Impact of Wildlife on Access Network Facilities—Problems Caused by Monkeys and Countermeasures against Them

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Abstract

Telecommunication network facilities are exposed to a variety of indoor and outdoor environments in which they can be affected by the activities of wildlife. This article introduces problems caused by monkeys on access network facilities and countermeasures against these problems. This is the sixty-eighth article in a series on telecommunication technologies.

Keywords: aerial cable, cosine curve hanger (CCH), monkey

1. Introduction

Telecommunication network facilities are exposed to a variety of indoor and outdoor environments in which they can be affected by the activities of wildlife. Various problems caused by wildlife on access network facilities (such as telecommunication cables) have been reported (**Fig. 1**). Technical Assistance and Support Center (TASC) has investigated the problems caused by wildlife on telecommunication network facilities and has taken countermeasures against these problems [1]. In this article, we focus on the problems caused by monkeys and our countermeasures against these problems.

2. Problems caused by monkeys regarding telecommunication network facilities and countermeasures against them

Cases of monkeys entering residential areas have become more common due to factors such as the depopulation of villages [2]. Consequently, monkeys have directly affected telecommunication network facilities, and through behavior such as crossing aerial cables, they have also affected the lives of residents in the neighborhood. Two such cases and the countermeasures taken are introduced in the following sections.

2.1 Direct impact on NTT's telecommunication network facilities

2.1.1 Background

Along an aerial cable route crossing a national highway, a sagging optical fiber cable was broken by a passing vehicle snagging it (**Fig. 2**). At the initial deployment, this aerial optical-fiber cable was bundled together with other cables by using a cosine curve hanger (CCH). However, from the footage captured from the dashcam of the vehicle involved in the incident, it was clear that the cable in question was unbundled from the CCH even though other cables remained bundled at the time of contact with the vehicle.

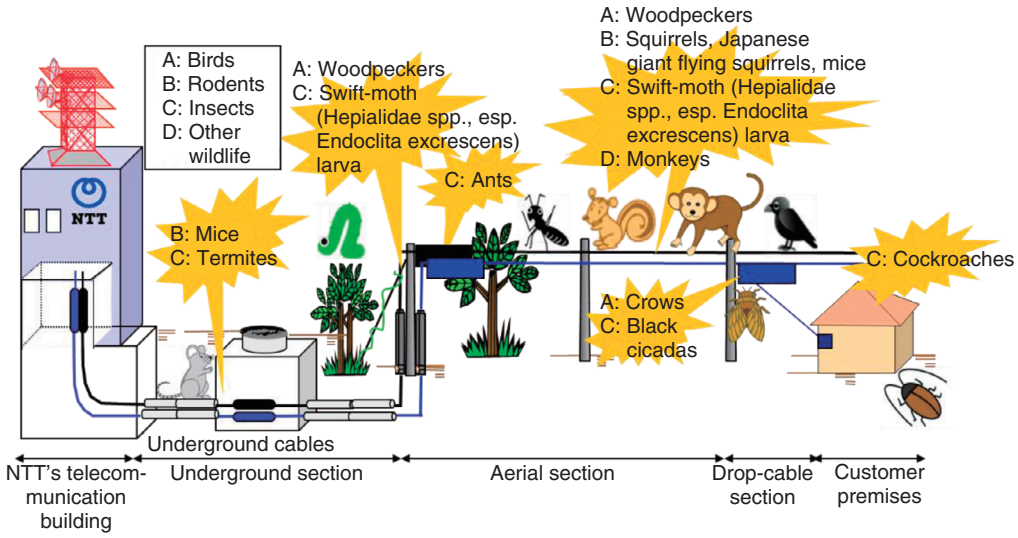


Fig. 1. Impact of wildlife on telecommunication network facilities.

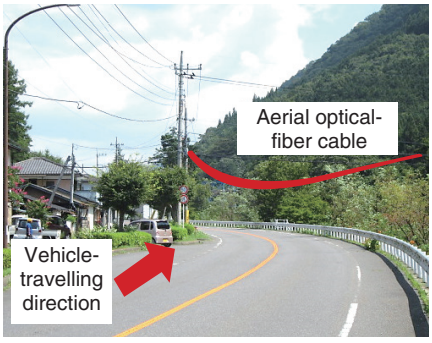


Fig. 2. Sagging cable.

Fig. 3. Monkeys crossing cables.

2.1.2 Investigation and analysis of the cause

To investigate the cause of the problem, we set up a fixed-point camera at the site to monitor the cable status for approximately a month. From the captured video, we observed more than a dozen monkeys per day crossing the cable in the incident section. Although the monkeys did not deliberately unbundle the cable, they strongly grabbed the cable for running and sometimes pulled the cable when losing their balance (**Fig. 3**).

After observing the monkeys' actions, we conducted an experiment to verify the possibility that the behavior of the monkeys caused the sagging of the cable. At an experimental site, we deployed optical cables bundled using a CCH, as shown in (1) in **Fig. 4**, and locally applied a pulling force to a part of the cable (Fig. 4(2)) to simulate a monkey applying a pulling (down) force on a cable at that part. When the locally applied pulling force was gradually increased and reached about 3 kg, the cable was unbundled from the CCH (Fig. 4(3)) and sagged (Fig. 4(4)). The monkeys captured on video were Japanese macaques, which were estimated to weigh about 7 to 15 kg. We therefore considered that they were capable of applying a force exceeding 3 kg when they pulled the cable. There was also no occurrence of severe weather conditions or natural disasters, such as typhoons or heavy rainfall, that could have caused the cable to sag before the incident; therefore, we determined that the sagging of the cable was due to the behavior of monkeys crossing the cable.

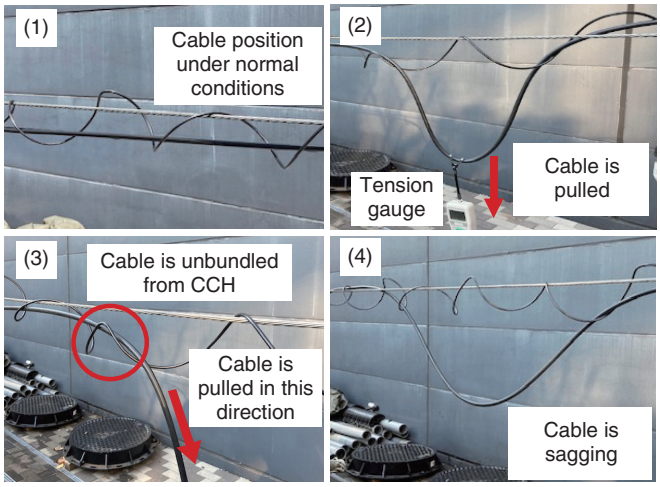


Fig. 4. How a cable sags.

(a) Securing a cable (b) Reinforcing SH

Fig. 5. Countermeasures against cables sagging.

2.1.3 Countermeasures

We took the following countermeasures to prevent the cable from sagging due to the above-described behavior of monkeys.

(1) The CCH was replaced with a spiral hanger (SH), which is mainly used in high-wind areas, and the cable was secured to the suspension wire with tying bands (**Fig. 5(a)**).

(2) To prevent the SH from falling, "quick holders," which are fixtures that prevent damage to the connectors of the SH and stop them from dislodging, were installed (**Fig. 5(b)**).

After these countermeasures were implemented, cable sagging did not recur. We thus believe that similar countermeasures will be effective at other locations in similar environments.

2.2 Example of impact on the neighboring community

2.2.1 Background

In an area, a large number of monkeys were seen crossing telecommunication cables and became a hot topic of conversation on social networking services. Neighboring residents requested that the monkeys be prevented from crossing NTT's telecommunication cables because they were invading nearby fields and destroying crops. From the results of interviews with a person monitoring monkeys commissioned by local governments, we learned that the monkeys formed groups of about 40 and traversed the cables daily in search of food.

2.2.2 Countermeasures

Since the above problem was already affecting the

Fig. 6. Bird-damage-prevention device

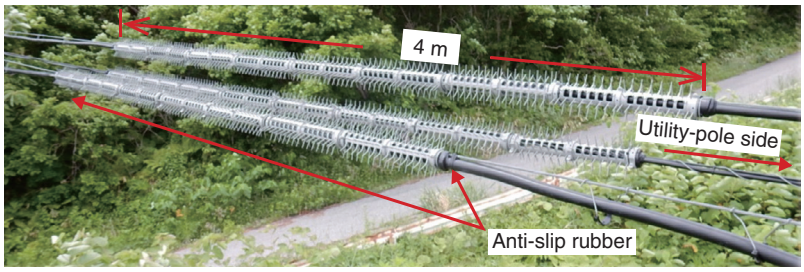


Fig. 7. Appearance of countermeasure device.

lives of nearby residents and immediate countermeasures were needed, we examined countermeasures using currently available products. From the perspective of biodiversity protection, we focused on devising a countermeasure that would not significantly affect the behavior of the monkeys but would prevent them invading the living areas of nearby residents by traversing the cables.

We devised a countermeasure using a commercially available bird-damage-prevention device to make it harder for monkeys to cross the cable (**Fig. 6**). This device has a spiked surface for preventing birds from perching on cables, and when attached to the cable, it rotates and makes it difficult for a monkey to grab the cable.

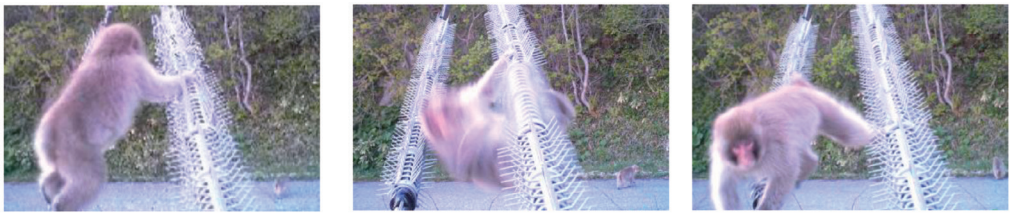
We installed the device on an optical fiber cable deployed in high monkey traffic area. Initially, the device was effective in preventing monkeys from crossing the cable. However, we found that monkeys have very high motor skills, i.e., can leap two to three meters horizontally and have an excellent sense of balance, so they can easily avoid the device and cross the cable, even from a precarious position. After repeated trials while studying the structure and installation method of the device, we determined that the following installation method to be effective (**Fig. 7**).

(1) To make the countermeasure device rotate more easily (i.e., more unstable), cut the device into two pieces of 250 mm in length (half the original length) and install the pieces.
(2) To stop the monkeys jumping over the device, attach multiple pieces (16 in total) with a total length of 4 m to the cable.

After adopting this installation method, we confirmed that any monkeys that tried crossing the section of the cable in question gave up and turned back (**Fig. 8**).

3. Concluding remarks

Examples of problems with telecommunication network facilities caused by monkeys and countermeasures against them were introduced. The surrounding environments of telecommunication network facilities vary considerably, and even if the problem is the same at each site (in this example,



(a) Monkey places its hand on the countermeasure device

(b) The device spins

(c) The monkey turns back and runs away

Fig. 8. A monkey trying to cross the countermeasure device, failing, and turning back.

monkeys crossing telecommunication cables), it is necessary to consider countermeasures that are appropriate for each site.

TASC, including its predecessor, the Technical Cooperation Department, has been supporting the field through technical cooperation activities for more than 50 years. Using the knowledge and experience accumulated to date, as well as new technologies, we will continue our efforts to improve the reliability of telecommunication network facilities and reduce failures.

References

[1] "Case Studies on Biological Damage to Telecommunication Access Facilities and Countermeasures," NTT Technical Journal, Vol. 27, No. 10, pp. 67–70, 2015 (in Japanese).

[2] Y. Muroyama, "How to Get Along with Monkeys in the Village: Damage Control Concerning Wild Animals," Kyoto University Press, 2003 (in Japanese).