



INSIGHTS FROM LONG-TERM PHOTO-IDENTIFICATION IN THE NORTHWESTERN MEDITERRANEAN: NOT SO FAITHFUL SPERM WHALES IN A HAZARDOUS AREA?

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INTRODUCTION

The sperm whale (*Physeter macrocephalus*) is a common species in the Mediterranean Sea, where it constitutes an approximately closed population. It often bears persistent natural markings and flukes before its foraging dives, enabling it to be non-invasively studied by photo-identification.

Results obtained this way can provide valuable knowledge on several topics such as population estimates (Rendell *et al.*, 2014), social behaviour (Drouot-Dulau & Gannier, 2007) or long-range movements (Thompson *et al.*, 2024).



FIELD METHODS

Groupe de Recherche sur les Cétacés has been photo-identifying sperm whales in the Mediterranean with a consistent methodology since the early nineties. Animals are detected visually from a 9-12 m sailboat, with or without previous acoustic guidance. Pictures are taken with 300-600 mm telelenses (or UAV in some rare cases), enabling the boat to stay farther than 100 m from the whale and preventing disturbance. The main aims of the photographers are the two faces of the fluke displayed by the sperm whale upon diving, but pictures of the flanks are also taken when possible.

ANALYSIS AND DATASET OVERVIEW

273 identifications were obtained between **1991** and **2024** in the whole Mediterranean, from spring to fall; from thousands of reviewed pictures, 996 were selected and visually described in a dedicated spreadsheet database.

Stability and comparability of the identification process over time was confirmed using a 0-3 quality index across three periods (mean quality index = 2.15 during 1991-2004, 2.20 (2005-2014) and 2.19 (2015-2024)).

While the trailing edge of the fluke has traditionally been the main diagnostic feature for sperm whale photo-identification, depigmentation spots, albeit more dependent on picture lighting, have proved to be quite reliable and useful (for up to 31% of individuals) when dealing with unmarked trailing edges, as recently pointed out by *e.g.* Alessi *et al.* (2014).

Matchings were looked for using spreadsheet queries and visual comparisons, and validated by consensus among the four authors; **64** recaptures involving **36** individuals were found.

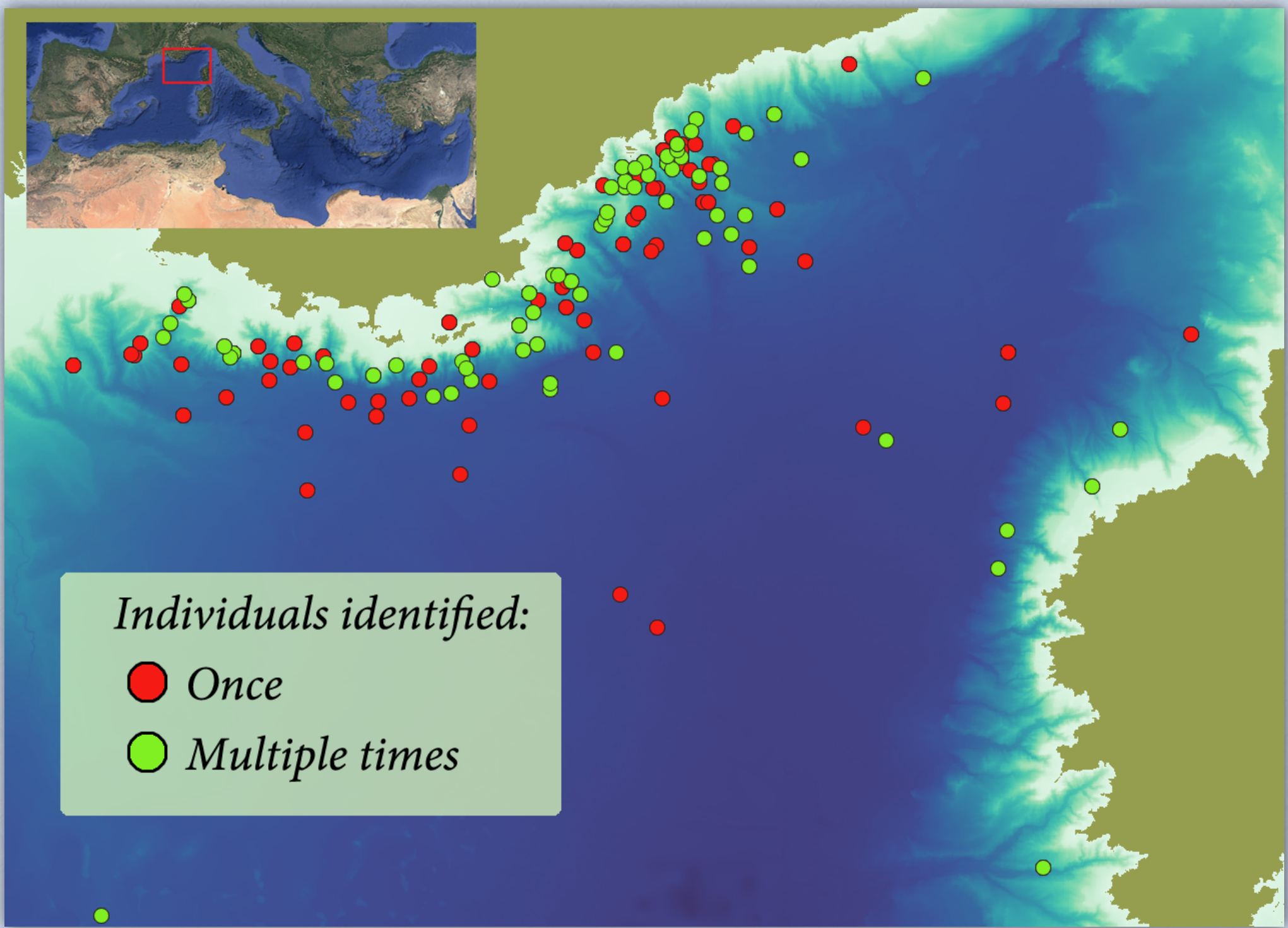
NORTHWESTERN MEDITERRANEAN SUBSET

In order to focus on long-term site fidelity, further analyses were performed on a subset obtained in the Liguro-Provençal area (Northwestern Mediterranean area between 41°N, 5°E and 44°N, 9.3°E) that contained **187** identifications, of which 52 were made in 1991-2004, 60 in 2005-2014, and 75 in 2015-2024. Matching analyses yielded a total of **54** recaptures on **28** individuals, which were assumed to be adult or subadult males based on their size, morphological aspect and group structure.



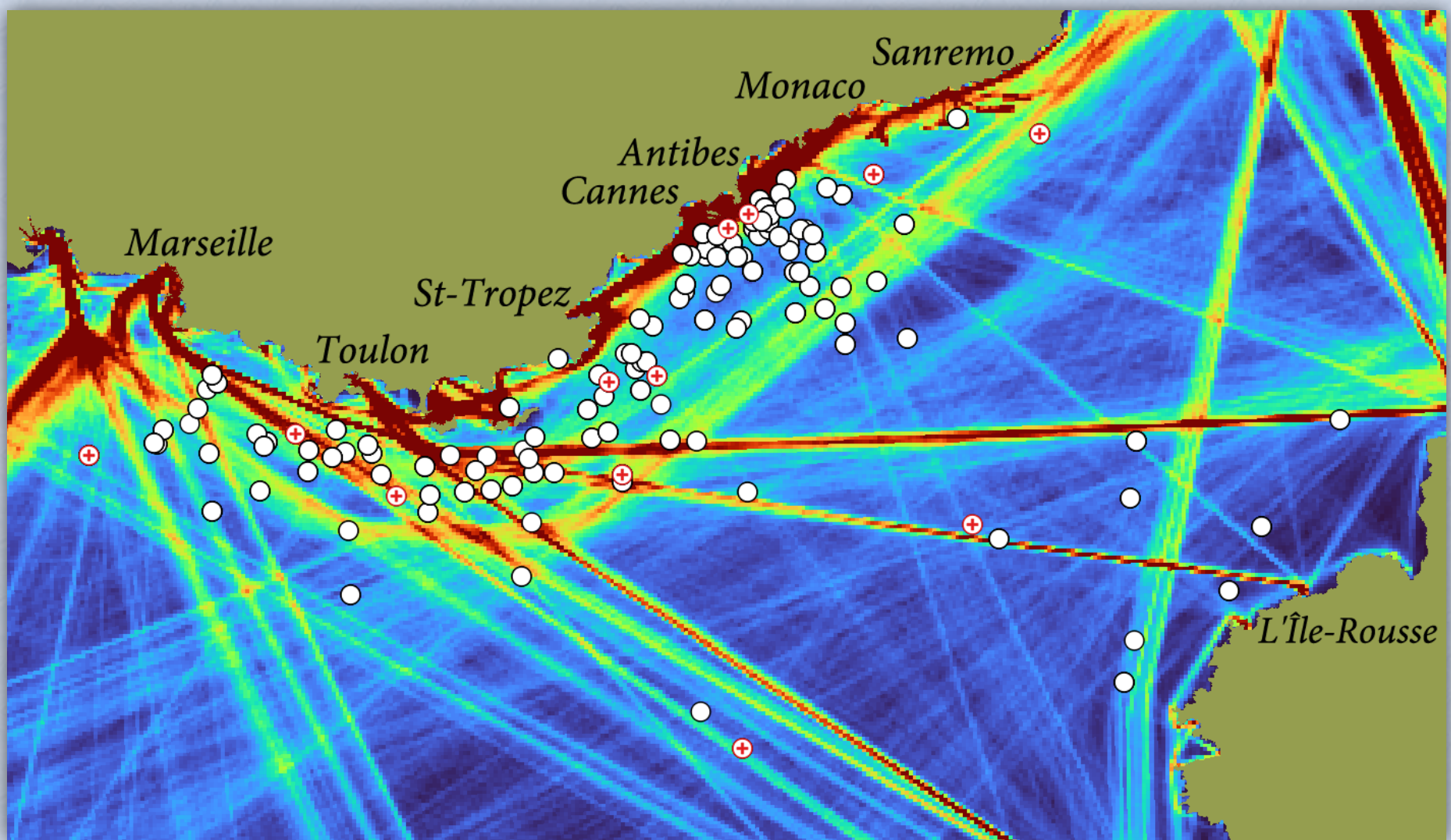
Individual Pluto Pm105103B seen on 02 August 2005 (left) and on 20 July 2018 (right)
— note the stability of the fluke aspect with a 13-year gap

Using this geographically restricted subset, we particularly explored two results: the prevalence of injuries related to ship collisions and the individual long-term regional fidelity (or lack thereof).

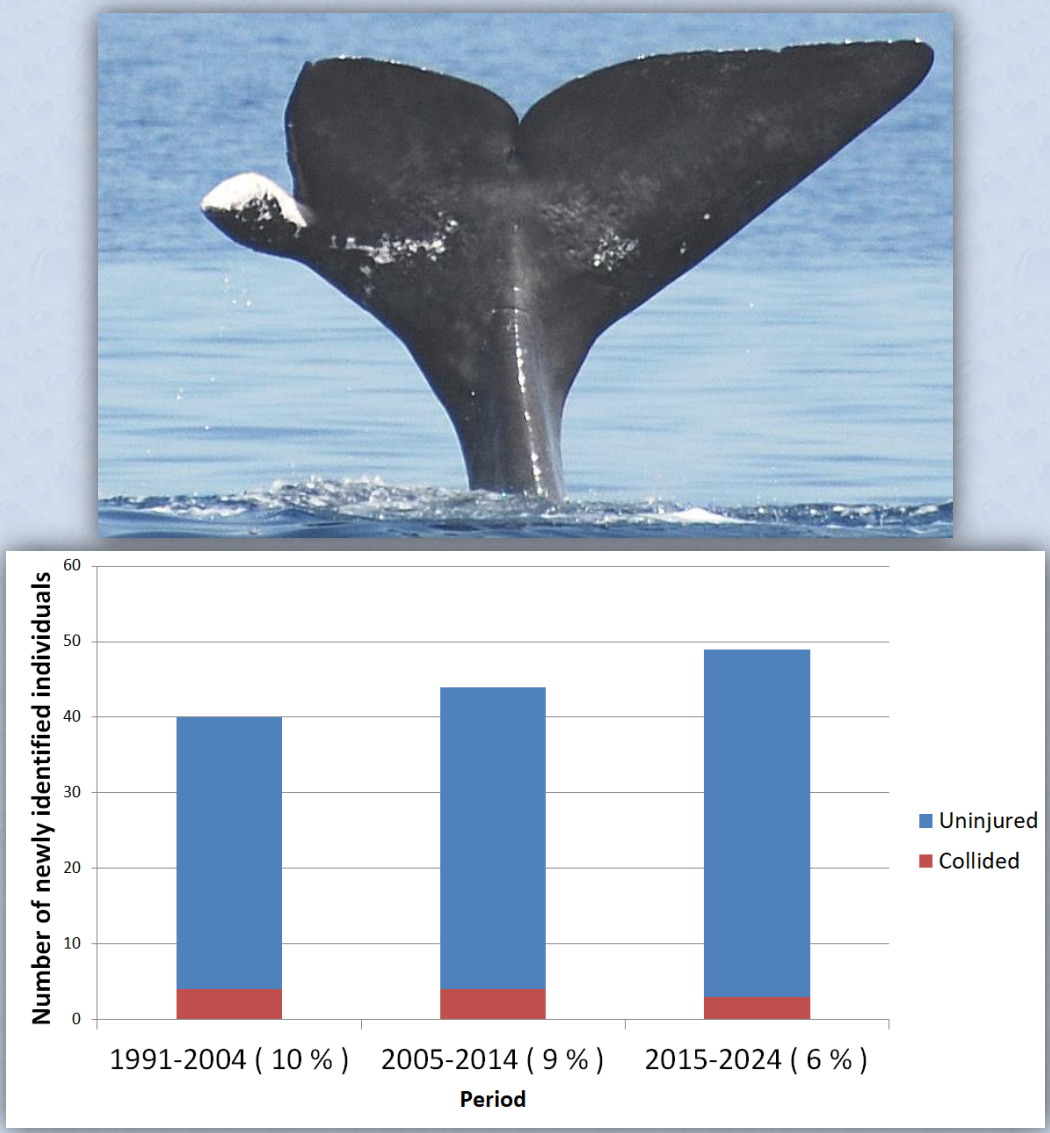


FOCUS ON SHIP-RELATED INJURIES

Signs of ship collisions were assessed in the Liguro-Provençal subset: sperm whale local distribution overlaps with very busy traffic lines. Doubtful cases were discarded, and **11** individuals were found presenting mild to severe ship-related injuries. No individual with severely injured fluke was resighted after initial identification.



Identified sperm whales (red crosses for injured individuals) and 2024 VMS route densities

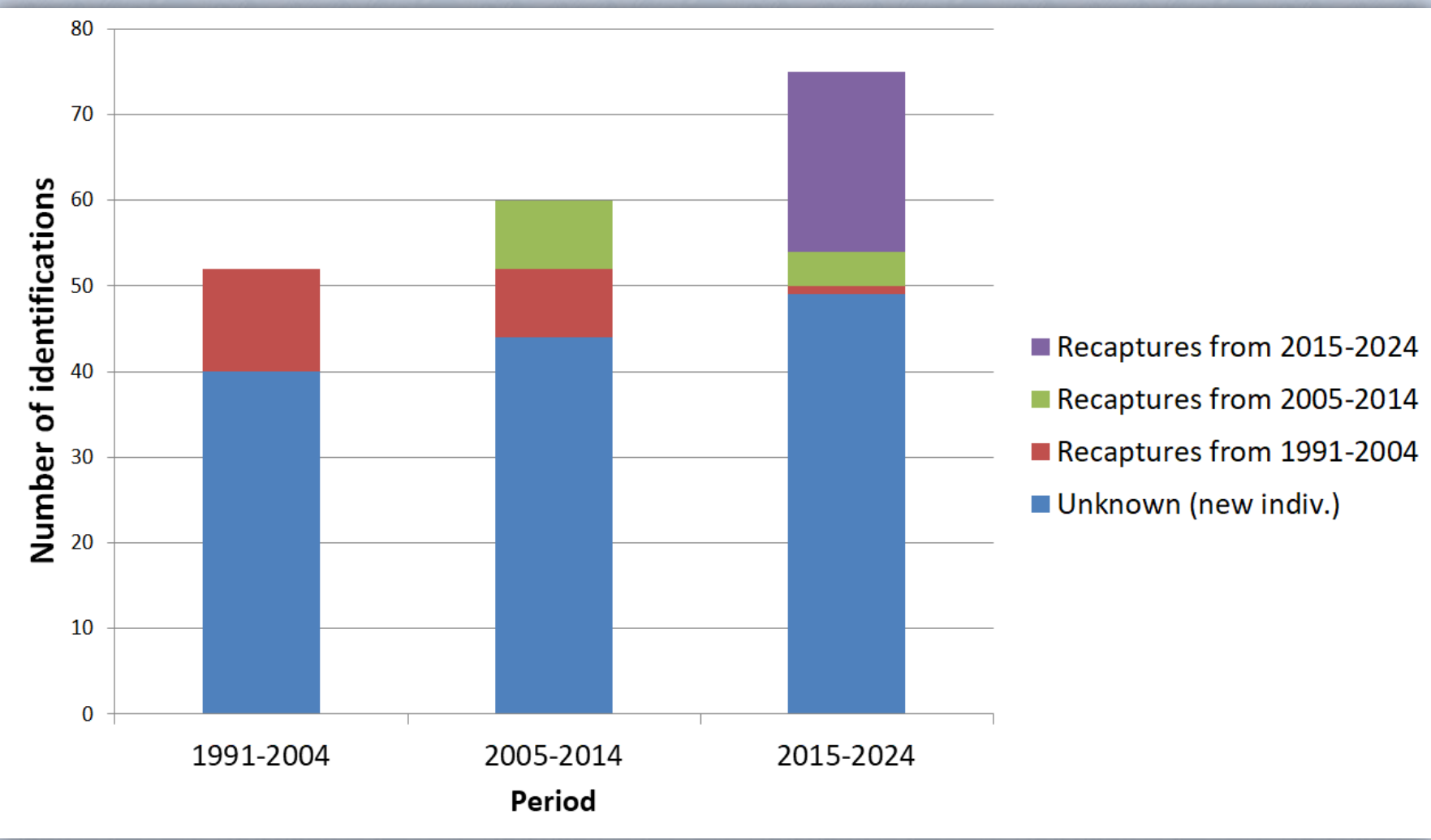
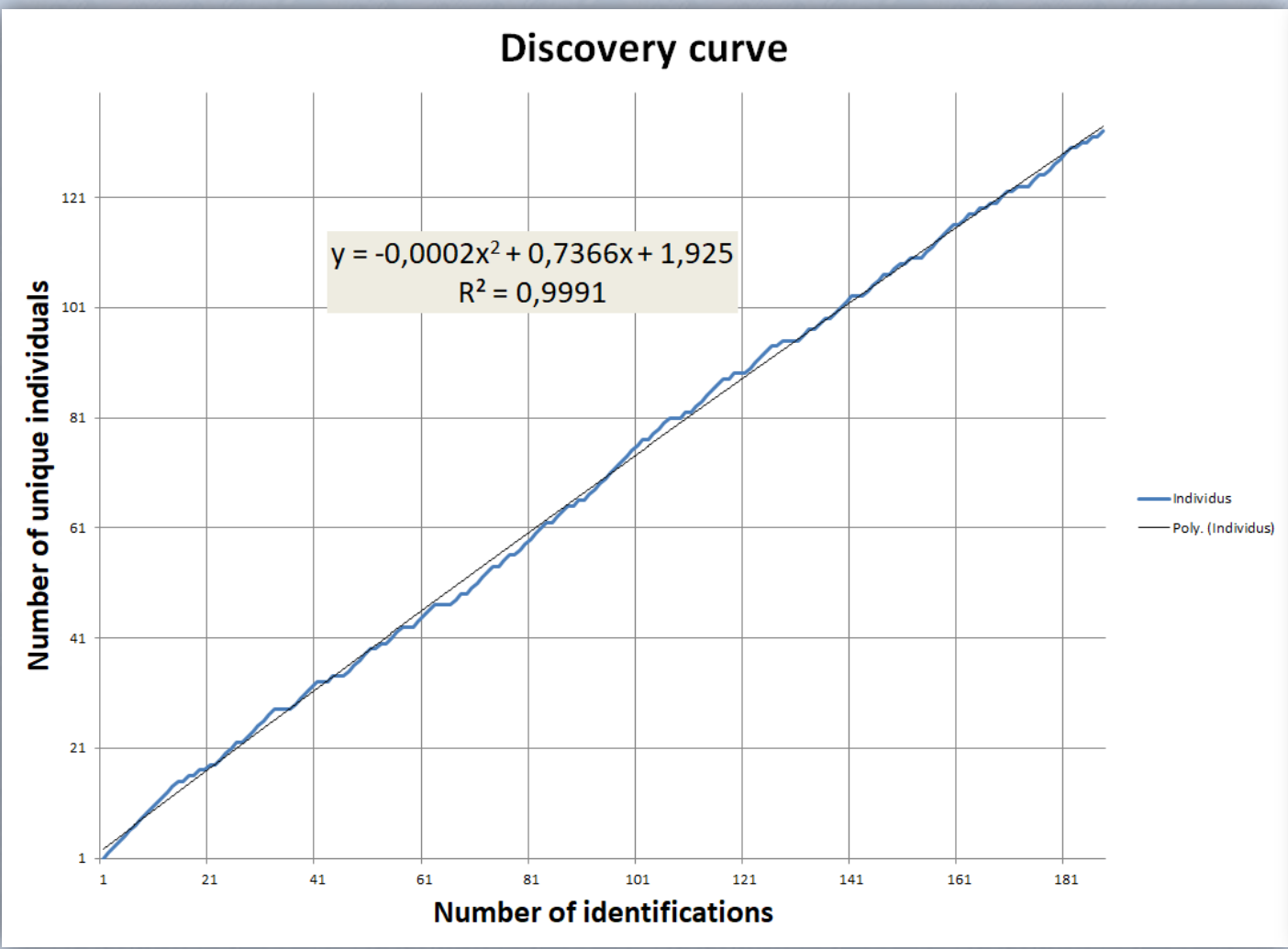


Comparison over time revealed an apparent decrease in wounded whale frequency over the three periods (**10% to 9% to 6%**). While its significance should be more precisely assessed, this might be related to, during the last two decades, a raised awareness about this problem among mariners and/or the development of technological tools to prevent collisions (*e.g.* *REPCET* since the early 2010s based on visual data sharing or *WHALESafe* based on real time acoustic localization of sperm whales (Alessi *et al.*, 2016)) and/or the end of High-Speed Ferries commercial use between Corsica and mainland France in 2011.

Alessi *et al.* (2014) found a similar injury rate (8%) in Italian waters of the Pelagos Sanctuary over the 2004-2012 period. In contrast, Panigada *et al.* (2020) estimated the *REPCET* actual efficiency to be <1% (in 2018) due to a low number of equipped vessels despite legal requirements and found no trend over the 2007-2018 period (injury rate fluctuating between 9% and 17%).

ABOUT LONG-TERM SITE FIDELITY

In the NW Mediterranean subset, recaptured animals were identified 2-7 times across 1-4 different years. Picture comparisons highlighted a striking stability of the external aspect of individuals between their first and last identifications (max span = **15 years**); this could indicate that these time spans are short compared to their age.



The discovery curve over the 187 identifications in 34-year period was remarkably linear with a 0.74 coefficient, showing that new individuals kept being encountered with a consistent rate. Likewise, while the longer interval between consecutive captures was 13 years, intervals between first and last captures were generally short (median = **2 summers**).

Although these results will benefit from additional data, they could point towards a rather short site fidelity for feeding adult and subadult male sperm whales, coupled to some regular summering ground switching across the Mediterranean sea. As a matter of fact, intra- and inter-basin movements between feeding grounds have been documented in the Mediterranean (Frantzis *et al.*, 2011; Carpinelli *et al.*, 2014; Thompson *et al.*, 2024; GREC unpub. data); therefore, a “few consecutive summers” residency pattern, that has already been highlighted in other regions (*e.g.* Kobayashi & Amano, 2020), might be at least partially valid in the Liguro-Provençal area —... assuming that observed residencies are not reduced by any abnormally high local mortality.

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