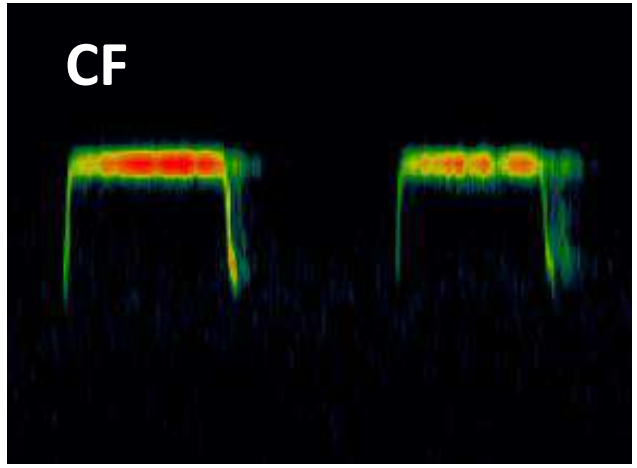
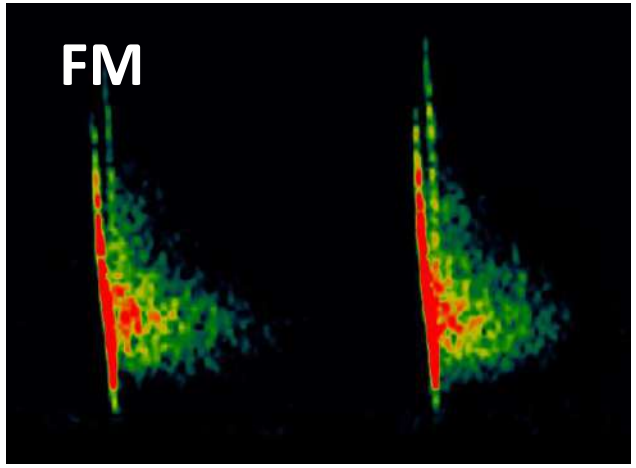
Identification key of bat echolocation calls

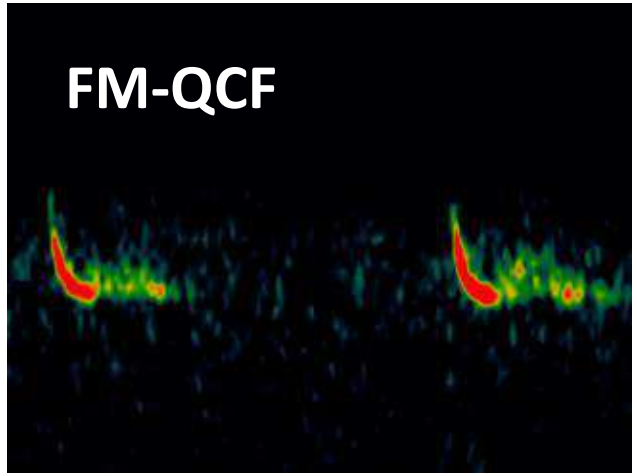
Version 8

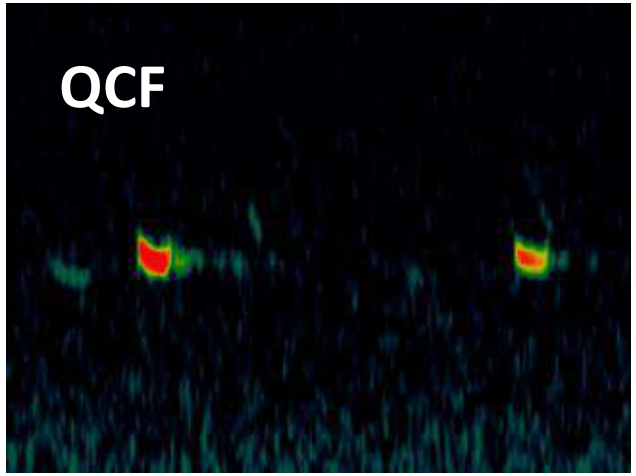
ATTENTION: the species can be easily misidentified. Please be cautious with your classifications.
CONTACT US IN CASE OF DOUBT!

Basic classification of bat echolocation call structure









CF: constant frequency (staple shape)

FM: modulated frequency (almost vertical)

FM-QCF: modulated frequency + quasi-constant frequency (hockey stick shape)

QCF: quasi-constant frequency (almost flat)

Click on the images to go to the corresponding section

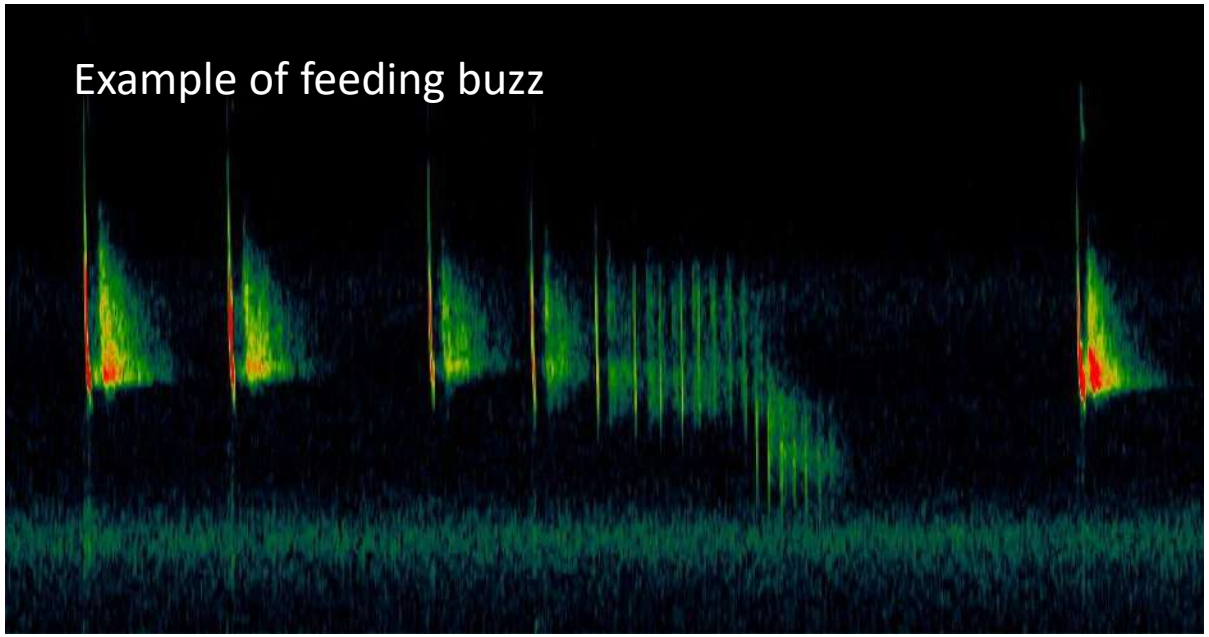
Concepts used in this key: FME (Frequency of Maximum Energy); **harmonic** (each component of the call, found at multiple frequencies simultaneously resembling duplicate pulses or echoes).

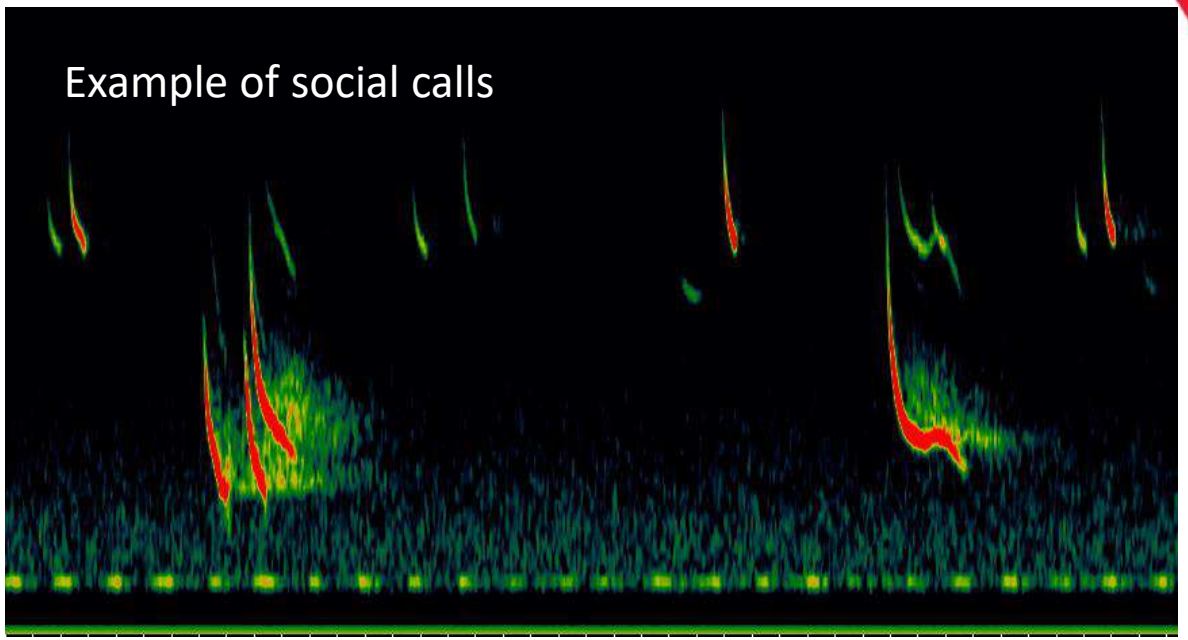
Other acoustic structures not included in the key

Version 8

This key does not include:

1. Feeding buzzes: clusters of calls, generally short, grouped together, sequentially increasing the rhythm and usually preceded by commuting calls at a regular beat rhythm.
2. Social calls: calls with a wide variety of shapes, usually longer than echolocation calls, wavy or with multiple structures and irregular beat rhythm.





Bat echolocation call key

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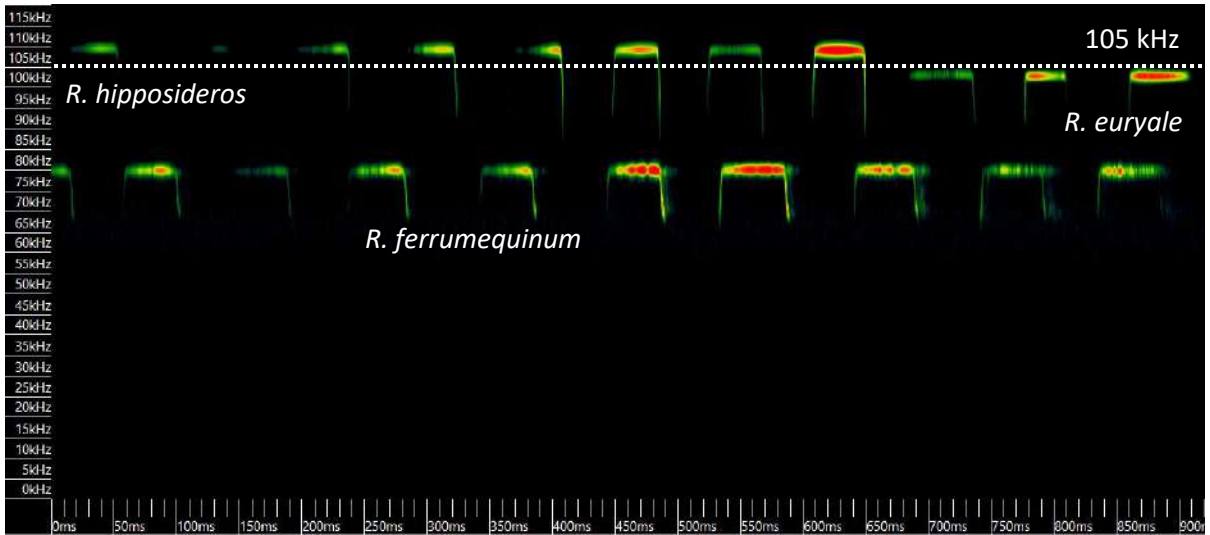
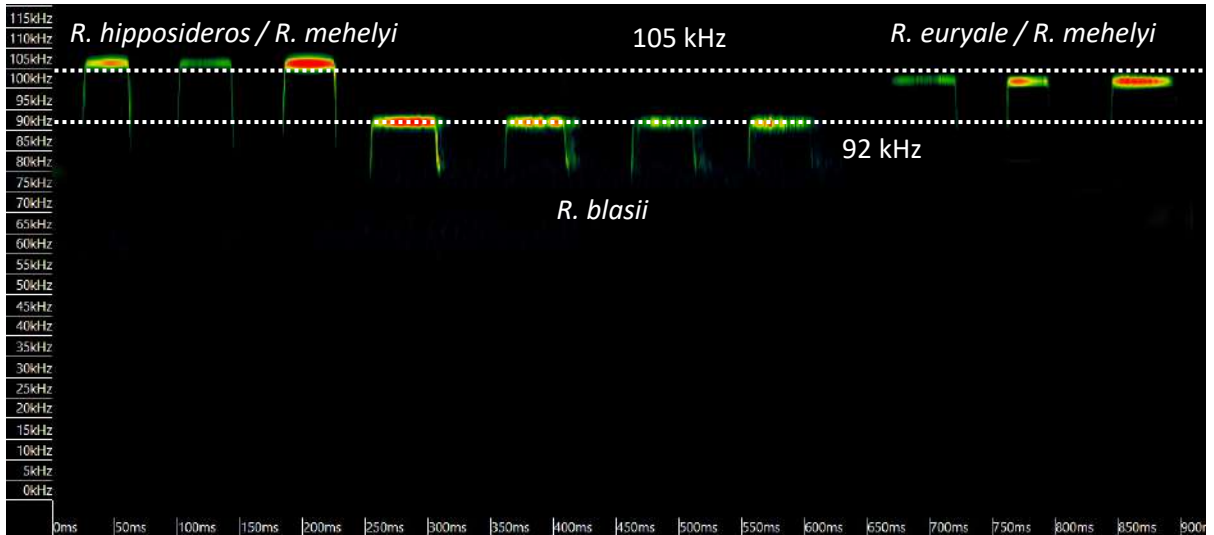
1. Calls with a flat component (CF). Staple shape calls:
   - 1.1. Calls with FME between 75-85 kHz — *Rhinolophus ferrumequinum* (Rhifer)
   - 1.2. Calls with FME between 92-94 kHz — *Rhinolophus blasii* (Rhibla)
   - 1.3. Calls with FME between 100-105 kHz — *Rhinolophus euryale* (Rhieur)
   - 1.4. Calls with FME between 106-114 kHz — *Rhinolophus hipposideros* (Rhihip)

It is very important to confirm the presence of *Rhinolophus mehelyi* in your region.
In case of absence or doubt, you should use the following phonic groups:

   - 1.5. Calls with FME between 100-105 kHz — *Rhinolophus euryale/Rhinolophus mehelyi* (Reurmeh)
   - 1.6. Calls with FME between 106-114 kHz — *Rhinolophus hipposideros/Rhinolophus mehelyi* (Rhipmeh)





Bat echolocation call key

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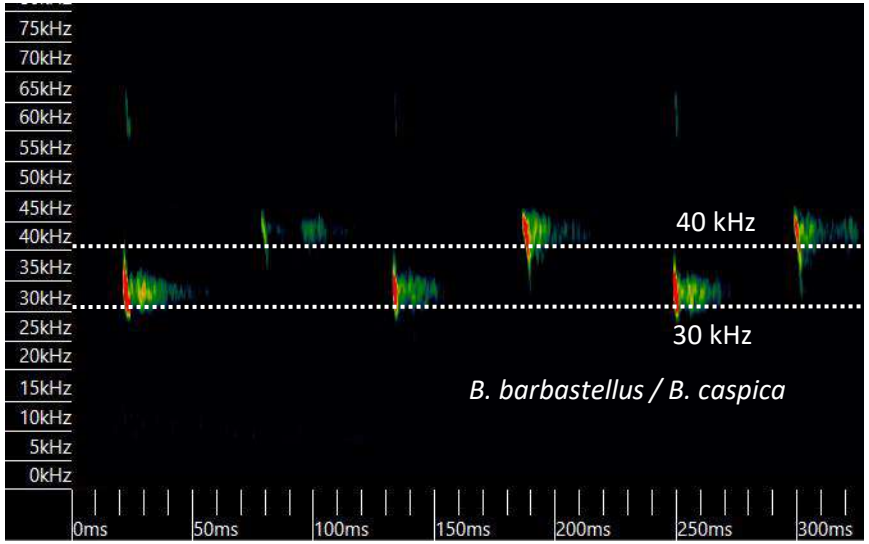
2. Alternate calls at 30 and 40 kHz with different curvature (concave-convex). Sometimes, only one call type is visible at 30 kHz. *Barbastella barbastellus* (Barbar)

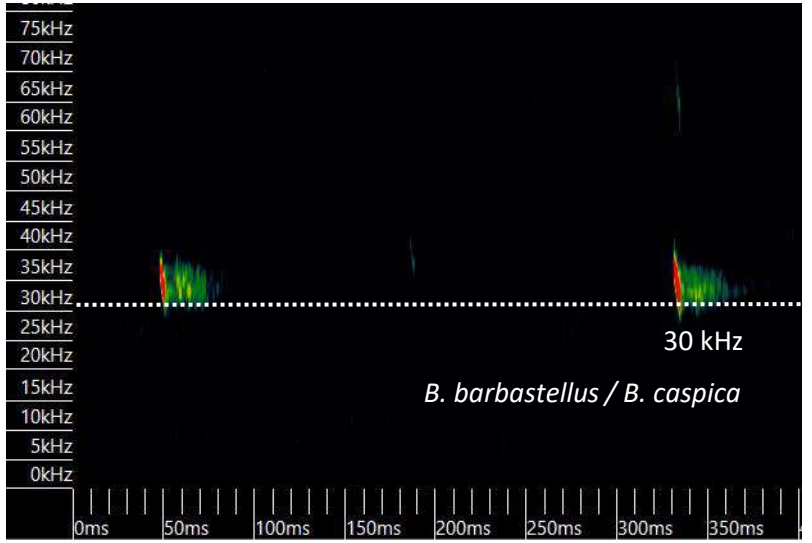
(In the Caucasus region *: Barbastella barbastellus/Barbastella caspica* – (BarSp))

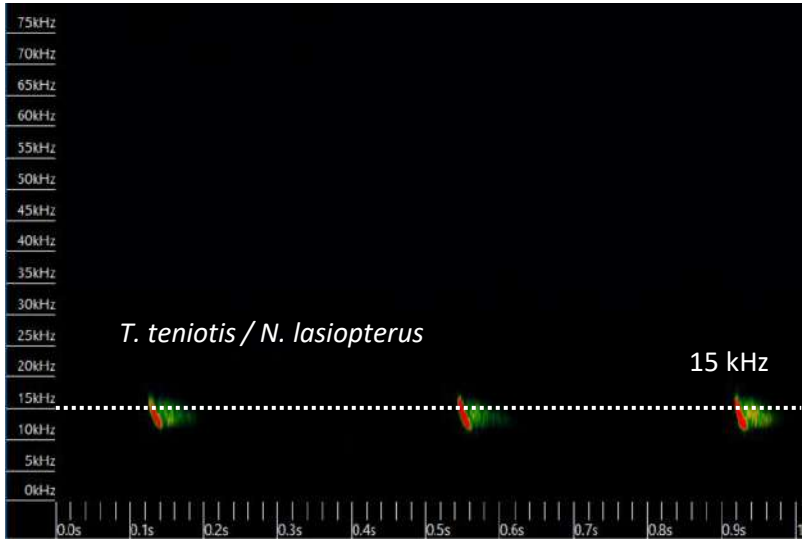
3. Calls with a vertical or modulated component (FM) followed by a curve or flat part (QCF). Hockey stick shape calls.

3.1. Calls with FME between 6-15 kHz *Tadarida teniotis/Nyctalus lasiopterus* (TadNyc)

(Some bird species can be confused with this phonic group. In case of doubt, play it at normal speed)







Bat echolocation call key

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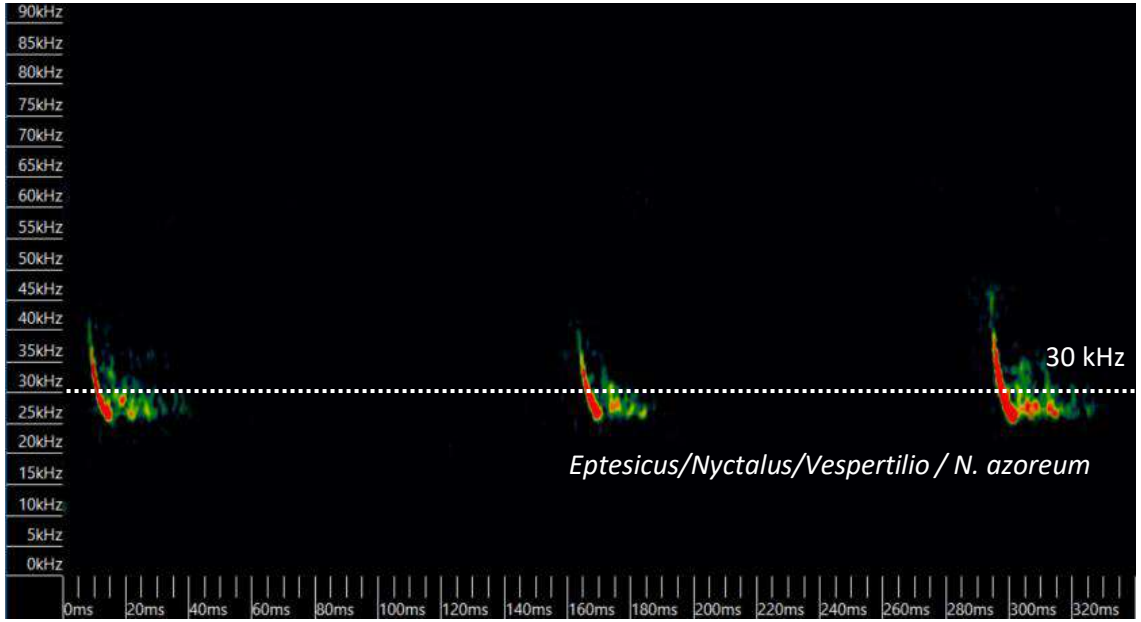
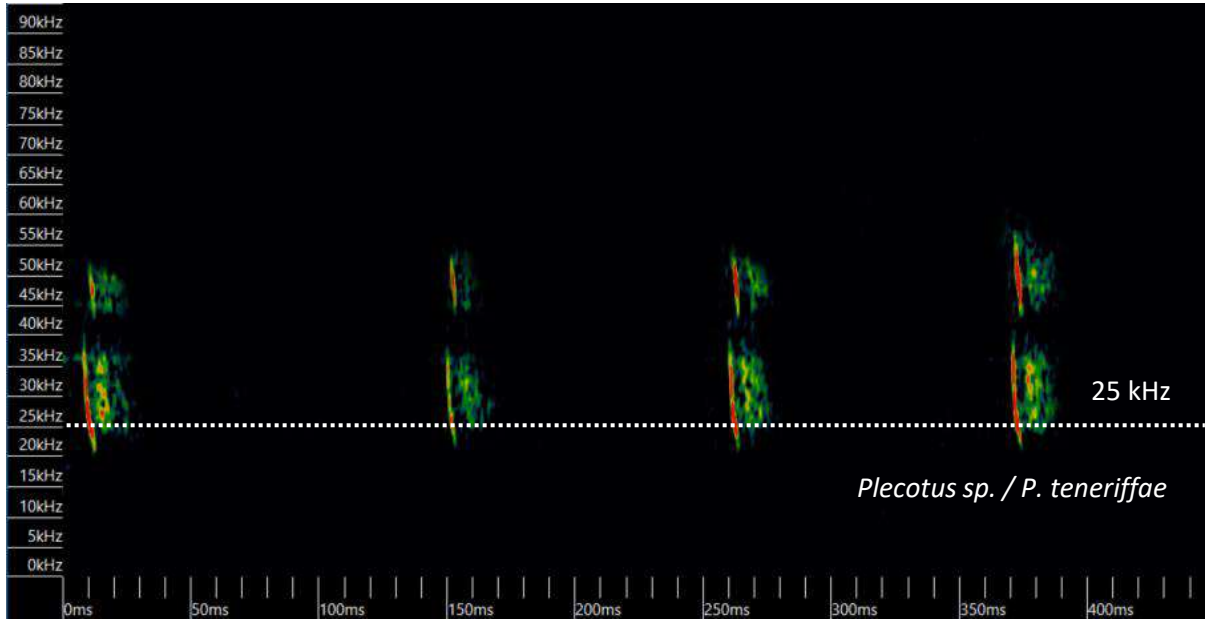
3.2. Generally intense calls with FME between 20-30 kHz
(duration 2,5 -10 ms) *Eptesicus/Nyctalus/ Vespertilio* (EptNycVes)

(In the Azores: *Nyctalus azoreum* – (Nycazo))

3.3. Generally weak calls with FME between 25-30 kHz, and
two components or harmonics (duration 1,2 - 8 ms) *Plecotus sp.* (PleSp)

(In the Canary Islands: *Plecotus teneriffae* – (Pleten))





Bat echolocation call key

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3.4. Calls with FME between 30 -33 kHz — *Hypsugo savii* (Hypsav)

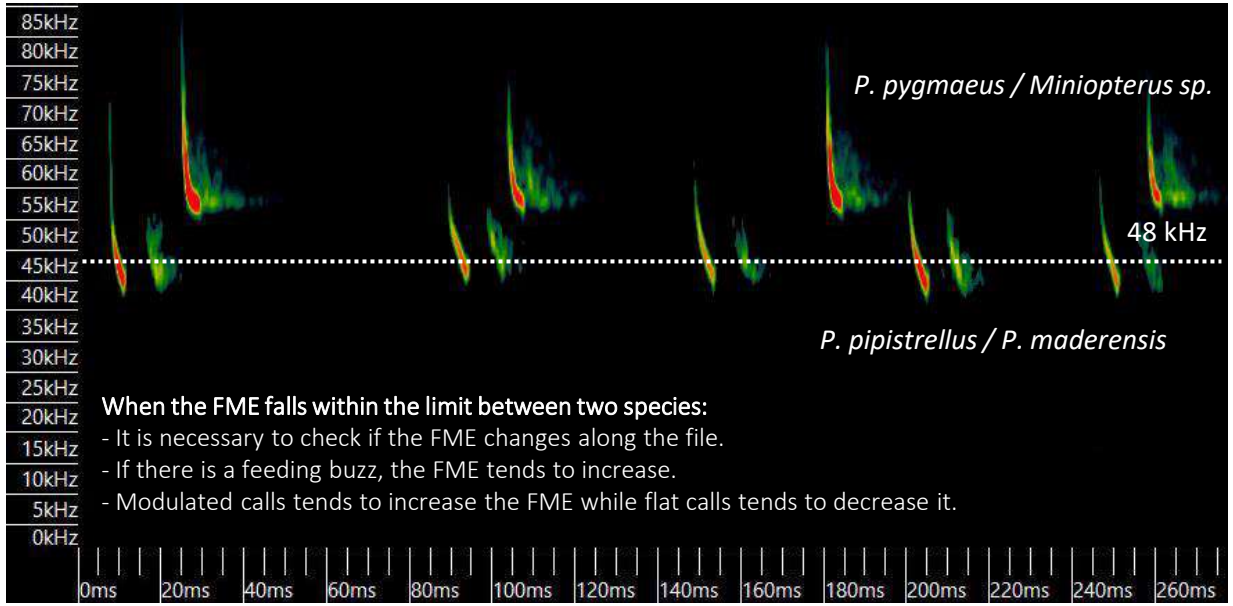
3.5. Calls with FME between 34-40 kHz — *Pipistrellus kuhlii/Pipistrellus nathusii* (Pkuhnat)

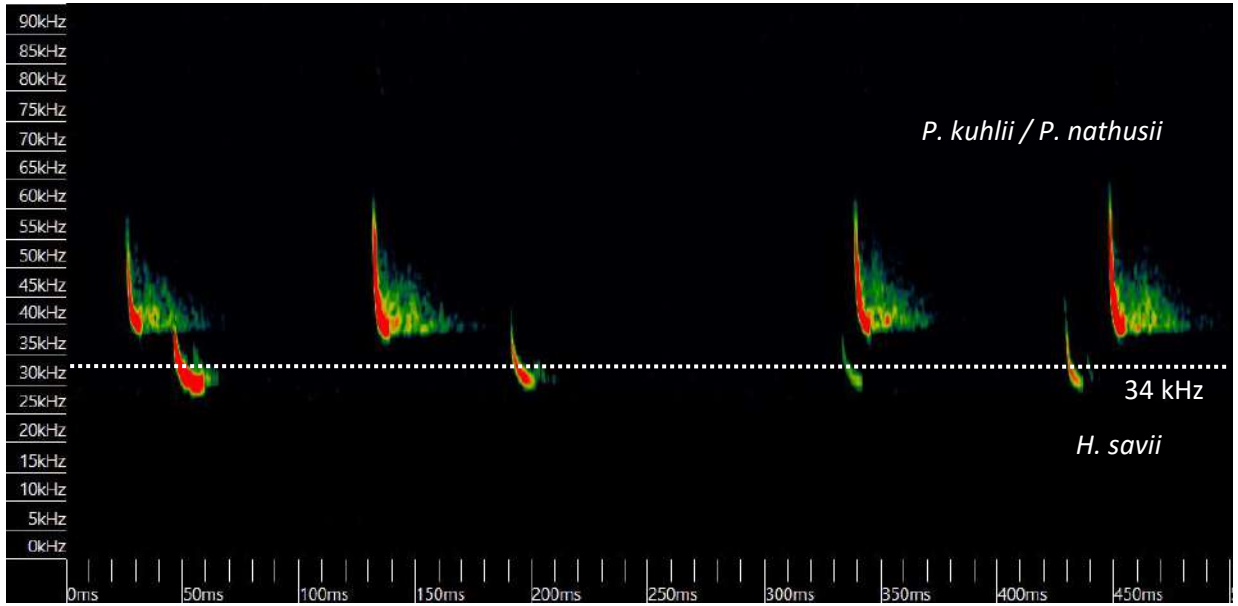
(If there is only one bat species present, it should be classified as *P. kuhlii* – (Pipkuh) or *P. nathusii* – (Pipnat))

3.6. Calls with FME between 42-48 kHz — *Pipistrellus pipistrellus* (Pippip)

(In the Canary Islands or Madeira*: Pipistrellus maderensis* – (Pipmad))

3.7. Calls with FME > 48 kHz — *Pipistrellus pygmaeus/Miniopterus sp.*(PpygMin)





Bat echolocation call key

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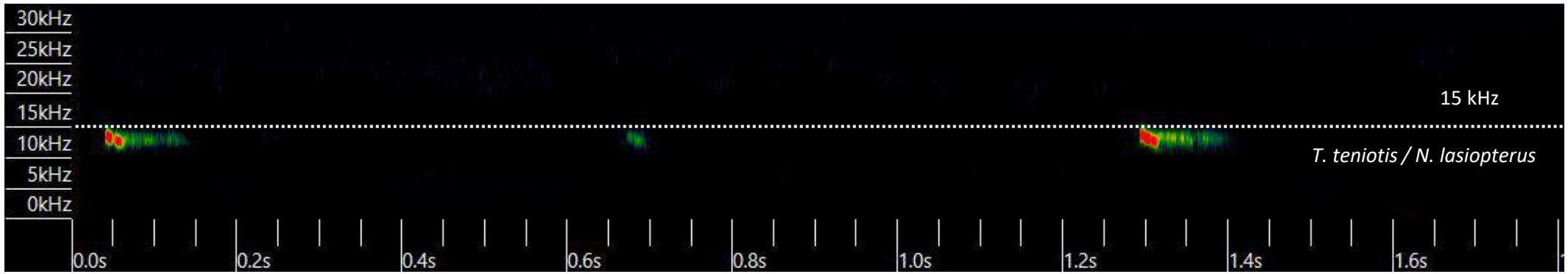
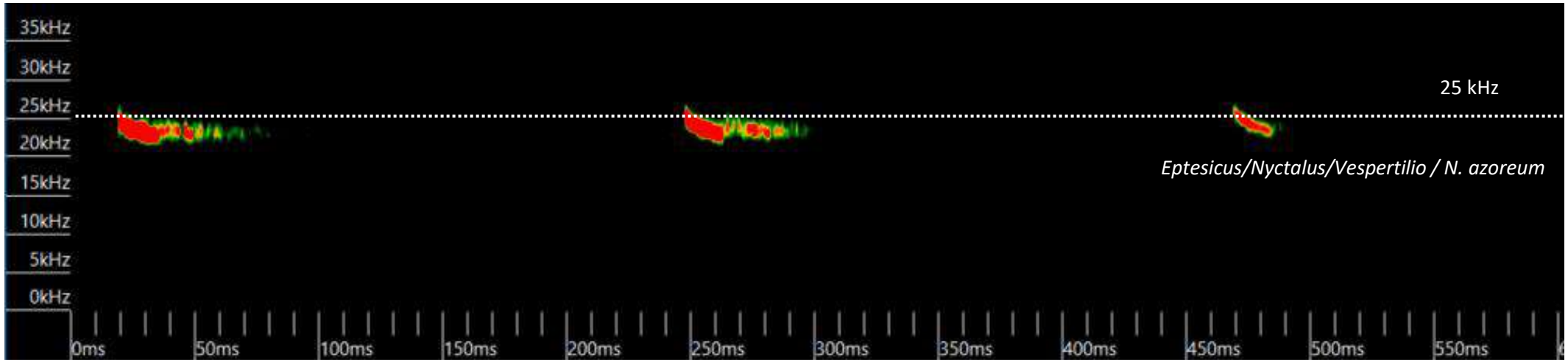
4. Calls with only the quasi-constant frequency component, almost flat

   4.1. Calls with FME between 6-15 kHz — *Tadarida teniotis/Nyctalus lasiopterus* (TadNyc)

   4.2. Calls with FME between 20-25 kHz — *Eptesicus/Nyctalus/Vespertilio* (EptNycVes)

(In the Azores: *Nyctalus azoreum* – (Nycazo))





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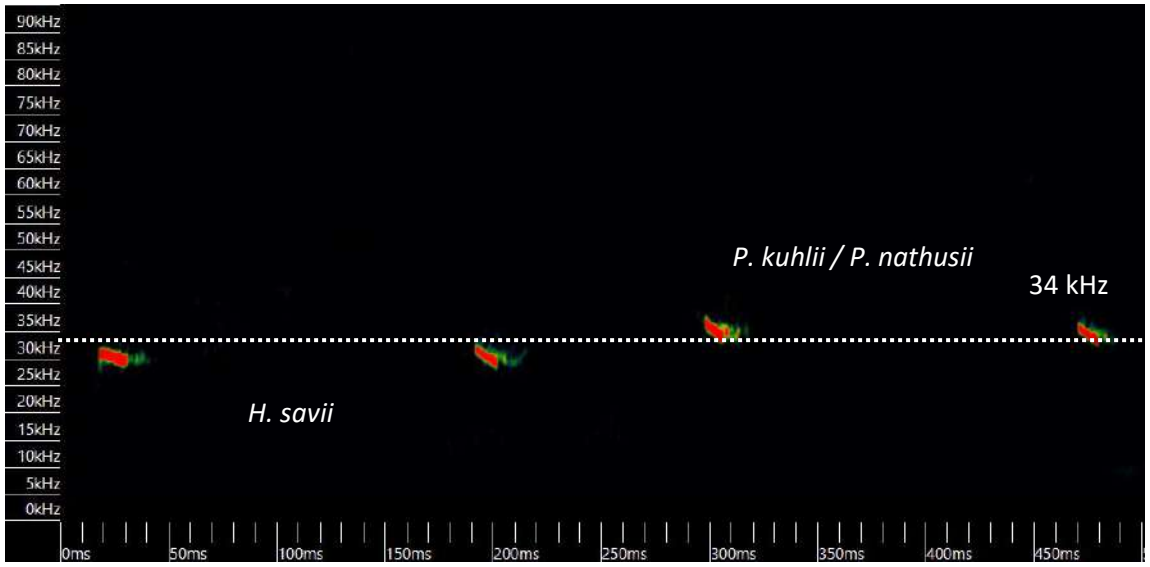
4.3. Calls with FME between 30 -33 kHz — *Hypsugo savii* (Hypsav)

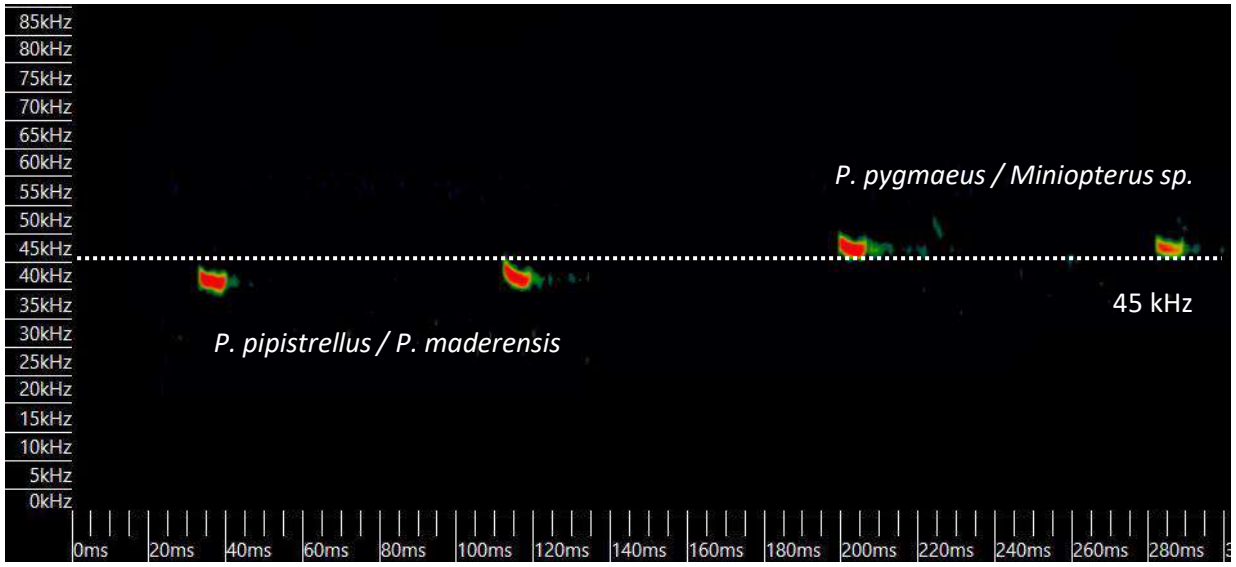
4.4. Calls with FME between 34-40 kHz — *Pipistrellus kuhlii/Pipistrellus nathusii* (Pkuhnat)

4.5. Calls with FME between 41-45 kHz — *Pipistrellus pipistrellus* (Pippip)

(In the Canary Islands or Madeira: *Pipistrellus maderensis* – (Pipmad))

4.6. Calls with FME > 48 kHz — *Pipistrellus pygmaeus/Miniopterus sp.* (PpygMin)





Bat echolocation call key

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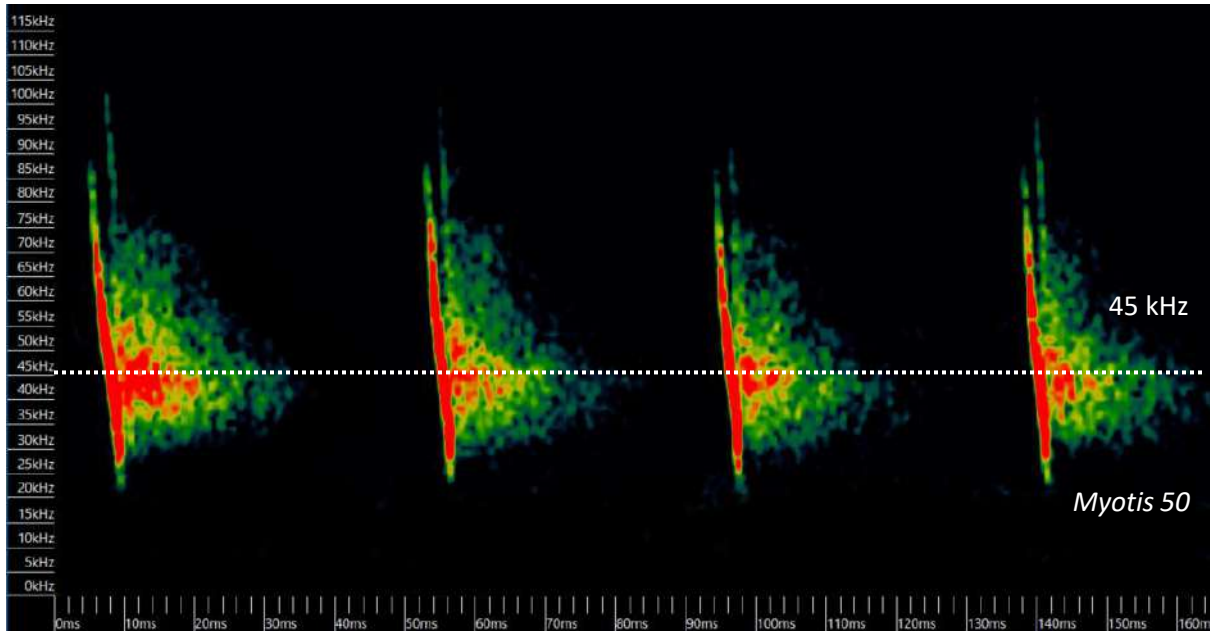
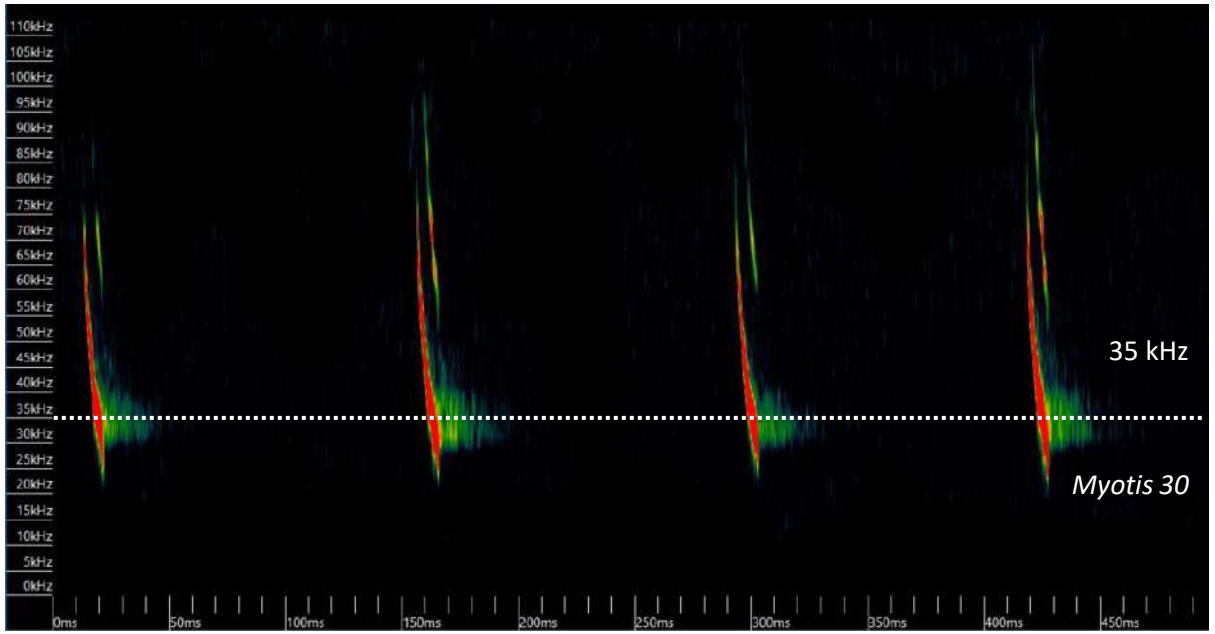
5. Calls with only the vertical or modulated component (FM). No hockey stick shape calls

5.1. Calls with FME between 45-70 kHz — *Myotis 50* (Myo50)

5.2. Calls with FME between 25-35 kHz — *Myotis 30* (Myo30)

***You must confirm that calls do NOT have hockey stick shape by using the horizontal zoom.**





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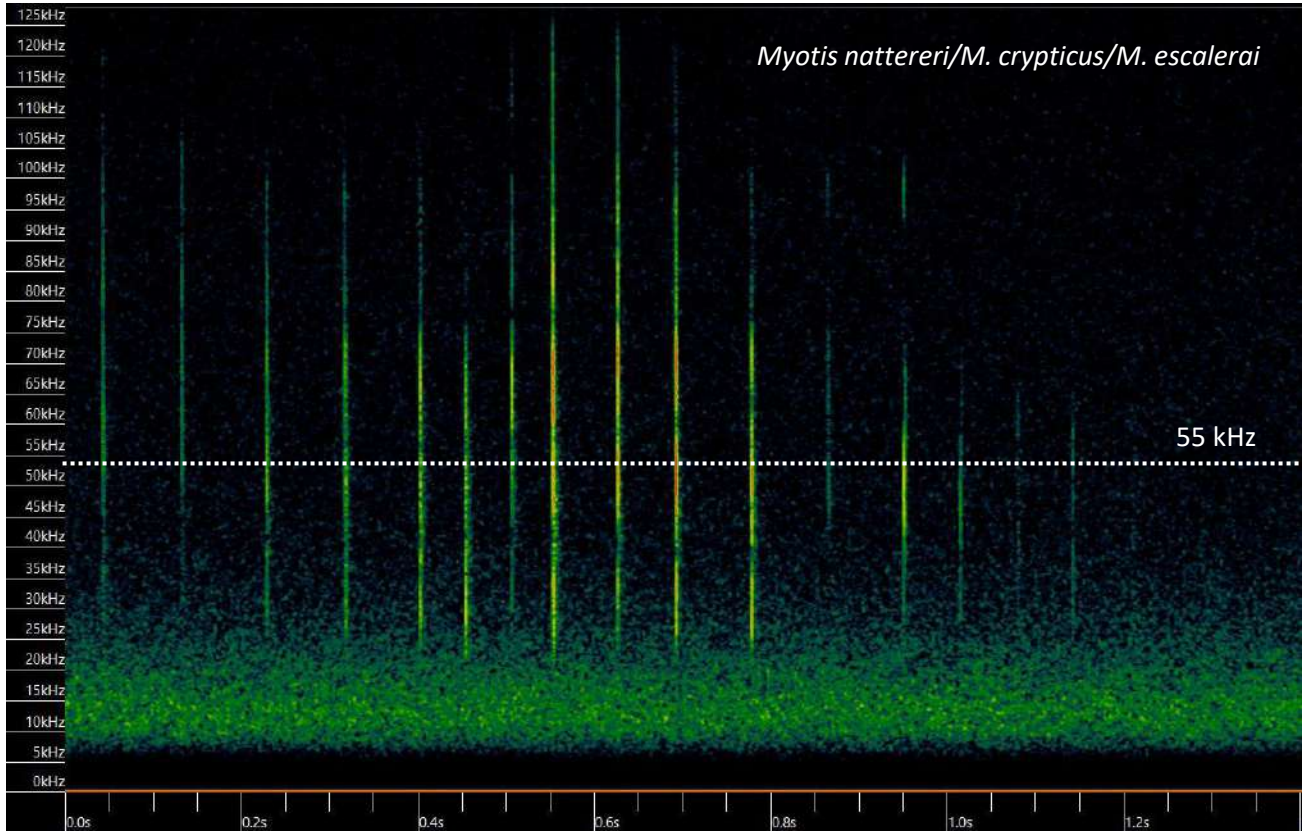
5.3. Calls with FME between 40-70 kHz, fully vertical, starting at 110-120 kHz and ending at 10 -20 kHz.

Myotis nattereri/Myotis crypticus/Myotis escalerai (Mnat)



Annex: Advanced acoustic identification

Version 8

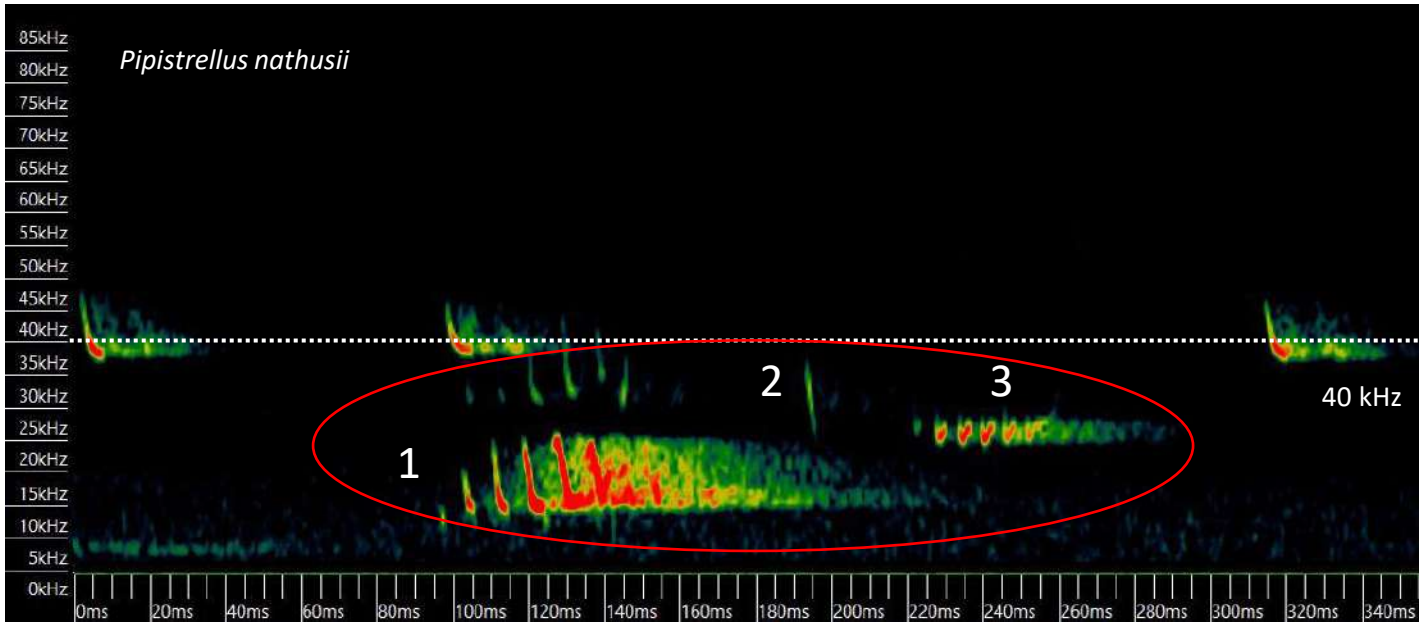
Social calls of *Pipistrellus nathusii and P. kuhlii*

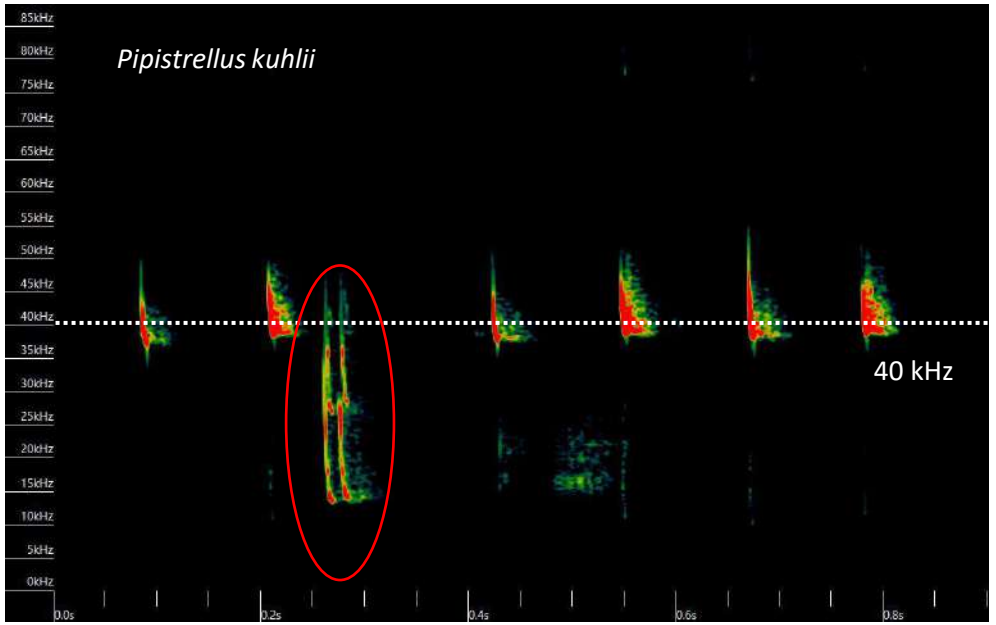
- Social calls with three differentiated components. The first one is a group of calls at lower frequencies (1), the second is a single and highly modulated call (2), and the third and final is a group of 4 or 5 calls at higher frequencies than the previous ones (3).

Pipistrellus nathusii (Pipnat)

- Two single social calls with FME between 12 and 16 kHz

Pipistrellus kuhlii (Pipkuh)





Annex: Advanced acoustic identification

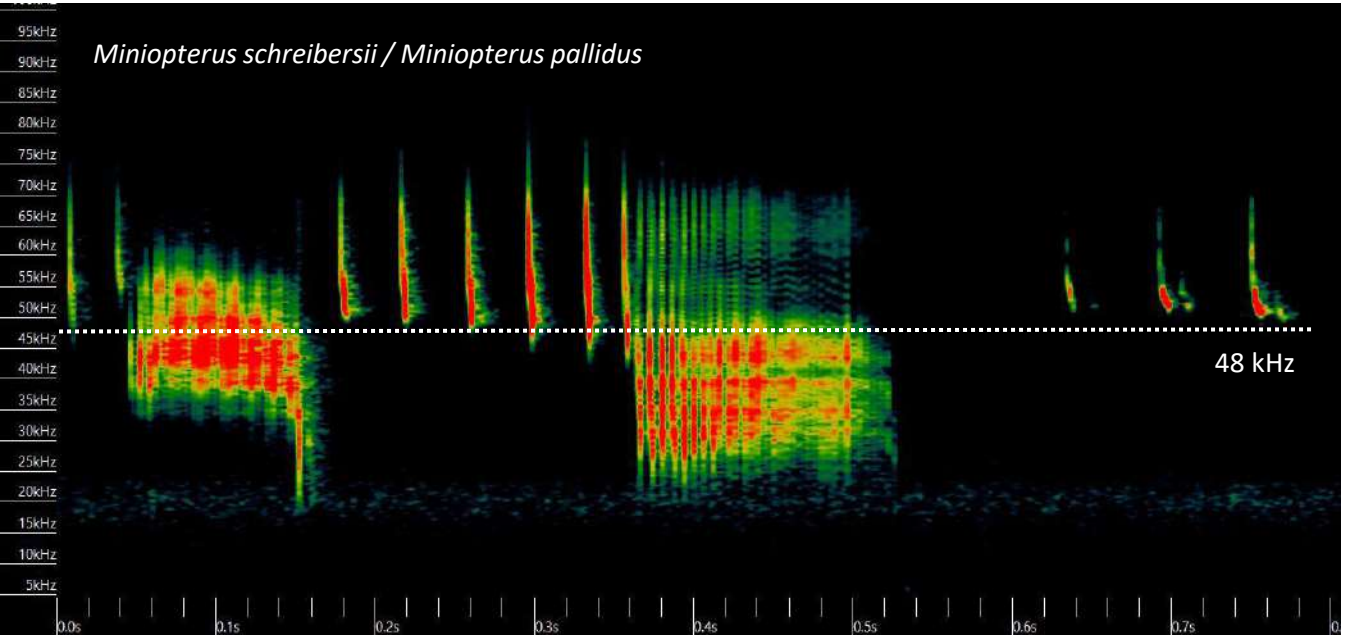
Version 8

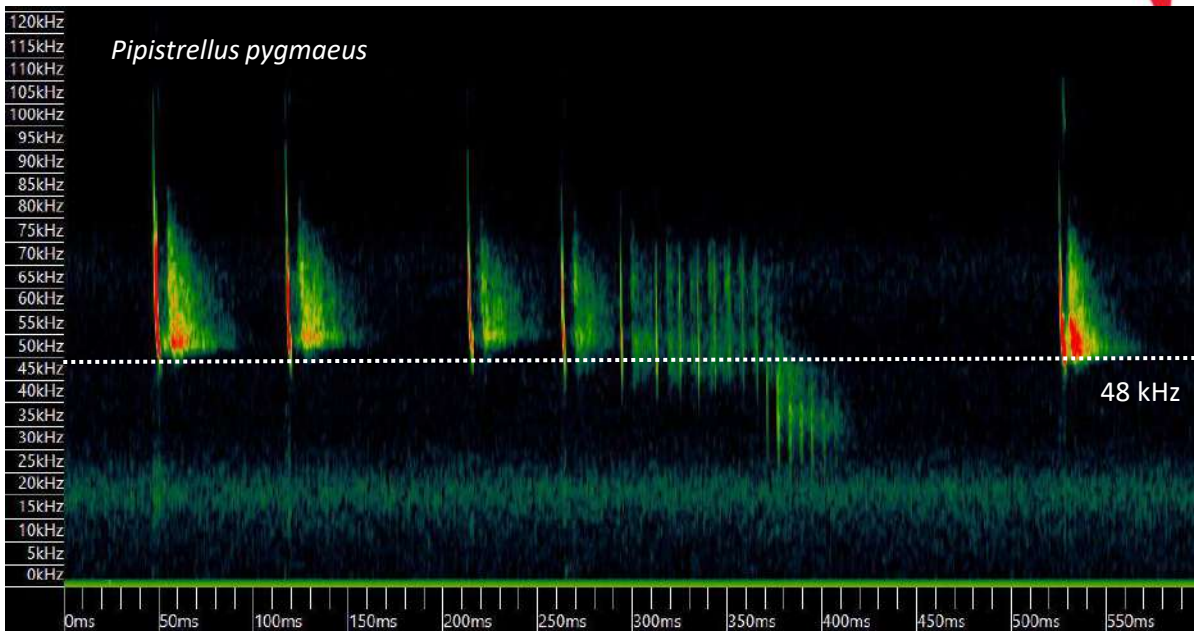
Identification of *Miniopterus sp.*

- Feeding buzz with all the similar pulses and without the final approach phase found in *Pipistrellus pygmaeus*.

Miniopterus schreibersii (Minsch)

(In the Caucasus region: *Miniopterus schreibersii/Miniopterus pallidus* (MinSp))





Annex: Advanced acoustic identification

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Specific cases

- Calls with FME between 21 and 26 kHz in Turkey.

Taphozous nudiventris (Tapnud)