



Inland freshwater bodies as “cooling islands”: water-based recreation facing global warming

Alice Nikolli¹, Pierre Durand², Sylvie Clarimont²,
Jeoffrey Dehez³, Gaëlle Deletraz²

1. Université Savoie Mont Blanc, EDYTEM

2. Université de Pau et des Pays de l'Adour, TREE

3. INRAE Nouvelle Aquitaine Bordeaux

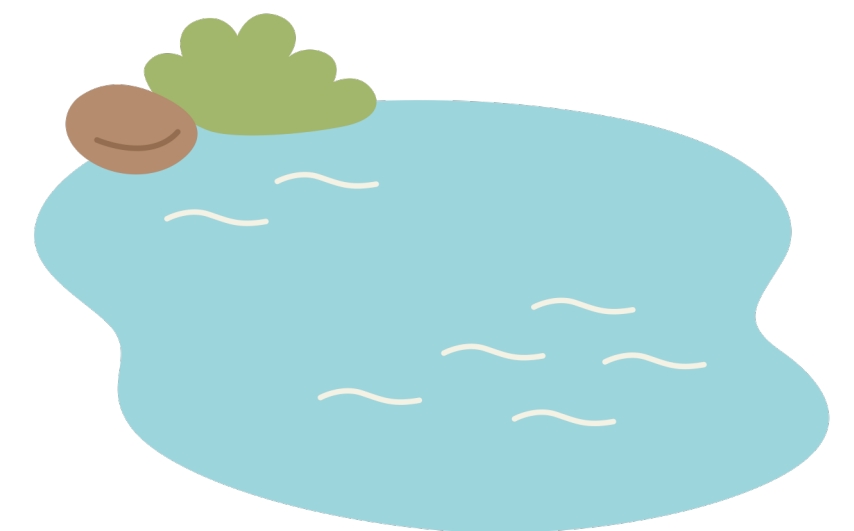


Table of contents

1

Introduction

2

Materials & methods

3

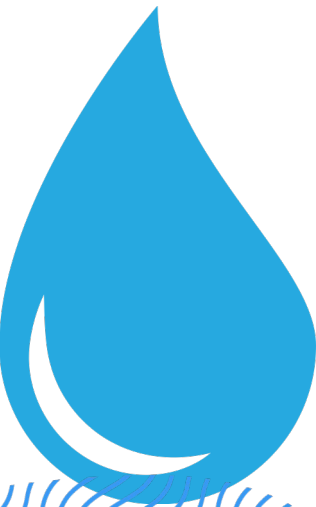
Results

4

Discussion



Introduction



Introduction

Climate context:

- Global rise in temperatures and more frequent heatwaves (IPCC, 2022) are impacting health and well-being (Ige-Elegbede et al., 2024), both daily and in tourism.

Role of inland freshwater bodies:

- Lakes, reservoirs, ponds can serve as « cooling island » (Völker et al., 2013; Du et al., 2016). They are becoming more attractive during heatwaves (Juschten et al., 2019, Pröbstl-Haider et al., 2021) but face new environmental pressures.

Bridging the knowledge gap:

- Recreational issues that inland waterbodies are facing in a warming world are much less well-known compared to recreational areas like coastal (Köberl et al., 2016) or mountain regions (Vij et al., 2021).

In this context, the **“ILEAUT-NA” research program** aims to investigate the recreational uses and management of lakes and other similar inland freshwater bodies, with a particular focus on climate change adaptation and environmental justice (access to nature and water for all).



Varetz Pond,
June 2024,
Pierre Durand

Introduction

The first step of the program methodology is a systematic newspaper review conducted in the regional daily press.

- While social networks have become a seemingly inexhaustible source of textual data, the daily press also remains a good way of exploring the issues associated with a given research object, at various scales and over time (Boyer et al., 2021).
- In France, the regional daily press remains very strong and popular, with 43 millions of people reading it monthly (63% of French population) and 20 millions daily (29%) (Texier and Werly, 2022).
- It plays an important role in disseminating social norms and values at local level (Bousquet & Amiel, 2021), particularly in tourism (Violier, 2007).



In a context of a growing concern about climate change and adaptation, which representations does the press convey about inland waterbodies?



Is their "cooling island" effect recognized, and how recreational uses are connected to environmental challenges and other functions?



Introduction

The study area is the Nouvelle Aquitaine region, which offers a wide sample of inland waterbodies (coastal and mountain lakes, reservoirs, pit lakes, ponds...), with very different recreational and touristic functions.



Ayous lake, July 2023, Alice Nikolli



Varetz Pond, June 2024, Pierre Durand



Rouffiac Lake, June 2024, Pierre Durand



Parentis Lake, September 2023, Pierre Durand

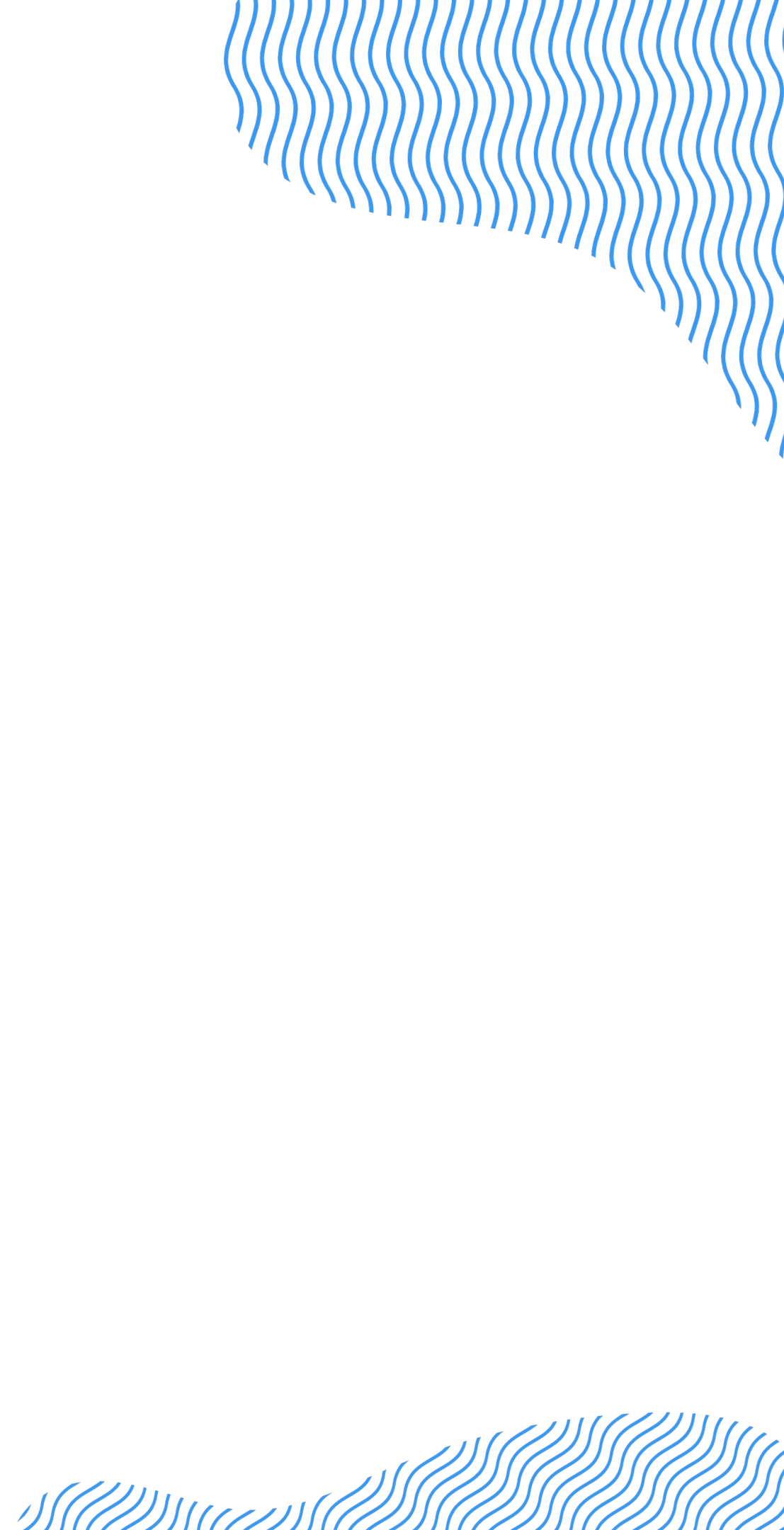
Nouvelle-Aquitaine regional boundaries in France.



Map creation, Alice Nikolli, August 2024



**Materials &
methods**



Iterative data selection and filtering



Source of the data: the media content aggregation platform “Europresse”.

Keywords: lac, plan d'eau, étang, base nautique, base de loisirs.

Geographical coverage: the Nouvelle-Aquitaine region (12 départements).

The **first corpus** included **20'623 articles from 2000 to 2023** but showed important biases:

- The geographical filter provided by Europresse is inaccurate, producing a very heterogeneous representation of the 12 départements.
- Temporal coverage was uneven, with only one newspaper (Sud Ouest) available throughout the entire period.
- The corpus contained many duplicates between print and web editions.



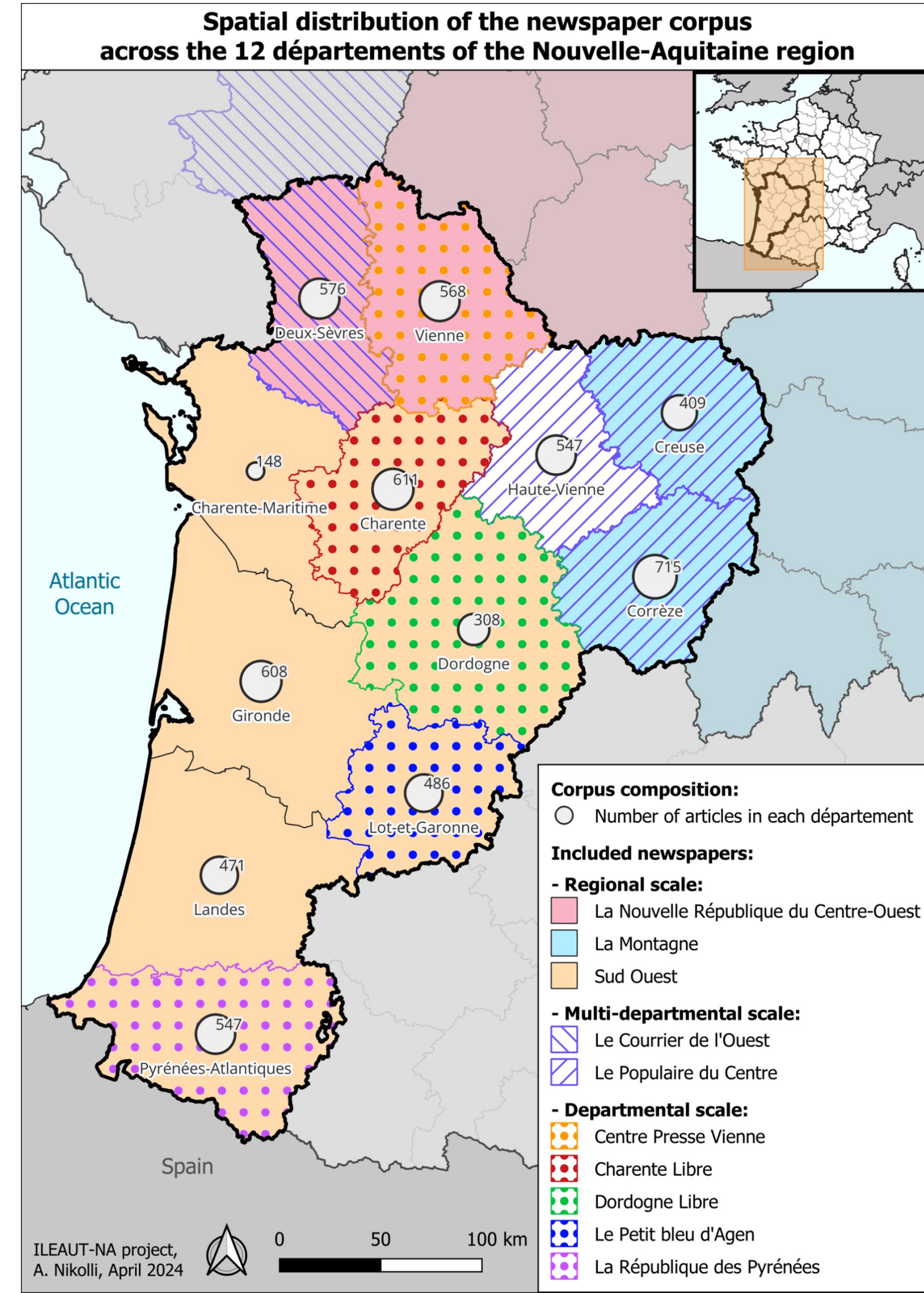
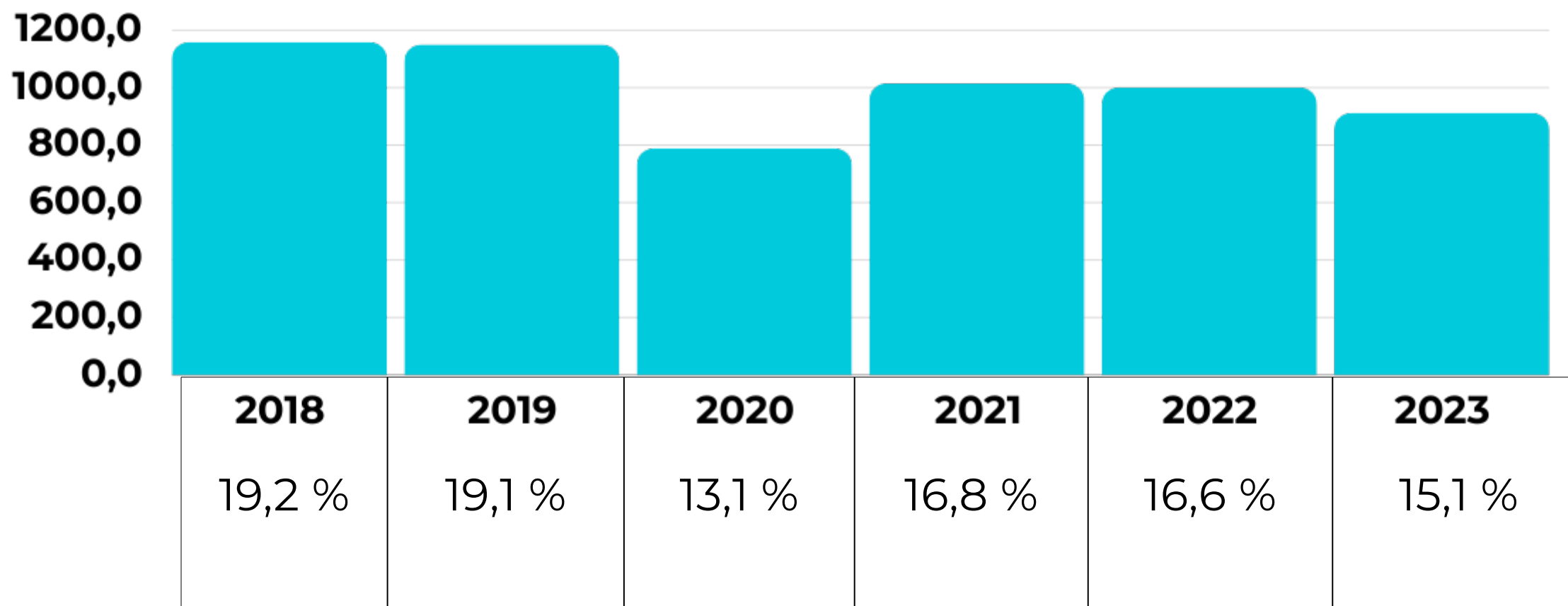
Bias mitigation or filtering processes:

- The study period was shortened: 2018-2023.
- The selection of newspapers was adjusted to ensure a representative coverage of all 12 départements.
- Only print media articles were included (exception for one newspaper only available in the web version)

6'023 articles

Composition of the final corpus

- There is a better balance among départements except regarding Charente-Maritime, where limited coverage is due to the absence of departmental press. This lower representation aligns with its actual media coverage.
- Proportion of articles by year :



A two-step method



Inductive phase

Global and exploratory approach to the corpus



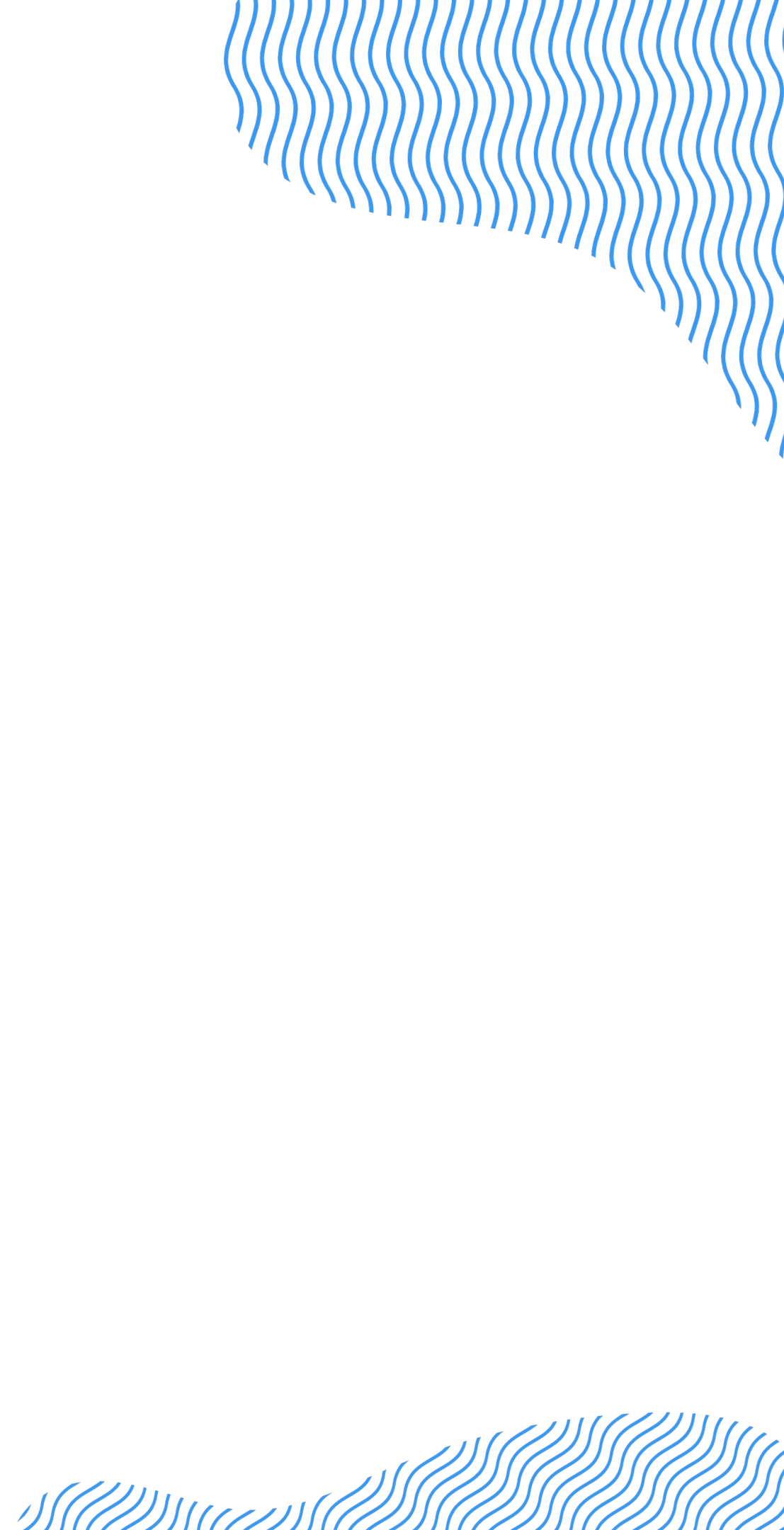
Deductive phase

Refining the analysis
according to our hypotheses
and pre-established coding

- > ● Planning
- > ● Drowning / First Aid
- > ● Actors
- > ● Conflict
- > ● Overtourism
- > ● Biodiversity
- > ● Climate concerns
- > ● Water quantity
- > ● Water quality
- > ● Productive uses
- > ● Recreational activities

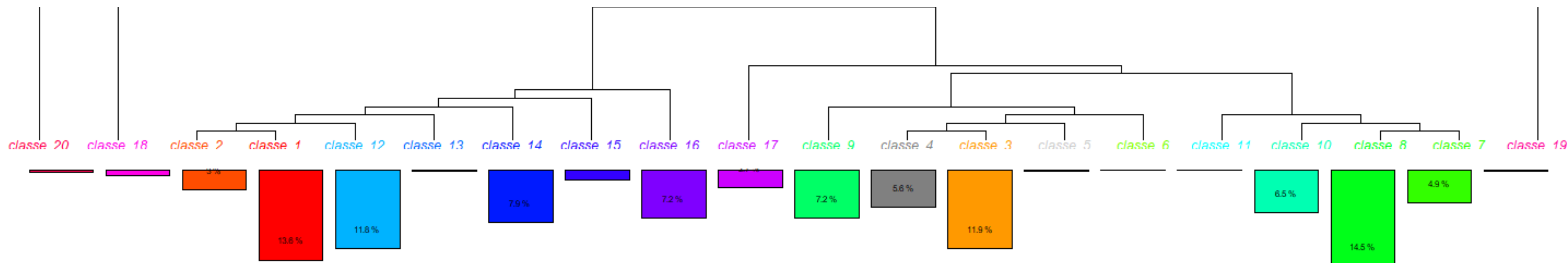


Results



Recreational activities dominate media discourse

Using the Reinert method



16h	paraître	restauration	fête	enfant	messe	course	email	pêche	causse	maire	conseil	projet	corlu	maine	suffisa	cyano	eau	espèc	stepha
18h	web	produit	heure	activité	biscarre	km	protec	truite	agricu	jean	comm	travail	gert	loire	méthode	baigna	niveau	oiseau	frederi
17h	républi	produc	concer	jeu	parentis	épreuve	page	carte	chamb	adjoint	commu	bâtimen	vallier	maurice	encadre	analys	bassin	faune	xavier
15h	article	marché	h	nautiqu	pastoral	champi	publier	lâcher	bousqu	pierre	budget	service	brossac	sèvres	estimer	ars	mètre	flore	fabien
14h30	pyréné	buvette	soirée	base	born	france	www	kg	cassag	marier	subventi	aménag	gérard	beaurepa	manoeuvr	interdicti	pluie	naturel	ludovic
17h30	courrier	frite	musiqu	loisir	sanguine	compéti	mail	carpe	serge	directeu	élu	logemer	gérant	secrétaire	bruit	interdit	sécheres	protège	gille
14h	ouest	boissor	spectac	pédalo	bourg	coureur	fr	ouvertur	garonne	christoph	montant	mettre	bail	biodiversi	saisir	pompier	vanne	animal	olivier
16h30	site	déguste	organis	aire	mimizan	triathlon	com	pêcheur	lot	michel	voter	entrepris	judiciaire	cheval	maîtrise	gendarm	alimentel	humide	vincent
15h30	afp	glace	artifice	profiter	joseph	champion	renseign	tanche	franken	philippe	municipa	quartier	faux	région	suspendr	victime	barrage	biodiver	laurent
19h	source	artisan	musical	pique_n	église	club	facebook	brochet	tribunal	trésorier	conventi	étude	société	financem	plaisir	mort	vidange	zone	laure
fitness	consulter	vin	animatio	gonflabl	h	départ	article	étang	pinel	chef	syndicat	social	camping	siècle	technique	algue	baiss	préserve	christine
cirque	orthéz	plat	feu	canoë	heure	natation	édition	garder	préfète	missioux	unanimit	travailler	assainissi	saint	repren	interdire	digue	héron	cassagne
11h30	jump	food	rendez_	sport	ensemble	marcher	newslett	samedi	hauteriv	délégué	financer	établisse	tribunal	accord	chantier	prélèver	aval	réserve	arnaud
water	recomm	crêpe	vendred	plage	plage	distance	https	sandre	retenue	luc	communi	lancer	procédur	état	beau	résultat	climatique	milieu	fabrice
voile	connecte	dessert	samedi	paddle	célébrer	manche	contact	empoiss	coordina	conseille	aquitaine	réhabilita	recupére	inquiétud	travail	santé	versant	plante	christine
11h	réagir	fromage	gratuit	initiation	dimanche	cadet	inscriptio	vente	administi	claire	départen	propriéta	pascal	voilier	réaménaç	gendarm	cube	natura	didier
10h30	fr	truck	festival	famille	grand	junior	égalemen	carnassie	prison	alain	région	démarch	commerc	justifier	doigt	secours	rivière	végétal	benjamin
10h	www	cuisine	salle	proposé	chapelle	équipe	creuser	communa	illégal	secrétaire	financem	camping	affirmer	élevage	accident	hiver	ruisseau	écosystè	david
gym	castet	menu	repas	ski	juilien	podium	internet	canne	béatrice	bernard	vote	équipeme	didier	oppositior	risque	sec	richesse	observer	rocher
atelier	lettre	verre	musicien	paddles	saint	catégorie	boîte	annuel	lagarde	expliquer	départen	camping	étang	oppositior	chien	cours	reproduc	reproduc	eric
golf	renseign	grillade	groupe	sportif	forge	participar	c2_1	pêcher	procès	nicolas	agence	équipeme	préventio	pointe	surveillai	lacs	rare	observer	nicolas
arc	com	exposar	soir	balader	apéro	circuit	info	perche	sursis	jacques	nouvelle	répondre	propriétai	femme	taux	sol	noir	observer	christian
collectif				proposer	cyclable	discipline		journalier	cr	françois		urbain	disputer		canal		arbre		martine

1

Recreational activities dominate media discourse

Using the Reinert method

The Reinert method, utilizing text segments, performs a thematic classification to reveal predominant topics. The classes generated can be grouped into three thematic categories:

Proportion of sports and leisure : 44%

Festivities	13,6 %
Leisure activities	11,9 %
Competitions	7,9 %
Fishing	7,2 %
Catering, food	3 %

Proportion of environmental concerns : 26 %

Water quantity	14,5 %
Water quality	6,5 %
Fauna and Flora	4,9 %

Proportion of political or planning : 25 %

Planning	11,9 %
Elected representative	7,2 %
Local government	5,6 %

Proportion of others : 6 %

Caussade lake	2,7 %
Irrelevant	3,2 %

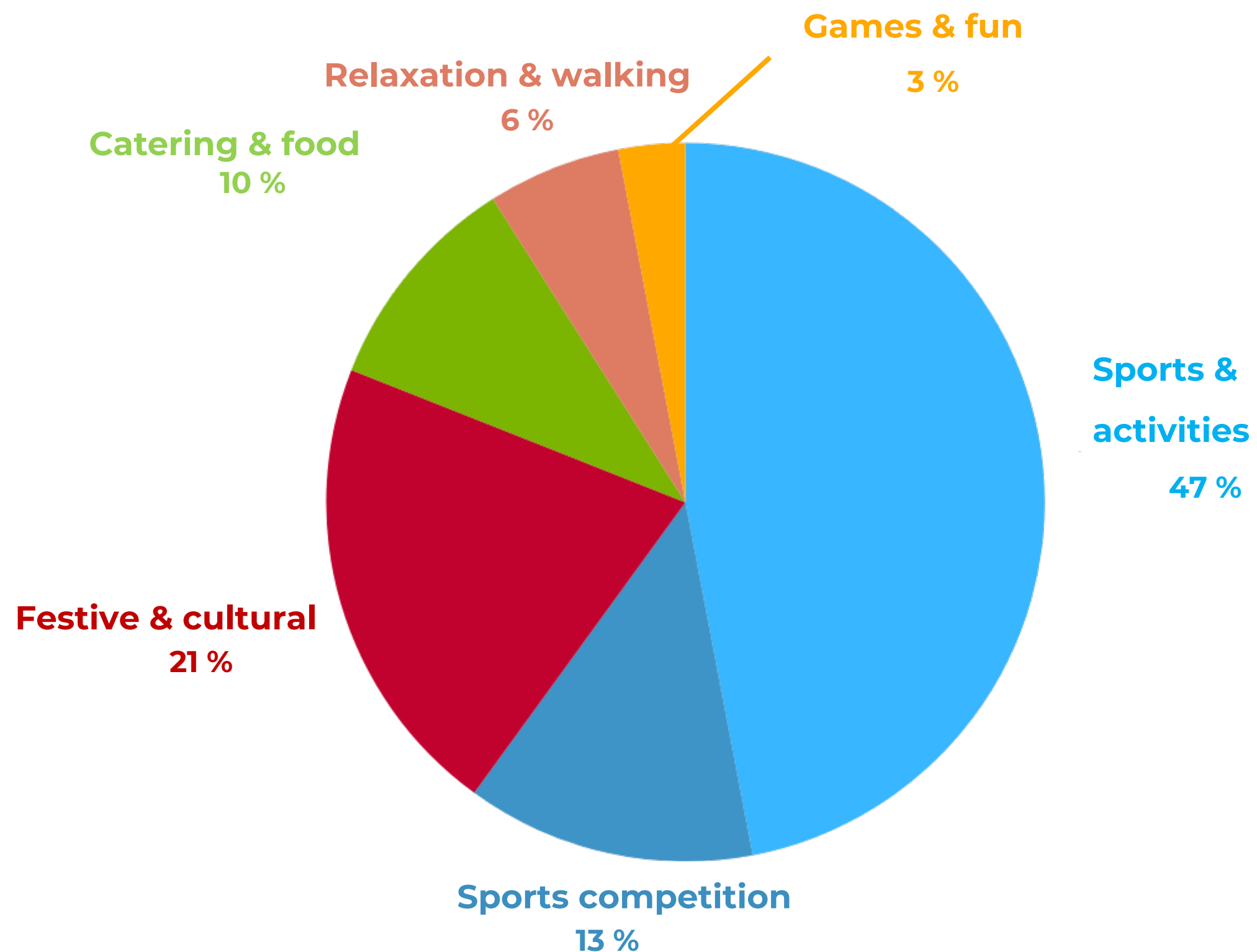
Whereas many lakes are multifunctional, non-recreational uses (agriculture, hydroelectricity) are given very little attention in the corpus.

Sports, activities, and festivities are the most represented

Relaxation and walking are marginal

- Findings contrast with Dehez (2020), which highlights a preference for tranquility, walking and picnic.
- A notable co-occurrence exists between recreational activities and the codes related to associations and their stakeholders.

Using thematic coding

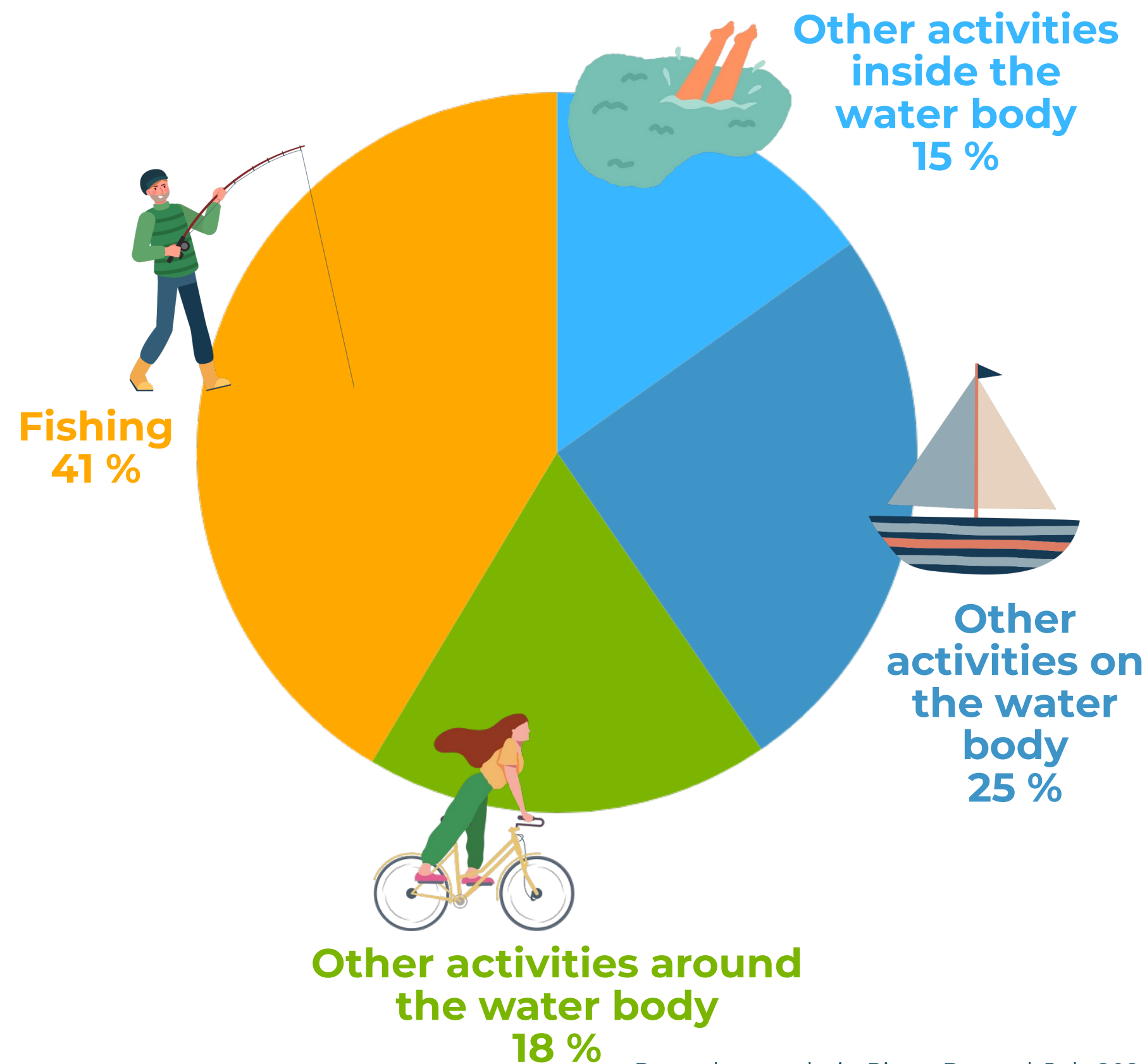


Within the “Sports & activities” category

The term “Fishing” is central in media coverage

- But the over-representation should be considered in context, as it is often associated with events or aquatic management issues.

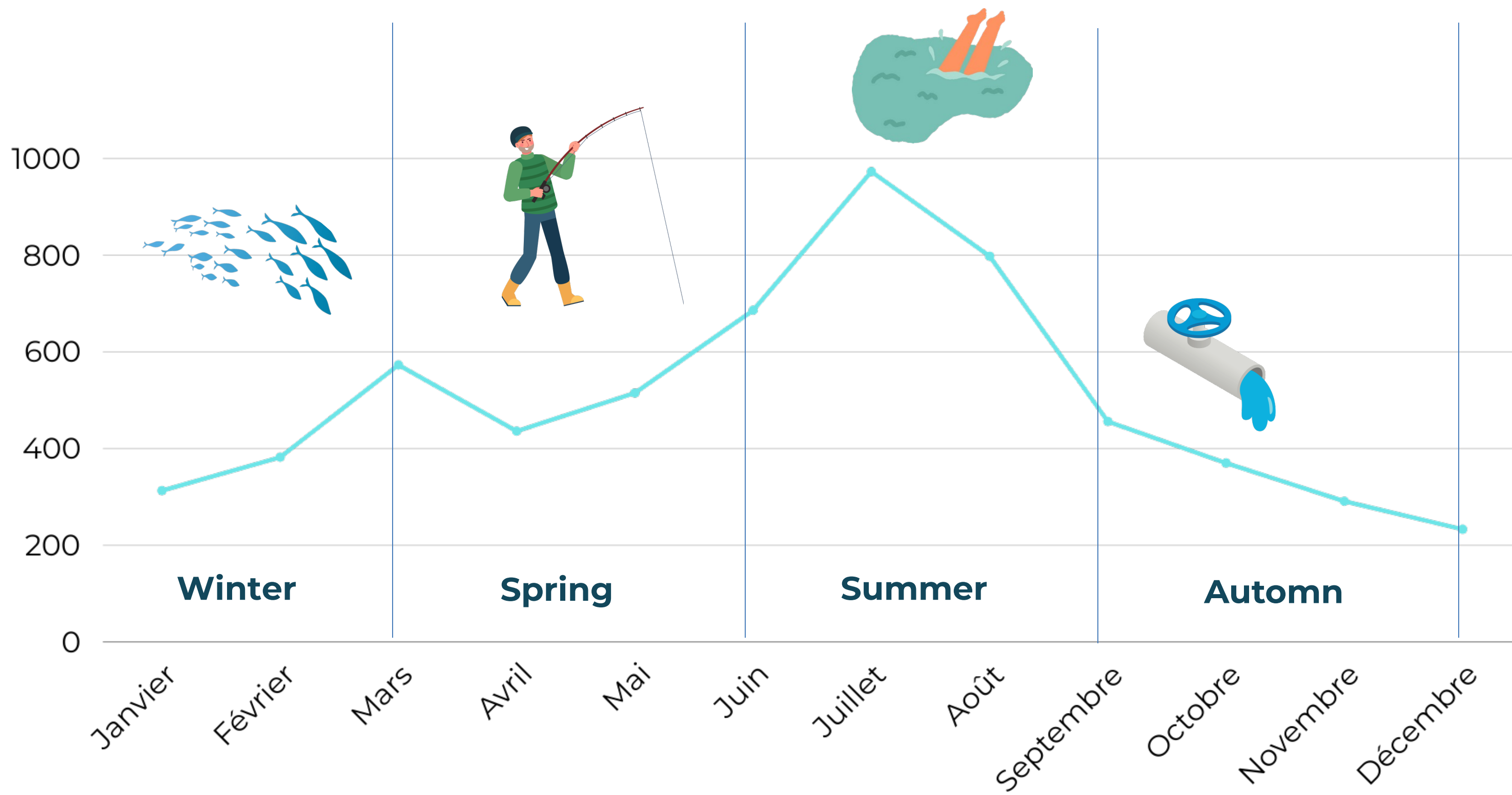
Using thematic coding



A pronounced seasonality

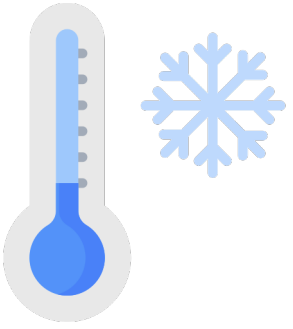
Qualitatively & quantitatively

Amount of articles by month and significant themes over each season



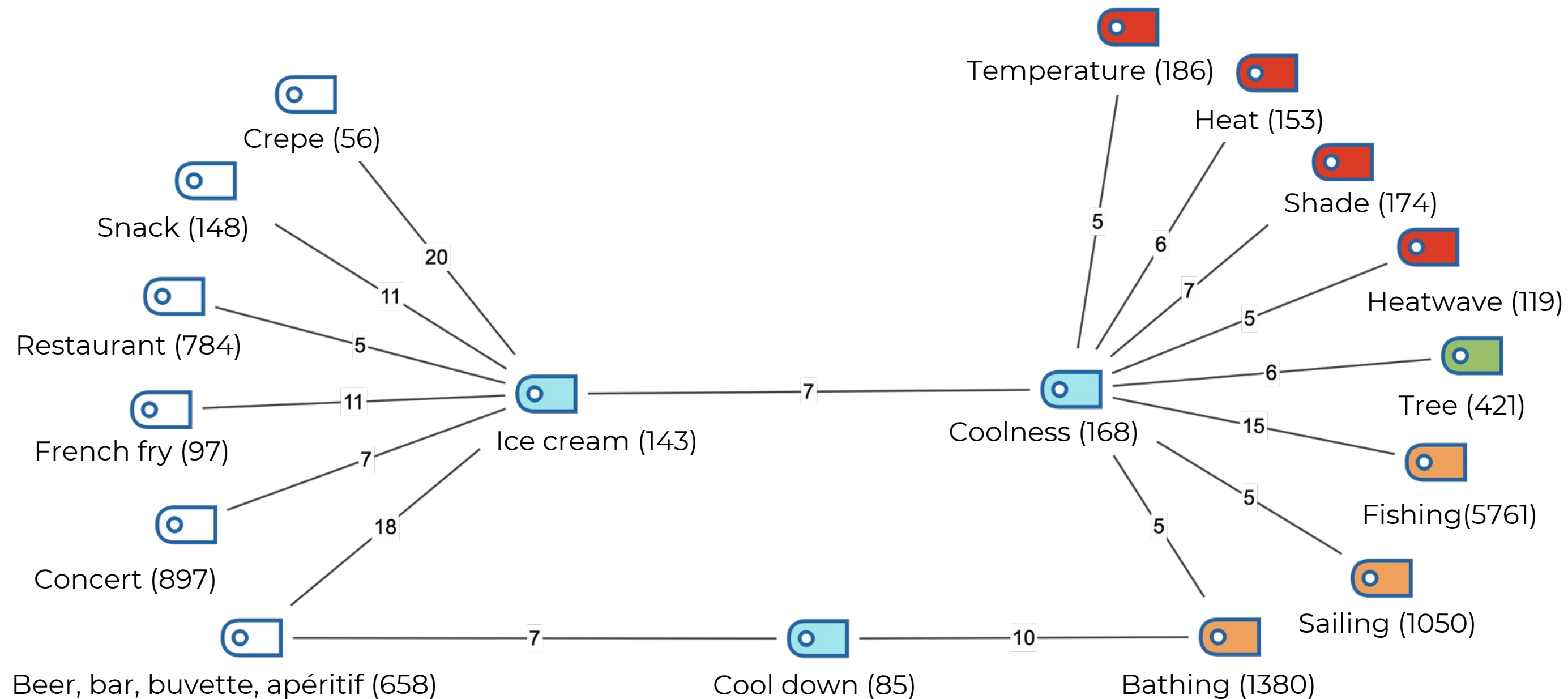
Climate references account for merely 2% of codes

The “cooling island” dimension goes beyond swimming



The co-occurrence model shows that:

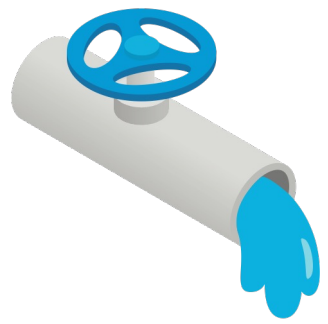
- **Fishing, sailing** and **bathing** are strongly linked to the “**coolness**” code.
- However, this theme is also linked to the codes “**tree**” and “**shade**”, which moderate the role of water and reposition the water body within its immediate environment.



6

Water quantity issues are disconnected from recreational activities

The main focus is on routine maintenance work

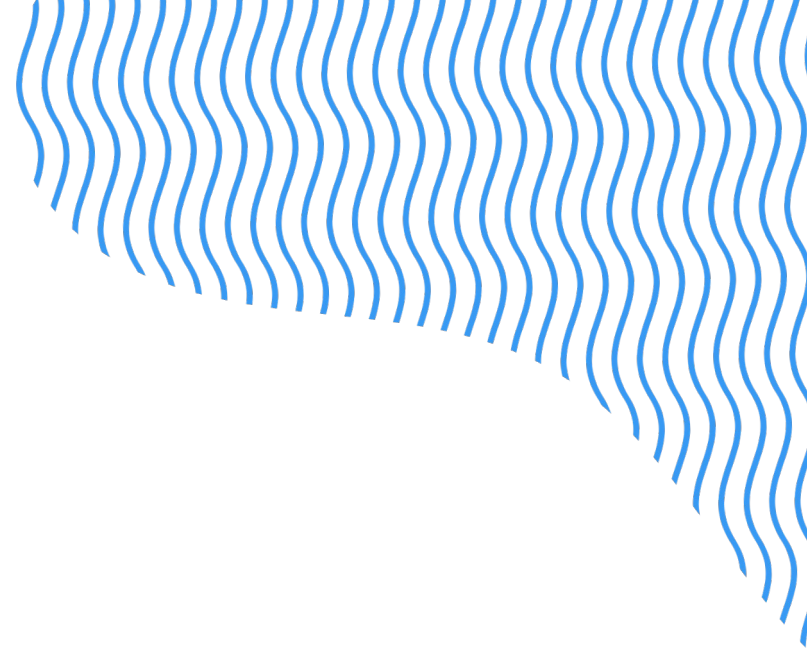


- The main terms associated to water quantity (including hydrological extremes: flood, etc.) refer to routine maintenance of waterbodies and hydraulic facilities (emptying, filling, dyke...)
- Apart from fishing, references to recreational uses are very scarce.
- References to the effects of climate change (drought) are also scarce and mainly related to agricultural issues – with a probable ‘Caussade effect’ (ongoing conflict surrounding the illegal construction of an irrigation lake).



Serres-Castet lake, Benjamin Martin, July 2022

Discussion



A limited vision of the water body

The press analysis confirms the importance of the recreational function of inland freshwater bodies. But productive uses and stakeholders are frequently overlooked.

Discrepancy between media coverage and actual practices

The prominence of certain sports and events in the media may be tied to their capacity to draw attention and widespread interest. This focus overshadows:

1. Other recreational activities (quieter, yet still popular among visitors).
2. The productive uses (irrigation, hydroelectricity).



Bioux-Artigues dam, Benjamin Martin, July 2022

The regional press conveys a partial view of water quantity and quality challenges

Although water quality and quantity are highly dependent, the press corpus gives more attention to quality, and does not draw links between the two.

When it comes to water quantity issues, neither recreational functions nor climate change are central in the press discourse.

However, in discussions about water quality, cyanobacteria blooms take center stage, and concerns related to recreational uses become more prominent. The media's focus on this aspect may impact risk management (Dubé et al., 2016) and contribute to decision-making regarding temporary bathing prohibition.



The sign indicates "Swimming prohibited. Too high concentration of cyanobacteria (blue algae)".

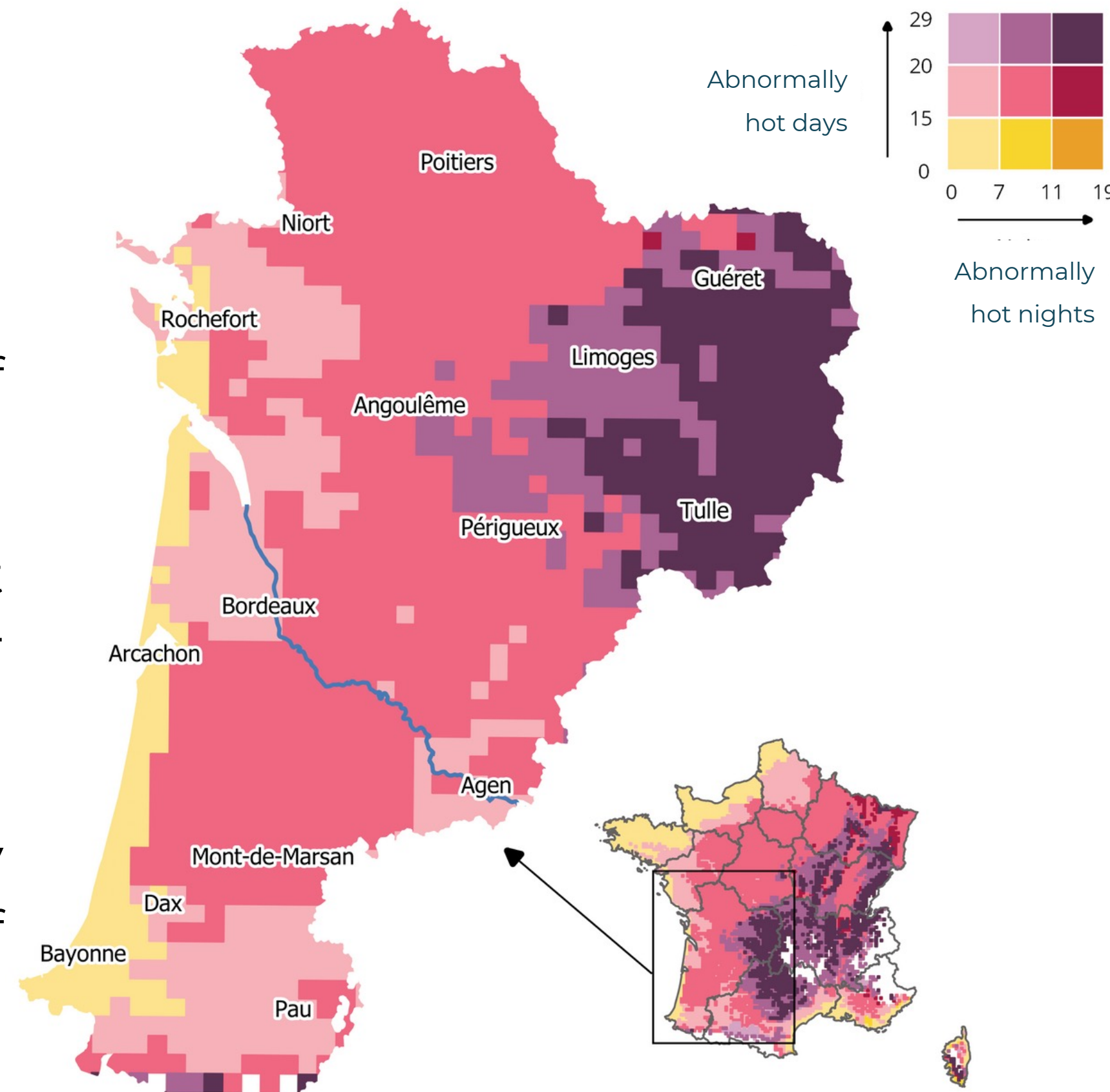
Arfeuille lake, Pierre Durand, June 2024

A nuanced perspective on cooling islands

Despite global warming and alarming projections for 2050, climate references remain marginal in the articles, accounting for only 2% of the codes.

- Cooling is not only associated with swimming but also with the surrounding environment of the water body (trees, ice cream).
- The limited visibility may result from insufficient awareness about the cooling benefits of water bodies.
- While media attention for this topic peaks only during heatwaves, ongoing acknowledgment of their cooling effect seems important.

Frequency of abnormally hot days and nights for the period 2021-2050.



Limits

- Such regional press corpus generalizes, obscuring important local contexts.
- The limited availability of newspapers over time restricts the analysis period.
- A regional overview generates a large corpus, implying a quantitative approach and preventing a detailed in-depth reading.

Perspectives



Thank you for your attention

pierre.durand@univ-pau.fr



UMR 6031
TREE



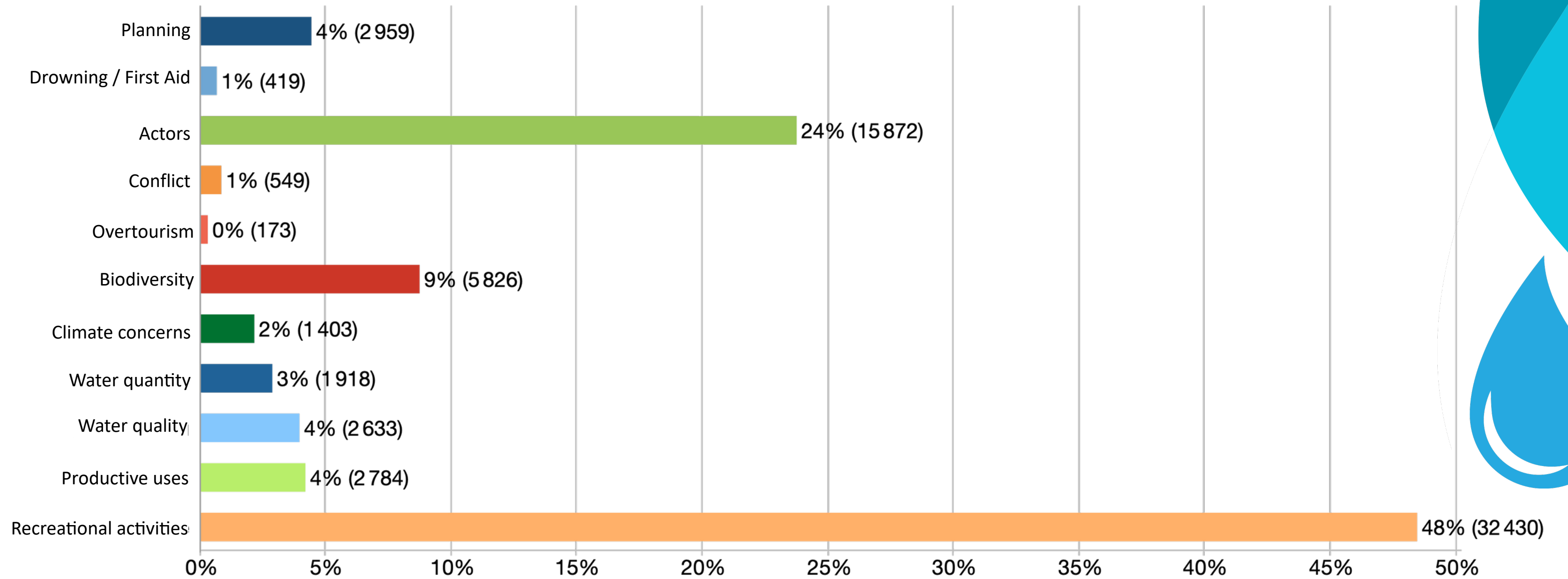
PAU BÉARN
PYRÉNÉES
Communauté d'Agglomération

Lacanau lake, April 2024, Pierre Durand

References

- Bousquet, F., & Amiel, P. (2021). La presse quotidienne régionale. La Découverte.
- Boyer, A.-L., Le Lay, Y.-F. & Marty, P. (2021), « Coping with scarcity: The construction of the water conservation imperative in newspapers (1999–2018) », *Global Environmental Change*, vol. 71, pp. 102387.
- David M., Cantat O. et Gérard É., 2022, « L'îlot de fraîcheur du Cotentin (Normandie) : un eldorado de l'adaptation aux canicules ? », 35ème Colloque annuel de l'Association internationale de climatologie, AIC, 7 p.
- Dehez, J. (2020). Etude de fréquentation sur lac d'Aureilhan (Landes). INRAE (France).
- Du, H., Song, X., Jiang, H., Kan, Z., Wang, Z., & Cai, Y. (2016). Research on the cooling island effects of water body: A case study of Shanghai, China. *Ecological Indicators*, 67, 31-38.
- Dubé, K., Brisson, G., Doyon, S., & Levesque, B. (2016). La prolifération des cyanobactéries au Québec: Une perspective de sciences sociales sur le risque et la gestion. *VertigO - la revue électronique en sciences de l'environnement*, Volume 16 Numéro 2, Article Volume 16 Numéro 2.
- Greillet, C. (2019). Les toxines de cyanobactéries: Une préoccupation sanitaire croissante. *Le bulletin des vigilances de l'Anses*, 8.
- IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp.
- Juschten, M., Brandenburg, C., Hössinger, R., Liebl, U., Offenzeller, M., Prutsch, A., Unbehauen, W., Weber, F., & Jiricka-Pürner, A. (2019). Out of the City Heat—Way to Less or More Sustainable Futures? *Sustainability*, 11(1).
- Köberl, J., F. Pretenthaler and D.N. Bird, 2016: Modelling climate change impacts on tourism demand: a comparative study from Sardinia (Italy) and Cap Bon (Tunisia). *Sci. Total Environ.*, 543, 1039–1053.
- Texier, J.-C., & Werly, R. (2022). Presse et territoires. Une si fertile proximité. *Nevicata*.
- Völker, S., Baumeister, H., Claßen, T., Hornberg, C., & Kistemann, T. (2013). Evidence for the temperature-mitigating capacity of urban blue space—a health geographic perspective. *ERDKUNDE*, 67(4).
- Violier, P. (2007). Tourisme et médias: Regards d'un géographe. *Le Temps des médias*, 8(1), 159-170.
- Vij, S., Biesbroek, R., Adler, C., & Muccione, V. (2021). Climate Change Adaptation in European Mountain Systems: A Systematic Mapping of Academic Research. *Mountain Research and Development*, 41, A1-A6.

Thematic proportions



Water quantity

