Monitoring of bat activity near the entrance of a roost of pond bats *Myotis dasycneme* in Oostkerke (Damme) at the end of June and beginning of July 2019

Marc Van De Sijpe

Introduction

On 21 May 2017, a small maternity colony of the pond bat (*Myotis dasycneme*) was found by Bob Vandendriessche with the help of telemetry, after the capture of an adult female, named 'Sterre', by the bat group Natuurpunt vzw. This very small maternity colony of an estimated ten animals was located in a house in the Sint-Kwintenstraat in Oostkerke. Hunting pond bats were observed above the major waterways and ponds near the colony, including the Damse Vaart, the Schipdonk Canal, the Leopold Canal, the town moats of Damme, and occasionally also above smaller ditches in the grasslands that lie next to the major waterways. In the summer of 2019, another investigation was conducted with catches, telemetry and detectors. The colony was then found in a house, a few houses away in the same street. The ridge at the back of the house is one of the exit openings. To get an idea of the activity pattern of the pond bat near the roost entrance, an automatic detector (Wildlife Acoustics SM4) was installed for 7 consecutive nights, from 29 June to 5 July 2019, opposite the exit opening at a distance of about ten meters (in the parking lot of the restaurant-hotel 'Het Oud Gemeentehuis'). A second automatic detector, also an SM4, was hung twenty meters away in an apple tree in the garden of the restaurant-hotel, with the intention of checking which species forage in the garden, and whether the pond bats from the nearby colony also continue to forage here for a while before moving to the more traditional hunting grounds (large open water). Hunting in the nearby gardens by the pond bat 'Sterre' was observed by Bob Vandendriessche during the first temetric study, shortly after emergence from the roost.

Yellow arrow left side: One of the entrances of the small maternity roost of pond bats (Eén van de uitvliegopeningen van de kraamkolonie meervleermuizen).
Yellow arrow right side: Location of the automatic detector, the microphone is directed toward the entrance. (Locatie van de automatische detector, de microfoon is naar de uitvliegopening gericht)

The expected pattern, even of fairly small maternity colonies like this, is that after sunset, the animals leave the colony one by one and leave for the hunting grounds. In April/May when the maternity colony is formed and when there are no young in the colony yet, there is usually a quiet period after the last bat has left the colony (Voûte 1972). When the weather is favorable, the adult pond bats stay in the hunting grounds all night during that period and only return to the colony in the morning. Before flying back inside, the bats continue to fly in circles near the entrance opening for a long time upon arrival. If more and more animals return towards the morning, a swarm of bats can form. This swarming behavior is striking, especially in large colonies. As it gets further light, the animals enter the roost one by one. Although a species such as the pond bat can continue to forage in the spring at temperatures just above freezing low above the water surface, where it remains slightly warmer, many animals return to the colony earlier in unfavorable weather (cold, rain, wind) and then stay in the colony for the rest of the night. Usually the first young are born in the pond maternity colonies end of May, beginning of June. From that moment on, shortly after emergence, there are already some adult females that return to the colony to rear their young. There is then a regular coming and going during the night to be observed at the entrance of the colony. At the beginning of July, the young become more and more independent, start to fly out with the adults. Research in the Netherlands by A-J Haarsma has shown that from June 20 some adult females have already left the maternity colony and can then mix with groups of males. The research presented below used automatic detectors is situated in the period when at least some of the adult females and juveniles are still present in the maternity colony, and a number of the juveniles will already fly out.

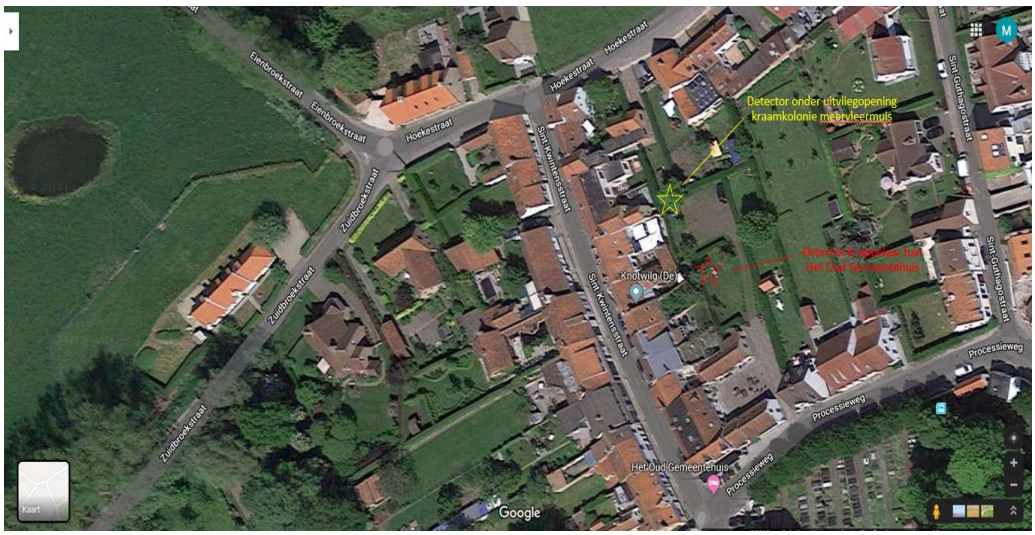
Yellow arrow: Location of the (second) automatic detector, the microphone directed towards the garden lawn. (Locatie van de automatische detector, de microfoon is naar het grasveld gericht).

In addition to the pond bat, the opportunity was also taken to monitor other bat species present. In a house on the corner of the same street there is a colony of the common pipistrelle (*Pipistrellus pipistrellus*). In and around the village and along the nearby large watercourses, various other bat species were observed using various methods (catches, detectors), namely the common nocule (*Nyctalus noctule*), Leisler's bat (*Nyctalus leiseri)*, the parti-coloured bat (*Vespertilio murinus*), the common serotine (*Eptesicus* serotinus), Nathusius' pipistrelle (*Pipistrellus nathusii*), Kuhl's pipistrelle *(Pipistrellus kuhlii*), brown long-eared bat *(Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), Whiskered/Brandt's bat (*Myotis*

mystacinus/brandtii), Natterer's bat *(Myotis nattereri)* and greater horseshoe bat (*Rhinolophus ferrumequinum*). Some of the species mentioned above prefer to hunt above water, another part in forests, parks, orchards and gardens. Some species can also be found above pastures grazed by cattle.

Methods

Each night, minute by minute, it was noted which species of bat the detector could register in the vicinity of the microphone. The detectors, recording ultrasounds, were set up with a maximum recording time of 7 seconds. If bats fly continuously around the microphone during 1 minute emitting non stop ultrasounds, the detector will take 7 to 8 recordings per minute. The data were analysed manually and all plotted in graphs, see below. From bottom to top: the red dots represent the contacts of the common pipistrelle (*Pipistrellus pipistrellus* , abbreviated Pippip), the grey dots of the Nathusius' pipistrelle (*Pipistrellus nathusii*, Pipnat), the yellow dots of the common noctule (*Nyctalus noctula*, Nycnoc), the reddish-brown dots of the Leisler's bat (*Nyctalus* leisleri), the blue dots of the common serotine (*Eptesicus serotinus,* Eptser), the green dots of the pond bat (*Myotis dasycneme*, Myodas) and the orange dots of the Daubenton's bat (*Myotis daubentonii*, Myodau). Because the research mainly focused on the pond bat in particular, for the registrations at the exit opening of the maternity colony, not only the contacts of animals in flight (green dots) – shown by it's typical echolocation signals - were noted, but also separately those containing social calls of pond bats (purple dots), those of recordings with more than two pond bats flying together, an indication of swarming behaviour, brown dots), and finally sounds of pond bats when immobile in the roost (but which have not yet flown out, black dots). The latter type of sound can be distinguished from a flying individual quite easily because of the more quiet nature of the sonar sounds and the frayed appearance of the signal; echolocation from behind the roof tiles, so many obstacles between the bat's mouth and the microphone of the automatic detector. These calls were found in most cases just before the first bat emerged.



Yellow star : detector near the entrance of the pond bat maternity roost (Detector onder de uitvliegopening kraamkolonie meervleermuis).

Red star: detector in apple tree in the garden of hotel-restaurant Het Oud Gemeentehuis (Detector in appelaar tuin Het Oud Gemeentehuis).

In the spring of 2019, one of the automatic detectors was placed in the poplar alley along the Zuidbroekstraat, with the microphone pointing in the direction of the grassland behind it (dark). Previous research showed that several bats commute here between Leopold/Schipdonk Canals on the one hand and the village of Oostkerke with its surrounding castle park on the other. This detector remained continuously at the scene from 18 February 2019 to 10 April 2019 (for 52 nights). The intention was to find out when the first pond bats appeared here again after the inactive winter period, an indirect indication of when the first pond bats arrive or wake up in the summer colony. The winter roosts of these pond bats are unknown so it remain unclear if they hibernate in a distant hibernaculum and migrate to the summer roost during spring or if they spent the winter hibernating in the same house as where the summer colony resides. The first pond bat was recorded on 1 April 2019. The following nights there were always contacts with (several) pond bats, commuting over the grassland along the poplar alley.

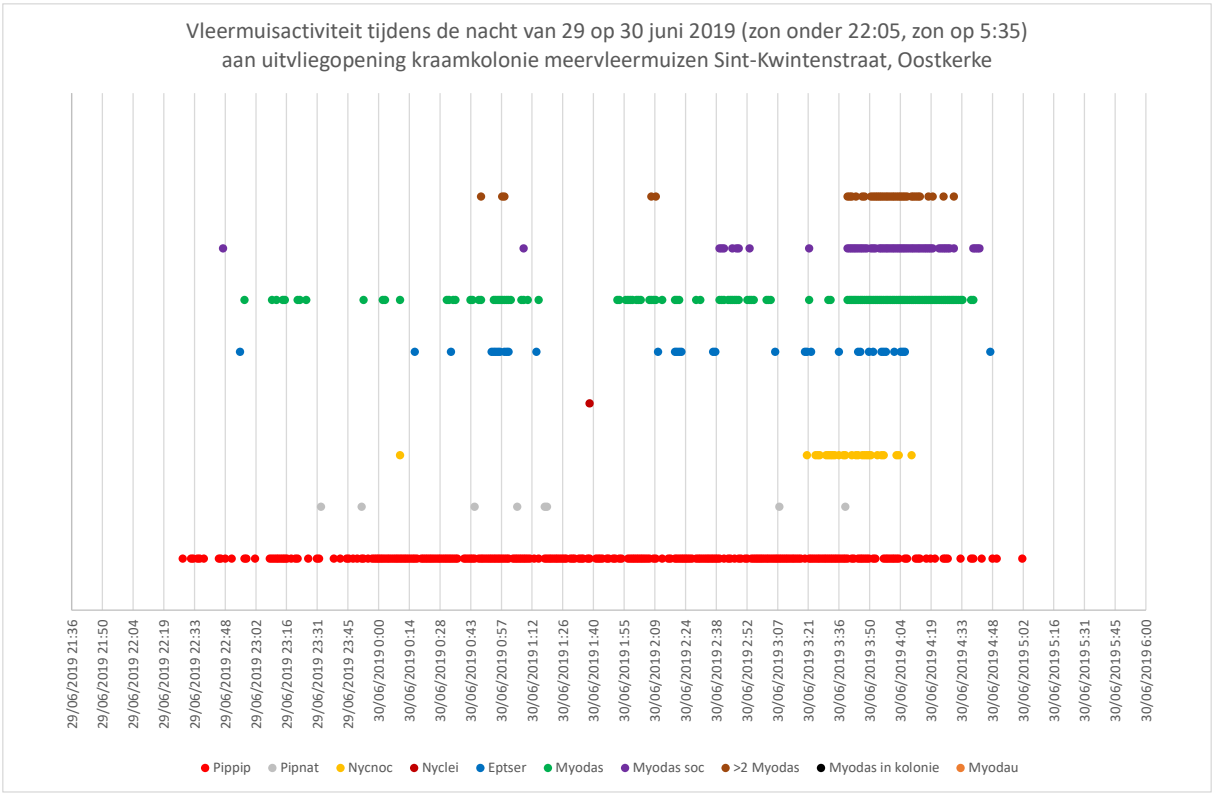
Results

During the seven consecutive nights from 29 June to 5 July 2019, a total of 15107 recordings were taken at the back of the house where the nursery colony of the pond bat is located, and 6010 from the apple tree in the garden of Het Oud Gemeentehuis.

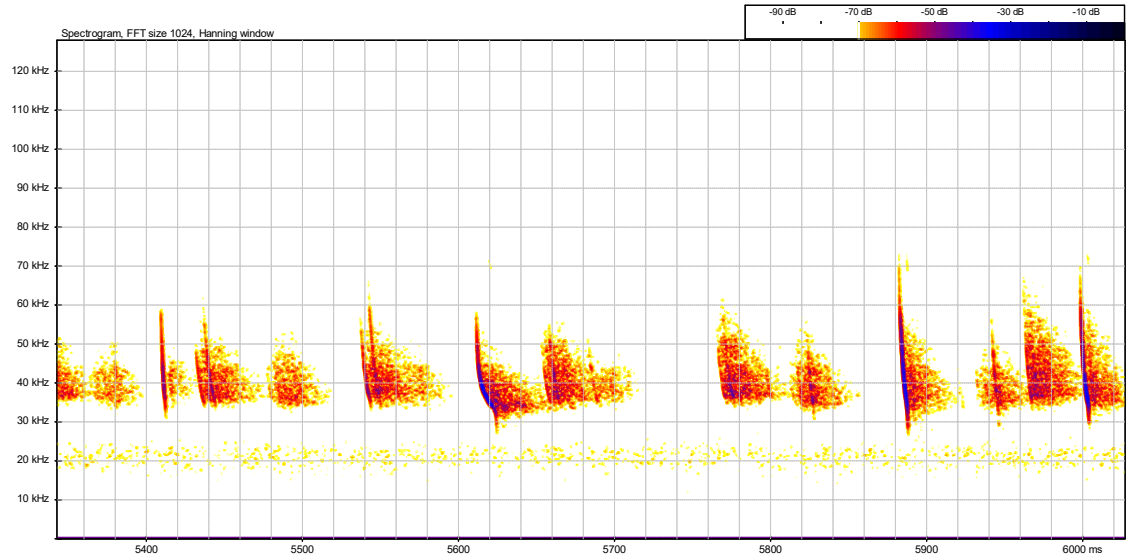
A. Monitoring at the entrance of the roost

A1 : Night of 29 to 30 June 2019

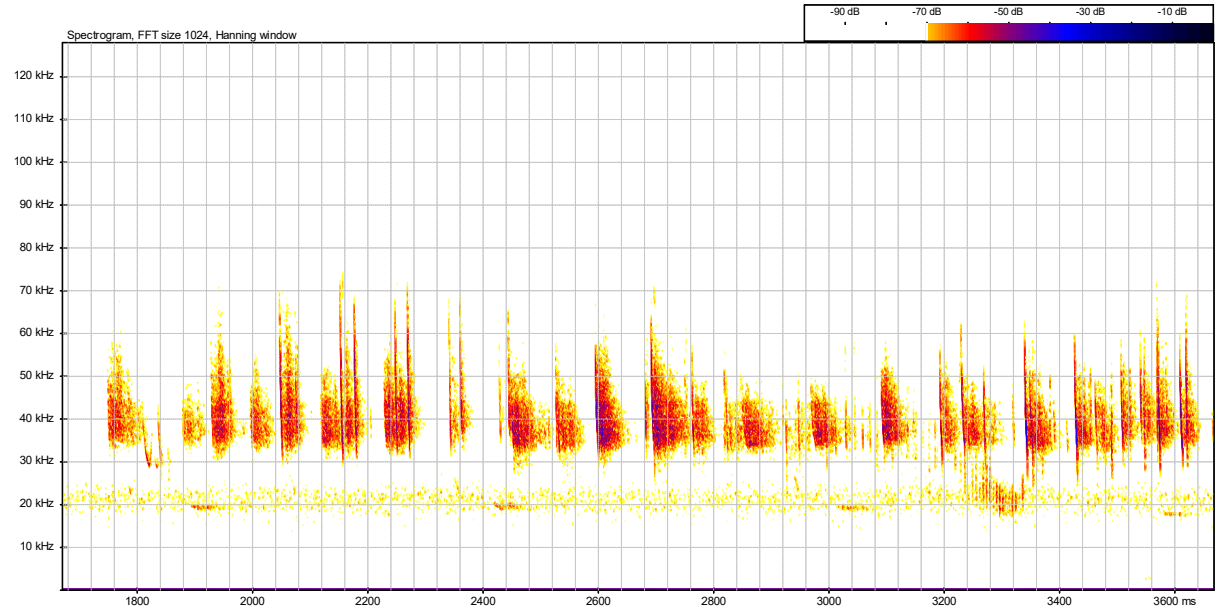
The common pipistrelle, of which a colony is known on the same street, began its flight activity that night 27 minutes after sunset and the last contact was 33 minutes before sunrise. During 236 minutes of the total of 451 minutes available between sunset and sunrise, activity of this species was detected, which is 58% of the available time. The graph shows that between 0:00 and 4:00 there was almost continuous activity of common pipistrelle in the vicinity of the detector. The Nathusius' pipistrelle was not very active during this night at that location and was only observed during 8 minutes, less than 2% of the available time. The first Nathusius' pipistrelle contact of that night was only at 1h28min after sunset. The common noctule was detected for 27 minutes of the 451 minutes available during this night. There was continuous activity between 3:20 and 4:00, and only one recording before that. The common noctule came above the village center to forage here only in the late night. A large summer colony of 60 to 90 common noctules is known in a hollow tree along the Damse Vaart, about 2 km away. In the middle of the night, there was one recording of a Leisler's bat. In itself not an isolated case because this species was previously observed during a field excursion with manual detectors in the Zwin natural reserve, about 10 km from this location. The common serotine was recorded for 36 minutes (8% of the time), the first contact was 50 minutes after sunset. The common serotine too was more active here during the second half of the night. During 128 of the 451 minutes (28% of the time), the detector recorded activity of pond bat(s). The first recording of echolocation pulses from a flying pond bat were taken at 22:57, 52 minutes after sunset, and the last one at 6:34, 56 minutes before sunrise. The graph clearly shows that between 3:40 and 4:30, echolocation pulses from multiple flying animals and also social calls were continuously recorded. This time interval, here between two and one hour before sunrise, corresponds to the early morning swarm period, during which the pond bats return to the roost site, swarm around the entrance and finally enter the roost.



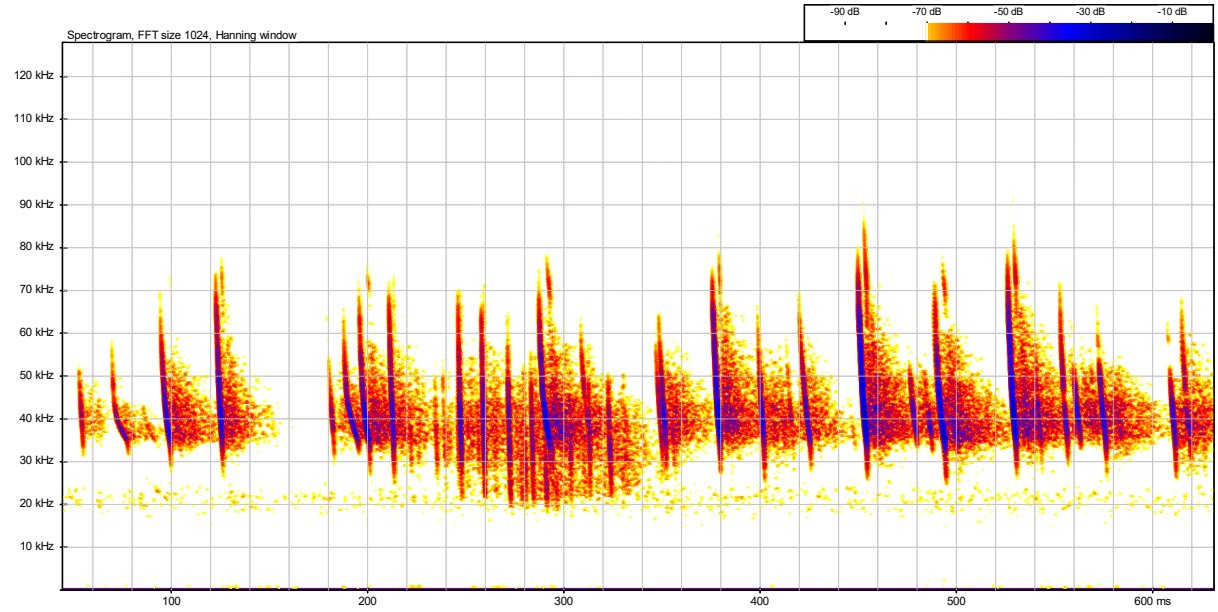
A1. Bat activity during the night of 29 to 30 June 2019 (sunset 22:05, sunrise 5:35) near the entrance of the pond bat maternity roost in Oostkerke.



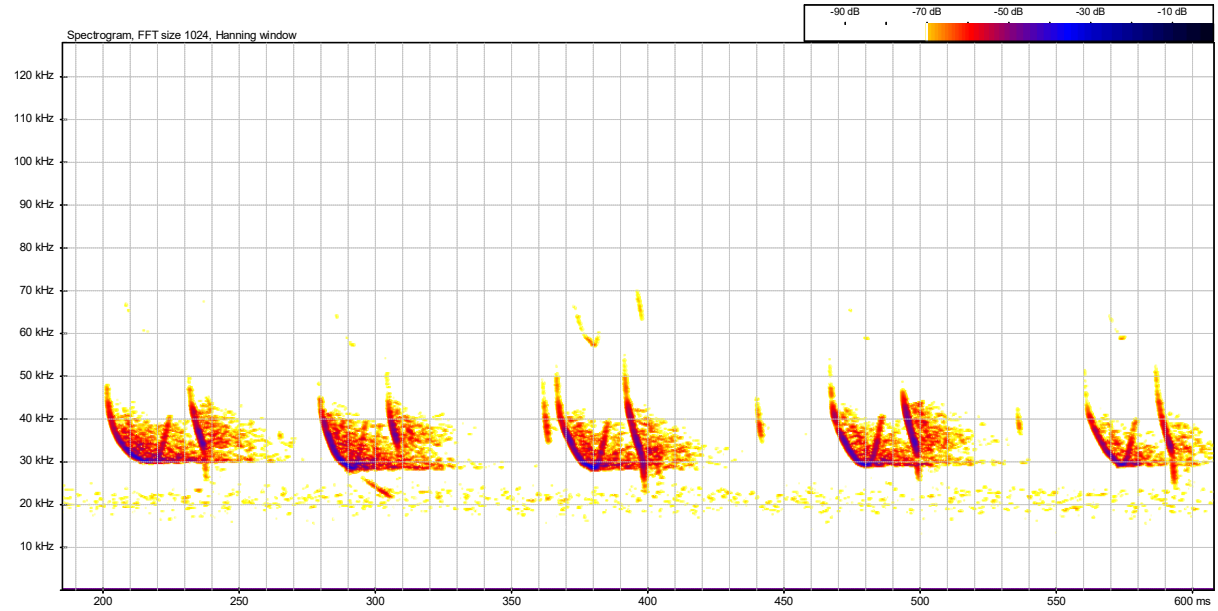
Recording from 30 June 2019 at 04:00: a 15 ms long pond bat echolocation pulse in between the more frequent shorter pulses during the morning swarming around the maternity roost.



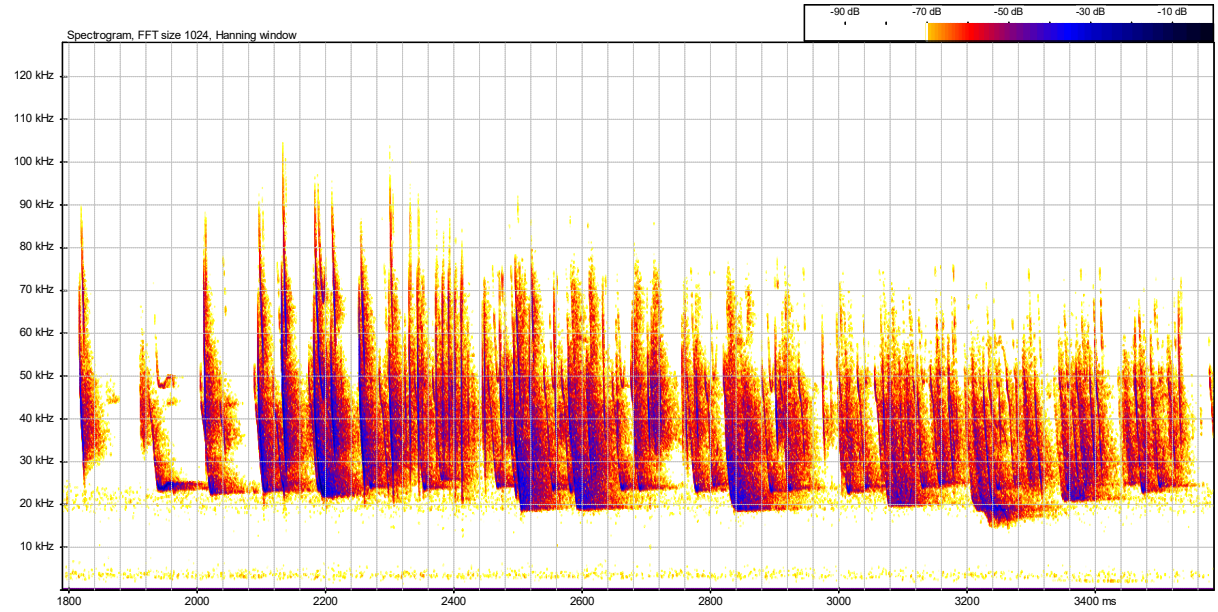
Recording from 30 June 2019 at 04:01: pond bat echolocation pulses during morning swarming around the maternity roost, the short pulses between 2800 and 3400ms are probably from an individual that is landing.



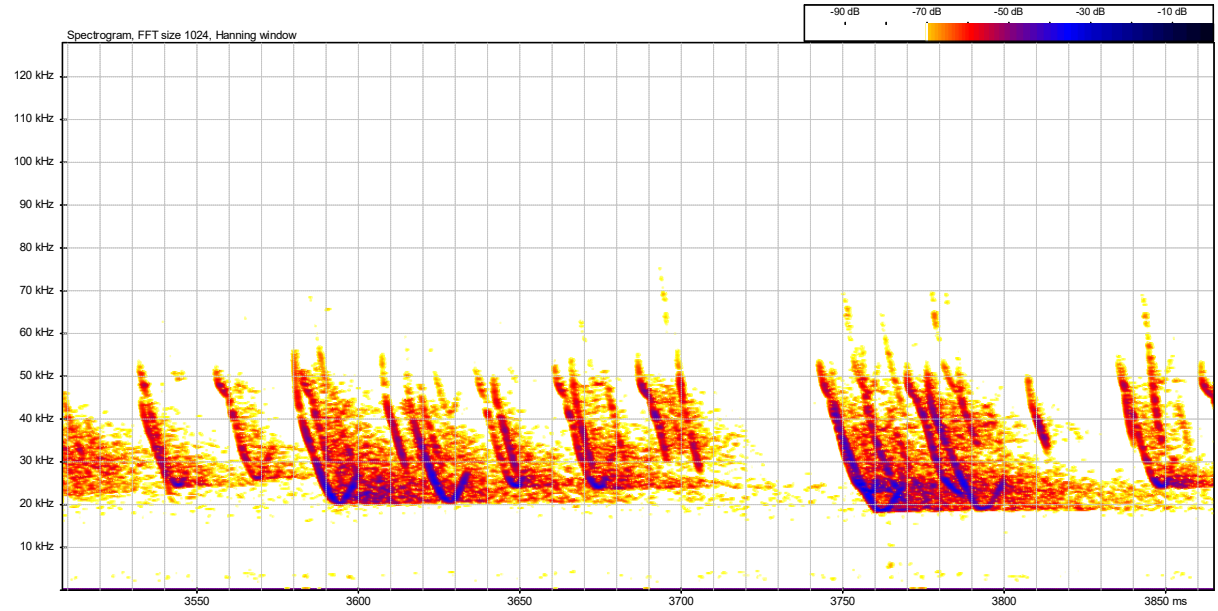
Recording from 30 June 2019 at 4:01: pond bat echolocation pulses during morning swarms around the maternity roost, multiple animals at the same time, and both short steep and slightly longer echolocation pulses.



Recording from 30 June 2019 at 04:08: pond bat social calls and echolocation pulses during morning swarms around the maternity roost in Oostkerke. The social calls are FM-qcf with an upward FM end (U-shapes) with qcf at or just below 30 kHz.



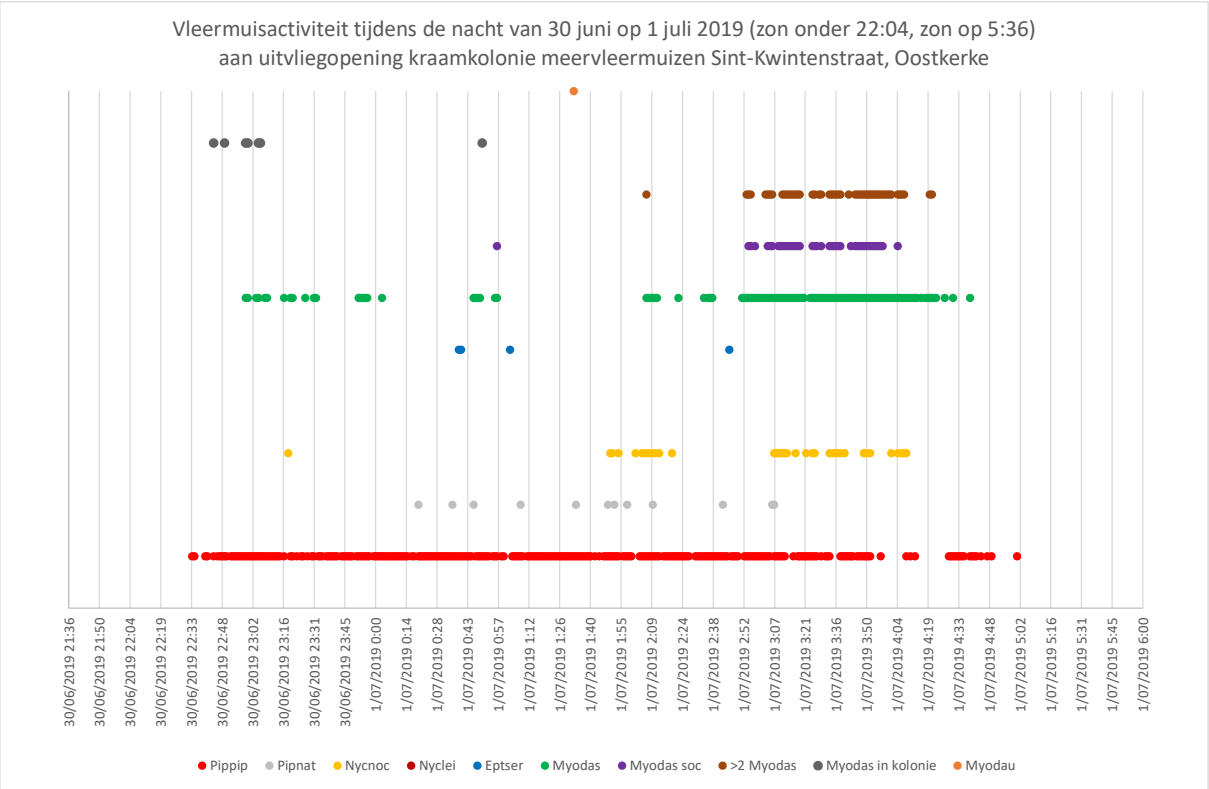
Sonogram of recording from 30 June 2019 at 04:25: pond bat social calls and echolocation pulses during morning swarms around the maternity roost in Oostkerke.



Sonogram of recordings from 30 June 2019 at 04:25: pond bat social calls and echolocation pulses during morning swarms around the maternity roost in Oostkerke. The social calls are FM-qcf in structure with qcf just below 20 kHz or at 25 kHz.

A2 : Night of 30 June to 1 July 2019

The pattern of pond bat activity during the second of the seven nights was broadly similar to that of the previous night. During this night, the automatic detector recorded pond bat activity during 126 of the 453 minutes available between sunset and sunrise (28% of the available time). At 22:44 - exactly 40 minutes after sunset - the detector registered sounds of pond bats in a perched position – probably an animal calling from the ridge of the house to explore the area before emerging (black dots in the graph). At 22:59 (55min after sunset) the first pond bat flew out. At 00:50 the detector again recorded sound from a stationary pond bat and at 00:57 social calls from a pond bat. From 02:52 (2h44min before sunrise) the swarming behavior around the entry opening clearly started, with continuous recordings of echolocation calls of pond bats in flight (calling several individuals together) and social calls as well. The morning swarming continued until 04:23 (1h23min before sunrise). Then there were a few more isolated pond bat contacts, the last one at 04:39 (57min before sunrise).



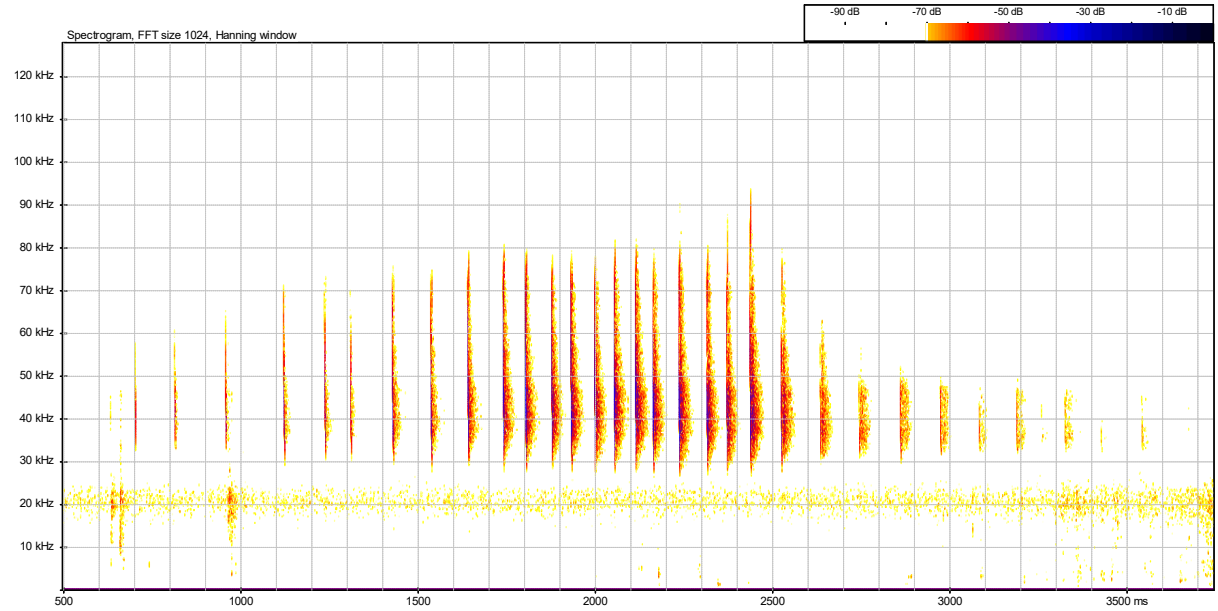
A2. Bat activity during the night of 30 June to 1 July 2019 (sunset 22:04, sunrise 5:36) near the entrance of the pond bat maternity roost in Oostkerke.

A3 : Night of 1 to 2 July 2019

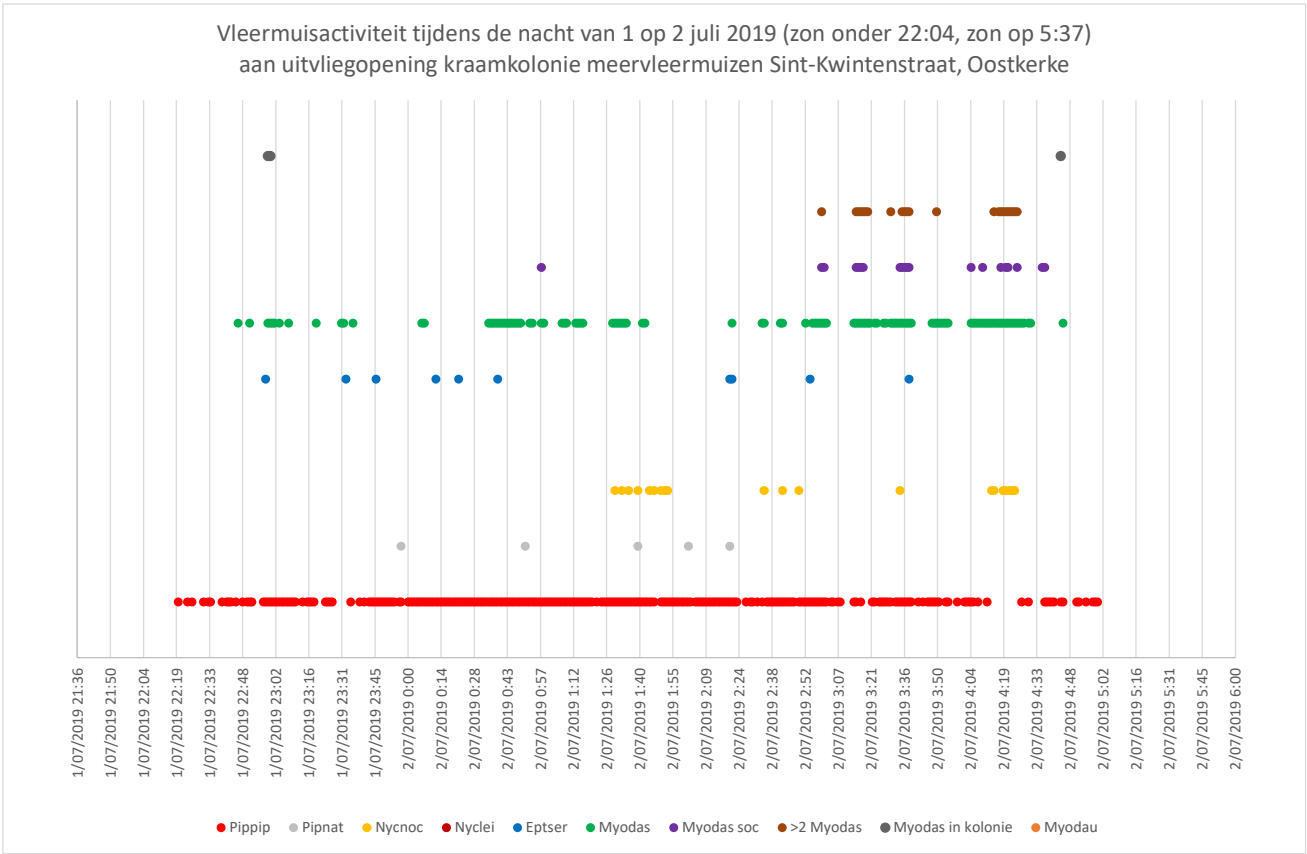
The third night yielded pond bat contacts during 119 of the 453 minutes (26% of the available time), with the first individual emerging at 22:46 (42 min after sunset) and the last contact at 04:45 (52 min before sunrise). The morning swarming was less continuous this time, rather spread out in different gusts between 02:56 and 03:38.

A4 : Night of 2 to 3 July 2019

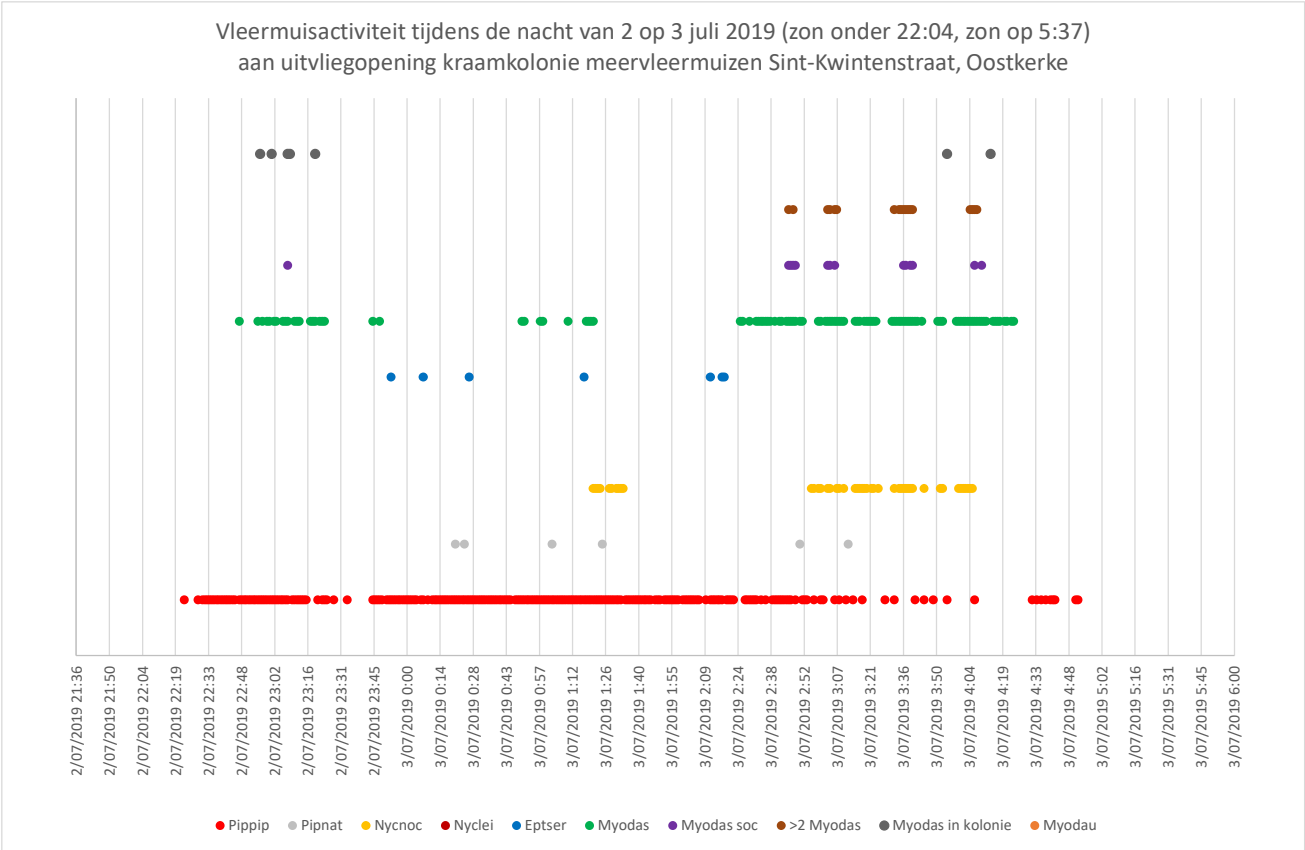
The fourth night yielded pond bat contacts during 108 of the 454 minutes (24% of the available time), with the first individual emerging at 22:47 (43min after sunset) and the last contact at 04:24 (1h13min before sunrise). The morning swarming was spread out in different gusts between 02:46 and 04:10, just like during the previous night.



Recording of 2 July 2019 at 22:47: first emerging pond bat from the maternity roost in the house in Oostkerke. The very first echolocation pulses of this call sequence, directly after the bat left the entrance, have a duration about 2.5 ms and are steep FM signals of about 80 to 27 kHz with peak energy just above 40 kHz.



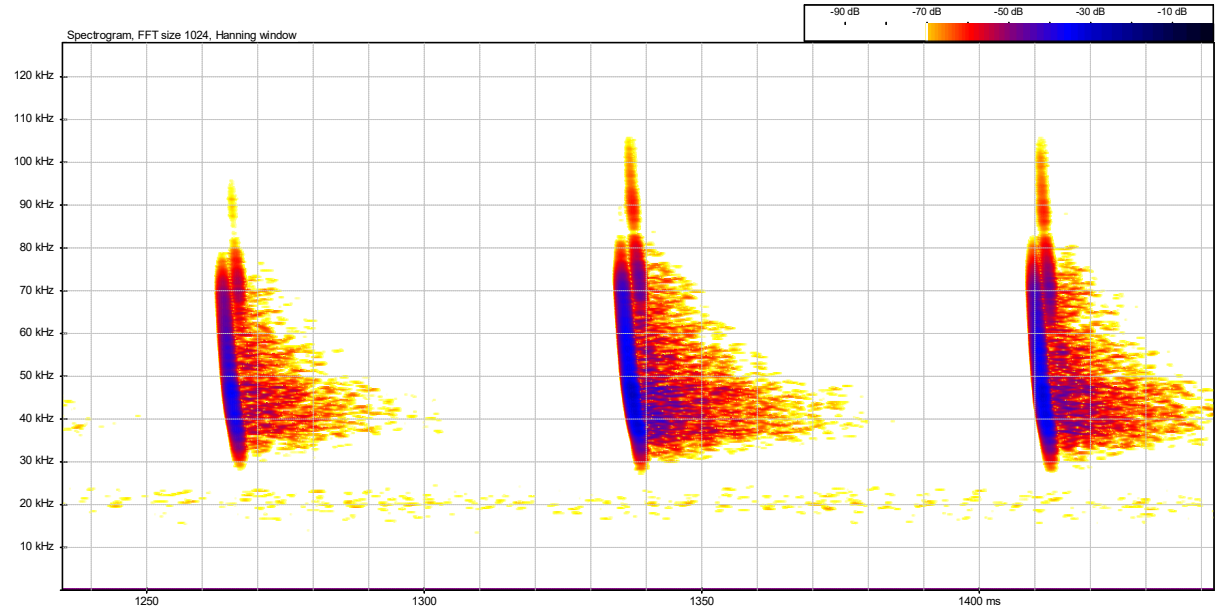
A3. Bat activity during the night of 1 to 2 July 2019 (sunset 22:04, sunrise 5:37) near the entrance of the pond bat maternity roost in Oostkerke.



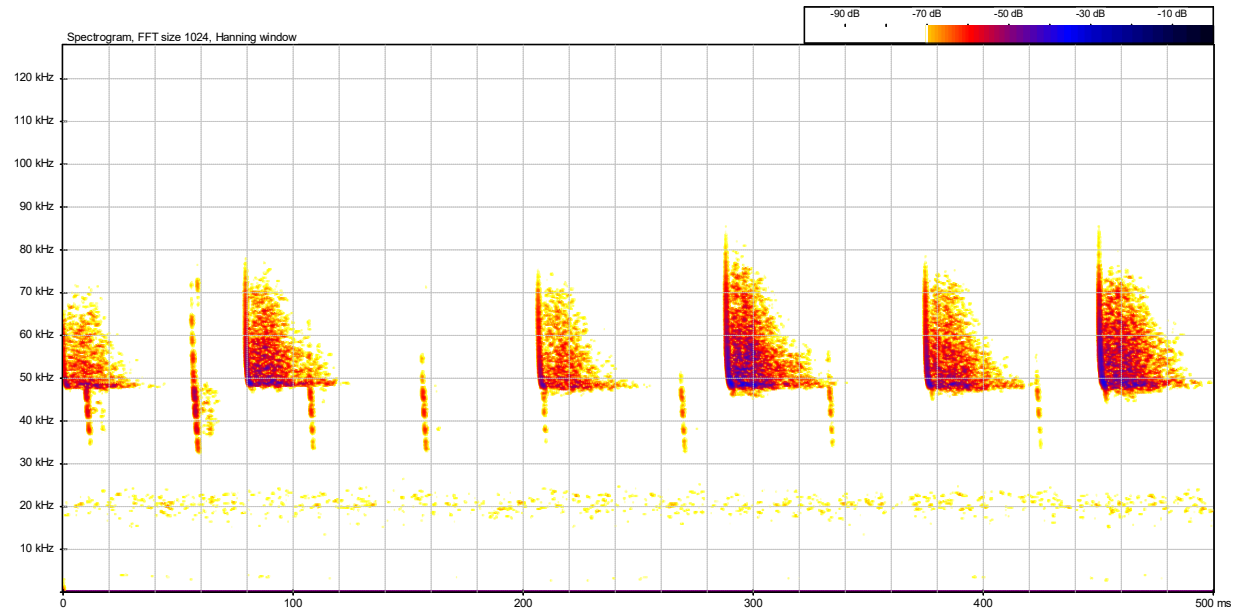
A4. Bat activity during the night of 2 to 3 July 2019 (sunset 22:04, sunrise 5:37) near the entrance of the pond bat maternity roost in Oostkerke.

A5 : Night of 3 to 4 July 2019

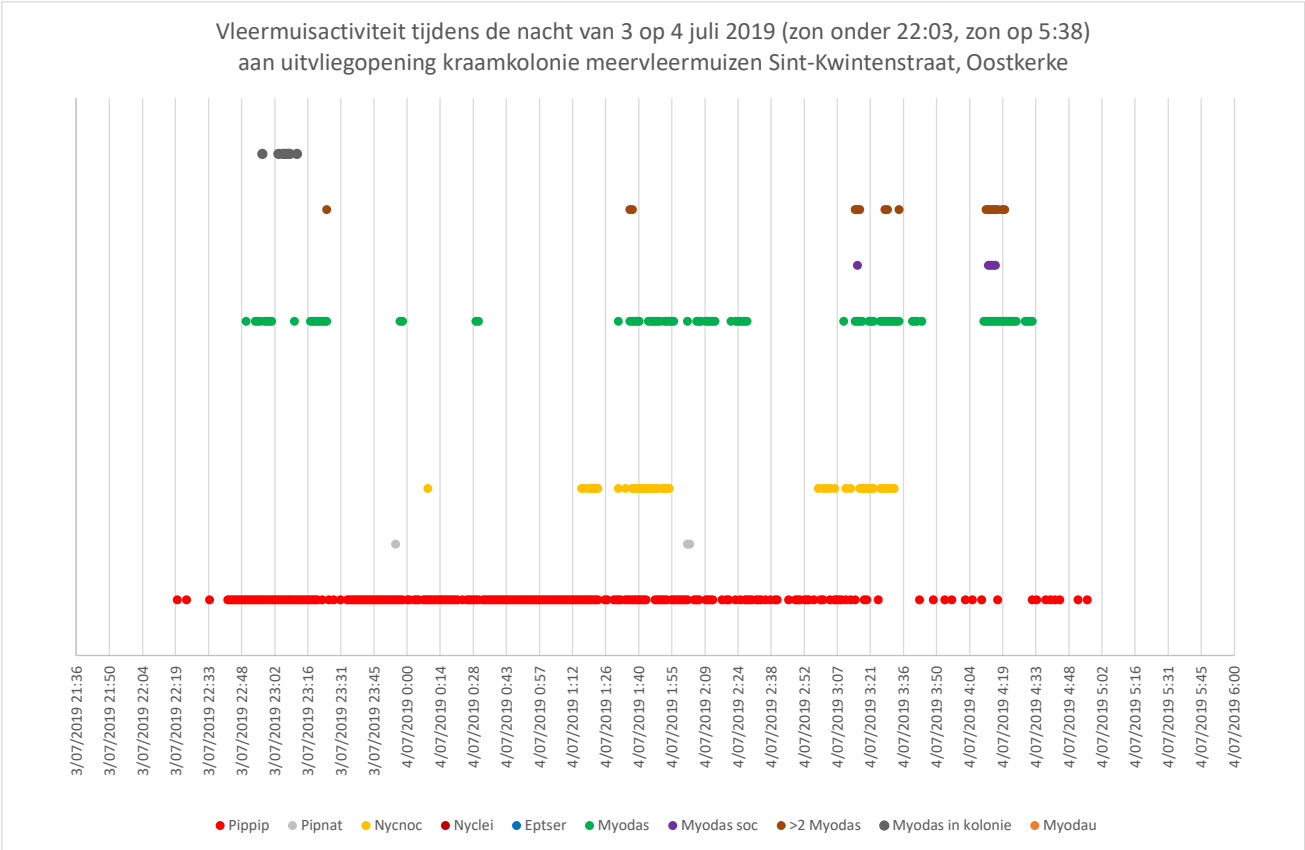
The fifth night yielded pond bat contacts during 94 of the 456 minutes (21% of the available time), with the first fledging already at 22:50 (47min after sunset) and the last contact at 04:32 (1h06min before sunrise). The morning swarming was less intense than during the previous nights and again in different gusts.



Recording of 3 July 2019 at 22:54: emerging pond bat, fairly short FM echolocation pulses up to 4 ms and peak frequency around 39 kHz.



Recording of 3 July 2019 at 22:55: the loud pulses FM-qcf with qcf just below 50 kHz are from a common pipistrelle flying around the house, the short FM echolocation pulses on the other hand are from a pond bat. The pulses do not come through very well, probably another animal that observes the surroundings from behind the ridge tiles before fledging.



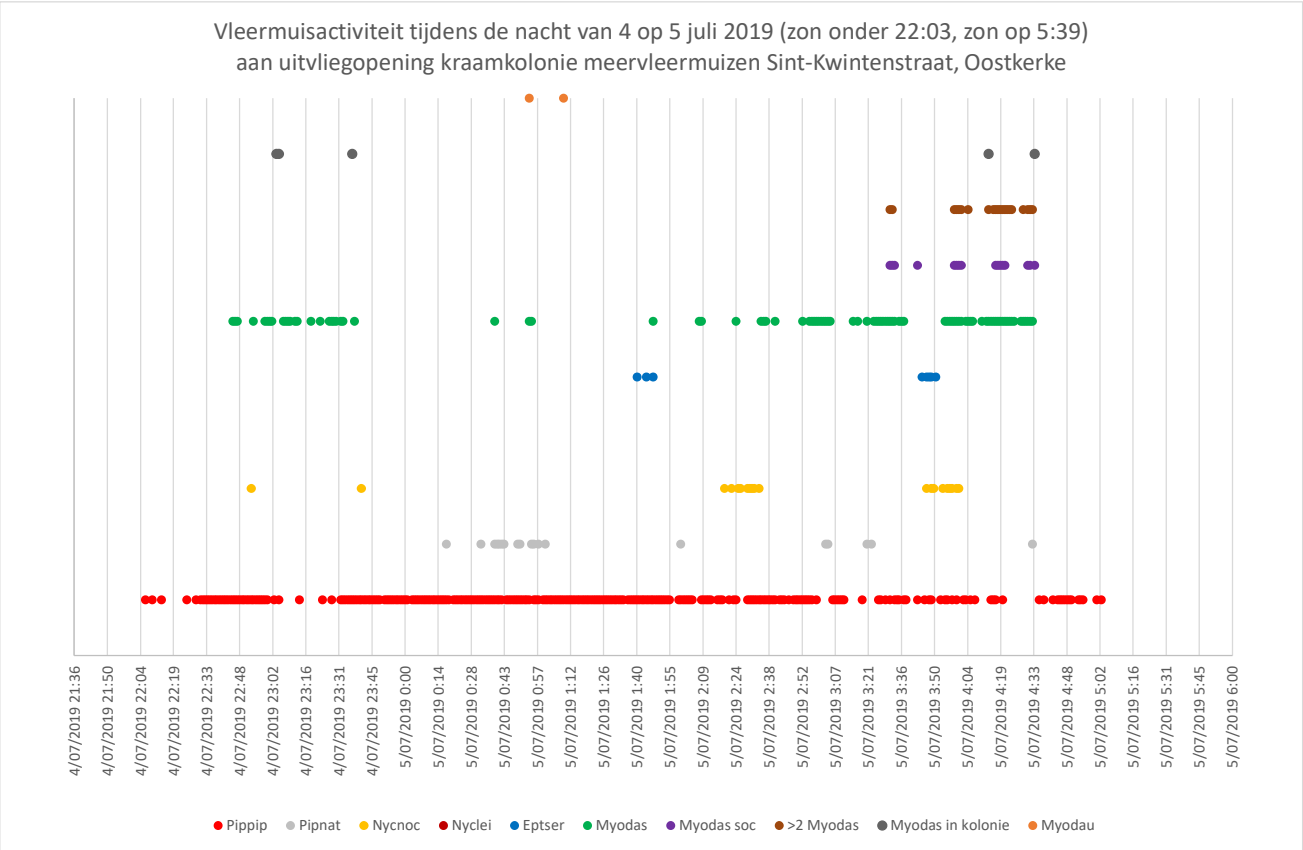
A5. Bat activity during the night of 3 to 4 July 2019 (sunset 22:03, sunrise 5:38) near the entrance of the pond bat maternity roost in Oostkerke.

A6 : Night of 4 to 5 July 2019

Night six brought pond bat contacts during 93 of the 457 minutes (20% of the available time), with the first individual emerging at 22:45 (42min after sunset) and the last contact at 04:34 (1h05min before sunrise). The morning swarming was a bit more concentrated this time in a time span of 20 minutes between 04:14 and 04:34.

A7 : Night of 5 to 6 July 2019

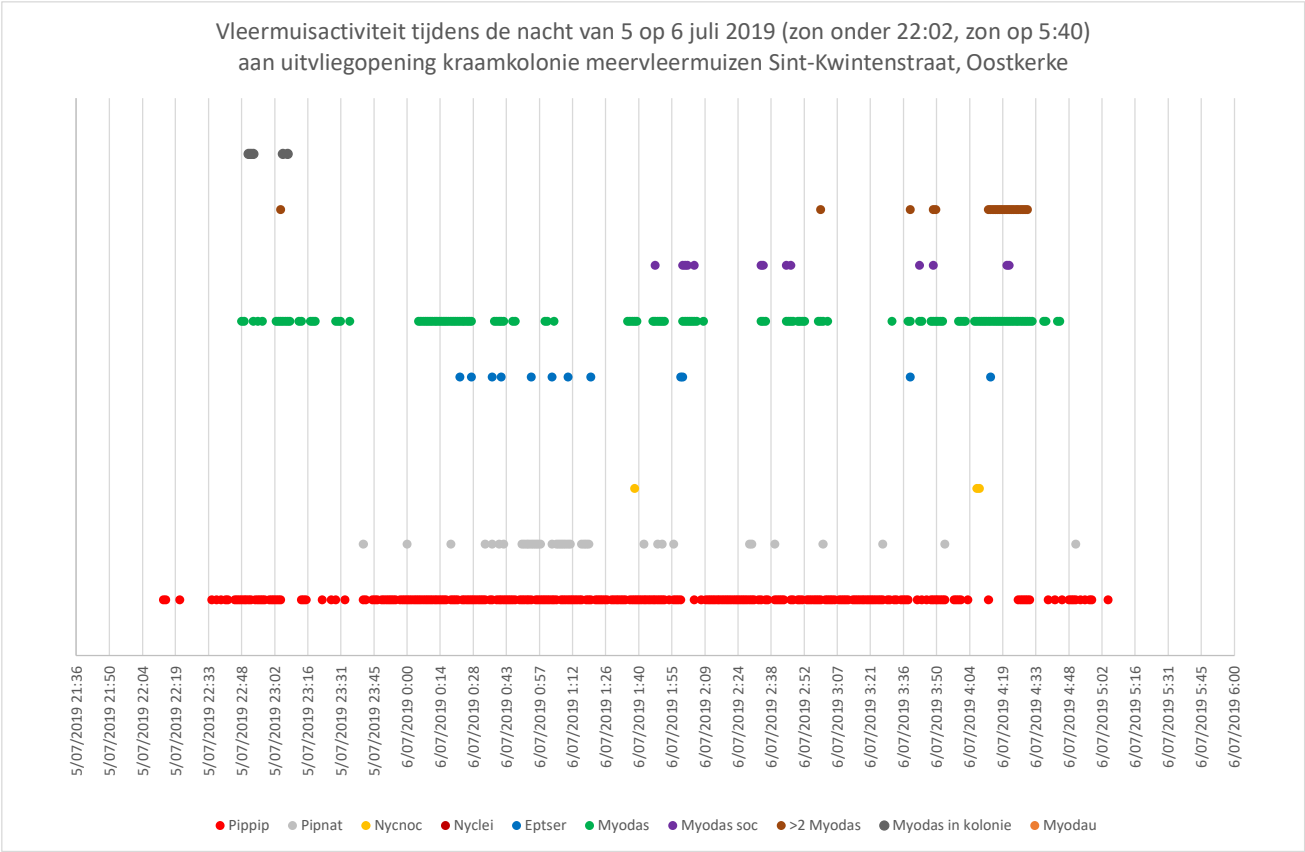
The seventh and final monitoring night yielded pond bat contacts during 134 of the 459 minutes (29% of the available time), with the first bat emerging at 22:48 (46min after sunset) and the last contact at 04:44 (56min before sunrise). The activity pattern of the pond bat around the exit opening was slightly different this night. In the middle of the night – between 01:36 and 02:53 – there were gusts of echolocation pulses from a flying pond bat and also regular social calls. Between 04:13 and 04:30 there was a relatively short but intense continuous morning swarm activity, with more than fifteen minutes of continuous recordings with echolocation pulses from several pond bats flying together, but this time with few social calls.



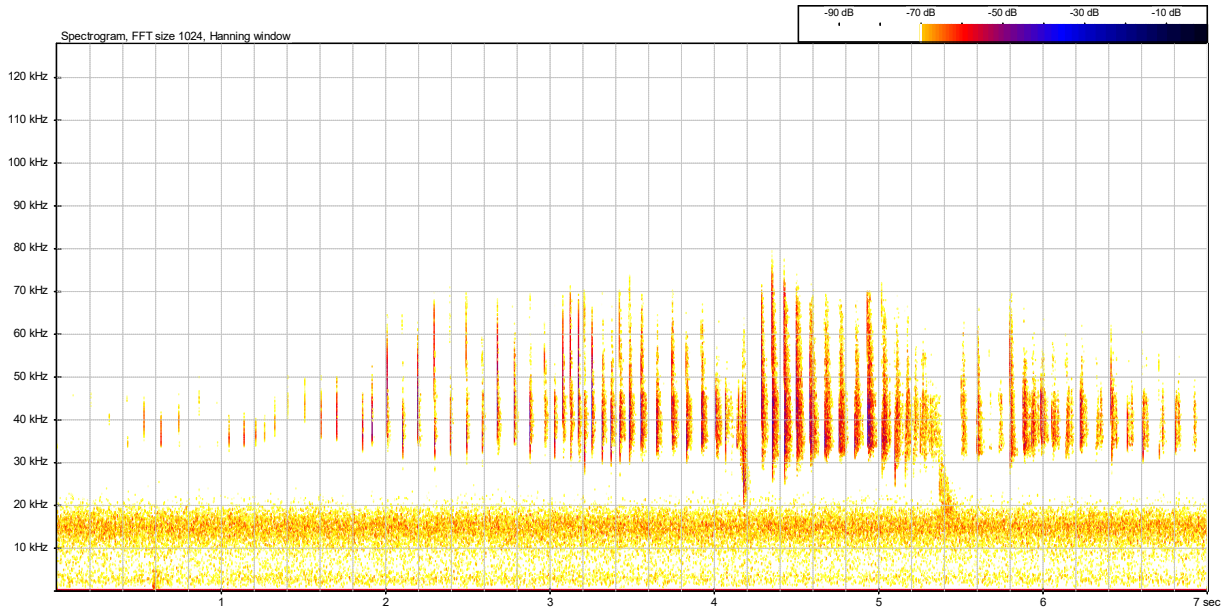
A6. Bat activity during the night of 4 to 5 July 2019 (sunset 22:03, sunrise 5:39) near the entrance of the pond bat maternity roost in Oostkerke.

B. Recordings in the garden of Het Oud Gemeentehuis

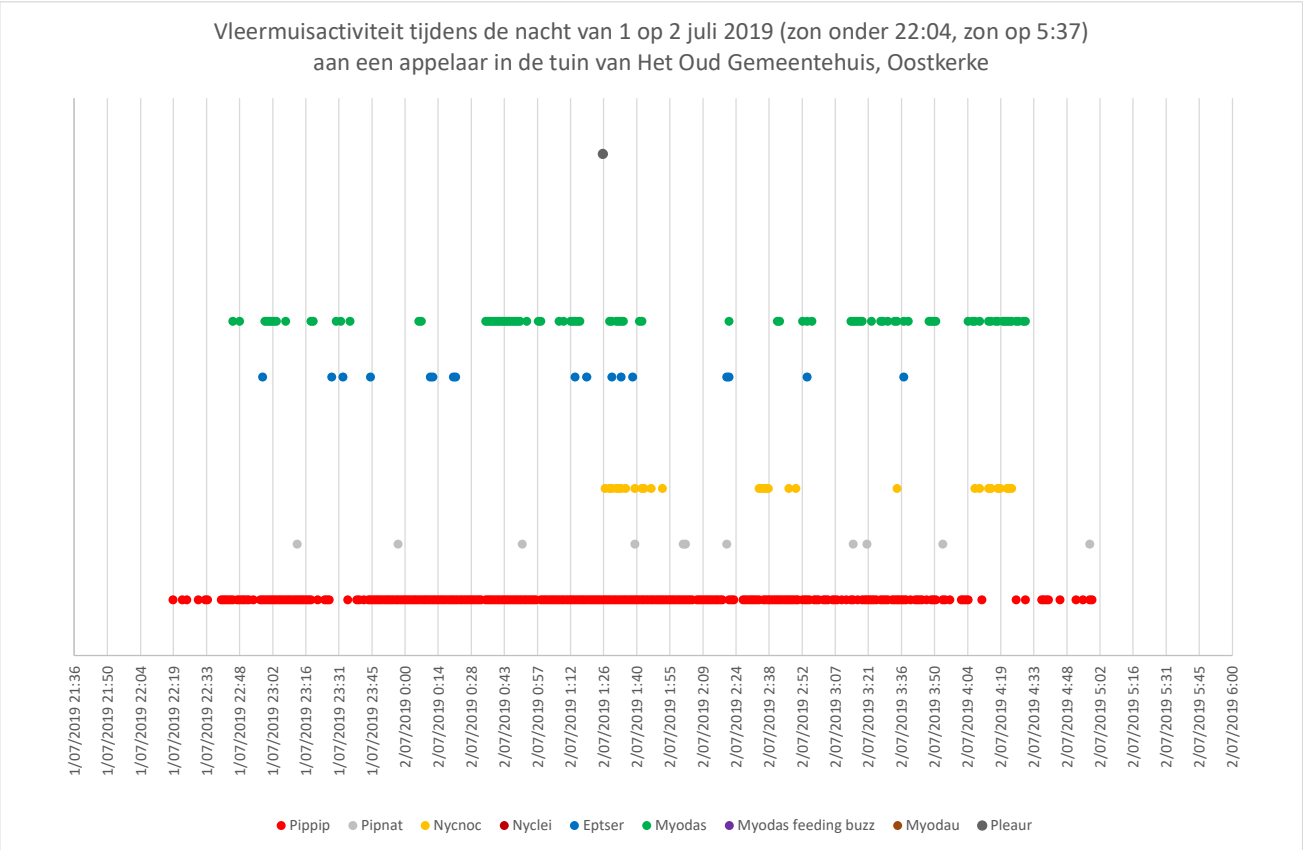
By way of example, the activity pattern in the garden was documented in the examples below. The green dots represent the pond bat contacts (echolocation pulses of the bat in flight, search phase calls) and the purple dots the feeding buzzes of pond bats. During this period, only 3 pond bat feeding buzzes could be found in the recordings of the automatic detector. So the pond bat did indeed hunt in the garden of Het Oud Gemeentehuis, even though only very sporadically. Two feeding buzzes were recorded on 2 July 2019 at 23:17 (1h13min after sunset) and at 23:48 (1h44min after sunset). The third feeding buzz was recorded the following night, on 3 July 2019 at 23:24 (1h21min after sunset). The feeding buzzes in the garden took place during the first part of the night, shortly after emergence from the roost. What is striking is that there are continuous pond bat contacts in the garden during these night without feeding buzzes, as can be clearly seen in the graphs of the night of 1 to 2 July. Possibly these are animals that fly around near the exit opening, maybe test flights of juveniles that do not venture too far from the roost (Voûte 1972).



A7. Bat activity during the night of 5 to 6 July 2019 (sunset 22:02, sunrise 5:40) near the entrance of the pond bat maternity roost in Oostkerke.



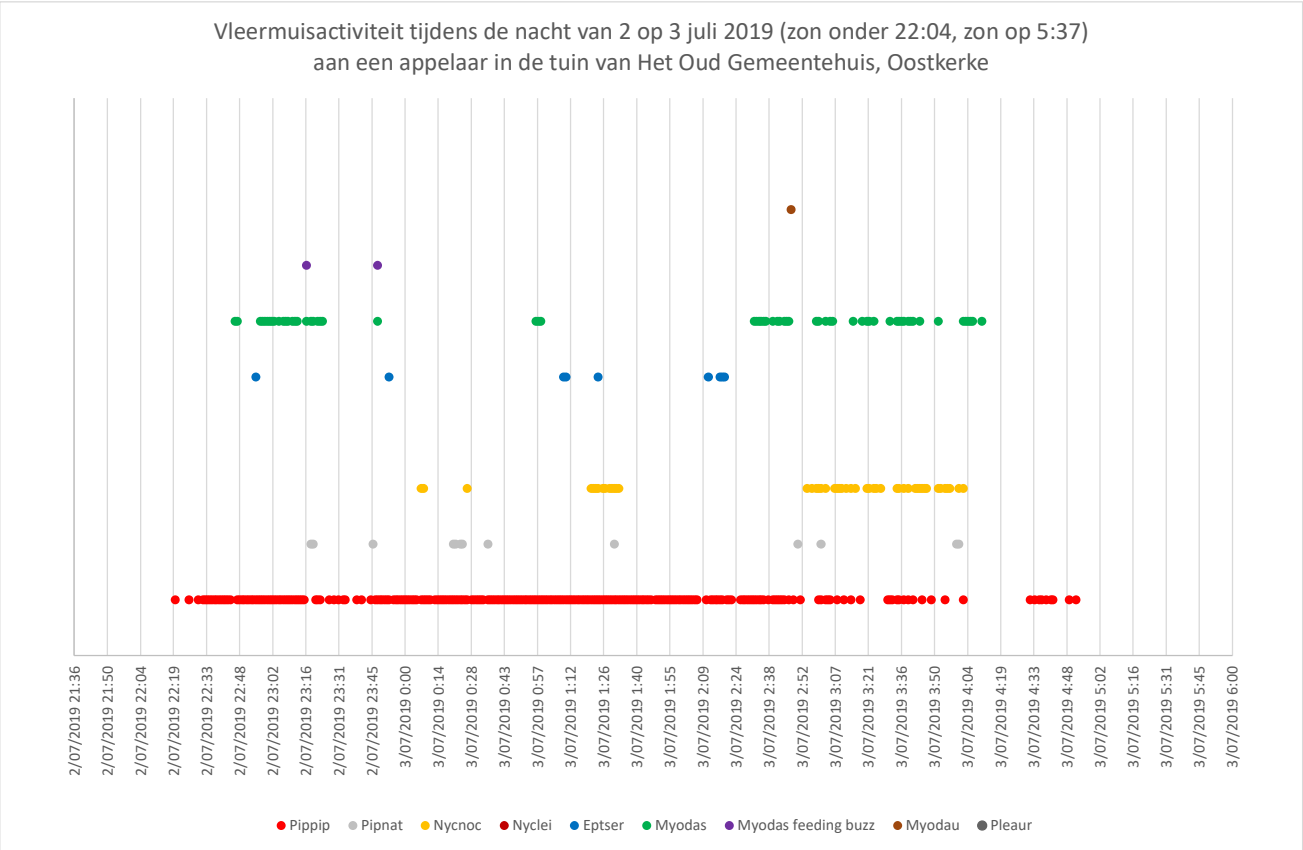
Recording of 3 July 2019 at 23:24 in the garden of Het Oud Gemeentehuis in Oostkerke. Series of echolocation signals from a pond bat flying around nearby, the pulses of the search phase are about 6 ms long FM pulses with peak frequency at 36 kHz, with two feeding buzzes in between.



B3. Bat activity during the night of 1 to 2 July 2019 (third night at location B, sunset 22:04, sunrise 5:37) in the garden of the hotel-restaurant Het Oud Gemeentehuis.

Discussion

This monitoring study at the entrance of one of the few maternity colonies of the pond bat observed in Belgium thus far gives an idea of the times of emergence, swarming and entrance of this species in the period shortly after midsummer night 2019. Additionally it provides data about the activity of other species of bats. During this part of the season, juvenile pond bats often fly out with the mothers and make their first test flights. This monitoring did not come too soon, because this colony already disappeared from the radar shortly after the Covid pandemic outbreak in 2020. Some of the social calls of the pond bat that were recorded near the Oostkerke roost are very similar in shape and frequencies to those described from large nursery colonies in the Netherlands by Carola Van den Tempel (Russ 2021). The second detector in the garden of restaurant-hotel Het Oud Gemeentehuis was able to register some clear cases of feeding buzzes of pond bat, proof that this species sometimes hunts for a while in the immediate vicinity of the roost, as many bat species do. This confirms the earlier telemetry observations by Bob Vandendriessche of the radiotagged pond bat 'Sterre' in 2017.



B4. Bat activity during the night of 2 to 3 July 2019 (sunset 22:04, sunrise 5:37) in the garden of the hotel-restaurant Het Oud Gemeentehuis.

Acknowledgements

Many thanks to Mr. Olivier Moffaert for the hospitality and the permission to install the detectors in the garden of the restaurant-hotel Het Oud Gemeentehuis.

References

Russ, J. 2021. Bat Calls of Britain and Europe. A guide to species identification. Pelagic Publishing.

Van De Sijpe, M. & B. Vandendriessche. 2025. De meervleermuis in Vlaanderen, een kritieke situatie. Zoogdier 36-1.

Voûte, A. 1972. Bijdrage tot de oecologie van de meervleermuis *Myotis dasycneme (Boie, 1825).* Proefschrift. Grosfeld-Offset, Berlicum (N-Br.)