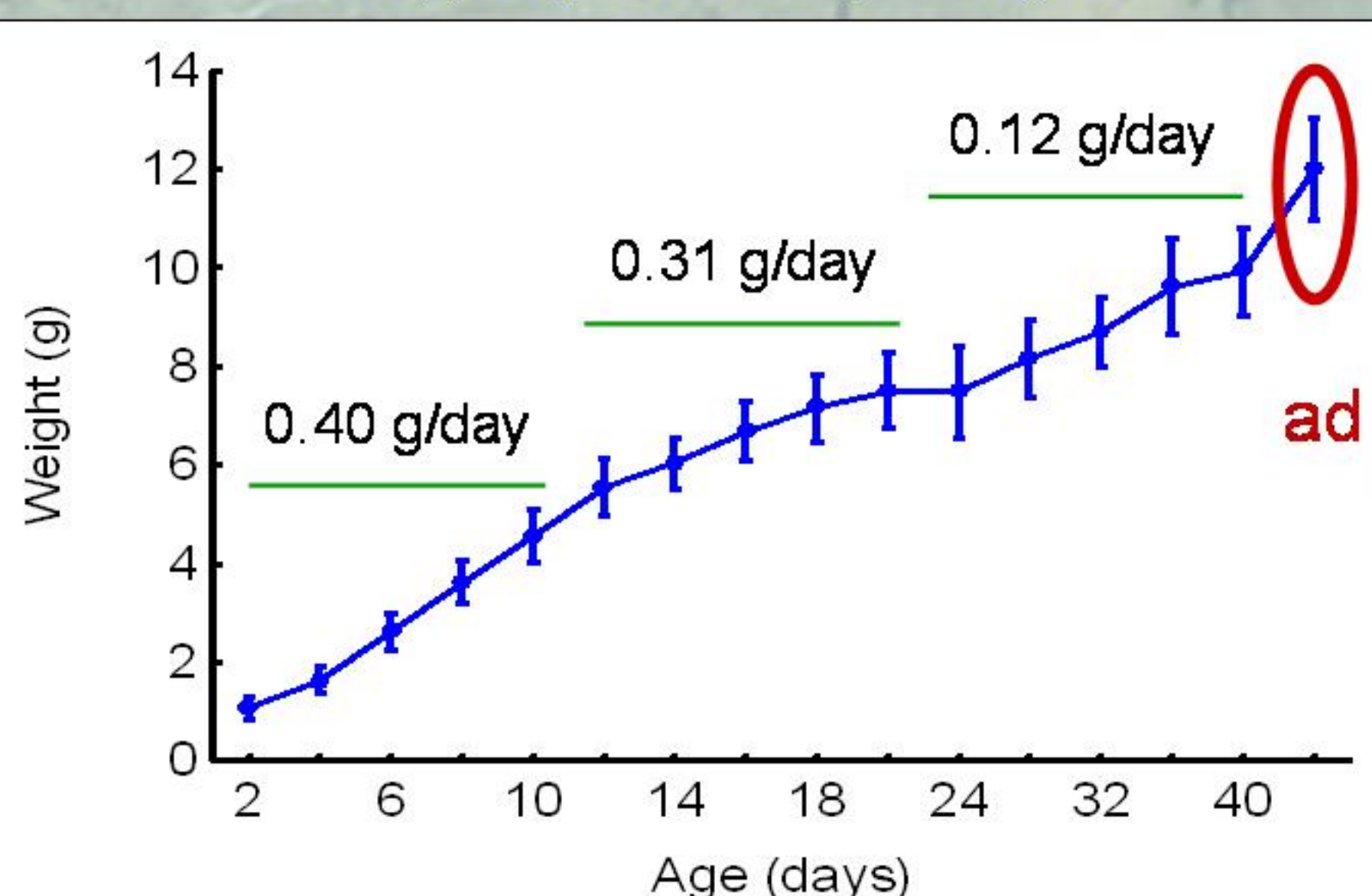


The fundamental frequency of tonal squeaks was the same across ages of young and in adults. Moreover, the fundamental frequency and pulse rate of pulsed screeches even increased with age.

Weight = 0.94±0.27 g  
Body length = 25.4±2.3 mm



## Ontogeny of body weight



Weight = 7.51±1.29 g  
Body length = 62.4±3.2 mm

Therefore, piebald shrews represent another mammalian species with lack of the ontogenetic decrease of frequency from pups to adults.

