

INTRODUCTION

The use of **seabirds** as monitors of the marine environment has been widely addressed. In the European Atlantic Area the Northern Fulmar (*Fulmarus glacialis*) has been used for monitoring the **ingestion of plastic litter** by marine fauna; this is particularly relevant for the implementation of the Marine Strategy Framework Directive (MSFD). However, this species is very scarce in the Southern European Atlantic Area and therefore it cannot be used as a biomonitor species. Hence, there is a need to assess alternative seabird species as biomonitors of plastic litter in the abovementioned region.

The **aims** of this study were 1) to **assess the ingestion of plastics by two seabird species** widely distributed in the SE Bay of Biscay: the Common Guillemot (*Uria aalge*) and the Northern Gannet (*Morus bassanus*); 2) to **evaluate their suitability as biomonitors of plastic litter** in the study area.



Fig. 1. Seabirds selected for monitoring plastic litter in the SE Bay of Biscay.

MATERIALS AND METHODS

- Study area: Southeastern Bay of Biscay.
- Birds analysed: 50 dead guillemots from beach surveys and 23 gannets (2 from beach surveys and 21 from rehabilitation centres in Cantabria (C), Bizkaia (B) and Gipuzkoa (G) provinces) were obtained for the study.

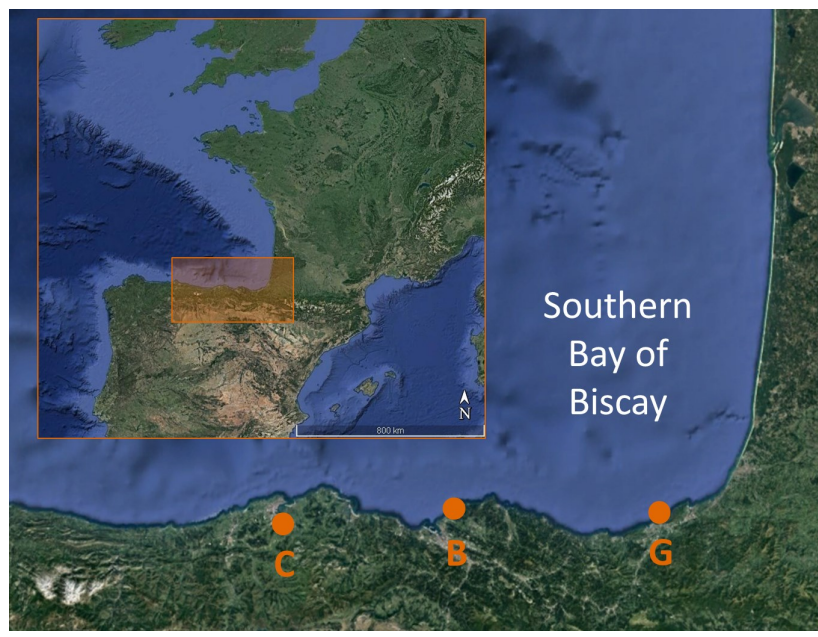


Fig. 2. Study area and the rehabilitation centres where some seabirds were obtained.

- Seabirds were dissected and stomach contents were analyzed in search of plastic litter following van Franeker et al. (2011).
- Biometric measurements were carried out (age, sex, head, bill, wing length, general condition, organs condition, gonad development, etc.).

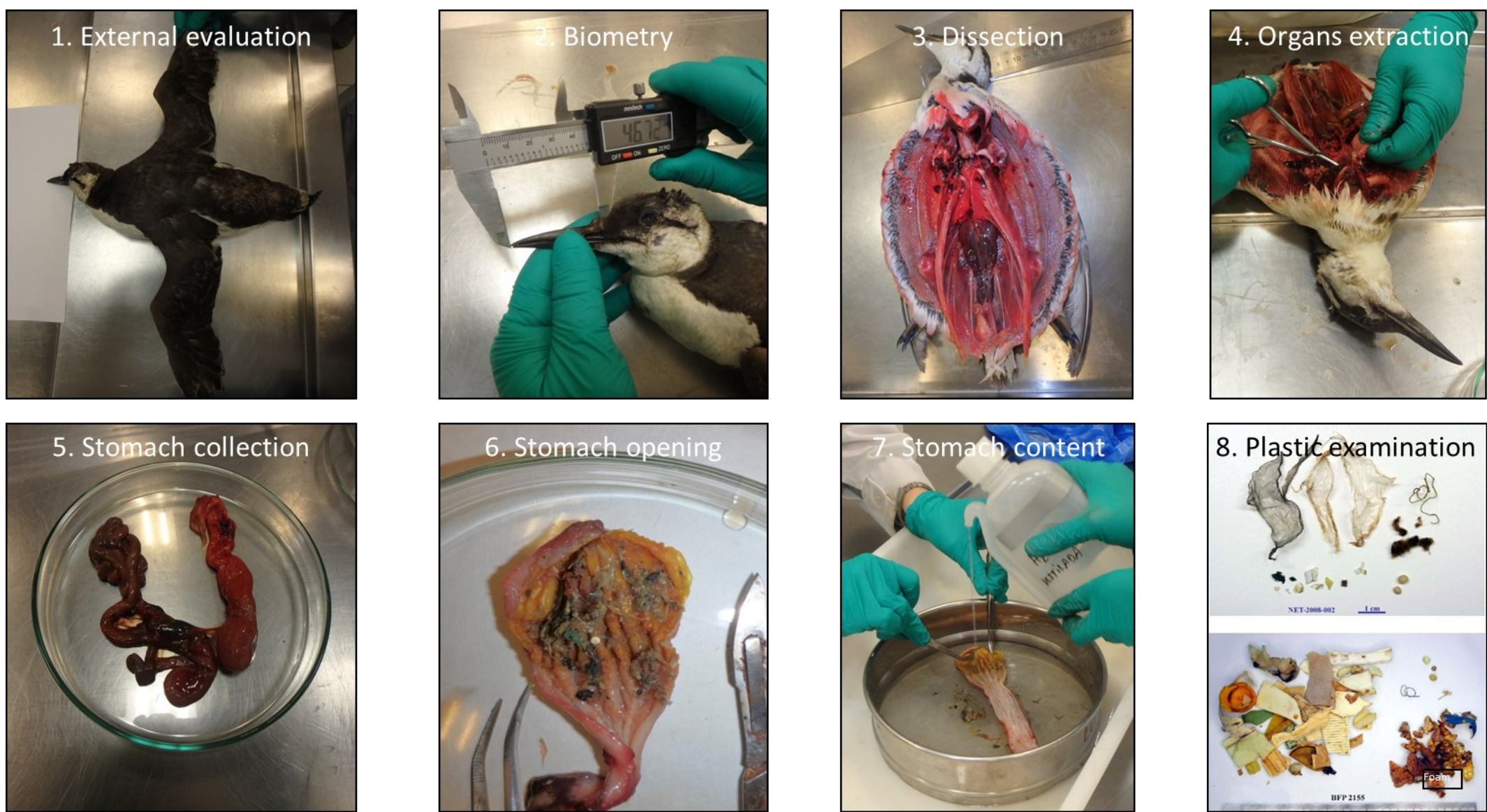


Fig. 3. Procedure to obtain plastics from the stomach of seabirds.

- The following endpoints of plastic ingestion were recorded:
 - Number and mass of plastics per individual.
 - Size, type and color of plastics found in each individual.
 - Prevalence of the occurrence of plastics for each species.
 - Average number of plastic per individual for each species.

RESULTS AND DISCUSSION

Table 1. Occurrence of plastics in the stomach of Common Guillemots and Northern Gannets of the North Atlantic area. The results obtained in this work are compared with those from other studies. Data on sample size (number of birds analysed), prevalence (% of birds with plastics) and average number of particles (per individual) are presented.

Common Guillemot (<i>Uria aalge</i>)					
Reference	Sample (n)	Prev. (%)	Aver. Numb. particles	Geographic area	Survey period
This study	50	10.0	0.14	SE Bay of Biscay	2016-2017
Acampora et al. (2016)	25	12.0	0.12	Ireland	2014-2016
Bond et al. (2013)	60	1.7	0.016	Newfoundland (Canada)	1996-1997
Bond et al. (2013)	11	9.1	0.09	Newfoundland (Canada)	2011-2012
Muzaffar (2000)	28	0.0	0.00	Newfoundland (Canada)	2006
Northern Gannet (<i>Morus bassanus</i>)					
Reference	Sample (n)	Prev. (%)	Aver. Numb. particles	Geographic area	Survey period
This study	23	13.0	0.30	SE Bay of Biscay	2016-2017
Acampora et al. (2016)	15	26.7	0.46	Ireland	2014-2016
Moser and Lee (1992)	7	0.0	0.0	North Carolina (USA)	1975-1989

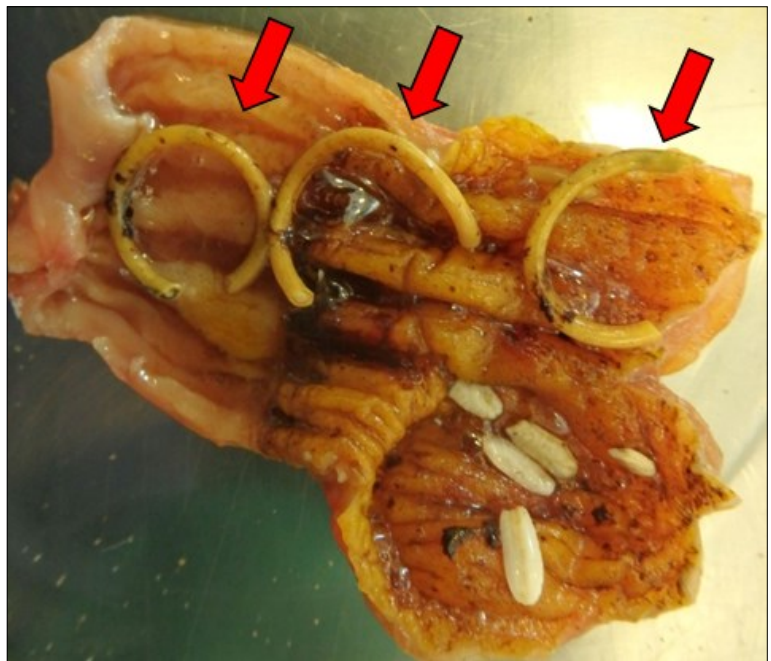


Fig. 4. Stomach of a Common Guillemot showing whitish plastic fragments (red arrows) and otoliths.



Fig. 5. Stomach of a Northern Gannet showing nylon threads attached to fishing hooks.

Plastics were found in **5 out of 50 of the studied Common Guillemots (10%)**. The size range of these plastics was 1.8-45 mm. The type of plastics found were fragments, foam and fibre. The prevalence of plastic litter in this species in this work is comparable with the results from other studies and areas of the North Atlantic.

Plastics were found in **3 out of 23 of the studied Northern Gannets (13%)**. They corresponded to nylon threads for fishing. **Fishing hooks** were also present in the gastro-intestinal tract of two birds. This evidences the interaction of fishing activities with seabirds in this area.

The prevalence of plastic in the stomachs of the analyzed species is **much lower than the values reported in several studies for the Northern Fulmar** (median of 81%), reflecting differences in foraging strategies and, therefore, in the vulnerability to plastic ingestion, provided that higher plastic concentration occurs in the surface.

Very few studies have been carried out for these two species in the North Atlantic. **This work presents the first data on plastic ingestion by seabirds in the Bay of Biscay.**

CONCLUSION

- Due to their widespread distribution, abundance and carcasses availability, the Common Guillemot and the Northern Gannet are good candidates for monitoring the ingestion of plastic litter by seabirds in the Bay of Biscay.
- Ingested plastic occurrence is consistent with other studies but more data is needed for the implementation of the MSFD.

References: Van Franeker JA, et al. (2011). Environ. Poll. 159: 2609-2615. • Bond AL, et al. (2013). Mar. Pollut. Bull. 77: 192–195. • Moser ML and DS Lee (1992). Colon. waterbirds 15: 83–94. • Muzaffar SB (2000.) J. Wildlife Dis. 45: 672–683. • Acampora H et al. (2016) Mar. Env. Res. 120: 122-129.

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