

Population Dynamics and Habitat Change of Tasmanian Devils

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Abstract. Tasmanian devils (*Sarcophilus harrisii*) are the largest extant carnivorous marsupials and play an important ecological role in Tasmania. However, their populations have declined significantly in recent years. This paper looks at the main factors that affect Tasmanian devil populations. It focuses on Devil Facial Tumour Disease (DFTD) and habitat change. The study uses published articles and reports. These sources were collected from academic databases. Most studies were published between 2000 and 2025. Many studies report that DFTD is the main cause of population decline. In many areas, populations have dropped by more than 80%. In some places, the decline is over 90%. The disease has spread across most parts of Tasmania. It has changed population size and structure. Habitat change also affects devils. It can change movement patterns and food availability. Conservation programs such as translocation are used to support populations. These findings show that both disease and environmental factors are important for Tasmanian devil conservation.

Keywords: *Sarcophilus harrisii*, Devil Facial Tumour Disease, wildlife disease, habitat modification, conservation biology

1. Introduction

The Tasmanian devil (*Sarcophilus harrisii*) is the largest carnivorous marsupial active in Australia, on the island state of Tasmania. As both a predator and scavenger, the species plays a crucial role in maintaining ecosystem balance by consuming carrion and regulating populations of smaller animals [1, 2]. Historically, Tasmanian devils were distributed across mainland Australia, but they became extinct on the mainland thousands of years ago and now survives only in Tasmania [2].

In recent decades, Tasmanian devil populations have declined dramatically. This decline is associated with several environmental and biological pressures, including loss of habitat, increasing bushfire frequency, climate change and disease outbreaks. One of the main reasons for this decline is Devil Facial Tumour Disease (DFTD), a rare contagious cancer that spreads through biting during social interactions. The disease first appeared in the 1990s, and it has spread across most of Tasmania and caused population reductions exceeding 80%, with some regions experiencing declines greater than 90% [2, 3].

Although DFTD is one of the most significant factors, environmental conditions still can not be ignored. Changes in land use may affect movement patterns and resource availability, also take part

in change of population dynamics and habitat. Therefore, this paper studies and analyses from different aspects, the ecological role of the Tasmanian devil, the impact of diseases, and habitat changes in order to understand the reasons of why the decline happened in population of Tasmanian devils.

Tasmanian devils are important. Not only because they are threatened, but also because they play a key role in the ecosystem. They contribute to remove dead animals and influence other species through feeding and competition. Because of this, a decline in devil numbers may affect the whole ecosystem on Tasmania. So studying their population change is important. It helps us understand how disease and habitat change work together.

2. Ecological role of the Tasmanian devil

Tasmanian devils (*Sarcophilus harrisii*) hold a distinctive position in Tasmanian ecosystems, functioning simultaneously as active hunters and opportunistic scavengers. Their diet, which spans carrion, small mammals, and birds, means that a single devil can consume an entire carcass, bones included [1]. This feeding behaviour accelerates nutrient return to the soil and, in doing so, helps stabilise the broader ecosystem.

Beyond their direct feeding role, devils shape the dynamics of other species in ways that are less immediately obvious. Their presence appears to suppress populations of smaller predators, including introduced species like feral cats, possibly through competition for food resources [2]. The removal of this suppressive pressure, as devil numbers have dropped due to devil facial tumour disease (DFTD), has been linked to measurable increases in mesopredator activity, with downstream consequences for prey populations and vegetation.

Devils also seem to influence the spatial behaviour of co-occurring predators. Field observations suggest that smaller carnivores shift their foraging times and locations when devils are present, which reduces direct competition [2]. Where devil populations have thinned, however, species like quolls and feral cats have been recorded expanding into areas they previously avoided, placing new pressure on small mammals already facing habitat loss.

The scavenging function of devils has a practical consequence that is easy to overlook: carcass removal. A dead wombat or wallaby, left unscavenged, decomposes slowly and inconsistently. Devils accelerate this process substantially, releasing nitrogen and phosphorus back into the soil at a faster rate and supporting the plant communities that depend on them. In ecosystems with reduced devil activity, this decomposition function appears to slow noticeably.

There is also a tentative connection between devil scavenging and pathogen load in the environment. Removing animal carcasses promptly reduces the time disease-causing organisms persist in soil and water, though this effect has not been quantified precisely in Tasmanian conditions. What is clearer is that declining devil numbers coincide with weaker ecosystem-level clean-up, and the downstream health implications of this are not trivial, even if they remain understudied.

It must be acknowledged that significant gaps remain. Most published research concentrates on scavenging behaviour and mesopredator suppression, while comparatively little examines devils' effects on soil chemistry or plant recruitment. Long-term field studies across different habitat types, such as dry sclerophyll forest versus coastal scrub, would help determine whether the ecological roles described here are consistent or context-dependent.

3. Devil Facial tumour disease and population decline

Devil Facial Tumour Disease (DFTD) is widely considered to be the main cause of Tasmanian devil population decline. The disease is a kind of transmissible cancer. It spreads through biting during social interactions, and tumour cells move directly between individuals [2].

Unlike other kinds of cancers, DFTD spreads as a living cell line. The tumour cells act as an infectious agent. This allows the disease to move in a more direct way from one Tasmanian devil to another during aggressive contact [4-9]. This feature is rare. It makes DFTD one of the few known transmissible cancers in nature. It also explains that why the disease has such a strong impact.

DFTD can also avoid the immune system. The tumour cells show low expression of MHC-I molecules. This makes it hard for the host to recognise them [2]. As a result, the tumour can grow in new individuals. This increases the success of infection.

Since the first case was found in 1996, DFTD has spread across most of Tasmania. Research has shown that local populations have declined by more than 80%, and some have declined by over 90% [2, 3]. Some local populations decline by up to 95% [6]. These numbers are very high for wildlife populations. The disease causes high mortality and has significantly reduced population size. Unfortunately, DFTD does not only reduce population size. It also changes population structure. In many areas, older devils become rare. This is because infected animals often die early. As a result, the population becomes younger. Some females may start breeding earlier. This may help the population continue in the short term. However, it also shows that normal life patterns are changing. So the disease affects both number and structure.

However, some populations still survive at low levels. This survival may be linked to rapid evolution. Genetic studies show changes in regions related to immune function [6]. This suggests that devils may develop some resistance. Other research shows that populations may not go extinct. Instead, they may reach a new balance with the disease [7]. This balance does not mean the problem is solved. Population size may still stay low. Small populations can face more risks. For example, they may lose genetic diversity, and may also recover more slowly after other events. These include fire or habitat loss. So long-term survival is still uncertain.

There are actually two different strains of DFTD: DFT1 and DFT2. The second strain was discovered later and behaves slightly differently. Both strains spread by biting, but they may have different effects on survival. Some research suggests that DFT2 is less aggressive, but this is still being studied. Having two transmissible cancers makes the situation more complex for conservation.

4. Habitat change and environmental pressure

In addition to disease, habitat change also affects Tasmanian devils. Landscape modification, such as forestry and plantations change, may alter the structure of habitat and affect how devils use their environment. Research shows that devils are able to live in modified landscapes, including plantation forests. They often rely on plantation areas and roads for moving and feeding.

Studies show that devils can live in modified landscapes. But their behaviour changes. They do not strongly prefer one habitat type at a large scale. However, inside plantation areas, they prefer plantations that are 4–7 years old. The selection ratio is about 1.52 [3]. Devils also prefer roads and plantation edges. They use these areas for both movement and foraging. The selection ratio for roads can reach about 2.48 to 2.97. For plantation edges, it is about 2.24 to 2.78 [3]. This shows that habitat change does not only reduce available space of the devils, it also changes how devils move and feed.

However, those areas can also increase risk such as road accidents [5]. These landscapes have both benefits and risks. Roads can help devils move faster. They can also find food such as roadkill. But roads also increase the chance of death. On the other hand, Tasmanian devils often use areas between forest and farmland. These areas can provide food. But they may also increase competition and disease spread [8].

Habitat fragmentation can reduce connectivity between populations. This may limit dispersal and affect long-term survival. Environmental changes can also influence the resources, such as prey and shelter sites, which may increase ecological pressure of the species.

Studies of Translocation further highlight the importance of habitat. For example, research about Maria Island shows that translocated devils can survive after translocation and create new home ranges, but their lives are dependent on environmental conditions [4]. Conservation programs such as assisted colonisation aim to create disease-free populations and support recovery [7-10].

Behaviour is also important in translocation. Devils use scent to recognise each other. If individuals become familiar before release, they may fight less. This can improve survival after translocation [5]. However, there are also risks. Adding captive animals may affect the genetics of wild populations. It may reduce local adaptation and also increase disease spread if not managed carefully [7].

5. Methodology

This study is based on a review of published research. The data were collected from academic databases such as Google Scholar and Springer Nature. Keywords included Tasmanian devil, DFTD, population decline, and habitat change. The study included research published between 2000 and 2025. Only peer-reviewed articles and book chapters were selected. The study collected data on population trends and environmental factors. It also collected information on disease spread and habitat use. The data were compared and summarised to identify main patterns. For each study, the author recorded the main findings about population change, disease spread, and habitat use. I then compared these findings across studies to look for common patterns.

6. Results

Many studies report that Tasmanian devil populations have declined significantly due to the spread of DFTD. In many regions, populations have dropped by more than 80%, and in some areas the decline is greater than 90% [2, 3]. The disease started in the north-east of Tasmania in 1996 and has spread across most of the island, affecting a large proportion of the species' range [2].

The disease spreads easily through biting, improving the transmission of tumour cells between individuals [2]. The disease causes high death rates and changes population structure. The presence of more than one transmissible cancer increases the risk to the species [4].

Environmental factors also influence population dynamics. Studies show that devils continue to use modified landscapes, such as plantation and roads for movement and foraging [3]. Habitat change can increase stress and affect long-term survival. Translocation programs show that devils can survive in new areas under suitable conditions [6, 8]. Not all areas have been affected equally. In the north-east, where DFTD first appeared, populations have declined the most. In remote parts of the west, the disease arrived later, and declines have been smaller so far. This regional variation suggests that timing and local conditions both matter.

The results show a clear pattern. Disease is the main cause of decline, but habitat conditions also affect outcomes. Some landscapes still support devils, while others increase risk. Conservation

actions can help. But their success depends on local conditions. So population change is caused by more than one factor, and the current situation also needs to be improved from different aspects.

7. Discussion

The decline of the Tasmanian devil is a major conservation challenge. Current evidence shows that DFTD is the primary driver of population decline and has a strong effect on population size. However, environmental factors may also play a role.

Habitat conditions shape how well devil populations survive and recover [5, 6]. The same disease does not always produce the same outcome. In areas with sufficient food and shelter, devils may withstand infection longer. In degraded habitats, animals are already under stress, and disease tends to hit harder. This means that habitat quality and disease pressure do not operate independently; they interact, and the combined effect can be greater than either factor alone.

Human activity adds another layer of complexity. Roads, farmland, and plantations fragment the landscape and alter how devils move between areas. Greater movement between groups raises the chance of disease transmission. At the same time, modified environments often supply carrion, which attracts devils and concentrates them in the same locations. The same habitat feature can therefore both support survival and accelerate infection spread.

Long-term recovery is harder to assess than population counts alone suggest. A group that appears numerically stable may still carry risks: low genetic diversity leaves it vulnerable to future disease strains, and heavy reliance on modified habitat creates exposure to new threats if land use changes again. These factors are difficult to observe directly, which makes recovery harder to confirm.

Predicting future trends carries similar uncertainty. Some evidence points to gradual adaptation in devil populations, but the pace of this process remains unclear. Environmental conditions will continue to shift, affecting both survival rates and breeding success. No single projection can account for all of this, so conservation planning needs to remain open to multiple possible outcomes rather than committing to one expected trajectory.

Even populations that persist alongside the disease tend to remain small. Small groups are disproportionately sensitive to disturbance. A single fire season or a further round of habitat loss can reverse years of slow recovery. Sustained, long-term protection is therefore not optional; it is a basic condition for any meaningful recovery.

Given this, management approaches should vary by location. Some areas may require stronger habitat protection, while others may benefit more from intensive disease monitoring. Applying a single strategy across all sites is unlikely to be effective. Future research should continue examining disease and habitat together, rather than treating them as separate problems, and should look for ways to support devil recovery across a range of environmental conditions.

8. Conclusion

The Tasmanian devil holds a central place in Tasmania's ecological structure, and its decline over recent decades reflects the severity of Devil Facial Tumour Disease (DFTD). Across most of the species' range, population numbers have fallen sharply as the disease spreads through direct contact between individuals. Habitat change and environmental pressure compound this problem, affecting how devils move, access resources, and recover over time.

The evidence reviewed here points to a consistent pattern. DFTD remains the primary driver of population decline, but habitat conditions shape how individual populations respond. In some areas,

suitable habitat appears to buffer the effects of disease; in others, degraded or fragmented environments may accelerate population loss. Decline, in other words, is not the product of a single cause. It reflects the interaction between a highly transmissible disease and a landscape that is itself under pressure.

This has direct implications for conservation. Strategies focused on disease management alone are unlikely to be sufficient. Habitat protection needs to be treated as an equal priority, not a secondary concern. Long-term monitoring across different environmental conditions will also be necessary, since the relationship between disease and habitat appears to vary by location. Continued research into this interaction will help refine protection efforts as conditions change.

The Tasmanian devil case also carries a broader lesson. Many threatened species face not one problem but several at once. When this is true, management that targets only the most visible threat tends to underestimate the full picture. Addressing disease and habitat together, rather than in sequence, gives recovery efforts a more realistic foundation.

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