

IUCN SSC Bat Specialist Group (BSG) recommendations to reduce the risk of transmission of SARS-CoV-2 from humans to bats by cavers

MAP: Minimize, Assess, Protect

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Overview

The recommendations given below relate to minimizing the risk of human to bat transmission of SARS-CoV-2, the virus that causes the disease Covid-19. All activities involving close contact with wild animals, including bats, retain some risk of accidental transmission of pathogens between species, this includes from humans to animals. Humans can transmit SARS-CoV-2 to other animals: most notably, in the Netherlands and Denmark, SARS-CoV-2 was transmitted to mink in farms, then spread through these domestic mink populations, and may have even been transmitted back to farm workers [1,2]. Humans have also transmitted SARS-CoV-2 to domestic dogs [3], cats [3] and captive tigers [4]. SARS-CoV-2 uses the ACE2 (angiotensin converting enzyme 2) receptors of the host to infect cells. Analyses predict that SARS-CoV-2 could bind to the ACE2 receptor in at least three genera (types) of bats [5]. Further, Egyptian rousette bats (which naturally live in caves) became infected with SARS-CoV-2 when exposed in a laboratory experiment [6].

Due to the potential risks to bats, in April 2020 the IUCN BSG convened a global panel of experts to assess the risk of human-to-bat transmission and to develop appropriate mitigation strategies to protect bats from SARS-CoV-2. Based on current knowledge, it is the opinion of the panel that there is a **credible risk of human-to-bat transmission of SARS-CoV-2**, but that this risk can be reduced using appropriate mitigation strategies.

The recommendations below have been conceived specifically to modify caving practices to protect bats from accidental SARS-CoV-2 exposure and transmission from cavers. However, under all circumstances cave users should avoid disturbing bats and follow existing best practice.

The panel recognises that our understanding of SARS-CoV-2 is changing rapidly and advises the speleological community that this is a **living document** with updates anticipated.

BEST PRACTICE: Minimize disturbance to bats and follow cave governing body and public health regulations. We remind cavers to never touch or handle bats and to maintain general best practices to minimize disturbance to bats, such as avoiding narrow passages where bats are present, avoiding drilling or making loud noise around bats, and not visiting caves during bat hibernation and breeding seasons when bats are more vulnerable to stress.

The BSG recommendations are additional to (1) existing guidelines, regulations, or guidance from national or local caving governing bodies and (2) public health recommendations and mandates in place to mitigate COVID-19. Cavers should continue to follow all regulation and guidance set by their local or national governing bodies and public health officials.

Background

The IUCN BSG considers it important to provide recommendations to professionals and members of the public who may come into contact with bats to minimize the risk of disease transmission. This is particularly important when people come into frequent and prolonged contact with bats and may not have access to necessary advice, training, or equipment. The following recommendations have been developed to encourage and assist cavers around the world to prepare and implement mitigation strategies to reduce the potential risk of transmission of SARs-CoV-2 from humans to bats.

Current research suggests that the ancestor of SARS-CoV-2 arose in bats between 40 and 70 years ago. However, the current form of SARS-CoV-2 is genetically different and is circulating in humans, not bats. Consequently, there does not appear to be a risk that humans can catch SARS-CoV-2 from bats. However, the IUCN BSG considers that there is a credible risk of humans transmitting the virus to bats. This could have consequences for public attitudes towards bats, bat health, and if the virus were to establish in bat populations, for human health. Fortunately, this risk can be significantly reduced using appropriate mitigation strategies.

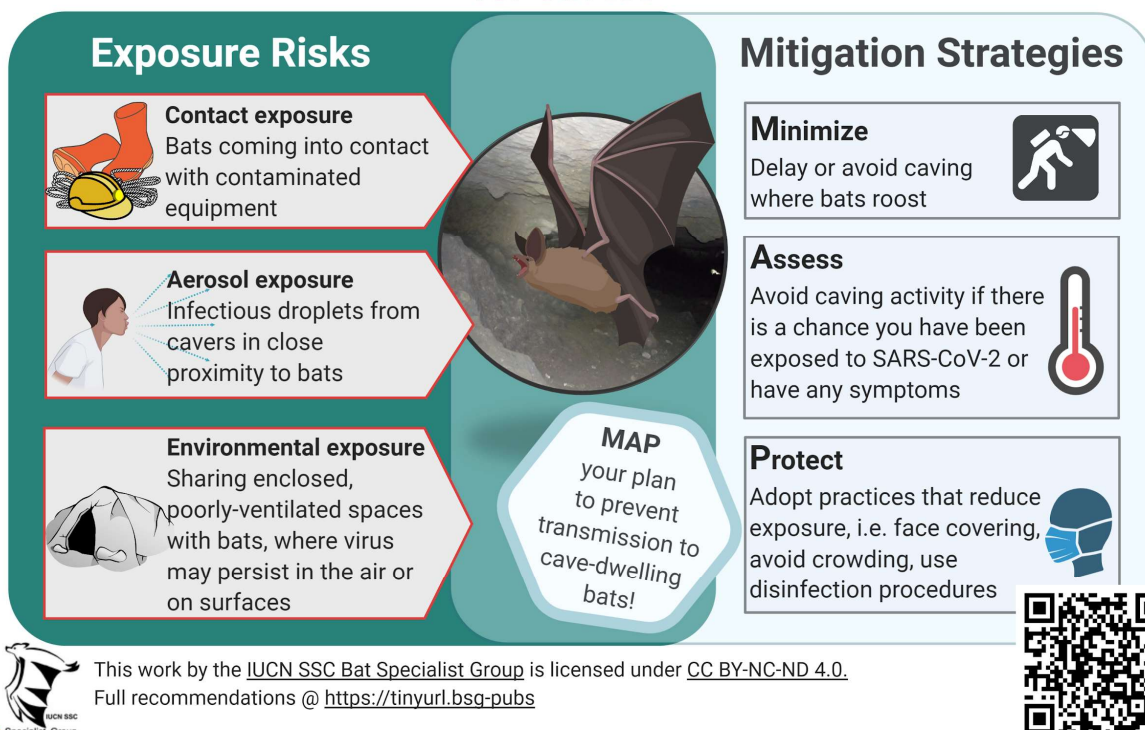
Bats could potentially be exposed to SARS-CoV-2 through infectious **aerosols** (droplets), **contact**, or **environmental contamination**. The likelihood of human-to-bat transmission of SARS-CoV-2 also increases when humans have recently worked in or come from countries or sites with high rates of human viral infection. While caving generally involves no direct contact with bats, and direct contact should always be avoided, there may also be risks associated with indirect contact. Sharing closed areas with bats, such as cave passages or chambers, especially if poorly ventilated, may pose a risk to bats because the aerosols that people breath out and could contain SARS-CoV-2 can linger in the air or on surfaces [7].

BSG Recommendations For Cavers: Minimize, Assess, Protect (MAP)

The following recommendations aim to minimize the risk of accidental adverse impacts of caving and speleological activities on bats due to SARS-CoV-2. These recommendations were developed for cavers, caving clubs or associations, and national or local authorities responsible for issuing permits and authorization of caving activities. The scale of the risk of human to bat transmission of SARS-CoV-2 remains unknown, although research is ongoing. Therefore, the IUCN BSG has adopted a precautionary approach. Specifically, we recommend that the speleological community adopts the IUCN BSG Minimize, Assess, Protect mitigation strategy and “MAP” their planned activities to prevent human to bat transmission:

1. **Minimize** caving activities where bats are present until more is known about exposure, infectivity, and transmissibility of SARS-CoV-2 from humans to bats.
2. **Assess** the risk you may pose of exposing bats to SARS-CoV-2 and avoid contact with bats if you have, or suspect you have, COVID-19 or have been exposed to someone with or suspected to have COVID-19.
3. **Protect** bats by adopting caving practices that reduce opportunities for exposure to SARS-CoV-2.

Preventing human-to-bat transmission of SARS-CoV-2 *for cavers*



1. MINIMIZE caving activities through avoidance, delay, replacement, or reduction.

- **Avoid** activities where bats are present. Move activities that usually take place in caves where bats are present to sites where there are no bats.
- **Delay** projects, such as cave exploration and drills, where bats are present until more is known about the risk of human-to-bat transmission of SARS-CoV-2.
- When possible, **replace** practical activities with ones that do not require entry into caves, such as surface exploration or theoretical activities.
- If entry into caves where bats are present is necessary:
 - **Reduce** the number of caves to explore, prioritizing sites where fewer bats are present.
 - **Reduce** the size of teams to the minimum needed for a safe expedition.
 - **Reduce** the size of courses and workshops that involve entering a cave with bats.
 - **Reduce** the time spent in spaces where bats roost, such as during topographic surveys or underground photography.

2. ASSESS the probability that you are shedding SARS-CoV-2 and may expose bats.

2.1 Regularly assess the probability that you may be shedding SARS-CoV-2 and avoid proximity to bats when infected or after potentially being exposed to SARS-CoV-2

All individuals at high risk of carrying SARS-CoV-2 should avoid any caving activity where bats are present. This includes:

- All individuals diagnosed with COVID-19 in the last 14 days.
- All individuals showing symptoms typical of COVID-19, such as fever above 37.5 °C / 98.6°F, cough, fatigue, or anosmia (loss or reduction of the ability to smell and taste) in the last 14 days.
- All individuals with known contacts with people diagnosed with COVID-19 or showing typical symptoms within the previous 14 days.

BEST PRACTICE: We strongly encourage all cavers who have had or suspect they have had COVID-19 to not resume caving until they have received a negative test if this is possible in their country

Where available, periodic screening for SARS-CoV-2 of individuals involved in caving activities should be implemented to detect possible exposure of animals.

If travel to caves significantly elevates exposure risk, individuals should take all measures possible to minimize exposure from other people and consider avoiding caving for 14 days following arrival at the caving site. They should carefully self-monitor for any COVID-19 symptoms.

In addition, cavers should modify their activities where bats may be present according to the epidemiological situation of their region or country. Epidemic peaks elevate the risk of human-to-bat transmission from asymptomatic cases. We recognize that knowledge of the local epidemiology of SARS-CoV-2 is highly dependent on the diagnostic capabilities of each country. In cases where no information is available, the risk should be considered high.

2.2 Assess the probability that you may expose bats to SARS-CoV-2.

Caving activities carry different levels of exposure probability. Risk of SARS-CoV-2 exposure and possible transmission increases with the duration of the interaction, proximity of the caver to bats, and air circulation. Enclosed spaces increase the potential of aerosol build up. Subterranean surveys and explorations where bats are present are high risk settings, especially if activities are sustained.

- Assess air circulation in the cave, as this contributes to the ease of spread and persistence of the virus in the environment.
- Assess the length of stay while exploring underground sites.
- Assess and prioritize the activities to be carried out, limiting invasive processes, such as topography, photography, rigging, hydrological geological studies, etc.
- Where available, refer to databases or inventories of caves where bats are present and limit access to them to avoid exposing bat colonies. Consider generating such a database if one is not already available for your region or country.

3. PROTECT bats by adopting caving practices that reduce bats' potential exposure to SARS-CoV-2 and general disturbance and stress

- As always, **avoid any direct contact** with bats. Do not handle bats.
- **Avoid being close to bats.** Do not approach bats in caves and maintain a distance of at least 2 m. Avoid using narrow passages where bats are present. Do not linger in galleries, chambers, or passages where bats are present. Leave such areas as quickly and safely as possible.
- **Avoid establishing camps** inside caves where bats roost.
- **Wear a face covering.** The use of face masks or coverings should be mandatory in restricted environments in the presence of bats
- **Avoid crowding** inside the caves, especially in narrow areas.
- Without exception, enter caves with **clean and disinfected equipment** (collective and personal equipment, including clothes), even if the caves surveyed lie within

the same exploration zone as another cave [See **BOX 1: EQUIPMENT DISINFECTION RECOMMENDATIONS**]

BEST PRACTICE: CRITICAL ACTION -- Clearly track all activities, locations visited and the personnel involved to have clear information on sites and bats that could have been exposed to the pathogen, should a caver be diagnosed with the disease.

BOX 1: EQUIPMENT DISINFECTION RECOMMENDATIONS

Collective and personal caving equipment requires specific care and cleaning.

Personal equipment should not be shared between individuals.

Collective equipment should be prepared and cleaned by a single person to reduce the risk of exposure to SARS-CoV-2. Collective equipment should be left in quarantine for at least 72 hours following cleaning. Consider washing equipment in a hot water bath at 55°C (131°F) for 20 minutes. Testing by scientists at the United States Forest Service in 2017 showed no significant decrease in strength of harnesses and ropes after a 20 min water bath at 55°C (131°F). Consult with equipment manufacturers for further instruction on the cleaning, disinfection, and maintenance of caving equipment. Further study is required to determine the persistence of SARS-CoV-2 on different surfaces used in caving practice (cloth, metal, plastics, etc.).

A list of helpful (but non-exhaustive) links:

Government agencies, caving groups, and non-governmental organizations:

- <https://caves.org/WNS/Rope%20and%20harness%20decon%20tests.pdf>
- https://ffspeleo.fr/image/uploader/kfm/divers_docs/20200526_FFS_ProtocolePhase3.pdf (French)

Equipment maintenance links from manufacturers:

- https://www.camp.it/blogAllegati/Protocollo%20de%20higienizaci%C3%B3n%20de%20los%20productos%20CAMP%20r1%2003-06-2020%20ESP_3067d76c-55ac-4b2a-8382-80d1f9ade3d9.pdf (Spanish)
- <https://www.petzl.com/US/en/Professional/News/2020-4-17/Recommendations-for-disinfecting-your-equipment>
- https://issuu.com/mh.asac/docs/degradacion_20epi_20pultimo (Spanish)
- https://www.blackdiamondequipment.com/on/demandware.static/-/Library-Sites-SharedLibrary/default/dwcc5723d5/tech-pdfs/S20_EquipmentCleaning_17x11_all%20lang.pdf

Further Reading and References

For more detailed recommendations including:

- disinfectant recommendations,
- recommendations on face coverings,

- general and basic best practices for field hygiene for standard bat survey work involving capture and handling of bats,

see: [IUCN SSC Bat Specialist Group \(BSG\) Recommended Strategy for Researchers to Reduce the Risk of Transmission of SARS-CoV-2 from Humans to Bats.](#)

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