CHAPTER TWO

Lions

I would like you to try to imagine that you are a rural Tanzanian villager. This isn't going to be easy, but it's important to try. For the purposes of this imagineering, you live in the Lindi region, which is next to the coast in the south-east corner of Tanzania. Feel free to take a look on Google Earth if it helps you to picture the place. If you do, you'll notice one thing pretty quickly: Tanzania is a big country. At just over 945,000km^2 (365,000 square miles) it is larger than Spain, Portugal, Italy, Belgium (that geographical staple of area calculations) and most of Wales combined. It shows just how large African countries are that – while being larger than substantial chunks of Europe combined – Tanzania still only manages to rank a paltry 13th in the table of largest countries in Africa. In fact, with 54 recognised countries across Africa, Tanzania only just squeaks into the top quarter.

The Lindi region, where you live, is 'just' 66,000km^2 (25,000 square miles) or a little over a 'pair of Belgiums'. That said, if the Lindi region were an African country, rather than just one of the 31 regions of Tanzania, it would be the 41st largest, just between Sierra Leone and Togo. I guess the point I am trying to make here is that when we talk of 'Africa', it is rare for many people who haven't had the opportunity to spend time there to have much of an idea of just how vast some of the areas

concerned are. This sense of scale is important, because when we are thinking about predators and human – predator interactions in many places across the world, geographical scale is going to prove to be a vital consideration. Among other things, scale influences remoteness, relative development, predator abundance, biodiversity and human population density. Of the 31 regions, or *mikoa*, that make up Tanzania, your region of Lindi has one of the lowest population densities. Tanzania overall, though, has an expanding population. Indeed, East Africa (which includes Tanzania, Kenya, Uganda and Ethiopia) is one of the fastest growing regions in the world. The extent of this expansion can be gauged simply by looking at population trends over the past 20 years. At the start of the century there were 35 million people in Tanzania, which by 2018 had risen to 56 million. This an increase of 21 million, or 60 per cent, in 18 years. In 1988, there were just 23 million people in Tanzania, which means the population has almost tripled in 30 years. Population rarely expands evenly across countries, especially larger countries, and in Tanzania most population growth has been concentrated in the north. Together with a general trend of urbanisation over the past 50 years, expanding northern populations mean that the southern regions, like Lindi, still remain relatively undeveloped, at least for now.

The Lindi region has just under 900,000 people and is split up into five districts. The district you call home is Ruangwa. By this stage of geographical division, we are getting into area sizes that are more familiar and comfortable. Ruangwa is the smallest district in the

Lindi region, with an area of around 2,500km^2 (965 square miles). This is more or less the size of the English county of Dorset. You and your family live, grow crops and graze livestock here.

One sign of the undeveloped nature of the Ruangwa district is the general lack of paved roads. One estimate puts this as low as 5km (3 miles). These days we have the advantage of being able to check out such claims without leaving our homes, thanks to Google Earth. Heading down to the Ruangwa district, the initial zoomed-out images make the whole region look like wilderness. As in many other parts of Tanzania – and indeed the world more widely – what looks like wilderness very often isn't. Zooming in closer reveals the distinctive signs of a human-dominated – or at least human-affected – landscape. Once we get even closer to the ground, a mosaic of regularly sized, more or less straight-edged cleared areas comes into view. It can be hard to get your eye in at first, but once you have, cultivated areas can easily be distinguished, spread throughout much of the district. Zooming in yet further reveals huts and other signs of habitation, as well as tracks across the ground made by wildlife, people and vehicles. Flying virtually around the region, the '5km of paved roads' claim starts to look like a realistic estimate, but despite the lack of infrastructure development it is hard to escape the signs of human presence. Zooming into a patch of woodland reveals the regular pattern of a plantation, while a closer look at a patch of scrub shows more than 10 huts within cleared areas of bushes and trees. Some parts of the district are less amenable to cultivation and there it is harder to find signs of human

presence. Thick bands of dark vegetation, for example, mark out drainage lines and seasonal rivers, while thicker stands of trees seem relatively resistant to human impacts, at least for now. So, Ruangwa may not be a heavily developed area, and population density is relatively very low, but it would be a big mistake to think that this is truly 'wild' country. As we will see, it could end up being an even bigger mistake to think of it as 'tamed'.

So, there you are, living a rural existence in southern Tanzania. It is a lifestyle that wouldn't be so different in a great many other countries throughout the world. Millions, perhaps billions of people live some distance from cities and advanced infrastructure, but nonetheless they are people who are very much part of the modern world. Just like you, these are people who need food and shelter, water and power, people with hopes and aspirations, people who love their children and tolerate their in-laws. This is important to keep in mind because quite soon we are going to have to think about people being eaten, and this will inevitably involve numbers and statistics. When those numbers grow large, the humanity that contributes to them becomes obscured and forgotten. But we must never lose sight of the fact that behind these numbers are real people. They might live far away, and they might have a different culture and lifestyle, but in every way that really matters they are just like you and me.

Speaking of you, it just so happens that when we join you down in Tanzania it is mid-April, and the heaviest rains are falling. This might make moving around more difficult at times, and even hazardous as dry river beds

fill with rapid floods, but your crops of cassava, maize and sorghum have grown well and you are spending long days in the fields harvesting whatever is ready. It isn't just humans that find your crops attractive; bush pigs are present in good numbers around your fields. At night, these large, intelligent and powerful relatives of the domestic pig roam in groups of perhaps a dozen or more individuals. To help to protect your crops from them you are sleeping in a makeshift hut. A decent enough construction of branches and twigs, your hut is raised on a platform less than 2m (6ft 7in) above the ground and provides reasonable shelter from the elements.[1] Bush pigs are a great example of the label 'pest' being highly subjective. They might be the last thing you want to be around if you are a Tanzanian farmer, yet they are a species some wildlife tourists are desperate to see. It is all about perspective – and from your current perspective, a sleeping platform above the ground, they are more than just a pest. You see, the problem with bush pigs is that, as well as eating your crops, they attract lions – and Tanzania has more lions than any other country.

Lions past and present

Some of us think of lions these days as a 'safari' species, prowling the endless plains of Africa. Their modern-day range backs up this impression. Most lions are now found in southern and eastern Africa, and they are a much sought-after species by tourists on safari to destinations like Kruger National Park in South Africa or Hwange National Park in Zimbabwe. The modern lion range, though, is a hugely contracted fragment of

the species' historical range. Lions were once dispersed far more widely across Africa, as well as parts of southern Europe and Asia. For example, lions were once commonplace in Greece, although they seem to have disappeared from there at least 1,500 years ago. Lions were also present throughout the southern and eastern Caucasus until around 1,000 years ago. Now, wild lions outside of Africa are limited to the Gir National Park and surrounding area in the western India state of Gujarat. These Indian lions are also but a tiny remnant of a Central Asian and Indian distribution that included Saudi Arabia, Iran, Iraq and much of the northern swathe of India. We are fairly and squarely to blame for this historical range contraction and for the modern-day threats to lions. Although the precise reasons behind any decline can be complex, the overarching themes are ones we will return to frequently in this book: predators are persecuted because they are dangerous to us and our livestock; we reduce their habitat through encroachment; and we deplete their prey by hunting.

Within Africa, lion range has greatly contracted over the past century or so. This decline in geographical range goes hand-in-hand with a huge decline in overall population. Lions are now either absent or extremely rare in most of North and West Africa. They have been extirpated (made locally extinct) from Mauritania, Gambia, Togo, Djibouti, Lesotho and very probably Sierra Leone (a country with the Italian word for 'lion' in its name) and Eritrea. It is also likely that lions are no longer present in Ghana, Guinea, Guinea Bissau, Ivory Coast and Mali. Tantalising camera-trap images suggest that lions may be present in a few countries formally written

off but, from a historical range that included most of Africa except the Sahara Desert and the rainforests of the Congo River Basin, lion range has contracted to perhaps a quarter of what it once was.

In terms of overall population, estimates vary. Lions are difficult to survey in many parts of their range and – despite the global attention paid to lion conservation – ~~uu~~funding for on-the-ground research and accurate counts is hard to find. Even when groups and individuals are funded to undertake such research, population estimates are just that – estimates. Keith Somerville provides a good overview of lion populations in his book, *Humans and Lions: Conflict, Conservation and Coexistence*, and he concludes that the general opinion of conservation scientists working on lions is that the population is somewhere between 20,000 and 39,000. Amy Dickman, one of the world's top lion researchers and the leader of the Ruaha Carnivore Project in Central Tanzania, suggests a likely number somewhere just under 24,000, while others stand behind a figure of 20,000. The simple answer is that we don't know for sure, but I've yet to see a credible estimate that doesn't fall somewhere between 20,000 and 25,000.

Overall population estimates are useful, of course, but only up to a point. Current population does not give us any idea of how the population has changed over time. Without the context provided by historical population data we can have little hope of gaining insight into potential future population trends. Once we factor in historical estimates, the situation with lions looks even more dire. We have enough of a problem gaining reliable estimates of the population now – when lions are

greatly restricted in terms of range and we have modern survey methods – so historical population estimates have even more error associated with them. With that in mind, it is sobering to learn that best-guess estimates suggest that lions may have numbered 400,000 in 1950 and perhaps as many as 100,000 in the mid-1990s. I wouldn't want to bet my house on whether those figures are even within 10 per cent of the actual number, but regardless of the detail the bigger picture is horribly clear.

What overall population figures also mask is local variation. To sidestep slightly into some fundamental ecology, all species have an 'overall population'. However, unless a species is so limited in its range that all members live within 'mixing range' of each other, such headline figures are less useful than knowing about how that overall population is dispersed through the species' total range. In reality, most species exist as different, more-or-less separate populations within the overall range. Exceptions to this are species whose range is limited to a single location, such as those endemic to small islands. In most species, though, individuals from different populations within the total range may have only limited contact with each other, if any contact at all. There may be some immigration and emigration from different populations and this can be important to limit the harmful effects of inbreeding, especially when population size is low. Despite considerable dispersal ability, however, a lion living in Ruaha National Park in Tanzania will never meet a lion prowling Pilanesberg National Park in South Africa. Individual lions from each population would have no problem breeding with each other – they are undeniably the same species – but

they will never breed simply because they will never meet.

To conserve species, it is vital to understand population ecology because it lets us understand the specific threats faced by different populations and then tailor our conservation approaches accordingly. So, while lions are in decline overall – and their range is contracting – if we examine individual populations of lions across their range we see a more nuanced pattern. In some areas, lion populations are declining calamitously, with populations in West and Central Africa of particular concern. In parts of southern Africa, however, we see some areas where lions are actually increasing in numbers, especially in fenced areas. Understanding these population nuances is vital if we are to take the appropriate conservation measures. It is also an important part of gaining a better understanding of the threats that lions pose to people. The occurrence of lions across a landscape and the threats those particular lions face are important in building up an understanding of how the interactions between us and them could lead to human predation.

To return to your imagined life in Tanzania, the fear of predation is high in your mind because you are perched just above the ground trying to protect your crops from rampaging bush pigs. Pigs, you'll remember, attract lions and not only do you live in the country with the highest population of lions anywhere in the world, you live in a region with a relatively high number of attacks; and you are undertaking an activity that puts you at particular risk of being attacked. We know this because, in 2005, well-known lion researcher Craig

Packer and others analysed lion attacks that were reported in Tanzania in the 15 years following 1990.[1]

Lion attacks in Tanzania

In those 15 years, more than 563 Tanzanians were killed by lions and at least 308 were injured. These combined figures were updated in 2007 to exceed 1,000 people attacked.[2] Forty-five per cent of those attacks happened in just six coastal districts and Lindi district accounted for around half. The attacks were characterised in many cases by an unusual feature: lions entered human settlements and areas of agriculture seemingly to seek out humans.[3] In other words, this was active 'deliberate' predation. The number of reported attacks increased quite sharply after 1990 from fewer than 30 per year to around 100 per year from 2002 onwards. 1999 was a particularly bad year, when more than 130 people were attacked. Packer *et al.* attribute this striking increase in attacks to the rise in Tanzania's human population and a linked decrease in the availably of prey for lions outside of protected areas. Where wildlife is protected in national parks, or in the better-protected and managed hunting blocks that spread out across Tanzania's landscape, lions have access to non-human prey. Where lions roam in less well-protected landscapes their normal prey is depleted. In such situations, humans (and that would include you perching above your fields) become acceptable prey.

If we think back to Harry Wolhuter in Chapter One, the first game ranger of Kruger National Park, then his near-fatal attack by lions probably summarises most people's impression of a 'classic' lion attack. He was out

on patrol when he was charged by the initial lion. He was on horseback and very much in the 'wilderness'. If we think of predator attacks, it is likely that we think about these wilderness-located, adventuresome encounters. But the data from Tanzania show very clearly that the reality of lion attacks is generally far more mundane. Packer *et al.* were able to categorise attacks into different contexts, and these tell a story of domesticity and village life rather than derring-do and misadventure. Attacks occurred when people were in or by their house, when they were going to the toilet (most commonly outside), or when they were walking, herding or tending crops. In other words, attacks happened when people were living their everyday lives, going about perfectly ordinary activities. Some attacks did occur when people (mostly men) were hunting lions that had attacked people or cattle, but these were the minority. As the paper starkly relates, 'Lions pull people out of bed, attack nursing mothers and catch children playing outside.' To be attacked while outside is awful, but to be attacked by a 150kg (330lb) lion while in your house, perhaps while even asleep, is truly the stuff of nightmares. The construction of rural houses is such that they provide only the merest security. With the majority having roofs thatched with grass or reed stems – and many also having similarly thatched walls – lions can simply force their way inside. If people venture outside to go to the toilet they are especially vulnerable. More than 18 per cent of the 538 victims of attacks whose age was known were under 10 years old.

Time of year plays a part in lion attacks in this area. Nearly 40 per cent of attacks occurred during the

March–May period when people harvest their crops. You will recall that it was April when you were imagining being out in the fields, and you will also recall that you were protecting your crops from bush pigs. The sense of security that a wooden structure beneath you and thatched walls and a roof above might provide is illusionary and your position in the fields makes you especially vulnerable to attack. More than 27 per cent of attacks involve people in precisely your current position, often while they are sleeping.

Complex interactions

The relationship between crop protection against bush pigs, lion presence and subsequent attacks is complex. Packer *et al.* interviewed people who reported that lions were seen entering villages or fields in pursuit of bush pigs. They also reported in some cases tolerating the presence of lions because they helped to control the numbers of bush pig crop raiders, although lions in pursuit of bush pigs may find themselves in villages whose crops attract the bush pigs in the first place. The situation is further complicated by the overall abundance of the species that would normally be hunted by lions. Packer *et al.* concluded that attacks on people were highest in districts with the lowest abundance of species such as kudu, zebra, hartebeest, impala or dik-dik, and the highest abundance of bush pigs. Nearly half of the variance in attacks found between districts (some districts having high numbers of attacks, for example, and others having low numbers) could be explained just by the dearth of prey and the abundance of bush pigs. Interestingly, adding in other

factors like human population density, cattle density, agricultural land cover or proximity to a protected area (where lions are more common) did not add any additional explanation for the variance seen in attacks between districts. The conclusion is that lion attacks are being driven by a depletion of prey species and an increase in bush pigs, which are acting as a maintenance diet in areas where settlement and agricultural disturbance have reduced other prey. Bush pigs are attracted to crops at harvest time, so lions follow them. When you add people into the mix, the result can be tragic.

Further analysis of attacks published in 2010 revealed finer-scale patterns in human–lion interactions. This analysis, led by Hadas Kushnir, compared attacks between the Lindi region and the Rufiji district. Rufiji is in the west of Tanzania, is less densely populated than Lindi and contains part of the Selous Game Reserve, a source of wild lions. Overall, Rufiji contains more lions, more prey and slightly fewer people than Lindi in an area a little under 50 per cent larger. The pattern of attacks between the two regions is quite different. Lindi (more people, more densely populated, fewer lions, lower prey) suffered 190 attacks between 1990 and 2007, and Rufiji (more lions) had 101. Interviews were conducted in the two regions, focusing on a pair of neighbouring villages in each region, one of which had high attacks and the other no attacks. Through this approach, the team was able to unpick some of the human activities that made attacks more likely. It confirmed the findings of Packer *et al.* that lower wild prey density and increased abundance of bush pigs were

risk factors for lion attacks, but also added the ownership of fewer assets, poorly constructed huts or houses, having to walk further to get resources and more nights sleeping outside. What these additional risk factors point to is the role of poverty in being attacked. Having a poorly constructed dwelling in a location further from resources and owning few assets make you vulnerable. As we will see with other predatory species, it is the poor of the world that overwhelmingly bear the brunt of predation.

The approach used by Kushnir *et al.* allowed them to look at differences between Lindi and Rufiji, and start to disentangle some of the complex human factors that underpin different susceptibility to lion attacks. Clearly, to be attacked by a lion you need two things in place: people in positions of vulnerability and lions; just having lions in an area is not sufficient. What Kushnir *et al.* found was that different human behaviours – some of which link closely to economic development, underpinned by landscape and agricultural differences – were critical in explaining patterns of predation on humans.

In Rufiji, the majority of attacks occurred at night, inside structures in agricultural fields in which people were sleeping – much like the makeshift hut you found yourself in when imagining you were a Tanzanian villager. The Rufiji River separates settlements on the north side from agriculture to the south. People tend to have houses in the villages on the north side and temporary dwellings in their fields on the south side, where they spend most of their time during harvest seasons. Staying in the fields overnight is vital because

many of the crop-raiding species – including bush pigs, warthogs, vervet monkeys, baboons and elephants – often come at night. Interviewing the villagers led to suggestions that lions are predominately found to the south of the river and are to some extent unable to cross the river and enter villages. The situation in Lindi is similar in that residents are reliant on small-scale agriculture. However, in Lindi there is no geographical separation between fields and villages, which tend to be closer together than in Rufiji. Lindi residents may have to walk anywhere between 5 minutes to 2.5 hours to travel between the two. For longer trips, overnight stays may be preferable and although Rufiji residents may sleep in fields during some times at harvest, they do so far less than in Lindi. Further differences between the two locations are revealed when residents were asked about water collecting. The river in Rufiji is a convenient local resource, but Lindi residents had to walk, sometimes for an hour or so, to get water from wells. So while in Rufiji attacks often occurred at night in fields, in Lindi people tend to be more susceptible to attacks when walking.

The numbers of people attacked and killed are horrific enough, but behind them lie terrible stories of human suffering. As Amy Dickman succinctly summed up when I interviewed her for a BBC radio documentary on predation of humans,[4] these attacks are 'totally devastating for everyone involved'. Men are taken more often than women and very often those men will be the breadwinners of the family. Children are also killed, causing unspeakable pain for the families involved. While some attacks can plausibly be thought of as

defensive, the entering of homes where people are sleeping can only be interpreted as a predatory behaviour. Of the more than 1,000 Tanzanians attacked between 1990 and 2009, more than two-thirds were killed and the victims eaten. That humans are prey in these situations is further underlined by the fact that in the Ruaha district of Tanzania there is evidence of lions actually adjusting their behaviour to take advantage of the novel prey resource offered by humans. Dickman described to me how, when analysing attacks in that area, she had imagined they would be focused on what might be described as 'easy prey': the elderly, the infirm or the very young. In fact, attacks in that area were focused on men aged between 20–40. The vast majority of these men had a common feature that overcame their physicality to make them unusually vulnerable: they were drunk. These men, walking home after an evening of drinking, were blissfully unaware of their surroundings and as vulnerable as drunk people walking anywhere. With a characteristic smell, gait and sound, it is not hard to imagine lions swiftly learning that such people are easy prey.

Another factor in the predation of humans – and in predation overall – is the lunar cycle. Despite the impression created by the countless sequences of lions hunting in daylight on nature documentaries, lions are essentially nocturnal predators and the majority of human predation events occur at night. It gets more nuanced though. Looking at the timing of predation events in relation to the lunar cycle revealed that most attacks on humans occurred in the weeks following the full moon.[5] During this period we get the darkest

evening hours, but this is also the time of night when we tend to be most active; a bad combination for us if nocturnal predators are around.

Understanding the patterns that lie beneath human–wildlife conflict is more than just an academic exercise. Knowledge of how, where, why and when attacks happen, as well as who is attacked, allows us to develop and plan mitigation strategies that protect people. Such strategies can also protect predators. Retaliatory and pre-emptive killing based on fear of future attacks is a major driver of predator decline in many cases. I'll return to this topic later on in this chapter when I consider mitigation and the future.

Beyond Tanzania

With the highest number of lions of any country, a growing human population and a relatively well-developed history of wildlife research, it is perhaps not surprising that Tanzania has become a focus of study into lion attacks – but attacks do occur elsewhere. At the end of 2020, news media sites around the world were abuzz with the story of wildlife researcher Gotz Neef. Neef was awoken by a lion while camping in the Okavango Delta in Botswana. The old male lion, described variously as emaciated and starving, had apparently been ejected from his pride and saw Neef as an easy meal. The lion made what turned out to be a fatal mistake when it pounced on the researcher's tent. Neef fought back (as prey often does), punching the lion in the face, while others nearby threw elephant dung and a flash-bang (a loud, firecracker-type device designed to scare away animals) at the lion. The lion

retreated back into the bush and was later euthanised (a common euphemism for shot). During the attack, Neef sustained serious injuries including 16 puncture wounds, some broken bones and deep scratches on his head and back.[6] The wildlife researcher survived the attack, but there can be little doubt that had he not fought so hard and had campmates nearby to help, he would have ended up being eaten.

If we look behind the lurid headlines, the story of Neef illustrates a number of important points. First, as with Harry Wolhuter in Kruger, fighting back against a predator individually can only go so far. In the end, both men owed their lives to the support of others. In Wolhuter's case, it was the men who came to rescue him when the first lion that attacked had him stuck up a tree, injured and certain to die without medical intervention. For Neef, it was the quick thinking and bravery of others in the camp that drove the lion back into the bush, and doubtless also helped in the administering of essential first aid. On our own, against a far heavier, stronger and quicker predator we are not physically much of a match. Had Neef been carrying a suitable firearm – and been able to use such a weapon effectively in a highly stressful situation – then he might have been able to subdue the lion without assistance, but it is clear that, even then, having others around would be a strong advantage. Our sociability and our communities protect us to some extent against predation.

The second point we can take from Neef's encounter is an idea we will return to frequently in other chapters: the 'incapacitated man-eater'. The lion that attacked

Neef was described as old, emaciated and starving, and certainly such an animal would have problems taking an antelope, warthog or bush pig. I saw a highly emaciated lion in Pilanesberg National Park in South Africa in 2018 that was most likely in a similar state to the one that attacked Neef. The animal walked slowly, pelvis and spine clearly visible through the skin. No longer part of a pride, and with no realistic chance of catching anything larger than a dung beetle, this individual will likely have either starved to death or been taken by hyenas, or other lions. It is easy to imagine such an animal desperately wandering into a human camp in search of an easy meal. Indian-born British hunter and naturalist Jim Corbett – who we will meet again in Chapter Three – suggested that most tigers and leopards that resort to hunting people were injured or incapacitated in some way. While that may have been true of the cats Corbett hunted down – and might be true in some cases now – it does not seem to be the case in modern-day India or with the lions attacking villagers in Tanzania.

The third point is that predatory lion attacks happen outside of the relatively well-documented areas of Tanzania. Neef was attacked in Botswana and, albeit more than a century ago, Wolhuter was attacked in South Africa. In Kenya in 2017, 18-year-old Weldon Kirui was attacked and mostly eaten in 2017 in Nairobi National Park,[7] a protected area only 7km (4 miles) south of Kenya's capital city. Nairobi's high-rise skyline is actually visible from much of the park, although less so at 2 a.m. when the attack happened. The victim was a Maasai who was grazing his cattle in the National Park

at night, which is illegal but a drought had forced the herders to take advantage of whatever pasture they could find.

It is instructive to look at the way the attack on Kirui was covered outside Kenya. The only mention I could find online in a UK press outlet was in the *Evening Standard*.[8] The details of the attack are related, but Kirui, despite being named in the Kenya report, is unnamed. He is simply identified as a Maasai, stripped of any personal identity. This fatal attack, barely mentioned outside Kenya, contrasts sharply with Neef's non-fatal attack, which was covered globally. Neef, a white researcher on an expedition funded by *National Geographic*, was always named. Neef was never just 'a wildlife researcher' or 'a man'. Meanwhile, if you search for 'Nairobi lions' in the UK press there are plenty of mentions of a lion that escaped the National Park and was shot, replete with plenty of angry comments from readers incensed that a lion was killed. The death of Cecil the lion was a global phenomenon, yet the deaths of countless rural poor barely warrant a mention. It seems that not all Black Lives Matter.

This skewed priority, where individual animals are accorded distinctions, rights and protections above those of the rural people living 'elsewhere' – or where the lives of white people from developed countries are given higher priority than others – is a major issue in conservation. It is far from a recent phenomenon. Kenya was home to perhaps the most famous 'man-eating lions' of all: the Tsavo man-eaters. This coalition of two male lions terrorised the workers constructing the railway through Tsavo between March and December

in 1898. The death toll inflicted by this pair has been variously disputed, with estimates of between 28 and 135 victims. Some indication of why it has proved difficult to calculate the number of people killed can be derived from the fact that a well-known account in 1907 gave the death toll as 28 labourers and 'scores of unfortunate African natives'. The name of the man who killed the lions, Lieutenant Colonel Patterson, is well known and accompanies every account of the incident (including this one) and yet the names of the victims are largely forgotten. Even in modern times it is difficult, and often impossible, to get reliable data on the number of people killed by predators when such attacks happen to the rural poor in relatively underdeveloped regions.

As locations for lion attacks in the modern world, we can add South Africa to Tanzania, Kenya and Botswana. There are a number of reports of (again, unnamed) poachers being killed and eaten by lions in Kruger National Park, sites in Limpopo province and other locations. People are also attacked and killed by lions in South Africa, but not eaten. In these cases, it is not always clear whether such attacks are truly predatory. Kobus Marais, an anti-poaching ranger and dog handler I spoke to in 2016 while fact-finding for a BBC Radio 4 documentary on rhino poaching, was killed by a lion in Pilanesberg National Park in 2021. The lion that attacked him was officially described as being very thin, emaciated and in poor condition (similar to the lion I saw in the same location three years previously). The lion was shot, but not before Marais had suffered fatal wounds from the lion, which was described as 'lying in wait'.[9] All the

evidence in that case pointed to Marais being a victim of a predatory attack, even though he wasn't eaten.

In an international seminar on the conservation and management of large carnivores in Africa, held in 2006, the session covering lions, conflict and conservation stated that 'even in the twenty-first century man-eating is a serious problem in Ethiopia, Tanzania and Mozambique',[10] adding two more countries to a growing list. Mozambique is home to a growing and viable population of lions, but also suffers from attacks. For example, according to a report prepared in 2007, since 1974 at least 34 people had been killed by lions in the Niassa National Reserve.[11] During just the 27 months between July 2006 and September 2008, 24 people were reported to have been killed by lions in Mozambique, with a concentration of attacks in the area bordering Kruger National Park in South Africa.[12] Ethiopia saw a particularly striking and horrific example of lion attacks in 2005 when, according to reports, a pride of lions killed 20 villagers and injured 10 more in a week.[13] More recently, a lion pride killed four people in 2020 in the Gambella region and reports of those attacks include reference to similar events in previous years.[14]

We can also add Uganda to the list of countries with well-documented lion attacks. Data maintained by the Ugandan government showed that there were 275 attacks by lions on humans there between 1923 and 1994, and 75 per cent of attacks were fatal.[15] Elsewhere, in 2017, a 10-year-old girl going to the toilet was killed by a lion in Zimbabwe,[16] while three boys were lucky to survive an attack there in 2020.[17] In Zambia, lions killed and ate

Lantone Phiri as he was walking in the remote town of Nyimba in 2011,[18] and 21-year-old Anthony Chibulu was killed and partly eaten in the Mambwe district. Zambia was also home to one of the largest human-attacking lions ever recorded, the Mfuwe man-eater,[19] which killed and ate six people in the Luangwa River valley before being shot in 1991.[20] There are many such stories, both reported and unreported.[21]

Most people living in lion country will not end up being attacked and may only rarely, if ever, see a lion. Nonetheless, the presence of lions is a prerequisite for being attacked. Outside of the countries where lions are relatively more numerous, attacks are much more unusual. The rarity of lions in these areas – and the fact that lions may be restricted to known and protected areas (and so less likely to be free-ranging) – probably plays a role in reducing attacks. In West and Central Africa, for example, where lions are found in low densities in countries like Benin, Niger, Cameroon and Guinea, deaths of humans are rare.[22] However, the infrequency of lion attacks on people does not mean that conflict with lions, especially through the depredation of cattle, is not a problem in these areas – as we will see shortly.

Beyond Africa

The only place outside Africa with free-ranging wild lions is Gir National Park, a forested area in Gujarat, India. According to official figures (and keep that 'according to' in mind as we move ahead), this population has been increasing at an accelerating rate in recent years, and numbered more than 674 in 2020 (a rise of 29 per cent from 2015).[23] Prime Minister

Narendra Modi tweeted this good news and announced that the population had also had a geographical range increase of 36 per cent. This conservation success story was widely picked up by the world's media, as indeed it should have been. However, a bit of digging reveals that the situation is a little more complex than Modi's tweet suggested. It was by no means all good news for the lions of India during 2020. Across the year, despite the increases trumpeted by Modi, lions started to die and in numbers that were, for some observers at least, concerning. Ten lions died in January, a further 12 in February, followed by 10 more in March. By the time May ended, a further 50 were reported to have died.[24]

Something that can be forgotten when media stories document 'mass die-offs' and other seemingly shocking mortality events is that animals die. Nothing lives forever. When you have a reasonably sized population of animals that live, as lions do, for perhaps 10–14 years, then you would expect some turnover. Cubs will be born and a proportion of these will not make it to adulthood. Meanwhile, older lions will die. The issue, with any population, is when the death rate observed exceeds what might be reasonably expected to occur from the natural background mortality rate. When this point is breached it becomes reasonable to assume that something untoward may be going on, and that some intervention may be required to stop or slow down the additional population loss. This is especially the case for species of conservation concern and when we suspect (as is often the case) that the increased mortality may be due to something we are doing. In fact, lions around Gir have died from unnatural causes before. In the areas

around the protected National Park, where lions can roam in a wider human-dominated landscape, at least 30 lions died in a 10-year period as a consequence of falling down open wells. When deaths occur as a consequence of some human-centred activity or feature then it may be relatively straightforward to prevent or reduce further deaths. In this case, the simple measure of building a parapet wall around wells was sufficient to result in no lions, or any other species, dying in them.[25] Of course, with tens of thousands of wells already in the landscape and others being dug, a wholesale conversion is by no means straightforward, but it is at least possible. Other sources of mass mortality can be far harder to ameliorate, even if the source of mortality can be determined.

The cause of the lion deaths occurring in 2020 has so far proved hard to pin down. Indeed, there seems to be little agreement as to whether the deaths even require an explanation. In March 2021, the Gujarat government announced in the state assembly that 313 lions had died in the Gir National Park in the two previous years,[26] but only two adults and eight cubs were considered to have died from 'unnatural causes'. In 2019 the state assembly was told that as many as 222 lions died after 2017, but that only 23 of these had died from unnatural causes (which included falling into wells).[27] At this point, politics kicks in. The opposition party claimed in 2020 that rotting cattle meat, transported illegally into the National Park from surrounding villages, was to blame for deaths that were being counted as natural. Meanwhile, canine distemper virus (CDV), which is known to have caused lion deaths in Gir in 2018,[28] has

been suggested as a cause of excess deaths by some. A reasonable explanation – CDV and related viruses have caused mortality in African lions – but its presence in India was denied by the chief conservator of forests of the Junagadh Wildlife Circle, D. T. Vasavada, who stated in 2020: 'There is no CDV here in Gir … This issue of CDV is a media-versus-Gujarat government thing; it has no truth to it.'[29] In other words, CDV was fake news, with a whiff of political game-playing. It is a measure of our relationship with lions, and their cultural and even political importance, that they are affected by fake news and political posturing.

The situation in India is further complicated by the fact that counting lions is far more difficult than it first appears. Bear in mind that in India lions only live in one area, centred on Gir National Park. That is an area of 1,412km^2 (545 square miles), supporting 674 lions, according to the 2020 figures. This is an area just 7 per cent the size of Kruger National Park in South Africa (19,485km^2/3,662 square miles), which is estimated to have around 1,600 lions. Although very different types of habitat, having nearly half the individuals in an area almost 14 times smaller, seems as though it should make counting lions in Gir relatively straightforward compared with other areas of lion range. Once you add the fact that lions are sizeable creatures, often quite vocal, live in groups, and leave kills and footprints around the landscape, you start to build up a picture of an animal that should be relatively easy to census. As is often the case when armchair assumptions get applied to ecological scenarios, the reality is rather different. Even with healthy populations in smaller areas, lions

are still relatively thin on the ground. If we assume 674 individuals evenly spread through the 1,412km^2 (545 square miles) of Gir National Park, then that is only one lion for every 2km^2 (0.7 square miles). Even at relatively higher densities, the lions of India have a lot of land in which to hide. That is, of course, before you include vegetation cover and topography. Lions are also surprisingly well camouflaged in natural vegetation. That nondescript light brown, in conjunction with the ability to be very still while lying down, can make lions all but invisible. I once drove past a vehicle in Botswana that had stopped to view a lion resting just 15m from the road. The occupants had got lucky and glimpsed an ear moving slightly as they drove along. Coming in the opposite direction, we certainly would not have spotted it. They left us to the sighting and we watched this lone lion for a few minutes before realising that there were other lions lying up in the grass. In fact, at least four other lions were eventually visible and I am quite sure there may been others sleeping in the hot afternoon sun. The reality is that animals can be very hard to count even with the best methods available – and in Gir National Park it has been suggested that the methods being used to count lions are far from the best available.

In 2020, Yadvendradev Jhala, senior scientist at the Wildlife Institute of India, was damning in his appraisal of the lion-survey methodology being used in Gir National Park. Dismissing them as 100-year-old methods that would not 'stand the scrutiny of contemporary science', Jhala makes a strong point. The lion survey was conducted using the 'block count' method, which is logically very straightforward. You

count lions that you find in given survey areas (the 'blocks'), then multiply to estimate the lions that you should find across the whole area. In this case waterholes within counting blocks across the park were staked out for two days and lions were counted by 1,400 people. There are all kinds of problems with this approach, but often in ecology you have to work with what you have even if it is far from ideal. The accuracy of the final estimate produced by this method is greatly affected by the behaviour of the animals; for example, if they roam over large areas the same animals can be counted in multiple blocks and lead to an overestimate. Alternatively, a failure to detect animals at the survey point, if they happen to avoid waterholes that day, for instance, can result in underestimates. These problems are well known, and modern methods – including using camera traps, the identification of individual animals by unique marks or from DNA analysis, sophisticated statistical approaches and greatly increased survey efforts – generally provide far more accurate population estimates. However, some experts have argued that camera trapping is not effective for lions because they are harder to identify individually; unlike leopards or tigers they don't have so many obvious, individual-specific markings. Estimates from some quarters suggest that there are probably 700 more lions living outside the protected survey area (although it is unclear how these estimates are reached).

It is all a bit of a mess. I contacted Jhala in an attempt to get some clarity but, alas, his reply only made things murkier. As he told me in 2021, 'There could be anywhere between 350 to 1,000 lions. Without a proper

assessment, numbers are political populations.' Meanwhile, the issue of whether there are in fact 'excess deaths' and unnatural mortality – and if so whether these deaths are caused by canine distemper virus or some other factor – remains unresolved and hotly contested. Again, I was hoping for clarity from Jhala, but his frustration with the situation is clear in his reply: 'There has been no transparency regarding CDV and lion deaths. My research permits of 25 years were cancelled, since what I have been saying and writing based on scientific data is not palatable to the forest officials and the government (I work for the government, though!). I do not have scientifically valid information on CDV deaths, but lions are dying in the Gir landscape.'

What is a little clearer is the threat posed to people by lions. Between 2007 and 2017 in the wider Gir landscape, 190 attacks were recorded resulting in 12 fatalities (4 per cent of attacks or 1.3 deaths per year). For comparison, in the same landscape, leopards were responsible for 383 attacks in 2011–2016, resulting in 41 fatalities or around 7 per year.[30] The low percentage of fatalities from attacks is interesting and the conclusion is that lion attacks are 'mostly accidental', arising not from deliberate stalking of humans as prey (the usual pattern in Tanzania), but from self-defence when lions are 'spooked' by surprise encounters. Revealingly, an attitudes survey of residents in the area showed that communities benefiting economically from lions (by lion predation on agricultural pests like bush pigs and from tourism) were far more tolerant of their presence than pastoralists who experienced some livestock losses from lions. This is an important point to bear in mind

and one that we will return to frequently. People can be surprisingly tolerant of dangerous predators if there is some benefit to them being around. At this point – and I am assuming a few things about you as a reader – it would be helpful to park your privileged notion of wildlife having aesthetic or intrinsic value. Unless you live in fear of being stalked by a lion, or having your livelihood destroyed by one, you don't really have a solid position to comment on costs and benefits.

Living with conflict

There is a great deal of uncertainty when it comes to gauging the precise impact that lions have on humans through direct, predatory attacks. Record keeping varies, data may not be collected well or at all, deaths may not be recorded, bodies may not be recovered and what information we have is often distributed among different sources. As such, it is currently impossible to say exactly how many people are killed by lions every year across their entire range. What we can say, with certainty, is that lions do present a real risk to human beings through predatory attacks in many areas where the two species coexist. Lions do hunt and kill people, and the rural poor in countries like Tanzania bear the brunt of these attacks.

Simple coexistence between lions and humans is not sufficient to elevate the threat from 'notional' to 'real'. Lions in protected areas, where human–lion interactions may be more controlled, represent far less of a threat than lions that roam freely in areas where people live, grow crops, walk or work. However, it is also fair to say that lions in these areas have far more to fear from

people than people do from them. This is not to trivialise the fact that hundreds of people a year are injured or killed, and eaten, by lions. But from a conservation perspective we cannot lose sight of the fact that a great many lions are killed in retaliatory and pre-emptive attacks.

While the killing and eating of people clearly represents the extreme end of human–wildlife conflict, it is still relatively uncommon compared with other forms of conflict. With lions, this conflict is most often manifested through the killing of livestock. Predation of livestock is a common concern for many who live in areas where predators are present. Plans to reintroduce predators like wolves to landscapes, including part of Scotland, are often met by objections based on the fact that predators kill livestock (see Chapter Nine). It is common to hear these concerns downplayed by advocates of 'rewilding' and certainly it is by no means a given that predators in areas with livestock will become 'livestock killers'. However, predators most certainly do kill livestock and for poor people living on marginal land such losses can become life-threatening. It is no surprise that people faced with potential losses will not spend much time evaluating relative risk when a simple solution is to hand. Consequently, lions and many other predators have long faced persecution from people scared for their lives and the lives of their animals, which for many communities around the world are deeply intertwined. A common theme that emerges, whether it is goats in Tanzania, cattle in India or sheep in the Highlands of Scotland is 'compensation'. Sure, you might lose some

animals, but 'we' can just pay the bill and move on. I would suggest, politely, that it is a very privileged position indeed to pontificate about compensation for livestock losses when you neither suffer the loss nor write the cheque.

Reducing conflict

Reducing conflict is not straightforward, but before considering the options available we need to examine the nature of human–lion conflicts more generally. This involves tackling some difficult topics that lurk beneath the surface of many conservation issues. My focus in this book is on human predation and it is inevitable perhaps that much of the negative lion media coverage highlights these attacks. As we have already seen, though, media coverage of attacks is far from uniform. The non-fatal mauling of a white man in Botswana can become viral news, while the killing and eating of villagers in Ethiopia escapes any international attention. We should not then be surprised that when most lion-related deaths do warrant a mention, their coverage is usually derisory at best. By not naming victims, such coverage perhaps also reveals deep racial prejudices and the persistence of a pervasive, and largely unchallenged, colonial attitude when it comes to predators and the people who live alongside them.

In fact, the developed world media tends to be far more focused on the predators themselves than the human cost they impose. When Cecil the lion was shot and killed by Walter Palmer in 2015, the story took a few weeks to really take hold – but once it did it become a popular news story for days and then weeks. The

media outrage – and subsequent public outrage – grew rapidly, but I saw no reports of anyone being killed and eaten by lions in the UK media during the 'Cecil summer'. There most definitely will have been such incidents, but the death of poor rural people in distant countries seems to resonate far less with Western observers than the death of a lion.

David Macdonald, the then head of the unit (WildCRU) at the University of Oxford that had collared Cecil, said that 'in terms of attracting global attention, it [Cecil] was the largest story in the history of wildlife conservation'.[31] Let's just let that sink in. We are seeing habitat destruction across the world; poisoning incidents that involve hundreds of vultures at a time; a rhino-poaching crisis in South Africa that is nowhere near under control; an international illegal trade in pangolins that many believe is an existential crisis for several species; the bleaching of coral reefs; over-exploitation of marine resources; the list goes on. Against this backdrop, a leading conservation biologist identifies, rightly in my opinion, the death of a single, old, lion as 'the largest story in the history of wildlife conservation'. As I mentioned at the start of the book, I visited South Africa to record a BBC radio documentary about trophy hunting around two months after the Cecil story broke, and Cecil and Palmer were both still big news, with stories, updates and speculation appearing frequently in both traditional and social media. I am typing this on a morning more than six years after the event and a quick search of Twitter reveals 11 tweets in the past 24 hours directly referencing Cecil the lion, all

of which have other Twitter users engaging with them. A single lion, that died six years ago…

Some balance on the Cecil story was provided by the Zimbabwean media, although the voices heard there were seldom amplified internationally (see the pattern?). Alex Magaisa, writing in the Zimbabwe paper the *Herald* on 30 July reported that he had never heard of Cecil and that neither had his friends and family. Magaisa went to say that 'the manner in which the story has been presented by international media seems somewhat far removed from the lived realities of most of the local people'.[32] As Keith Somerville pointed out in his definitive paper on the coverage of Cecil,[33] the Zimbabwean columnist Farai Sevenzo wrote on BBC's African news website (interestingly on the same day that Magaisa was commenting in the *Herald*) that 'Zimbabweans feel somewhat bemused by the attention the world is giving to the killing of a lion'. What Sevenzo goes on to say is especially relevant when it comes to addressing wider issues of human–wildlife conflict. He points out that Zimbabwe was confused by the surge in international media interest in Zimbabwe, especially as it 'did not come from the high unemployment figures, the food shortages, the state persecution of vendors, the lack of medicines, the lack of cash – but from a lion named 'Cecil' by conservationists'.[34] In other words, Western observers seemed to value the life of a single animal over the lives of Zimbabwean people.

Cecil the lion was perhaps an aberration, a coincidence of timing and events. The viral nature of the story can arguably be traced to what the *Daily Telegraph* described as an 'impassioned rant' by US TV talk-show host Jimmy

Kimmel.[35] During a section of the show focusing on the story, Kimmel asked an absent Palmer, 'The big question is, why are you shooting a lion in the first place? I'm honestly curious to know why a human being would be compelled to do that. How is that fun? Is it that difficult for you to get an erection that you need to kill things?' Kimmel also appealed to people to donate to WildCRU. The conservation unit's website crashed and it received more than a million dollars during the weeks following Kimmel's appeal. Whether Kimmel would have encouraged such donations knowing that members of WildCRU – as conservation scientists and leading experts in lion conservation – have publicly, and patiently, sought to explain the evidence as to why trophy hunting can in fact be good for conservation is a question I will leave hanging. With a large audience and a wide sphere of influence, Kimmel's outburst, during which he appeared to shed tears, gave the story a boost that the internet and social media subsequently magnified. Further stories involving named animals and hunters began to emerge, including Xanda the lion ('son of Cecil')[36] and Voortrekker the elephant,[37] but none of the sequels have had the traction and longevity of the original.

When media reports do carry stories of predator attacks on people, those reports can be equally unhelpful for conservation. By ignoring those who are most likely to be the victims of attacks, the media blur the public focus on real conservation issues; but by sensationalising attacks people's natural – and sensible – wariness of predators is enhanced to a point when these animals become feared and vilified. In a study of 1,774 media reports of large predator attacks most stories (59 per

cent) were published in North America, followed by Europe (20 per cent), Asia (15 per cent) and only 2.6 per cent in Africa despite a large number of attacks by lions and crocodiles (more on crocodiles in Chapter Four).[38] Lions barely featured and it was brown bears (which we'll cover in Chapter Eight) that led the way, accounting for 16 per cent of stories. The number of people killed in a week in Tanzania alone is probably double the number of people killed each year by brown bears in North America, but you wouldn't know that if you focused on media reports. The language being used to describe attacks – and the predators themselves – was often negative and included words like 'horror', 'nightmare', 'terrifying' and 'gruesome'. Graphical elements including lurid descriptions and photographs are often present, and may be enhanced on social media where such elements can also encourage wider sharing. The UK press rarely shows graphic images, but other countries often have fewer reservations. It still comes as a shock seeing front pages abroad featuring human remains, gory injuries, mutilated bodies and so on. As I will talk about in the next chapter, I frequently receive horrific images from India of people who have fallen victim to tigers and leopards, and in many cases these images have appeared in the local press or are shared on social media. Such images and loaded language might, as the authors of the study point out, 'lead to an unjustified and amplified fear in the public with consequent lower tolerance toward predators and decrease in the support for conservation plans'.

A fear of predators is entirely rational and reflects an evolutionary legacy from our long line of ancestors who

faced a real and regular threat of becoming prey. I interviewed a number of researchers who work with predators for a BBC radio series and a common theme that emerged was the 'hairs on the back of the neck standing up' reaction that we have to them.[39] For many of us living modern lifestyles the actual threat posed by predators is essentially zero, but the threat posed by predators to many in the developing world is very real. Interestingly, the perception of the risk of attack is also very real, at least for those living in Tanzania.

A study of the perception of risk of predatory lion attacks for people living in Tanzania was published in 2019 by two researchers we have met before: Hadas Kushnir and Craig Packer. As in previous studies we have explored, it was the districts of Rufiji and Lindi that came under the microscope, this time through questionnaire-based interviews of members of randomly selected households. The study included questions that aimed to unpick the effects of demographic factors (age, gender), personal experience of lions, and family history of attacks on perception of risk. Two questions specifically asked people about their perception of risk ('How likely do you think you are to be attacked by a lion?') and concern about that risk ('Are you worried about being attacked by a lion?').[40]

As we know, more than 1,000 people were attacked by lions in Tanzania between 1990 and 2007. Most attacks were unprovoked and clearly predatory in motivation. The numbers are high and we must not lose sight of the human cost, but equally the overall risk to any given individual is low. Kushnir and Packer conclude that with 'an average of 15.5 attacks per year in Rufiji and

Lindi, a combined population of ~450,000 people in the two districts and an average lifespan in Tanzania of 55.9 years, a realistic estimate of an individual's lifetime chances of being attacked is well below 1 per cent'. This is true when we consider the population overall, but not everyone in these districts is equally at risk from attack. We know that certain activities put some people at more risk than others, so the risk posed by lions to certain groups within a population is higher than the calculated population-wide risk; likewise some groups have lower risk. We can also be swayed by seemingly low numbers. Less than 1 per cent might be a totally acceptable risk for, say, suffering a sprain playing tennis, but a wholly unacceptable risk for something that has potentially fatal consequences. Our appetite for risk depends on the nature of the consequences of that risk. In June 2021, I completed the QCovid University of Oxford risk calculator,[41] and based on a number of factors relating to my age, gender and health I had a considerably less than 1 per cent chance of even being admitted to hospital with Covid-19 and a far lower risk of dying. Despite this low risk, I was very happy to receive my vaccinations and, I won't lie, that happiness didn't come from the perspective of the 'greater good' and the lower risk of transmission that comes from being vaccinated. Even though I know the numbers, my appetite for disease risk is relatively low, which is also the reason I get a flu jab every autumn. I have a family, dependents, a life that I don't want to risk if I don't have to. Sure, my actual risk is low, but perhaps my perception or inward sense of risk – and the amount I may be concerned by it – are higher. Rural Tanzanians, facing existential

threats, have a similarly skewed but understandable sense of risk.

Across the survey, 53 per cent of people thought they were 'very likely' to be attacked by a lion, and 69 per cent worried about being attacked. There were no significant differences between people living in villages who had suffered lion attacks and those who hadn't, or between people who had suffered a family member being attacked and those who hadn't. People with more education were more likely to be worried about attacks and thought they were more likely to be attacked, but there were no differences in perception or concern between genders. There were also no differences based on sightings of lions or signs of lions, with one exception: people who saw signs of lions (tracks and scat) in their village were more likely to be worried or very worried about being attacked than those who hadn't seen signs in their village. And who can blame them?

As might be expected, the discussion section of this study focused on the high perceived risk and level of worry compared with the actual risk. Academic discussions about how psychological factors influence risk perception, the level of loss, false beliefs, mismatches with other higher risks, the role of dread and fear, and so on, are interesting – and potentially important in understanding and mitigating human–wildlife conflicts. Understanding where risk is over- and underestimated, for example, can direct behavioural changes and education towards reducing risk, to the benefit of people and lions alike. What such discussions ignore, though, is a very basic and far more human fact. A good deal

more than half of the people living in these districts live in fear of being attacked and eaten by lions.

Reducing the fear and worry associated with living alongside predators is not an easy task. Ultimately it may be impossible to remove concerns without removing all predators, no matter how small the actual risk may be. It is at this stage that we need to accept that grown-up decisions need to be taken if we want the world to be a certain way. We cannot simply look on from afar and decide that lions are more important than people, and that losing a 'few people here and there' is an acceptable price to pay. This sentiment, rife on social media among those who profess to love animals, is inhumane, ignorant and hugely damaging for conservation. The simple fact is that conservation goals of maintaining predators in the wild may well be in conflict with local goals that prioritise human needs. It is finding the delicate balance of these often-opposing forces that is the essence of modern, informed and successful conservation, but it is far from easy. To be successful in maintaining predators around human populations, where the risk of being attacked and eaten are real, we cannot ignore people, but if we can keep people safe then we also stand a good chance of keeping predators safe.

One way to reduce the risk of predation is simply to fence predators into areas in which humans are excluded or allowed to venture only in very controlled ways. This 'fenced fortress' model of conservation may also be successful in reducing poaching and producing workable economic wildlife-based activities like photo-tourism. It can certainly work to reassure communities. When I interviewed people around Pilanesberg National

Park in South Africa about their fears of living with lions just over the predator-proof fence, I got very little sense of concern from them precisely because the park is surrounded by a well-maintained secure fence. Leopards elicited more of a reaction – and their reputation for being versatile, wily and stealthy is certainly well deserved, as we will see in Chapter Seven. The main concern, though, wasn't a predator but a herbivore; escaping elephants were far more worrying to local people than animals with sharp teeth and claws. It would be interesting to see whether people's fear of lions increased following the death of Kobus Marais, but my guess would be not. The incident, horrendous though it was, occurred within the fence and to someone working in a job that is inherently risky.

Speaking to Craig Packer in 2015 it was very clear that he felt fences were important for the future of lions, keeping them safe from us and us from them. I well remember standing by a large fence in the Dinokeng Game Reserve in South Africa interviewing him about lions with several large males sitting just a few metres away on the other side of the fence. The lions were part of Kevin 'the lion whisperer' Richardson's sanctuary, associated with Dinokeng, and visitors staying at the sanctuary could have close encounters with his lions. Richardson and the Dinokeng sanctuary hit the international news in 2018 for all the wrong reasons. While Richardson was walking with a colleague and three lions in the reserve, one of the lions charged after an impala, ran a couple of kilometres and encountered a 22-year-old woman who was on-site with a friend interviewing the manager of the Dinokeng Game

Reserve. The woman, who was unnamed in the resulting international media, was described as being 'mauled to death', but given the circumstances it feels safe to describe it as a predatory attack.[42]

Three years before that incident, and no more than a few kilometres from it, I asked Packer what we needed to keep lions safe and his reply was simple: 'Fences, fences, fences', adding later, '… and money'. His answer neatly reflected the title of a paper, of which he was the lead author, published two years before our interview: 'Conserving large carnivores: dollar and fence'. Lion populations in fenced areas were concluded to be more stable and cheaper to conserve than unfenced populations. A key argument made by Packer and others is that fenced populations can reach numbers close to their carrying capacity, whereas unfenced populations rarely do due to human factors. Overall, they concluded that half of unfenced populations are ultimately doomed over the coming few decades.[43] Others, including Amy Dickman, have argued that fenced populations can often exceed their carrying capacity, causing costly issues – something that is widely acknowledged when I have spoken to managers of fenced populations – and are relatively small. Due to these factors unfenced populations allow many more lions to be conserved per dollar; in other words, unfenced populations represent a more efficient use of funds. Fences also impose considerable economic cost initially (predator-proof fences at landscape scales are not cheap) and fragment the landscape, imposing an ecological cost.[44] Fences that keep lions in also prevent the natural movement of other species that are unable

to travel under, through or over the fence. This can be a major problem for herbivores especially, which can end up overgrazing areas they are unable to move away from. Over time, populations may also become inbred, reducing genetic diversity, and potentially reducing overall population health and productivity. Aside from the larger and more obvious species, fences can prevent smaller animals – like honey badgers, genets and civets – from moving around the landscape, potentially producing pockets of lower than normal biodiversity. Some of the issues fences cause can be solved with good management. A man with more than 60 years of wildlife and habitat management summed it up to me very succinctly, 'If we put a fence around, we have to manage it,' and management is costly.

There are sometimes further, human, costs to fences and to exclusionary 'fortress' conservation methods. The exclusion of people to create protected areas, whether they are fenced or not, can lead to human rights abuses at all levels, including exclusion from areas of cultural significance and denial of livelihood. Human rights abuses may escalate with this approach, as has been well documented in the Republic of the Congo (and elsewhere), where armed 'ecoguards' – funded in part by the conservation group WWF – beat up, intimated and, according to some reports, imprisoned and tortured Baka tribespeople living close to a proposed national park.[45] There was no actual fence involved, but the exclusionary philosophy is the same. In summary, fences can solve some problems but cause others, and they are a source of sometimes heated controversy and disagreement across conservation.

What we can say for sure, though, is that putting a fence around lions does work in some places, but it may not be an effective or desirable solution everywhere. If ever there was an example of where one size really doesn't fit all, it is conservation.

If physically separating the living spaces of lions and people is not always an option then it may be possible to make people safe from lions in their homes and villages. In principle, 'lion-proofing' dwellings should be reasonably straightforward. If a lion was outside my house right now, for example, I would feel quite safe inside, with doors and windows firmly shut. There is no chance whatsoever of a lion coming in through the walls, crawling up and in under the roof, or simply walking through the entrance. However, my home has a sturdiness and permanence that is not shared, or even possible, for many that live in areas where there are lions. Many rural villagers in Tanzania and elsewhere are living in structures that are not, and cannot be made, lion proof as a consequence of the building materials being used. Traditional mud houses offer some security perhaps, with walls more solid than those in dwellings made from grasses and reeds, but unless entrances can be blocked effectively – and a roof made solid and well connected – it would be hard to call it lion proof.

The main source of human–predator conflict is livestock depredation, and lion killings are often motivated by retaliation for past livestock predation or as pre-emptive killings to prevent future losses. Keeping livestock safe from lions has multiple benefits: protecting livestock from horrendous stress, injury and death; protecting people's livelihood and security; potentially

preventing lions from habituating to easily available food in proximity to people; and reducing human–lion conflict and lion killings. One approach that has proved simple and effective is the lion-proof *boma*.

The term '*boma*' (also *kraal*) is widely used across eastern and southern Africa. Most often it refers to a livestock enclosure, although the word can also be used for other forms of enclosures including those where people gather. A *boma* can be as simple as some thorny acacia branches piled up to roughly enclose an area in which livestock can be corralled for the night. Alternatively, it can be used in a grander sense, referring to a stockade or a fortified enclosure. A simple *boma* uses materials found in the bush to create a structure for keeping relatively docile herbivores contained. It is cheap, easy and works well at containing livestock, but it does not keep predators out. In Kenya, cattle tend to be herded into *bomas* at night and when lions approach cattle panic, causing a stampede that results in cattle bursting out of the *boma* and into the bush. Lions and hyenas (see Chapter Six) may take some, and there is considerable cost involved in rounding up the rest. Some lions may even learn to jump over *boma* walls. Collaring studies showed that lions collared on livestock kills were nearly four times more likely to be shot in response to livestock damage than those collared on wildlife kills, strongly suggesting that lions start to specialise in livestock. Lion-proof *bomas* developed around the Amboseli National Park in Kenya by the charity Born Free consist of 2m (6ft 7in) high eucalyptus posts, triple-twisted chain-link fencing and flattened oil drums, and have proved effective at keeping livestock

(and in turn, lions) safe,[46] reducing human–lion conflict to the benefit of both species. However, while a simple *boma* is cheap or free, lion-proof livestock *bomas* involve more effort and additional resources.

Lion-proofing *bomas* by using materials not found readily in the bush is a great approach in some areas, but it can't be used everywhere simply because resources are limited. However, thick thornbush *bomas*, or *bomas* that are made from stone (especially if there is a fence on top) can be effective. Another method is to locate livestock *bomas* nearer to humans, where studies have shown lions are generally reluctant to approach, although weaker lions or lions that have become attuned to hunting livestock could potentially develop into more of a problem if livestock and people are located close to each other. Dogs have also proved to be effective at deterring lions, not by chasing off the predators, but by warning herders who can then do the chasing. The fact that lions can be moved away from sites by people giving chase leads to the possibility of 'hazing' predators.

Hazing, or aversive conditioning to give it a more scientific name, is the idea of building up a negative association between a behaviour (approaching livestock for example) and an unpleasant stimulus such as bright lights, a loud noise or being chased. If the behaviour is 'negatively reinforced' enough, then the animal should avoid carrying out the behaviour. To put it another way, you scare the crap out of the animal when it does something you don't want it to do and it learns not to do it. In principle[47] this technique can work well, but in the real-world conditions of the field it can be difficult to

pull off. I have seen this first hand with attempts to 'teach' rhino to avoid hanging around near fences where they could be shot from a road by poachers after their horns. Initially, beeping vehicle horns and making a noise is enough to move a rhino on, but fairly swiftly they get used to the disturbance. It isn't long before they park up where they like and ignore pretty much anything. The problem, then, with this approach is what is termed 'habituation', when animals get used to an unpleasant stimulus and it no longer has a strong effect on them. This is what has been found with lions. Aversive conditioning can work – and for some lions it does – but there needs to be consistent aversive conditioning and ideally it needs to occur early on in the development of the behaviour you are trying to condition them away from. When chases were isolated events or performed inconsistently lions did not learn, and in practice it is not always going to be possible to chase lions away consistently enough for them to learn. Nonetheless, this 'hazing' approach may be promising in some situations and is another tool in the human–wildlife conflict-reduction toolbox.

A fatal solution?

At some point it may not be possible to deter a lion that has focused on killing livestock or hunting humans. It may be necessary to kill the lion to prevent further harm. That killing may be undertaken in a variety of ways, some legal and with an eye on welfare, and some less so. Communities may take the decision to hunt down the lion, and in many places this would likely include the use of dogs, spears and whatever else was to

hand. When humans work together even relatively simple tools can be used to kill predators. I was sent a video recently of a leopard suspected of killing people in India being killed by villagers. They had surrounded the animal in a field and simply closed in around it in an ever-tightening circle. At some point the leopard made a break for freedom, charging directly at a person in a style that is characteristic of leopards. That person was injured, but not badly, and the rest of the people present fell upon the cat and beat it to death with heavy sticks.

Lions in southern Tanzania are commonly killed by being speared, and Amy Dickman explained to me that the act of spearing a lion gains the hunter considerable prestige within the community. She went on to tell me that one specific role in the hunt involves giving away your spear and walking up unarmed to the bush where the lion is waiting in order to entice it out for others to spear. The reward for acting as bait is to have women dance for you. I am sure that must be quite a dance given the risk. This type of killing can at least be reasonably targeted towards a specific individual, but other forms of killing are far less precise. Snares, wire nooses that trap animals, account for the suffering and deaths of countless creatures. Lions may be targeted by snares set for them in retaliation for killing livestock or people, but far more commonly they end up as 'by-catch' in snares set to catch antelope and other large herbivores. Snares cause immense suffering as the captured animal writhes around trying to escape, resulting in deep and often fatal wounds. Foothold or leghold traps (also called 'gin traps') are also deployed and may catch lions, which are killed when the

trapper returns. The most common method of retaliation, though, according to Dickman, is poisoning, where a carcass is laced and left for lions to find. In 2015 in Kenya, for example, Maasai herders laced a cow carcass with the insecticide carbosulfan after losing cattle to lion attacks. Three of the well-known 'Marsh Pride' of lions died in the incident.[48] Such poisonings are frequent events and it is common for many scavengers, including increasingly threatened vultures, to be poisoned alongside the targeted species. It is rare for these real threats to wildlife to gain any traction in the world's media and it is a great shame that the outrage generated over the Cecil killing does not seem to apply to the regular snaring, trapping, spearing and poisoning of lions across their range. Perhaps if it did, there might be more funding and resources directed to solving some of the real threats facing the world's great predators.

Informal – and what may also be illegal – methods of lion control have little regard for any sense of animal welfare and may have repercussions for many other species. Poisoning is especially indiscriminate, cruel and a major threat to a wide range of species. On the other hand, officially sanctioned interventions can be undertaken in ways that are targeted, precise and – with regard to animal welfare – considerably more ethical. If an animal is designated as a 'problem animal' then it can be dealt with under some form of Problem Animal Control (PAC) (with a PAC permit or similar officially issued permission). In practice, PAC most commonly equates to shooting the individual causing the problems.

Killing 'problem animals' is, to say the least, problematic. First, there are genuine conservation

concerns. Killing an animal reduces the overall population, albeit only by one, but if the animal is of breeding age then future progeny are also removed. In some species, it is also the case that certain individuals may have a disproportionate role in the social structure and their removal could cause wider issues. This may sometimes be the case with dominant male lions and some elephants. Before these concerns become a problem, it is first necessary to find and kill the problem individual. In some cases, this might be straightforward. Some individuals may be clearly identifiable or have a predictable pattern of behaviour. Even if the animal is more elusive, many trackers have skills that are hard to believe unless you have seen them in action – and harder still to fathom when you have. However, it remains the case that animals other than the target animal may be misidentified and killed. The killing itself is also a difficult issue to navigate. A lion is a large animal and requires a combination of the right bullet hitting in the right place to ensure a quick and ethical kill. Even a very large bullet, placed very well and doing a huge amount of damage when it hits, may not instantly kill the animal. There are many videos online of lions that have been shot subsequently running off, leaping around and other horrors. These videos are usually accompanied by comments lamenting the shooter's incompetence and pointing out the welfare and ethical implications of the situation, but most videos simply reflect the fact that killing animals is not a clean and tidy process, and not something ever to be taken lightly. I have spoken with people who have shot problem lions in professional wildlife-management roles and my

lasting impression of those conversations is of the respect they had for the animals and their desire to ensure that the 'job' (as they saw it) was done ethically and to the best of their abilities. Killing a lion through an official 'death sentence' may be a difficult conflict resolution to swallow, but it pays to reflect on what are likely to be the alternative control methods employed, quietly, indiscriminately and without official sanction. And what may happen if someone doesn't make that tricky decision.

Another frequent question raised around the issue of problem animals is, 'Why do they have to kill them – why don't they move them?' Such an intervention is termed 'translocation' and involves darting the animal with an anaesthetic to knock it out, transporting it (most likely heavily tranquilised) to another location and releasing it. Despite seeming more humane, and aligning with what many would think are conservation goals, it is not an intervention that is always supported by most conservation biologists. There are many good reasons for being hesitant about translocation as a solution to problem carnivores – and because it is an issue I will return to in almost every other chapter, it is worth exploring these reasons a little now. Although I will focus on lions, most of what can be said about them applies equally to other species.

The problems with translocation start simply because of the technological realities of darting an animal with a 'capture gun'. Such guns fire a 'ballistic syringe' using compressed air – they are basically a type of air rifle firing a modified hypodermic syringe that discharges its contents into the animal when it makes contact.

They can be very effective, but their range is limited – usually considered to be less than 30m (98ft). The closer the better really, because a syringe is not an ideal projectile to fling through the air and the precision of the set-up is not great, especially as range increases. Once you get beyond a certain range not only may you miss the animal, or hit it in the wrong place, but there may not be enough penetration for the drugs you administer to work properly. Throw in the effects of a little cross-wind and you really are looking at a technique that requires the operator to be close.[49] That is very far from ideal when dealing with a problem predator. Anaesthetics can work swiftly, but they are not instantaneous. What this means is that a problem animal, likely to be stressed and defensive as a consequence of being cornered, has been shot at close range with a syringe containing a drug with a lag time. The question now is, do you suppose a large animal with adrenaline pumping can cover the 10–30m (33–98ft) to the source of this new insult more rapidly than the anaesthetic takes effect? The footage I was sent from India of a leopard darted at 30m (98ft) showed that, in that case at least, the answer was a solid yes, and with more than enough left in the tank to maul the person who fired the syringe.

So, the approach is dangerous to people, but it can also be dangerous to animals. Pre-darting stress can be considerable and once the drugs take hold the animal may suffer adverse reactions enhanced by stress. Getting the correct dose is difficult and relies often on having a good idea of the animal's body weight. Animals can die under anaesthetic even when all the right precautions are

taken. Once the animal is out, it must be moved to a new location and that transportation phase can be a complex mix of veterinary support (to keep the drugged animal alive), transport logistics and bureaucracy (before, during and after transport). Once these difficult and potentially very costly stages have been successfully navigated, it is necessary to release the animal somewhere suitable. This release site needs to work for the individual concerned, but it also needs to not cause issues for other members of the species already present at the site. Releasing a lion on to land that already contains lions will probably spark conflict between the interloper and the resident lions, potentially pushing the problem lion off prime habitat and closer to, say, livestock or human settlement. If the species is absent from the area then you must ask why, and also question the point of the translocation from a conservation perspective since the individual will not be able to breed. Overall, the problems very often outweigh the benefits and the cost may be prohibitive in any case. This is not to say that translocation can't work, and it is used in some cases, but it is not the go-to solution many believe it to be.

People are key

Human behaviour in its widest sense – and how our behaviour interacts with lion behaviour – is ultimately perhaps the most important factor in attacks. If we can change our behaviour, directing people away from risky behaviours, then lion attacks should reduce. How people perceive the risks of different behaviour versus the actual risk has an important role to play here. The risk-perception work undertaken by Kushnir and Packer in southeastern Tanzania, for example, showed that people

strikingly underestimated the risk of lion attacks around their homes, while overestimating the risk associated with farming or guarding crops. In other words, people felt they were more at risk than they actually would be doing activities away from the home, but felt far safer than they should at home doing mundane tasks (including going to the toilet). Kushnir and Packer equate this to the low perceived risk of a daily activity like driving compared to the higher perceived risk of the less mundane (but actually safer) activity of flying. Patterns of lion attacks established in different areas and our basic knowledge of human behaviour lead us inevitably to the conclusion that there won't be a single simple behavioural solution to reducing lion attacks in practice. However, developing an understanding of when, where and which people are most at risk – and ways to convert that academic knowledge into useful, practical behavioural change – will be crucial. Understanding the perception of risk, and where and why it may differ from reality, might well help deliver that impact, but could also help greatly in reducing fear and in turn the potential for pre-emptive lion killing. The message is clear: if we wish to conserve predators then we cannot ignore or devalue people.