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The wolf debate in Switzerland: A spatial and temporal analysis performing geographic information retrieval on newspaper articles

GEO 511 Master's Thesis

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Abstract

Few wildlife species in Switzerland spark as much controversy as the gray wolf *canis lupus*. While its return is a conservation success, it has also fueled intense debates, particularly due to conflicts with livestock farmers, evolving into a broader societal issue. This study examines Swiss media coverage to gain insights into the public discourse surrounding wolves and the human-wolf conflict. It explores the spatial distribution of media coverage from 1995 to the present across two linguistic regions, and three landscape types: Alps, Jura, and Swiss Plateau.

Natural Language Processing (NLP) with spaCy and topic modeling using Latent Dirichlet Allocation (LDA) were applied to extract key themes associated with wolves. Additionally, a novel approach is introduced by using geoparsing, via the Geoparser library, to analyze the geographical representation of wolf-related media coverage.

The results reveal that media coverage initially followed the wolf's recolonization of high-altitude regions. However, as wolf population expanded into the lowland Swiss Plateau, media attention disproportionately shifted to these areas, underrepresenting mountain regions. This bias may be linked to the concentration of major newspapers in lowland urban centers. The Swiss press primarily focused on wolf lethal regulations, and depredations on sheep. Discussions on coexistence were widespread, whereas legislative issues were more prominent in mountainous regions. Future research could explore differences in newspaper coverage or extend the analysis to other large predators.

Keywords: wolf, Switzerland, news media analysis, geoparsing, GIR, NLP, topic modeling

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1 Introduction

1.1 Research motivation: wolf conservation and human-wolf conflict

The recovery of the gray wolf (*Canis lupus*) population remains one of the most polarizing debates in Switzerland and across the northern hemisphere. During the 19th century, intensifying human activities, the loss of natural habitats, and the decline of natural prey populations exacerbated conflicts with large predators, leading to a growing intolerance toward wolves. Seen as a threat to human safety and livestock, wolves, along other great predators such as bears and lynxes, were nearly eradicated from the European continent (Ledger et al., 2022). It was the social, economic and ecological changes of the 1970s that created the conditions for the species' recovery (Boitani et al., 2023; Chapron et al., 2014). The ecological importance of apex predators has since been recognized and valued, leading to the protection of wolves under the 1982 Bern Convention and the 1992 EU Habitats Directive. Since then, wolves have begun to recolonize Europe. In the 1970s, their presence was limited to Eastern Europe and a few southern regions, such as the Italian Apennines. Today, however, they occupy the majority of the continent. On the IUCN Red list of threatened species, the gray wolf is now classified as Least Concern on a global scale (Blanco & Sundseth, 2023; Boitani et al., 2023).

Although the predator has been saved from extinction, coexistence with humans in Europe's densely populated landscapes remains an important challenge for its conservation. Furthermore, the wolf population remains regionally at risk, with the Alpine population, for instance, still classified as Near Threatened (LCIE & Boitani L, 2022). Predators such as wolves typically occupy large territories ($100 - 500\,\mathrm{km}^2$) and travel long distances, sometimes exceeding 1000 km (Ledger et al., 2022). There are simply no areas of such vast size exclusively dedicated to wildlife and nature in Europe, making intrusion into human activities inevitable (Chapron et al., 2014). While wolves positively impact ecosystems by regulating ungulates, they frequently attack livestock. Conflicts with farmers are considered one of the primary threats to wolf conservation (Blanco & Sundseth, 2023). The issue of wolf preservation has become highly political and emotional in many countries, including in Switzerland. The wolf appears to have become a symbol of social conflict between urban and rural populations, as the direct impact of the species' return is borne by local communities, while decisions regarding wolf management are made by the broader population, most of whom have no direct experience with wolves (Chapron et al., 2014; Gross E et al., 2021; KORA, 2020).

Successful coexistence with wolves will only be achievable if the concerns of all stakeholder groups are addressed (Linnell, 2013). Public attitudes play a critical role in species conservation: Low social acceptance can lead to opposition to recovery plans, increased calls for legal culling, or even poaching (Blanco & Sundseth, 2023; Chapron et al., 2014). This is particularly significant in Switzerland's direct democratic political system, where individuals can directly influence legislation and conservation measures (e.g., vote on the revision of the Swiss Hunting Act in 2020). Monitoring public attitude is therefore crucial to ensuring the successful recovery of the species (Chapron et al., 2014; Gross E et al., 2021).

A commonly used approach to assess public attitudes toward large predators is to analyze news media content. The return of the wolf and the conflicts it generates is a newsworthy topic extensively covered by the media (Arbieu et al., 2021), with reports often emerging from the very first signs of the species' reappearance. Moreover, news media are among the most important sources of public knowledge about wolves (Arbieu et al., 2019; Savanta, 2023). The analysis of news media content has thus proved to be an effective method of accessing public attitudes (Houston et al., 2010; Zscheischler & Friedrich, 2022).

1.2 Research goals: the wolf debate in the Swiss media

The objective of this master's thesis is to assess how the wolf debate has been covered in the Swiss media from its reappearance in Switzerland in 1995 to 2024 by means of a quantitative media analysis. The extent of the coverage will tell us how important the issue has been over the years, which can then be related to socio-political changes. The main topics within the wolf debate can be extracted (e.g., Chandelier et al., 2018; Trainotti et al., 2024), as well as the tone used to present the news (e.g., positive, neutral, negative (Bombieri et al., 2018; Houston et al., 2010)). By crossing media studies with GIS tools, it will also be possible to conduct a spatial analysis of the places covered, adding further dimensions to the study of the debate (Lindgren & Wong, 2012; Rinner et al., 2018).

Switzerland is a country with unique characteristics: First, it is divided into four linguistic regions, each with its own set of newspapers. As a result, the population does not consume the same news sources. Differences in public attitudes, reflected in the variations in media coverage between linguistic regions, should therefore be noticeable. This cultural and linguistic divide is a widely known subject of Swiss politics and can be witnessed in many vote results (Zierhofer, 2005). Second, in addition to the rural-urban divide, the country comprises three main topographical regions: The Alps, the Jura and the Swiss Plateau. These regions differ in population density, natural habitats, and farming practices, which in turn influence their exposure to wolf habitat suitability and vulnerability to wolf predation. Mountainous areas, which provide more natural habitat and support higher ungulate populations, are more likely to host wolf packs than urban lowland areas (Behr et al., 2017). At the same time, extensive farming is the predominant practice in these high-altitude regions, requiring greater adaptation of protective measures against livestock predation (KORA, 2020).

Identifying the locations most frequently highlighted by the media, along with the associated topics and tone, and comparing them with actual wolf sightings, could reveal potential connections between the spatial pattern of news coverage and other observed socio-political phenomena, such as public acceptance of wolves and political decisions (Duffy et al., 2020; Lindgren & Wong, 2012; Roy et al., 2022).

2 Background

This chapter begins by providing context to the wolf situation in Switzerland in Section 2.1, presenting key themes, issues, and stakeholders that have been central to the debate over the years and frequently featured in news coverage, as well as public attitude toward wolves. Next, Section 2.2 introduces text content analysis approaches using Natural Language Processing and geoparsing. Map visualization methods are presented in Section 2.3, followed by an overview of wolf-related media studies in Section 2.4. Finally, the chapter concludes with the research gaps in Section 2.5 and research questions in Section 2.6 guiding this thesis.

2.1 Context

Firstly, the evolution of the wolf population and wolf management in Switzerland will be examined. Then, the main stakeholders involved in the debate will be identified, with a special particular attention to the Swiss media landscape. Lastly, the geographical and demographic distribution of support and opposition to wolves among different groups will be explored.

2.1.1 Wolf situation in Switzerland

The wolf disappeared from Switzerland and most European countries during the 19th century. However, it persisted in the Apennines range in Italy, and since the species was granted nationwide protection in 1971 (Genovesi, 2022), wolves began expanding northward, eventually reaching the Alps. In Switzerland, the wolf has been protected since 1982 under the Bern Convention and since 1986 under the Swiss Hunting Act, along with its ordinance coming into effect in 1988.

The first confirmed evidence of the wolf's return to Switzerland was observed in 1995 in the Alpine canton of Valais, specifically in Val Ferret. From this entry point, more individuals migrated, following a primary immigration path running southwest to northeast, reaching the cantons of Ticino and Graubünden (KORA, 2020). However, the wolf population remained low in the following years, mainly due to human-wolf conflicts with farmers. Despite the small number of individuals, wolves caused significant livestock losses due to the absence of protective measures, particularly in high-altitude pastures where domestic animals traditionally graze during the summer with little or no supervision (Mink et al., 2024). Political tensions and pressure from the farming community led to both legal and illegal killings of wolves, severely hindering the species' expansion (Behr et al., 2017; KORA, 2020). Consequently, it was not until 2012 that the first confirmed reproduction occurred on Swiss territory, in Calanda in the canton of Graubünden (KORA, 2024).

Since then, the wolf population has gradually increased and expanded, with new packs forming in the mountainous regions of the cantons of Ticino, Valais, and Bern, as well as in the Jura Mountains from 2019 onwards (KORA, 2024). The number of wolves grew from approximately 10 individuals in 2012 to around 75 genetically identified wolves in 2019. This population growth led to numerous legislative changes and debates regarding wolf management. The Swiss Hunting Ordinance was first revised in 2012 to introduce more options for regulating wolves (Conseil fédéral et al., 2012), and again in 2015 to delegate certain shootings authorizations to the cantonal authorities (Office fédéral de l'environnement OFEV, 2015). In 2013, federal support for herd protection was introduced (Conseil fédéral et al., 2013). Furthermore, the Swiss Wolf Concept, a federal framework initially established in 2004 to guide wolf management, was updated in 2016 (Office fédéral de l'environnement OFEV, 2023).

From 2019 onwards, the wolf population experienced a sharp rise across Switzerland, with 315

wolves genetically identified in 2023. This increase was accompanied by an important rise in livestock predations, keeping wolf management at the center of political debate. In the canton of Uri, a popular initiative titled '*on the regulation of large carnivores in the canton of Uri*' was put to a vote in 2019 and accepted by 70.2% of the cantonal population (Kantonale Verwaltung Uri, 2019). Nationally, the entire Swiss population voted in 2020 on a proposed revision of the Swiss Hunting Law that would have granted cantons greater flexibility in regulating wolves (Office fédéral de la statistique, 2020). The proposal was rejected by 51.9%. In 2021, the canton of Valais voted on a popular initiative titled '*for a canton of Valais without large predators*', which had been launched in 2017. This initiative was approved by 62.7% of voters (Canton du Valais, 2021). Subsequently, in 2023, a new revision of the Swiss Hunting Law of 2022 came into force, introducing measures for the preventive regulation of the wolf population. Under the revised act, cantons could proactively regulate wolf populations between September 1 and January 31 each year, with provisions allowing for the culling of entire packs (Conseil fédéral et al., 2023). During the first regulation period at the end of 2023, requests for lethal regulations were submitted by the cantons of Graubünden, Valais, Vaud, St. Gallen and Ticino. Permissions were granted to cull 12 wolf packs and regulate several others (Conseil fédéral et al., 2024). By the end of 2024, during the second preventive regulation period, the same cantons submitted new requests, and authorizations were granted for at least 7 wolf packs to be culled, with additional packs subject to regulation (Office fédéral de l'environnement OFEV, 2024). While it is too early to determine the full impact of these preventive measures on the wolf population, the most recent estimate for 2024 places the number of packs at 35 (KORA, 2024). The effectiveness and ecological consequences of this regulation period remain to be seen.

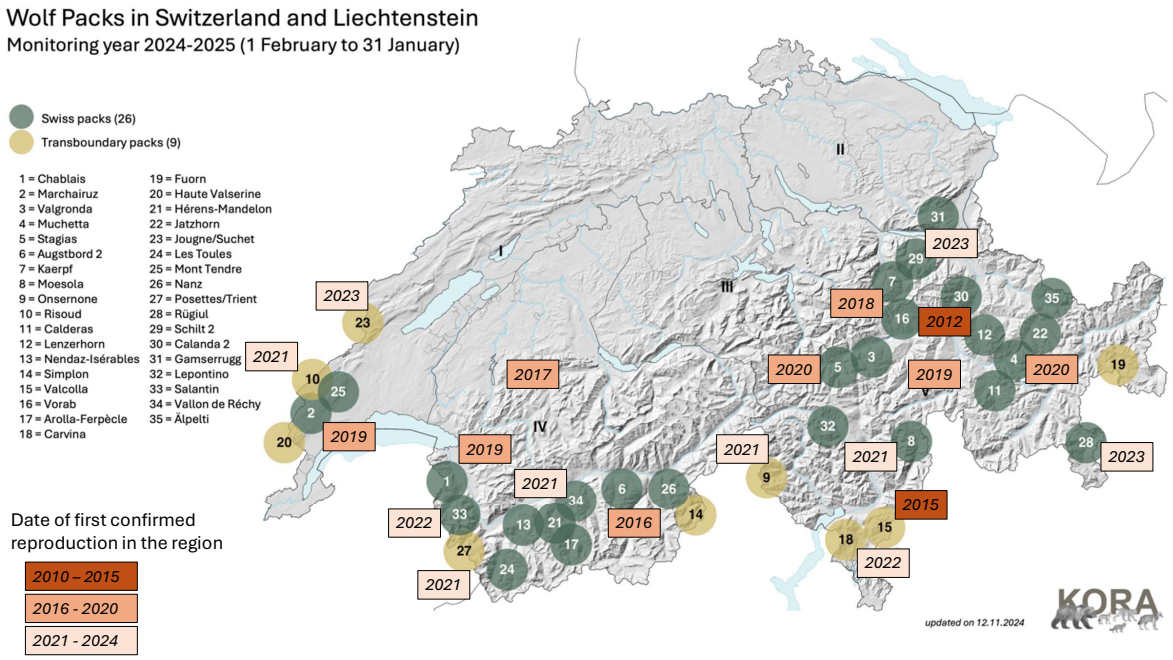


Figure 1: Current evidence of packs in Switzerland and Liechtenstein. Updated on 12.11.2024. Data source: LBC, cantons, private individuals; Map: © KORA/GIS. Annotation '*Date of first confirmed reproduction in the region*' added by the author

In Switzerland, as in neighboring countries, highly polarized groups have emerged, advocating either for or against wolves (KORA, 2020). Parliamentarians have consistently submitted motions (e.g., Fournier, Engler, Hassler), some of which have resulted in changes to Swiss law. There have also been recurring proposals to amend the Bern Convention to reduce wolf protection (Conseil

fédéral et al., 2011; Council of Europe, 2025; Office fédéral de l'environnement OFEV, 2006). Popular initiatives frequently appear, either to protected wolves (2011 and 2012, which failed to gather sufficient signatures) or to regulate them (2019 in Uri and 2021 in Valais, both accepted; 2023, insufficient signatures; 2024, ongoing) (Chancellerie fédérale, 2024). Across Europe, similar challenges are arising, leading to a proposal in September 2024 to downgrade the wolf's protection status under the Bern convention from strictly protected (Appendix II) to protected (Appendix III). This proposal was approved by the Bern Convention Standing Committee in December 2024 (Council of Europe, 2025).

Figure 1 shows the current evidence of packs in Switzerland and the dates of the first confirmed reproduction in the region. Figure 2 illustrates the changes in legislation, the evolution of wolf populations and livestock predation. Figure 3 displays the loss of wolves over time by cause of death.

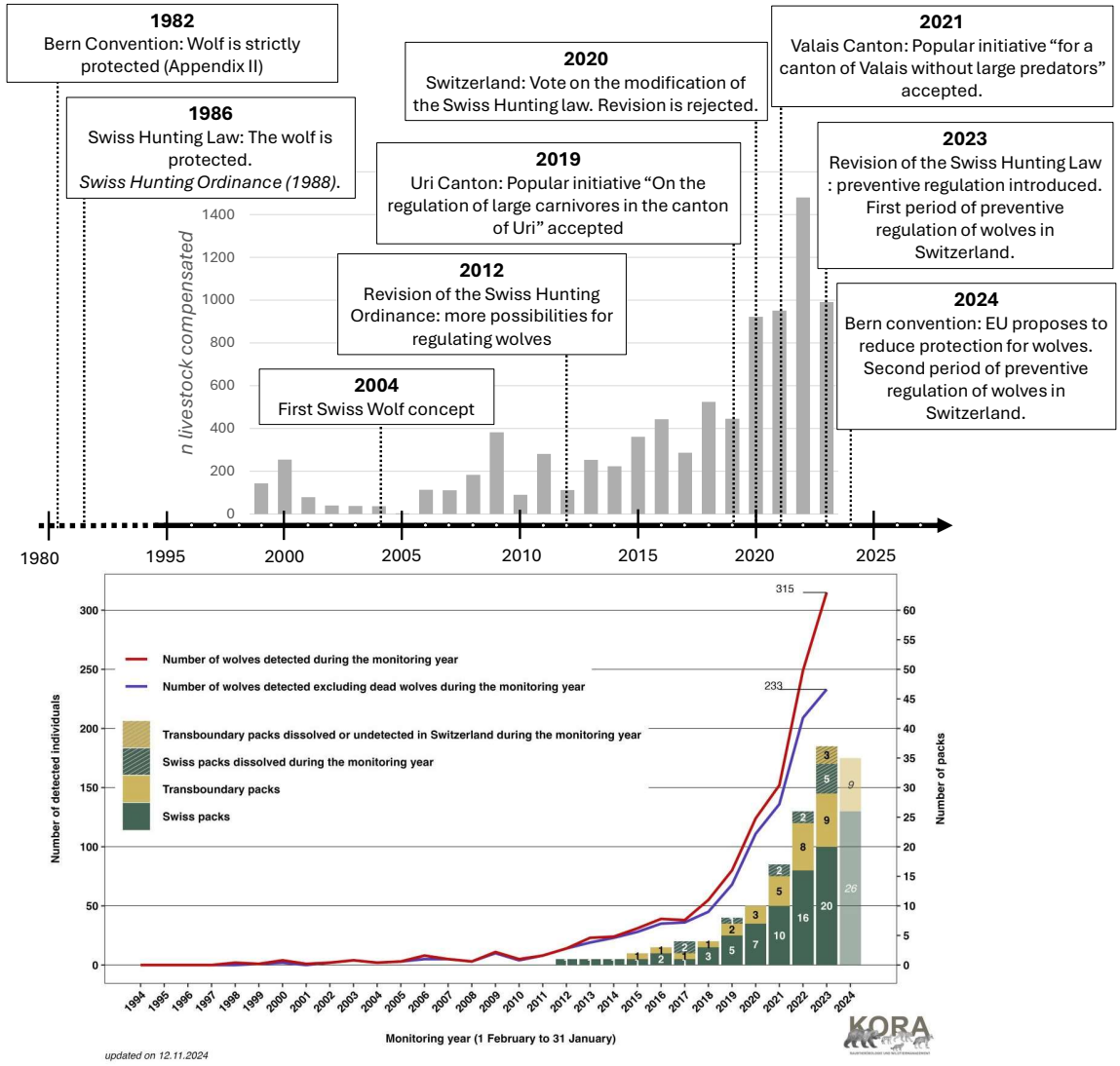


Figure 2: *Top*: Evolution of wolf legislation in Switzerland (timeline created by the author), overlaid with livestock compensated for wolf attacks in Switzerland (1999–2023). Data for November and December 2023 are not yet included. Data source for livestock depredation: © FOEN / KORA. *Bottom*: Long term evolution of the number of detected individuals and packs in Switzerland and Liechtenstein. Updated on 12.11.2024. Data source: LBC, cantons, private individuals; Map: © KORA/GIS

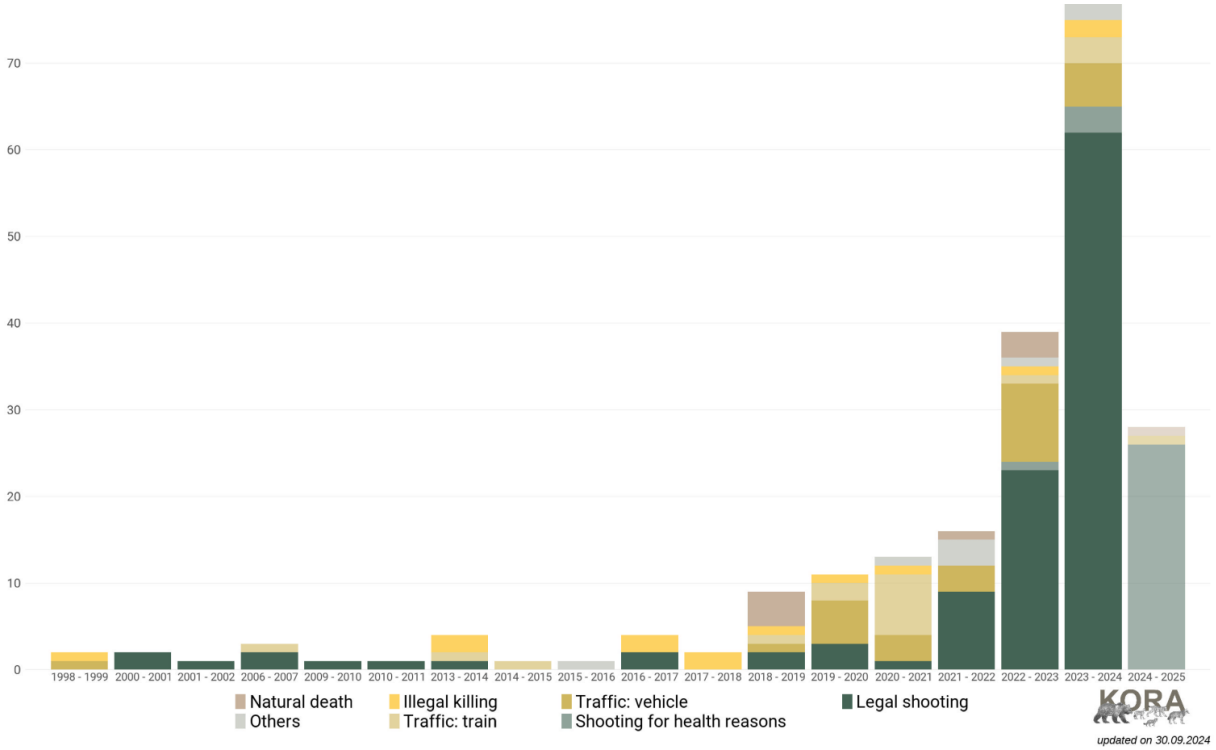


Figure 3: Cause of death of wolves in Switzerland for each monitoring year. Updated on 30.09.2024. Data: @FIWI, Graphic: © KORA

2.1.2 Stakeholder groups

The wolf conflict is global, and despite national differences, the same key actors are involved across all countries. Linnell (2013) examined the wolf-human coexistence in Europe and identified 17 important stakeholders in wolf-related conflicts. Grossmann et al. (2020), in their analysis of stakeholder network in 14 countries, condensed these into 10 categories. Among these, the four most influential groups are: Hunters, livestock owners and farmers, ministries and administration for the environment, and nature conservationists (e.g., NGOs, National parks, environmentalists). Other less influential actors include foresters, local residents, the media, political representatives, scientists and the tourism sectors. These groups often find themselves in opposition, fueling debates. Below is a list of the most prominent stakeholders in Switzerland and their concerns, which are frequently represented in the media.

Policy makers and scientists

At the federal level, wolf management falls under the jurisdiction of the Federal Department of the Environment, Transport, Energy and Communications (fr: DETEC, ge: UVEK). Since the wolf's return, the federal councilor in charge of the department has changed several times: Doris Leuthard (2010–2018), Simonetta Sommaruga (2019–2022), and more recently, Albert Rösti, who has been in charge since 2023. Rösti is frequently mentioned in recent news articles when talking about the new preventive regulatory measures introduced this year.

The Federal Office for the Environment FOEN (fr: Office fédéral de l'environnement OFEV (2024), ge: BAFU) is the surveillance authority responsible for wolf management (OFEFP, BUWAL before 2006). Its responsibilities include drafting the Wolf Concept document, monitoring the wolf population and livestock predation in collaboration with the cantons, and assisting

farmers in implementing protection measures. FOEN is also responsible for authorizing shooting requests for wolf population management that are submitted by the cantons. The Federal Office has commissioned the in-state foundation KORA (2024) – Carnivore Ecology and Wildlife Management to monitor the wolf situation. The scientific institute works closely with the gamekeepers and cantons, as well as the Institute for Fish and Wildlife Health at the university of Bern (FIWI) and the university of Lausanne, which carry out the analysis of prey and dead individuals. Since 2003, the FOEN has also commissioned the Swiss Association for the Development of Agriculture and Rural Areas AGRIDEA (2016) for coordinating the implementation of measures to protect herds and counselling the livestock.

At the cantonal level, wolf management is handled by specific departments and offices, which vary in name and structure depending on the canton. For example, in the canton of Valais, this responsibility is assigned to the Department of Security, Institutions and Sport, specifically the Hunting, Fishing, and Wildlife Service (fr: *Département de la sécurité, des institutions et du sport, Service de la chasse, de la pêche et de la faune*; ge: *Departement für Sicherheit, Institutionen und Sport, Dienststelle für Jagd, Fischerei und Wildtiere*).

Livestock owners and farmers

The livestock owners are represented by the Swiss Sheep Breeding Federation (fr: *Fédération suisse d'élevage ovin FSEO (2024)*, ge : *Schweizerischer Schafzuchtverband*), the swiss farmers' union (fr: *Union suisse des paysans (2024)*, Ge: *Schweizer Bauernverband*), and the Swiss Alpine Society (fr: *Société suisse d'économie alpestre (2024)*, ge: *Schweizerischer Alpwirtschaftlicher Verband*). Recently, on December 2, 2024, they communicated the need to further regulate the wolf populations.

Livestock owners are particularly affected by the return of wolf, especially those managing extensive pastures in Swiss alpine summer farms (Mink et al., 2024). Historically, there was no need for protection, and shepherds only checked the herds occasionally. As a result, no measures were in place when wolves returned. Livestock owners in areas considered at risk were the first to adopt protective measures, with the most common being electric fences, night enclosures, and livestock guardian dogs, especially for sheep. Additionally, some have incorporated breeding cows, donkeys and llamas into their herds (AGRIDEA, 2016). The most suitable protection methods, however, depend on various factors such as regional topography, farming system and type of livestock (KORA, 2020). A significant challenge arises from outdoor recreational activities, as hiking trails often pass through pastures, causing frequent conflicts with herding dogs or breeding cows.

The farming community is already facing significant pressure from socioeconomic factors, with farms becoming increasingly reliant on direct payments from the Confederation (KORA, 2020; Mink et al., 2024). Mink et al. (2024) examined the connection between wolf attacks and Alpine summer farms, particularly in sheep farming. The study found that different grazing systems are differently affected. Farms with a tradition of permanent grazing (livestock left unattended) must adapt to rotational grazing (livestock regularly change pastures) or permanent shepherding. However, many small farms lack the capacity to make such changes. This leads to either improved protection measures or, in some cases, farm abandonment due to insufficient economic support. Regions frequently affected by wolf attacks have seen a rapid decline in alpine summer farms with permanent grazing systems (Office fédéral de l'agriculture OFAG, 2024).

Nature conservationists

Since the return of the wolves, and even before, environmental organizations have worked to protect wolves and biodiversity. The most prominent international organizations active in the Swiss context and media include WWF, Pro Natura and BirdLife. Local associations focused on wolf conservation include CHWOLF (2024), and the Swiss Wolf Group (fr: *Groupe Loup Suisse GLS*, ge: *Gruppe Wolf Schweiz (2024) GWS*).

These organizations are often in the news because they frequently oppose decisions to cull wolves. In 2019, their resistance to the revision of the Swiss Hunting Law led to a referendum, and the national vote in 2020 was successful (Office fédéral de l'environnement OFEV, 2020). However, they did not support a referendum for the 2022 revision, citing the unlikelihood of success and the fact that, although the revision was not ideal, it still allowed for coexistence (WWF Suisse, 2023). More recently, in response to FOEN's authorization to cull the entire wolf pack in the Swiss National Park (Fuorn), they appealed to both the Confederation and cantons and launched a petition (Pro Natura, 2024), also supported by the Swiss National Park (Parc National Suisse, 2024).

Hunters

Hunters have traditionally opposed the return of the wolf, as they compete for the same prey (Linnell, 2013). Gamekeepers are in charge of carrying out wolf population control measures, but hunters may be called upon to assist if gamekeepers are overwhelmed, which is especially the case in the canton of Valais. Completing an additional training is a requirement for those authorized to shoot wolves (JagdSchweiz, 2024; Office fédéral de l'environnement OFEV, 2023). The Swiss hunting community is regrouped under the Swiss hunting association (fr: *ChasseSuisse*, ge: *JagdSchweiz*) The association approved the 2022 revision of the Hunting Law, but did not support the 2023 initiative aiming at making the wolf huntable, estimating the revision was sufficient for now (JagdSchweiz, 2024).

Other groups

Various actors, composed of a mixture of the different stakeholders, are mentioned in the debate to a lesser extent.

The Swiss Association for the Protection of Lands against Large Predators (fr: *Association Suisse pour la protection des territoires contre les grands prédateurs ASPTcontreGP*, ge : *Verein Schweiz zum Schutz der ländlichen Lebensräume vor Grossraubtieren VSLvGRT*) stands in opposition to the environmental organizations. It was established in 2015 following the consolidation of regional sections. Primarily composed of members from the farming community, it operates across Switzerland with these cantonal divisions. They believe that the new hunting revision does not go far enough and advocate for initiatives that reinforce regulations. They emphasize the dangers posed by the proliferation of wolves and stress the urgent need for action. They support all decisions regarding wolf culling (ASPTcontreGP, 2024).

In opposition to this viewpoint, the association Organization for the Protection of Alpine Pastures OPPAL (fr: *Organisation Pour la Protection des Alpage*) founded in 2020 believes in the coexistence between wildlife and humans. They focus their activities on three areas: assisting with herd monitoring, raising public awareness, and contributing to scientific research. Their activities are focused on the mountain summer pastures of the cantons of Vaud and Valais. Comprising volunteers and civilian workers, they collaborate closely with livestock owners to guard herds at night. Human presence has proven to be an effective protection measure, as no pasture

under their watch has suffered wolf attacks since the association's creation. In 2024, 24 mountain pastures were guarded by 477 volunteers and 25 civilian workers, successfully supporting 90 livestock owners (Oppal, 2023).

Media

The Swiss media scene is structured around two main elements. At the national level, it is anchored by the Swiss Public Broadcasting Corporation SRG SSR (2024) (fr: *Radio Télévision Suisse RTS*, ge: *Schweizer Radio und Fernsehen SRF*). On a regional scale, the press landscape is largely controlled by three key publishing groups: the TX Group (Tamedia AG), NZZ Media Group (*NZZ Mediengruppe*) and CH Media, a partnership formed in 2018 between AZ Medien and NZZ-Regionalmedien. Since 2010, SDA (*Schweizerische Depeschenagentur*) is the only national Swiss news agency and after merging with the picture agency Keystone in 2018, they became SDA-Keystone. Tables 1 and 2 show the most prominent daily newspaper in Switzerland between 2010 and 2020 (Bonfadelli & Meier, 2021).

The Swiss media scene was recently evaluated by Bonfadelli and Meier (2021) and they highlighted a few important points:

Firstly, there has been an impoverishment in the diversity of media sources over the last 10 years, with a merger of media and publishing companies that began even earlier in the 2000s. TX Group is present in all three language regions thanks to its free commuter newspaper 20Minutes (fr: 20Minutes, ge: *20Minuten*, it: *20Minuti*), and it also operates in the large cities and regions of Zurich, Bern and Lake Geneva (Tages-Anzeiger, Berner Zeitung, and 24heures). Its newsroom delivers titles to more than 20 media houses in 13 cantons. CH Media, for its part, focus on the German-speaking Swiss Plateau (Aargauer Zeitung, Luzerner Zeitung, and St. Galler Tagblatt), and the NZZ Media Group has a national reach. Finally smaller publishing houses complete the scene, such as Editions Suisses Holding (ESH Médias SA), regionally dominant in French-speaking Valais and Neuchâtel (Le Nouvelliste, ArcInfo), and Somedia AG, in Graubünden (Bündner Tagblatt, Südostschweiz Zeitung). With the headquarters of TX Group, Ringier and NZZ-Group being in Zurich, the city is Switzerland's journalistic capital. This concentration of publishing houses, but also the creation of newsrooms that issue titles to several different newspapers, and cooperation with foreign newspapers, has a significant consequence for the readers, as it reduces the diversity of sources. As a result, it has become very common to find the same articles or the same content published in different newspapers. An analysis from Fög (2019) showed that only 74% of news articles of the main Swiss-Germany newspapers were unique in 2018.

Secondly, the authors of the study also highlighted the fact that journalists are under increasing pressure, due among other things to foreign competition and the emergence of social medias, which have become the sole source of information for a large proportion of the young population. Journalists are increasingly required to use Public Relations material from third parties, such as influential political and business stakeholders. News framing is also evolving. Traditionally rather audience oriented, although this depends on the type of media, the emergence of online platforms is guiding the selection of topics more towards personalization (Bonfadelli & Meier, 2021).

The literature shows that media play an important role in the wolf conflict and in social debates in general, functioning both as a mirror of societal discussions and as a guide by influencing what issues people should consider important (Linnell, 2013; agenda-setting theory: McCombs and Shaw, 1972). In their meta-analysis of studies on attitudes towards wolves, Dressel et al. (2015) found that media coverage increased as the wolf population expand. In their studies, Arbieu et al. (2021) and Bombieri et al. (2018) demonstrated the influence and risks of news

framing and choice of tone on public opinion. Evolution of Swiss media landscape has certainly a repercussion on the wolf debate.

Publisher company	**Impact on**	**Newspaper**	**Category (swissdox)**
TX Group	language region	20Minutes *	PRD - regional
		24Heures (VD) *	PRD - regional
		Tribune de Genève (GE) *	PRD - regional
	online	lematin.ch	WWE - online medium
Ringier	language region	Le Temps (VD) *	Until 2018: PRD - regional From 2018: PND - national
ESH Médias	language region	Le Nouvelliste (VS)	*Not in Swissdox*
		ArcInfo (NE)	*Not in Swissdox*
	region	la Côte (VD)	*Not in Swissdox*

Table 1: Summary of the main daily newspaper at national and regional level for the French speaking part. The asterisk indicates the leading newspapers. (Bonfadelli & Meier, 2021; Swissdox, 2024)

Publisher company	**Impact on**	**Newspaper**	**Category (swissdox)**
TX Group	language region	20Minuten *	PRD - regional
		Tages-Anzeiger (ZH) *	PND - national
	region	Berner Zeitung (BE) *	PRD - regional
		der Bund (BE) *	PRD - regional
		Basler Zeitung (BS/BL)	PRD - regional
	online	20minuten.ch	WWE - online medium
		tagesanzeiger.ch	WWE - online medium
Ringier	language region	Blick *	PND - national
	online	blick.ch	WWE - online medium
CH Media	language region	Luzerner Zeitung (LU) (Neue Luzerner Zeitung until 2016)	PRD - regional
		AZ Aargauer Zeitung (AG) *	Until 2019: PRD - regional From 2019: PND - national
		St. Galler Tagblatt (SG)	PRD - regional
	region	Baselland Zeitung (BL)	PRD - regional
		Solothurner Zeitung (SO)	PRD - regional
		Thurgauer Zeitung (TG)	PRD - regional
		Urner Zeitung (UR)	PRD - regional
	online	watson.ch	WWE - online medium
NZZ-Group	language region	NZZ *	PND - national
Somedia	language region	Südostschweiz (GR)	*Not in Swissdox*
		La Quotidiana (GR)	*Not in Swissdox*
	region	Bündner Tagblatt (GR)	*Not in Swissdox*
		Südostschweiz (GL)	*Not in Swissdox*

Table 2: Summary of the main daily newspaper at national and regional level for the German speaking part. The asterisk indicates the leading newspapers. (Bonfadelli & Meier, 2021; Swissdox, 2024)

2.1.3 Public attitude toward wolves

Studies and observations from neighboring countries have highlighted certain trends in the wolf conflict. A noticeable divide exists between rural populations and local stakeholders who are directly affected, such as farmers and hunters, who tend to be more opposed, and urban populations or the broader public, who generally support wolf conservation without bearing the associated costs (Chapron et al., 2014; KORA, 2020; Linnell, 2013; Zscheischler & Friedrich, 2022). Some studies also suggest that people are less likely to accept the arrival of new wolves compared to populations that have been established for a longer period (Houston et al., 2010). It appears that the longer wolves remain in a region, the more negative attitudes toward them tend to grow (Dressel et al., 2015).

The study of Caluori and Hunziker (2001) appears to confirm that these trends are also relevant for Switzerland: in 1998, they conducted 10 in-depth interviews with theoretically sampled individuals from German-speaking Switzerland. From this, they identified three types of attitudes toward wolves: the '*modern wolf opponent*', for whom wolves symbolize wilderness with a negative connotation, threatening farms and the traditional separation between human activities and nature; the '*postmodern wolf proponent*', who sees the wolf as a positive symbol of wilderness, representing environmental recovery and in need of protection; and finally the '*ambivalent wolf proponent*', who generally holds a positive view of wolves but is easily swayed when the wolf issue becomes more personal. It is estimated that the majority of the Swiss population falls into this last category.

More recently, Behr et al. (2017) analyzed the socio-ecological conditions for the return of wolves in Switzerland by integrating a Habitat Suitability Model with a Human Acceptance Model. The spatial acceptance was assessed by sending 10'000 questionnaires across Switzerland in 2015. The habitat suitability model identified high-altitude regions, the Alps and the Jura Mountains, as areas favorable for wolf recolonization. However, the resulting Human Acceptance Model revealed that support for wolves decreased with increasing altitude and proximity to confirmed wolf presence, aligning with existing literature on urban-rural divide and the intolerance growing with wolf presence. Overall, the Alpine regions demonstrated significant opposition to the return of the wolves. Key factors influencing acceptance include direct and indirect experiences with the wolves, educational background, the necessity of livestock protection measures, concerns about wolves, and interest in wolf-related topics. When combining the two models, only a few socio-ecologically suitable areas remain, primarily situated in the Jura Mountains, as well as certain regions of the southern Alps (e.g., Ticino) and eastern Alps (e.g., Graubünden). The population in the western Alps (e.g., Valais) and central Alps (e.g., Uri) show low acceptance of wolves, despite the ecological capacity to accommodate more individuals. The authors conclude by stressing the need for careful monitoring of these identified socio-ecologically suitable regions and proactive management of the wolf's return, as these areas are crucial for the species' conservation. They also warn that the situation may shift as wolf numbers grow, particularly since their study was conducted when the wolf population was still relatively low and newly established.

The following years, the vote of 2020 on the revision of the Swiss Hunting Law to allow more flexibilities for regulating wolves, seemed indeed to confirm their fears. The national vote concluded with an overall success (51.9% against the revision), implying the majority of Swiss population were in favor of the wolf (Figure 4). However, noticeable regional trends emerged. Rural areas showed greater support to the revision compared to urban centers, with 57.9% for the revisions versus 37.1% in city centers, reflecting patterns observed in the literature. Alpine cantons such as Valais, Uri and Graubünden strongly supported the revision, with over 60% approval. In contrast, urban cantons like Geneva and Basel-Stadt opposed the revision, with less than 40% in favor. At the communal level, notable differences emerged when compared to the 2015 acceptance map from Behr et al. (2017). At that time, most communes in the Jura Mountains

appeared more favorable to wolves, except for the Vallée de Joux and the French border area around Sainte-Croix. The 2020 vote revealed some shifts: while the Vallée de Joux remained opposed to wolves, Sainte-Croix border area had shifted to supporting them. Additional communes, such as the border region of La Brévine and several municipalities in the canton of Jura, particularly in Ajoie, also expressed opposition to wolves. The evolution of the wolf population alone does not fully explain the observed differences in attitudes. While the first wolf pack in the Jura Mountains settled in the Col du Marchairuz (VD) in 2019, the population in this region was already showing opposition to wolves in 2015. In other parts of the Jura massif, evidence of wolf presence was still minimal, even in 2020, and no livestock losses due to wolves had been recorded (KORA, 2024). Nevertheless, these regions shifted towards supporting the revision for stricter regulations. Regarding linguistic regions, the Italian-speaking population showed the highest support for the revision, with 52.4% in favor, compared to 48.9% in the German-speaking region and 44.6% in the French-speaking region (Office fédéral de la statistique, 2020).

This overview highlights the regions most affected by wolf-related debates. Permanent wolf populations have been established along the French and Italian borders. The primary migration route for wolves passes through the valleys of the canton of Valais, which along with Vaud, Ticino, Graubünden, Saint-Gallen and Glarus, hosts the majority of Switzerland's wolf packs. The canton of Valais and Uri have consistently taken a firm stance against wolves over the years. A key factor contributing to Valais' strong anti-wolf stance may lie in the region's cultural and agricultural characteristics. Due to its challenging topography, many farms in Valais rely on permanent grazing systems, necessitating significant adaptations to accommodate wolf presence. Additionally, in Oberwallis, the breeding of blackface sheep holds deep cultural significance and has become a focal point in the local debates. The wolf, as a direct threat to these sheep, evokes strong emotional reactions, further intensifying the conflict (Imoberdorf & Emmenegger, 2020; KORA, 2020). KORA (2020) suggested that this strong opposition could have delayed the implementation of protective measures.

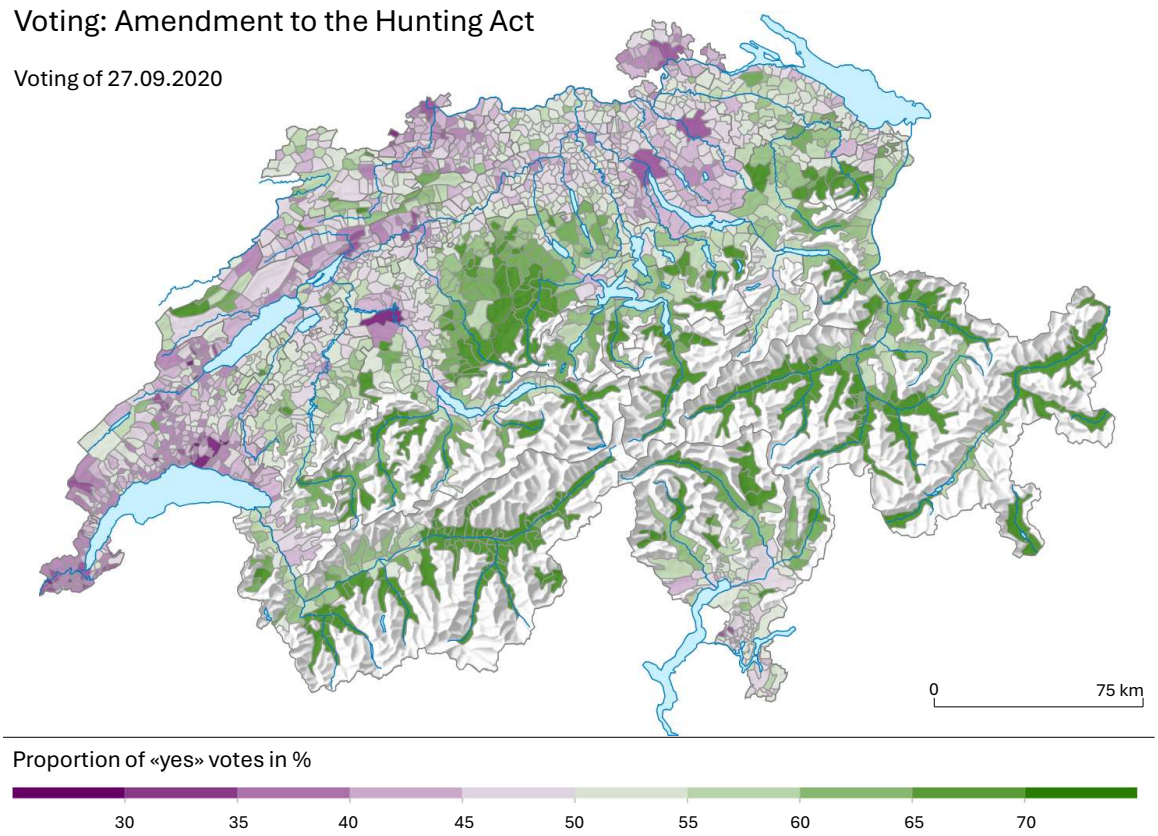


Figure 4: Results of the voting of 27.09.2020 on the amendment to the Swiss Hunting Act to allow more flexibilities to the cantons for regulating wolves. Purple: against the revision. Green: for the revision. The revision was rejected by 51.9%. Data and map: Office federal de la statistique, ThemaKart, Neuchâtel 2010-2024

2.2 Text content analysis approaches

Multiple disciplines are interested in analyzing the content of texts. As computer science has evolved, the field of content analysis has undergone many changes, and we have seen the emergence of various approaches such as computational content analysis, information retrieval and information systems (Krippendorff, 2018). As a multidisciplinary tool, the computer processing of texts goes by different names, such as corpus linguistic or natural language processing, depending on the research field (Purves et al., 2022). Some researchers distinguish between qualitative and quantitative content analysis (Krippendorff, 2018). Since the former is an approach of close reading of a relatively small number of texts, this master thesis takes a quantitative approach.

Another research direction in content analysis focuses on the geographical information embedded in texts. This approach, called Geographical Text Analysis (GTA) by Gregory and Hardie (2011), seeks to identify and extract location-based references from texts to enable spatial analysis of large datasets. It is also commonly referred to in the literature as Geographical Information Retrieval (GIR). GIR is dedicated to "*improving the quality of geographically specific information retrieval with a focus on access to unstructured documents, such as those found on the Web*" (Jones & Purves, 2008). The method builds on principles from the broader field of Information Retrieval (IR), defined as "*finding material (usually documents) of an unstructured nature (usually text) that satisfies an information need from within large collections (usually stored on computers)*" (Manning et al., 2008). Analyzing texts in this way allows for the geographical visualization of patterns, providing deeper insights into the analysis. Given that wolf-related issues are highly

localized, this approach is particularly relevant for studying this topic.

2.2.1 Basics in Natural Language Processing

Inferring information from unstructured texts in a computational and automated manner requires a solid understanding of linguistic concepts and grammatical structures, which can be taught to computers. This process is language-specific for this reason. Natural Language Processing (NLP) techniques rely on large statistical models that are pre-trained on labeled texts in the target language (Manning & Schutze, 1999). Various tools are available for NLP tasks, including Python libraries like Stanford Core NLP, spaCy, the Natural Language Toolkit (NLTK), Transformers (Hugging Face), and Gensim. Below, the fundamental operations involved in natural language processing will be explored.

To work with text, the first step is *tokenization*, which involves segmentation of the text into smaller units. These units are then classified according to their semantic type (meaning), such as name, verb, or adjective, a process known as *Part-Of-Speech (POS)* tagging. Some words may appear in different forms within the text (morphology; e.g., singular, plural, conjugated forms), and some specific rules are applied to return them to their dictionary form (e.g., dictionary form of '*wolves*' is '*wolf*'). This process is called *lemmatization*. Another operation, *stemming*, consists in removing suffixes to return words to their root form (e.g., '*hunting*' reduced to '*hunt*'). The overall meaning of a sentence is determined by its structure (syntax), and the relationships between the words are revealed through *dependency parsing* (e.g., subject, object, etc.) (Explosion, 2024; Manning & Schutze, 1999; Purves et al., 2022). Tables 3 and 4 illustrate these operations.

Sentence	*Un animal a tué une dizaine de moutons au Tessin.*										
Token	Un	animal	a	tué	une	dizaine	de	moutons	au	Tessin	.
Lemma	un	animal	avoir	tuer	un	dizaine	de	mouton	au	Tessin	.
POS	DET	NOUN	AUX	VERB	DET	NOUN	ADP	NOUN	ADP	PROPN	PUNCT
Stop word	True	False	True	False	True	False	True	False	True	False	False

Table 3: Natural Language Processing operations on a French sentence: tokenization, lemmatization, Part-Of-Speech tagging and definition of stop words

Sentence	*Bündner Wildhüter haben in der oberen Surselva einen Einzelnwolf erlegt.*										
Token	Bündner	Wildhüter	haben	in	der	oberen	Surselva	einen	Einzelnwolf	erlegt	.
Lemma	Bündner	Wildhüter	haben	in	der	oberer	Surselva	ein	Einzelnwolf	erlegen	.
POS	ADJ	NOUN	AUX	ADP	DET	ADJ	NOUN	DET	NOUN	VERB	PUNCT
Stop word	False	False	True	True	True	False	False	True	False	False	False

Table 4: Natural Language Processing operations on a German sentence: tokenization, lemmatization, Part-Of-Speech tagging and definition of stop words

These operations are commonly referred to as preprocessing steps. The purpose is to clean the text, remove noise (such as numbers or special characters), normalizing it (e.g., converting to lower case, standardizing punctuation and hyphenation), and keeping only the essential words that convey meaningful information. This includes removing *stop words*, common grammatical words (e.g., '*the*', '*at*', '*in*') which do not contribute to the overall meaning. These steps are crucial for ensuring that subsequent analyses are accurate and meaningful.

Another approach, less computationally intensive, is to use *regular expressions* (Manning & Schutze, 1999). This method allows for searching specific patterns in the text, such as non-alphanumeric characters or specific order of terms, and applying operations like removal or conversion to lowercase. It is, however, limited in scope, as it does not incorporate any linguistic annotations.

Term frequency and similarity

The most straightforward operation to characterize the texts is to calculate the most frequent terms in a document, since, assuming that stop words have been removed, they are most likely to provide information about the overall meaning of the text. The most common method is the TF-IDF (Term Frequency-Inverse Document frequency) which compares the term frequency within the document with the term frequency in the whole corpus. This is particularly useful for ranking and indexing documents in terms to their relevance to the topic (Manning et al., 2008).

Another common operation is to check how similar words are to each other within a text, or how similar the documents in a collection are to each other. The simplest way to compare word meaning is to represent words as vectors in the document space and compare how similar they are. There are several different metrics, such as cosine similarity, Jaccard coefficient or Euclidean distance measurement (Manning & Schutze, 1999).

2.2.2 Text categorization and topic modeling

One of the key objectives in NLP is text classification, which involves categorizing texts into two or more predefined groups. This range from performing binary classification, such as assessing whether a document is relevant to a specific query or not, to gaining a broad understanding of the different topics within a corpus by determining the distribution of documents across various topics and identifying trends and patterns. To achieve this, supervised or unsupervised classifiers are employed. *Supervised classification models* must first be trained on a labeled dataset. The dataset is divided in to training and validation sets, where the model learns from the training data and its performance is evaluated on the validation set. Performance metrics, such as classification accuracy, indicate how effectively the model correctly categorizes texts. Example of supervised classifier are decision trees, maximum entropy modeling or k-nearest neighbor (Manning & Schutze, 1999). *Unsupervised models*, on the other hand, do not require labeled data, which makes them less time-intensive. These models use similarity measures to automatically infer categories and can provide a quick overview of the main topics within a document. Popular unsupervised classifiers include topic modeling techniques such as BERTopic, Structural Topic Modeling (STM) or Latent Dirichlet Allocation (LDA) (Purves et al., 2022).

2.2.3 Geoparsing

Extracting the locations from the texts involves two main steps: Toponym recognition and toponym resolution (Purves et al., 2018).

Toponym recognition is the task of identifying place names in text, complemented by another NLP operation known as *Named Entity Recognition (NER)*. It extracts the individual meaning of the word and classifies it into predefined categories such as person names, places, organizations or time. In this case, location entities (commonly abbreviated as LOC) are being searched for. This requires the use of pre-trained statistical models. For example, the spaCy library provides pre-trained pipelines, that can also be fine-tuned by the users by training them on an annotated set to further improve the accuracy of toponym recognition (Explosion, 2024).

The second step, toponym resolution, is to associate the identified place name with a unique referent, i.e. coordinates. This requires the use of *gazetteers*, which are dictionaries of known places. Most gazetteers contain locations that relate to administrative regions, such as country names, cities or districts, natural landmarks, such as names of lakes or mountains, and sometimes public entities, such as street names, bus stops, hotels or museums. Gazetteer often include not only place names and coordinates, but also the administrative levels and any alternative names due to linguistic, local or historical variations. For example, Lake Geneva on the border

between France and Switzerland, is called '*Genfersee*' in German, and has two widely used names in French: '*lac de Genève*' and '*Léman*'. These different names all refer to the same entity, therefore they need to be stored as one in the database. The most widely used gazetteer is GeoNames, a freely available worldwide database (Unxos GmbH, 2024). Other alternatives include the Getty Thesaurus of Geographic Names (The Getty Research Institute, 2024) or local alternatives, often produced by government agencies responsible for topography and surveying, such as the Ordnance Survey 1:50'000 gazetteer in Great Britain (Ordnance Survey, 2024) or swissNAMES3D in Switzerland (Office fédéral de topographie swisstopo, 2024).

2.2.4 Challenges of Natural Language Processing

Here are listed the main challenges of Natural Language Processing which have to be addressed to get accurate results.

NLP for non-English languages: While a wide range of tools and datasets is available for developing and fine-tuning NLP applications in English, this is far from being the case for all languages. Although French and German are still among the languages with the largest number of resources (Bender, 2019), most NLP tools, particularly geoparsing tools, are primarily developed and evaluated for the English language, raising questions about their applicability to other languages (Leppämäki et al., 2024). For instance, a notable characteristic of English is its reliance on word order rather than inflections to determine grammatical categories, whereas other languages, such as German, rely more heavily on inflections, requiring greater emphasis on lemmatization during preprocessing. This directly influences NLP tasks such as POS tagging and NER (Bender, 2019; Manning & Schutze, 1999; Ortmann et al., 2019). For the present study, this implies that working with a language other than English may introduce additional challenges (Explosion, 2024; Nothman et al., 2013).

Compound words: Words in a sentence are split into individual tokens, and the most common and straightforward way to do this is to segment on the whitespace. However, some words need to be treated as a single entity because, on their own, they either lack meaning or convey a different one. Compound terms often appear as separate words in a text but function as a single unit (Manning & Schutze, 1999). For example, in French, the '*Vallée de Conches*' in the canton of Valais is a complete place name. Extracting only '*Conches*' would be meaningless in context and the geocoding might fail, as it is likely registered in the gazetteer under its full name. In the opposite case, some words may need to be split because they combine multiple distinct elements into a single term. This is particularly common in languages like German, where compound words are formed by merging words without spaces. For example, '*Calandasrudel*' refers to the wolf pack in the Calanda region and would ideally be segmented into '*Calanda*' and '*Rudel*'. A simple whitespace-based tokenization cannot handle such cases. This poses challenges for geocoding, as '*Calanda*' would be included in the gazetteer, but compound variations like '*Calandasrudel*' are typically absent.

Word sense disambiguation and idioms: The same words can have different meanings depending on how they are combined with other words in the sentence. The statistical model uses the context and the inflection form of the language to predict the correct meaning and correctly proceed to Part-of-Speech tagging or Named Entity Recognition (Manning & Schutze, 1999). This challenge is carried further in the case of geoparsing: it is not enough to recognize that a term refers to a place, but the geoparser has to be able to distinguish the geographical use of the place names from metonymic use (Gritta et al., 2018; Jones & Purves, 2008). For example, the city of Bern is often mentioned in news articles not for its geographical significance but as a symbol or reference to the seat of the government.

Placename disambiguation: A same name can refer to different places (e.g., Freiburg in Switzerland or Freiburg in Germany), or different names can refer to the same place (e.g., Genf

and Geneva). The context and the completeness of the gazetteer are very important for a correct result.

Places with vague boundaries: Assigning exact coordinates to the identified place name can be difficult if the geographical terminology is vague. This may be because the place referred to does not have precise boundaries (e.g., the Alps, the Swiss Central Plateau, ...), or because the writer uses vague spatial terminology, such as "in the north of" or "near" (Gritta et al., 2018; Jones & Purves, 2008).

2.3 Data visualization and spatial analysis

Various visualization methods can be employed to represent locations extracted through geoparsing, effectively highlighting patterns or identifying hot and cold spots in the data.

Simple point representation

The most straightforward approach involves representing the data as point coordinates. Visual variables, such as transparency, size or color, can be adjusted to reflect attribute differences, like location saliency (e.g., adapting these variables to the number of mentions). Examples of such visual variables can be found in the study of DiBiase et al. (1992). However, this simple representation has limitations, particularly when dealing with large datasets. Overlapping points can obscure patterns and hinder interpretation. To address this issue, several methods are commonly applied, which will be described below.

Data aggregation

A common generalization technique in spatial analysis is to create choropleth maps by aggregating results into spatial units. For instance, in Switzerland, geoparsed locations can be aggregated at different administrative levels, such as cantons, districts, or communes (see the example of the voting map in Figure 4). The method appears straightforward to implement, however, it is challenged by the Modifiable Areal Unit Problem (MAUP): Aggregating data into artificial spatial units may introduce biases in interpretation and lead to a loss of data and precision. Changing the scale of spatial units (scale effect) or their boundaries (zoning effect) can lead to significantly different results (Buzzelli, 2020). For example, in the voting map mentioned earlier, changing the scale, such as presenting the vote results at the district level, would make some local variations become invisible. This would have happened in communes like those in the Vallée de Joux in the Vaud Jura or certain areas in the Neuchâtel Jura, such as La Brévine. Additionally, normalization may be necessary if the spatial units are not of comparable size. For example, the canton of Graubünden is almost 200 times larger in area than the canton of Basel-Stadt, which could distort interpretations if absolute values are used.

Spatial clustering

Another approach to analyzing point clusters and density involves applying spatial clustering methods. Various clustering algorithms can be utilized, such as k-means, DBScan, or agglomerative clustering (scikit-learn developers, 2024a). Point clusters can be transformed into polygons using techniques like bounding boxes, convex hulls, or Voronoi polygons. These polygons can subsequently be analyzed with various measures to characterize differences between clusters.

Density representation can also be achieved using quadrat or hexagonal binning. This involves overlaying a grid across the study area, with each cell reflecting the number of points it contains.

Additionally, heat maps generated using Kernel Density Estimation (KDE) are another common approach. Selecting an appropriate bandwidth in KDE is crucial to ensure the visualization effectively reveals spatial patterns.

Visualization of changes

In addition to visualizing spatial changes in the data, one might also want to represent changes over time or in attributes (e.g., topics). For instance, Purves and Mackaness (2016) utilized a grid to demonstrate how tags in geo-referenced photographs evolved spatially. Different approaches can be employed, with one of the simplest being the use of small multiples, which are referred to as time series when illustrating temporal changes. However, other visualization methods can also be applied. DiBiase et al. (1992) provide examples of how dynamic variables (duration, rate of change, and order) can be used to create compelling animations.

Comparison of spatial distribution between variables

When analyzing a specific pattern, it is often helpful to compare it with other variables, such as population density. Instead of relying solely on side-by-side visual comparisons, CHI maps offer a more insightful approach. These maps are valuable tools for comparing the spatial distribution of different variables, as they highlight the observed values against the expected values, effectively revealing cold and hot spots within the data.

2.4 Wolf media studies

Media coverage of the wolf discourse has been examined in several studies around the world.

In the USA and Canada, Houston et al. (2010) analyzed print news media from 1999 to 2008 to understand how the attitudes towards wolves had changed over the years, and how they differed between states with established wolf populations or new wolf populations. They extracted attitude expressions from the articles and developed a conceptual framework to classify them into three categories: beliefs, attitudes and norms/judgments. Their valence (positive, negative) was then assessed. They found out that over the whole time period, 72% of all expressions were negative, and that the negative expressions increased over the years. The main themes were the impact of wolves on human activities and the need for lethal wolf control. States with new wolf populations had significantly more negative expressions than states with established wolf populations.

In France, Chandelier et al. (2018) examined topic differences between a national and a regional newspaper of an alpine department (Alpes-Maritimes) from 1993 to 2014 by the mean of Structural Topic Modeling. (STM). They identified 15 topics, and analyzed the four most important ones in detail: lethal regulation of wolf population, farmers' field experience of the wolf, debates involving stakeholders and institutions - all three can be grouped under management issues related to wolf recovery- and representation of wolves and human public interactions. The national newspaper tends to talk about the issue in a general way and focus the discussions on the wolf, whereas the regional newspaper reports more facts and focuses on the human point of view. Interestingly, the proportion of the four themes increased over time for the national newspaper, but for the regional newspapers, only 3 increased and 1, the theme about debates involving stakeholders and institution, showed a significant decrease. The authors suggest that this may be related to a reduction in discussion of alternative management approaches.

Killion et al. (2018) studied a larger time period, from 1960 to 2015, to uncover the most salient topics and their evolution over time since the reappearance of wolves in Idaho. They conducted

topic modeling with Latent Dirichlet Allocation (LDA) and derived six distinct topics: policy, hunting, biological status, implementation of management, recovery, and human-wolf conflict. They found that topic importance shifted significantly before and after two major wolf events in the US: the reintroduction of wolves and the delisting from the US Endangered Species Act. Another finding is the difference in topic importance between local and national news, with local news tending to report more on conflict than national news, which focuses more on wolf policy and biological status.

Bombieri et al. (2018) analyzed media reports from 2005 to 2016 from all around the world about predator's attacks on humans (e.g., wolves, sharks, lions) to highlight how the media conveys information and influences public perceptions of risk and acceptance. They developed a set of criteria to rate the content of an article (title, subheading, pictures) as neutral, positive or safe, or graphic (e.g., showing predator claws or teethes or an injured human). Most of the wolf reports were neutral.

The case of a north-western region of Spain was explored by Delibes-Mateos (2020) who analyzed a regional newspaper from 2006 to 2017 and compared the coverage between the northern part of the region, a region with permanent wolf population and where it is a game species, and the southern part, where the wolf is strictly protected and wolves have recently recolonized the region. Although there are fewer wolves in the south, more attacks on livestock have been reported. Seven topics were derived from the data: Wolf-livestock interactions, wolf conservation, wolf-livestock coexistence, hunting, poaching, natural value and dissemination. The results revealed that news articles in the southern regions focused more on wolf-livestock conflicts, while those in the northern regions covered a broader range of topics, including wolf conservation and hunting. The overall focus was mainly on the southern region, where the wolf has recently recolonized due to increased livestock predation.

Arbieu et al. (2021) analyzed how news is selected and framed by the European media by comparing how two different cases of human attacks, allegedly by wolves or dogs (in Greece 2017 and Germany 2018), were reported in the media in European countries. The findings show that the media tends to focus more on cases where wolves are the primary suspects, highlighting the perceived newsworthiness of wolf-related stories.

The content of news articles in Norway from 1970 to 2022 about large carnivores was analyzed by Sponberg and Mathiesen (2022) to find out whether media coverage had changed over the years, whether it differed between local and national newspapers, and how the different species were portrayed. The authors defined some rules and classified the articles as being written in a positive way (in favor of the predators), negative (against the predators), or neutral. They discovered that wolves were the subject of the majority of articles, with their portrayal becoming increasingly negative over the years. In contrast, articles about bears showed an increasing trend towards positive representation. Local newspapers tended to be more negative than national newspapers, probably because they focused on regional incidents, such as wolf predation on sheep, which were only reported locally.

In Germany, Zscheischler and Friedrich (2022) looked at online print media and reader comments between 2018 and 2019 to get insights into the human-wolf conflict and more particularly about the urban-rural divide. They conducted a qualitative content analysis, evaluating the articles using a combination of deductive and inductive methods. The rural-urban divide was confirmed, as well as a political alienation from the rural areas. Media discourse focuses on issues such as appropriate wolf population management, including population regulation, changes in hunting laws, reported damages, and related compensation measures. While the media coverage tended to be balanced and factual, with the exception of some conservative newspapers, reader comments were significantly more polarized, expressing either strong pro-wolf or anti-wolves sentiments.

Trainotti et al. (2024) analyzed the differences in topics and valence between regional newspapers

and areas in the Eastern Italian Alps in 2019 and 2020. News valence and attitude expressions were assessed using the frameworks developed by Bombieri et al. (2018) and Houston et al. (2010). The results showed that media coverage was predominantly neutral, but negative expressions of attitude outnumbered positive ones. The main topics covered were wolf management and predation. The area with the highest coverage and the most negative portrayal, focusing more on wolf depredation, was the mountainous region with the most alpine pastures. In contrast, the semi-mountainous area with the highest wolf population had more articles with positive portrayals. The authors suggest that this may be due to the region's experience with a permanent brown bear population.

Finally, Cracco et al. (2024) looked at a regional nature park in the Eastern Alps and conducted a multi-method comparison of social values and perceptions: A news media analysis, a survey with micro-narratives, go-along interviews and focus groups. News coverage from 2000 to 2022 was analyzed computationally and qualitatively using NLP structural topic modeling and a sentiment analysis using a German-based sentiment lexicon (SentiWS). The outcomes indicated that the sentiment of the news media was slightly more negative. The year 2019 saw an increase in published articles about wolves, especially on online platforms, but this salience was not reflected in the other methods, such as the survey with micro-narratives, showing an amplification of the wolf debate in the media. The authors suggest that this highlights how the news media landscape is influenced by groups and institutions, including pro-wolf or pro-rural organizations, as well as federal institutions.

A detailed summary of the various themes explored in these studies is provided in Appendix A. The identified themes include: *policy and wolf management* (implementation, regulation methods, livestock protection, policy), *conflict with farmers* (livestock predation), *conflicts with the public in general* (impact on human activities, public demonstrations, debates), *wolf conservation and status* (monitoring, recovery), *hunting and poaching*, *wolf tourism*, and *wolf representation.*

2.5 Research gaps

Media coverage in the Alpine region has been studied by Chandelier et al. (2018) for the western French part between 1993 and 2014, by Trainotti et al. (2024) for the eastern Italian part between 2019 and 2020, and by Cracco et al. (2024) for the local regional park in the Swiss Eastern Alps between 2000 and 2022. A first research gap has been identified, as no studies have examined the media landscape of the whole of Switzerland from 1995 to 2024, following the return of the wolf in 1995. This master's thesis aims to fill this gap by looking at the media in the German and French-speaking regions. This will cover the most of the Swiss Alps, the Swiss Plateau and the Swiss Jura Mountains, regions that have not been covered so far.

A second research gap was identified, as no wolf studies were found that focused on the geographical content of newspapers. The benefits of uncovering the spatial coverage of news have been highlighted by Rinner et al. (2018), who emphasized its potential as a multidisciplinary tool in journalism studies. This approach can enhance the understanding of socio-cultural patterns by revealing how journalism reports on specific places and the potential effects such reporting may have on readers' perceptions of these locations. For instance, Paterson and Gregory (2019) examined discourses around poverty and its association to places through newspapers in the UK and demonstrated how Geographical Text Analysis could be applied to large amounts of data. This geospatial approach has also been employed to study other environmental issues. Duffy et al. (2020) examined print media to visualize the regional distribution of themes related to the risks and benefits of marine aquaculture. Similarly, Roy et al. (2022) studied the spatial patterns of discourse around dams in New England in order to better understand decision-making about dam maintenance or removal. These examples illustrate that such an approach can be successfully applied to environmental topics, including carnivore conflicts, providing valuable insights

into spatial and thematic dynamics.

Finally, research on natural language processing (NLP), particularly in the field of geoparsing, remains limited for languages other than English. This study addresses this gap by applying NLP methods to French and German texts, assessing whether these methods, originally developed for English, can be effectively adapted to these languages. Additionally, it seeks to identify potential issues specific to working with languages other than English.

2.6 Research questions

The aim of this master's thesis is to examine how the wolf debate has been portrayed in Swiss media, focusing on geographical patterns, thematic trends, and changes over time since the reappearance of this large predator. The following research questions will be addressed:

RQ1: How can news articles related to the wolf debate be effectively identified and extracted?

The performance of the methods applied in this study will be evaluated in light of the challenges identified. The following hypotheses will be discussed:

Hypotheses

— **H1**: NLP methods, even if primarily developed with and for English texts, will be effective when applied to German and French texts.

— **H2**: The performance will be sufficient to identify locations associated with the wolf debate and to reveal spatial and temporal patterns.

RQ2: What is the spatio-temporal distribution of the news articles discussing wolves? Are there regions receiving more or less media attention than expected relative to the local wolf population?

Wolves in Switzerland are monitored by KORA (2024), which provides an extensive database of wolf sightings. By comparing the locations that predominate in the media with the actual locations of wolf populations, it will be possible to identify areas that receive disproportionate media attention (hot spots) or little (cold spots).

Hypotheses

— **H1**: What are the most salient places of the corpora? Are there any places that stand out for the frequency of mentions? How do these locations compare to wolf dynamics? Are there notable differences between regions, language areas, or other socio-cultural factors, such as lowland vs mountainous areas or regions with various levels of wolf acceptance?

— **H2**: Is the topic of wolf considered newsworthy? Which events are considered more important?

RQ3: What is the spatio-temporal distribution of topics associated with wolves ?

Analyzing the topics about wolves will provide insights into temporal trends and variations across linguistic regions.

Hypotheses

— **H1**: What are the most salient topics in the corpus, and which stakeholders are most prominently represented ?

— **H2**: Regarding the spatio-temporal distribution of topics, do specific events, such as votes, trigger shifts in topic saliency, or does topic evolution align with wolf dynamics?

— **H3**: Are there distinct patterns across regions, language areas, or other socio-cultural factors, such as differences between lowland and mountainous areas or levels of wolf acceptance?

3 Data and Methods

The data that permitted the conduct of this master's thesis will be presented in Section 3.1. Then, the different steps required to create the corpus of news media on the wolf debate will be reviewed in Section 3.2. Finally, methods for extracting topics from articles will be discussed in Section 3.3, and methods for extracting locations will be covered in Section 3.4. Figure 5 summarizes the workflow.

The analysis was conducted with the help of the programming language Python (Python Software Foundation, 2024b), as various range of packages are available for NLP processing, and statistical and spatial analysis. The code used throughout the entire project is available in Appendix B.

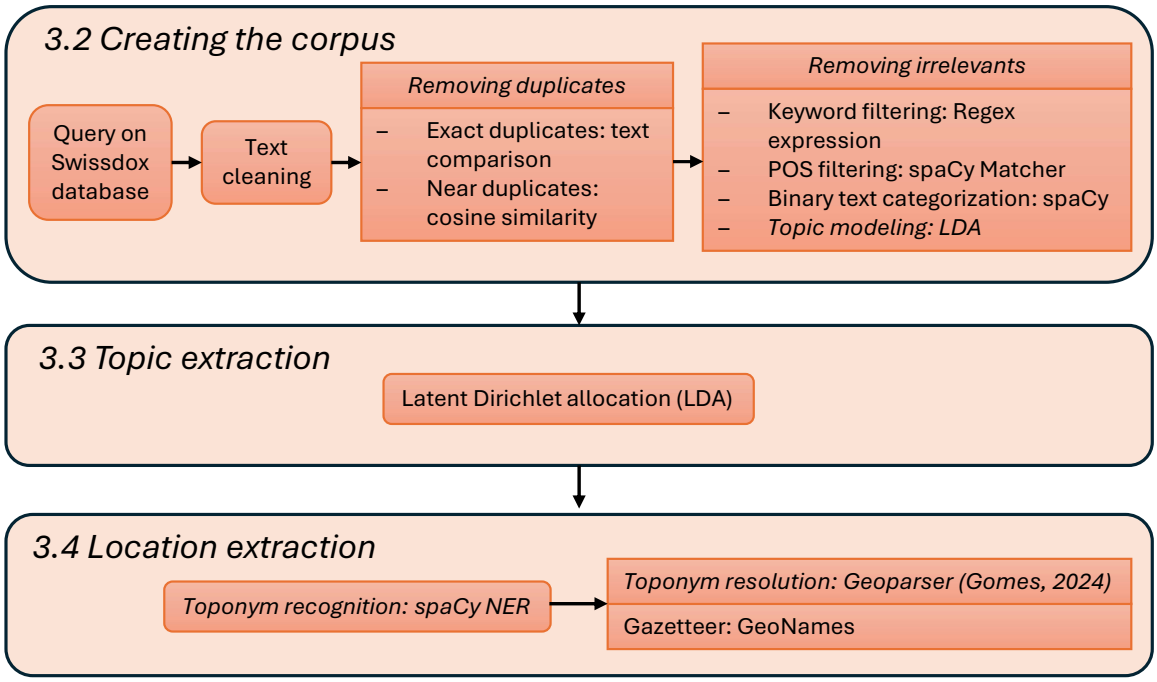


Figure 5: Overview of the methodology and workflow

3.1 Data

3.1.1 Newspaper article collection

Swiss newspaper articles on wolves were acquired from the Swiss media database Swissdox (Linguistic Research Infrastructure | UZH, 2023). The database contains approximately 27 million published Swiss media articles (both print and digital), with 5000-6000 new articles added daily. Founded by the main Swiss media companies Ringier SA and TX Group (Tamedia AG), and the Swiss Public Broadcasting Corporation SRG SSR, it provides access to over 250 Swiss media sources. The oldest newspaper dates back to 1911, but the majority of the publications are from the past 25 years (Figure 6). Most of the articles are in German, accounting for 83.5% of the total (approximately 23 million compared to 4 million in French). Some articles may have been published multiple times, and some content might have been shared between newspapers. The sources with the highest number of publications are the *St. Galler Tagblatt,* the *Neue Zürcher Zeitung* and the *Berner Zeitung* (German-language dailies with over 1 million publications). For French-language newspapers, these are the *Tribune de Genève*, and *le Temps* (dailies with over 500'000 publications). However, some local newspapers, such as *Le Nouvelliste* in the canton

of Valais or *Südostschweiz* in the canton of Graubünden, are not included in the database (see Tables 1 and 2 for the leading newspapers).

Through Swissdox@LiRI service, users can query the database by specifying options such as language, source (newspaper name), document type (e.g., regional daily newspaper, magazine, online medium, according to PDLN definitions), date range, and keywords. The query returns all articles that contain the specified keywords in the core text.

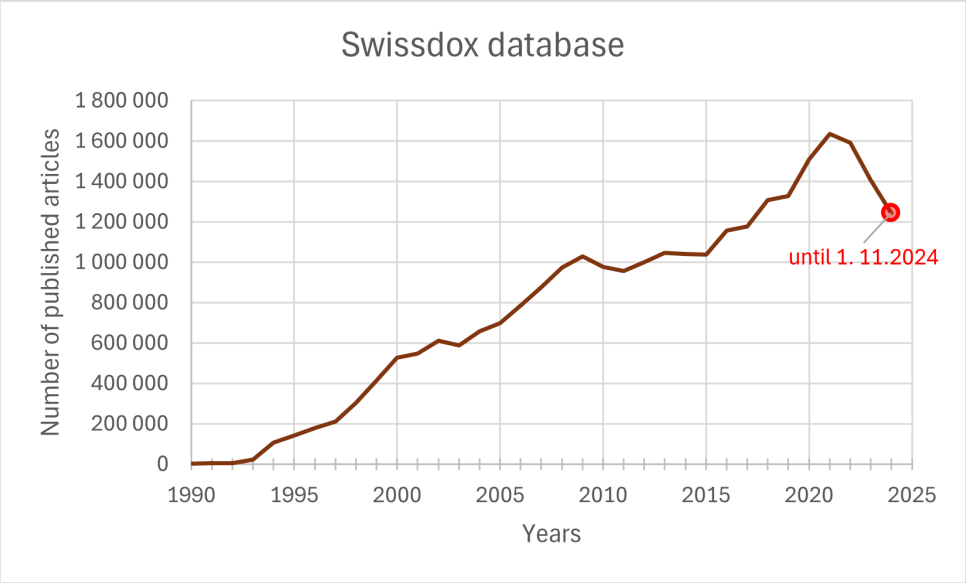


Figure 6: Swissdox database. Number of articles between 1.1.1990 and 1.11.2024. Data as of November 2024. Source: Swissdox@LiRI - Swissdox core metadata

3.1.2 Gazetteer

As detailed in Section 2.2.3, extracting geographical information from texts requires the use of a gazetteer for geocoding. For this master's thesis, GeoNames (Unxos GmbH, 2024) was selected.

GeoNames is an open-access geographical database with worldwide coverage, featuring over 25 million geographical names, of which about 80'000 entries are recorded for Switzerland. The database includes a wide range of geographical features, such as administrative divisions (e.g., country, canton, municipality), urban settlements (e.g., city, village), land use areas (e.g., park, field, nature reserve), transport networks (e.g., roads, railways), hydrographic and topographic features (e.g., rivers, mountains), vegetation areas (e.g., forest, vineyards) and some individual features (e.g., bus stop, building, dam). Data sources for Switzerland are diverse, including opendata.swiss (Federal Statistical Office, 2024), swisstopo (swisstopo, 2024), and the Federal Statistical Office (FSO, 2024).

GeoNames provides various attributes for each entry, including place names in different languages (both primary and alternate names), latitude/longitude coordinates in the WGS84 coordinate system, feature type, administrative hierarchy, country, altitude, and population.

3.1.3 Language statistical models

For the natural language processing, the user-friendly open-source Python library spaCy was used (Explosion (2024), version 3.7.5). The library provides pre-trained pipelines for processing 25 languages, including French and German. Each pipeline consists of various components, such as tokenization, parsing or Named Entity Recognition, trained on labeled data using statistical

models. These models include a vocabulary containing all lexical entries and their linguistic annotations, word vectors (multi-dimensional representations of words, with semantically similar words closer together in the vector space), and language-specific data files containing rules and exceptions for the language. Different pipelines are available for each language, with different components and sizes. Larger pipelines include more extensive vocabularies and word vectors, leading to higher accuracy but requiring more processing power. For this study, the largest pipelines were selected, offering the most comprehensive word vector tables (about 500'000 entries) and vocabularies: `fr_core_news_lg` for French and `de_core_news_lg` for German. The pipelines primarily rely on the *TIGER corpus* for German, which was developed using articles from the daily Frankfurter Rundschau, and the *French Sequoia corpus* for French, built from four sources: the French Europarl, the daily L'Est républicain, Wikipedia Fr, and the European Medicines Agency. For the NER component, both pipelines also rely on *wikiNER*, a multilingual annotated dataset automatically generated from Wikipedia (Explosion, 2024).

3.2 Creating the corpus

3.2.1 Querying the newspaper database

The media database was queried twice: once to extract the French articles and once to extract the German ones, using a distinct set of keywords for each language (see Table 5). Articles were retrieved if at least one keyword appeared in the core text, along with the following relevant attributes: date and time of publication, source medium, document type, title (header), and text content. A single query for both languages with the full list of keywords would have introduced a potential risk of noise. For example, '*Wolf*' in French articles would only have referred to personalities or films. Additionally, the linguistic differences necessitate the use of separate NLP pipelines for the subsequent steps, making it more practical to work with two distinct datasets. Splitting the data also simplifies handling large datasets.

The date range was selected from 1 January 1994, one year before the return of the wolf to Switzerland, providing a baseline, to 1 November 2024, the date where all livestock are expected to have left the summer Alpine pastures for the current year (Mink et al., 2024; Oppal, 2023). The keywords in French include the word '*loup*' (the French term for wolf), along with its plural and feminine forms. The German keywords include the equivalent term '*Wolf*', but with an additional term '*Wolfsrudel*' to capture references to wolf packs. This addition was not necessary in French, as compound nouns are separated by a space ('*meute de loups*'), and searching for '*pack*' alone showed that the additional results referred exclusively to the scout movement.

Swissdox allows users to query the corpus using search modifier (such as asterisks for truncation) and Boolean operators. For example, the keyword '`Wolf*`' could have been used to ensure all compounds and German grammatical inflections of the word (cases, or '*Kasus*' in German) were included. However, this approach introduced significant noise, retrieving unrelated results like city names starting with '*Wolf*' (e.g., Wolfsburg, Wolfenschiessen). In the literature, Chandelier et al. (2018) created the corpus by searching the database with the term '*loup*' in the title to ensure that all retrieved articles would be relevant. Delibes-Mateos (2020) searched for the Spanish equivalent '*lobo*' in the texts, and Killion et al. (2018) looked for the singular and plural forms of '*wolf*' and '*wolves*'. In contrast, Trainotti et al. (2024) used an extended list of terms, including '*wolf*', '*large carnivores*', '*attack*', '*predation*', '*pack*' and '*head*', and then manually removed the irrelevant ones. The keywords for this master's thesis were selected to capture all articles relevant to this research while limiting irrelevance, as the size of the corpus did not allow for a manual review.

Parameters	**French and German queries**	
Date range	01.01.1994 - 01.11.2024	
Doctypes	All except video and audio medium (PDLN category National TV channel, code: TNT)	
	French query	**German query**
Language	fr	de
Keywords	loup, loups, louve, louves	Wolf, Wölfe, Wölfen, Wölfin, Wölfinnen, Wolfsrudel, Wolfsrudeln, Wolfsrudels

Table 5: Parameters used for querying the Swiss media database

3.2.2 Cleaning the raw texts

The texts extracted from Swissdox are written in XML format and also contain some HTML tags for articles published online. The first step was to remove all related HTML and XML tags (e.g., `<p>`, `<tx>`, `<a href>`). This was done using regular expressions (Python Software Foundation, 2024a). Hyperlinks, website and phone numbers were also removed. Certain tags, used to identify authors and legend captions, were excluded from the text content, as they did not belong in the core text. This process resulted in clean, human-readable text, facilitating interpretation in the subsequent steps.

To prepare the texts for computational analysis, additional cleaning was necessary to improve performance (see Section 2.2.1). The operations were carried out using spaCy and included the removal of special characters, punctuation, stop words, and lemmatization. While NLP tools represent the most effective approach, they are time-consuming and require significant computational resources. Therefore, when they were sufficient, regular expressions were used as a faster and less resource-intensive alternative.

3.2.3 Removing duplicate articles

Some articles have been republished by different media sources from the same agencies, and thus may appear multiple times in the database. This repetition, however, is problematic due to the additional computational and human resource costs, as no new information is acquired from these duplicates. Furthermore, the over-representation of certain articles can disrupt machine learning algorithms, introducing bias by training them on the same content (Gibson et al., 2008; Rodier & Carter, 2020). Killion et al. (2018) and Cracco et al. (2024) also faced this issue in their media studies and removed them.

In this work, two types of duplicates are defined:

1. *Exact duplicates*: Articles with exactly the same content, including text with superficial variations such as uppercase words, different punctuations marks or special characters (e.g., a different set of quotes) that can be caught by regular expressions.

2. *Near-duplicates*: Following the definitions provided by Alonso et al. (2013) and Rodier and Carter (2020) for duplicates found on the web, near-duplicates are articles that are almost identical in content, but contain small differences. These can include rewording certain sentences, the addition or removal of a paragraph, the inclusion of a lead text, or even just the addition of a news section name (e.g., '*fauna*') at the beginning of the article. Examples are provided in Appendix C (French: Q1, Q2. German: Q3, Q4).

Exact duplicates are identified by comparing the cleaned content of the articles. When duplicates are found, the article with the oldest publication date and time is retained, as it is presumed to be the original. If the documents have the same date and time, the article with the longest text is kept.

To detect near-duplicates articles, cosine similarity is used. This similarity method calculates the cosine of the angle between two word vectors, producing a similarity score between 0 and 1. Values closer to 1 indicate higher similarity between documents. In spaCy, this is implemented by comparing the average of the token vectors for each document (Explosion, 2024), meaning documents sharing the same words, even if arranged in a different order, will have high cosine similarity scores. Conversely, documents that express the same meaning using different wordings will score lower. Since the objective of this study is to identify the republishing of same articles, focusing on documents with near-identical wordings makes this implementation particularly suitable.

Thresholds - cosine similarity

Due to the size of the corpus and computational constraints, it was not possible to perform all the comparisons between each pair of articles in the corpus. Therefore, a maximum number of days between two publications was chosen based on statistics. Although almost completely similar articles (cosine value > 0.999) could be found up to a year after the first publication, most duplicates were found within 1–2 days after the first publication (Figure 7). *Two days* was therefore chosen as the threshold. The cosine similarity value of *0.994* was chosen by trial and error to ensure that most duplicates were caught and to limit the false matches.

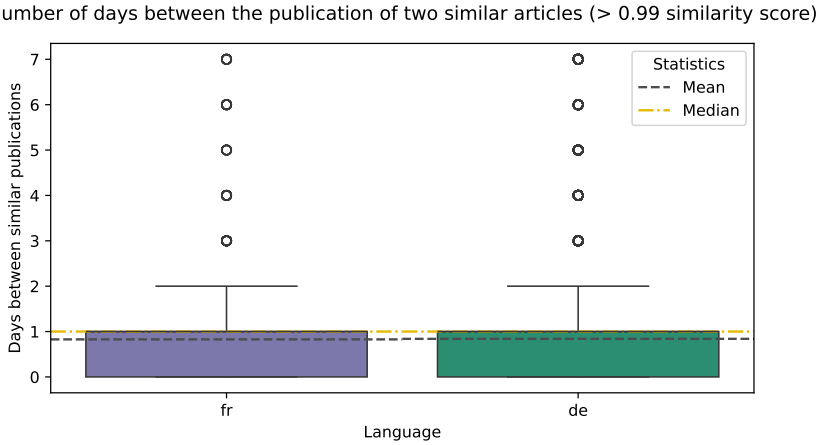


Figure 7: Box plots illustrating the distribution of time intervals between similar publications, up to 7 days, for both the French and German datasets. Both exhibit very similar distributions

3.2.4 Removing irrelevant articles

The query also returned many articles that are not relevant to the research question. In the literature, two categories are defined: primary and secondary articles. According to Chandelier et al. (2018), Delibes-Mateos (2020), and Trainotti et al. (2024), primary articles are those where the wolf is the main topic, whereas Zscheischler and Friedrich (2022) considered only articles on the wolf conflict specifically. Secondary articles refer to those that mention the wolf but do not focus on it as the main subject. Only Delibes-Mateos (2020) analyzed those. Based on the corpus and on the literature, the categories defined for this study are the following:

1. *Primary articles*: Articles where human-wolf conflict is the main focus of the discussion.
2. *Secondary articles*: Articles that reference to the animal but do not focus on the conflict itself. These include topics such as expositions, zoos, or movies featuring wolves.
3. *Non-animal references*: Articles where the term '*wolf*' is used, but does not refer to the animal at all.

Non-animal references included mentions of sports teams (e.g., football, hockey), movie titles (e.g., The Wolf of Wall Street, Dances with Wolves), and idiomatic expressions, such as '*connu comme le loup blanc*' or '*le loup et l'agneau*' in French and '*ein Wolf im Schafspelz*' or '*Wolfgrinsen*' in German.

Categories 2 and 3 were considered irrelevant to the study and were removed. The process involved five distinct approaches, outlined below:

Wolf term present in the first paragraph

Articles with the wolf as the main topic should mention the animal within the first paragraph or within the title (Abid et al., 2020; Chandelier et al., 2018). Regular expressions were used to look for an extended list of keywords within the title and the first 600 characters of the text content. Keywords were extended with '*wolf cub*' and '*young wolf*', especially to catch the compound words in German (Table 6).

French keywords	German keywords
loup, louve, louveteau, loups, louves, louveteaux	wolf, wölfe, wölfen, wölfin, Wölfinnen, Wolfsrudel, Wolfsrudeln, Wolfsrudels, wolfswelpe, wolfswelpen, jungwolf, jungwölfe

Table 6: Extended list of keywords designing wolves in French and German

Keyword filtering

The following categories were found to generate noise in the dataset, including sports teams, the Turkish political movement '*Grey Wolves*', scouting, and other references such as werewolves. Regular expressions were used to search for keywords related to these categories within the text content, and all matching results were removed. The categories and associated keywords are listed in Table 7. The keywords were carefully chosen to avoid unintentionally removing of relevant matches. For instance, removing all articles containing the German keyword '*Roman*', a term used to refer to books in German, could have led to errors, as it can also refer to personal names. Some articles specifically mentioned a person with this first name involved in wolf-related decision-making in the canton of Thurgau.

Part-of-Speech filtering (German)

In German, the term '*Wolf*' does not only refer to the animal *canis lupus*, but is also a common surname in German-speaking countries. Therefore, the query returned many articles mentioning personalities with this family name, such as Stefan Wolf, sport executive in the Swiss football

Irrelevant category	French related keywords	German related keywords
Sport	FC, football, club, match, olympique, champion, championne, hockey	eishockey, fussball, FC, football, club, klub, meisterschaft, weltmeister, weltmeisterin, YB, FCZ, Schwimmclub
Culture	film, cinéma, livre, roman, musique, musical, musicale, exposition, théâtre, documentaire	buch, bücher, kino, musik, musikal, ausstellung, literatur, krimi, kinofilm, theater
Zoo	zoo, parc animalier	wildpark, tierpark, zoo
Terrorism and geopolitics	djihadiste, terrorisme, terroriste, moscou, poutine	Dschihadist, Jihadisten, terrorismus, Terror, terrorist, Attentäter, Attentate, moskau, putin
Scouting	scout, éclaireur	pfadi, pfadis
Various	Wall street, garou	Wall street, werwolf

Table 7: Categories and associated keywords not relevant to the wolf conflict

scene, or Christa wolf, a German writer. To sort them out, the rule-based matcher engine from spaCy was used (Explosion, 2024). It works similarly to regular expressions, but in addition to looking for specific patterns in the text, it can also check for linguistic annotations, like Part-Of-Speech tagging.

Two search patterns were used in the matcher: one to identify occurrences of the term '*wolf*' tagged as proper nouns, and another to capture all other instances of the term. These patterns were applied to the first 600 characters of each text to reduce processing time and computational resources. The following rule was then applied to determine article relevance: if more than 60% of the occurrences of the term '*wolf*' were not tagged as proper nouns, the article was considered as relevant. This approach adds flexibility, as the matcher can sometimes predict the Part-Of-Speech incorrectly. Nevertheless, to improve accuracy, a more robust spaCy pipeline, `de_dep_news_trf`, was used. This pipeline is based on a transformer model, meaning that instead of using static word vectors, the words embeddings are context-dependent, varying according to the surrounding context.

Text categorization

Another approach taken to try and eliminate any remaining irrelevant articles involved training a binary text classification model to predict whether an article was relevant (classified as '*wolf*') or not (classified as '*other*'). The '*wolf*' category corresponds to the definition of primary article introduced earlier. This was implemented in spaCy using the trainable *TextCategorizer* pipeline (Explosion, 2024). This component allows users to train a neural network model, which works on vector representations of words. For each article, the model assigns a probability score to each category ('*wolf*' and '*other*'), with the scores summing to 1. The value ranges from 1 (most likely an article about wolves) to 0 (most likely an article about something else). Based on the inspection of results, a threshold of *0.7* was chosen to classify an article as primary.

The parameters used for training the models for both languages are summarized in Table 8. To evaluate the models' performance, 20% of the labeled data was set aside for testing. Following the reasoning that the main topic of an article is typically introduced in the title or the first

paragraph, the text content was truncated to the first 1500 characters. The text was then preprocessed by retaining only alphabetic characters, removing stop words, and reducing tokens to their lemma form.

Language	Trained spaCy pipeline	N articles annotated		
		True	False	Total
French	`fr_core_news_lg`	191	151	342
German	`de_core_news_lg`	112	67	179

Table 8: Parameters and data used for training the binary text categorization model, presenting the number of articles annotated as relevant ('*wolf*') and irrelevant ('*other*')

Topic modeling

Despite the approaches described above, some irrelevant articles still remained. These were identified during the subsequent step where topic modeling was applied. Details can be found in Section 3.3.

3.3 Topic extraction

Once the corpus was created and filtered, topic modeling was used to uncover themes in the dataset. This was performed using the unsupervised classification model *Latent Dirichlet Allocation (LDA)*. LDA is a hierarchical Bayesian model that assumes each article is a mixture of different topics, with parameters defined at three levels: corpus, document and word. A word's association with a topic is inferred from its co-occurrence with other terms in the documents (Blei et al., 2003). For implementing LDA, the Python library Gensim (Řehůřek, 2024), designed for text mining, was used. The process involved several steps, which are outlined below.

Following the Killion et al. (2018) approach, the text was first cleaned up, reduced to its lemma form and filtered to retain only words that could help identify a topic. Therefore, high frequency terms such as stop words, but also terms used as search keywords (i.e. '*wolf*', '*wolf pack*', etc.) were removed. In addition, only tokens with part-of-speech tagged as noun, verb, adjective or adverb were retained. In order to avoid topics being defined by locations (e.g., the topic Canton of Valais), all entities labeled as locations were also removed.

In a second step, a dictionary is created that summarizes all the terms present in the corpus and their frequency (bag-of-words). Words appearing in more than 50% of the articles (high frequency) were removed, as well as terms appearing in less than 10 articles (low frequency). The approach from Killion et al. (2018) set the lower limit at 10% of articles, but this was too restrictive for the present study.

Finally, the last step is to define the hyper-parameters. Three hyper-parameters need to be defined: a number of topics (often represented as K), a prior assumption about the document-topic distribution (α), and a prior assumption about the topic-word distribution (β). *Alpha* values range from 0.01, where documents tend to be dominated by 1 or 2 main topics, to 1 (symmetric), where each document tends to be a mixture of all topics. The *alpha* value can also be set to asymmetric, assuming that some topics are more likely than others in the documents. *Beta* values range from 0.01, where every topic is described by a few important words, to 1 (symmetric), where every word can be related to any topic.

The model was trained for each combination of the number of topics (ranging from 2 to 15, as suggested by findings in the literature on wolf media studies, e.g., Chandelier et al. (2018)), an

alpha value (0.01, 0.31, 0.61, 0.91, symmetric, or asymmetric) and a *beta* value (0.01, 0.31,0.61, or symmetric). To evaluate the model's performance, 20% of the articles were reserved for testing, and both coherence and perplexity scores were calculated. The coherence score measures the quality of the generated topics by assessing the semantic similarity of the top co-occurring words within each topic. Values closer to 1 indicate higher quality. Perplexity, used in combination with coherence, evaluates the model's performance on unseen samples. Values closer to 0 indicate better performance. To improve accuracy, a cross-validation method was employed, ensuring that all data contributed to the training process (scikit-learn developers, 2024b). The average coherence and perplexity scores from 5-fold cross-validation were calculated for each parameter combination. Figures 8 and 9 illustrate the coherence and perplexity scores for all tested number of topics.

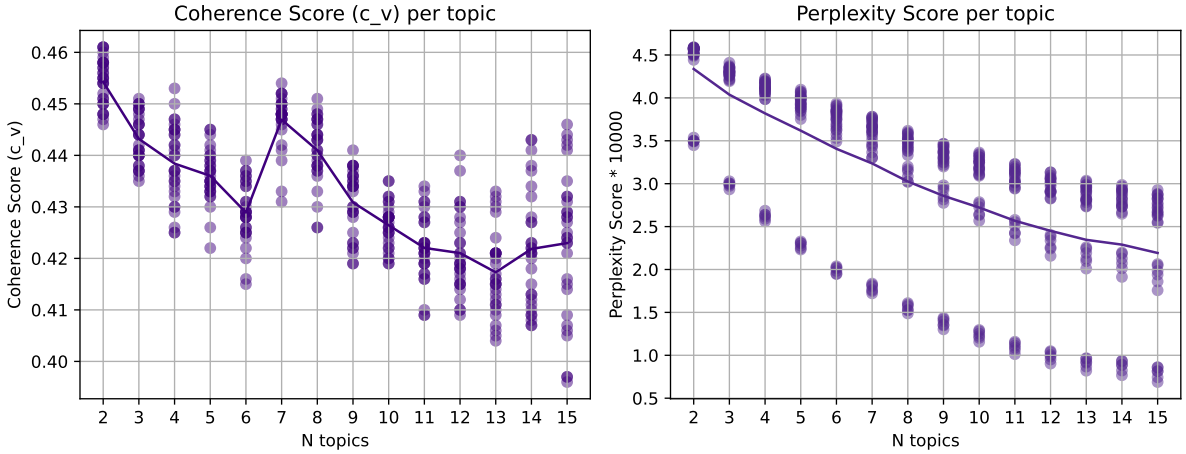


Figure 8: Coherence and perplexity scores (average of the 5 folds) of each K, alpha, beta combination for the French model

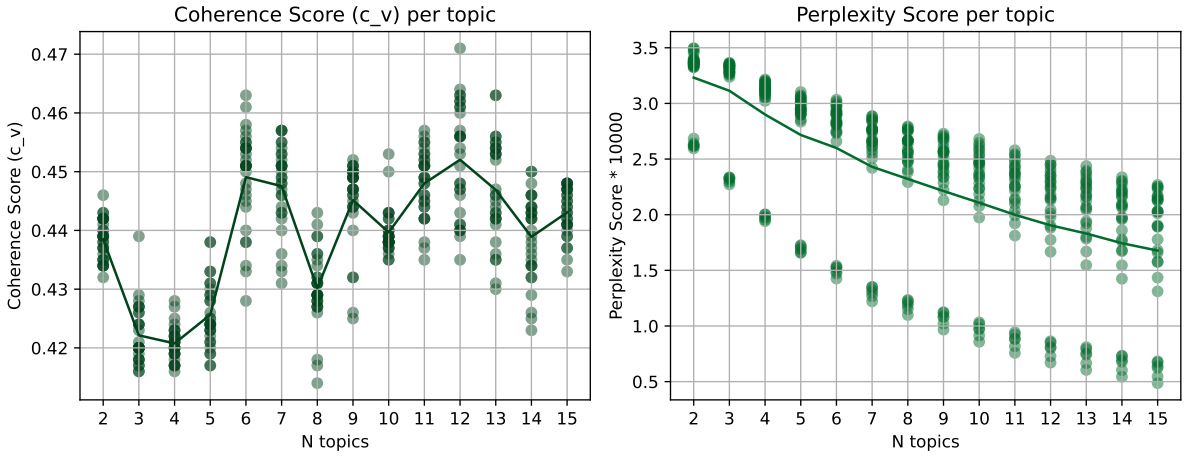


Figure 9: Coherence and perplexity scores (average of the 5 folds) of each K, alpha, beta combination for the German model

3.4 Location extraction

To extract locations, toponyms must first be recognized and then resolved.

3.4.1 Toponym recognition: spaCy NER component

Locations mentioned in the texts were identified using the *Named Entity Recognizer (NER)* component of spaCy (Explosion, 2024). To enhance its accuracy, the component was fine-tuned on the dataset for both languages. A sample of articles was manually annotated using the Python library *spaCy-annotator* (Alemani, 2024) to categorize the following entities: locations (LOC), organizations (ORG), people (PER), and wolves (WOLF). While LOC, ORG and PER are pre-trained categories in spaCy, the WOLF category was newly introduced to capture references to specific wolves (e.g., F8, M31). Although the primary focus was on extracting locations, annotating the other categories was necessary to prevent the model from unlearning previously trained entities. Additionally, entities under ORG or WOLF were sometimes incorrectly predicted a LOC by the initial models.

The datasets and parameters used for training the models are detailed in Table 9. 20 % of the labeled data was set aside for testing.

Language	Trained spaCy pipeline	N articles annotated	Total entities annotated
French	`fr_core_news_lg`	21	LOC: 241, ORG: 143, PER: 63, WOLF: 15
German	`de_core_news_lg`	24	LOC: 264, ORG: 55, PER: 85, WOLF: 20

Table 9: Data and parameters used for training the NER component

3.4.2 Toponym resolution: Geoparser

The geocoding of the toponyms was performed using the Python library Geoparser (Gomes, 2024), a library specifically designed to identify and resolve toponyms in unstructured texts.

The geoparser relies on three core components: a natural language processing (NLP) and toponym recognition model (NER), a SentenceTransformer model, and a gazetteer database. First, the texts are preprocessed through Named Entity Recognition (NER) to identify geographical entities. Then, a list of potential candidates is generated from the gazetteer for each entity labeled as a location, and a textual representation is created for both the toponym and its candidate location. The surrounding context is used for the toponym's textual representation (defined as a span of characters before and after the location entity), while the gazetteer attributes are used for the candidate locations. For instance, the toponym '*Paris*' could lead to multiple candidates, including a hotel in Andorra. The descriptive text generated would look like this: '*Paris (hotel) in Andorra*'. A SentenceTransformer model is then employed to convert these textual representations into embeddings within a shared vector space. Finally, cosine similarity is used to measure the degree of similarity between the embeddings. The candidate location with the highest similarity score is then attributed to the toponym.

Toponym recognition is performed with spaCy pipelines. Users can either utilize a pre-trained pipeline directly available from spaCy or supply a manually fine-tuned one. Regarding the SentenceTransformer model, the Geoparser library offers two fine-tuned models for English, which come in different sizes. For other languages, multilingual SentenceTransformer models need to be fine-tuned manually. An annotator is provided to facilitate the training. Currently supported gazetteers include GeoNames and the recently added SwissNames3D for Switzerland.

For this study, the fine-tuned spaCy pipelines from the previous section were employed. A multilingual model, `distiluse-base-multilingual-cased-v1` (SBERT, 2024), was selected and fine-tuned using the same dataset used for training the NER component (see Table 9). As for the gazetteer, GeoNames was used, as at the time of the analysis, this was the only gazetteer available in the library.

4 Results

This chapter is organized as follows: First, the performance of the methods and models will be presented in Section 4.1. Subsequently, results of the Sections 3.2, 3.3 and 3.4 will be examined individually in Sections 4.2, 4.3 and 4.4. These elements will then been analyzed together by linking geoparsing with topics in Section 4.5 and additional wolf data in Section 4.6. Finally, a regional wrap-up will be provided in the concluding Section 4.7.

The analysis is further supported by extracts from the newspaper articles, referenced as (Q#). These can be found in Appendix C for additional context.

4.1 Model performance

4.1.1 Creating the corpus

This section describes the detailed results of each processing step, listed in the order in which they were performed. The number of articles removed per step is summarized in Table 10. The visualization per year and per language is given in Figures 10 and 11.

Number of articles remaining after each processing step								
Lang	Original	Keyword	Exact duplicates	Near duplicates	POS	TextCat	LDA topic	Final
FR	26772	8624	7755	6450	6450	3888	2926	2926
GE	130833	41391	30490	26402	14448	8711	7027	7027
Total	157605	50015	38245	32852	20898	12599	9953	9953
Percentage remaining after each processing step								
% FR		32	90	83	100	60	75	11
% GE		32	74	87	55	60	81	5
Total		32	76	86	64	40	79	6

Table 10: Number and proportion of articles remaining after each processing step, and for the final corpus

Swissdox query

The query returned a total of 157'605 articles: 26'772 news articles for French, and 130'833 news articles for German. The proportion of articles between French and German (83%) is similar to the proportion in the whole Swissdox database.

Keyword filtering: first paragraph and ignored categories

To reduce time and computational resources, the keyword filtering was performed before the other steps, as regular expressions can be easily applied to large datasets. A first 60% of the original dataset was reduced by checking the presence of wolves related keyword in the first paragraph, and another 8% was removed with the ignored categories, the most important being sport and culture. The original dataset was therefore reduced of about 68% for both languages. The proportion between French and German dataset remained the same, suggesting datasets were equally affected per the wrong categories.

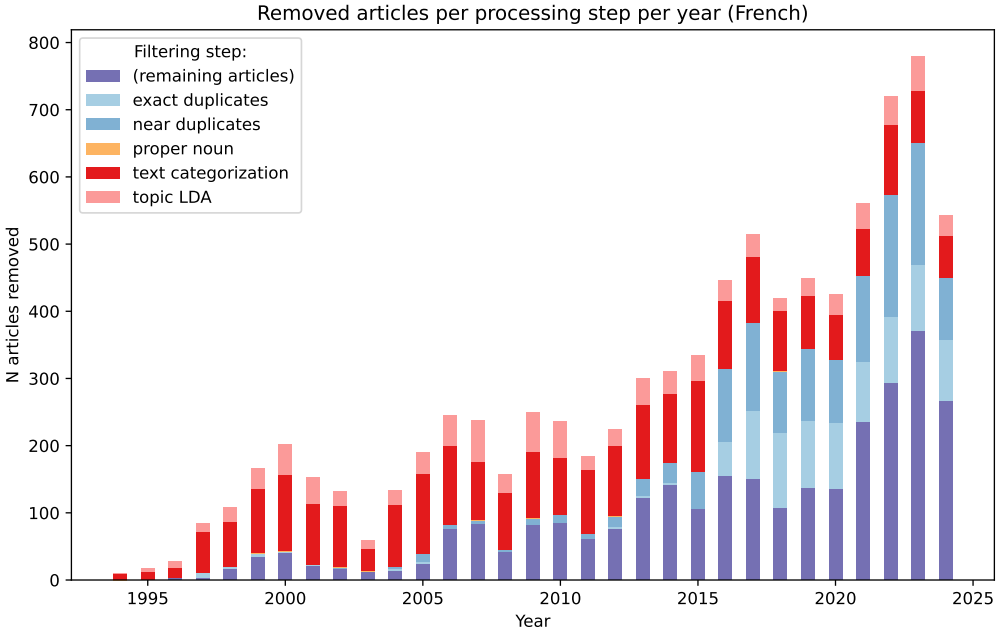


Figure 10: Articles removed per year and processing step (French). Keyword filtering is not included to improve visibility

Removing duplicates

More exact duplicates were identified in the filtered German dataset than in the French one, with 26% of the articles removed in the German dataset from the previous step, compared to 10% in the French one. These results are in line with the 2018 study, which found that 74% of articles in Swiss-German media were unique (Fög, 2019). Subsequently, the proportion of near-duplicates removed was comparable in both datasets, at approximately 15%.

The most affected years are as follows: For French outlets, an important increase in duplicates begins around 2016, with 47 duplicates found in 2015 compared to 87 in 2016. German outlets experienced a similar increase in 2016 but saw an even larger spike in 2020, rising from 284 in 2019 to 482 in 2020. This trend may be linked to the merger of several publishing companies in 2018 to form CH Media (Section 2.1.2). The French outlets primarily include newspapers published by TX Group, such as *24 Heures* (print and online at *24heures.ch*), *Tribune de Genève* (print and online at *tdg.ch*), *lematin.ch*, and *20 minutes online*. German outlets also feature newspapers from TX Group, such as *Berner Zeitung* (print and online), *der Bund*, *Tages-Anzeiger* (print and online). In addition, a large number of newspapers belong to CH Media, including *St. Galler Tagblatt*, *Thurgauer Zeitung*, *Appenzeller Zeitung*, *Toggenburger Tagblatt*, and many other regional newspaper variants.

The maximum time difference between exact duplicate publications, no time constraint having been applied during this filtering, is 4 days for French outlets and 753 days for German outlets. This surprisingly high number has been investigated and is mostly related to irrelevant articles covering general or historical topics rather than current events (e.g., '*How did the wolf get into the Wolfwil coat of arms?*').

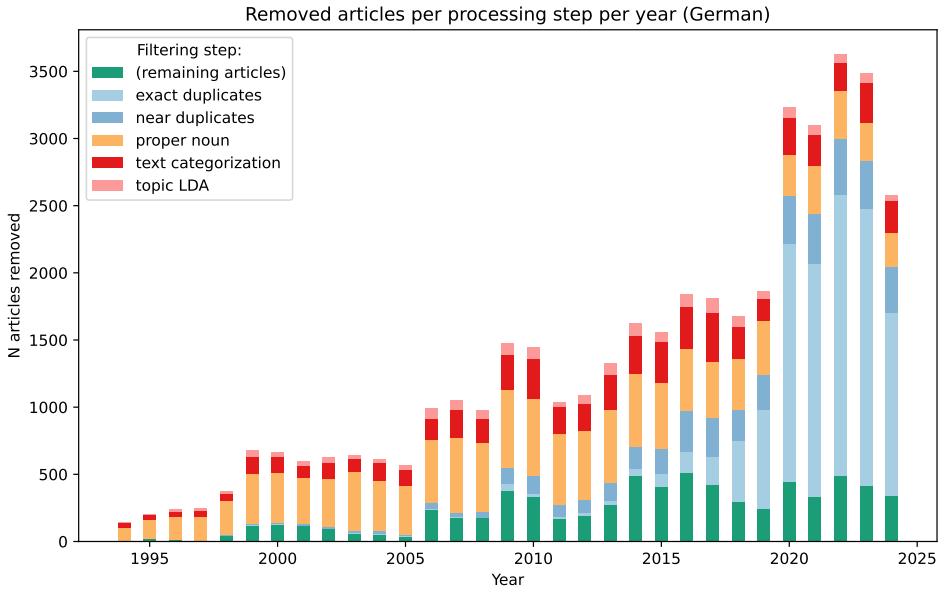


Figure 11: Articles removed per year and processing step (German). Keyword filtering is not included to improve visibility

Part-Of-Speech filtering

The proper noun matcher was applied to filter out articles about personalities with the surname '*Wolf*', resulting in the removal of approximately half of the remaining data in the German dataset. The distribution remained consistent across the years. Upon inspecting the data, it became clear that even though the best performing model (`trf`) was used, the model still made some errors, which justifies the use of a threshold.

Binary text categorization

The binary text categorization model was applied to the remaining dataset to filter out all other articles not relevant to the present study. This finally reduced the previous dataset from about 40% for both languages. The performance of the models for the '*wolf*' category (relevant) is summarized in Table 11: The French model performed better than the German one in term of F-score, which could be explained by the fact more articles were used for training in the former. However, the German model had a perfect precision (1.0), meaning that while it struggled to catch all the relevant articles (with a recall of 0.83), all the instances it identified were correct. For mapping related locations, prioritizing precision over recall is preferable to avoid mapping irrelevant locations, as it is assumed that relevant locations will be mentioned multiple times in the dataset.

Language	Number of annotated articles	F-score macro	Wolf category		
			Precision	Recall	F-score
French	342	0.91	0.9	0.95	0.925
German	179	0.89	1	0.83	0.9

Table 11: Performance of the binary Text Categorization models

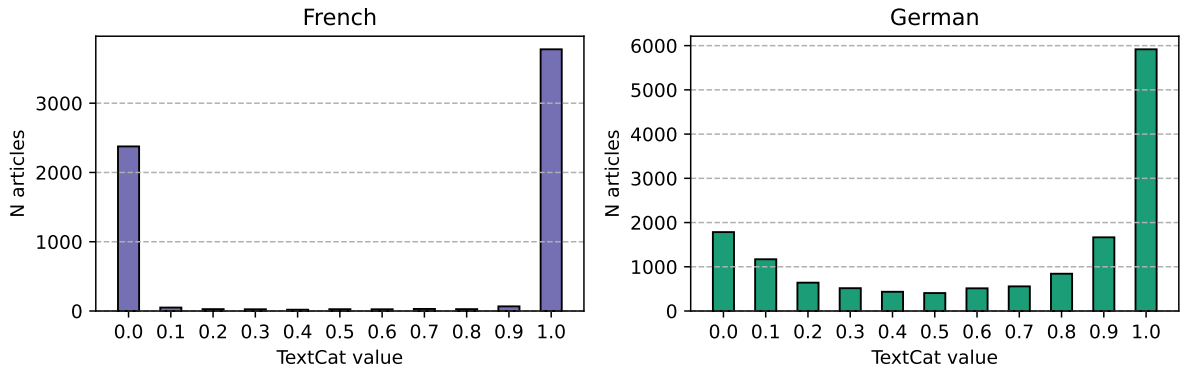


Figure 12: Distribution of '*Wolf*' category scores in binary text categorization

Figure 12 shows the probability distribution of the articles pertaining to the relevant '*wolf*' category. For French, the results are almost binary: most articles are either relevant (1: 59%) or irrelevant (0: 37%), with only 4% falling in between. In contrast, for German, there seems to be more ambiguity, as the distribution is more spread out between relevant (0.9-1: 52%) and irrelevant (0-0.1: 20%), leaving 28% in between. This justified the use of a 0.7 threshold. These differences could be due to the quality of the model training, but could also simply be due to the general performance of natural language processing the languages.

Identified irrelevant topics

In the next section, articles were assigned to a topic, and several themes were identified as containing irrelevant and secondary articles, representing 25% of the French corpus and 19% of the German corpus. Two topics in the French dataset regrouped secondary content that mentioned the wolf but did not focus on it as the main topic, such as discussions about bears or other large predators, as well as completely unrelated subjects like finance or idioms. Three topics in the German corpus were identified as irrelevant: one secondary topic focused on the biology and evolution of dogs, another on idioms and movies or books, and a final small category (1% of all articles) was a mixture of wolf sightings and unrelated stories. Due to its small size, this category was excluded from the analysis.

About 21% of the remaining dataset has therefore been removed. More details on the method can be found in Section 4.1.2.

4.1.2 Extracting the topics

Based on the best coherence scores (Figures 8 and 9), but also on the visual inspection of topic variance (Figures 13 and 14), *8 topics* were selected for the French dataset and *12 topics* for the German dataset. These choices are consistent with previous studies of the wolf debate in the media, falling between 6 topics (Killion et al., 2018) (LDA) and 15 (Chandelier et al., 2018) (STM). The *alpha* parameter with the best coherence score was 0.91 for French, meaning that the documents tended to be dominated by 1 or 2 main topics, whereas it was asymmetric for German, meaning that some topics were more likely to appear in the dataset than others. As for the *Beta* parameters, topics in the French corpus were mainly represented by a few important words, while German topics tended to share similar terms (0.01 for French and 0.31 for German). The finally selected hyper-parameters and the corresponding coherence score are summarized in Table 12.

Language	Number of topics	Alpha	Beta	Coherence score
French	8	0.91	0.01	0.451
German	12	asymmetric	0.31	0.471

Table 12: Chosen hyper-parameters for the LDA model and coherence score

After applying the model, each document was assigned a distribution of topic probabilities that summed to approximately 1. The topic with the highest probability score was assigned to the document as its primary topic. Topics were named manually after a careful review of the most salient words and an examination of the 5-10 articles that were most representative of each topic. Insights from the literature also guided the identification of category names. The figures 13 and 14 show the topics projected onto a two-dimensional space using PCA for dimensionality reduction. The two axes represent the directions of maximum variance between topics. Circles that are close or overlap are closely related in terms of content. The size of each circle represents the proportion of the corresponding topic within the dataset. Rectangles show the main theme under which they are regrouped. The PCA visualizations are also available interactively in Appendix B, which allows exploring term frequencies as well.

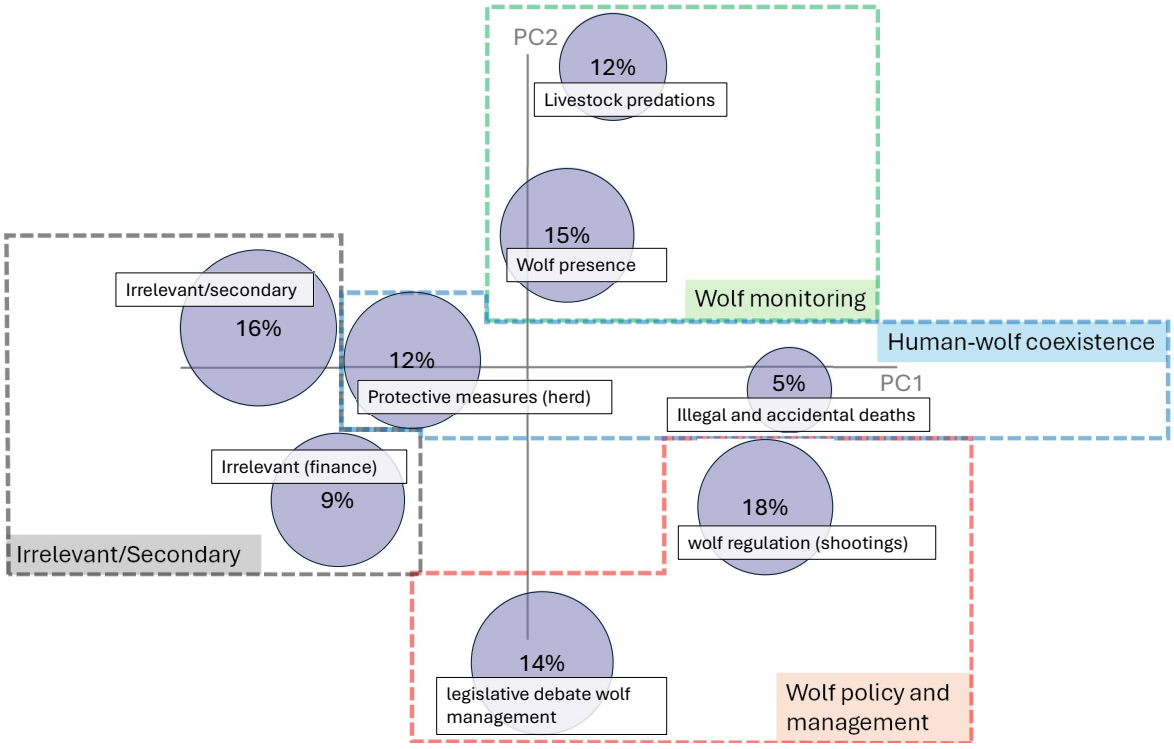


Figure 13: PCA variance visualization of the 8 topics (French)

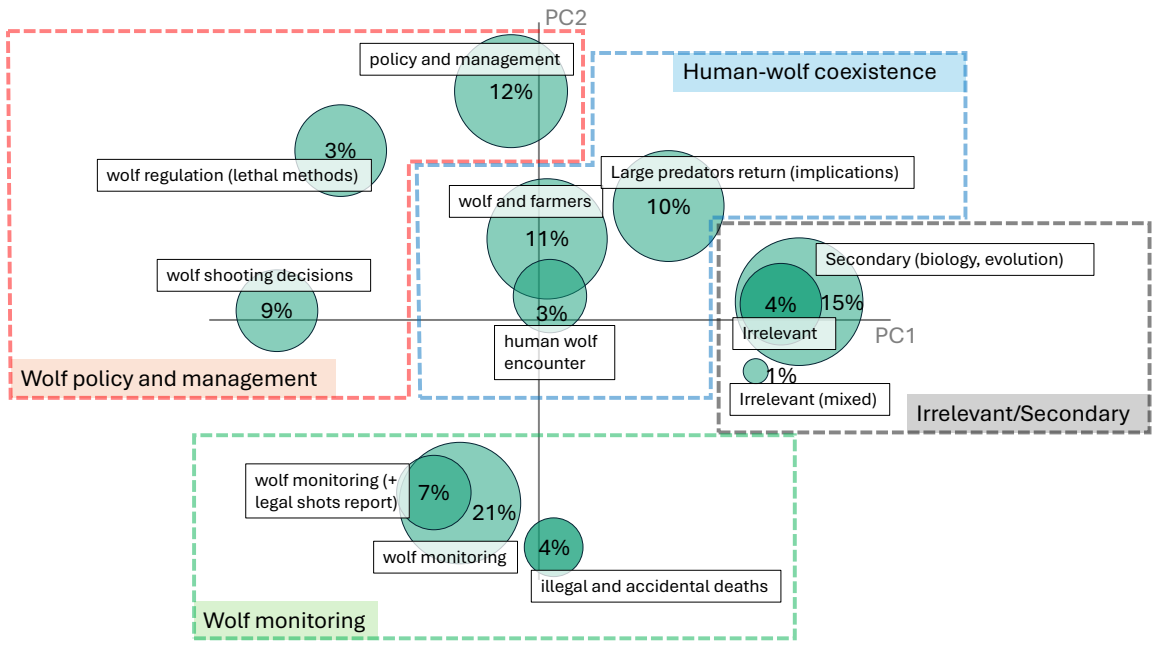


Figure 14: PCA variance visualization of the 12 topics (German)

4.1.3 Extracting the locations

Toponym recognition

The fine-tuning of the spaCy NER recognition is shown in Table 13. The overall F-score is 0.88 for French and 0.89 for German. The location entity also performed well, with a better F-score in German than in French, with 0.94 against 0.89. In both cases, precision is better than recall, meaning the locations identified are mostly correct, but that the models tend to miss more locations. As for the wolf category, it performed relatively poorly in both languages (0.67 French and 0.2 German). This could be due to the fact that very few entities were annotated (20 and 15), whereas training a whole new class requires much more annotation than fine-tuning. Around 100 examples are recommended in spaCy (Explosion, 2024).

Language	Trained spaCy pipeline	Entity	F-score	Precision	Recall
French	`fr_core_news_lg`	*NER*	*0.88*	*0.95*	*0.82*
		LOC	0.89	0.97	0.82
		WOLF	0.67	1	0.5
		ORG	0.83	0.92	0.75
		PER	0.94	0.89	1
German	`de_core_news_lg`	*NER*	*0.89*	*0.92*	*0.86*
		LOC	0.94	0.97	0.9
		WOLF	0.2	0.5	0.14
		ORG	0.57	0.47	0.72
		PER	0.95	1	0.9

Table 13: Models performance - training the NER component

Toponym resolution

The training performance of the transformer model can be seen in Table 14. The proportion of correctly resolved toponyms (accuracy) is better for French than for German (0.88 versus 0.63). After examining the results, the low accuracy could be due to the ambiguity between cantons and cities, as there are separate entities for the two different administrative levels, although they share the same name.

Language	Transformer	Accuracy	Accuracy at 161km	Mean Error Distance	Area Under The Curve
French	`distiluse-base-multilingual-cased-v1`	0.88	0.94	1179.3	0.05
German	`distiluse-base-multilingual-cased-v1`	0.63	0.9	2011.9	0.17

Table 14: Models performance - training the Geoparser

Many entities identified as locations by spaCy could not be resolved. Table 15 lists the top 10 unresolved terms and their frequency in the corpus. These entities remained unresolved due to one of five primary issues: missing entries in the gazetteer (e.g. Haut-Valais, Appenzellerland), errors in entity parsing (e.g., massif du Calanda instead of Calanda), grammatical inflections in language (German Genitiv: KantonS Bern), typographical errors in the source text (e.g., Risoud instead of Risoux, St.Gallen written without proper spacing), or incorrect classification of non-location terms as places (e.g., demonyms, Agridea, Siedlungsnähe).

Some of the important unresolved places of the French corpus refer to the Upper-Valais (Haut-Valais and Vallée de Conches), Calanda region, and to the '*Pied du Jura*', a place name used to refer to the region at the junction between the Jura Mountains and the Swiss Plateau, primarily in Vaud. In the German corpus, important missing locations refer to Central Switzerland and cantons.

Map representation

A unique list of locations was extracted for each article. Article attributes (e.g., year, newspaper) were then assigned to these locations. Creating an appropriate representation of the resulting locations was challenging for several reasons: a place could have been identified by a single article, or it could have been referred to more than a thousand time. Therefore, to reflect the saliency of each location, transparency was used to indicate the number of occurrence. A second issue was the fact that each place, including large regions such as the Alps, are associated with a single set of coordinates. To prevent this from inaccurate local saliency, the large regions that could be identified (see Figure 15) were removed from the visualization. To prevent similar clusters specific to the cantons, those were not represented as points but instead were colored if they were mentioned at least once.

The Jura Mountains entity was not present in the list of identified locations, but other entities were found during the analysis process that should have been removed as well (see Sections 4.4.1 and 4.7).

Background data from Swisstopo were used to facilitate the visualization (swisstopo, 2024).

All		French		German	
Locations	**Count**	**Locations**	**Count**	**Locations**	**Count**
Haut-Valais	220	Haut-Valais	220	Zentralschweiz	203
Zentralschweiz	203	vallée de Conches	172	Bündnerland	164
vallée de Conches	172	massif du Calanda	96	Siedlungsnähe	145
Bündnerland	164	valaisans	88	Kantons Bern	139
Siedlungsnähe	145	vaudoise	71	Kantons Wallis	129
Kantons Bern	139	Chablais valaisan	63	Schweizer Alpen	120
Kantons Wallis	129	Risoud	62	Appenzellerland	113
Schweizer Alpen	120	Valaisans	50	Kanton St.Gallen	113
Kanton St.Gallen	113	Agridea	39	Kantons Graubünden	112
Appenzellerland	113	pied du Jura	36	St.Gallen	107

Table 15: Top 10 unresolved locations

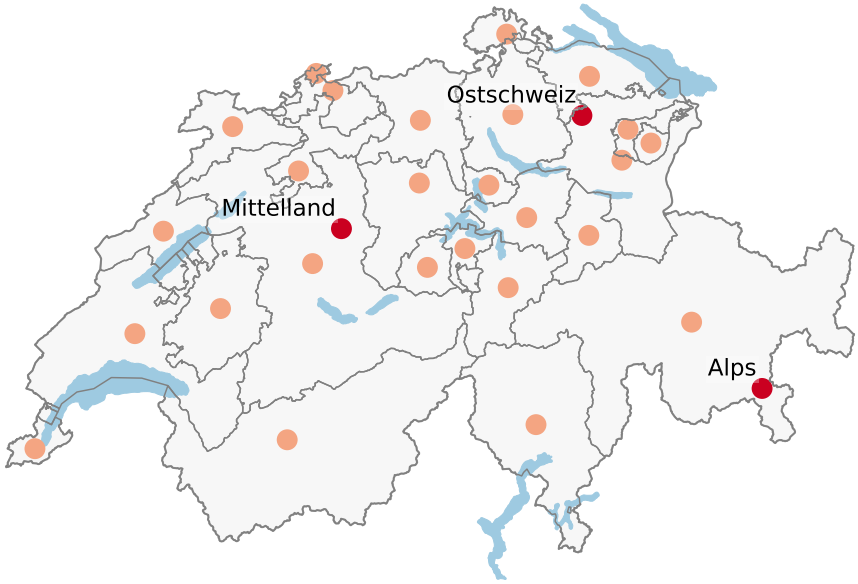


Figure 15: GeoNames' coordinates for the cantons and large regions identified: the Alps, the Swiss Plateau (*Mitteland*) and eastern Switzerland (*Ostschweiz*)

4.2 Newspaper article collection

The final corpus is composed of 2926 French articles and 7027 German articles spanning 30 years (total: 9953), originating from 26 Swiss media outlets in French and 100 Swiss media outlets in German. The initial dataset was reduced by 89% in French and 95% for German. The proportion between French and German is 30% to 70%: more articles have been removed during the filtering process in German than in French, mainly due to the issue with '*Wolf*' being both a proper noun and an animal in German.

Most media studies in the literature have focused on one or two specific newspapers (e.g., Chandelier et al., 2018; Delibes-Mateos, 2020; Killion et al., 2018), a few specific years (e.g., Trainotti et al., 2024; Zscheischler and Friedrich, 2022), or a small region (e.g., Cracco et al., 2024). Therefore, it is difficult to compare the number of articles retrieved to those studies. Additionally, the researchers employed different methods to build their corpus: some extracted articles

from databases and conducted quantitative analysis, while others relied on systematic collections and conducted qualitative analysis, which resulted in variations in the quality of the corpus. For example, Houston et al. (2010) analyzed 10 years of print media from 147 sources in USA and Canada, and identified 6144 relevant articles. In contrast, the present study includes online articles, spans three times the time range, and does not differentiate between media sources. This may suggest that its results are comparable, however, due to the differences in country and population size, drawing definitive conclusions remains challenging.

The number of published articles per year is shown in Figure 17. The overall frequency has increased over time, following the general rise in articles in the Swissdox database. The important growth in the Swissdox database from 2015 onward can be attributed to the increase in duplicate articles. The two corpus exhibit similar trends until 2019. From 2020 onward, French media demonstrate greater saliency compared to German media. This will be further analyzed in Section 4.7.

The distribution of articles across different document types is shown in Figure 16. For both languages, the most common types are regional daily newspapers and online media, with online media being more prevalent in the French dataset. The most salient newspapers operate both print newspapers and online platforms.

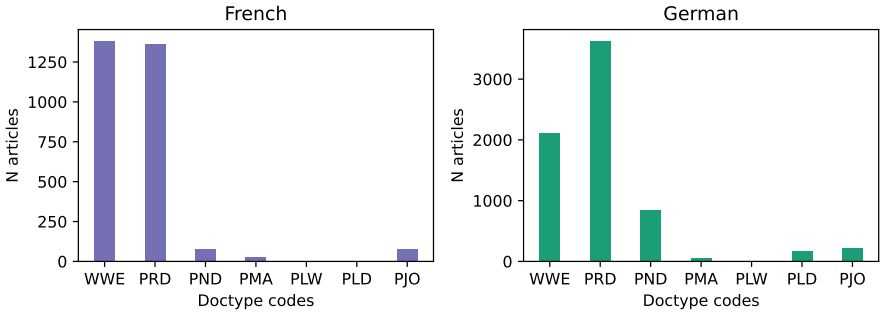


Figure 16: Article distribution by document type. Codes: WWE: online, PRD: regional daily, PND: national daily, PJO: regional weekly, PLD: local daily, PMA: magazine, PLW: local weekly

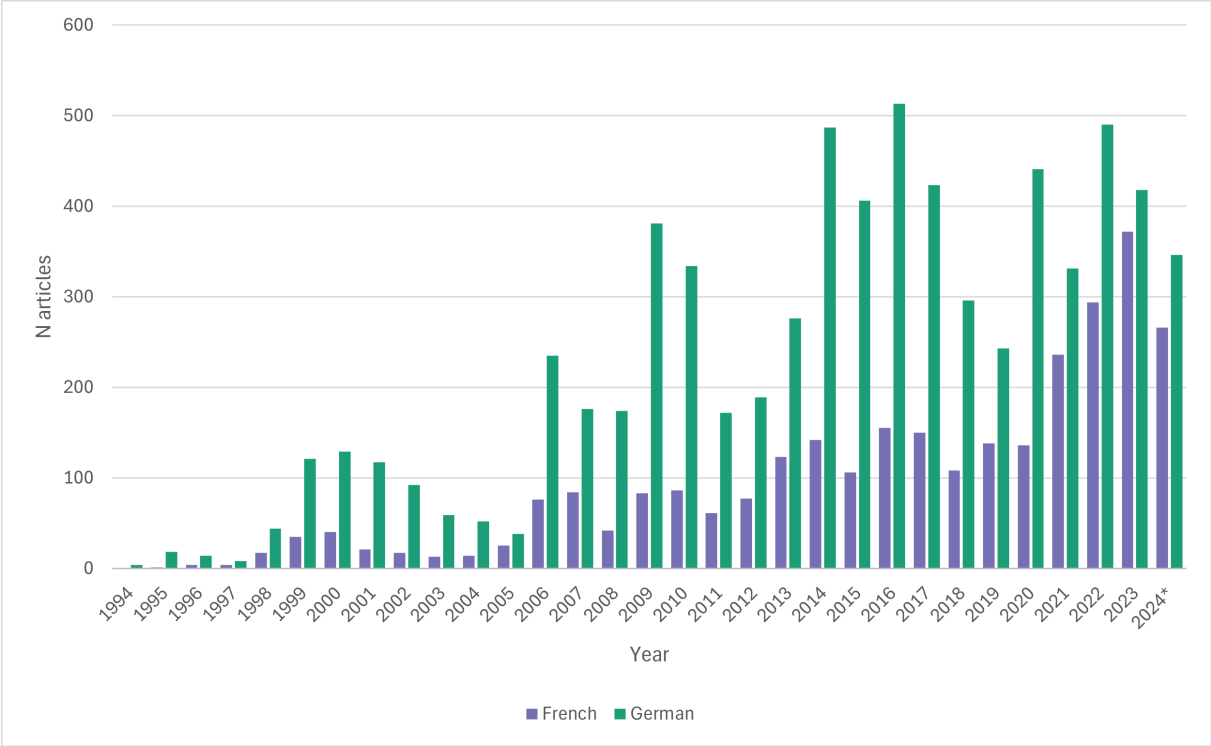
The top media outlets are listed in Tables 16 and 17. In the French corpus, the leading sources include the regional daily newspapers and their online versions, such as *20 minutes*, *le Matin*, *24 Heures*, and *la Tribune de Genève*. Additionally, the online platform of the Swiss Radio and Television for French speakers *RTS.ch* and the national daily newspaper *Le Temps* are prominent. In the German corpus, key sources include regional daily newspapers like *Berner Zeitung*, *Neue Luzerner Zeitung*, *St.Galler Tagblatt*, *der Bund*, and *20 minuten*, along with its online counterpart. The corpus also includes the online platform of the Swiss Radio and Television for German speakers *SRF.ch*, and national dailies like *Neue Zürcher Zeitung*, *Tages-Anzeiger*, and the online platform of the *Blick*. These results align with the newspapers that have the most articles of the Swissdox database. The leading newspapers identified in the literature review were also found in this analysis.

Medium	Document type	N articles	%
20 Minutes	PRD	366	12.5
24 Heures	PRD	309	10.6
tdg.ch	WWE	284	9.7
20 minutes online	WWE	264	9.0
Le Matin	PRD	241	8.2
Tribune de Genève	PRD	238	8.1
24heures.ch	WWE	215	7.3
Le Temps	PND, PRD	203	6.9
RTS.ch	WWE	197	6.7
lematin.ch	WWE	169	5.8

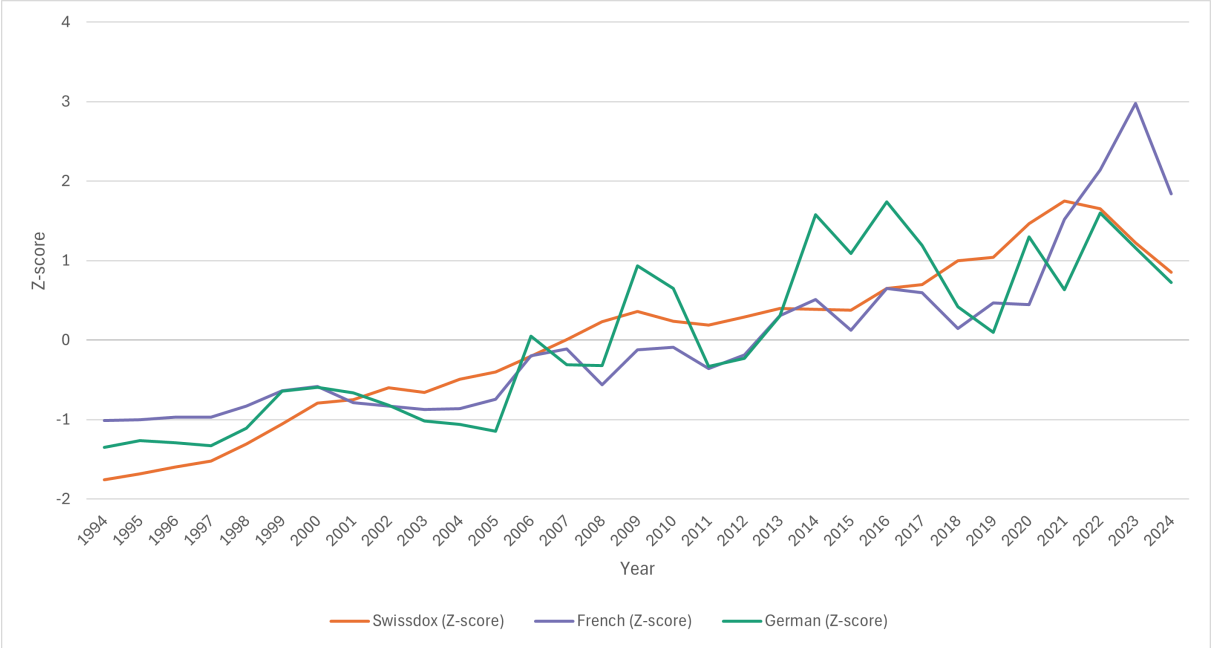
Table 16: Medium with the most publications in the French dataset. Codes: WWE: online, PRD: regional daily, PND: national daily

Medium	Document type	N articles	%
Berner Zeitung	PRD	543	7.7
Neue Luzerner Zeitung	PRD	408	5.8
20 Minuten	PRD	397	5.6
srf.ch	WWE	374	5.3
Blick.ch	WWE	336	4.8
Neue Zürcher Zeitung	PND	321	4.6
St. Galler Tagblatt	PRD	313	4.5
Der Bund	PRD	284	4.0
Tages-Anzeiger	PND	278	4.0
20 Minuten Online	WWE	272	3.9

Table 17: Medium with the most publications in the German dataset. Codes: WWE: online, PRD: regional daily, PND: national daily



(a) Number of articles per year



(b) Z-score normalization

Figure 17: Annual distribution of articles by language. Data for 2024 is only up until 1.11.2024

4.3 Topics

The 3888 French articles were classified into 8 topics. Excluding the two irrelevant categories, the 6 topics, listed in order of salience in the corpus, are: Wolf lethal regulation (shooting) (18% of all articles), wolf monitoring (15%), legislative debate on wolf management (14%), wolf attack on livestock (12%), protective measures (herd) (12%), and illegal and accidental deaths (5%).

The 8711 German articles were classified into 12 topics. Excluding the three irrelevant categories, the remaining 9 topics are: Wolf monitoring (sightings and predations) (21%), political decision and debate on wolf management (12%), wolf-farmer conflicts (12%), implications of the return of the large predators (10%), wolf shooting decisions (9%), wolf monitoring (sightings, predations and shootings) (7%), illegal and accidental deaths (4%), human-wolf encounters (3%), and wolf lethal regulation (shootings) (3%). The two topics of wolf monitoring are overlapping, with one focusing more on the regulations than the other. As for the two lethal regulations topics, the first covers the issue more generally, while the second focuses primarily on requests due to livestock depredation.

The topics found in both datasets align with the key topics identified in the literature, including wolf management (Trainotti et al., 2024; Zscheischler & Friedrich, 2022), particularly debates involving stakeholders and institutions (Chandelier et al., 2018), as well as lethal regulations (Chandelier et al., 2018; Houston et al., 2010) and wolf-farmer experiences and conflicts (Chandelier et al., 2018; Trainotti et al., 2024).

Figures 18 and 19 show the proportion of the topic over time.

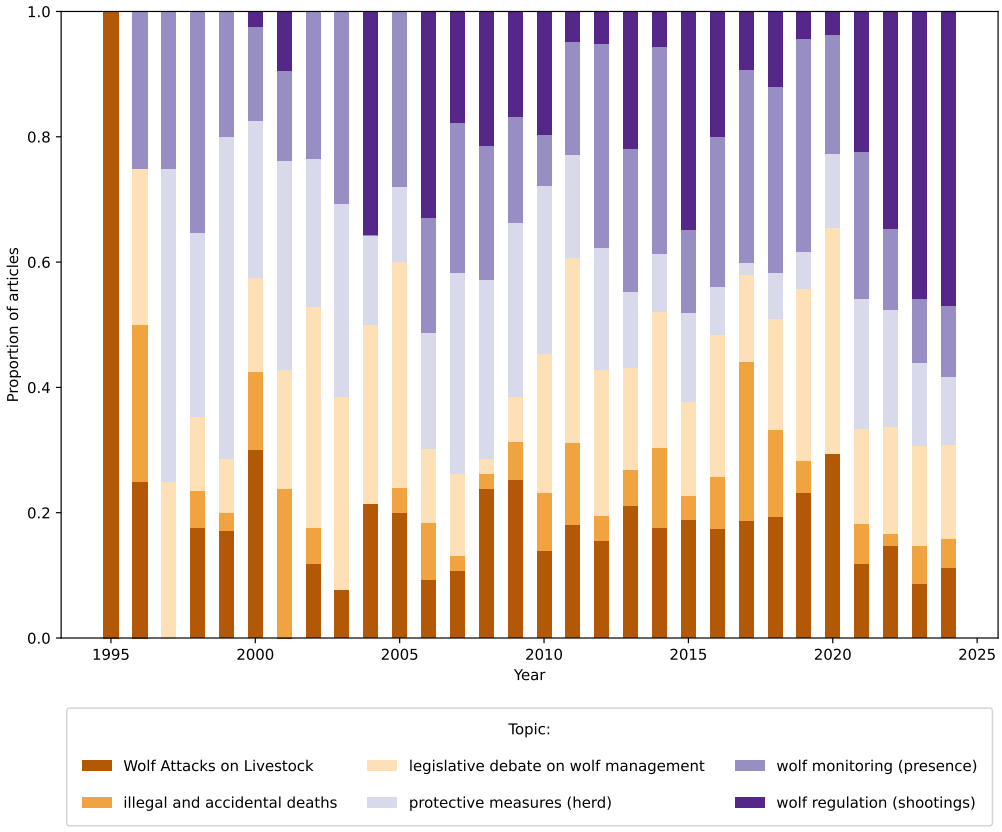


Figure 18: Proportion of articles over time by topic (French). The years 1994 to 1997 have fewer than 10 articles. Data for 2024 is only until 1.11

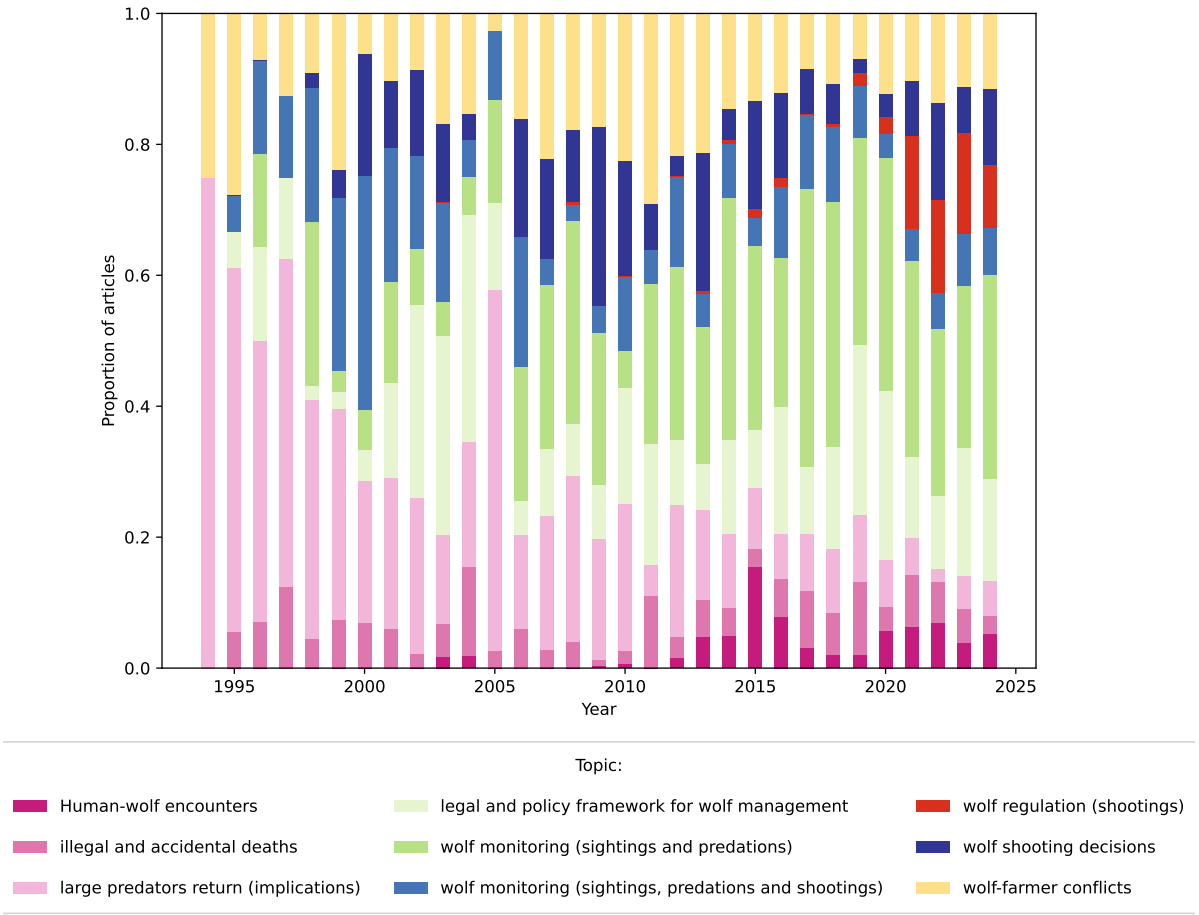


Figure 19: Proportion of articles over time by topic (German). The years 1994 and 1997 have fewer than 10 articles. Data for 2024 is only until 1.11

The resulting topics from the French and German datasets are difficult to compare, as the unsupervised classification method does not allow for the creation of predefined classes. Nonetheless, to facilitate interpretation, the topics were grouped into the following themes: Wolf policy and management, wolf monitoring, and human-wolf coexistence. Due to differences in tone and the focus of discussion, either centered on the human aspect (coexistence theme) or on the wolf aspect (monitoring theme), topics with similar content in both French and German corpora (e.g., illegal and accidental deaths) were not grouped under the same theme.

Each theme will be reviewed below. Tables 18 and 19, presented at the end of this section, summarize the topics per theme. The 10 most frequent words and a representative text for each topic are also provided. Descriptions for the irrelevant and secondary themes can be found in Appendix D.

4.3.1 Wolf policy and management

This theme includes all articles discussing political decisions, changes in legislation, wolf regulation decisions and the debates surrounding these issues. This is the most represented theme in the French dataset (32% of all articles) and includes the two topics: *wolf lethal regulation*, and *legislative debate on wolf management*. Articles on the *lethal regulation* topic mainly discuss the quotas and criteria for the preventive shooting of wolves, shooting authorizations issued by federal authorities, appeals by nature protection associations against these decisions, and court

rulings. Frequently mentioned words include terms referring to the Federal Office for the Environment and to the cantons. For example, the name '*Favre*' often appears, likely referring to Frédéric Favre, the head of the responsible department in Valais. In the *legislative debate on wolf management* topic, the focus is on wolf legislation. The frequent appearance of the term '*Hunt*' suggests references to the Swiss Hunting Law and its amendments, which could explain the high frequency of terms related to other animal species (e.g., lynx, beaver). Terms such as '*mention*' or '*initiative*' are also commonly used. *Legislative debate on wolf management* is present throughout the entire timeline, whereas *lethal regulation* shows more variation: it increased noticeably from 2020, representing almost 50% of all articles in 2023 and 2024. This reflects the general rise in articles observed from 2020, which may indicate that most of new articles focus on this subject and are linked to the new regulations introduced in 2023.

In the German corpus, this theme represents 24% of all articles and includes three topics: *legal and policy framework for wolf management*, *wolf shooting decisions* and *wolf lethal regulation (shootings). Legal and policy framework for wolf management* includes articles discussing political decision and debates on wolf management, with terms referring to politics (e.g., referendum, initiative, motions, parliament) as well as mentions of the head of Federal department Simmonetta Sommaruga and Albert Rösti. Articles of *wolf shooting decision* focus on the authorizations issued, appeals, and quotas. Commonly mentioned terms include '*livestock*', '*sheep*', and '*herd protection*', which suggest the motivations behind these decisions. Articles on *wolf lethal regulation* primarily discuss requests for wolf regulation due to wolf predation on livestock and the resulting debates. The environmental organization WWF frequently appears in the articles. The first two topics are present throughout the years, but *wolf lethal regulation* appears almost exclusively from 2021, suggesting a shift between 2020 and 2021. An inspection of the articles reveals the creation of a new section in 2021 on the online platform of the NZZ newspaper, aimed at providing updates on the wolf, which accounts for 23% of all articles on this topic.

The variation in the salience of wolf regulation in both datasets appears to reflect the loss of wolves due to legal shootings, as reported by KORA (Figure 3), particularly from 2020.

4.3.2 Monitoring

The monitoring theme encompasses articles reporting on wolf presence, sightings, predations, and population dynamics, with an emphasis on the great predator. It is the second most salient theme in the French dataset (27%) and concerns *wolf monitoring (presence)* and *wolf attacks on livestock*. Articles on *wolf monitoring (presence)* report wolf sightings and evidence of presence (tracks, droppings, photo traps), with terms related to biology (e.g. analysis, presence). In contrast, *wolf attacks on livestock* not only cover wolf sightings but also document livestock predations, with '*sheep*' and '*attacks*' being prominent terms. However, this topic also includes frequent occurrences of unrelated terms such as '*fire*', '*drunk*' and '*Sunday*' suggesting a mixture of articles within the topic. An inspection of the articles reveals that many are news briefs, briefly reporting wolf-related news alongside unrelated ones (see example on Q5). Both topics are present throughout the years. *Attacks on livestock* do not replicate the number of livestock compensated each year: although the local peaks in 2000 and 2009 in this topic could correlate with compensation trends, as well as the increasing trend between 2006 and 2015, the important rise in predations from 2020 is not reflected. Additionally, despite the near absence of reported livestock predations in 2005, articles on the topic were still published.

Monitoring is the most salient theme in the German dataset (32%). It concerns *wolf monitoring (sightings and predations)*, *wolf monitoring (sightings, predations and shootings)*, and *illegal and accidental deaths*. Articles in the first topic discuss wolf sightings, wolf predation on livestock and photo traps. The most frequent terms include '*sheep*', '*attacks*', and '*gamekeeper*'. The PCA representation of the topics (see Figure 14) shows that the second topic is a subcategory of the

first: it also reports on wolves that were legally shot. This is reflected in the most frequent terms, which center around hunting and shots, with a stronger focus on individuals such as Peter Juesy, the hunt inspector of the canton of Bern until 2015. The last topic addresses illegal shootings and reports of wolves killed in traffic accidents. The most frequent terms include '*police*', '*car*', and an inspection of articles reveals that this topic contains an important number of news briefs (see example on Q6). All three topics are present throughout the years. However, the number of wolves accidentally killed or shot each year does not align with the evolution of the *illegal and accidental death* topic, which shows peaks in 2004, 2011 and 2019.

4.3.3 Human-wolf coexistence

Human-wolf coexistence, unlike the monitoring theme, focuses on the growing conflicts between humans and wolves. It is the least represented theme in the French dataset (17%) and concerns the topics *protective measures (herd)* and *illegal and accidental deaths*. The first topic focuses on the protective measures to be implemented, such as herd surveillance with protection dogs or other methods like the use of llamas. Frequent terms include '*dog*' (and patou), '*livestock owner*', or '*herd*'. Stakeholders such as Oppal, Prométerre, and Agridea are also frequently mentioned. The second topic covers articles that discuss illegal shootings and wolves killed in traffic accidents. The most frequent terms include those related to hunting, poaching and investigation, as well as the demonym '*valaisan*', referring to the canton of Valais. This suggests that, while addressing the same subject as its counterpart in the German dataset, this topic in the French dataset places more emphasis on the illegal aspect and the human perspective. Both topics are present throughout the years, with *protective measures* losing importance over time. *Illegal and accidental deaths* show important peaks in 2001 and 2017, accounting for around 20% of all articles in those years. However, neither of these topics replicates the variations in livestock predation or wolf loss over the years.

Coexistence represents 24% of all articles in the German dataset and concerns the topics: *wolf-farmer conflicts*, *large predators return (implications)* and *human-wolf encounters*. *Wolf-farmer conflicts* report on the impact of the wolf's return on livestock owners, highlighting their fear, anger, and concerns. These articles also discuss the implementation of protective measures, with the most frequent terms being '*sheep*', '*dog*' and '*herd*', as well as mentions of sheep breeding co-operatives. The *implications of the large predator return* topic addresses the benefits and challenges associated with the wolf's return, as well as its image and symbolic significance. The most frequent words include '*human*' and terms related to nature and other animal species, such as lynx, bear, and deer. *Human-wolf encounters* articles focus on reported encounters between humans and wolves and the measures to prevent such incidents, such as teaching wolves to avoid humans through legal shootings. Frequent words include '*human*', '*behavior*', '*shooting*' (including rubber shot), and '*scaring*'. The topics of *wolf-farmer conflict* and *human-wolf encounters* overlap in the PCA representation, indicating that some articles about wolf-human encounters also address farmers' experiences with wolves.

The three topics show variations overtime: *wolf-farmer conflicts* increased to a peak in 2011, then decreased until 2020, where they appeared to stabilize. This trend does not seem to correlate directly with the number of livestock predated per year. However, the very low salience of the topic in 2005 could be explained by the near absence of livestock predations that year. *Human-wolf encounters* were not prominently present in the dataset before 2012-2013 and peaked in 2015. This suggests a shift in topics from 2012. *Implications of the large predator return* shows a decreasing trend, becoming progressively less important over time. This could reflect the ongoing wolf recolonization and population growth. The high saliency of the topic observed in 2005, representing around 60% of all articles, suggests a particular event that year. This period is also marked by a low overall number of articles and the near absence of topics such

as *wolf shooting decision* and *wolf-farmer conflicts*, which dominate in other years. The lack of wolf-related news during this time might explain the heightened prominence of this more general topic.

Title	Description	10 most frequent words	Representative text (first 600 characters)
Policy (32%)			
1: Wolf regulation (shootings) (18%)	wolf shooting authorizations delivered, wolf regulation (shooting), wolf shooting due to predation on livestock, thresholds	tir, abattre, canton, autorisation, fédéral, tuer, régulation, chasse, autoriser, environnement	Les gardes-faune ont tué un loup isolé sur l'alpage deFerpècle (VS). Une autorisation de tir avait été délivrée le 4 septembre. Un loup isolé a été abattu jeudi par les gardes-faune valaisans dans la région d'Arolla, sur l'alpage de Ferpècle, au sud des Alpes. Une autorisation de tir émanant du conseiller d'État en charge du Département de la sécurité, des institutions et du sport, Frédéric Favre, avait été délivrée le 4 septembre dernier. Conditions réunies pour une autorisation de tir. Pas moins de 11 animaux de rentes (ovins et bovins) ont été victimes d'un loup isolé dans cette région...
4: Legislative debate on wolf management (14%)	vote, wolf legislation, debate on wolf management, change in legislation	protection, loi, conseil, espèce, fédéral, chasse, protéger, population, pouvoir, canton	La révision de la loi sur la chasse adoptée par le Parlement suisse est combattue par référendum. La législation controversée, qui assouplit les conditions d'abattage des loups, sera soumise au vote populaire le 27 septembre. En savoir plus sur l'auteur.e Le contenu de la nouvelle loi:La révision de la loi fédérale sur la chasse et la protection des mammifères et oiseaux sauvages prévoit notamment que le loup et le bouquetin soient considérés comme des «espèces protégées régulables». Elle décrit les conditions dans lesquelles ils peuvent être abattus, y compris dans les zones de protection...
Monitoring (27%)			
3: Wolf monitoring (presence) (15%)	wolf sightings, proof of presence, photo traps, return of wolf	présence, région, analyse, dernier, individu, année, territoire, observer, faune, mâle	Trois jeunes loups ont été identifiés au Marchairuz. Leur observation prouve la présence d'une meute dans le canton de Vaud. Historique. La naissance d'au moins trois louveteaux a été constatée récemment dans le Jura vaudois, grâce à un piège photographique. Les observations, réalisées dans le cadre du suivi du canidé mis en place par le Département du territoire et de l'environnement (DTE), attestent la constitution d'une meute dans la région du Marchairuz, selon un communiqué diffusé mercredi. Avec cette observation, il y a désormais sept loups recensés sur le territoire cantonal...
5: Wolf attacks on livestock (12%)	livestock predations, wolf sightings	mouton, tuer, attaque, nuit, bête, dernier, jour, prédateur, attaquer, mort	Un troupeau de moutons a été attaqué lundi par un loup à Eischoll, en Valais. Au cours de l'attaque, qui s'est déroulée à proximité de maisons d'habitation, un mouton a été tué. Un loup a attaqué un troupeau de moutons lundi à l'aube dans un enclos à une vingtaine de mètres d'habitations à Eischoll (VS). Trois personnes ont vu le prédateur qui s'est esquivé à leur approche. Un mouton a été tué. L'attaque n'a pas directement été vue par les témoins, a déclaré lundi le chef du Service cantonal de la chasse Peter Scheibler, confirmant une information de Radio Rottu...
Human-wolf coexistence (17%)			
6: Protective measures (herd) (12%)	protective mesures, herd surveillance, herd dog, lamas	troupeau, éleveur, chien, mouton, protection, alpage, berger, attaque, prédateur, falloir	Michael Baggenstos, berger à Vers-chez-Perrin, a choisi d'encadrer ses bêtes en transhumance par son chien «Sasso», un berger des Abruzzes. Quelque part entre Corges et Vers-chez-Perrin, deux hameaux de Payerne, quelque 500 moutons bêlent en chœur tout en profitant des généreuses repousses d'herbe de l'automne pour se nourrir, en ce frais lundi de décembre. Installé à Vers-chez-Perrin depuis quatre ans, Michael Baggenstos a choisi, cet hiver, d'organiser une transhumance pour ses bêtes et celles de deux collègues. «Ce n'était pas prévu, mais j'ai décidé d'encadrer le troupeau par «Sasso»...
8: Illegal and accidental deaths (5%)	illegal shots, wolves killed in traffic accidents	chasse, chasseur, valaisan, abattre, public, mort, cantonal, suisse, retrouver, enquête	Un homme soupçonné d'avoir tué un loup en 2016 a été en grande partie acquitté vendredi par le Tribunal de district de Brigue (VS). Les preuves n'étaient pas suffisantes sur ce point aux yeux du juge. Le Ministère public fera recours. Le tribunal a estimé que les indices qui pesaient sur le prévenu ne constituaient pas des preuves suffisantes et qu'il est impossible de conclure à sa responsabilité dans le tir du loup retrouvé mort en mars 2016 à Rarogne. L'analyse de la balle retrouvée dans le cadavre de l'animal ne permet pas non plus de conclure à la culpabilité de l'accusé...

Table 18: Topics grouped per theme in the French corpus. The numbers in the title show order of importance in the whole corpus, with the proportion of articles in parentheses

Title	Description	10 most frequent words	Representative text (first 600 characters)
Policy (24%)			
3: Legal and policy framework for wolf management (12%)	Political decision and debate on wolf management	kanton, bundesrat, jagdgesetz, schutz, schaden, ständerat, nationalrat, geschützt, abschuss, parlament	Der Ständerat hat gestern einen Vorstoss des ehemaligen Walliser CVP-Ständerats René Imoberdorf mit 26 zu 17 Stimmen abgelehnt. Die Motion ist damit vom Tisch. Nein sagte der Ständerat auch zu einer Standesinitiative des Kantons Wallis mit demselben Anliegen. Hätten Nationalund Ständerat zugestimmt, wäre der Schutz des Wolfes aufgehoben worden. Die Schweiz hätte die Berner Konvention kündigen müssen...
6: Wolf shooting decisions (9%)	Wolf shootings authorizations, predations threshold, debate against wolf shooting authorizations	schaf, abschuss, gerissen, abschussbewilligung, kanton, wwf, monat, töten, nutztier, freigeben	Der Walliser Umweltdirektor Jacques Melly hat den Abschuss von zwei Wölfen bewilligt. Es handelt sich um je ein Raubtier im Chablais und im Zentralwallis. In beiden Regionen wurden in den vergangenen Wochen Dutzende von Schafen von Wölfen gerissen. Wie die Walliser Staatskanzlei am Donnerstag mitteilte, traf Melly den Entscheid aufgrund eines Berichts der interkantonalen Wolfs-Kommission. Diese habe an einer Sitzung vom Dienstag eine allgemeine Schadensbilanz erstellt und sei zum Schluss gekommen, dass die Abschusskriterien in beiden Regionen erfüllt seien...
11: Wolf regulation (shootings) (3%)	Requests for wolf regulation (shooting) due to wolf predation on livestock	nutztier, rudel, kanton, herdenschutz, abschuss, mensch, gerissen, schaden, zahl, schaf	Mit der zunehmenden Wolfspopulation in der Schweiz kommt es vermehrt zu Rissen an Nutztieren, und auch heikle Begegnungen zwischen Wölfen und Menschen nehmen zu. Neuste Entwicklungen. Im Kanton Graubünden sind in der Nacht vom 31.Juli auf den 1.August zwei männliche Jungwölfe erlegt worden. Die beiden Tiere gehörten zum Beverinrudel. Das Bundesamt für Umwelt (Bafu) hatte am 14. Juli 2022 auf Gesuch des Kantons Graubünden den Abschussbewilligt. Das Rudel hatte zuvor innert weniger Tage auf nahe gelegenen Alpenzwei ausgewachsene Mutterkühe und davor ausserdem eine hohe Zahl an Schafen gerissen...
Monitoring (32%)			
1: Wolf monitoring (sightings and predations) (21%)	wolf predation on livestock, wolf sightings, photo traps	schaf, gerissen, handeln, kanton, gebiet, wildhüter, bestätigen, sichten, woche, wolf	Heiden · Auf einer Weide bei einem Bauernhof ausserhalb von Heiden wurden am Wochenende zwei tote Schafe gefunden. «Die Art der Verletzungen an den Kadavern und die Spuren am Fundort deuten auf einen Wolfsriss hin», teilte die Ausserrhoder Jagdverwaltung gestern mit. Das Raubtier kam wie aus dem Nichts. «Es gab in letzter Zeit keine Anzeichen, dass sich ein Wolf inder Gegend aufhält», sagt Jagdverwalter Heinz Nigg. Auch habe es seit dem Wochenende keine neuen Hinweise mehr gegeben. «Wir wissen nicht, ob sich der Wolf noch in der Region aufhält oder ob er weitergewandert ist.»...
7: Wolf monitoring (sightings, predations and shootings) (7%)	Wolf sightings, wolf predation on livestock, wolf shootings	jäger, jagd, erlegen, schaf, handeln, abschuss, wildhüter, gerissen, töten, jagdinspektor	Im Emmental sind erstmals Spuren eines Wolfs nachgewiesen worden. Er riss bei Schangnau eine Rothirschkuh, wie die DNA-Analyse ergab. Vermutlich handelt es sich um den «Luzerner Wolf» namens M20. Auch in der Nähe von Genf ist ein Wolf fotografiert worden. Der «Luzerner Wolf» M20 war 2008 aus Norditalien zugewandert und hält sich seither vor allem in der Innerschweiz auf. Der bernische Jagdinspektor Peter Jusey bestätigte am Montag Informationen der «Berner Zeitung», wonach die Schafhirte und die Behörden in der Region Schangnau ins Bild gesetzt wurden. Kein Abschuss geplant...
8: Illegal and accidental deaths (4%)	illegal shots, wolves killed in traffic accidents	polizei, auto, finden, kadaver, mann, handeln, töten, franken, untersuchung, verletzen	Chur. Unbekannte haben im Kanton Graubünden einen etwa einjährigen Wolf mit Schrot geschossen. Danach wurde der Kadaver unter einer Strassenbrücke auf Gemeindegebiet von Sils im Domleschg entsorgt. Dem Täter droht eine Haftstrafe. Bei dem am Dienstag von Waldarbeitern entdeckten Tier handle es sich aufgrund bisheriger Erkenntnisse um einen im Jahr 2015 geborenen, männlichen Jungwolf, teilte das Bündner Amt für Jagd und Fischerei gestern mit. Aufgrund der vorgefundenen Situation sei davon auszugehen, dass der Wolf nicht an der Fundstelle geschossen, sondern als Kadaver über den Rand einer Strasse...

Title	Description	10 most frequent words	Representative text (first 600 characters)
Human-wolf coexistence (24%)			
4: Wolf-farmer conflicts (11%)	Impact of wolf return on livestock owners, fear, anger and worry of farmers, implementation of protective measures	schaf, hund, herde, gerissen, herdenschutz, bauer, schützen, schafhalter, sommer, hirt	LUZERN. Seit wieder ein Wolf in der Zentralschweiz unterwegs ist, sorgen sich Bauern um ihre Schafe. Hirtenhunde sind derzeit gefragt wie kaum zuvor. «Mehrere Zentralschweizer Bauern integrieren zurzeit Hirtenhunde in ihre Schafherden», sagt Oliver Hess, Verantwortlicher Herdenschutz Zentralschweiz. Dies sei auf die Rückkehr des Wolfes zurückzuführen (20 Minuten berichtete). Im vergangenen Jahr habe es in dieser Gegend noch keine ständige Behirtung gegeben. «Doch in den letzten Monaten haben bereits fünf hiesige Bauern Hirtenhunde gekauft», so Hess weiter...
5: Large predators return (implications) (10%)	Benefits from wolf, wolf image and symbol, great predators and densely populated landscapes	luchs, mensch, bär, jäger, leben, raubtier, natur, wald, reh, lebensraum	Vor dem Tierschutzverein Oberaargau sprach der Wildbiologe Andreas Ryser über die Problematik der Wiederansiedlung des Luchses, die einzelnen «Besuche» des Wolfes in der Schweiz sowie die Voraussetzungen dafür, dass auch der Bär in unseren Landen wieder heimisch werden könnte. LANGENTHAL. Andreas Ryser befasste sich in seinem Referat an der Hauptversammlung des Tierschutzvereins Oberaargau in Langenthal hauptsächlich mit der wiederaufkommenden Problematik der Begegnung des Menschen mit dem Grossraubtier. Ende des letzten Jahrhunderts waren in der Schweiz Luchse, Bären und Wölfe in der Schweiz...
10: Human-wolf encounters (3%)	Human wolf encounters, teaching wolves to stay away from humans through legal shots (to make them shy again)	mensch, rudel, verhalten, abschuss, kanton, dorf, siedlung, bafu, nähe, sehen	In Schwändi filmte eine Autofahrerin am Samstag einen Wolf beim Überqueren der Strasse. In den sozialen Medien löst das Video des wilden Tiers gemischte Gefühle aus. Darum gehts. Im Kanton Glarus wurde am Wochenende ein Wolf gesichtet. Eine Autofahrerin filmte das Tier beim Überqueren der Strasse. Das Video macht auf Facebook die Runde. Die Wolfssichtung löst bei Userinnen und Usern verschiedene Gefühle aus. Eine Spezialistin ordnet den Fall ein und kann Anwohnerinnen und Anwohnern die Angst nehmen. Auf Facebook kursiert derzeit ein Video von einem Wolf, der die Strasse überquert...

Table 19: Topics grouped per theme in the German corpus. The numbers in the title show order of importance in the whole corpus, with the proportion of articles in parentheses

4.4 Locations

4.4.1 Top locations

Across the articles, 4016 unique resolved locations were identified. After filtering for locations in Switzerland or its immediate proximity (bounding box), 2513 unique locations remained, with a total of 35'339 mentions. The most frequent feature types were *first-order administrative division* (cantons: 14'370 mentions), *populated place* (commune names: 7617 mentions), *mountains* (2041 mentions), *valley* (1628 mentions) and *second-order administrative division* (districts: 1609 mentions). The prominent presence of mountains and valleys suggests a focus on regions suitable for wolves. Table 20 lists the top 10 resolved locations. For both languages, the most frequently mentioned location, after the country itself, is the canton of Valais, followed by the canton of Graubünden. These two cantons are mountainous regions that hosted the first wolves and have consistently had the largest wolf populations over the years.

In the French dataset, the next most frequent locations are the canton of Vaud, and the '*Jura-Nord vaudois district*'. After inspecting the articles where these locations were mentioned, it was found that the term '*Jura*' was almost always used to refer to the Jura Mountains. Therefore, the resolved location should have been '*Jura Mountains*'. A similar observation was made for the canton of Jura. Other notable locations include the canton of Bern, the Alps and the *Col du Marchairuz* (a pass in Vaud), where the first wolf pack formed in the Jura Mountains, and the neighboring countries of Italy and France.

In the German dataset, the top mentioned locations also include the canton of Bern, the Alps (which was mistakenly associated with Aleppo in Syria), as well as the cantons of Zurich, Uri, St. Gallen and Luzern. Italy is also frequently mentioned.

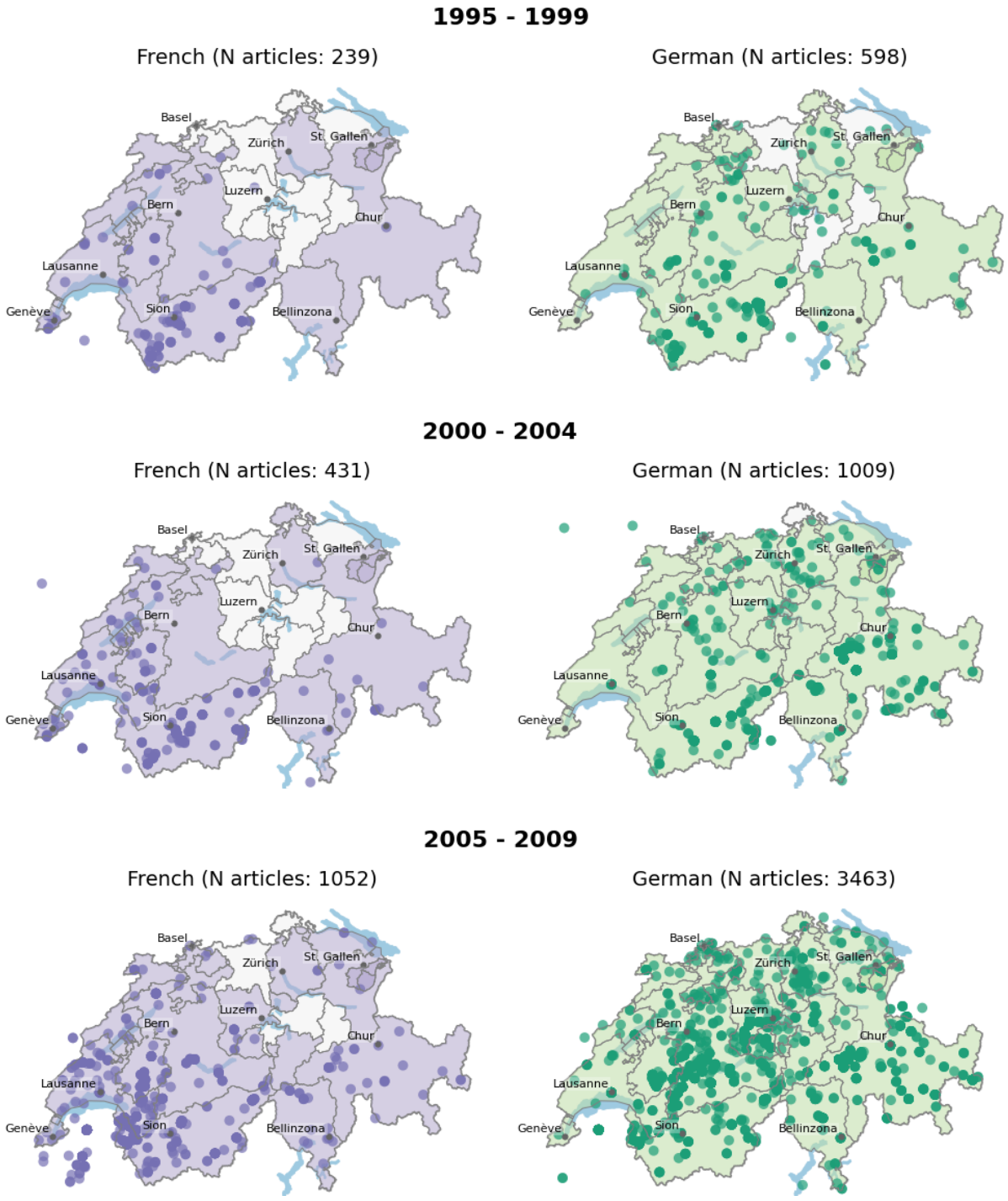
The first observation is that the top locations, except for Graubünden and bilingual regions like Bern and Valais, reflect linguistic barriers. The fact that wolves immigrated from Italy could explain the mentions of Italy in both datasets. The frequent mention of France may reflect the high wolf population in the French Alps.

All		**French**		**German**	
Locations	**Count**	**Locations**	**Count**	**Locations**	**Count**
Switzerland	*9000*	*Switzerland*	*2514*	*Switzerland*	*6486*
Canton du Valais	4928	Canton du Valais	1964	Canton du Valais	2964
Kanton Graubünden	3217	Kanton Graubünden	1070	Kanton Graubünden	2147
Canton de Berne	1965	Canton de Vaud	642	Canton de Berne	1563
Alps	1850	Jura-Nord vaudois District	511	Alps	1486
Italian Republic	1224	Canton de Berne	402	Kanton Zürich	964
Kanton Zürich	1059	Alps	364	Italian Republic	900
Kanton Uri	931	Col du Marchairuz	361	Kanton Uri	804
Canton de Vaud	920	Italian Republic	324	Aleppo	791
Kanton St. Gallen	908	Canton de Jura	301	Kanton St. Gallen	773
Cantone Ticino	825	Republic of France	289	Kanton Luzern	725

Table 20: Top 10 resolved locations

4.4.2 Mapping articles

Figure 20 displays small multiples of mentioned locations across all articles, with each mentioned location represented as a point with transparency reflecting the number of mentions. The data is grouped into 5-years periods to capture trends over time. Individual-year small multiples are available in Appendix E. The evolution of the places will be examined by region, enriched with information on the main themes and compared with the presence of wolves in Section 4.7.



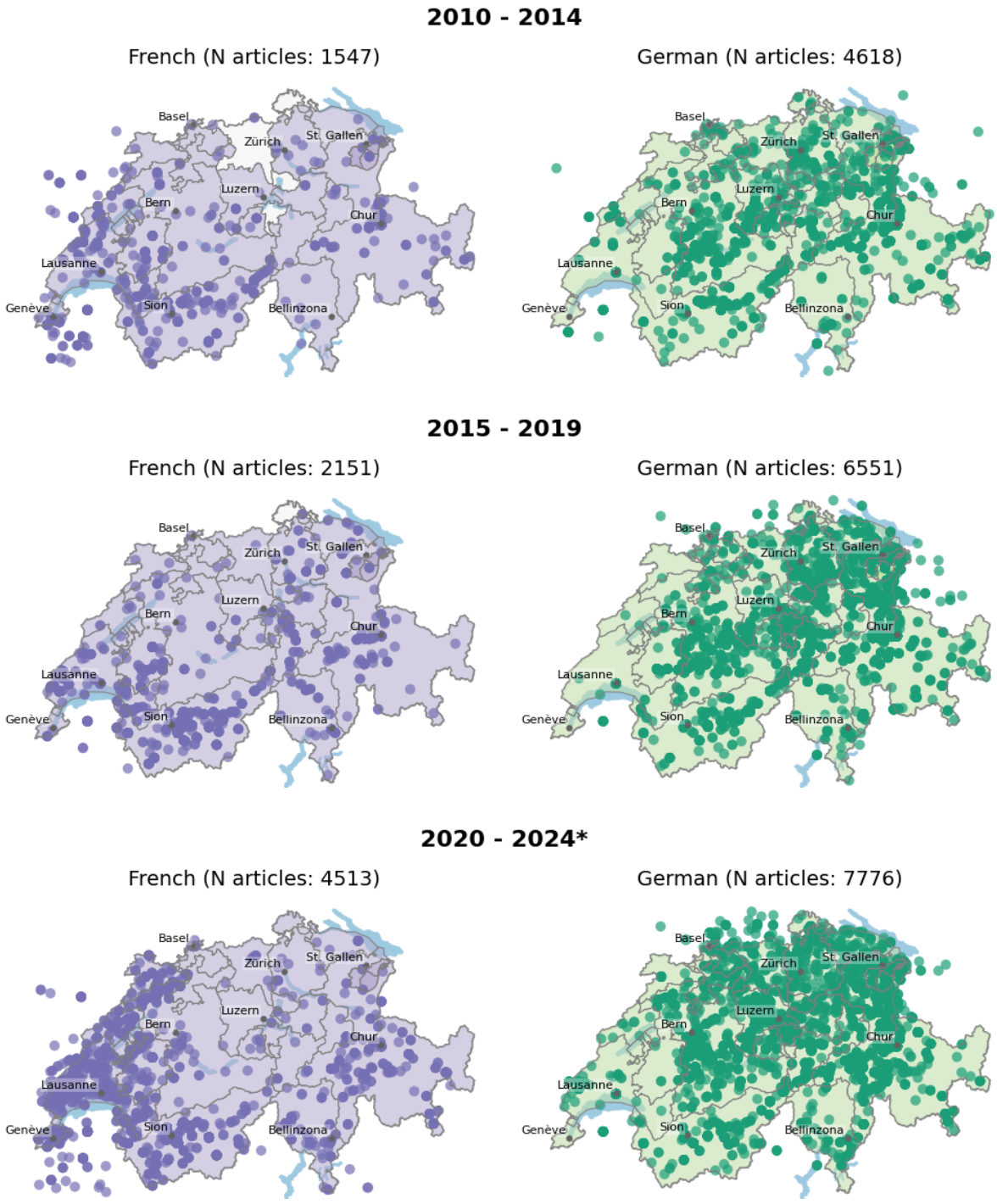


Figure 20: Small multiples: Locations grouped in 5-years periods. Point transparency indicates location saliency. Cantons are colored if mentioned instead of being represented by points. Large regions identified on Figure 15 have been removed. Data for 2024 is only up until 1.11.2024

4.5 Mapping topics

Each location has been attributed the topic of the article it came from. Figures 21 and 22 display the total number of locations per topic for all years. Cantons are colored instead of being represented as points when mentioned.

Articles in the French corpus about *wolf lethal regulations* focus mainly on the Alpine regions and on the Jura Mountains, while topics like *Wolf monitoring (presence*) and *wolf attacks on livestock* show a more even distribution across the territory. Interestingly, *Legislative debate on wolf management* is associated with very few locations compared to the other topics, despite having a similar number of articles. This suggests that these articles tend to discuss broader, global events rather than focusing on specific localities. The few location mentions reflect the locations most affected by the decisions (e.g., in Vaud Jura (Q7), in Valais(Q8)), or where the debates take place and affect the most the policy decisions (e.g., in Simplon (Q9)). Articles on *protective measures (herd)* are predominantly focused on Romandie. In contrast, articles on *Illegal and accidental deaths* are more localized, with most mentions occurring in Valais, Calanda-Chur, and La Broye (FR). This topic has fewer articles (only 5% of the total) compared to the others (which represent more than 10% each), which may explain its more concentrated geographic distribution.

In the German corpus, articles on *Wolf monitoring* with mentions about sightings and predations show widespread coverage across Switzerland, reflecting the high number of articles (21%, against 12% for the second most salient one). Articles on *wolf monitoring* with additional mentions of the shooting regulations are concentrated in the Alpine regions and Bern-Mittelland, but the low proportion of articles on this topic (3%) could explain the heavily focus on specific regions. *Legal and policy framework for wolf management*, similar to its counterpart in the French dataset, is linked to fewer locations than expected, with concentrations in central Switzerland and Calanda (GR) (e.g., Q73). *Wolf-farmer conflicts* articles appear throughout German-speaking Switzerland and the canton of Valais, with additional mentions in Ticino and Vaud. *Implications of the large predator return* is widely distributed across German-speaking Switzerland, with a notable focus on the Swiss Plateau. Inspection of the articles show that articles tend to not mention locations at all (e.g., Q24), to reflect the first wolf sightings and their implications (e.g., Q79), or to reflect the locations of the writers or news agency (e.g., Q10). The last topics represent less than 10% of all articles: *wolf shooting decisions* focus on specific regions, from Valais to Uri, Vaud Jura, Entlebuch (LU), from Gruyère (FR) to southern Bern-Mittelland, and Sarganserland (SG). *Illegal and accidental deaths* have a more global coverage, with a focus on the regions from Oberwallis (VS) to Calanda (GR), and Central Switzerland. *Human-wolf encounters* are concentrated in Surselva-Calanda (GR) and Bern-Mittelland, while *Wolf lethal regulations* show a very similar distribution, with additional mentions in Vaud Jura and Beverin.

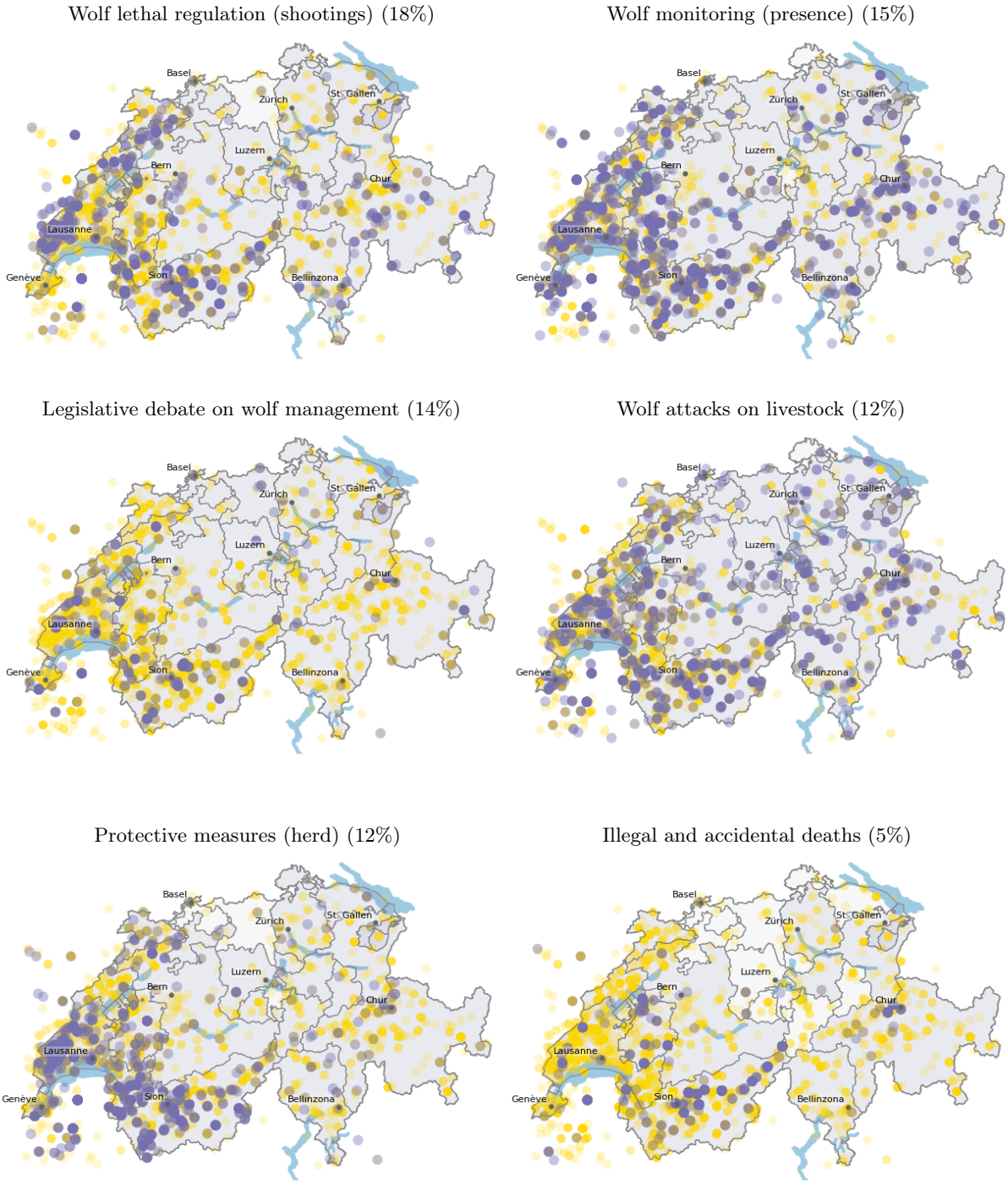


Figure 21: Topic distribution for all years (French). Purple: topic of interest. Yellow: all other topics

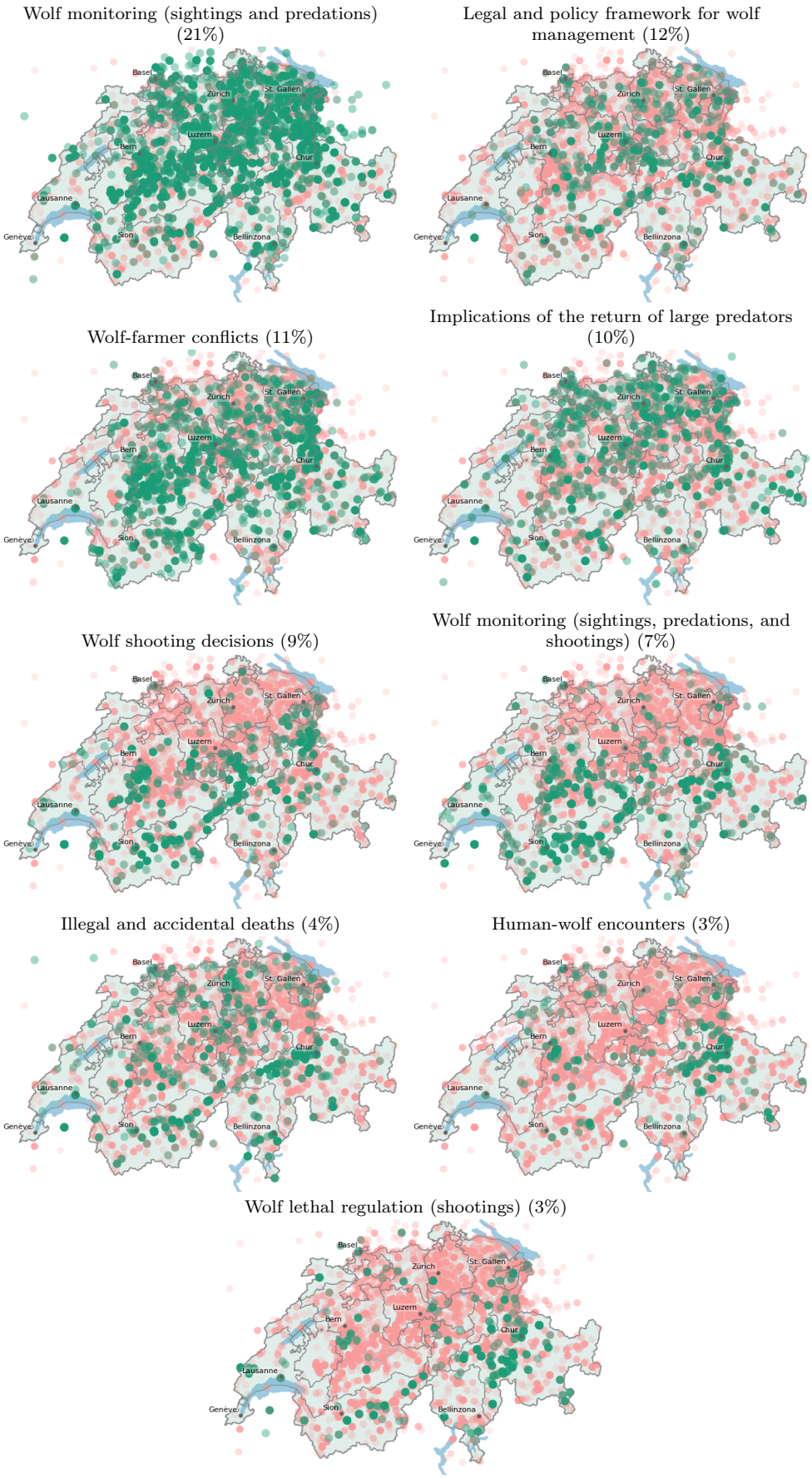


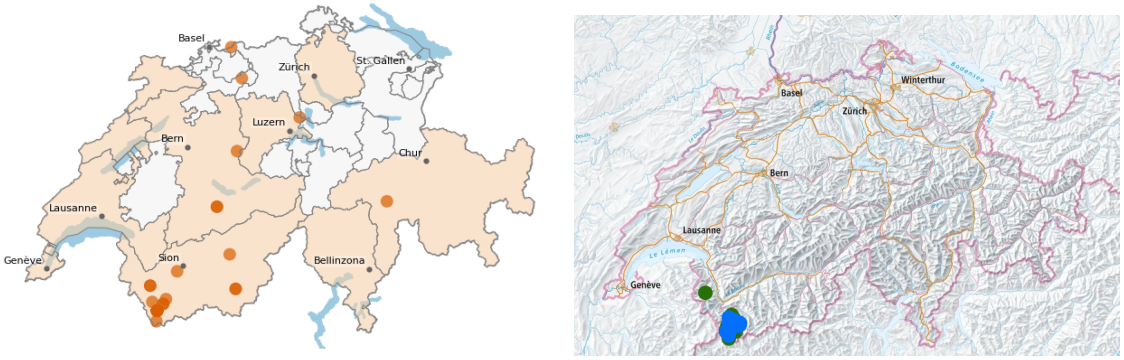
Figure 22: Topic distribution for all years (German). Green: topic of interest. Pink: all other topics

4.6 Linking geoparsing to additional wolf data

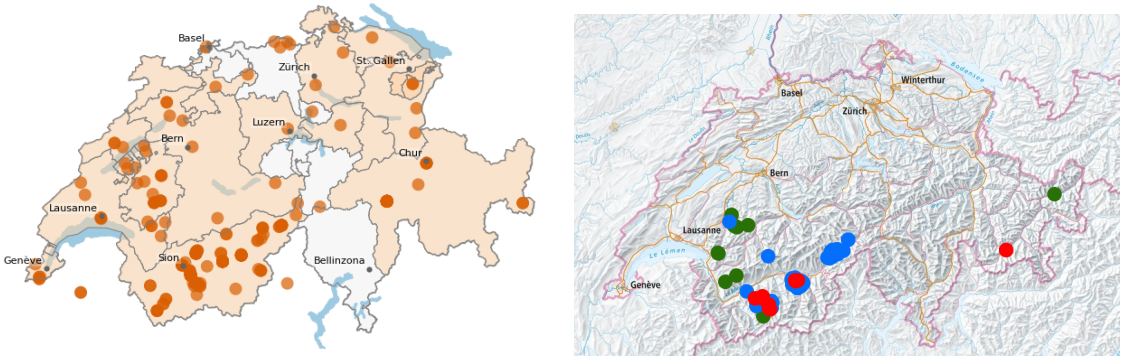
KORA, the in-state foundation mandated by the Federal Office for the Environment, is responsible for monitoring the wolf situation. They make this data publicly available through static maps and a '*Monitoring center*', an online tool to browse the database. Each observation of wolf presence is recorded with coordinates and categorized according to its type (e.g., photo traps, genetics, livestock predation) and SCALP criteria. The SCALP criteria is a classification system, derived from lynx monitoring, that quantifies the validity and verifiability of an observation. It ranges from C1: hard facts, such as genetic observations, C2: observations made by trained personnel, such as gamekeepers, and C3: other observations that cannot be verified (KORA, 2024).

Figure 23 displays KORA's proof of presence against the locations found in both German and French corpora for snapshots of years between 1995 and 2024. This is analyzed in the following Section 4.7.

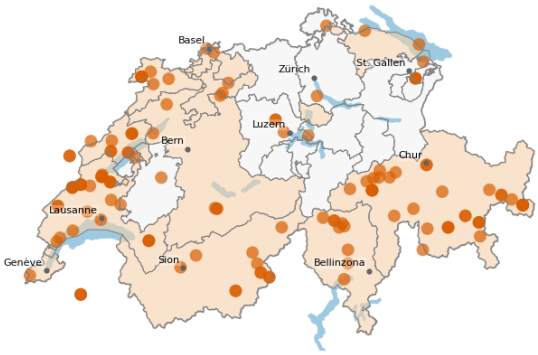
1995

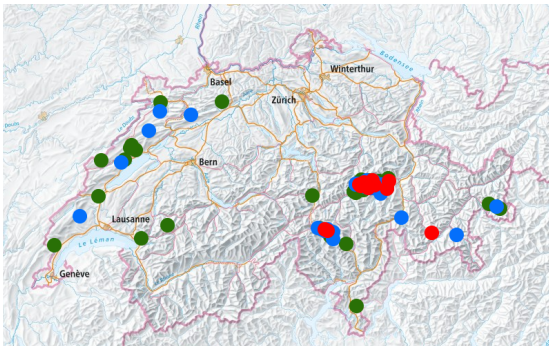


2000

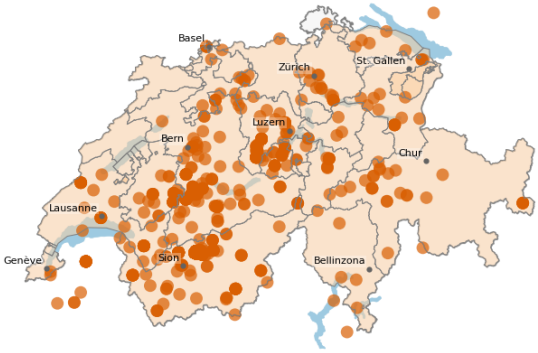


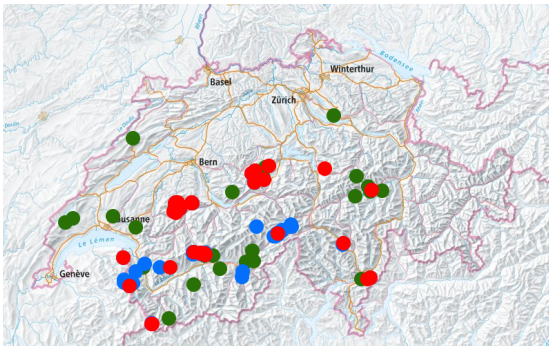
2005



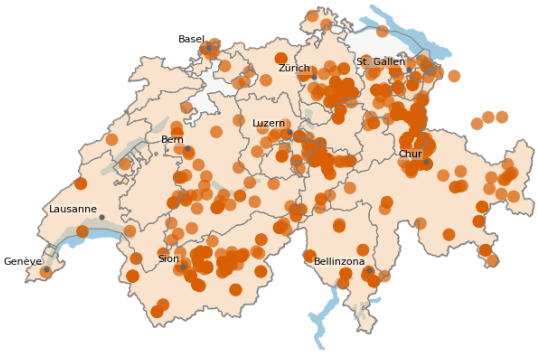


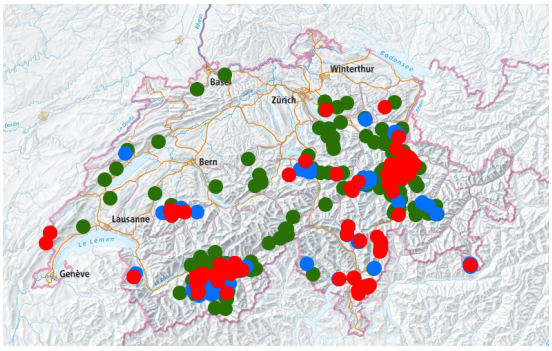
2010



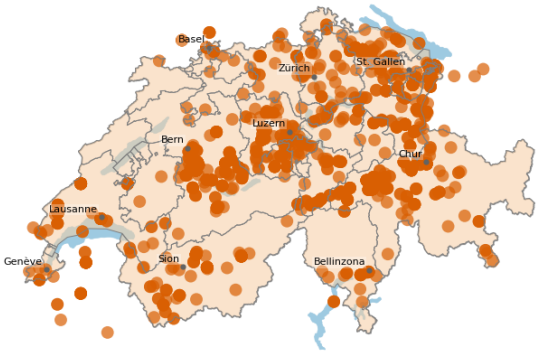


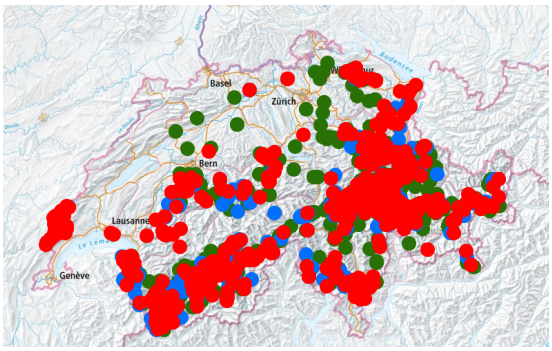
2015





2020





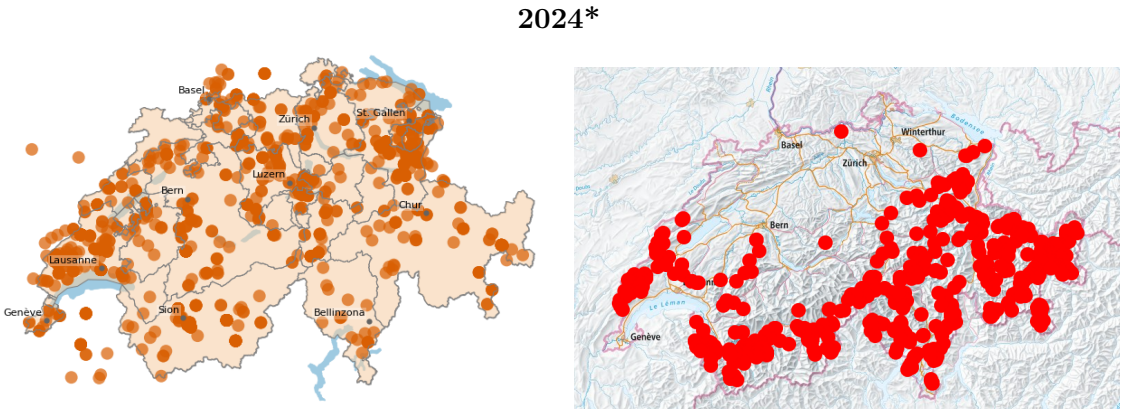


Figure 23: Comparison between wolf observations and mentioned location in articles of the French and German corpora. *Left*: Locations mentioned in articles (data processed by the author). *Right*: Wolf observations from KORA. Red: C1 (hard facts), Blue: C2 (verified observations), Green: C3 (unverifiable observations). Data for year 2024 is not complete. Data source: ©KORA

4.7 Synthesis - Timeline and media analysis

The evolution of locations mentioned in the articles will be reviewed in light of key events in the wolf chronology in Switzerland and compared to the additional data on wolf dynamics (KORA, 2020). A general timeline for Switzerland as a whole will be presented first, structured by the main variations in article frequency, followed by a detailed review of each region. Regional groupings have been selected to facilitate the analysis and interpretation.

4.7.1 Timeline

1994-2005: Rising trends followed by decline post-2000.
The return of the wolf to Switzerland began in Val Ferret (VS) in 1994, with the predation of some livestock and the genetic confirmation of its presence in 1995. This coincides with the start of the media coverage in the French and German language regions (Q11, Q12). In the following years, further signs of wolf presence were reported along the south-west to north-east migration route from Valais to Ticino and Graubünden. The few individuals caused considerable damage to livestock, particularly in Valais, where around 200 depredations were recorded in 2000. This coincides with a peak of news coverage in that year (e.g. in the French corpus (Q13, Q14) and in the German corpus (Q15, Q16)). Another case of depredation in Val Bregaglia (GR) occurred in 2001 (Q17, Q18), but since then, as the wolf population is still limited to a few individuals, depredations decrease to almost zero in 2005. This is reflected in media coverage, which also drops to its lowest point in 2004-2005.

In addition to articles on depredations, most of which occurred in Valais, news articles also mention wolf sightings in other regions of Switzerland, such as in the Jura and the Swiss Plateau (Q20, Q21), as well as in Gruyère (FR), with reference to lynx conflicts (Q22). Some articles also mention the creation of the Swiss Wolf Concept and the proposal to amend the Bern Convention in 2004 (Q19). Finally, some articles across Switzerland address the return of large carnivores in general (Q23, Q24). Regardless of noise, the news coverage appears to visually correlate with the wolf population dynamics.

2005-2011: Fluctuating trends with peaks in 2006–2007 and 2009–2010.
From 2005 onwards, media attention rises again, likely driven by an increase in livestock depredations (reaching nearly 400 cases in 2009) and a growing number of wolf sightings not only in Valais and Graubünden but also in the Pre-Alps and Central Switzerland (Examples of articles reporting wolf sightings in Gruyère (FR) and Berner Oberland (Q25, Q26)). Protective measures were still in their developmental phase, focusing primarily on specific vulnerable areas. This was reflected in numerous articles addressing wolf regulations and debates, such as those in Chablais (VS) (Q27, Q28) and Entlebuch (LU) (Q29, Q30). While cases in Valais and Graubünden continued to be reported, media coverage intensified in the Swiss Plateau, a trend that does not visually align with actual wolf population dynamics.

2011-2019: Increasing and fluctuating trends, marked by the German corpus' highest coverage peak in 2016.
This period is characterized by a growing wolf population in the Alps, the formations of the first wolf packs, their expansion to the Swiss Plateau and Jura, and numerous policy changes and debates regarding wolf management. Key developments include amendments to the Swiss Hunting Ordinance (Q35, Q36), and initiatives in Uri (Q57, Q58) and in Valais. Media coverage increased accordingly in both linguistic regions, reaching its peak saliency in the German media in 2016.

The formation of the first wolf pack in Calanda (GR) in 2012 (Q31, Q32) was followed by Val Morobbia (TI) in 2015, Augstbord (VS) in 2016, Gantrisch (FR/BE) in 2017, a second pack in Calanda in 2018, and eventually packs in the Chablais (VS) and Vaud Jura (VD) in 2019. Simultaneously, wolf individuals spread across Switzerland, with sightings reported in nearly all cantons (e.g., in Appenzell (Q43, Q44), or in the Vaud Jura (Q45, Q46)). Depredation numbers rose sharply, reaching record levels in Valais and increasing noticeably in Graubünden, Bern, Uri and Ticino.

Media coverage tends to mirror wolf dynamics, although the Swiss Plateau remains disproportionately represented compared to the Alpine cantons of Valais and Graubünden. Several noteworthy events received extensive media attention: wolves sighted in urban areas, including a wolf struck by a train in Schlieren (ZH) in 2014 (Q37, Q38), and another sighting in Bulle (FR) in 2017 (Q47, Q48), significant predation incidents in Nidwald and in Isenthal (UR) during 2015-2016 (Q39, Q40), and an illegal wolf shooting in Val d'Anniviers (VS) in 2017 (Q41, Q42).

2019–November 2024: Rising trends with fluctuations and divergences between German and French corpora.
Since 2019, the wolf population has surged, increasing from approximately 75 genetically identified individuals in 2019 to 315 in 2023. The growth was accompanied by a sharp rise in livestock predation, climbing from around 400 cases in 2019 to 900 in 2020 and 1400 in 2022. Media attention has largely focused on newly colonized areas in the Swiss Plateau, such as the Vaud Jura (Q49, Q50) and North-Eastern Switzerland (Q51, Q52). Changes in wolf management policy have also continued during this period, including the 2020 vote on the Swiss Hunting Law (Q53, Q54), the 2021 initiative in Valais (Q55, Q56), and the introduction of preventive wolf shooting regulations in 2023 (Q59, Q60).

Saliency in the German media intensified again in 2020 and 2022. In contrast, while the French media consistently maintained important attention on the wolf issue since its return, it reached unprecedented levels from 2021 onward. This peak likely reflects the increased newsworthiness associated with the growing wolf population in the Jura. Notably, in 2023, the number of articles in the French dataset nearly matched that of the German dataset, despite differences in overall media proportions.

4.7.2 Analysis per region

Western Switzerland: cantons of Geneva, Vaud, Fribourg, Neuchâtel and Jura

A certain amount of noise has to be taken into account when analyzing the spatial distribution: Demonyms, such as '*vaudois*' (VD), '*genevois*' (GE), or '*neuchâtelois*' (NE), have been identified as location entities and resolved to local places that are mostly unrelated. '*Vaudois*' (VD) was resolved to the Jura-Nord vaudois district, '*genevois*' (GE) to Saint-Julien-en-Genevois (France) and '*neuchâtelois*' (NE) to the hospital of Neuchâtel. Other important locations were resolved in the wrong places, such as the Pre-Alps, which was resolved at a village in the canton of Fribourg, or the Vaud Alps at a bank near the town of Aigle.

Along with the canton of Valais, this region features the most frequently referenced locations in the French corpus, while receiving little attention in the German media. The locations mentions in the French media mainly reflect the wolf's expansion into the Swiss Plateau and the Jura Mountains. Articles report wolves sightings in the Pre-Alps and Jura since the start of the migration process (e.g., in Gruyère (Q25, Q26), in Bulle (Q47, Q48) and Vaud Jura (Q45, Q46)). Since the formation of the first wolf pack in the Jura at *Col du Marchairuz (VD)* in 2019, media coverage has intensified in the canton of Vaud, even surpassing Valais as the leading region in French media attention.

French media focused mainly on Vaud, while German media concentrated on areas from the canton of Neuchâtel to the canton of Jura, in Gantrisch (FR/BE), and in the Vaud Jura. In terms of topics, the region is affected by all French topics, while for the German media, the Vaud Jura is strongly concerned with the topic of wolf lethal regulations, which started to be relevant from 2021. The canton of Jura receives few mentions, reflecting the low wolf population in this region, while the canton of Geneva receives a lot of coverage despite very few reported wolf sightings. A large part of the articles are news brief, which generated many incorrect referenced locations in the city of Geneva (e.g., Q5). This could be explained by the fact that some of the most salient newspapers in the corpus are based there (e.g., Tribune de Genève), as well as by the high population density. On the other hand, articles about wolf monitoring tend to correctly refer to relevant information about wolf presence (Q61, Q62, Q63). A possible explanation could be that the articles refer to wolf presence in nearby France, which is not included in the data reported by KORA.

Canton of Valais

In this region, artifacts to be cautious of include the same issue with demonyms in the French corpus, which created hot spots in Crans-Montana in reference to several clinics. Another observed artifact is the large region of the Pennine Alps, resolved to coordinates somewhere in Oberwallis.

The mentions occur almost every year, with the area of interest shifting over time between Chablais (e.g., in 2006 (Q27, Q28)), Sion, Val d'Hérens, Val d'Anniviers (e.g., in 2017 (Q41, Q42), Brig, Simplon, and Goms (e.g., in 2021 Q64). The French-speaking media show greater interest in the French Alps than the German media.

The reported locations tend to align with wolf presence. Oberwallis is not systematically reported each year for wolf presence, whereas central Valais is. From 2019 onward, the coverage by the French media diminishes, despite the continued growth in wolf observations. This could reflect a shift in media attention to the Jura in the French-speaking press.

The canton is concerned with all French topics, but for German topics, there are interestingly more widely distributed locations for wolf-farmer conflicts than wolf monitoring reports.

Canton of Bern

Caution is needed for an artifact in the French corpus, where an entity in GeoNames refers to the canton of Jura within the canton of Bern, and another in the German corpus which refers to the large region of the Berner Oberland. Additionally, the city of Bern is salient in the German dataset, with its metonymic use referring to the Federal Authorities. However, it is notably absent from the French corpus. This surprising absence could be due to a systematic association with the canton of Bern, or it could result from the annotated data the entity recognizer in spaCy was trained on, which aimed to differentiate the metonymic and geographical senses of the place.

The region is extensively covered in the German corpus, but much less so in the French one, which is limited to 2023-2024 in Gantrisch (FR/BE) (Q65). Some of the first wolves to migrate to Switzerland passed through the Berner Oberland (e.g., Pre-Alps, Q26), but wolves intensification only began in 2007 in Gantrisch (FR/BE) and intensified over the years, where a wolf pack briefly formed in 2017, but was culled (Q66). The distribution of locations in the German media roughly matches the wolf distribution, but the coverage is meaningfully more intense, not necessarily aligning with the timeline, and additional locations without wolf presence are cited, such as Oberaargau (Q67). This might reflect the fact that some of the most prominent newspapers in the German corpus are based here (e.g., Berner Zeitung), which likely leads to greater interest and coverage in the canton, resulting in more noise as well.

In terms of topic distribution, Gantrisch (FR/BE) is concerned with all German topics, while the rest of the canton is not affected by lethal regulations.

Canton of Ticino

The region is covered equally by the French and German media, and the coverage generally matches the wolf distribution. While the region is not the main focus of either media, the German media tend to report slightly more than the French media.

Media coverage of both corpora began in 2004 in Leventina, coinciding with the first sightings (Q69). Wolves were subsequently spotted around Bellinzona and in Valle Maggia. Media coverage has continued over the years, notably with the formation of the second wolf pack of Switzerland in Morobbia (Q68).

Canton of Graubünden

A hotspot artifact was created in the south of Surselva, with many entities in the Alps being extracted as '*Val*' instead of '*Val d'Hérens*' for instance, which were resolved to the commune of Vals.

The canton is of interest to both media outlets, but the German media show more interest, citing more different locations than the French media. The first wolf sightings date back to 2001 in Val Bregaglia (Q17, Q18) and from 2002 in Surselva. Wolf presence intensifies in the region, reaching Calanda, and since the formation of the first pack there (Q31, Q32), wolves have been sighted across the entire Graubünden territory, extending into both high and low Engadine. From 2018-2019, the wolf arrived permanently in the Beverin regional park, in the Swiss National Park and in Val Müstair. News coverage intensified only in Beverin in 2019, with both French and German media reporting on the presence, which remained prominent over the years (Q70, Q71). This supports the findings of Cracco et al. (2024), who determined that the wolf became a important topic in Beverin starting at that time. If media coverage tended to align with wolf dynamics before 2015, this is no longer the case afterward. The intensification of wolf presence across the entire territory of Graubünden from 2015 is not reflected in the media, which even seem to show a

decrease in attention over the years, despite the continued growth of the wolf population. Similar to the canton of Valais, this shift in focus could be due to the media's attention turning to the newly colonized regions in Eastern and Central Switzerland. Additionally, the Engadine is mostly not mentioned at all. This could reflect the language border, as the Engadine is characterized by regions where Romansh and Italian are spoken. However, other Romansh-speaking areas, such as Surselva, still received substantial coverage.

In terms of topic, the regions from Surselva to Calanda are frequently mentioned in discussions about the legal and policy framework for wolf management, suggesting that the region played a significant role in decision-making or debates (Q72, Q73). There is also notable interest in the topic of human-wolf encounters, which became especially salient from 2012, peaking in 2015. This topic appears to reflect the growing wolf population in Calanda and Surselva (Q74). Finally, the topic of illegal and accidental deaths was also prominent, with most articles referring to wolves being killed in traffic, reflecting the high wolf population in the region (Q75).

Central Switzerland: cantons of Lucerne, Obwalden, Nidwalden, Uri, Schwyz and Zug

The location entity '*Bundesplatz*' created an artifact, as it resolved to a place in the city of Lucerne instead of Bern.

The region receives a high level of attention in the German corpus, in contrast to the French one. Wolf presence is reported very thoroughly. Wolf signs of presence first appeared between 2008 and 2013 in Entlebuch (LU) and Obwalden, which triggered German news coverage (Q29, Q30). Obwalden tended to be overreported compared to the actual sightings. From 2013, wolves moved in Uri, and in Isenthal in 2015, with media coverage shifting accordingly. The wolf population intensified in the region until 2017. The canton of Uri is characterized by a high number of livestock depredations (a total of 100 between 2016 and 2018; KORA, 2020). The canton seems to have struggled particularly with one individual (M68), which killed 69 cattle by itself in 2016 (Q39, Q40). Combined with predations by other wolves, this could explain the local population's low acceptance of wolves and the support for the 2019 initiative allowing more regulation on wolves (Q57, Q58). The case was also heavily covered in the French media in 2015-2016, mainly with articles focusing on '*wolf attacks on livestock*' and '*wolf lethal regulation*'. In the German media, Uri was mostly associated with '*wolf monitoring (predations)*' and '*wolf shooting decisions*', reflecting the key discussions in the media at that time. From 2017 onwards, wolves came and went through the regions, with each development being covered by the German media, whereas the French media showed limited interest, except in the Uri case.

Eastern Switzerland: cantons of Glarus, St. Gallen, Appenzell Innerrhoden and Ausserrhoden, and Thurgau

The district referred to as '*Mittelland*' of Appenzell (AR) created an artifact.

The region is mostly not covered by the French media but receives much higher attention from the German media.

The first wolf presence was reported in 2014, with observations from Sarganserland (SG) and Glarus, to Appenzell and Gossau (SG) (Q43, Q44). Observations continued throughout the years, with an intensified presence from 2019 onward. German news coverage, however, began before 2014 across the region, intensifying in 2015 with the increase in wolf numbers in Sarganserland (SG). In general, there seems to be an overreporting of locations compared to the actual wolf presence, but the coverage tends to align with the observations. The German media also extended coverage to Liechtenstein (Q76).

The few French articles on the region focus on wolf monitoring and attacks on livestock. In contrast, the German media have a different focus: in the Alpine region, the emphasis is on regulations (Q77), while in the Swiss Plateau, the focus is on the implications of the return of large predators (Q78).

Canton of Zurich

A geoparsing error has been observed: Schlieren appears to have resolved as a location in the canton of Uri (mountain peak) or in the Zurich Oberland.

The region is characterized by a lower number of wolves compared to the previous regions studied, and this is reflected in the media coverage. Wolf presence was first recorded in 2014, with a wolf being killed by a train in Schlieren (Q37, Q38). This case was widely reported in both German and French media, as the first proof of wolf sightings in the canton of Zurich. The high saliency of the case could also be explained by it being the first observation of wolves in densely built urban areas. Wolf presence then continued to be recorded from 2015 in the Horgen district, Zurich Unterland and Oberland (Q52). The news media tend to report presence accurately, but more locations are mentioned, likely due to the noise introduced by the news brief and the most prominent newspapers.

French corpus coverage includes Schlieren in 2014, and livestock predations in Bonstetten in 2022. In terms of topic saliency, these articles are mostly associated with wolf attacks on livestock. Some locations, however, are linked to irrelevant subjects found in news briefs (e.g., Q5). As for the German media, the news brief topic of illegal and accidental deaths also shows notable saliency. Otherwise, the focus is on the return of large predators, rather than on topics related to regulations (Q79).

Northern Switzerland: cantons of Basel-Stadt, Basel-Landschaft, Solothurn, Aargau and Schaffhausen

The rivers Reuss and Aare created hotspot artifacts in the canton of Aargau for both corpora. Another artifact in the German corpus involves the demonyms '*St. Galler*' (SG) which resolved to a bus stop in the city of Basel, and '*Solothurner*', which resolved to the hospital in Solothurn. The large region '*Northwestschweiz*' was also resolved in Basel-Stadt.

This region is the least impacted by wolves in all of Switzerland, as reflected by its low media coverage. There were some wolf sightings from the Jura starting in 2004, but limited wolf presence was recorded before 2017 in Liestal, and later in 2021 in Solothurn. Outside of noise from news brief, the region is mostly not covered at all by the French corpus. The German media show inexplicably high coverage from 2007 in Basel-Landschaft and Solothurn, which cannot be attributed to actual wolf presence (e.g., wild cat Q81). Most articles focus on the topic of '*implications of wolf return*' (Q80). Additionally, news brief also created a hotspot in this region (e.g., Q6).

5 Discussion

The chapter will address each research question by analyzing the results in the light of the literature review and contextual considerations.

5.1 Methodological performance assessment

RQ1: How can news articles related to the wolf debate be effectively identified and extracted?

To address the research goals of this thesis, it was necessary to first construct an appropriate corpus, then classify it by extracting topics, and finally extract locations. Various methods were employed to achieve these objectives, with varying degrees of success. The key steps of the process are reviewed in this section.

Duplicate removal: After querying the database, an essential task was to remove duplicate articles. An inspection of the retrieved articles revealed an important number of duplicates among newspapers belonging to the same publisher group or sharing content from the same newsrooms. Addressing this issue was crucial to avoid amplifying the existing bias towards newspapers with a higher volume of articles.

To apply the cosine similarity method, two thresholds needed to be determined: a cosine similarity value and a time threshold, both of which directly influence the number of remaining articles. A two-days threshold was selected, as most duplicate articles fall within this timeframe. However, this choice is open to debate, as duplicates have been observed up to seven days later, and occasionally beyond. Investigating why newspapers republish articles after such a time span, and analyzing the type of information these articles contain, would be crucial. One possible explanation lies in the varying publication frequencies across newspapers (e.g., daily, weekly, or monthly) and different types of documents (online versus print).

Irrelevant removal: The final task in creating the corpus, and also the most challenging, was filtering out irrelevant articles. Various methods were employed: keyword filtering (to include and exclude specific terms), Part-Of-Speech filtering in German to remove instances of '*Mx. Wolf*', and a trained neural network model. Despite these efforts, an large number of irrelevant articles remained, which were later identified during the topic modeling phase (962 French articles and 1684 German articles). This suggests that the employed methods could be improved.

Results of the neural network models were imperfect for both languages, prompting further reflection on whether performance could have been improved with additional training data. It also raises the question of whether training a neural model was truly necessary or if topic modeling alone would have sufficed. Conversely, one might ask whether the effectiveness of the topic modeling could have been enhanced if the dataset had been free of irrelevant articles.

Also relevant to the removal of irrelevant articles and topic modeling was the presence of news briefs in the corpus. These were predominantly classified under the same topics in both corpora and mostly reported on events in cities of interest to the major newspapers (e.g., Geneva, Zurich), thereby creating false hotspots. This added complexity to the analysis and introduced excessive noise into the data, making it challenging to distinguish between irrelevant locations tied to news briefs and others. One potential solution would be to consider these articles as irrelevant and to exclude them from the analysis. Another approach could be to involve modeling topics within individual texts rather than across the entire corpus, effectively creating distinct articles from a single text. Alternatively, the methods for extracting locations could be revised. Instead of extracting all mentioned place names from an article, the focus could be shifted to those that *co-occur* within a certain span around a specific search keyword (Purves et al., 2022). This approach, referred to as Place-Name Co-occurrences (PNCs) by Paterson and Gregory (2019),

has been applied in various studies. For example, Duffy et al. (2020) used the same method and additionally chose to extract only the main location of the articles, defined by a set of rules.

Topic extraction: The use of an unsupervised classification method successfully allowed for the identification of the key themes in each corpus. However, the performance of the models could be better evaluated. For instance, Killion et al. (2018) manually annotated a subset of articles for validation. Alternatively, another topic modeling approach could be used, for example, Chandelier et al. (2018) employed STM to enhance the analysis by examining how the year of publication and newspaper outlets influence topic prevalence.

One area for improvement in the current implementation is the way in which topics are assigned to articles. At present, the topic with the highest probability score is assigned to each article, even though the article may be a mixture of topics, which is a core idea of Latent Dirichlet Allocation (LDA). A more refined approach could be to involve assigning topic scores directly to each place mentioned in the articles.

Toponym recognition: When evaluating the initial performance of the spaCy NER component, several issues were observed, such as misclassifications of organizations (ORG) and wolf name identifiers (e.g., F8, M31) as locations (LOC). Fine-tuning the model improved the accuracy, but introduced some new errors in the French pipeline: demonyms were initially not recognized as locations by the NER component, nonetheless, the model was subsequently trained to recognize these terms as locations, as they often refer to geographical regions. This, however, posed challenges during the toponym resolution phase. While some demonyms add precision to regional names (e.g., '*Jura vaudois*', '*Chablais valaisan*', '*territoire genevois*'), many are used in contexts that do not correspond to actual locations (e.g., '*un médecin genevois*', '*le gouvernement valaisan*'). This resulted in two potential outcomes: either the demonyms failed to resolve due to missing entries in the gazetteer, or they were resolved incorrectly, introducing noise into the data (e.g., in '*Cran Montana*' or '*district Jura-Nord vaudois*'). This issue should be addressed in future training of the NER component.

Additionally, several issues with NER were identified in both French and German pipelines in Sections 4.1.3 and 4.7 (e.g., '*Siedlungsnähe*', '*Agridea*'). These issues could be addressed by augmenting the training dataset with more annotated articles that include these problematic terms.

Toponym resolution: For toponym resolution, the Geoparser Python Library was used. Originally developed and tested on English texts, it was necessary to fine-tune a multilingual SentenceTransformer model (Gomes, 2024). After proper training, most locations were correctly resolved, nonetheless, some toponym resolution errors were identified in Sections 4.1.3 and 4.7, and these could be corrected by adding the problematic locations to the training set. The main challenge, however, lies in addressing the missing entries in the gazetteer. One potential solution could be to use a Swiss-specific gazetteer, though this introduces new considerations.

When changing the gazetteer, it is important to ensure consistency between the NER component and the gazetteer. For example, GeoNames includes both '*Vaud*' and '*canton de Vaud*' as alternate names, offering flexibility. In contrast, the Calanda massif is registered only as '*Calanda*', and not '*massif du Calanda*'. It would be necessary to examine how SwissNames3D registers location names and their possible alternate names. Acheson et al. (2020), who investigated gazetteer matching and compared natural features between SwissNames3D and GeoNames, provide useful insights on this matter.

Additionally, while a local gazetteer would be more accurate for Swiss locations, it would not cover locations outside of Switzerland. This could lead to the misclassification of the approximately 1500 non-Swiss locations found in the corpus, which might be wrongly resolved, even if their similarity scores to Swiss entries in the gazetteer are low. One possible approach to mitigate this risk would be to set a threshold: if the similarity score is below a certain limit, the location

should remain unresolved, thereby avoiding misclassification.

Visualization: Finally, the last task was to create proper visualization and to perform spatial analysis of the results. Visualizing the results of this study was challenging as it had to account for noise in the data, and deal with both large and small regions represented as single coordinates.

The visualization implemented, which attempted to exclude large regions, was sufficient to reveal differences in spatial patterns between regions, years, language areas, topics, and for comparison with ground truth data. Nevertheless, it could be improved: as the years go by and the number of articles increases, the points start to become visually cluttered, making interpretation more difficult. Spatial clustering methods, such as heat maps or hexagonal binning, could be used to better generalize the results. Rinner et al. (2018) provide good examples by analyzing the distribution of local news in Toronto. For the comparison with wolf data, a proper statistical representation (e.g., CHI maps) would also have been more appropriate, though this will probably bring additional challenges (e.g., adjusting the scale of the gazetteer to that of the wolf observations).

While the above solutions have been proposed to reduce the noise by improving the methods, it can be assumed that errors will persist, making it important to find an effective way to deal with the noise in visualization (Gregory et al., 2015). An easy solution for handling low-frequency noise (e.g., a location mentioned only once in an irrelevant article) could have been to set a minimum frequency threshold, while high-frequency errors (e.g., systematic toponym resolution errors) could have been manually investigated. However, noise often mixes with relevant locations, as seen in the clustering of irrelevant locations in major cities.

Media geography studies often choose to exclude large regions from their analysis. For instance, Rinner et al. (2018) deliberately discarded them due to the complexity of their geographical representation, while Duffy et al. (2020) and Paterson and Gregory (2019) only retained locations that aligned with the specific scale of their search.

In this study, the focus was on comparing patterns between cantons and larger regions within those cantons. As such, regions larger than the district level were excluded from the analysis. The challenge lay in determining the extent of toponyms and distinguishing region sizes. Excluding cantons using GeoNames' administrative levels was straightforward, but other features, such as valleys or regions, lacked clear scale distinctions. Identifying large regions, which often create unexpected hot spots, required manual review. A potential solution could be focusing on the commune names, as these were the most frequently mentioned locations in the corpus after cantons. However, it is important to consider the potential data loss that could result from excluding regions.

Hypothesis 1: Working with non-English texts

The NLP tools employed proved to be suitable for the target languages of this study. While the models required fine-tuning, this step is standard for improving accuracy, even for English pipelines. The Geoparser library, originally tested on English, performed well on French and German when combined with trained components. A localized gazetteer could potentially improve performance, but it has yet to be tested.

Challenges were still identified, particularly with German, due to grammatical complexities such as compound words and case inflections. SpaCy NLP pipeline proved incapable of handling compound words, making it unable to separate the location component from the entire word and to recognize toponyms within them (e.g. *Beverinrudel*). Additionally, SpaCy's lack of integration between lemmatization and NER hindered accurate toponym resolution with inflected forms (e.g., *KantonS Bern*).

This issue can be compared to problems arising from misspelled location names, an issue briefly mentioned by Gritta et al. (2018). It is particularly relevant for German, but may also affect other languages that rely heavily on inflections. In the current extensive corpus, however, this issue was not significant, as prominent locations were often mentioned multiple times without modification. Additionally, these cases mostly occur when a location is used as an attribute to describe another object or entity (e.g., *Jagdinspektorat des Kantons Bern*: Hunting Inspectorate of the Canton of Bern). Such instances might be treated similarly to demonyms. However, the problem persists that these forms are captured in languages such as French or English, but not in German, leading to inconsistencies between languages and complicating cross-language comparisons.

Hypothesis 2: Feasibility of the analysis

The second hypothesis questioned whether the results obtained were sufficient to study the wolf debate in news articles. The results were adequate for proceeding with the analysis. However, some improvements are needed, particularly in filtering out irrelevant articles, geoparsing, and visualizing the results. The presence of noise made it difficult to rely solely on the maps for the interpretation, requiring a manual review. Nevertheless, considering the large amount of data that had to be processed initially, manual coding, such as in the environmental studies of Rinner et al. (2018), would have been too labor-intensive and expensive. Gregory et al. (2015) argue that researchers should accept that the results of Geographical Text Analysis may contain errors and keep this in mind during interpretation.

5.2 Spatio-temporal distribution of news articles

RQ2: What is the spatio-temporal distribution of the news articles discussing wolves? Are there regions receiving more or less media attention than expected relative to the local wolf population?

Articles frequency, wolf dynamics and socio-cultural variables

Without surprise, the regions that stood out over the years in both corpora were the first to welcome wolf populations: the Alpine cantons of Valais and Graubünden. Over time, as wolves colonized new areas, the media began to highlight other regions, such as in the Bern Pre-Alps, Central Switzerland, or the Vaud Jura. Consistent with the findings from other studies on wolf-related media, coverage increased as the wolf population expanded (Dressel et al., 2015; Sponberg & Mathiesen, 2022). This also aligns with the conclusions of a project led by von Arx et al. (2020) ('*Kommunikationsprojekt Wolf*'), which analyzed how federal authorities communicate information about wolves to the public. Interviewees emphasized the need for the local population to be informed following the first evidence of wolf presence in a region.

However, while media coverage tends to follow wolf expansion, its intensity does not accurately reflect the distribution of the wolf population, particularly since 2019. While most wolves remain in mountainous regions such as Valais and Graubünden, media attention has shifted to the Swiss Plateau, over-representing cantons such as Bern, Vaud, and Zurich, despite their smaller wolf populations.

One possible explanation for this bias could be the gazetteer GeoNames. Among the sources listed for Switzerland, in addition to the general data provided by official authorities, three sources are exclusively from Zurich (e.g., data.stadt-zuerich.ch). This could result in a higher number of place names available for Zurich compared to other regions, increasing the likelihood

of successful geoparsing matches. However, this alone does not account for the prominence of other lowland locations.

The most apparent factor behind this discrepancy could lie in the news database. The Swissdox database was expected to provide comprehensive coverage of Swiss newspapers. However, significant local sources are absent, as the database predominantly includes articles from the three main publishing groups (see Section 2.1.2), omitting important regional newspapers. For instance, key sources for the canton of Graubünden, such as *Südostschweiz* and *Bündner Tagblatt*, as well as for the canton of Valais, such as *Le Nouvelliste* or the *Walliser Bote* in Oberwallis, are missing. To estimate the volume of missing articles, queries conducted on December 3, 2024 returned approximately 2938 results for the keyword '`loup`' on *Le Nouvelliste*[1], and 3263 results for '`wolf -Fussball -hockey -wolfsburg`' on *Südostschweiz*[2]. Even taking into account for a reduction due to filtering out irrelevant articles, this represents a large number of relevant articles excluded from this study.

This notable lack of local newspapers resulted in the underrepresentation of mountainous areas. Furthermore, the newspapers with the highest coverage are based in the Swiss Plateau. Lindgren and Wong (2012) demonstrated how the mapping of newspaper articles revealed the regions of the newspapers' target audience. The current results seem to reveal that their target audience is also mainly in the Swiss Plateau, where population is also the highest. This overrepresentation further biased the results.

The effect of the regions of newspapers' target audience is even better visible with the linguistic barrier: Both French-speaking and German-speaking media focus on their own linguistic regions and only important events, such as an important livestock depredation, or the colonization of a new landscape (e.g., Alps, Jura, Swiss Plateau) cross the border. The Italian and Romansh speaking parts, after the first recolonization stage, were mostly forgotten. Interestingly, the French-language media also frequently mentioned wolf sightings in the French Alps and the French Jura. This media attention reflects the wolf population in France and might also be related to the target region of the most prominent newspaper in Geneva, a region that is more closely connected to France than other cantons.

These target audience regions could be further analyzed in future studies. Additionally, it would be interesting to examine whether newspapers that claim to target a national audience (e.g., 20minutes, NZZ, Le Temps) also exhibit a bias towards the most populated regions and what implications this might have. The media play a crucial role in shaping how people perceive places (Cresswell, 2004; Lindgren & Wong, 2012).

Nevertheless, recognizing the bias towards the lowland urban audience helps to explain the shift in focus from the highlands to the lowlands as wolves expanded. This appears to reflect, as found in previous studies, that people's concerns increase with proximity to wolves and that their attitudes evolve, thereby changing the debate (Dressel et al., 2015; Hunziker et al., 2001), and ultimately leading to greater media salience.

Better investigations should be conducted to understand why salience has increased more importantly in the French-language corpus than in the German-language media over the past few years. One explanation is the growing presence of wolves in the Vaud Jura and the target audience of major French-language newspapers, but other factors may also play a role. As of this year, the lowland French-speaking population appears to be showing greater interest in the wolf issue. The media salience coincides with the creation of Oppal, an association promoting human-wolf coexistence in French-speaking Switzerland. The leading newspaper in the canton of Vaud even used the wolf as part of an advertisement for newspaper subscription, displayed on a public bus

[1] https://www.lenouvelliste.ch/recherche?q=loup

[2] https://www.suedostschweiz.ch/search?keywords=W%C3%B6lfe+-Fussball+-Hockey+-Wolfsburg&search=Suche

in the heart of Lausanne (Figure 24). This further demonstrates the significance of the topic to the local population.

In 2015, the Jura Mountains were identified by Behr et al. (2017) as one of the few areas suitable for wolves that still enjoyed public acceptance. From 2017, KORA implemented photo traps throughout the Vaud Jura to actively track the wolf population and the formation of packs, whereas in Valais, similar efforts were only conducted sporadically in 2014 and 2019-2020 (KORA, 2020). As a result, wolf monitoring efforts are better documented in the Vaud Jura than in the Valais. Additionally, in 2022, KORA launched a new research project entitled '*Wolves and Cattle*' (2022-2026) in the canton of Vaud, motivated by an increase in cattle depredations, to better understand the behaviors of wolves and bovine, and subsequently improve coexistence (KORA, 2024). These findings further highlight the importance of this region in human-wolf conflicts and emphasize the need for further research in the future.

Newsworthiness of wolf topic and events

Literature has shown that large predators, and the wolf in particular, are newsworthy subjects (Arbieu et al., 2021; Bombieri et al., 2018). The results of this study confirm this, as media coverage began and continued throughout the recolonization of the wolves in Switzerland.

The most salient locations include areas key to the recolonization process in the cantons of Valais and Graubünden, and the most salient years coincide with significant changes and debates in wolf management legislation. However, the most heavily reported events were linked to major cases of depredations, an issue that the media tend to focus on, often emphasizing emotional and negative aspects rather than the facts (Bednarek & Caple, 2014; von Arx et al., 2020). These observations are also consistent with the findings of Sponberg and Mathiesen (2022), who identified a relationship between the newsworthiness of the wolf issue in the Norwegian media, depredations, and changes in wolf management policy.

Newsworthiness is also influenced by proximity (Bednarek & Caple, 2014): cases occurring in regions targeted by the most prominent newspapers were more heavily reported than those in other areas. For example, the first wolf sightings in urban environment received great media coverage. It would be interesting to explore in future studies how the urban recolonization of wolves was covered, in comparison, by local newspapers in the cantons of Graubünden or Valais.

5.3 Spatio-temporal distribution of topics

RQ3: What is the spatio-temporal distribution of topics associated with wolves ?

A single topic was assigned to each article based on an unsupervised classification method using word frequency analysis. These topics were then geographically represented by linking them to the locations mentioned in the articles. This geographical representation helps to reveal what the main concerns of an area could be, or at least how newspaper readers might be perceiving these locations (Cresswell, 2004).

Topics and stakeholders

Both corpora were characterized with the presence of three themes: *wolf policy and management*, which encompasses debates on policy and lethal wolf regulations, *wolf monitoring*, which includes articles focusing on sightings, predations, wolf dynamics, and finally *wolf-human coexistence*, a theme that centers more on human perspectives, addressing topics related to conflicts, interactions and implications. These key themes were also identified in the media studies on the wolves debate (Section 2.4).

The French corpus had a stronger focus on lethal regulation on wolves compared to the German corpus, which, conversely, placed more emphasis on livestock predation, particularly sheep. Almost half of the articles in the German corpus mentioned sheep, making it one of the most frequent terms across the three themes. This is not surprising, as most livestock predation in Switzerland, as in Europe, involves sheep (Blanco & Sundseth, 2023; KORA, 2020).

This predominance highlights the core of the debate surrounding wolves in Switzerland: A larger number of sheep are predated by wolves, generating conflicts with farmers, which are reflected in political debates and lethal wolf regulations. Several studies have identified that conflicts with farmers are one of the main threats to wolf conservation (Boitani et al., 2023), and low acceptance is directly linked to legal or illegal shootings of wolves (Behr et al., 2017; Chapron et al., 2014). The results of this study seem to confirm this.

The effectiveness of the lethal regulation to mitigate the damages is a highly debated subject in wolf management, with inconclusive conclusions to date, as study results do not agree (Blanco & Sundseth, 2023). The present study confirms that this debate is not only prevalent in Europe but also highly relevant in Switzerland, particularly since the wolf population began intensifying in 2019, raising concerns about uncontrolled population growth, which led to the introduction of preventive regulations in 2023.

The stakeholders most represented in the corpora are the policymakers (e.g., Federal Office for the Environment, cantons, Federal Council), livestock owners, and hunters, which align with three of the four most influential stakeholder groups identified by Grossmann et al. (2020). The fourth group, nature conservationists, mostly appears in articles about lethal regulations, as they oppose them. WWF is the organization most frequently cited. Finally, gamekeepers are also frequently mentioned in the German corpus, reflecting the key role they play in informing the public (von Arx et al., 2020). Further analysis could be conducted on the stakeholders by associating them with the locations in which they appear in the articles, uncovering the regions in which they are most predominant within the debates. This could be especially interesting for environmental organizations, as they both work in the field and seek support from populations in urban areas (Imoberdorf & Emmenegger, 2020).

Topic frequency, wolf dynamics and specific events

Topics related to wolf monitoring, focusing on the wolf's perspective, have global coverage across Switzerland and the entire timeline, reflecting wolf's expansion. In contrast, the other two themes showed spatial and temporal variations, which cannot be fully explained by wolf data.

The topics related to wolf management policy highlighted key locations that play a pivotal role in the wolf debate and management decisions, including areas central to discussions, regions impacted by policy changes, and places that significantly influence the direction of wolf management strategies. Unsurprisingly, these were located in areas with dense wolf populations and heated conflicts with farmers due to livestock depredations. The intensification of wolf presence in Switzerland from 2019, followed by the augmentation of lethal regulations, led to a shift in topics, with these topics gaining increased saliency.

Topics within the coexistence theme related to wolf-farmer interactions (e.g., the topic of '*protective measures*' in the French corpus and '*wolf-farmer conflicts*' in the German one), as well as the implications of the wolf's return in the German corpus, have global coverage but tend to decrease in importance over the years. This decline can be expected for the implication of the wolf's return: its stronger focus on the Swiss Plateau compared to other topics highlights the interest from the urban population since the early stages of colonization, despite the lack of proximity. The decreasing trend, however, shows that the discourse shifted from theoretical, distant discussions to concrete implications of wolf presence as wolves expanded beyond the Alps

over the years. This shift could also be linked to a change in attitude associated with proximity (Dressel et al., 2015; Hunziker et al., 2001).

As for topics related to wolf-farmer interactions, this decreasing trend is surprising, as one might expect the number of articles to grow with the expansion of the wolf population. Spatial coverage is also not limited to certain mountainous areas, as seen with the regulations, suggesting that protective measures are key elements of the debate, but are slowly losing importance over the years. An explanation could be found in the way protective measures were implemented in Switzerland: in the first stage, the strategy focused on vulnerable areas and testing different measures. In the second stage, around 2013, support shifted from regional to national. Protective measures were incorporated in the law, and two competence centers were created: one for supporting the implementation of protective measures and the other for herding dogs (KORA, 2020). These developments suggest that protective measures were more important in the debate initially, as there was uncertainty about the best course of action, and farmers may have felt abandoned and helpless. In contrast, in recent years, more knowledge has been gathered, and support has been organized. Killion et al. (2018) found that the saliency of wolf-farmer conflicts within the media in Idaho tended to decrease after more regulations were introduced, following the delisting of the wolf. This may also explain the trend in the German corpus, which shifted from increasing to decreasing in 2011, possibly reflecting the introduction of more regulations in 2012 (KORA, 2020).

These observations show that topic variation can be related to wolf dynamics, such as wolf expansion and recolonization, but also to changes in wolf management policies, similar to the findings of Killion et al. (2018). However, these variations could also be influenced by other factors, such as livestock depredation. For example, the year 2005 was characterized by almost no livestock depredations despite the presence of wolves, which translated into lower media coverage and a dominance of more positive topics, such as the implications of the wolf's return or monitoring. In future studies, conducting statistical comparisons with wolf data specific to each region could enhance the analysis, and uncover correlations between different variables. Instead of determining topics based on text content alone, additional information, such as the publication year, could be incorporated (e.g., Structural topic modeling). This approach would allow for a more detailed investigation into the increase in media saliency over the past few years, especially concerning wolf lethal regulations.

Socio-cultural variables

One might question the differences between the two linguistic regions of Switzerland studied. Trainotti et al. (2024), who also examined two different language areas in the Eastern Alps (Italian and German), found discrepancies in news valence, with German coverage being more negative than positive, suggesting that cultural differences might influence on the debate. In this present study, spatial comparisons of topics between the two linguistic regions are challenging to make, as the articles were grouped into different topics in each corpus. It appears that the German media places a greater focus on the topic of monitoring, while the French media emphasizes wolf management policy. Another interesting difference was observed in the topics focusing on illegal and accidental wolf deaths. The French corpus tends to focus more on illegal shootings, while the German media covers accidents more extensively. However, these observations should be further investigated before drawing any conclusions. Bias may have been introduced by the unsupervised topic categorization, data noise, and the target audience of the primary newspapers in each corpus. Additionally, this could simply reflect the longer and more established wolf population in the German-speaking region. Traffic accidents are one of the leading causes of wolf mortality in Europe, so it is not surprising to find more reports of wolf accidents in densely populated landscapes (Blanco & Sundseth, 2023; KORA, 2020).

The literature has identified a discrepancy between urban and rural populations regarding the wolf issue (Chapron et al., 2014; Zscheischler & Friedrich, 2022). Urban populations generally hold positive attitudes towards wolves, largely due to a lack of direct negative interactions, while rural communities bear the costs and perceive threats to their livelihoods or activities. This divide is reflected in the spatial distribution of some of the topics: topics that are considered positive or neutral, such as wolf monitoring or the implications of the return of large predators, tend to focus on the Swiss Plateau (lowland, more urban), whereas discussions on wolf management are centered in the highland regions, indicating that the impacts of policy are felt mostly there.

Figure 24: Advertisment for 24 Heures - bus Lausanne 13.05.2024

6 Conclusions

6.1 Main findings

This master's thesis aimed to gain a comprehensive understanding of the wolf debate in the Swiss media. Articles from both French- and German-speaking media, covering the period from the first wolf sightings in 1995 to 2024, were analyzed. A corpus of articles on the wolf debate was compiled, filtered to remove duplicates and irrelevant content, and classified into different topics. Their geographical distribution was mapped based on the locations mentioned in the articles. This approach made it possible to identify the regions most prominently featured in the Swiss press and, by extension, in the public discourse. Additionally, it highlighted the main concerns associated with each region and allowed for comparison with real-world wolf observations.

The coverage revealed that the wolf debate is a highly newsworthy topic in Switzerland. The number of articles has increased over the years, roughly mirroring the expansion of the wolf population, first in the Alps and Pre-Alps, then in the Jura Mountains. An important shift in media coverage occurred in 2019, coinciding with the intensification of wolf presence in the Swiss Plateau. While wolves remain primarily concentrated in the mountainous regions of the Alps and Jura, media attention has increasingly shifted towards the lowlands. Possible explanations include biases in the Swissdox database, which excludes key local newspapers, as well as the tendency of major newspapers to focus on regions where their target audience is concentrated, particularly in the densely populated Swiss Plateau. In recent years, the Vaud Jura has emerged as a particularly salient region in the wolf debate.

Major media coverage has focused on key events such as the recolonization of wolves in new regions and important cases of livestock depredation. The debate centers primarily on wolf management, particularly lethal regulations, and on the conflicts between wolves and farmers, especially concerning sheep predation, as well as on wolf monitoring. Topic variations reflect not only the expansion of the wolf population but also changes in management policies and livestock depredations. While wolf management topics are predominantly associated with mountainous regions, discussions on human-wolf coexistence extend across all areas, including lowland urban regions.

The linguistic barrier is clearly visible in the geographical distribution of the articles, as both media primarily report on their respective linguistic regions. Only particularly newsworthy events, such as major predation incidents or the colonization of new types of territory (e.g., the Alps, the Jura), cross the language border. The French-speaking media tend to focus more on regulations, whereas the German-speaking media place greater emphasis on livestock depredations. In recent years, the proportion of wolf-related news has been higher in the French media compared to the German media. Possible explanations include the target audience of the major newspapers and the growing interest of both the public and scientists, in the Vaud Jura.

6.2 Limitations

The results are limited by data collection and language: only major Swiss newspapers are included, while important local ones, particularly in the cantons most affected by wolves, Valais and Graubünden, are missing. Furthermore, the Italian- and Romansh-speaking media are absent, preventing a comprehensive coverage of the country and the Swiss Alps.

To study the wolf debate, a quantitative analysis of news media was chosen. This method has the advantage of allowing analysis of large amount of data over extended temporal scales while remaining relatively time-efficient. An alternative approach, as used by Sponberg and Mathiesen (2022), would be to focus on a few key years and conduct a qualitative analysis. The current

results provide insights into which years and locations would be particularly relevant for a more detailed examination, making such an approach feasible here as well. However, as noted by Krippendorff (2018), quantitative studies have the advantage of being more easily reproducible by researchers compared to qualitative studies. Nevertheless, this method is not error-free, and further efforts should be made to reduce noise in the results. Particular attention should be paid to filtering out irrelevant articles from the corpus and the improving geoparsing. Additionally, Cracco et al. (2024) demonstrated, through a comparison of different social indicator methods, that the analysis of news media can lead to an amplification of the debate. These considerations should be kept in mind when interpreting the results.

Finally, most conclusions were drawn from visual analysis and comparisons. In future work, the results should be better supported by statistical analyses and improved visualizations. Notably, the spatio-temporal distribution of article frequency could be statistically compared to other variables, such as wolf dynamics data, human population density, or voting results and studies on wolf acceptance levels. However, this introduces new considerations, such as ensuring that the compared variables are on matching scales (e.g., at the commune level).

Additionally, it is important to acknowledge potential biases in wolf data: While wolf sightings can provide a good indication of wolf population density, they may be biased towards regions with higher monitoring efforts, which is often the case in areas with higher human density and greater accessibility. Nonetheless, a possible method to mitigate this bias could be to focus solely on observations of livestock depredations. Not only do these events receive the most media attention and generate the most conflicts, but they are also systematically reported, as they lead to compensation for livestock owners. This makes them a more reliable dataset.

6.3 Contribution and insights

Studies of the wolf debate using media analysis have been conducted in Switzerland's neighboring countries, as well as in specific regions and time periods within Switzerland. This study, however, provides a comprehensive overview of the entire timeline of the wolf's return to Switzerland, as covered by the country's leading media. It encompasses the Swiss Plateau, as well as the French- and German-speaking regions of the Jura, the Pre-Alps and the Alps. Additionally, this is the first media study focusing on the Jura Mountains.

Topics across regions have been compared in previous studies by analyzing different media outlets with varying regional distributions, for instance between two regional newspapers (Delibes-Mateos, 2020) or between regional and national newspapers (Chandelier et al., 2018). This study introduces a novel approach to identify regional differences and patterns. By extracting the locations mentioned in the articles and mapping them by frequency, the regions most central to the debate could be highlighted. These findings can then be compared with ground truth data to identify '*hot*' and '*cold*' spots of meda attention. By associating each location with a specific topic, it was possible to further analyze which component of the debate each region was associated with. This method has proven effective in uncovering patterns similar to those found in previous studies, such as differences in coverage based on newspaper type, geographical and socio-cultural characteristics (e.g., lowlands vs mountainous areas, urban vs rural, different linguistic regions). Additionally, it provides valuable insights for journalism studies.

Finally, the challenge of working with non-English texts has been successfully addressed. Natural Language Processing (NLP) was conducted using the spaCy library, which offers pre-trained pipelines for 25 languages. After fine-tuning the models on a relatively small subset of the corpus, their performance proved to be good for the present study. Geoparsing was performed using the Geoparser Python library, which was primarily trained on English texts. Fine-tuning a multilingual SentenceTransformer model was necessary, but this was achievable with a relatively small subset of the corpus. Although the Geoparser made some errors, its overall performance was

satisfactory and allowed for meaningful interpretation of the results. Geoparsing was tested using the global gazetteer GeoNames, but the performance of a local gazetteer, such as SwissNames3D, remains to be evaluated.

German, due to its greater morphological complexity and inflectional variations compared to English and French, posed additional challenges. This resulted in some data loss, though not significant enough to hinder the analysis.

6.4 Outlook and perspectives

The current analysis could be extended by placing greater emphasis on stakeholders, individual wolves, or different newspapers:

By associating stakeholders with the locations in which they appear in articles, it would be possible to uncover their region of influence and where they are most active. It would also be interesting to examine whether certain national organizations place proportionally greater emphasis on specific regions (e.g., language regions). Trainotti et al. (2024), for example, compared the proportion of each stakeholder across the three regions of their study.

An inspection of the articles revealed that certain individual wolves had caused significant damage on their own, triggering a surge in media coverage. During the training process of the NER component, an attempt was made to recognize wolf name identifiers. While this was not successful in the current implementation, adding more training data could be sufficient to improve recognition. This would allow for an analysis of which wolves were the most newsworthy, the reasons behind their media coverage (e.g., depredations, litters, monitoring), and their geographical distribution. Such analysis could provide further insights into the debate and identify key elements that have shaped people's attitudes.

This study did not aim to compare different types of newspapers. However, previous studies on media coverage of wolves have shown that newspapers of different types or from different regions adopt distinct focuses and tones when reporting on the wolf issue (e.g., Chandelier et al., 2018; Trainotti et al., 2024). This could be further investigated in the present work, as the method used also enables the identification of newspapers' target regions. McCombs and Shaw (1972) highlighted the dual role of media outlets in both informing the public and shaping perceptions of newsworthiness, while Cresswell (2004) discussed the role of media in shaping perceptions of places. In this context, analyzing the Swiss media and comparing newspaper types to identify biases in place representation, their association with newsworthiness, and the topics they emphasize, would be a valuable extension of this study.

Building on the present study, future research could explore other large carnivores or conduct cross–border studies:

A comparison of wolf coverage in the Swiss media with coverage of other large predators, such as lynxes, could be insightful. Dressel et al. (2015) and Sponberg and Mathiesen (2022) observed different shifts in attitudes between bears and wolves. In Switzerland, a comparison with lynxes might be particularly relevant. Unlike wolves, which returned naturally, lynxes were reintroduced by humans to Switzerland (KORA, 2024). Because lynxes also prey on livestock, their presence creates conflicts with farmers. Comparing how the debate over lynxes evolved following the return of wolves to Switzerland, and how the two debates interact, could provide valuable insights.

Experts in large carnivore emphasize that predator management in Europe should not be confined to national boundaries, but should be approached on a larger scale (Chapron et al., 2014). Similarly, studies of wolf-related media could also be conducted across borders. The Jura Mountains, particularly the Vaud Jura, has been identified as a key location in Swiss media coverage, and the presence of cross-border wolf packs due to its proximity to the French border makes this region of particular interest. Although the authorities in both countries are working together

on wolf management, the differing policies in each country make collaboration challenging. A comparison of the Swiss and French media coverage of wolf recolonization in the Jura Mountains could provide valuable insights. French-speaking Swiss media have already shown a tendency to report on wolf sightings in neighboring regions of France. It would be interesting to investigate whether this cross-border interest is reciprocated in the French media. Additionally, the media coverage could be compared in terms of topics and frequency, in relation to wolf management decisions, actual wolf populations, and local acceptance of wolves. The issue of the return of large predators is a global challenge, and cross-border studies could help to compare issues, solutions, and concerns across countries, thus contributing to the achievement of human-wolf coexistence.

References

Abid, A., Ali, W., Farooq, M. S., Farooq, U., Khan, N. S., & Abid, K. (2020). Semi-Automatic Classification and Duplicate Detection From Human Loss News Corpus [Conference Name: IEEE Access]. *IEEE Access*, *8*, 97737–97747. https://doi.org/10.1109/ACCESS.2020.2995789

Acheson, E., Volpi, M., & Purves, R. S. (2020). Machine learning for cross-gazetteer matching of natural features [Publisher: Taylor & Francis]. *International Journal of Geographical Information Science*, *34*(4), 708–734. https://doi.org/10.1080/13658816.2019.1599123

AGRIDEA. (2016). Programme national de protection des troupeaux. Retrieved December 4, 2024, from https://www.protectiondestroupeaux.ch/fr/programme-national-de-protection-des-troupeaux/

Alemani, E. (2024). Spacy-annotator: SpaCy annotator for Named Entity Recognition (NER) using ipywidgets. Retrieved January 27, 2025, from https://github.com/ieriii/spacy-annotator

Alonso, O., Fetterly, D., & Manasse, M. (2013). Duplicate News Story Detection Revisited. In R. E. Banchs, F. Silvestri, T.-Y. Liu, M. Zhang, S. Gao, & J. Lang (Eds.), *Information Retrieval Technology* (pp. 203–214). Springer. https://doi.org/10.1007/978-3-642-45068-6_18

Arbieu, U., Chapron, G., Astaras, C., Bunnefeld, N., Harkins, S., Iliopoulos, Y., Mehring, M., Reinhardt, I., & Mueller, T. (2021). News selection and framing: The media as a stakeholder in human–carnivore coexistence. *Environmental Research Letters*, *16*(6), 064075. https://doi.org/10.1088/1748-9326/ac05ef

Arbieu, U., Mehring, M., Bunnefeld, N., Kaczensky, P., Reinhardt, I., Ansorge, H., Böhning-Gaese, K., Glikman, J. A., Kluth, G., Nowak, C., & Müller, T. (2019). Attitudes towards returning wolves (*Canis lupus*) in Germany: Exposure, information sources and trust matter. *Biological Conservation*, *234*, 202–210. https://doi.org/10.1016/j.biocon.2019.03.027

ASPTcontreGP. (2024). Association Suisse pour la protection des territoires contre les grands prédateurs. Retrieved December 5, 2024, from https://www.vsl-grt.ch/fr-CH

Bednarek, M., & Caple, H. (2014). Why do news values matter? Towards a new methodological framework for analysing news discourse in Critical Discourse Analysis and beyond [_eprint: https://doi.org/10.1177/0957926513516041]. *Discourse & Society*, *25*(2), 135–158. https://doi.org/10.1177/0957926513516041

Behr, D. M., Ozgul, A., & Cozzi, G. (2017). Combining human acceptance and habitat suitability in a unified socio-ecological suitability model: A case study of the wolf in Switzerland (S. Durant, Ed.). *Journal of Applied Ecology*, *54*(6), 1919–1929. https://doi.org/10.1111/1365-2664.12880

Bender, E. (2019). The #BenderRule: On Naming the Languages We Study and Why It Matters. *The Gradient*. https://thegradient.pub/the-benderrule-on-naming-the-languages-we-study-and-why-it-matters/

Blanco, J., & Sundseth, K. (2023). *The situation of the wolf (canis lupus) in the European union: An in depth analysis. A report of the N2K Group for DG Environment, European Commission.* Publications Office. Retrieved April 17, 2024, from https://data.europa.eu/doi/10.2779/187513

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent dirichlet allocation. *Journal of machine Learning research*, *3*(Jan), 993–1022.

Boitani, L., Phillips, M., & Jhala, Y. (2023). Canis lupus (amended version of 2018 assessment). *The IUCN Red List of Threatened Species*, *2023*. https://doi.org/10.2305/IUCN.UK.2023-1.RLTS.T3746A247624660.en

Bombieri, G., Nanni, V., Delgado, M. D. M., Fedriani, J. M., López-Bao, J. V., Pedrini, P., & Penteriani, V. (2018). Content Analysis of Media Reports on Predator Attacks on Humans: Toward an Understanding of Human Risk Perception and Predator Acceptance. *BioScience*, *68*(8), 577–584. https://doi.org/10.1093/biosci/biy072

Bonfadelli, H., & Meier, W. (2021). Switzerland: Highly concentrated leading news media in austerity and downsizing mode. In J. Trappel & T. Tomaz (Eds.), *The media for democracy monitor 2021: How leading news media survive digital transformation* (pp. 381–454). Nordicom. https://doi.org/10.48335/9789188855404-9

Buzzelli, M. (2020). Modifiable Areal Unit Problem. In A. Kobayashi (Ed.), *International Encyclopedia of Human Geography (Second Edition)* (Second Edition, pp. 169–173). Elsevier. https://doi.org/https://doi.org/10.1016/B978-0-08-102295-5.10406-8

Caluori, U., & Hunziker, M. (2001). Der Wolf: Bedrohung und Lichtgestalt–Deutungsmuster in der Schweizer Bevölkerung. *For. Snow Landsc. Res*, *76*(1), 2.

Canton du Valais. (2021). Initiative populaire "Pour un canton du Valais sans grands prédateurs". Retrieved December 4, 2024, from https://www.vs.ch/web/votel/initiative-populaire-pour-un-canton-du-valais-sans-grands-pr%C3%A9dateurs-

Chancellerie fédérale. (2024). Initiative populaires - Répertoire chronologique. Retrieved December 4, 2024, from https://www.bk.admin.ch/bk/fr/home/politische-rechte/pore-referenzseite.html

Chandelier, M., Steuckardt, A., Mathevet, R., Diwersy, S., & Gimenez, O. (2018). Content analysis of newspaper coverage of wolf recolonization in France using structural topic modeling. *Biological Conservation*, *220*, 254–261. https://doi.org/10.1016/j.biocon.2018.01.029

Chapron, G., Kaczensky, P., Linnell, J. D. C., Von Arx, M., Huber, D., Andrén, H., López-Bao, J. V., Adamec, M., Álvares, F., Anders, O., Balčiauskas, L., Balys, V., Bedő, P., Bego, F., Blanco, J. C., Breitenmoser, U., Brøseth, H., Bufka, L., Bunikyte, R., ... Boitani, L. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science*, *346*(6216), 1517–1519. https://doi.org/10.1126/science.1257553

CHWOLF. (2024). Das Portal für den Wolf in der Schweiz | CHWOLF.org. Retrieved December 5, 2024, from https://chwolf.org/

Conseil fédéral, Département fédéral de l'environnement, des transports, de l'énergie et de la communication, & Secrétariat général DETEC. (2012). Le Conseil fédéral adopte l'ordonnance sur la chasse révisée. Retrieved December 4, 2024, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-45119.html

Conseil fédéral, Office fédéral de l'environnement OFEV, & Secrétariat général DETEC. (2011). Gestion du loup: La Suisse va proposer une modification de la Convention de Berne. Retrieved December 4, 2024, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-42250.html

Conseil fédéral, Office fédéral de l'environnement OFEV, & Secrétariat général DETEC. (2013). Protection des troupeaux: Le Conseil fédéral approuve l'ordonnance sur la chasse révisée. Retrieved December 4, 2024, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-50853.html

Conseil fédéral, Office fédéral de l'environnement OFEV, & Secrétariat général DETEC. (2023). Loup : Le Conseil fédéral met en vigueur la régulation préventive des meutes. Retrieved December 4, 2024, from https://www.bafu.admin.ch/bafu/fr/home/themes/biodiversite/communiques.msg-id-98407.html

Conseil fédéral, Office fédéral de l'environnement OFEV, & Secrétariat général DETEC. (2024). Révision de l'ordonnance sur la chasse : Le Conseil fédéral ouvre la procédure de consultation. Retrieved December 4, 2024, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-100533.html

Council of Europe. (2025). Convention on the conservation of European wildlife and natural habitats (Bern Convention). Retrieved January 27, 2025, from https://www.coe.int/en/web/bern-convention

Cracco, M., Michel, A. H., Komossa, F., Kong, I., Backhaus, N., Thaler, L., Oliveri, T., & Walters, G. (2024). Where is the wolf? A multi-method comparison of social values and perceptions in a Swiss park [_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/wlb3.01267]. *Wildlife Biology*, *n/a*(n/a), e01267. https://doi.org/10.1002/wlb3.01267

Cresswell, T. (2004). *Place: A Short Introduction*. Blackwell Publishing.

Delibes-Mateos, M. (2020). Wolf Media Coverage in the Region of Castilla y León (Spain): Variations over Time and in Two Contrasting Socio-Ecological Settings [Number: 4 Publisher: Multidisciplinary Digital Publishing Institute]. *Animals*, *10*(4), 736. https://doi.org/10.3390/ani10040736

DiBiase, D., MacEachren, A. M., Krygier, J. B., & Reeves, C. (1992). Animation and the Role of Map Design in Scientific Visualization [Publisher: Taylor & Francis]. *Cartography and Geographic Information Systems*, *19*(4), 201–214. https://doi.org/10.1559/152304092783721295

Dressel, S., Sandström, C., & Ericsson, G. (2015). A meta-analysis of studies on attitudes toward bears and wolves across Europe 1976-2012. *Conservation biology : the journal of the Society for Conservation Biology*, *29*(2), 565–574. https://doi.org/10.1111/cobi.12420

Duffy, K. P., Cipparone, H. C., Johnson, E. S., Rickard, L. N., Beard, K., & Nascimento, F. (2020). Leveraging spatial dimensions of news media content analysis to explore place-based differences in natural resource issues. *Journal of Environmental Studies and Sciences*, *10*(3), 303–309. https://doi.org/10.1007/s13412-020-00595-9

Explosion. (2024). spaCy · Industrial-strength Natural Language Processing in Python. Retrieved December 5, 2024, from https://spacy.io/

Federal Statistical Office. (2024). Opendata.swiss. Retrieved December 6, 2024, from https://opendata.swiss/en

Fédération suisse d'élevage ovin FSEO. (2024). Fédération suisse d'élevage ovin FSEO [Section: Article Section]. Retrieved December 4, 2024, from http://www.sszv.ch/

Fög. (2019). *The Quality of the media - Switzerland - Yearbook2019* (R. C. for the Public Sphere & S. at the University of Zurich, Eds.). Schwabe Publishers. Retrieved December 5, 2024, from https://www.foeg.uzh.ch/en/jahrbuch-qdm.html

FSO. (2024). Federal Statistical Office. Retrieved December 6, 2024, from https://www.bfs.admin.ch/bfs/en/home.html

Genovesi, P. (2022). *Piano d'azione nazionale per la conservazione del Lupo (Canis lupus)* (P. Genovesi, Ed.; Vol. 13). Ministero dell'Ambiente - Istituto Nazionale Per La Fauna Selvatica.

Gibson, J., Wellner, B., & Lubar, S. (2008). Identification of duplicate news stories in web pages. *Workshop Programme*, *26*.

Gomes, D. (2024). Geoparser: A customizable geoparsing library for unstructured text. Retrieved December 10, 2024, from https://geoparser.app

Gregory, I. N., & Hardie, A. (2011). Visual GISting: Bringing together corpus linguistics and Geographical Information Systems. *Literary and Linguistic Computing*, *26*(3), 297–314. https://doi.org/10.1093/llc/fqr022

Gregory, I. N., Cooper, D., Hardie, A., & Rayson, P. (2015). Spatializing and analyzing digital texts: Corpora, GIS and places.

Gritta, M., Pilehvar, M. T., Limsopatham, N., & Collier, N. (2018). What's missing in geographical parsing? *Language Resources and Evaluation*, *52*(2), 603–623. https://doi.org/10.1007/s10579-017-9385-8

Gross E, Jayasinghe N., Brooks A., Polet G., Wadhwa R., & Hilderink-Koopmans F. (2021). A Future for All: The Need for Human-Wildlife Coexistence.

Grossmann, C. M., Patkó, L., Ortseifen, D., Kimmig, E., Cattoen, E.-M., & Schraml, U. (2020). Human-Large Carnivores Co-existence in Europe – A Comparative Stakeholder Network Analysis [Publisher: Frontiers]. *Frontiers in Ecology and Evolution*, *8*. https://doi.org/10.3389/fevo.2020.00266

Gruppe Wolf Schweiz. (2024). Groupe Loup Suisse - La voix des grands carnivores en Suisse. Retrieved December 5, 2024, from https://www.gruppe-wolf.ch/fr/Home.htm

Houston, M. J., Bruskotter, J. T., & Fan, D. (2010). Attitudes Toward Wolves in the United States and Canada: A Content Analysis of the Print News Media, 1999–2008. *Human Dimensions of Wildlife*, *15*(5), 389–403. https://doi.org/10.1080/10871209.2010.507563

Hunziker, M., Hoffmann, C. W., & Wild-Eck, S. (2001). Die Akzeptanz von Wolf, Luchs und «Stadtfuchs»–Ergebnisse einer gesamtschweizerisch-repräsentativen Umfrage. *Forest Snow and Landscape Research*, *76*(1/2), 301–326.

Imoberdorf, I., & Emmenegger, R. (2020). Diverging worlds of biodiversity and biosecurity: The presence of wolves in a Swiss Alpine territory [Num Pages: 24]. In *Managing the Return of the Wild*. Routledge.

JagdSchweiz. (2024). ChasseSuisse. Retrieved December 5, 2024, from https://www.chassesuisse.ch/fr/home-fr/

Jones, C. B., & Purves, R. S. (2008). Geographical information retrieval. *International Journal of Geographical Information Science*, *22*(3), 219–228. https://doi.org/10.1080/13658810701626343

Kantonale Verwaltung Uri. (2019). Eidgenössische und kantonale Abstimmung sowie kantonale Gerichtswahlen. Retrieved December 4, 2024, from https://www.ur.ch/abstimmungen/termine/9307

Killion, A. K., Melvin, T., Lindquist, E., & Carter, N. H. (2018). Tracking a half century of media reporting on gray wolves. *Conservation Biology*, *33*(3), 645–654. https://doi.org/10.1111/cobi.13225

KORA. (2020). *Vingt-cinq ans de présence du loup en Suisse : Bilan intermédiaire* (tech. rep. No. 91f) (Series: KORA-Bericht). KORA.

KORA. (2024). KORA – Carnivore Ecology and Wildlife Management. Retrieved December 4, 2024, from https://www.kora.ch/en

Krippendorff, K. (2018). *Content Analysis: An Introduction to Its Methodology* [Google-Books-ID: nE1aDwAAQBAJ]. SAGE Publications.

LCIE & Boitani L. (2022). *Assessment of the conservation status of the Wolf (Canis lupus) in Europe* (tech. rep. No. T-PVS/Inf(2022)45). International Union for Conservation of Nature. Strasbourg. Retrieved April 17, 2024, from https://rm.coe.int/inf45e-2022-wolf-assessment.../1680a7fa47

Ledger, S., Rutherford, C., Benham, C., Burfield, I., Deinet, S., Eaton, M., Freeman, R., Gray, C., Herrando, S., Puleston, H., Scott-Gatty, K., Staneva, A., & McRae, L. (2022). *Wildlife Comeback in Europe: Opportunities and challenges for species recovery. Final report to Rewilding Europe by the Zoological Society of London, BirdLife International and the European Bird Census Council. London, UK: ZSL.*

Leppämäki, T., Toivonen, T., & Hiippala, T. (2024). Geographical and linguistic perspectives on developing geoparsers with generic resources [Publisher: Taylor & Francis]. *International Journal of Geographical Information Science*, *38*(10), 2039–2060. https://doi.org/10.1080/13658816.2024.2369539

Lindgren, A., & Wong, C. (2012). Want to understand local news? Make a map. *Journalism Interest Group, CCA*, *25*.

Linguistic Research Infrastructure | UZH. (2023). Swissdox | LiRI. Retrieved December 5, 2024, from https://www.liri.uzh.ch/en/services/swissdox.html

Linnell, J. D. (2013). *From Conflict to Coexistence? Insights from Multidisciplinary Research into the Relationships between People, Large Carnivores and Institutions* (Report No. N070307/2012/629085/SER/B3). European Commission. Brussels.

Manning, C., Raghavan, P., & Schuetze, H. (2008). *Introduction to Information Retrieval* (Cambridge University Press, Ed.).

Manning, C., & Schutze, H. (1999). *Foundations of Statistical Natural Language Processing* [Google-Books-ID: YiFDxbEX3SUC]. MIT Press.

McCombs, M. e., & Shaw, D. l. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly*, *36*(2), 176–187. https://doi.org/10.1086/267990

Mink, S., Loginova, D., & Mann, S. (2024). Wolves' contribution to structural change in grazing systems among swiss alpine summer farms: The evidence from causal random forest [_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/1477-9552.12540]. *Journal of Agricultural Economics*, *75*(1), 201–217. https://doi.org/10.1111/1477-9552.12540

Nothman, J., Ringland, N., Radford, W., Murphy, T., & Curran, J. R. (2013). Learning multilingual named entity recognition from Wikipedia. *Artificial Intelligence*, *194*, 151–175. https://doi.org/https://doi.org/10.1016/j.artint.2012.03.006

Office fédéral de la statistique. (2020). Votation: Modification de la loi sur la chasse. Retrieved December 4, 2024, from https://www.bfs.admin.ch/bfs/fr/home/statistiques/politique/votations/annee-2020/2020-09-27/loi-chasse.html

Office fédéral de l'agriculture OFAG. (2024). Rapport agricole 2024 – Exploitations d'estivage. Retrieved December 4, 2024, from https://www.agrarbericht.ch/fr/exploitation/structures/exploitations-destivage

Office fédéral de l'environnement OFEV. (2006). Convention de Berne: Le loup toujours strictement protégé. Retrieved December 4, 2024, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-8525.html

Office fédéral de l'environnement OFEV. (2015). Révision de l'ordonnance sur la chasse: Ouverture de la procédure d'audition. Retrieved January 27, 2025, from https://www.admin.ch/gov/fr/accueil/documentation/communiques.msg-id-55925.html

Office fédéral de l'environnement OFEV. (2020). Révision de la loi sur la chasse. Retrieved December 5, 2024, from https://www.bafu.admin.ch/bafu/fr/home/themen/thema-biodiversitaet/biodiversitaet--dossiers/revision-jagd-und-wildtierschutzgesetz.html

Office fédéral de l'environnement OFEV. (2023). Plan Loup. Retrieved April 17, 2024, from www.bafu.admin.ch/uv-1605-f

Office fédéral de l'environnement OFEV. (2024). Deuxième régulation préventive des meutes de loups : État des lieux (fiche d'information). Retrieved November 29, 2024, from https://www.bafu.admin.ch/bafu/fr/home.html

Office fédéral de l'environnement OFEV. (2024). Office fédéral de l'environnement. Retrieved December 4, 2024, from https://www.bafu.admin.ch/bafu/fr/home.html

Office fédéral de topographie swisstopo. (2024). swissNAMES3D. Retrieved December 5, 2024, from https://www.swisstopo.admin.ch/fr/geodata/landscape/names3d.html

Oppal. (2023). Oppal — Organisation pour la protection des Alpages. Retrieved December 5, 2024, from https://oppal.ch

Ordnance Survey. (2024). Ordnance Survey | Great Britain's national mapping service. Retrieved December 5, 2024, from https://www.ordnancesurvey.co.uk/ordnance-survey-see-a-better-place

Ortmann, K., Roussel, A., & Dipper, S. (2019). Evaluating Off-the-Shelf NLP Tools for German. *Proceedings of the 15th Conference on Natural Language Processing (KONVENS 2019): Long Papers*, 212–222.

Parc National Suisse. (2024). Stellungnahme des Schweizerischen Nationalparks zur Abschussverfügung für das Fuorn-Wolfsrudel. Retrieved December 5, 2024, from https:

//nationalpark.ch/fr/medianews/stellungnahme-des-schweizerischen-nationalparks-zur-abschussverfuegung-fuer-das-fuorn-wolfsrudel/

Paterson, L. L., & Gregory, I. N. (2019). *Representations of Poverty and Place: Using Geographical Text Analysis to Understand Discourse*. Springer International Publishing. https://doi.org/10.1007/978-3-319-93503-4

Pro Natura. (2024). Appel à la Confédération et au canton: Éradiquer la meute du Parc national va beaucoup trop loin | Pro Natura. Retrieved December 5, 2024, from https://www.pronatura.ch/fr/2024/appel-la-confederation-et-au-canton-eradiquer-la-meute-du-parc-national-va-beaucoup-trop-loin

Purves, R. S., & Mackaness, W. A. (2016). A methodological toolbox for exploring collections of textually annotated georeferenced photographs. In C. Capineri, M. Haklay, H. Huang, V. Antoniou, J. Kettunen, F. Ostermann, & R. Purves (Eds.), *European Handbook of Crowdsourced Geographic Information* (pp. 145–156). Ubiquity Press. https://doi.org/10.5334/bax.k

Purves, R. S., Clough, P., Jones, C. B., Hall, M. H., & Murdock, V. (2018). Geographic Information Retrieval: Progress and Challenges in Spatial Search of Text. *Foundations and Trends® in Information Retrieval*, *12*(2-3), 164–318. https://doi.org/10.1561/1500000034

Purves, R. S., Koblet, O., & Adams, B. (Eds.). (2022). *Unlocking Environmental Narratives: Towards Understanding Human Environment Interactions through Computational Text Analysis*. Ubiquity Press. https://doi.org/10.5334/bcs

Python Software Foundation. (2024a). Re — Regular expression operations. Retrieved December 6, 2024, from https://docs.python.org/3/library/re.html

Python Software Foundation. (2024b). Welcome to Python.org. Retrieved December 6, 2024, from https://www.python.org/

Řehůřek, R. (2024). Gensim: Topic modelling for humans. Retrieved December 9, 2024, from https://radimrehurek.com/gensim/

Rinner, C., Komaromy, A., & Lindgren, A. (2018). Geospatial tools for the visualization and analysis of local news distribution. *Future Local News: Res. Reflections, Ryerson Journalism Res. Centre*, 1–22.

Rodier, S., & Carter, D. (2020). Online Near-Duplicate Detection of News Articles. In N. Calzolari, F. Béchet, P. Blache, K. Choukri, C. Cieri, T. Declerck, S. Goggi, H. Isahara, B. Maegaard, J. Mariani, H. Mazo, A. Moreno, J. Odijk, & S. Piperidis (Eds.), *Proceedings of the Twelfth Language Resources and Evaluation Conference* (pp. 1242–1249). European Language Resources Association. https://aclanthology.org/2020.lrec-1.156

Roy, S. G., McGreavy, B., Quiring, T., & Druschke, C. G. (2022). Damming news: Geospatial media discourse analysis of dams. *Environmental Management*, *70*(5), 840–854. https://doi.org/10.1007/s00267-022-01715-7

Savanta. (2023). *Understanding rural perspectives: A survey on attitudes towards large carnivores in rural communities* (tech. rep.). Eurogroup for Animals, Humane Society International/Europe, Fondation Brigitte Bardot, Dierenbescherming, Djurskyddet Sverige, Deutscher Tierschutzbund, World Animal Protection Denmark, World Animal Protection Netherlands, World Animal Protection Sweden, LAV. Retrieved October 4, 2024, from https://www.eurogroupforanimals.org/news/survey-wolves-should-be-strictly-protected-majority-rural-inhabitants-say

SBERT. (2024). Pretrained Models — Sentence Transformers documentation. Retrieved December 10, 2024, from https://www.sbert.net/docs/sentence_transformer/pretrained_models.html

scikit-learn developers. (2024a). 2.3. Clustering. Retrieved January 15, 2025, from https://scikit-learn/stable/modules/clustering.html

scikit-learn developers. (2024b). K-Fold cross-validator. Retrieved December 9, 2024, from https://scikit-learn/stable/modules/generated/sklearn.model_selection.KFold.html

Société suisse d'économie alpestre. (2024). Société suisse d'économie alpestre. Retrieved December 4, 2024, from https://www.alpwirtschaft.ch/fr/societe/sections-cantonales/

Sponberg, V. B., & Mathiesen, K. E. (2022). Media's portrayal of large predators in Norway from the protection by law in the 1970's till today: An insight into local and national newspapers. *GeoJournal*, *88*(3), 2705–2720. https://doi.org/10.1007/s10708-022-10763-9

SRG SSR. (2024). SRG SSR. Retrieved December 5, 2024, from https://www.srgssr.ch/en/home

Swissdox. (2024). Archives média. Retrieved December 5, 2024, from https://swissdox.ch/fr/archives-media/

swisstopo. (2024). Swisstopo – knowing where. Retrieved December 6, 2024, from https://www.swisstopo.admin.ch/en

The Getty Research Institute. (2024). Getty Thesaurus of Geographic Names (Getty Research Institute). Retrieved December 5, 2024, from https://www.getty.edu/research/tools/vocabularies/tgn/

Trainotti, N., Fedrigotti, C., Malavasi, S., Pedrini, P., & Bombieri, G. (2024). Wolf coverage and framing by newspapers across the Italian Eastern Alps. *Human Dimensions of Wildlife*, *29*(2), 176–193. https://doi.org/10.1080/10871209.2023.2212691

Union suisse des paysans. (2024). Union suisse des paysans - Au service de l'agriculture suisse. Retrieved December 4, 2024, from https://www.sbv-usp.ch/fr/

Unxos GmbH. (2024). GeoNames. Retrieved February 28, 2024, from https://www.geonames.org/

von Arx, M., Imoberdorf, I., & Breitenmoser, U. (2020). How to communicate wolf? Communication between the authorities and the population when wolves appear. In S. Hose & M. Heyer (Eds.), *Encounters with Wolves. Dynamics and Futures / Begegnungen mit Wölfen* (pp. 124–136, Vol. 32). Sorbisches Institut Bautzen. https://www.serbski-institut.de/downloads_old/dnlarchiv/Kleine_Reihe_32_web.pdf

WWF Suisse. (2023). Pour le loup et contre un nouveau référendum. Retrieved December 5, 2024, from https://www.wwf.ch/fr/stories/pour-le-loup-et-contre-un-nouveau-referendum

Zierhofer, W. (2005). „Röstigraben "–A Discourse on National Identity in Switzerland [Publisher: Ashgate Aldershot]. *B/ordering Space*, 223.

Zscheischler, J., & Friedrich, J. (2022). The wolf (canis lupus) as a symbol of an urban–rural divide? Results from a media discourse analysis on the human–wolf conflict in Germany. *Environmental Management*, *70*(6), 1051–1065. https://doi.org/10.1007/s00267-022-01719-3

Appendix

List of appendixes delivered with the master thesis:

A Topics found in the literature

B GitLab project: https://gitlab.uzh.ch/geocomp/wolf_debate_swiss_media

C Quotes from news media articles

D Irrelevant topics found in the French and German corpus

E Individual-year small multiples

Appendix A: Topics found in the literature

The tables summarize per themes the topics found in similar wolf media studies of Chandelier et al. (2018), Delibes-Mateos (2020), Killion et al. (2018), and Trainotti et al. (2024).

Original Paper			
Killion et al., 2018	Trainotti et al., 2024	Chandelier et al., 2018	Delibes-Mateos, 2020

Topic name	Description or example if provided	Words
Topics found in literature about '*Policy and wolf management*'		
Policy	"The policy topic included the details of the Endangered Species Act and policy options."	speci, endang, feder, protect, group,remove, list, act, rule, govern
Implementation	"How policies or management plans would be, or were, carried out and the parties responsible for those actions."	state, manag, plan, feder, propos, offici, depart, agenc, delist, bill
wolf management		
wolf attack prevention		
Lethal methods of wolf regulation	e.g. wolf national plan	Wolf, shot, attack, farmer, authoriz, more/less, livestock, harvest, protect, driven hunt, prefect, animal, hunting, associ, national, last, be, alpes-maritim, arrest, franc
Alternative solutions to livestock protection	e.g. help in watching livestock	Breeder, wolf, livestock, shepherd, sheph, help, dog, protect, franc, pastoral, more/less, associ, ovine, year, var., volunteer, animal, park ranger, all, mountain pasture
Topics found in literature about '*Conflict (farmer)*'		
Wolf-livestock interactions	"wolf attacks on livestock, management options to reduce or compensate livestock losses caused by wolves (e.g., fencing,guardian dogs, culling by social rangers, compensation schemes, etc.), farmers' claims for wolf attacks on livestock or policymakers declarations of intention to seek solutions for livestock damage caused by wolves."	
Wolf-livestock coexistence	"reference to both wolf conservation and wolf-livestock interaction. For example, regional wolf management plan, whose main goal is to promote the coexistence of wolf occurrence and conservation with traditional rural activities such as livestock raising"	
wolf predation on domestic or wild animals		

Consequences of wolf presence (wolf-centred)	e.g. attacks of wolves on livestock	Wolf, ewe, beast, sheep, livestock, more/less, since, attack, two, dog, other, animal,sheph, all, slaughter, breeder, park, mercantour, last, shepherd.
Consequences of wolf presence (farmers' experience centred)	e.g. testimony from a shepherd	Wolf, attack, more/less, livestock, breeder, beast, ewe, dog, sheph, animal, two, Wolf, attack, more/less, livestock, breeder, beast, ewe, dog, sheph, animal, two,
conflict	"instances of human-wolf conflict, largely the depredation of livestock and negative perceptions of wolves by stakeholders."	kill, livestock, ranch, people, sheep,attack, go, anim, land, cattle
Topics found in literature about '*Conflict (public)*'		
Wolf impact on human activities		
Demonstrations and claims in reaction to wolf presence	e.g. demonstration to support the pastoral economy	Wolf, shepherd, breeder, more/less, livestock, attack, two, all, patou, predator,comm, pastoral, park, sheep, dog, mayor, sheph, other, do, mercantour
Reactions to wolf'presence	e.g. wolf poached and hanged on a tree	Wolf, agricultural, more/less, president, breeder, farmer, agriculture, chamber, all, also, young, mountain, do, other, comm, good, still, fact/done, achievement
Demonstrations of militant groups	e.g. demonstrators save the wolf	Wolf, breeder, two, manifest, hautes-alp, more, animal, between, franc, sheep,plac, after, against, all, gap, have, hour, beast, other, ewe
Debates involving stakeholders and institutions	e.g. meeting of parliament and agricultural syndicates	Wolf, franc, commiss, more/less, agricultur, national, ministr, president, deput,presenc, breeder, all, predator, estros, park, area, elected officials, measur, protect,associ
Topics found in literature about '*Wolf conservation and status*'		
Wolf conservation	"need to conserve the wolf or references to factors that may threaten the conservation of this top predator. Among others, references to conservationists' claims about the negative effects of hunting on wolf conservation or the potential risks that the construction of human infrastructures like roads may have for wolves."	
recovery	"reintroduction process and recovery of wolves."	park, nation, area, recov, release,program, reintroduct, central,return, wild
status	"biological status of wolves and reports of their location and number" .	pack, kill, biologist, offici, near, area,report, first, pup, anim
wolf population status		
wolf sighting and dead wolf findings		
Scientific monitoring of the wolf	e.g. wolf capture and equipped with transmitter	Wolf, captur, mercantour, park, more/less, animal, two, predator, hunt, scientif,three, equipment, other, collar, all, be, species, wolf, lupus, since
Wolf recovery and human interactions France/Italie	e.g. wolf sighting in national park	Wolf, park, mercantour, two, animal, more/less, can, lupus, national, other, last,according to, predator, administ, since, all, approximatively, first, valley, species
Wolf presence in the Mercantour national park	e.g. wolf in the national park	Park, wolf, mercantour, more/less, two, common, all, council, chart, national,mayor, fact/done, vall, comm, last, do, other, be, big, first

Topics found in literature about '*Hunting and poaching*'		
Hunting	"wolf as a game species. For example, documents about the number of wolves that the government allowed hunters to kill in a particular hunting season or the monetary income generated by wolf hunting in some areas."	
Hunting	"information about hunting wolves and how wolves affect hunters who hunt wolf prey."	hunt, elk, game, popul, hunter,number, predat, kill, season, herd
Interactions between wolves and fauna	e.g. evolution of the chamois and mouflon population	Wolf, hunter, more, hunt, animal, species, mercantour, mouflon, chamois, bernard, popul, comm, all, last, park, baudin, wild boar, faun, wild, high
Poaching	"illegal killing of wolves, including poisoning, illegal shooting, trapping, etc."	
wolf poaching		
Topics found in literature about '*Wolf tourism*'		
Natural value	"wolf as an attraction for tourists and the natural value of some areas and referred specifically to wolf occurrence as one of the main assets of such areas."	
Topics found in literature about '*Dissemination and wolf representation*'		
Dissemination	"activities that aimed to disseminate knowledge about the wolf, including conferences, courses, or exhibitions."	
public event about wolf		
Wolf representations	e.g. wolf in mythology and religion	Wolf, more/less, animal, franc, associ, human/man, mercantour, park, give, all,give back/make, shepherd, since, comm, fact/done, good, organis, protect, wild,burl
Historical and pedagogical dimensions of wolf presence	e.g. exhibition and events to linked to celebrate the return of the wolf	Wolf, child, more/less, all, fairy tale, animal, hour, story, human, big, book, good,other, film, spectacl, small, fact/done, franc, current, discover.
Representation of wolves and human public interactions	e.g. animals released from zoo	Wolf, park, alpha, center, more/less, saint-martin-vésub, boreon, two, all, animal,three, visitor, first, pack, comm, franco, fact/done, other, day, project

Appendix C: Quotes from news media articles

Q#	Quotes in original languages
Q1	"Après l'attaque d'une meute sur les vaches de l'alpage de la Rionde Dessus, un projet pilote a été mis en place. Les animaux semblent apprécier. Le berger un peu moins. Les quarante vaches qui gambadent joyeusement dans le pré de la Rionde Dessus sont des stars en plus d'être des superhéros." *(tdg.ch, 02.09.2020)*
Q2	"Après l'attaque d'une meute sur des vaches dans le Jura vaudois, une clôture spéciale a été installée. Les animaux semblent apprécier ce projet pilote. Le berger moins. Les 40 vaches qui gambadent joyeusement dans le Jura vaudois, non loin de Genève, sont des stars." *(Tribune de Genève, 04.09.2020)*
Q3	"Der Wolf M35, der in Goms innerhalb eines Monats 28 Schafe gerissen hat, wird nicht zum Abschuss freigegeben. Die Schafe seien nicht genügend geschützt gewesen, teilte das Bundesamt für Umwelt (Bafu) mit." *(nzz.ch, 13.06.2013)*
Q4	"Die Walliser Bauern machen es sich zu einfach beim Umgang mit dem Wolf. Der Wolf M35, der im Goms (VS) innerhalb eines Monats 28 Schafe gerissen hat, wird nicht zum Abschuss freigegeben. Die Schafe seien nicht genügend geschützt gewesen, teilte das Bundesamt für Umwelt (Bafu) am Freitag mit." *(Tages-Anzeiger, 14.06.2013)*
Q5	"Pagaille dans l'élevage. SAINT-GALL Un mouton mort, d'autres grièvement blessés et un troupeau éparpillé dans la nature. [...] GRAND GENÈVE Le Conseil fédéral a validé mercredi les subventions destinées à de gros projets de mobilité sur sol français.[...] HAUTE-SAVOIE (F) Le sexagénaire porté disparu depuis cinq jours sur le Salève a été retrouvé sans vie, jeudi. [...]" *(20 minutes, 02.2023)*
Q6	"Riss Wolf noch mehr Schafe? SITTEN VS - Der Wolf, der im Aletschgebiet über 50 Schafe gerissen hat (gestern im BLICK), könnte der selbe sein, der schon seit über einem Jahr im Mittelwallis sein Unwesen treibt. [...] Delphingeburt im Freizeitpark LIPPERSWIL TG - Ein gesundes Delphinbaby ist in der Nacht auf ges-tern im Thurgauer «Conny Land» zur Welt gekommen. [...] Auf Flucht 5 Autos demoliert BASEL - In einer wilden Flucht durch Basel knallte ein 24-jähriger Einbrecher in drei parkierte Autos und ein Polizeifahrzeug, beschädigte dabei auch sein gestohlenes Fluchtfahrzeug. [...]" *(Blick, 07.2000)*
Q7	"Voilà dix ans que les critères permettant de «réguler» le canidé s'assouplissent peu à peu en Suisse, jusqu'à prévoir l'abattage de 62% des meutes. [...] Comment la possibilité d'abattre un animal auparavant quasi intouchable s'est-elle autant facilitée? Et en si peu de temps? En sachant que ce n'est pas fini. Fin août dernier, l'Office fédéral de l'environnement (OFEV) a décidé de se passer d'une consultation ordinaire pour proposer, en catimini, un véritable changement de stratégie face au prédateur. En décembre prochain, il sera peut-être possible, suivant certains critères (la pression du gibier sur la forêt par exemple), de décimer littéralement les meutes si elles dépassent un certain seuil par région. Par exemple deux sur tout le Jura, de Genève à Brugg (AG)" *(24 heures, 09.2023)*
Q8	"La Convention alpine et ses protocoles d'application suscitent des craintes dans les cantons alpins. Lancée par des Verts allemands, sans souci des intérêts et des besoins des populations vivant dans la zone que la convention est pourtant censée protéger, cette législation est l'exemple de ce qui nous attend demain. Il suffit pourtant de voir comment est perçu le retour du loup, selon que l'observateur vit à Genève ou au fond du val d'Hérens, pour mesurer la distance qui sépare la théorie de la réalité. Concoctée hors de Suisse et peaufinée lors de savants colloques réunissant des Européens à la fibre écologique sensible, cette législation est une culture hors sol. Vu de Berlin, de Paris ou même de Zurich, l'arc alpin est un espace à protéger absolument, une réserve où loups, lynx et bientôt ours devraient pouvoir s'ébattre librement, sans avoir à se soucier de l'homme, qui n'a qu'à vivre en ville... Vu des Grisons ou du Valais, l'arc alpin est un cadre de vie que les indigènes n'ont pas si mal aménagé et protégé jusqu'ici." *(Le Matin, 04.2000)*

Q#	Quotes in original languages
Q9	"Jean Bonnard «En égorgeant environ 40 moutons au sud et au nord du Simplon, le loup a causé des dommages considérables, souligne le Parti démocrate-chrétien du Haut-Valais. La mauvaise humeur se répand parmi les éleveurs de moutons et de chèvres...» Ces députés sont intervenus par voie d'interpellation auprès du Conseil d'Etat. Ils font remarquer que l'indemnisation fixée pour chaque animal victime du loup n'est pas satisfaisante. «Les éleveurs accordent plus de valeur à certaines bêtes en fonction de leurs particularités: bêtes primées, reproducteur ou non, etc.», argumentent-ils. Le désaccord ne porte pas que sur cela. Les agriculteurs du Haut-Valais trouvent injuste que seuls les animaux faisant partie de troupeaux surveillés par des bergers ou des chiens donneraient droit à ces indemnités. Les élus haut-valaisans jugent ces mesures trop radicales pour l'élevage valaisan, les exigences de gardiennage étant jugées peu réalistes, compte tenu de la dissémination et de la petite dimension des troupeaux. Enfin, dernier point soulevé: le loup est-il arrivé naturellement ou a-t-il été introduit illégalement dans la région du Simplon? Le Conseil d'Etat devrait répondre à cette interpellation lors de la prochaine session du Parlement." *(le Matin, 04.1999)*
Q10	"Noch vor ein paar Jahren waren das Erfolgsmeldungen: Der Biber ist wieder heimisch in der Schweiz. Der Luchs erfolgreich ausgesetzt. Der Wolf eingewandert. Und der Bär auch. Das waren noch Zeiten! Heute werden die Tiere nicht mehr geschützt, sondern gemanagt. [...] Liliane Minor ist TA-Redaktorin und wohnt in Bachenbülach." *(Tages-Anzeiger, 04.2008)*
Q11	"Val ferret. Sur les traces de la bête. Chien errant ou loup? Reportage et photos en compagnie des bergers qui ont déjà perdu plus de 70 moutons" *(L'Illustré, 08.1995)*
Q12	"Seit Ende Juli hat ein «wildes Tier» im Unterwalliser Val Ferret im Bezirk Entremont über 60 Schafe gerissen oder in den Tod gejagt." *(Der Bund, 08.1995)*
Q13	"L'annonce au début de la semaine de la présence d'un deuxième loup sévissant en Valais dans la région d'Aletsch, et ayant tué une soixantaine de moutons depuis un mois, avait causé une nouvelle poussée d'adrénaline au Service de la chasse du canton." *(Le Temps, 07.2000)*
Q14	" «Je ne veux pas, nous ne voulons pas, du loup ici!» Elle sait ce qu'elle dit, et pourquoi elle le dit. L'automne dernier, sur les alpages qui dominent Evolène, le prédateur avait déjà occis trois moutons dans le troupeau appartenant à Monique et à sa soeur Chantal. Il a récidivé (ou peut-être un autre, allez savoir...) dans la nuit du 29 au 30 avril, croquant trois agneaux, et complétant son menu en tuant trois bêtes un peu plus loin, chez Jean-Lucien Fauchère. " *(Le Matin, 05.2000)*
Q15	"RIEDERALP VS - Über 50 Schafe soll ein Wolf im Aletschgebiet seit dem 25. Juni gerissen haben." *(Blick, 07.2000)*
Q16	"Einmal mehr versetzt der Wolf das Oberwallis in Angst und Schrecken: Elf Schafe hat er übers Wochenende im Turtmanntal angegriffen. Sieben Tiere wurden dabei getötet, vier kamen mit Verletzungen davon. Ein zweiter Wolf?. Unklar ist, ob es sich beim Übeltäter um den zum Abschuss freigegebenen Wolf aus dem Val d'Hérens handelt oder aber um ein zweites Tier, wie ein Sprecher des Bundesamts für Umwelt, Wald und Landschaft (Buwal) gestern sagte." *(Neue Luzerner Zeitung, 08.2000)*
Q17	"Le couperet est tombé pour le loup du val Bregaglia: le Conseil d'Etat grison a donné mardi l'ordre de le tirer. Le prédateur venu d'Italie a tué 50 moutons et agneaux depuis avril, épuisant le quota fixé par les autorités fédérales pour pouvoir ordonner son abattage." *(Le Temps, 08.2001)*
Q18	"CHUR - Die Schafzüchter im Bergell haben die Nase voll: Sie fordern, dass ein aus Italien eingewanderter Wolf zum Abschuss freigegeben werde." *(Blick, 08.2001)*
Q19	"De nouveaux concepts « lynx et loup » ont été mis en consultation jusqu'à lundi par l'Office fédéral de l'environnement, des forêts et du paysage (Ofefp). Pour Pro Natura, ces textes « ouvrent la porte à l'abattage des grands prédateurs » et doivent être retirés." *(Tribune de Genève, 03.2004)*
Q20	"JURA Son arrivée était pressentie depuis des années: la preuve en est faite désormais: le loup a fait son apparition en Ajoie et dans le Jura neuchâtelois. " *(Le Matin, 02.2005)*
Q21	"Am Mont d'Or bei Vallorbe beobachtet ein Wildhüter einen Wolf, ein anderes Tier wird im Vallée du Joux gesichtet und bei Yverdon sollen sich gar zwei Isegrime in einer Kiesgrube aufgehalten haben. Das wäre die erste Beobachtung aus dem Mittelland." *(Solothurner Zeitung / MLZ, 03.2005)*

Q#	Quotes in original languages
Q22	"FRIBOURG · Le prédateur a-t-il franchi de nouvelles régions cantonales pour s'installer en Gruyère? L'analyse d'une crotte suspecte le dira . «Nous saurons dans quinze jours s'il s'agit d'un loup. Si c'est le cas, après la présence du lynx, un nouveau problème se posera à nous.»" *(Le Temps, 08.2000)*
Q23	"Graubünden könnte in naher Zukunft der erste Kanton sein, in dem die drei Grossraubtiere Luchs, Wolf und Bär wieder heimisch sind. Dies zeigt eine Studie des WWF über mögliche Lebensräume für Braunbären in den Alpentälern der Schweiz." *(St. Galler Tagblatt, 04.2005)*
Q24	"Tier und Wald erobern die Schweiz zurück. Was die Schweizer über Verwilderung denken, fand die Forscherin Nicole Bauer in einer Umfrage bei 1500 Haushalten heraus." *(Tages-Anzeiger, 10.2005)*
Q25	"Une bête sauvage a tué trois faons en une semaine en terres gruériennes. Les premiers indices pointent du doigt le loup. Le prédateur serait ainsi de retour dans le canton de Fribourg alors qu'il s'y était fait discret en 2008. Les trois événements ont été recensés respectivement le 5mars à Broc, le 8mars à Epagny et le 13mars à Estavannens" *(24 Heures, 03.2009)*
Q26	"DNA-Analysen von Kot- und Speichelproben haben bestätigt: Ein Wolf hat in den Kantonen Bern und Freiburg mehrfach Schafherden angegriffen." *(derbund.ch, 07.2009)*
Q27	"»RECOURS - A l'heure où l'Italie dénonce «l'extermination» de l'espèce en Suisse, l'association a annoncé hier qu'elle s'opposera à l'abattage du canidé présent dans le Chablais. Le WWF Suisse n'en démord pas. Le Conseil d'Etat valaisan rejetait fin octobre sa demande de reporter l'autorisation de tir du loup du Chablais. L'animal s'est attiré les hostilités, rappelons-le, depuis qu'il a tué 33 ovins dans un alpage de Collombey-Muraz." *(24 heures Région Lausannoise, 11.2006)*
Q28	"Im Unterwallis haben Wildhüter am Dienstag einen Wolf geschossen. Das Tier wurde in der Region von Arcojeux im Bezirk Monthey erlegt, nahe dem Ort, wo es zu Angriffen auf Schafe gekommen war. Ob es sich um jenes Tier handelte, das Ende September 31 Schafe gerissen hatte, ist nicht geklärt. Der WWF prüft eine Strafanzeige gegen die Regierung." *(Neue Zürcher Zeitung, 11.2006)*
Q29	"LUCERNE. Le canton de Lucerne a autorisé hier le tir du loup qui a égorgé au moins vingt-sept moutons au cours des dernières semaines. Le dépassement de la limite tolérée permet de prendre cette mesure dans un périmètre restreint de la vallée de l'Entlebuch. L'autorisation de tir est cependant limitée à soixante jours." *(20 Minutes, 08.2009)*
Q30	"200 Jahre hat man im Kanton Luzern auf ein Wiedersehen mit Isegrimm gewartet. Dann kam er – und muss nun bereits wieder gehen. Der Wolf hat im Entlebuch im Juli 27 Schafe gerissen und wird zum Abschuss freigegeben. Das Todesurteil für das geschützte Tier wird damit begründet, dass es zur Zeit keine andere Möglichkeit gebe, die Schafe zu schützen. " *(Newsnetz, 08.2009)*
Q31	"La meute de loups observée depuis septembre dans les Grisons compte huit individus, et non six comme supposé jusqu'ici. Les gardes-chasse ont pu les observer la semaine passée au pied du Calanda, massif dans lequel ils ont élu domicile. Il s'agit de la première meute de loups observée en Suisse depuis le retour du canidé dans le pays, en 1995." *(20 minutes, 12.2012)*
Q32	"Ein Wolfspaar in Graubünden hat Nachwuchs bekommen. Am Calanda im Bündner Rheintal sind Welpen gesichtet worden. Damit ist erstmals seit der Rückkehr des Wolfes in die Schweiz ein Wolfsrudel nachgewiesen worden. " *(Neue Zürcher Zeitung, 09.2012)*
Q33	"Les Cantons pourront prendre plus facilement des mesures pour juguler les effectifs de loups, de lynx, de castors et autres ours. Le Conseil fédéral a décidé hier de mettre en vigueur l'ordonnance sur la chasse révisée." *(20 minutes, 06.2012)*
Q34	"Der Bundesrat beugt sich beim Revidieren der Jagdverordnung – der Jägerlobby! Der Schutz von Luchs und Wolf wird aufgeweicht. Die Begründung ist haarsträubend, Wölfe und Luchse dürfen abgeknallt werden, «wenn sie die Jäger konkurrieren»." *(Der Landbote, 07.2012)*
Q35	"La Confédération a lancé vendredi l'audition concernant la révision de l'ordonnance sur la chasse, dans laquelle il propose d'accorder la compétence aux cantons pour le tir des loups. Dès juin, les cantons devraient pouvoir décider seuls d'abattre un loup qui a mangé des moutons, propose l'Office fédéral de l'environnement (OFEV)." *(RTS.ch, 01.2015)*

Q#	Quotes in original languages
Q36	"In den vergangenen Wochen rissen Wölfe unter anderem in den Kantonen Ob- und Nidwalden, Wallis und Uri mehrere Schafe. Nun reagiert der Bundesrat und passt die Verordnung an." *(srf.ch, 06.2015)*
Q37	"FAUNE Un jeune loup a été écrasé mercredi soir par un train à Schlieren, aux portes de Zurich. Cette présence du canidé est une première dans le canton et en milieu urbain depuis le retour de l'espèce en Suisse." *(Le Matin, 06.2014)*
Q38	"Ein Wolf, überfahren in Schlieren, im dicht besiedelten Limmattal – diese Meldung macht Schlagzeilen. Schlieren, das liegt praktisch an der Grenze zum Kanton Aargau." *(srf.ch, 06.2014)*
Q39	"Erstfeld (UR) Un loup a tué huit moutons dans la région d'Erstfeld. On ne sait pas encore s'il s'agit de l'animal photographié à la fin du mois d'avril à Seelisberg (UR). Il pourrait aussi s'agir d'un autre loup, qui a tué et blessé plusieurs moutons en mai dans la région d'Isenthal (UR)." *(Tribune de Genève, 06.2016)*
Q40	"Altdorf – Über 30 Schafe hat ein Wolf in den vergangenen zwei Wochen in Isenthal UR gerissen. Zwei Alpen und zwei Heimwesen suchte der Wolf heim, rund ein Dutzend Schafe werden zusätzlich vermisst." *(Blick, 06.2015)*
Q41	"Une prime de 10 000 francs est offerte pour retrouver celui qui a abattu illégalement une louve dans le val d'Anniviers. Une enquête pénale a également été ouverte. Après la chasse au loup, c'est une véritable chasse à l'homme qui a été lancée, hier, en Valais." *(Le Matin, 02.2017)*
Q42	"Im Val d'Anniviers ist eine erschossene Wölfin gefunden worden. Der Wolf ist im Kanton ein Dauerthema. Eine kürzlich eingereichte Initiative fordert ein Wallis ohne Grossraubtiere. Offenbar hat jemand schon damit angefangen, den Wolfbestand zu dezimieren." *(Tages-Anzeiger, 02.2017)*
Q43	"Les propriétaires de moutons et autres petits animaux d'élevage de la région de Wässern (AR) ont été avertis via SMS d'une éventuelle présence du loup. Deux moutons ont en effet été retrouvés morts, dimanche sur une prairie de Heiden (AR)" *(20 minutes online, 03.2017)*
Q44	"Appenzell. Auf einer Alp bei Urnäsch AR ist ein Reh von einem Wolf gerissen worden. Dies teilte die Ausserrhoder Kantonskanzlei gestern mit. Nach ersten Abklärungen stammte der Wolf aus Italien. Er könnte aber schon länger durch die Schweiz streifen. Es ist das zweite Mal, dass ein Wolf in Ausserrhoden zuschlägt." *(Neue Luzerner Zeitung, 04.2015)*
Q45	"Entre un et trois loups, de jeunes mâles solitaires, ont été identifiés sur le sol vaudois, qu'ils quittent d'ailleurs parfois. L'an dernier, ils ont attaqué à cinq reprises des troupeaux de moutons, sur des alpages de L'Abbaye et d'Arzier." *(24heures.ch, 05.2017)*
Q46	"Der Wolf hat sich in diesem Winter erstmals wieder ins Mittelland vorgewagt. Ein Raubtier attackierte im Dezember kurz hintereinander zwei Schafherden im Kanton Waadt und tötete insgesamt vier Tiere. " *(cash.ch, 01.2014)*
Q47	"Le jeune loup signalé en Gruyère ces derniers jours est un mâle. Une nouvelle observation a eu lieu samedi matin à Charmey. Des crottes et des poils ont été récupérés à des fins d'analyse. Déjà aperçu deux fois en zone urbaine, à Bulle et à Broc, il se montrait peu farouche, selon des témoignages recueillis par La Liberté." *(24 heures, 02.2017)*
Q48	"Ein junger Wolf ist im Kanton Freiburg zweimal in städtischem Gebiet gesichtet worden: Am Sonntag in Bulle und am Dienstag in Broc. Für die Menschen bedeute das keine Gefahr, hiess es bei den zuständigen Behörden nach der Publikation von Leserbildern in «20minutes». Spezialisten suchten nach Kot und Haaren des Tiers, um es zu identifizieren." *(Aargauer Zeitung / MLZ, 02.2017)*
Q49	"L'État fait une demande à Berne pour abattre deux carnassiers. Ils sont soupçonnés d'avoir dévoré six bovins. C'est du jamais-vu! Le Département de l'environnement et de la sécurité (DES) du Canton de Vaud va envoyer, pour la première fois de son histoire et «dans les plus brefs délais», une demande à la Confédération pour abattre le loup." *(Tribune de Genève, 08.2021)*
Q50	"Der Wolf breitet sich auch in der Romandie weiter aus. Im Kanton Waadt hat sich im vergangenen Sommer ein zweites Rudel etabliert. Die Präsenz des Rudels in der Region Risoud im Vallée de Joux im Waadtländer Jura sei bestätigt worden, nachdem in der Gegend ein Jungtier beobachtet worden sei, teilte der Kanton Waadt am Freitag mit." *(blick.ch, 09.2021)*

Q#	Quotes in original languages
Q51	"Le ministre de l'Environnement Albert Rösti avait sonné la grande chasse au loup en Suisse. Les cantons des Grisons, du Tessin, de St-Gall et du Valais ont annoncé avoir abattu quelque 51 loups au cours des deux derniers mois. Mais à Altstätten (SG), un loup s'est tranquillement promené dans les ruelles." *(blick.ch, 03.2024)*
Q52	" Der Wolf wird im Kanton Zürich immer mehr zum Thema. Vor wenigen Wochen riss ein Tier in Bonstetten 25 Schafe, auch im zugerischen Oberägeri wurde ein Wolf gesichtet. Könnten die Tiere hier bald heimisch werden? Experten halten dies für möglich. Ein besonders geeignetes Gebiet wäre die Albisregion. Dort gebe es viel Wald und Tiere, die der Wolf gerne frisst. " *(Zürichsee-Zeitung, 04.2022)*
Q53	"La révision de la loi sur la chasse divise. Pour ses partisans, elle «améliore la sécurité pour les animaux, la nature et l'homme. Ses opposants jugent qu'elle «menace la protection des espèces animales». Les conditions présidant à l'abattage du loup en sont le morceau de choix. Le peuple tranchera le 27 septembre prochain." *(swissinfo.ch, 07.2020)*
Q54	"Neues Jagdgesetz: Abstimmung vom 27. September. Um jedes gerissene Schaf gibt's ein grosses Tamtam, und 19 Schafe sind schon ein Skandal. Der Wolf ist halt ein praktisches Abstimmungssujet." *(Wiler Zeitung, 08.2020)*
Q55	"Vingt-cinq ans après le retour du loup, le canton veut ancrer dans sa Constitution sa défiance vis-à-vis des grands prédateurs. Un vote très identitaire, mais qui aura peu d'effets." *(lematin.ch, 11.2021)*
Q56	"Nun ist es amtlich: Die Walliserinnen und Walliser mögen keine Grossraubtiere – und schon gar nicht den Wolf. Zwei Drittel sagen Ja zur Initiative «Für ein Wallis ohne Grossraubtiere», im deutschsprachigen Oberwallis sind es sogar über 80 Prozent." *(srf.ch, 11.2021)*
Q57	"Dimanche 10 février, les Uranais devront dire s'ils acceptent d'ancrer la régulation des grandes prédateurs comme le loup, le lynx ou encore l'ours dans leur constitution cantonale. Une votation très attendue dans l'arc alpin." *(RTS.ch, 02.2019)*
Q58	"Am 10. Februar werden die Urnerinnen und Urner an der Urne über die kantonale Volksinitiative «Zur Regulierung von Grossraubtieren im Kanton Uri» und damit über ein sehr emotionales Thema abstimmen können." *(Urner Zeitung, 02.2019)*
Q59	"Le Conseil fédéral a autorisé dès décembre l'abattage dans les meutes en vue de prévenir des dégâts potentiels. Cette nouvelle stratégie consiste à réguler les meutes de manière proactive et non plus réactive. Les loups pourront être tirés préventivement dès le 1er décembre en vue de prévenir des dégâts." *(blick.ch, 11.2023)*
Q60	"Seit Freitag dürfen Jäger auf die Raubtiere anlegen – sieben Rudel sind allein im Wallis für den Abschuss freigegeben. Das Dorf Visperterminen kann aufatmen." *(blick.ch, 11.2023)*
Q61	"Déceler la présence d'un loup sur la montagne préférée des Genevois est tout simplement exceptionnel. Le photographier relève carrément de l'exploit. C'est pourtant ce qui est arrivé les 22, 23 et 24mars ainsi que le 12avril derniers. Un vrai coup de bol pour les étudiants de la Haute Ecole du paysage, d'ingénierie et d'architecture de Genève (HEPIA)." *(Le Matin, 04.2012)*
Q62	"Un ornithologue amateur a vu et photographié l'animal vendredi dans la commune de Choulex. C'est la troisième fois que le canidé est signalé dans le canton depuis début 2021." *(tdg.ch, 04.2023)*
Q63	"PRÉDATEURS Le canidé étant désormais observé régulièrement à Genève, des clôtures renforcées sont installées dans le canton pour protéger les troupeaux." *(Le Matin Dimanche, 02.2024)*
Q64	"SITTEN. Ein Wolfsrudel hat auf den Gommer Alpweiden, aber auch im nahen Binntal und Turtmanntal seit Juni Dutzende Schafe getötet oder verletzt. Bilder der getöteten und verletzten Tiere zirkulieren seit Tagen in den sozialen Medien und schrecken die Bevölkerung auf. Die Walliser Regierung hat nun reagiert: Der zuständige Staatsrat Frédéric Favre (FDP) habe gestern Abend den Abschuss eines Wolfs im Goms angeordnet" *(20 minuten, 07.2021)*

Q#	Quotes in original languages
Q65	"Un loup a été abattu par la surveillance de la chasse du canton de Berne dans la nuit de mercredi à jeudi, à Schwarzenburg. Il s'agit probablement du prédateur responsable de la majorité voire de la totalité des attaques d'animaux de rente récemment dans la région. Le loup a été tiré alors qu'il tentait de s'en prendre à un troupeau, quelques heures après une première attaque à Oberbalm, indique le canton dans un communiqué. Entre le 21 octobre et le 24 décembre dernier, 22 attaques de moutons ont été recensées dans les communes de Schwarzenburg, Rüschegg, Zimmerwald, Rüeggisberg et Niedermuhlern, alors même que dix de ces bêtes étaient suffisamment protégées." *(blick.ch, 01.2023)*
Q66	"FREIBURG Untersuchungen ergaben: Der im Greyerzbezirk vergiftete Wolf war ein Weibchen. Von ihrem ehemaligen Partner fehlt derzeit jede Spur." *(Berner Zeitung, 06.2017)*
Q67	"Vor dem Tierschutzverein Oberaargau sprach der Wildbiologe Andreas Ryser über die Problematik der Wiederansiedlung des Luchses, die einzelnen «Besuche» des Wolfes in der Schweiz sowie die Voraussetzungen dafür, dass auch der Bär in unseren Landen wieder heimisch werden könnte." *(Solothurner Zeitung, 06.1999)*
Q68	"Une louve a donné naissance à quatre petits dans le Val Morobbia, près de Bellinzone. C'est la troisième portée de cette femelle enregistrée comme F8 et du mâle M47, ont indiqué lundi les autorités tessinoises." *(tdg.ch, 08.2017)*
Q69	" In der oberen Leventina ist in der Nacht auf Montag ein Wolf von einem unbekannten Wilderer angeschossen worden. Nach Angaben des kantonalen Jagdamts wurde das Tier verletzt, aber nicht getötet." *(Der Bund, 02.2006)*
Q70	"Deux jeunes loups de la meute du Piz Beverin dans les Grisons ont été éliminés. Deux louveteaux doivent encore être abattus. Ils ont appris comment déjouer les protections des troupeaux." *(lematin.ch, 10.2019)*
Q71	"Die Wildhut des Amts für Jagd und Fischerei des Kantons Graubünden hat am Donnerstag bestätigt, dass in der Region Heinzenberg - Safien - Beverin ein Wolfsrudel mit mindestens fünf Jungwölfen lebt." *(Neue Zürcher Zeitung, 07.2019)*
Q72	"Le gouvernement du canton des Grisons estime que la révision des Plans Loup et Lynx n'est pas applicable dans la pratique. Comme les autres cantons concernés par la présence de ce grand prédateur, le canton des Grisons estime que les conditions posées pour pouvoir tirer un loup sont trop sévères. Le Plan Loup révisé est conçu pour des individus isolés et pas pour une meute de loups comme celle qui vit dans le massif de Calanda (GR), a indiqué jeudi le gouvernement Grison. " *(tdg.ch, 09.2014)*
Q73	"In der Surselva GR gehen Bäuerinnen und Bauern juristisch gegen den Wolf vor. Grundlage ist ein neues Rechts-Gutachten. Der Alpsommer ist noch jung. Das Thema aber ist ein altes in Graubünden: der Wolf. Im Kanton habe sich die Zahl der Tiere in den letzten zwei Jahren verdoppelt. " *(srf.ch, 07.2021)*
Q74	"Immer mehr Neugierige wollen das Wolfsrudel am Calanda sehen. Doch zu viele Besucher stressten nicht nur die Wölfe, sondern auch andere Wildtiere, gab das Bündner Amt für Jagd und Fischerei gestern zu bedenken. Vor allem das Füttern der Wölfe sei strikt zu unterlassen." *(Der Landbote, 11.2012)*
Q75	"Im Kanton Graubünden sind wieder zwei Wölfe bei Verkehrsunfällen totgefahren worden. Beide Tiere kamen in der selben Nacht im Bündner Oberland (Surselva) ums Leben. Insgesamt sechs Wölfe starben dieses Jahr im Gebirgskanton bei Unfällen" *(blick.ch, 12.2019)*
Q76	"Die Identität des am 25.Dezember 2018 im Fürstentum Liechtenstein nachgewiesenen Wolfes ist ermittelt worden. Wie das Amt für Umwelt mitteilt, handelt es sich um die Jungwölfin F30, die im Sommer 2017 als Welpe des Calandarudels geboren wurde." *(Wiler Zeitung, 02.2019)*
Q77	"Auf einer Alp der Gemeinde Flums wurden in diesem Sommer zehn Schafe in einer geschützten Herde von zwei Wölfen gerissen. Der Kanton erlässt jetzt eine Abschussbewilligung, da die Kriterien für einen Abschuss erfüllt sind. " *(tagblatt.ch, 09.2022)*

Q#	Quotes in original languages
Q78	"Der Wolf nimmt, was er kriegt, Hasen, Rehe, Gamsen, Steinböcke, Hirsche und Nutztiere wie Schafe, Ziegen und Kälber. Dabei geht der Wolf grobschlächtig vor, die Tiere sind nicht sofort tot, sie leiden grausam. Das sieht man bei den überlebenden verletzten Tieren, die so arg zugerichtet wurden, dass sie «erlöst» werden müssen. Thundorf, Tägerschen, Rossrüti, Bischofszell waren die letzten «Schlachthöfe», wo ist er als nächstes? Ein Problemwolf? Sicher! Ein Abschuss des Wolfes wird erst bei 25 gerissenen Tieren pro Monat oder 35 in drei Monaten ein Thema. " *(Toggenburger Tagblatt, 02.2020)*
Q79	"Der Wildtierbestand im Zürcher Unterland ist vielfältiger, als manche ahnen. Weitab der Berge trifft man mit etwas Glück auch hier auf Gämsen, Hirsche, Luchs und Goldschakal. Ein Wolf, der durch die Flughafengemeinde Rümlang streift, sorgt für grosses Staunen. Auch mitten in Watt bei Regensdorf und in Hüntwangen wurde vermutlich dasselbe Tier vergangene Woche noch gesichtet." *(zuonline.ch, 11.2023)*
Q80	"Will die Gesellschaft Wölfe, muss sie bereit sein, dafür zu bezahlen. Ein Plädoyer für einen pragmatischen Umgang mit einem faszinierenden Wildtier. Mit dem Riss von sieben Ziegen im Oberbaselbiet vor wenigen Tagen hat die Akte Wolf ein neues Kapitel erhalten. Zumindest in der Nordwestschweiz. Bislang war nicht gesichert, ob der Wolf tatsächlich in der Gegend ist." *(Basler Zeitung, 11.2021)*
Q81	"Eine Untersuchung zur Wildkatzenpopulation in der Region zeigt Erstaunliches: Die lange Zeit für ausgestorben gehaltene europäische Wildkatze ist zurück. In der Schweiz war die Felis Silvestris lange Zeit Bestandteil der Waldpopulation. " *(Basler Zeitung, 02.2008)*

Appendix D: Irrelevant topics found in French and German corpus

Topics for the irrelevant categories found in French and German corpus are listed below, categorized in the four themes. The numbers in the title show order of importance in the whole corpus, with the proportion of articles in parentheses.

French corpus

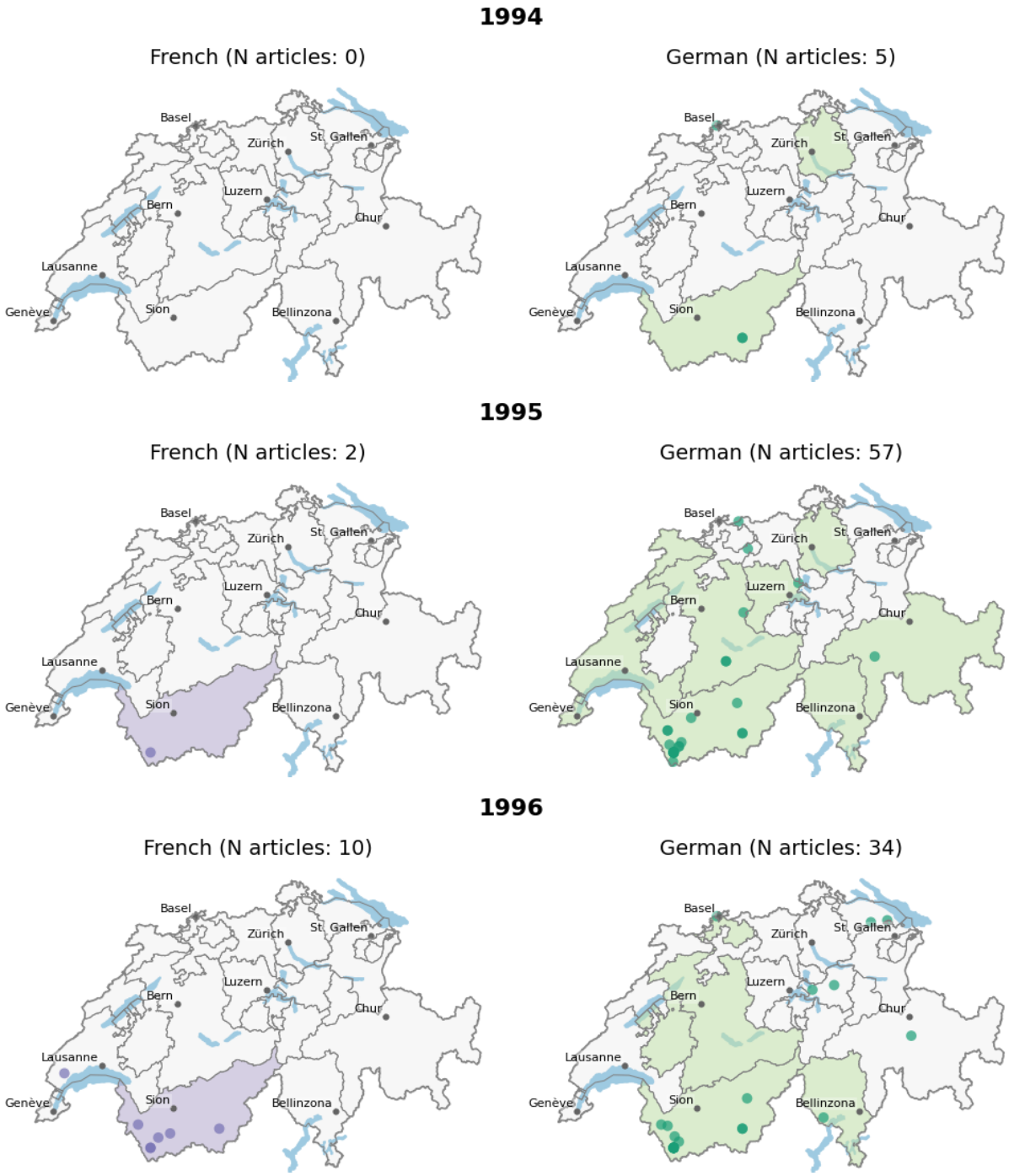
Title	Description	10 most frequent words	Representative text (first 600 characters)
Irrelevant/Secondary			
2: Irrelevant / Secondary (16%)	Irrelevant (idioms) and secondary (bear, great predators, human life stories)	homme, faire, petit, an, grand, ours, chien, voir, humain, nature	Sur le visage de Mike Horn, quelques traces de gelures, souvenirs à jamais gravés de toutes les difficultés qu'il a dû surmonter. Il a connu des températures avoisinant les 60 degrés, il a croisé des ours et des loups, s'est battu contre les tempêtes, contre le vent glacial. Il a marché des heures et des heures sans s'arrêter pour ne pas geler, ne pas mourir. Physiquement, l'exploit est immense. Moralement, il l'est tout autant. Dans l'immensité silencieuse des déserts blancs, Mike Horn s'est souvenu des maximes de son père pour surmonter la solitude...
7: Irrelevant (Finance) (9%)	Finance	faire, politique, an, grand, conseil, vouloir, falloir, devoir, année, bon	Pionnière de la finance durable, Angela de Wolff scrute les fonds ESG des plus grands acteurs financiers depuis plus de vingt ans. Femme de conviction et de dialogue, la fondatrice de la société Conser évoque les phases de doute par lesquelles elle est passée, comme tout entrepreneur, et la nécessaire transition que doit faire le monde de la finance. On la surnomme «la louve de la finance durable». «J'aime assez cette image. Il y a l'idée d'utiliser la force de la finance de manière nourricière, pour le collectif», pose d'emblée Angela de Wolff (Wolf signifiant «loup» en français)...

German corpus

Title	Description	10 most frequent words	Representative text (first 600 characters)
Irrelevant/Secondary			
2: Irrelevant / Secondary (15%)	Irrelevant (e.g. idioms "wolf im Schafpelz"), and secondary (e.g. fairy tale, films, books)	mensch, kind, leben, finden, stehen, sehen, frau, mann, lassen, bringen	Von Henryk M. Broder Nichtsist nationalistischer als die deutsche Friedensbewegung. Entgegen einer weitverbreiteten Ansicht ist der Nationalismus keine Domäne der Rechten. Der linke Nationalismus unterscheidet sich nur in einem Punkt vom rechten: Er tut so, als wäre er keiner. Es ist ein camouflierter Nationalismus, sozusagen ein Wolf im Schafspelz. Gerät das «Schaf» in Aufregung, dann dauert es meistens nicht lange, bis der Wolf zum Vorschein kommt. Und dann fangen sowohl rechte wie linke Deutsche ihre tagespolitischen Statements mit den Worten an: «Gerade wir als Deutsche...»
9: Secondary (4%)	Secondary articles: evolution, biology	hund, mensch, leben, forscher, zeigen, finden, rudel, verhalten, art, welpe	Genanalysen und Verhaltens-experimente lösen das Rätsel um die Herkunft des Hundes: Fast alle Vorfahren stammen von ostasiatischen Wölfen ab. Mops und Afghane rennen um die Wette, Chihuahua und Dogge kreiseln umeinander, Dackel und Retriever balgen um einen abgegriffenen Tennisball. Wer das bunte Treiben auf einer herbstlichen Parkwiese betrachtet, mag kaum glauben, was Forscher jetzt herausfanden: Nahezu alle Hunde haben die gleichen Vorfahren. Vor etwa 15 000 Jahren zähmten Menschen in Ostasien eine Hand voll Wölfe und legten damit den Grundstein für eine einzigartige Beziehung...
12: Irrelevant / Secondary / Mix (1%)	irrelevant (scout), secondary articles (wolf documentaries), wolf pack in Germany, wolf sightings	dettling, elefant, suter, pferd, sehen, leben, heulen, gerke, gruppe, bild	CHUR. Der Naturfotograf Peter Dettling begleitete 16 Monate lang das Wolfsrudel am Calanda. Das Ergebnis zeigt er nun in einer Dokumentarserie. «Als ich die Wölfe zum ersten Mal heulen hörte, war ich einfach fasziniert», erzählt Peter Dettling. Der gebürtige Bündner, der heute in Kanada lebt, hat die Wölfe im Calanda-Gebiet während vier Jahren begleitet und daraus eine Dokumentarserie erstellt. Das Projekt sei unglaublich schwierig gewesen: Wölfe seien sehr scheue Tiere. «Manchmal wollte ich aufgeben», sagt Dettling. Doch die Erfolgsmomente hätten ihn weitermachen lassen...

Appendix E: Individual-year small multiples

Locations mentioned in articles per year. Point transparency indicates location saliency. Cantons are colored if mentioned instead of being represented by points. Large regions identified on Figure 15 have been removed. Data for 2024 is only up until 1.11.2024



1997

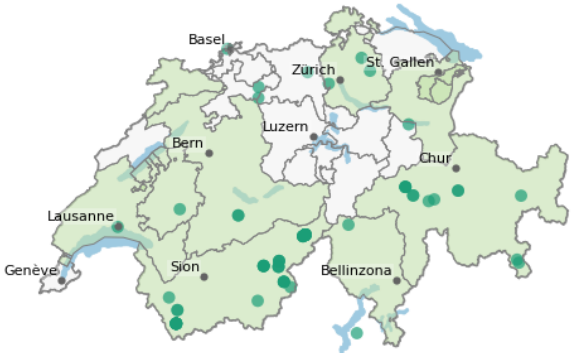
French (N articles: 12)

German (N articles: 16)

1998

French (N articles: 56)

German (N articles: 138)



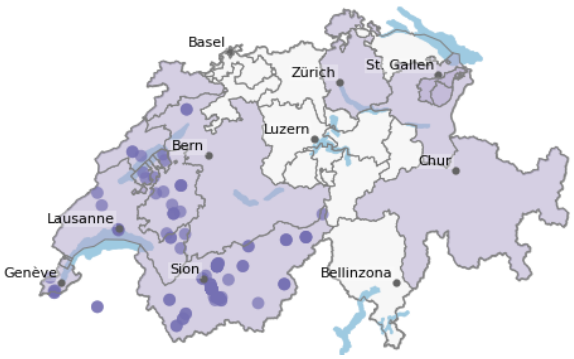
1999

French (N articles: 159)

German (N articles: 353)

2000

French (N articles: 178)



German (N articles: 271)

2001

French (N articles: 97)

German (N articles: 283)

2002

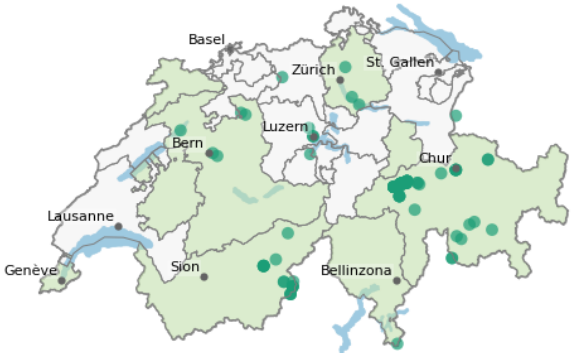
French (N articles: 75)

German (N articles: 189)

2003

French (N articles: 45)

German (N articles: 139)



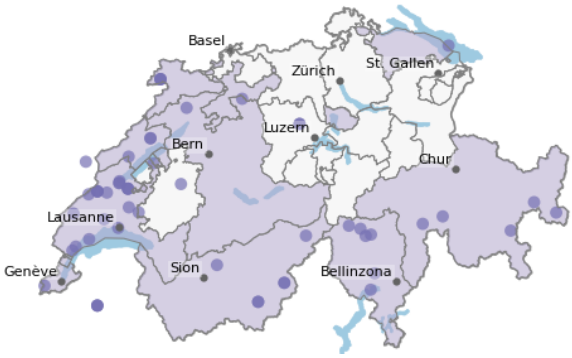
2004

French (N articles: 36)

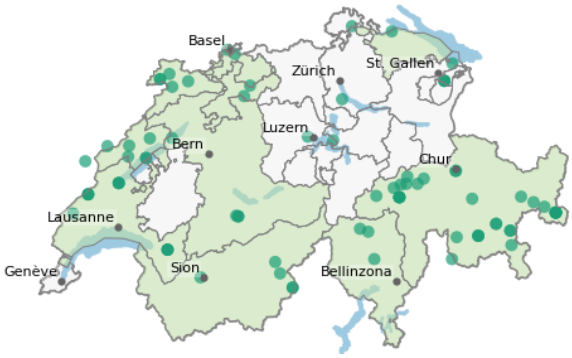
German (N articles: 127)

2005

French (N articles: 88)

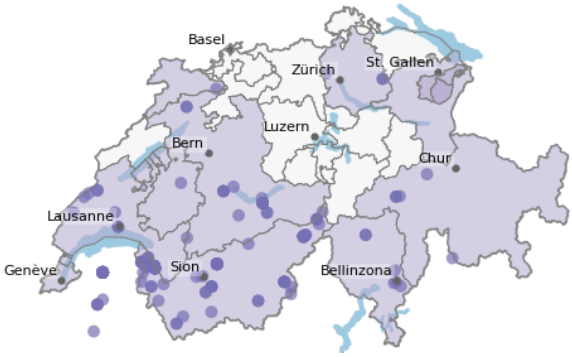


German (N articles: 123)



2006

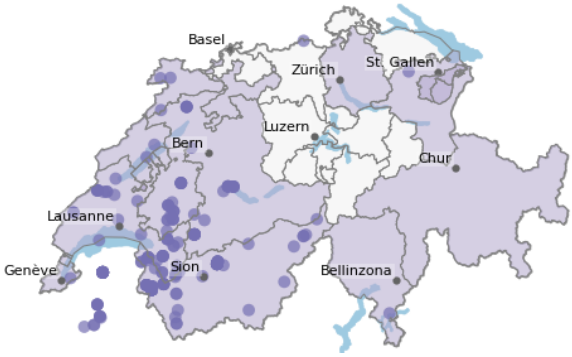
French (N articles: 262)



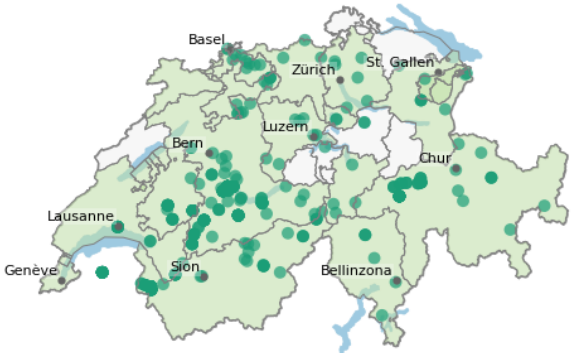
German (N articles: 840)

2007

French (N articles: 303)

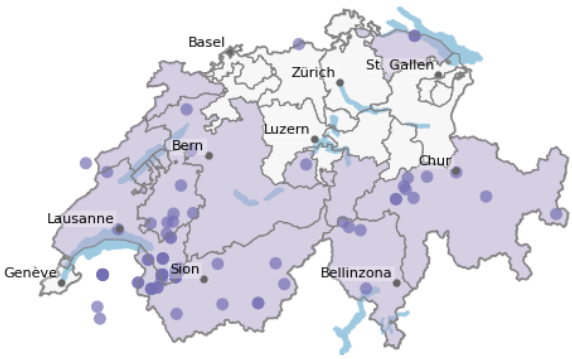


German (N articles: 591)



2008

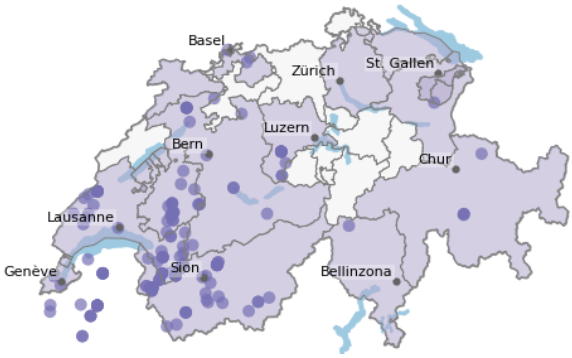
French (N articles: 127)



German (N articles: 685)

2009

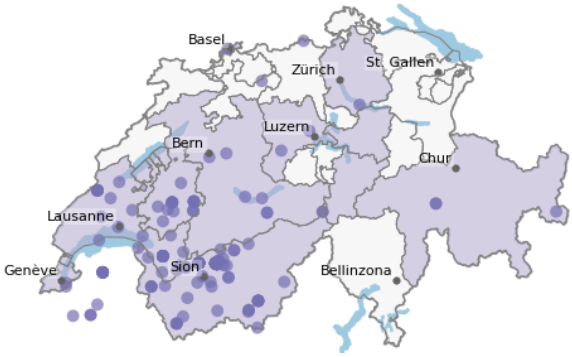
French (N articles: 272)



German (N articles: 1224)

2010

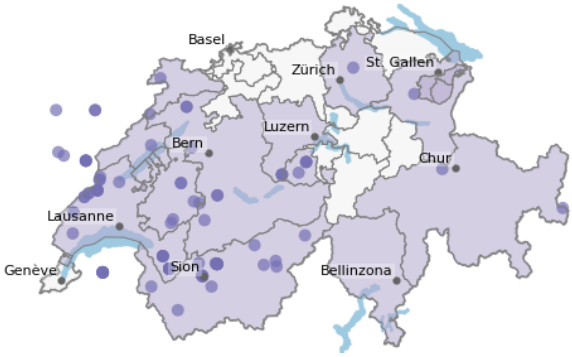
French (N articles: 309)



German (N articles: 813)

2011

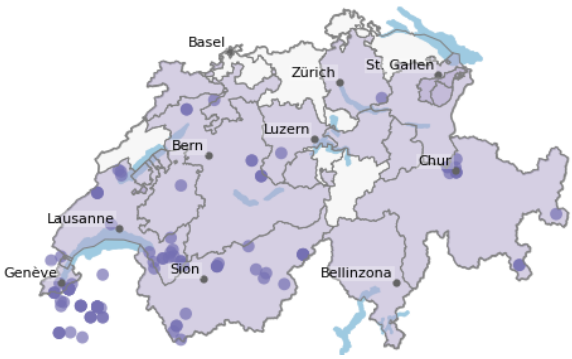
French (N articles: 162)



German (N articles: 440)

2012

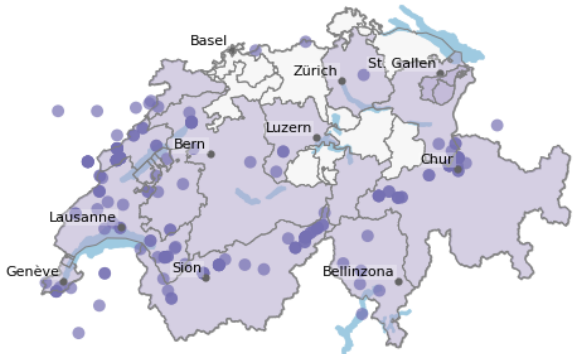
French (N articles: 208)



German (N articles: 618)

2013

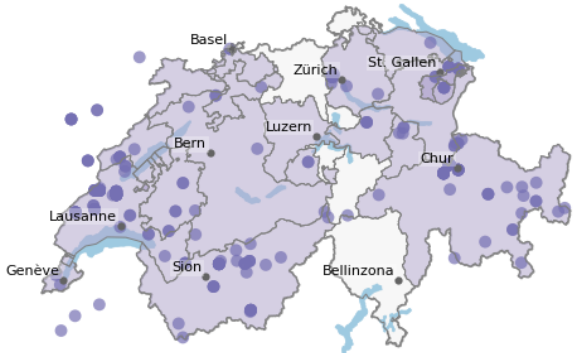
French (N articles: 370)



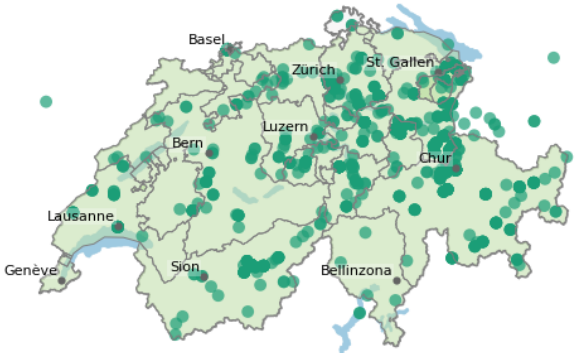
German (N articles: 998)

2014

French (N articles: 498)

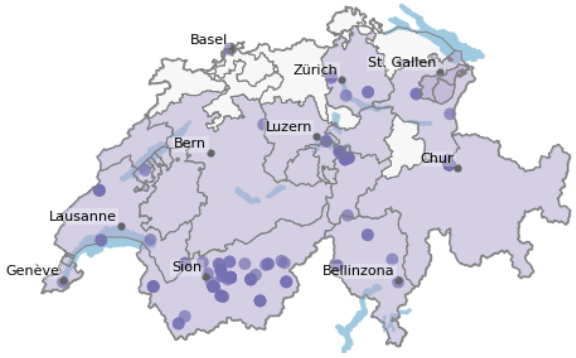


German (N articles: 1749)



2015

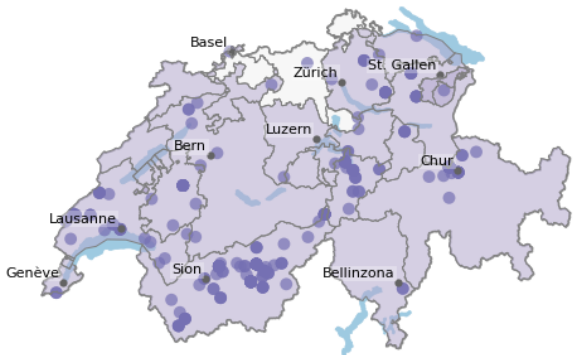
French (N articles: 276)



German (N articles: 1403)

2016

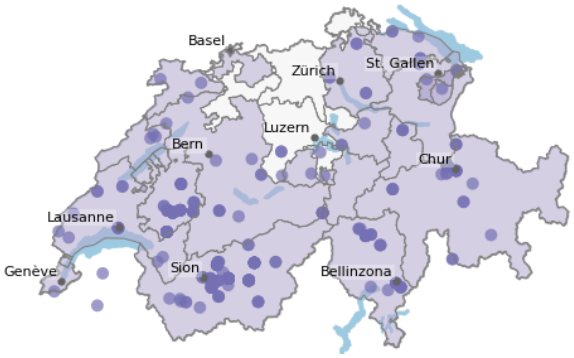
French (N articles: 526)



German (N articles: 1660)

2017

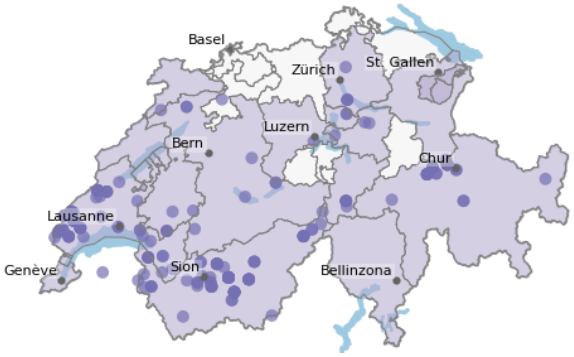
French (N articles: 532)



German (N articles: 1721)

2018

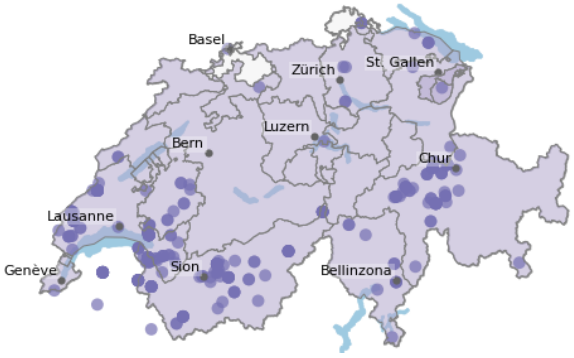
French (N articles: 321)



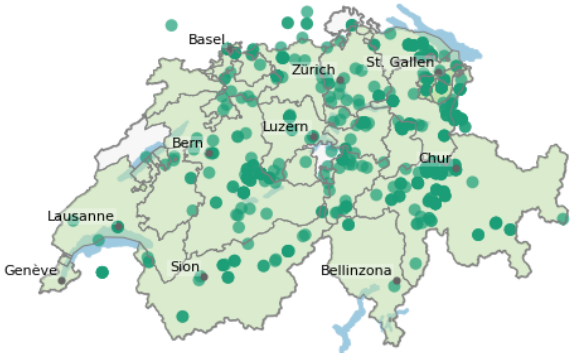
German (N articles: 911)

2019

French (N articles: 496)

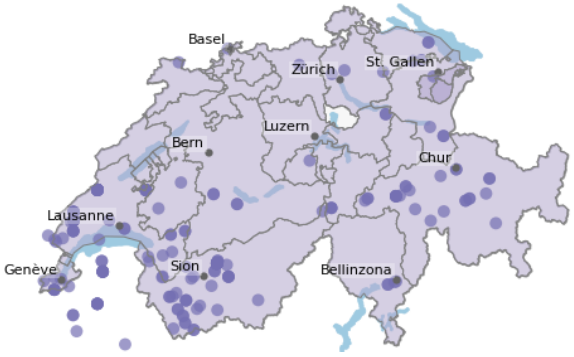


German (N articles: 856)



2020

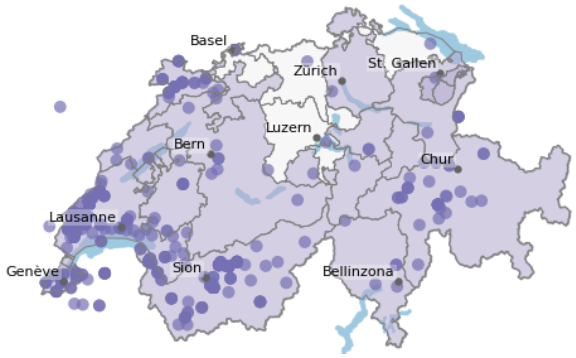
French (N articles: 364)



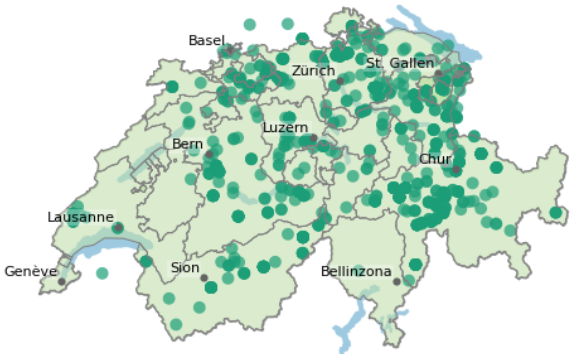
German (N articles: 1536)

2021

French (N articles: 858)

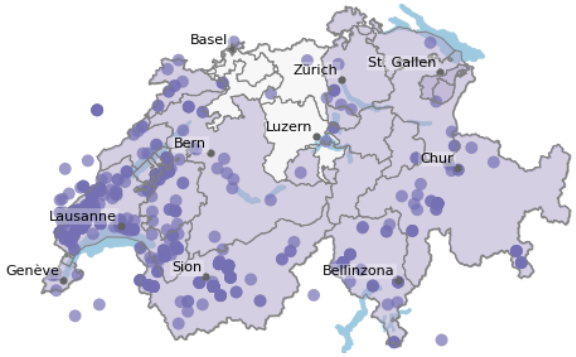


German (N articles: 1414)



2022

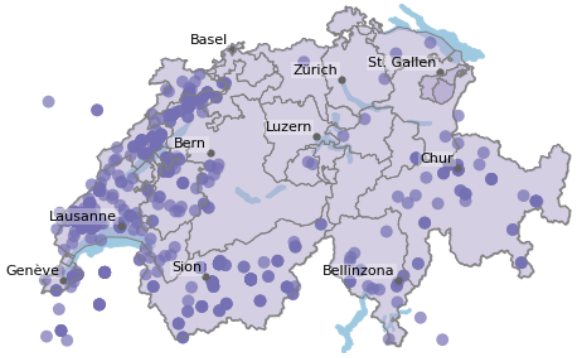
French (N articles: 1061)



German (N articles: 1989)

2023

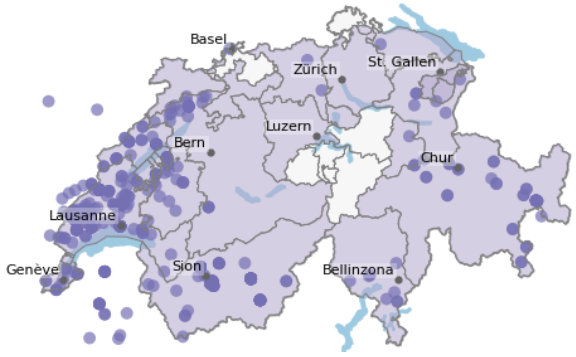
French (N articles: 1247)



German (N articles: 1619)

2024*

French (N articles: 983)



German (N articles: 1218)

Personal Declaration

I hereby declare that the submitted thesis is the result of my own, independent work. All external sources are explicitly acknowledged in the thesis.

I further declare that I have used artificial intelligence tools such as ChatGPT and DeepL for translation, reformulation, grammar, style corrections, and coding assistance. Nonetheless, I assume full responsibility for the content of this thesis.

Martine Besse

Zurich, 31 January 2025