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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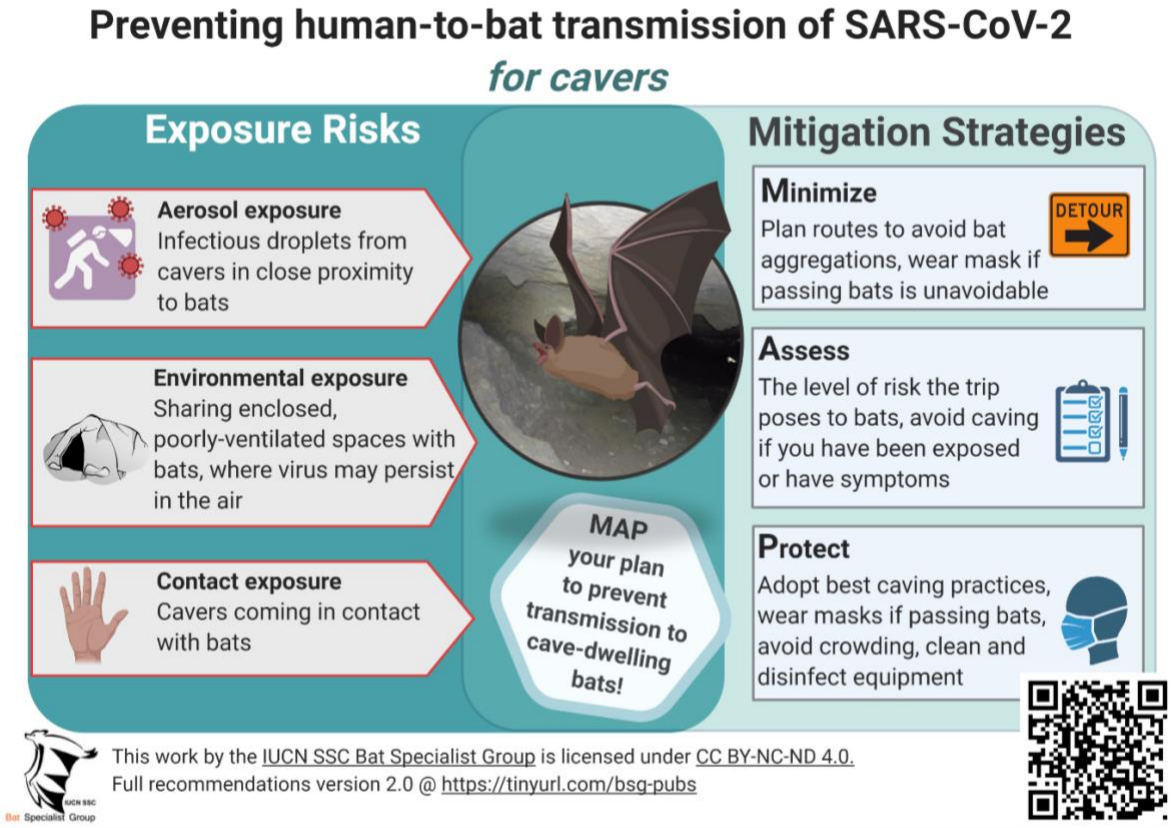


Overview

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. But this risk can be reduced using mitigation strategies, which now also include vaccination. In addition, cavers should always avoid disturbing bats and follow existing best practice, including published guidelines for

minimizing exposure to histoplasmosis [1] or contamination of materials with the fungi that causes White Nose Syndrome in bats [2].

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. The panel recognises that our understanding of SARS-CoV-2 has been changing rapidly and has continued to convene throughout 2020 and 2021 meet to review current research, and update stakeholder guidelines where necessary. Key developments since v1.0 of the guidelines include:

(1) It is now known that humans can transmit SARS-CoV-2 to other animals and the consequences can be devastating. In at least 11 countries across Europe and North American, SARS-CoV-2 was transmitted to mink on farms, spread through these populations, and may have even been transmitted back to farm workers [3,4]. This led to a massive cull of millions of mink [3–5]. Detection of SARS-CoV-2 in free-ranging mink may put wildlife at even further risk [6,7]. Humans have also transmitted SARS-CoV-2 to domestic dogs, cats and ferrets [8], and to zoo animals including captive gorillas, tigers, lions, snow leopards and puma [8]. Similarly, in a study currently undergoing editorial reviews [9] white-tailed deer have been infected by humans and may serve as reservoirs and periodically might have the potential to infect humans back.

(2) Since the last version of this document in August 2020, laboratory studies have shown that Egyptian fruit bats (*Rousettus aegyptiacus*) can be infected by SARS-CoV-2 in laboratory settings when given a high infectious dose [10] whereas big brown bats (*Eptesicus fuscus*) cannot [11]. We do not currently know how susceptible any of the other 1400+ bat species are to SARS-CoV-2, although modelling-based analyses suggest that the virus could potentially infect the cells in at least three genera of bats [12].

(3) Vaccines have become available that (a) reduce the risk of contracting COVID-19, (b) reduce symptoms in those who do contract COVID-19 despite being vaccinated (i.e., breakthrough cases), and (c) may reduce spreading in breakthrough cases [13–15]. However, vaccinated individuals may still have high virus loads, especially from the Delta variant and transmit to others [16,17]. We are still learning how long vaccines are protective (with some indications that protection may wane after 5-6 months [18–20]) and how protective they are against new variants of SARS-CoV-2.

(4) Infection and vaccination rates around the world are increasingly diverging. This presents different and changing levels of risk among and within countries.

(5) It is now understood that COVID-19 transmission is primarily airborne [21] via aerosols and that face masks play a critical role in reducing viral transmission [22].

Based on current knowledge, it is still 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, including vaccination.

The recommendations below have been conceived specifically to modify caving practices to protect bats from accidental SARS-CoV-2 exposure and transmission from cavers. These

measures may also protect cavers from contracting diseases, such as histoplasmosis, in caves where present. Regardless of current Covid-19 status, *under all circumstances* cave users should avoid disturbing bats and follow existing best practice.

BEST PRACTICE: Minimize disturbance to bats and follow cave governing bodies 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. Clean equipment and clothing between caves (see Box 2 for details) and wear a mask when in close proximity (< 2 m) to bats.

The BSG recommendations should be seen as 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.

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

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 relevant 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.

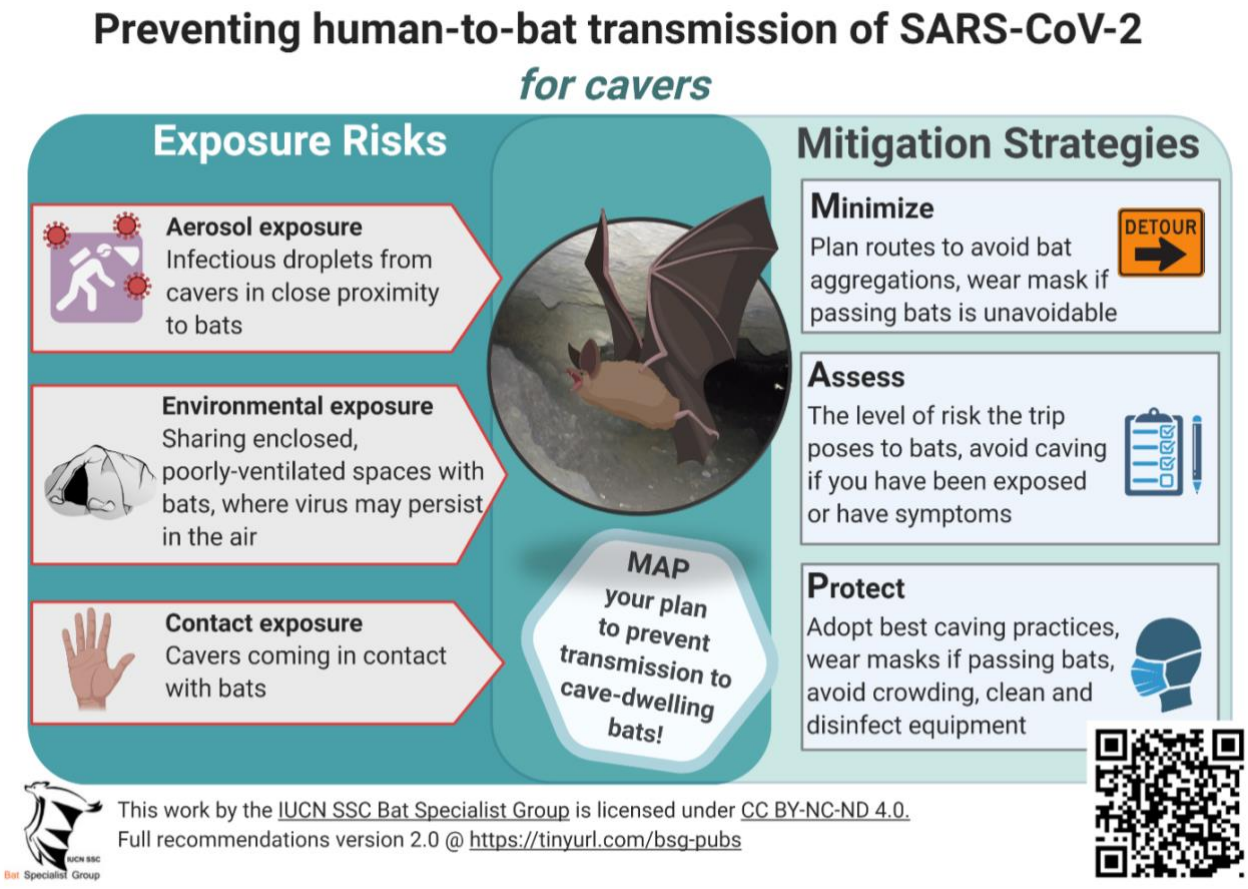
The ancestor of SARS-CoV-2, the virus that causes Covid-19, arose in bats at least some years before the pandemic began [23–25]. On-going research is continually changing our understanding of these processes and uncertainty remains [26]. It is important to remember that the current form of SARS-CoV-2 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 and bat conservation. Fortunately, this risk can be significantly reduced using appropriate mitigation strategies.

Bats could potentially be exposed to SARS-CoV-2 through infectious **aerosols** (droplets) and to a lesser extent via **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 breathe out and could contain SARS-CoV-2 can linger in the air or on surfaces [27].

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 **M**inimize, **A**ssess, **P**rotect mitigation strategy and "**MAP**" their planned activities to prevent human to bat transmission:

1. **Minimize** proximity and contact with bats when caving. Do not touch, handle, or stay close to bats. Reduce opportunities for exposure to SARS-CoV-2 by keeping your distance from bats and using masks when staying at least 2 m from them is not possible.
2. **Assess** the risk you may pose of exposing bats to SARS-CoV-2 and avoid caving 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 include avoiding visiting caves during bat hibernation and breeding seasons, and cleaning equipment and clothing between caves. If you must pass bats as part of your route **WEAR A MASK**.



1. **MINIMIZE the proximity and avoid contact with bats when caving.**
    - **Avoid** being close to bats when caving. Never touch or handle bats. Do not approach bats in caves and maintain a distance of **at least 2 m**. Avoid using narrow passages where bats are present. Avoid crowding inside the caves, especially in narrow areas. Do not linger in galleries, chambers, or passages where bats are present. Leave such areas as quickly and safely as possible.
    - IF you must pass bats as part of your route **wear a mask**.
    - Avoid establishing camps inside caves where bats roost.
    - Reduce the size of teams to the minimum needed for a safe expedition where bats are present.
    - **Reduce** the size of courses and workshops when entering a cave with bats.
    - **Reduce** the time spent in proximity to 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 <u>Regularly</u> 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-Co-V-2

We strongly recommend that cavers get vaccinated against COVID-19, subject to vaccine availability in your country of residence. 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, even if vaccinated.
- We strongly encourage all cavers that 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, consider periodic screening for SARS-CoV-2 of individuals, even if vaccinated, for example using rapid tests if you have access to them. This can help detect possible exposure of animals.

Assessment should be based on the epidemiological context and team-level vaccination status. Cavers should consult national and local information sources about epidemiological context (some tools are provided below) and query their team.

Example epidemiological tools: From Johns Hopkins University -- International Comparison of Positivity Rates and Tests Per Capita; from the University of Oxford -- https://ourworldindata.org/coronavirus. 91-DIVOC allows interactive visualization of data from either Johns Hopkins, University of Oxford, or both: https://91-divoc.com/pages/covid-visualization/.

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 and taking a Covid-19 test if available. They should carefully self-monitor for any COVID-19 symptoms.

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.
- IF you must pass bats as part of your route **wear a mask**. If the bats are in a poorly-ventilated chamber or passage, continue to wear your mask until you have cleared the chamber.
- **Avoid any** activities, especially exploration and drilling, during hibernation or breeding seasons where bats are present.
- 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)

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) [28]. 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 is provided below:
Government agencies, caving groups, and non-governmental organizations:

- https://caves.org/WNS/Rope%20and%20harness%20decon%20tests.pdf
- https://ffspeleo.fr/zaa73 (French)

Equipment maintenance links from manufacturers:

- https://www.camp.it/blogAllegati/Protocolo%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
- https://www.singingrock.com/covid-19-disinfection-statement

Further Reading & 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.

https://www.whitenosesyndrome.org/static-page/decontamination-information
Histoplasmosis - Protecting Workers at Risk (cdc.gov)

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