

SHORT NOTE

Alpine marmot eating chick: Prey consumption in the wild

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ABSTRACT

Animal prey consumption is occasionally reported in sciurids, both in captivity and in free-ranging animals. Due to the scarcity of observations, a detailed analysis of the main causes of this behaviour is lacking. Lack of nutrients and of fresh resources have been claimed to be major drivers of this behaviour, but other observations did not support this hypothesis. Here we report the description of predation and meat consumption of a chick by an alpine marmot (*Marmota marmota*) in the Gran Paradiso National Park (GPNP) at a time when ample vegetation was available. Our note adds to the reports that prey consumption by a herbivore does not exclusively occur at times of resource scarcity, and therefore adds evidence to the concept that carnivory by herbivores might just be driven by fortuitous opportunity.

Key words: alpine marmot, herbivores, meat consumption, predation

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Evidence is slowly accumulating that small herbivorous mammals occasionally consume animal matter: while not being capable of predating regularly on fast vertebrates, they consume meat provided by carcasses or rare killing events (Callahan, 1993; Clauss et al., 2016; Marti, 2018; Böhm and Landmann, 2021). Among sciurids, squirrels are often observed to consume carrion in both captive and free-ranging conditions (Abolit and Gilhen, 2011). In social species like alpine (*Marmota marmota*) or yellow-bellied (*M. flaviventris*) marmot, infanticide and eventually cannibalism have been reported (Armitage et al., 1979; Coulon, 1995; Blumstein, 1997; Ferrari et al., 2012; Denryter, 2019). These episodes, although not relevant for modifying the definition of the species' diet, which is herbivorous, are interesting but not completely understood. This is mainly due to the scarcity of observations in captive condition and even more rare and partial from natural habitats: for this reason, it is important to report every occasional observation. In this note we describe a single direct observation of predation by an alpine marmot on a chick ready to take off and fly.

In the context of the long-term research about alpine marmot organized by the GPNP, the researcher team inhabits the mountain hut in the base camp of Orvieilles (Valsavarenche 45°34', 7°11'). Most of the marmots in the surrounding area are marked and monitored remotely by using scopes throughout the summer (Ferrari et al., 2013); despite our regular presence, marmots conserve their natural behaviour and move away when a person approaches them (Dumont et al., 2012).

During the summer of 2018, as had already happened in previous years, we noticed the presence of nests of a black redstart (*Phoenicurus ochruros*) and a white wagtail (*Motacilla alba*) under the roof of the mountain hut, with the latter having two chicks ready to take off and fly at the time of this observation (Figure 1).

On 4 July at 3.00 pm, some movements on the side of the house caught our attention, so that we approached the point with the camera and the scope, keeping about 8 metres away from the marmot. We noticed a marked marmot, a female of 3 years, actively holding and eating a chick (Figure 2). The marmot was entirely focused on the activity, and it seemed not to be afraid by our relatively close presence, in contrast to their usual behaviour when eating vegetation. Once the marmot had finished eating the chick, it went away, leaving only a few feathers on the ground.

We then monitored the second chick, which was also on the ground but alive and moving: the marmot did not come back. The following day the chick was gone, but we cannot say if it was because of predation, and in this case by whom, or if it just moved away.

The chicks of the white wagtail were in the nest until a few hours before this observation, and we assume that the chicks had already fallen from the nest (maybe trying to fly or for another reason) when the marmot predated upon one of these. We think it is improbable that the marmot chased them from the nest, since the nest was located in a remote space in the attic, where the marmot would have found it difficult to take them out (although marmots can easily climb onto the roof of the mountain hut). The chick of the white wagtail was alive when the marmot started to consume it, as we observed some movements on the ground,



Figure 1 The second chick of the white wagtail (*Motacilla alba*) observed on the ground. Both chicks were ready to fly off. We assume they fell from the nest and that the marmot found one of them accidentally.

probably attracted by the movement or just randomly finding the chick on its way. The intensity and focus during the eating action was relevant, as this is not the usual way we observe marmots during feeding activity, when they normally scan the surrounding area and even more so when something or someone is close or approaching. We conclude that eating animal prey was a great opportunity though the marmot did not eat the second chick, which was not far away and potentially represented another good opportunity. We hypothesized that either the marmot simply had not realized the presence of the second chick, or that our presence discouraged the marmot from approaching the second one.

While infanticide may have a different ecological explanation (Coulon, 1995; Denryter, 2019; Trulio, 1996) that deviates from the case dealt with in this note, two main hypotheses are suggested in literature for vertebrate predation (defined as killing and eating a vertebrate, sensu [Cahallan, 1993]) by usually herbivorous rodents: authors suggested that prey consumption and/or cannibalism are favoured under prolonged unfavourable climatic conditions and are due to the lack of nutrients (Denryter, 2019). Unfavourable climatic conditions, and thus the absence of fresh food resources, seemed to be a good explanation in our previous observations from the same study area in the GPNP: in 2012, a prolonged snow cover together with the poor body condition of the dead marmot may have favoured its killing and cannibalism by conspecifics (Ferrari et al., 2012). But, this event had



Figure 2 The marked marmot (*Marmota marmota*), a female of 3 years old living in the area of Orvieilles in the GPNP, holding and eating the chick of a white wagtail (*Motacilla alba*). When the marmot went away we checked and only a few feathers were left on the ground.

different characteristics: it happened in July, when most of the vegetation is growing at its best (Ranghetti et al., 2016), in the first part of the afternoon with sunny weather; the marmot was in good body condition and well included in a family group. Finally, deprivation related to long winter or poor body condition seems to be unlikely in this event.

In an experimental context, Ballová et al. (2016) left some meat in front of Tatra marmot (*M. marmota latirostris*) burrows just after winter awakening, when vegetation was not yet available. By using remote camera traps they recorded the consumption of meat by marmots, concluding that the lack of nutrients and fresh food favoured meat consumption in marmots. However, a control experiment during a period of lush vegetation was lacking in this case, facilitating the alternative interpretation that marmots will simply consume meat if they encounter it. In an episode of infanticide in the yellow-bellied marmot where an adult individual consumed mainly the viscera of 2 pups, the author concluded that in this species, where this behaviour is more rare compared to Alpine marmots, cannibalism is not primarily driven by social dynamics but by lack of nutrients (Denryter, 2019).

Most of the predation and/or meat consumption events perpetrated by marmots have been observed in captivity where marmots were kept together with prey species and/or species with a carnivorous diet (Callahan, 1993; Arlt and Gebauer, 1996): interestingly, marmots were observed as really active in consuming and even defending meat food (Böhm and Landmann, 2021). In these cases, the authors tend to exclude the lack of nutrients since their diet is generally rich and varied (Böhm and Landmann, 2021) and climatic conditions are never too harsh. Potentially, a lack of natural behavioural stimuli in captivity may favour rare behaviour in wild animal species, but nowadays behavioural enrichment is a main requisite for zoos and captive centres, so we tend to discard this hypothesis. In any case, the context of captivity could be useful to investigate more in detail about this behaviour, which could be seen as a plastic adaptive behaviour.

In the case described in this note, climatic and vegetation conditions were favourable, and both the marmot and the chick were, at least apparently, in good shape. Interestingly, both in this and in the previous observation of cannibalism in the area, marmots seem to take a very small risk in killing other animals: in 2012 two marmots killed and consumed a marmot in poor body condition, and in 2018 the marmot consumed a harmless bird. The bird's parents might try to discourage a marmot from approaching a chick, but we had no evidence of adult birds around the marmot eating the chick in our case. About this point, during our daily observations, we frequently noticed that birds nesting on the ground of Alpine prairies (i.e. *Oenanthe oenanthe*) often attack a marmot moving close to the nest. We normally assume it is a defensive behaviour to avoid eggs consumption by marmots, but it will be interesting in the future to ascertain the developmental stages of eggs.

Finally, predation and meat consumption appear to be an opportunistic behaviour in marmots, which can be favoured under particular circumstances, but lack of nutrients or of fresh food resources may not always be the main driver, as we conclude in this note and in the previous observations (Böhm and Landmann, 2021). Actually, the view that there must be a special circumstance to make a primarily herbivorous mammal consume prey might stem more from a prejudiced human concept that assumes that a herbivore should not be able to thrive on animal matter, even though in terms of digestion, animal matter is not a challenge (Clauss et al., 2016). But maybe it is just the ecological opportunity that is mostly lacking in the lives of herbivores, due to a combination of specific adaptations: their ingestive anatomy and their behavioural focus on predator avoidance and food plant selection makes events when they can consume animal matter rare. Therefore, it has been suggested that opportunistic carnivory might be a common feature of basically all herbivorous mammals (reviewed in Dudley et al., 2016) not necessarily linked to anything else but fortuitous opportunity. This behaviour is observed both in free-ranging and captive animals; in the latter, it perhaps is more likely to happen and certainly easier to observe. It is hard to say how to improve the observations of this behaviour in the wild to investigate more in detail about potential drivers of it, so we emphasise the importance of reporting in published notes any observation and the relative circumstances.

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