Nakkaş Highway
Bat Surveys
Final Report



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1 INTRODUCTION

Background

Rönesans is planning to build a highway in İstanbul, extending from north of Büyükçekmece Lake to Başakşehir. The project includes a suspension bridge near Sazlıdere reservoir dam, on Sazlıdere which is located within Küçükçekmece Havzası KBA (Key Biodiversity Area) and close to Yarımburgaz caves in the south. There are concerns about the project's impact on bat populations that might regularly fly between the caves in the south and the Sazlıdere reservoir as a feeding area.

Four bat surveys have been planned for between July and October 2021.

Site Description

The Sazlıdere Bridge of Nakkaş Highway is located between km 51 and 52 of the project just south of the dam of the Sazlıdere Reservoir (Figure 1).

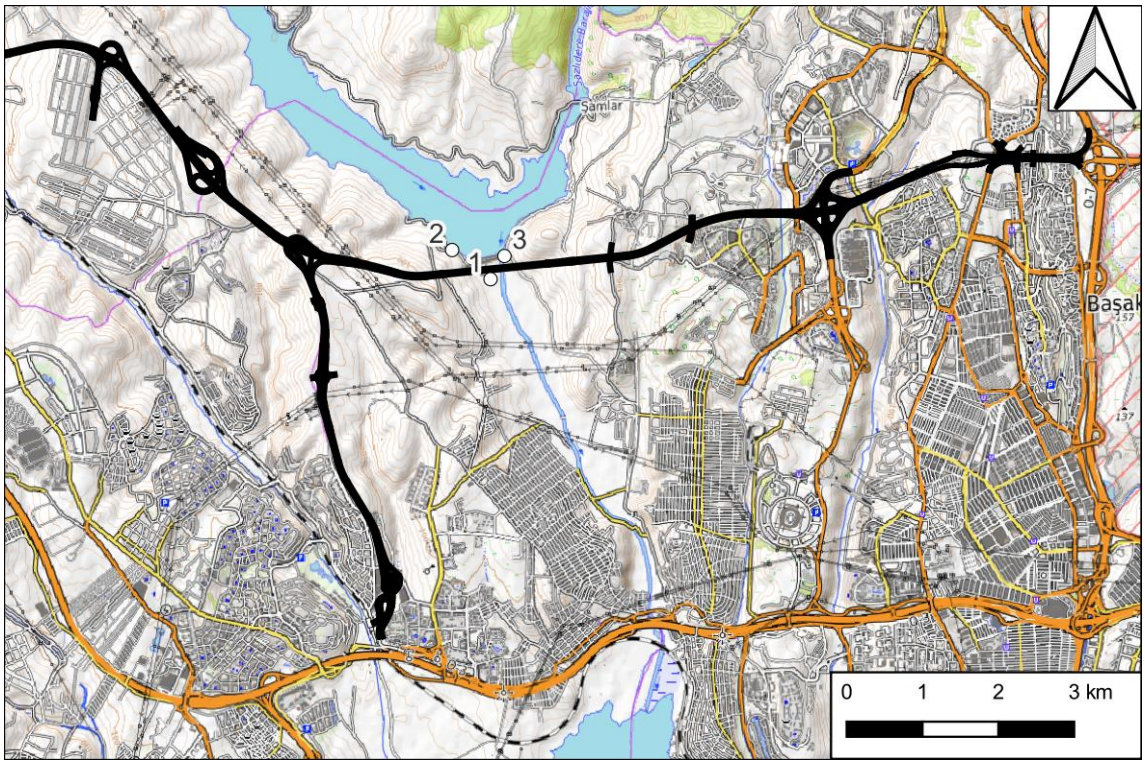


Figure 1. Location of Nakkaş Road Project and the Suspension Bridge, the subject of the bat surveys

Scoping

In this study we focused only on the bat populations in the section of at Sazlıdere Bridge, which is the only site seen as a potentially important habitat for bats, due to the presence of caves and wetland habitats as feeding grounds.

We scoped out the other site. Despite this we acknowledge that bat populations likely exist in the rural parts, and colonies should occur on the roofs of houses along the project site. There is no old-growth mature deciduous forest that can provide a good habitat for some important species. So in general, we scoped out bat populations in villages, houses etc.

Review of Existing Data

A list of expected bat species for the project area was generated based on the previous acoustic surveys in the close vicinity of the project area, the distribution maps of IUCN Red List of Threatened Species, and EUROBATS Guidelines (Rodrigues et al. 2014). The list includes 21 species (out of the total 37 species in Turkey) (Table 1).

Table 1. Bat species expected and recorded at the project site (IUCN 2020). Collision risk levels Rodrigues et al (2014). "Expected" column shows which species are likely to occur based on the review of available information. IUCN column shows Red List evaluation globally except when marked with Med: Mediterranean, or Eu: Europe.

Common Name	Scientific Name	Status	Red List	Collision Risk	Expected
Western Barbastelle	*Barbastella barbastellus*	Declining	**VU** (Eu)	Medium	X
Botta's Serotine	*Eptesicus bottae*	Unknown	LC	Medium	
Serotine	*Eptesicus serotinus*	Stable	LC	Medium	X
Savi's Pipistrelle	*Hypsugo savii*	Stable	LC	High	
Schreiber's Bent-winged Bat	*Miniopterus schreibersii*	Declining	**VU**	High	X
Steppe Whiskered Bat	*Myotis aurascens*	Stable	LC	Low	X
Bechstein's Myotis	*Myotis bechsteinii*	Declining	**VU** (Eu)	Low	X
Lesser Mouse-eared Myotis	*Myotis blythii*	Declining	NT (Eu, Med)	Low	X
Brandt's Myotis	*Myotis brandtii*	Stable	LC	Low	
Long-fingered Bat	*Myotis capaccinii*	Declining	**VU**	Low	X
Daubenton's Myotis	*Myotis daubentonii*	Stable	LC	Low	X
Geoffroy's Bat	*Myotis emarginatus*	Stable	LC	Low	X
Greater Mouse-eared Bat	*Myotis myotis*	Stable	LC	Low	X
Whiskered Myotis	*Myotis mystacinus*	Unknown	LC	Low	X
Natterer's Bat	*Myotis nattereri*	Stable	LC	Low	
Schaub's Myotis	*Myotis schaubi*	Unknown	DD	Low	
Giant Noctule	*Nyctalus lasiopterus*	Declining	**VU**	High	
Lesser Noctule	*Nyctalus leisleri*	Unknown	LC	High	
Noctule	*Nyctalus noctula*	Unknown	LC	High	X
Desert Long-eared Bat	*Otonycteris hemprichii*	Unknown	LC	Unknown	
Kuhl's Pipistrelle	*Pipistrellus kuhlii*	Unknown	LC	High	X
Nathusius' Pipistrelle	*Pipistrellus nathusii*	Unknown	LC	High	X
Common Pipistrelle	*Pipistrellus pipistrellus*	Stable	LC	High	X
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Unknown	LC	High	
Brown Long-eared Bat	*Plecotus auritus*	Stable	LC	Low	X
Grey Long-eared Bat	*Plecotus austriacus*	Declining	NT	Low	X
Mediterranean Long-eared Bat	*Plecotus kolombatovici*	Declining	NT (Eu)	Low	
Mountain Long-eared Bat	*Plecotus macrobullaris*	Declining	NT (Eu, Med)	Low	
Blasius's Horseshoe Bat	*Rhinolophus blasii*	Declining	VU (Eu)	Low	
Mediterranean Horseshoe Bat	*Rhinolophus euryale*	Declining	VU (Eu, Med)	Low	X
Greater Horseshoe Bat	*Rhinolophus ferrumequinum*	Declining	NT (Eu, Med)	Low	X
Lesser Horseshoe Bat	*Rhinolophus hipposideros*	Declining	NT (Eu, Med)	Low	X
Mehely's Horseshoe Bat	*Rhinolophus mehelyi*	Declining	**VU**	Low	X
Egyptian Fruit Bat	*Rousettus aegyptiacus*	Stable	NT (Med)	Low	
European Free-tailed Bat	*Tadarida teniotis*	Unknown	LC	High	
Naked-rumped Tomb Bat	*Taphozous nudiventris*	Stable	LC	Unknown	
Particoloured Bat	*Vespertilio murinus*	Stable	LC	High	

Yarımburgaz Cave has lost most of its natural properties. The only report summarises the presence of. The only available survey of the cave was done in march and May 1999 and a maximum of 3 individuals of bats were observed, belonging to *R. ferrumequinum*, *R. hipposideros* and *Miniopterus schreibersii*. The bat comunity is deserted the caves due to continuous disturbance by people (Ozgul and Bilgin 2000).

2 METHODOLOGY

Survey Timing

For each visit, two nights of acoustic surveys were conducted at each selected sampling point. Survey dates and field conditions are summarized in Table 2. Surveys started 30 minutes before sunset and ended 30 minutes after sunrise.

Table 2. Field survey conditions.

Visit	Date	SPs	Temp	Time	Wind	Cloud	Prec.
July	28/07	SP2, SP3 and mobile	26-23	20:15 - 06:15	NE 1 m/s	0%	0 mm
	30/07		28-19		NE 1 m/s	0%	0 mm
August	18/08	SP1	25-23	20:15 - 06:15	NE 1 m/s	20%	0 mm
	20/08		23-18		NE 3 m/s	10%	0 mm
September	13/09	SP1 and mobile	21-17	19:00 - 07:00	NE 1 m/s	80%	0 mm
	15/09		23-19		NE 2 m/s	30%	0 mm
October	06/10	SP1 and mobile	17-08	19:00 - 07:00	NE 3 m/s	10%	0 mm
	07/10		17-15		NE 2 m/s	0%	0 mm

Two full spectrum bat detectors (Batlogger M, Elekon) with omni-directional microphones (FG Black, Elekon) were used. The detectors were triggered by bat calls using the advance crest (CrestAdv) methodology. Recordings were made at 312500 Hz sample rate and each of them logged time and temperature. The microphones were located at around 1.5 m above the ground.

In transect surveys, surveyors slowly travelled along a route in the project site and used a mobile device which geo-tagged the recordings using the built-in GPS of the detectors. Transect surveys were carried out after sundown on the same nights as the static surveys.

Sampling Points

Access to good sampling points has been troublesome in the project site. The military post was available in July, but in August the military staff did not allow the placement of the detectors. Likewise, the detector within ISKI campus was not accessible on the first night onward.

The only accessible site was the lighting post within the camp site. It was about 15 meters high and gave a good coverage of high lighting bats that are likely to fly at bridge height. During acoustic surveys the lights were switched off not to attract additional bats by the lamps.

In July we sampled along the shores of

Table 3. Coordinates of the Sampling Points. UTM WGS84

Sampling Point	Longitude	Latitude	Location	Jul	Aug	Sep	Oct
SP1	28.71943	41.10354	Light post at the Campsite		x	x	X
SP2 (temp.)	28.71356	41.10712	NW of the dam wall on the lake shores	X			
SP3 (temp.)	28.72173	41.10634	10 m E of the reservoir dam	X			
Transect	28.71	41.10	Along the canal 2-4 km south of the site			X	X
Transect M2 (temp)	28.73	41.08	Southern shores of Sazlıdere dam lake	X			



Photo 1. From SP1 the 15 m high light post at the construction campsite.



Photo 2. Sampling Point SP2 by the army post (left) and SP3 in ISKI area (right).

Sound Analysis

Bat recordings obtained from the surveys were analysed using BatExplorer v2.1.4 and species identifications were done by following the methodology described in Barataud (2021), including the parameters in Dietz and Kiefer (2014). As the call parameters of some species overlap, in such cases definitive species identification is difficult and their identifications were reported as "possible." Feeding buzzes and social calls were also noted.

Transect Surveys

In July the transect surveys were planned to be along the shore of the Sazlıdere lake. Most bats were recorded near Şamlar village, on the small dam between two parts of the dam lake. The Noctules (Nyctalus) were recorded on the eastern part of the section. With the cancellation of the survey permit we had to abandon the survey by midnight.

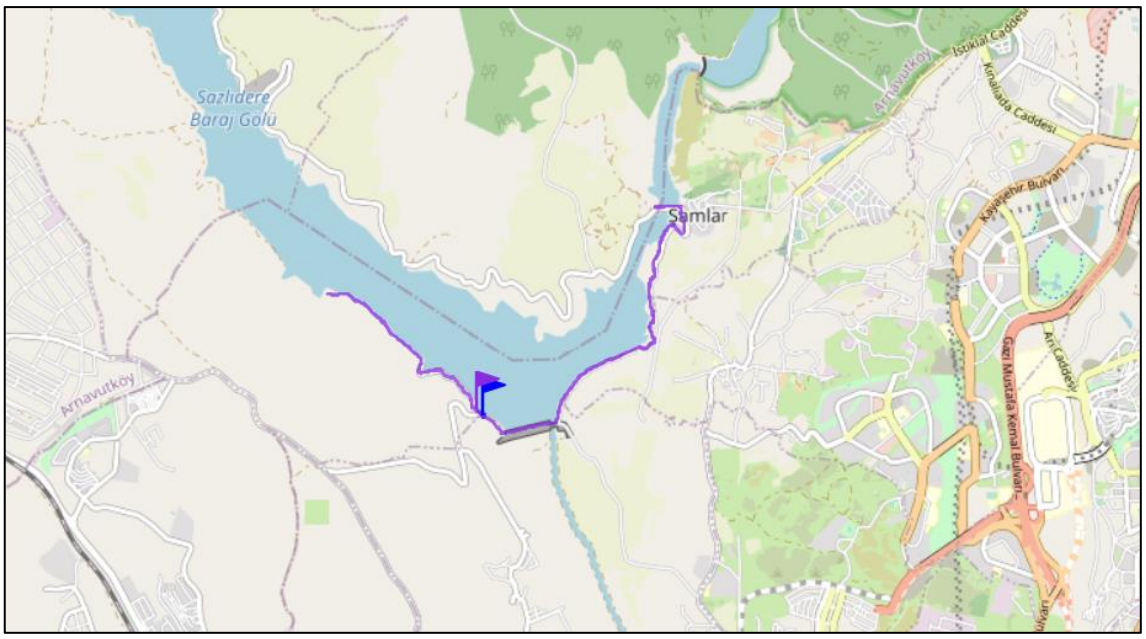


Figure 2. The transect route followed in July 2021. (Mobile 2)



Figure 3. The open landscape on the lake shore provides good habitat for feeding bats.

In September and October we surveyed along the canal in the south. The canal was partially accessible at most of the site due to construction and security issues. A bridge was constructed and large areas were used as landfill and storage sites. The land police did not allow to survey northern parts of the canal. The photo was taken from the most northerly point accessed during surveys. The area has also security issues.

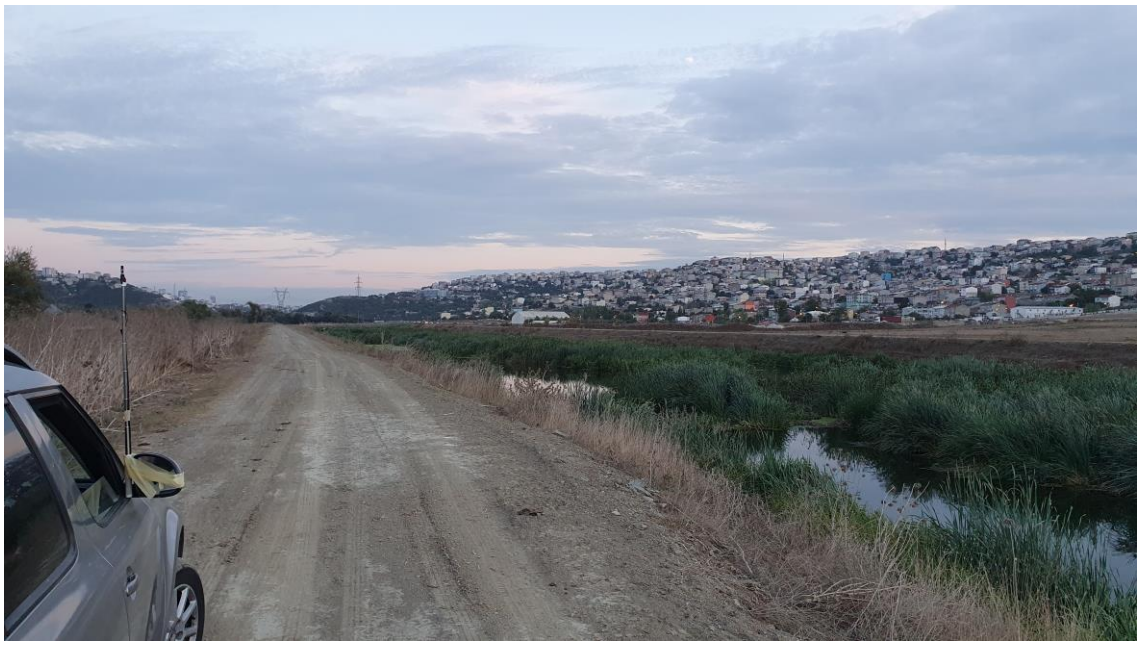


Photo 3. From mobile transect survey looking south from the most northern point.

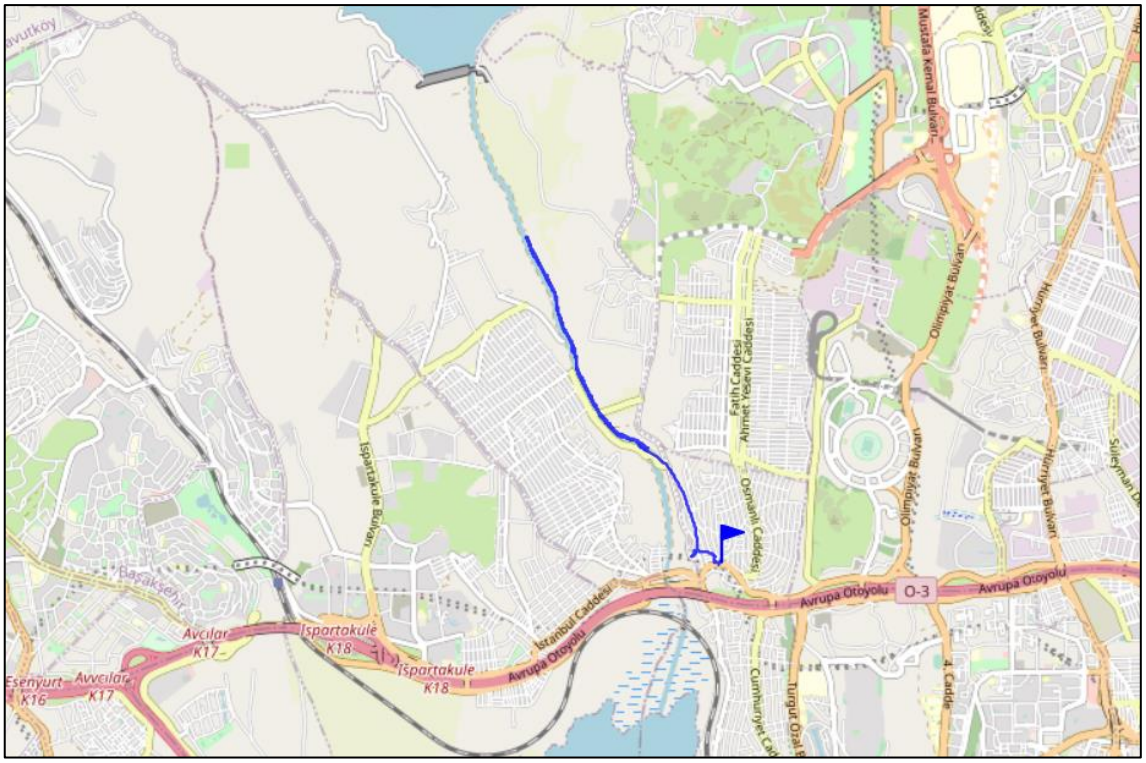


Figure 4. Locations of stationary sampling points and transect. (Mobile 1)

3 RESULTS

Static Acoustic Surveys

Most of the bats were Common Pipistrelle (*Pipistrellus pipistrellus*). Other common species were identified as Kuhl's or Nathusius' Pipistrelle (Pipistrellus kuhli/nathusii), possible the former due to the slight Mediterranean vegetation and climate of the site. Nathusius's Pipistrelle is a migratory species and has been recorded during migration in wind farms in European Turkey.

The Globally Threatened Giant Noctule (*Nyctalus lasiopterus*) was recorded along the shores of the damlake as well as along the canal south of the project site. Giant Noctule is known to occur at wetlands in autumn and spring migration.

Table 4. Complete breakdown of bat recordings.

Month	Group	Species	Scientific	IUCN	1		2		3		M	M2
					1	2	1	2	1	2	1	1
7	Nyctaloid group	Giant Noctule	Nyctalus lasiopterus	VU			1	3				6
		Noctule	Nyctalus noctula	LC								2
	Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC			263	418	162	183		410
		Soprano Pipistrelle	Pipistrellus pygmaeus	LC			3	1		1		
		Pipistrellus spec.	Pipistrellus spec.	NA			4	2	6	5		34
8	Nyctaloid group	Giant Noctule	Nyctalus lasiopterus	VU	1							
		Lesser Noctule	Nyctalus leisleri	LC	2	1						
		Noctule	Nyctalus noctula	LC	1							
	Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC	106	87						
		Savi's Pipistrelle	Hypsugo savii	LC		1						
		Soprano Pipistrelle	Pipistrellus pygmaeus	LC	1	2						
		Pipistrellus spec.	Pipistrellus spec.	NA	16	13						
9	Nyctaloid group	Giant Noctule	Nyctalus lasiopterus	VU							1	
		Lesser Noctule	Nyctalus leisleri	LC	3	4						
		Noctule	Nyctalus noctula	LC		1						
		Particoloured Bat	Vespertilio murinus	LC	5	5						
	Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC	138	83					307	
		Soprano Pipistrelle	Pipistrellus pygmaeus	LC	4	1					26	
		Pipistrellus spec.	Pipistrellus spec.	NA	109	99					94	
	Plecotus group	Brown Long-eared Bat	Plecotus auritus	LC		2						
10	Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC	557	640					187	
		Soprano Pipistrelle	Pipistrellus pygmaeus	LC	2						4	
		Pipistrellus spec.	Pipistrellus spec.	NA	9	17					36	

Station 2 was canceled. And station 3 was repalced by station 1.

This graph shows the maximum number of recordings during two night periods for each month. Data from station SP3 (July) and SP1 (Aug, Sep and Oct) was used.

Table 5. Bat Recordings from Stationaly Sampling Points.

Group	Species	Scientific	IUCN	Jul	Aug	Sep	Oct
Nyctaloid group	Giant Noctule	Nyctalus lasiopterus	VU	-	1	-	-
	Lesser Noctule	Nyctalus leisleri	LC	-	2	4	-
	Common Noctule	Nyctalus noctula	LC	-	1	1	-
	Particoloured Bat	Vespertilio murinus	LC	-	-	5	-
Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC	183	106	138	640
	Savi's Pipistrelle	Hypsugo savii	LC	-	1	-	-
	Soprano Pipistrelle	Pipistrellus pygmaeus	LC	1	2	4	2
	Pipistrellus spec.	Pipistrellus spec.	NA	6	16	109	17
Plecotus group	Brown Long-eared Bat	Plecotus auritus		-	-	2	-
Total				190	129	263	659

Recordings from Mobile stations. Note that in July M2 along the shore of Sazlıdere Dam (north of the project site) was used, and in September and October Sazlıdere stream (south of the project site).

Table 6. Bat Recordings from Mobile Stations

Group	Species	Scientific	IUCN	Jul	Sep	Oct
Nyctaloid group	Giant Noctule	Nyctalus lasiopterus	VU	6	1	-
	Common Noctule	Nyctalus noctula	LC	2	-	-
Pipistrelloid group	Common Pipistrelle	Pipistrellus pipistrellus	LC	410	307	187
	Soprano Pipistrelle	Pipistrellus pygmaeus	LC	-	26	4
	Pipistrellus spec.	Pipistrellus spec.	NA	34	94	36
Grand Total				452	428	227

Important Note on the Results

The lesser noctule (*Nyctalus leisleri*) was recorded during August and September at SP1 with a peak of 4 passes. Common noctule (*Nyctalus noctula*) was reported in July (south west shore), and in August (SP1, camp site) and September (SP1, camp site), single passes on all nights.

Soprano pipistrelle (*Pipistrellus pygmaeus*) was recorded in July (south west shore), and from Julye until October at SP1 (peak 26 passes). Common noctule was reported once in July (south west shore).

A Plecotus species and Particoloured Bat were reported at SP1 in September (peak 2 and 5 passes respectively). Savi's Pipistrelle (at SP1) was reported once in August.

DISCUSSION

The conditions for the survey was difficult due to difficulties with the permits from three different authorities, the Land Police, the company and ISKI (Istanbul Water and Canalization Authority). In general, the results obtained indicate a relatively low activity of bats along the shores of the Sazlıdere damlake. The limitations in the access rights does not seem to affect the conclusions on the status of and threats to bat populations.

According to previous studies, Yarımburgaz Cave, once possibly an important roost for bats, have been deserted. Our acoustic surveys are in line with this conclusion, as the bat activity in front of the cave were relatively low and did not suggest an active use of a roost. All caves in the area are heavily vandalised by "treasure hunters".

The survey aimed to investigate the bat activity level on the planned Sazlıdere bridge. The surveys along the Sazlıdere dam lake gives us a rough idea about the composition of the species in close vicinity. Likewise, the surveys along the canal in the south aimed to detect any commuting route of bats towards the project site.

Most of the bat passes were related to high-flying bats, expected to fly at bridge height, such as *Pipistrellus* species, majority being Common Pipistrelle (*Pipistrellus pipistrellus)*. Bats belonging to either Kuhl's Pipistrelle (*Pipistrellus kuhlii)* or Nathusius's Pipistrelle *(Pipistrellus nathusii)* were also commonly recorded. Bats belonging to either Great Noctule (*Nyctalus lasiopterus)* or Common Noctule *(Nyctalus noctula)* were also recorded.

The area in general includes good feeding grounds for bats. Both the dam lake and the canal has very low biodiversity value in general. Apparently the area is sprayed by insecticides frequently by the district municipalities.



Figure 5. Spraying insecticide by Başakşehir municipality vehicle on the canal.

Globally Threatened Species

Great Noctule (*Nyctalus lasiopterus*) is a globally threatened species with VU category. The species is known to concentrate along wetlands and bodies of water during spring and autumn migration.

Recommendations

The bridge may cause direct collision with bats. Bats are likely to cross the road at the height of the bridge and collide with moving vehicles. Bats are an endangered species.

The sides of the bridge could be covered with web net fences to protect bats from traffic accidents on the highway. A Web net fence of 4 meters' height can protect the animals from crossing the highway at traffic level.

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APPENDICES

Bat Recording Data

Data sheets available upon request.