Movements and habitat use of river dolphins (cetartiodactyla: Iniidae) in the Amazon and Orinoco river basins, determined from satellite tagging

Mosquera Guerra, Federico, Trujillo Fernando, Oliveira-da-Costa Marcelo, Marmontel Miriam, Van Damme Paul A, Carvajal-Castro Juan David, Mantilla- Meluk Hugo, Franco Nicole, & Armenteras-Pascual Dolors.

Context

González-Carmen et al. 2016

ICES Journal of Marine Science Advance Access published March 16, 2016

ICES Journal of Marine Science

ICES CIEM

ICES Journal of Marine Science; doi:10.1093/icesjms/fsw019

Distribution of megafaunal species in the Southwestern Atlantic: key ecological areas and opportunities for marine conservation

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[1]*Instituto de Investigaciones Marinas y Costeras (IIMyC), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)—Universidad Nacional de Mar del Plata (UNMdP), Mar del Plata, Argentina*
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González Carman, V., Mandiola, A., Alemany, D., Dassis, M., Seco Pon, J.P., Prosdocimi, L., Ponce de León, A., Mianzan, H., Acha, E.M., Rodríguez, D., Favero, M., and Copello, S. Distribution of megafaunal species in the Southwestern Atlantic: key ecological areas and opportunities for marine conservation. – ICES Journal of Marine Science, doi: 10.1093/icesjms/fsw019.

Received 14 July 2015; revised 7 January 2016; accepted 29 January 2016.

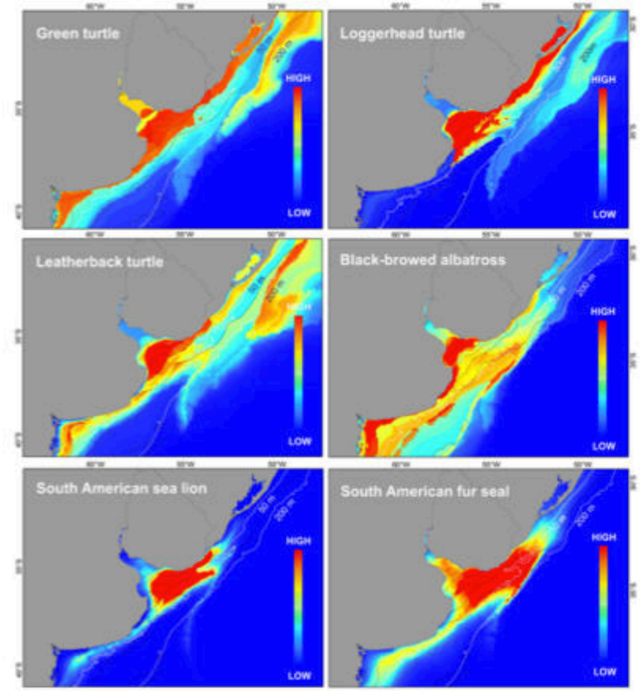

Figure 3. Potential distribution of megafaunal species during the autumn – winter period in the WTSA province and adjacent international waters modelled through maximum entropy. Black lines delimit oceanographic frontal areas and white lines indicate 50 and 200 m isobaths. This figure is available in black and white in print and in colour at *ICES Journal of Marine Science* online.

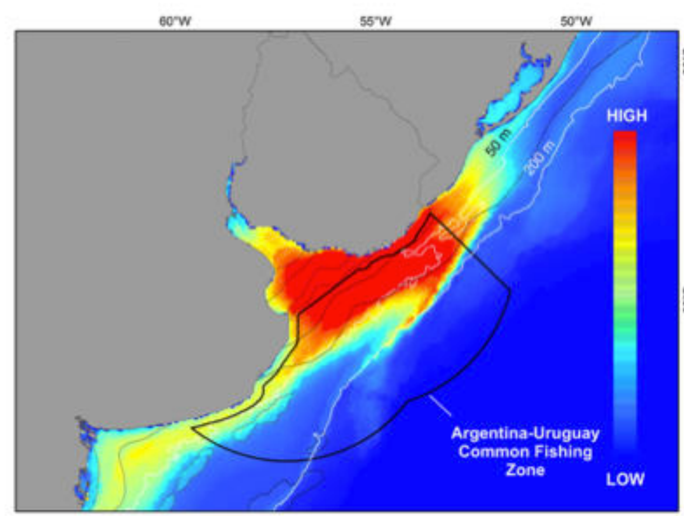

Figure 4. Overlap map of potential distribution of megafaunal species during the autumn – winter period in the WTSA province and adjacent international waters. Black lines delimit oceanographic frontal areas and white lines indicate 50 and 200 m isobaths. This figure is available in black and white in print and in colour at *ICES Journal of Marine Science* online.

Context

Wells et al. 2017

Vol. 33: 159–180, 2017
doi: 10.3354/esr00732

ENDANGERED SPECIES RESEARCH
Endang Species Res

Published January 31

Contribution to the Theme Section 'Effects of the Deepwater Horizon oil spill on protected marine species'

Ranging patterns of common bottlenose dolphins *Tursiops truncatus* in Barataria Bay, Louisiana, following the *Deepwater Horizon* oil spill

Randall S. Wells[1,*], Lori H. Schwacke[2], Teri K. Rowles[3], Brian C. Balmer[1,2], Eric Zolman[2], Todd Speakman[2], Forrest I. Townsend[4], Mandy C. Tumlin[5], Aaron Barleycorn[1], Krystan A. Wilkinson[1]

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[2]Hollings Marine Laboratory, National Centers for Coastal Ocean Science, National Oceanic and Atmospheric Administration, 331 Fort Johnson Road, Charleston, South Carolina 29412, USA
[3]Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 1315 East West Highway, Silver Spring, Maryland 20910, USA
[4]Bayside Hospital for Animals, 251 Racetrack Road NE, Fort Walton Beach, Florida 32547, USA
[5]Louisiana Department of Wildlife and Fisheries, 2000 Quail Drive, Baton Rouge, Louisiana 70808, USA

Fig. 11. Composite maps of home ranges of all dolphins (*Tursiops truncatus*) grouped by similar ranging patterns: (a) West, (b) Islands, (c) East

years in BAR, with 20 (45 %) recorded from each year during 2010 to 2014. All but 6 tagged dolphins (86 %) were documented in BAR during more than 1 season. These findings suggest the occurrence of long-term, year-round residence, as documented at many other sites in the GoM (Wells & Scott 1999, Balmer et al. 2008, Waring et al. 2013).

Data supporting these conclusions were derived from a large-scale data collection effort. Satellite-linked telemetry provides opportunities to collect large quantities of high quality location data remotely, day and night, regardless of weather. The greatest number of high quality locations obtained for a BAR dolphin was 399, compiled over 147 d, for Y38 (Table 1). For perspective, 12 to 26 yr of photo-ID survey data were required for 2 long-term resident bottlenose dolphins in Sarasota Bay with similar numbers of locations (F149, F232, authors' unpubl. data).

Table 3. Proportion of overlapping core areas (50 % utilization distribution [UD]) for dolphins (*Tursiops truncatus*) using different combinations of Barataria Bay habitats

	Island	East	West
Island	–	–	–
East	0.013	–	–
West	0.116	0.005	–

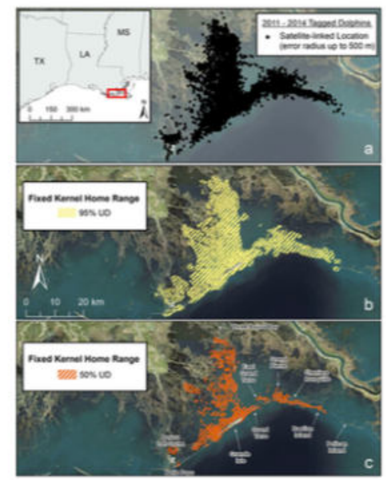

Fig. 4. Composite maps of all of the 44 dolphins (*Tursiops truncatus*) tagged during 2011 to 2014. (a) Satellite-linked locations for each tagged individual (<500 m error radius locations only); (b) fixed kernel home range (95 % utilization distribution [UD]) for each tagged dolphin; (c) fixed kernel core areas (50 % UD) for each tagged dolphin

48–260 d), 140 d for 2013 (range: 80–197 d), and 117 d for 2014 (range: 50–161 d). The total numbers of locations of all qualities received from each tag varied substantially within and between years. On average, 2011 tags produced 612 locations (range: 218–1067), 2013 tags produced 704 locations (range: 497–940), and 2014 tags produced 348 locations (range: 131–655).

All high quality location data (<500 m error radius) from all 44 dolphins tagged from 2011 to 2014 indicated that tagged dolphins remained in BAR throughout the tracking period (Fig. 4). The locations occurred within an area extending about 65 km east to west, from Bayou Lafourche/Belle Pass to Pelican Island, and about 70 km north to south, from Three Bayou Bay to the barrier islands, and encompassing the capture-release sites of the tagged animals (Fig. 2). Most (85.9 %) of the locations were inshore (north) of the barrier islands, while the remainder were in the GoM, but within 4.24 km of shore.

The distributions of tracking locations by capture year were similar for dolphins tagged in 2011 (Fig. 5) and 2014 (Fig. 6), and both were different from those for dolphins tagged in 2013 (Fig. 7), reflecting differences in geographical distribution of capture efforts across years (Fig. 2). Efforts in 2013 included the coastal marshes on the eastern side of BAR where no captures had occurred in 2011; efforts in 2014 fo-

Context

Bonetti et al. 2016

Geomorphology 260 (2016) 79–90

Contents lists available at ScienceDirect

Geomorphology

journal homepage: www.elsevier.com/locate/geomorph

A multi-scale GIS and hydrodynamic modelling approach to fish passage assessment: Clarence and Shoalhaven Rivers, NSW Australia

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ARTICLE INFO

Article history:
Received 29 April 2014
Received in revised form 5 June 2015
Accepted 6 June 2015
Available online 9 June 2015

Keywords:
Fish passage
Connectivity
River2D
HEC-RAS
Hydraulic modelling

ABSTRACT

Natural barriers such as waterfalls, cascades, rapids and riffles limit the dispersal and in-stream range of migratory fish, yet little is known of the interplay between these gradient dependent landforms, their hydraulic characteristics and flow rates that facilitate fish passage. The resurgence of dam construction in numerous river basins world-wide provides impetus to the development of robust techniques for assessment of the effects of downstream flow regime changes on natural fish passage barriers and associated consequences as to the length of rivers available to migratory species. This paper outlines a multi-scale technique for quantifying the relative magnitude of natural fish passage barriers in river systems and flow rates that facilitate passage by fish. First, a GIS-based approach is used to quantify channel gradients for the length of river or reach under investigation from a high resolution DEM, setting the magnitude of identified passage barriers in a longer context (tens to hundreds of km). Second, LIDAR, topographic and bathymetric survey-based hydrodynamic modelling is used to assess flow rates that can be regarded as facilitating passage across specific barriers identified by the river to reach scale gradient analysis. Examples of multi-scale approaches to fish passage assessment for flood-flow and low-flow passage issues are provided from the Clarence and Shoalhaven Rivers, NSW, Australia. In these river systems, passive acoustic telemetry data on actual movements and migrations by Australian bass (*Macquaria novemaculeata*) provide a means of validating modelled assessments of flow rates associated with successful fish passage across natural barriers. Analysis of actual fish movements across passage barriers in these river systems indicates that two dimensional hydraulic modelling can usefully quantify flow rates associated with the facilitation of fish passage across natural barriers by a majority of individual fishes for use in management decisions regarding environmental or instream flows.

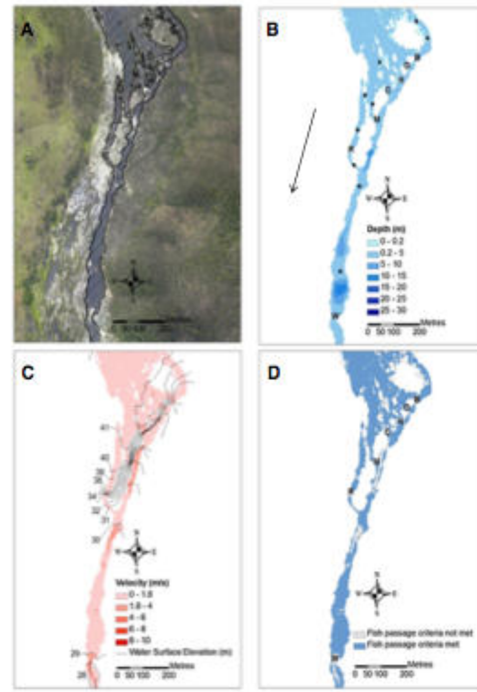

Fig. 4. River2D modelling results for mean annual flow of 94 m3 s^{-1}. (A) shows River2D wetted area over orthorectified aerial photography. (B) shows River2D modelled depths. (C) shows River2D modelled velocities overlain with modelled water surface elevation contours. (D) shows bivariate (criteria met or not met) fish passage assessment for upstream passage by adult Australian bass. Letters indicate prominent waterfalls named as follows: W – willow falls; R – rainbow falls; M – middle falls; C – cave falls; K – rocky falls; D – double falls; B – backchannel falls. Black dots on (B) indicate the location of prominent rapids.

Context

Christel et al. 2012

Estuarine, Coastal and Shelf Science 96 (2012) 257–261

Contents lists available at SciVerse ScienceDirect

Estuarine, Coastal and Shelf Science

journal homepage: www.elsevier.com/locate/ecss

Foraging movements of Audouin's gull (*Larus audouinii*) in the Ebro Delta, NW Mediterranean: A preliminary satellite-tracking study

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[b] Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas (CSIC), C/José Gutiérrez Abascal 2, 28006 Madrid, Spain
[c] Institut de Ciències del Mar (ICM-CSIC), P. Marítim de la Barceloneta 37-49, 08002 Barcelona, Spain
[d] C/Vilanova 8A, 07002 Palma de Mallorca, Mallorca, Illes Balears, Spain

A R T I C L E I N F O

Article history:
Received 27 April 2011
Accepted 8 November 2011
Available online 18 November 2011

Keywords:
Ebro Delta
foraging activity
foraging distribution
habitat use
marine birds
marine habitat
Mediterranean Sea
rice fields

A B S T R A C T

A knowledge of the foraging strategies of marine predators is essential to understand the intrinsic factors controlling their distribution, abundance and their ecological function within the marine ecosystem. Here, we investigated for the first time the foraging movements and activity patterns of Audouin's gull *Larus audouinii* by using satellite-tracking data from eight breeding adults in the main colony of the species worldwide (Ebro Delta, NW Mediterranean). Tagged gulls foraged in the marine area close to the breeding colony (62% of foraging locations) and in the terrestrial area of the Ebro Delta (mainly rice fields; 38% of foraging locations). The foraging activity patterns changed significantly throughout the day; lower from dusk through the first half of the night (19–1 h; 32% of active locations) and higher during the rest of the day (1–19 h; 75.5 ± 4.3% of active locations). These results confirm the foraging plasticity of this seabird and, based on previous information about the dietary habits of this species, we hypothesize how its time-dependent activity patterns and habitat use could be associated with variations in the availability of marine food resources (e.g. diel vertical migrations of pelagic fish) and the exploitation of terrestrial resources (e.g. American crayfish *Procambarus clarkii*).

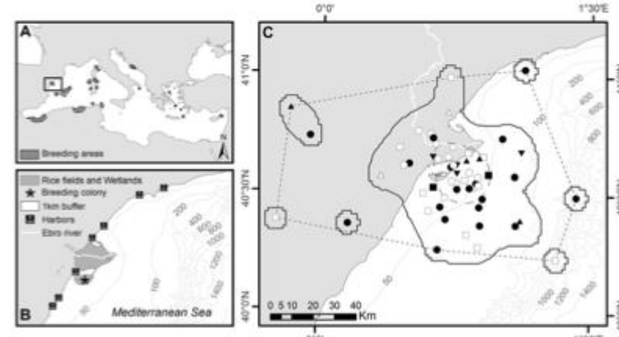


Fig. 1. (a) Breeding areas of the Mediterranean endemic Audouin's gull *Larus audouinii* and study area: Ebro Delta, NW Mediterranean. (BirdLife International, 2011) (b) Map of the Ebro Delta area indicating the Audouin's gull colony position with an asterisk and 1 km buffer area around la "Punta de la Banya" peninsula, the rice fields and wetlands shaded in dark gray and the location of the main harbors. (c) Foraging locations of 7 satellite-tracked Audouin's gulls during the breeding period of 2006. To better visualize the foraging locations' range the Minimum Convex polygon (short dashed line) is shown beside the 95% (solid line) and 50% (long dashed line) kernel polygons.

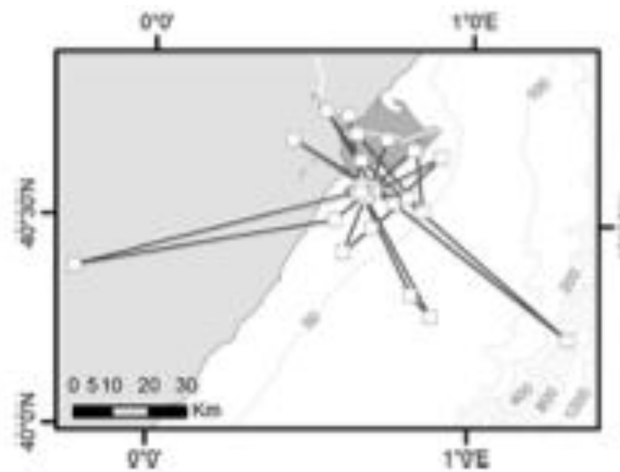


Fig. 2. Example of foraging trajectories for the individual "58980" (see Table 1 for more information).

Context

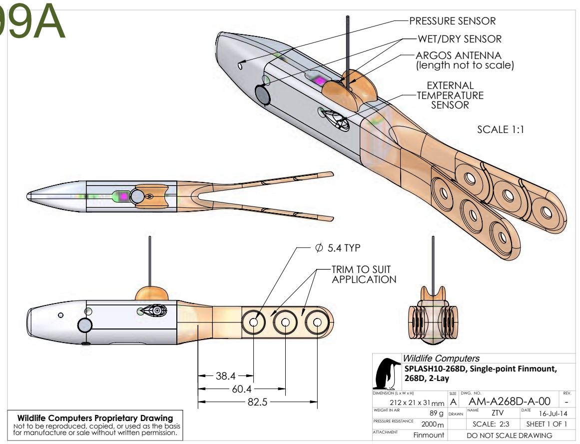
Largest diversity of river dolphins on the planet

Cetaceans most threatened on the planet

Hydroelectric
110-142
99-160 Planned
7 Construction
4 Operation

Material and Methods

Spot 299A



A. Capture; B. Transfer; C. Veterinary evaluation.

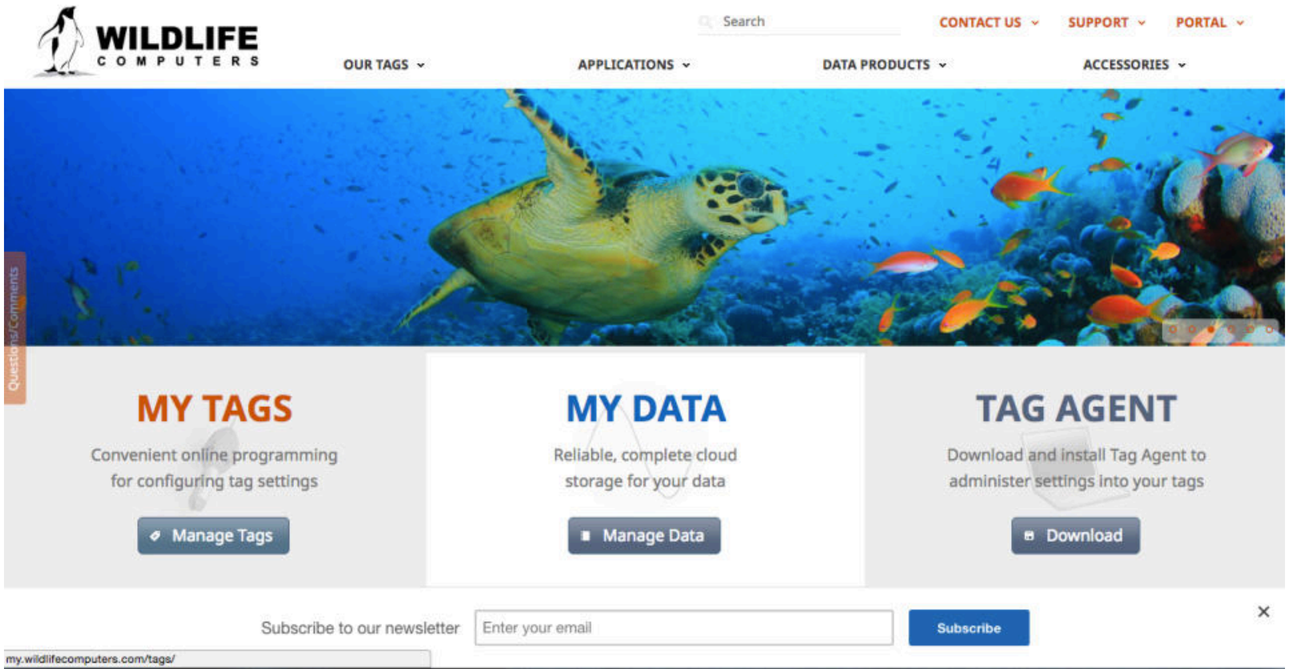
Material and Methods

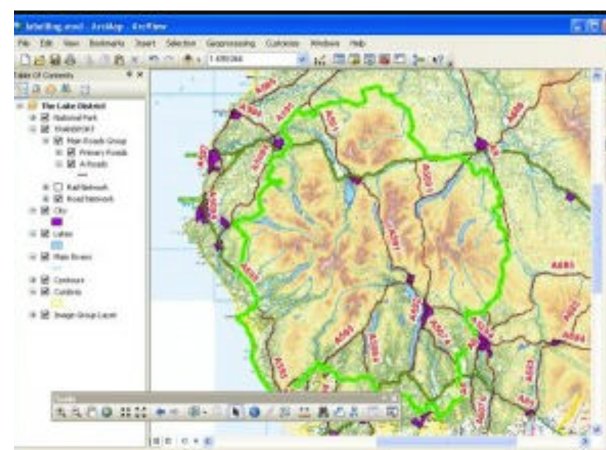
C. Roles; D. Hydration; E. Sedation and Sampling.

Material and Methods

F. Installation of the Tag; G. Hydration;
H. Stabilization and liberation.

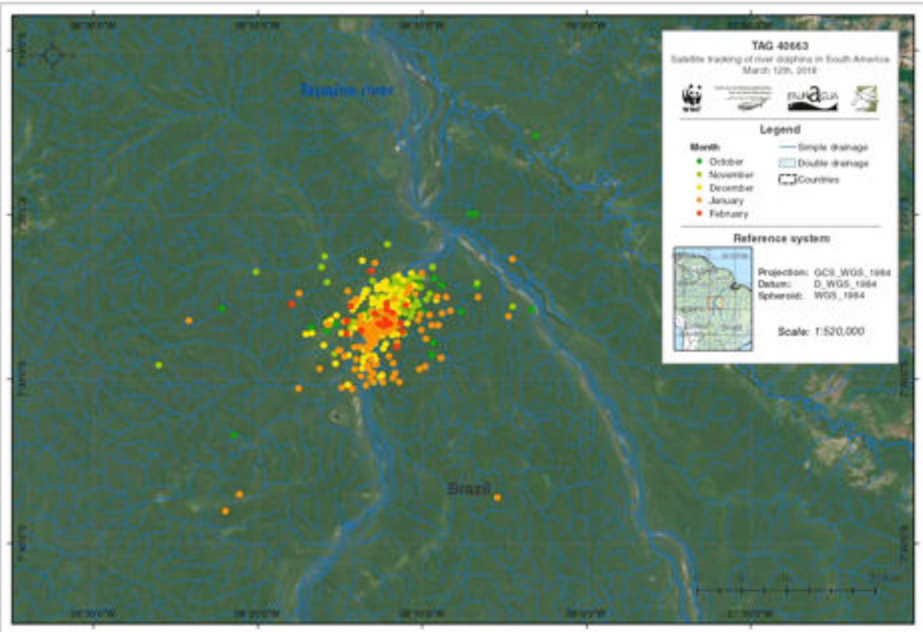
Material and Methods

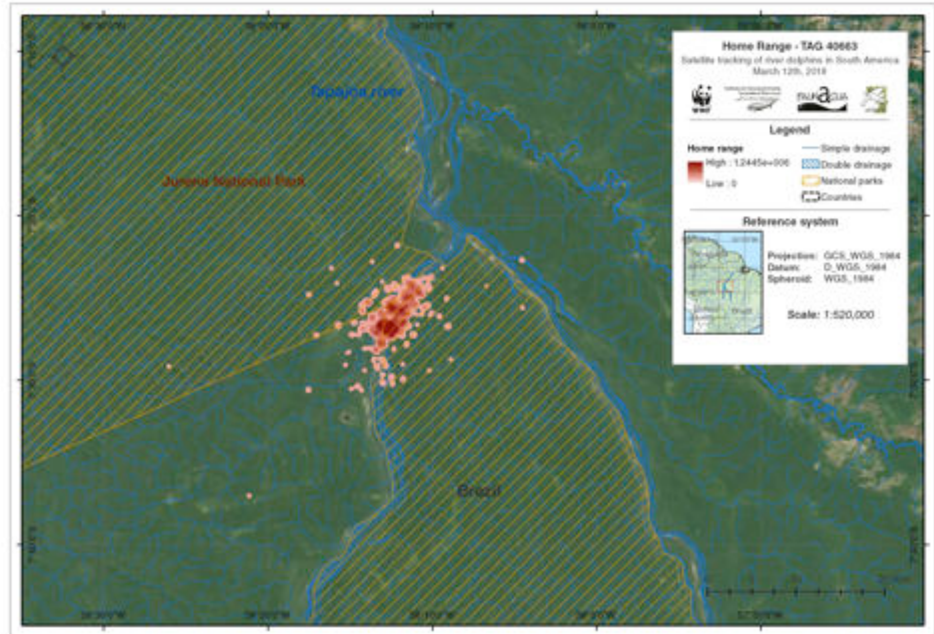




Results

Brasil

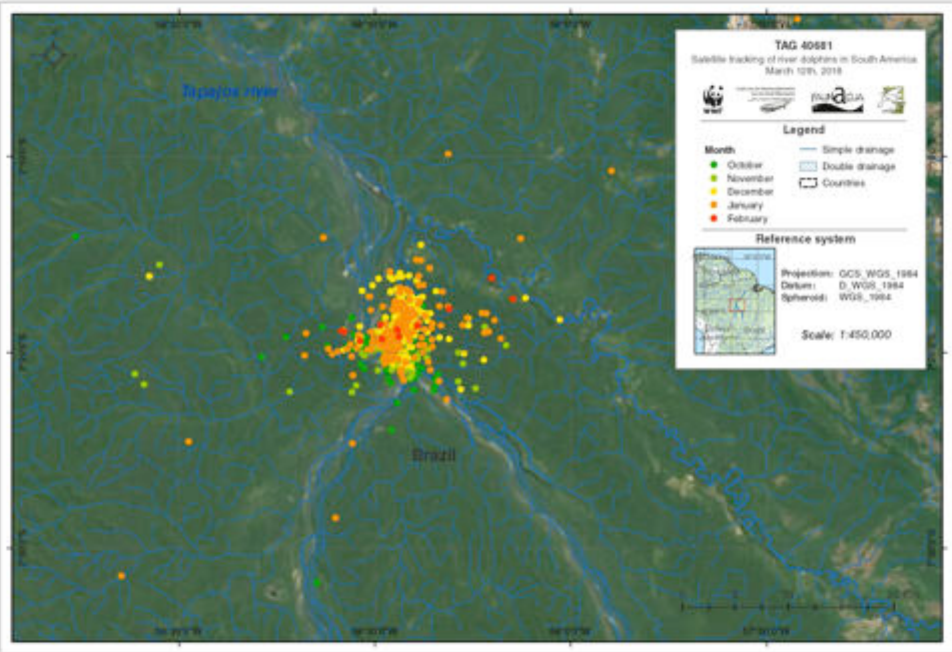


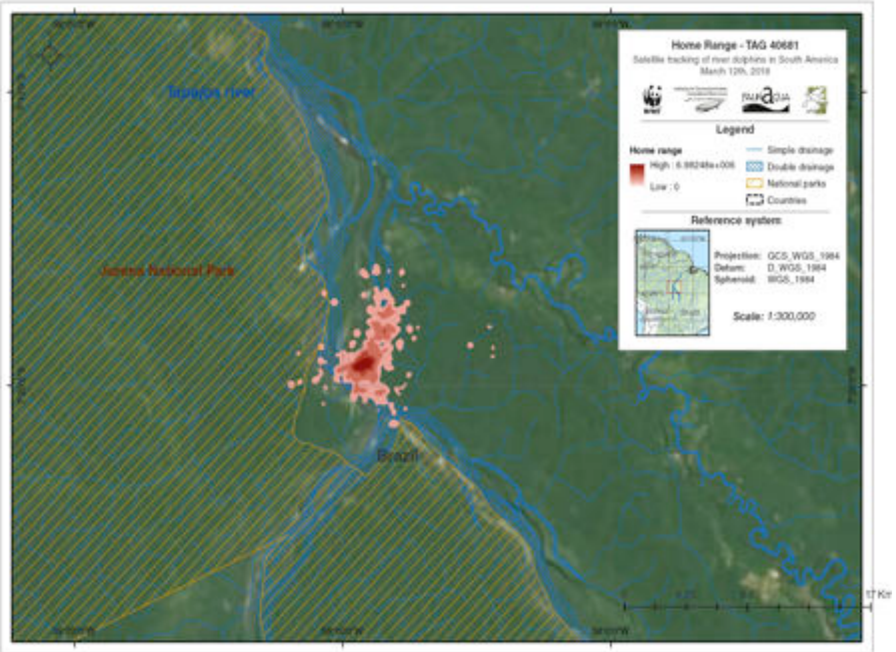


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Brasil	40663	54,4	12/01/18	23/01/18	1054

Results

Brasil





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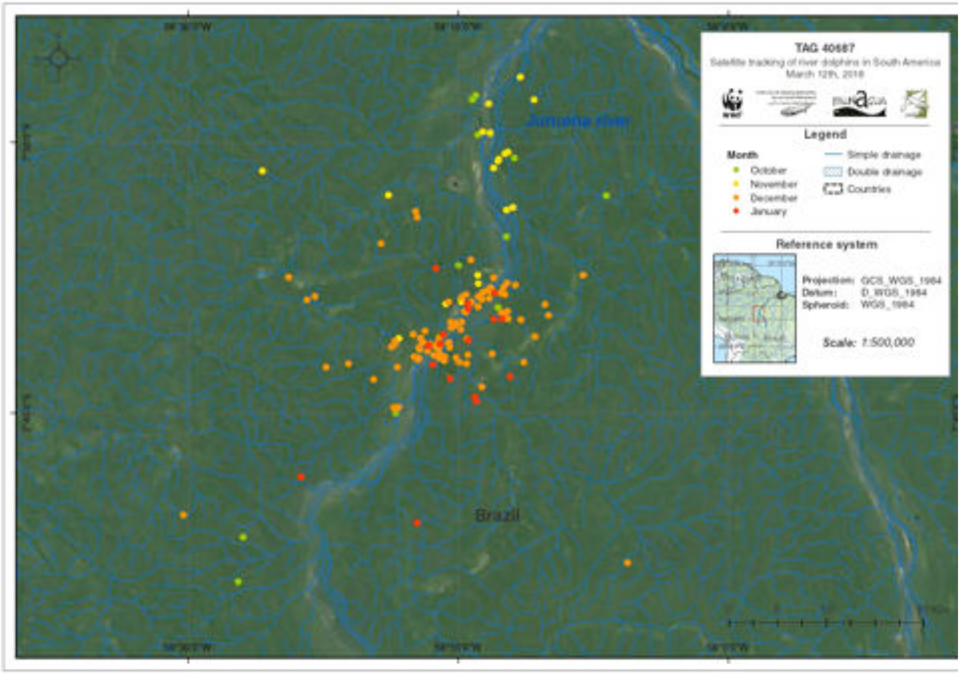
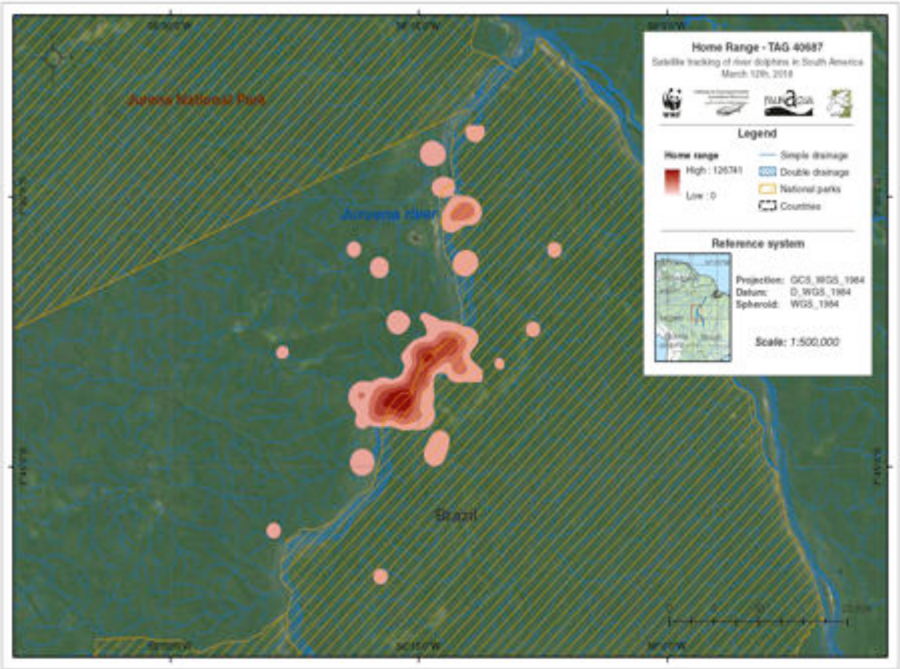
Results

Brasil

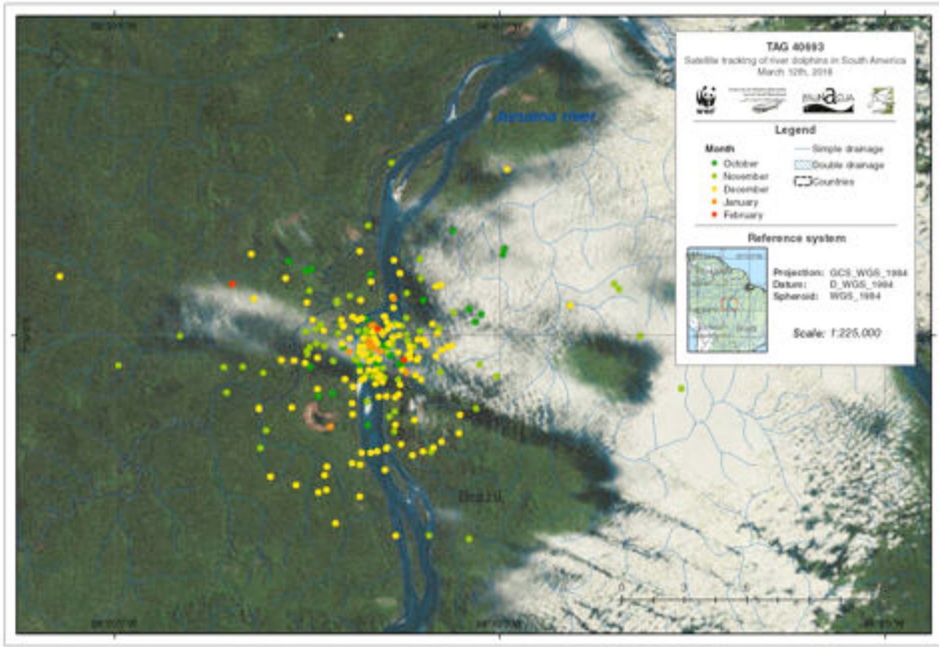


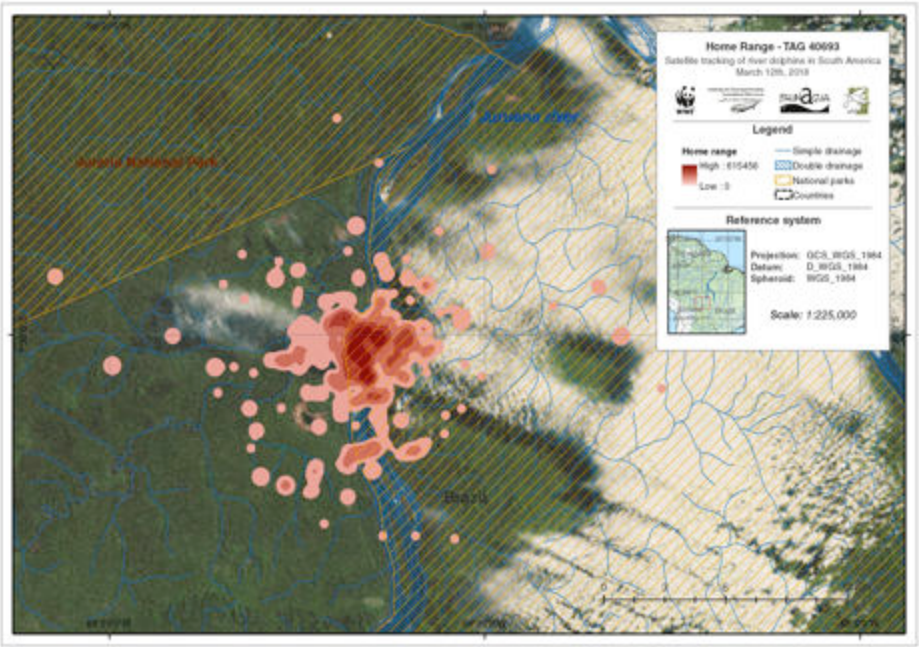


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Brasil	40687	70,5	18/10/17	18/11/17	327

Results

Brasil





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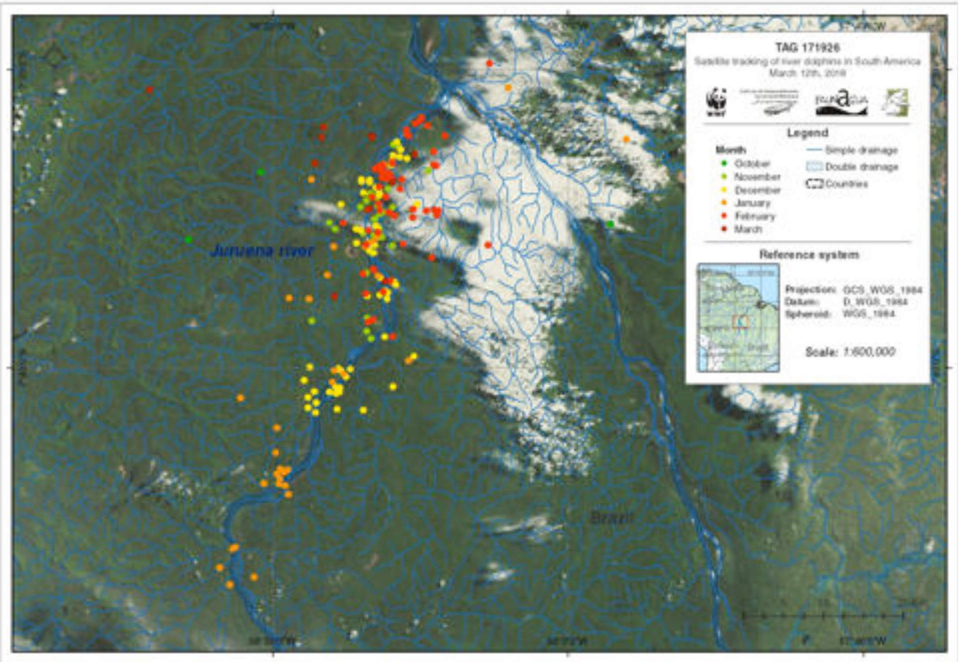
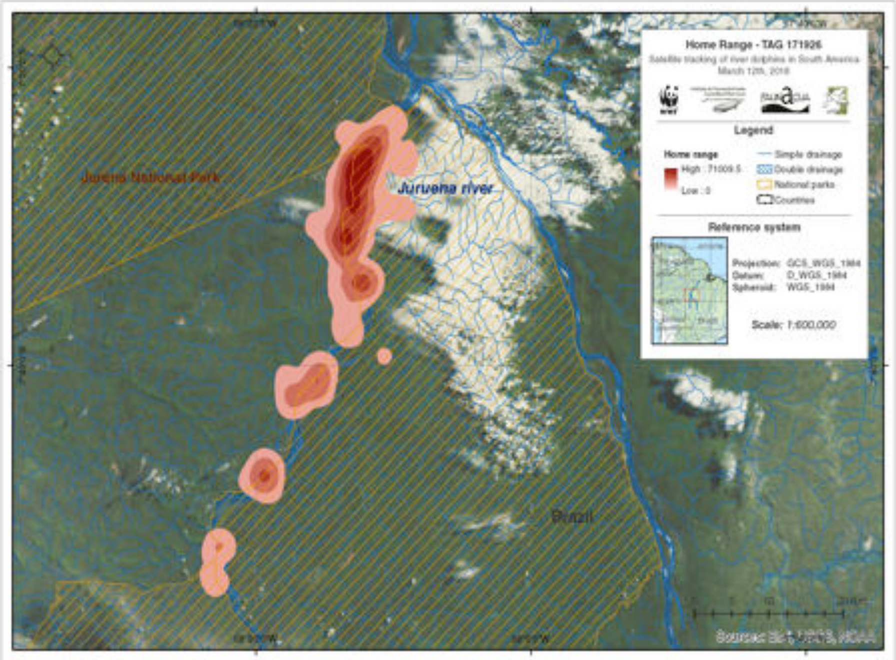
Brasil	40693	46,9	19/11/17	14/12/17	497

Results

Brasil

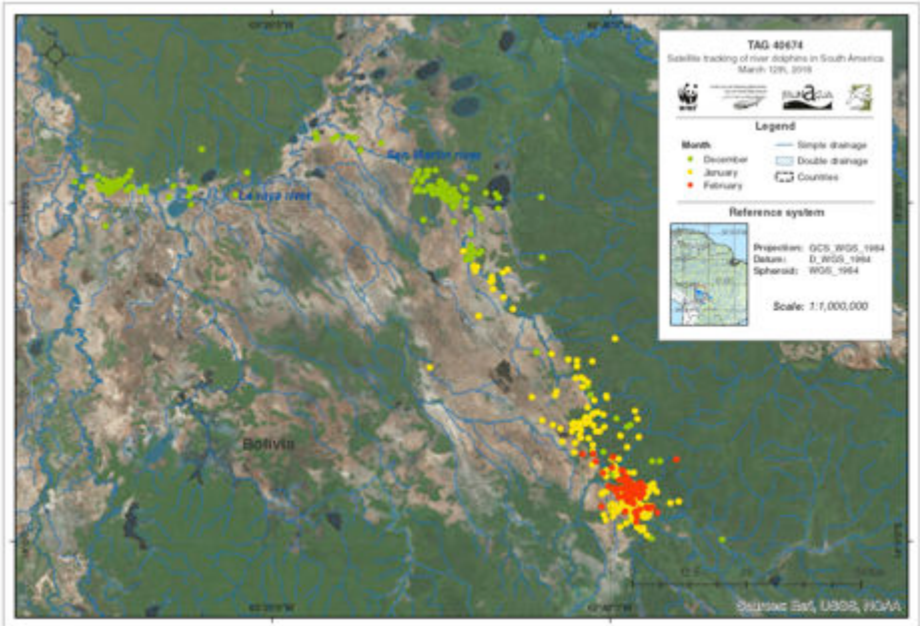


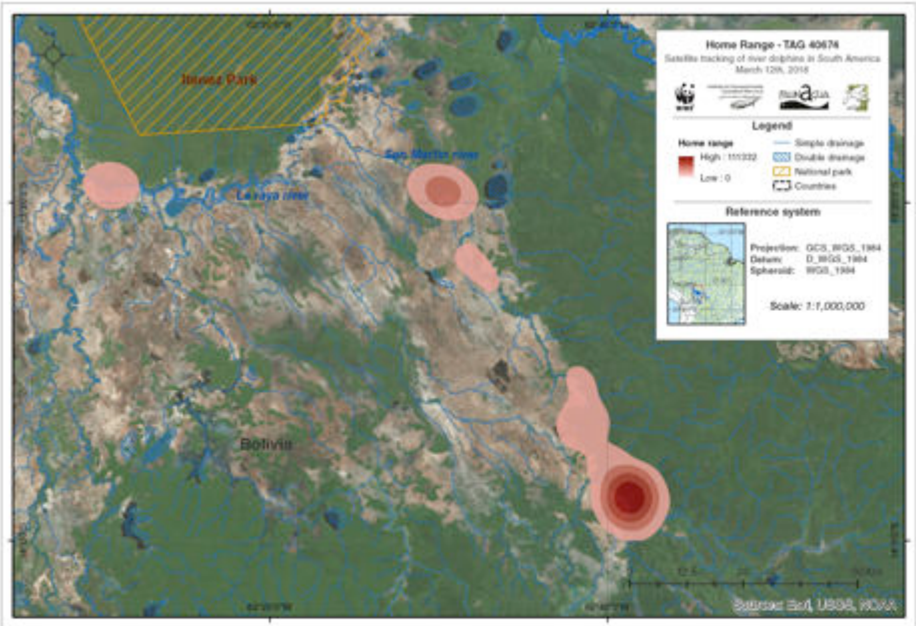


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Brasil	171926	85,0	1/01/18	6/02/18	550

Results

Bolivia





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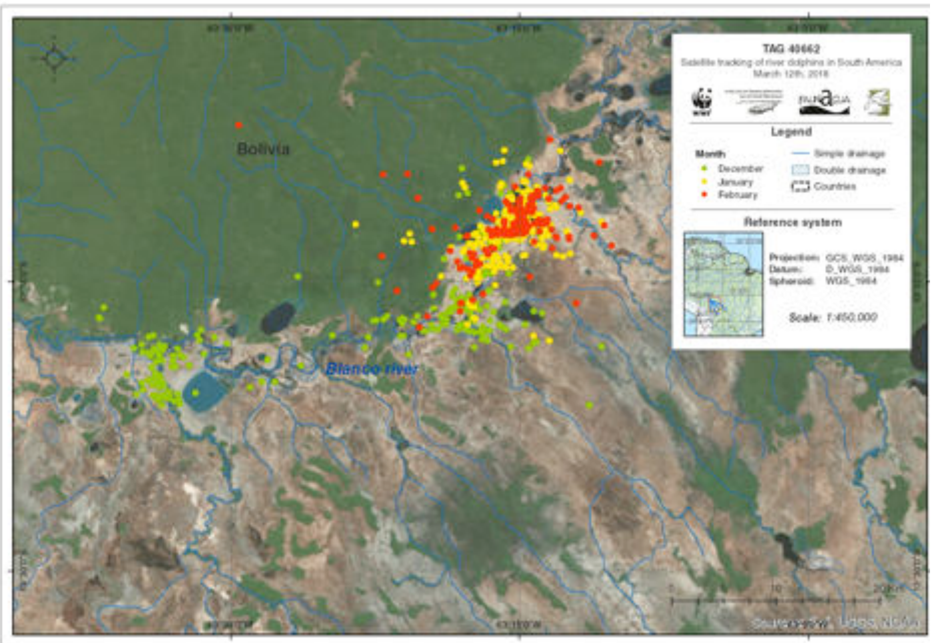
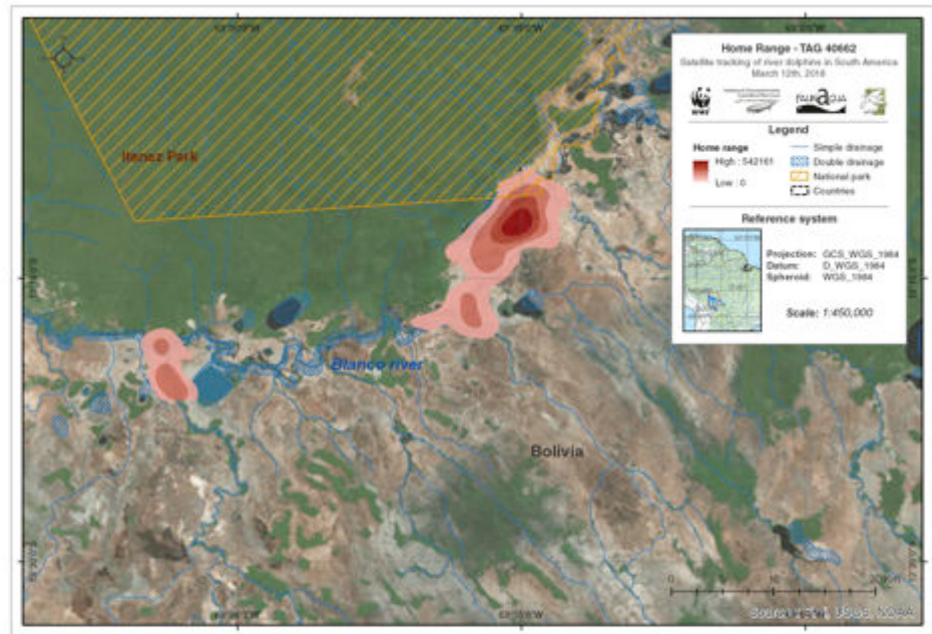
Bolivia	40674	333,7	2/12/17	20/12/17	1184

Results

Bolivia

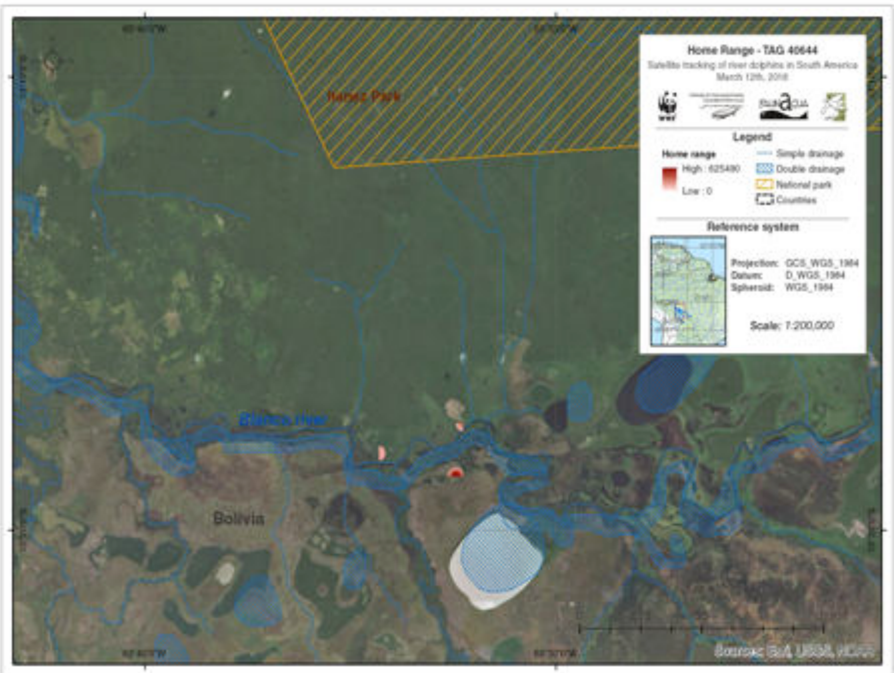




Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Bolivia	40662	114,1	1/12/17	3/01/18	1259

Results

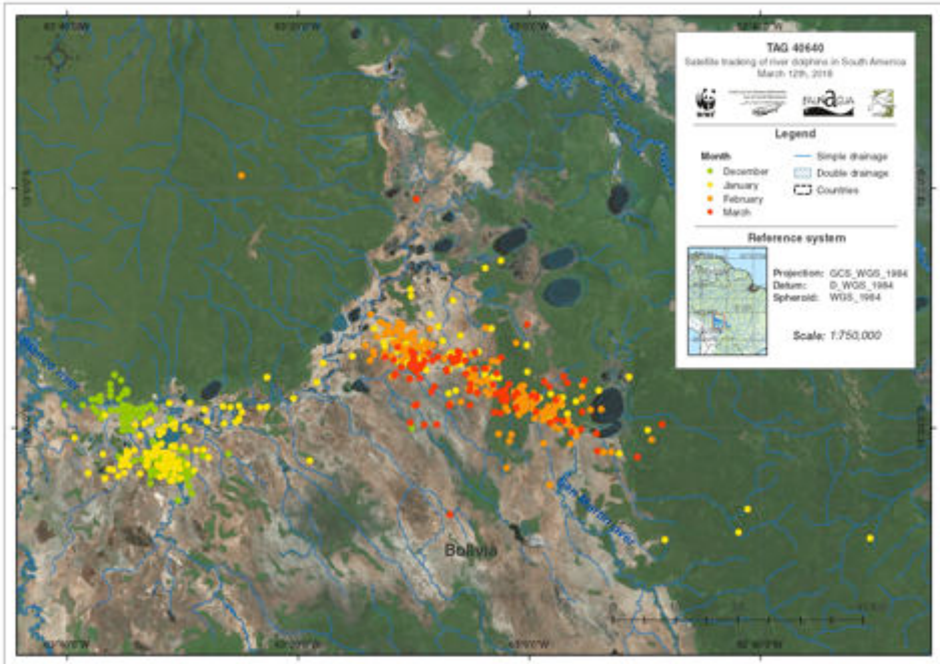
Bolivia

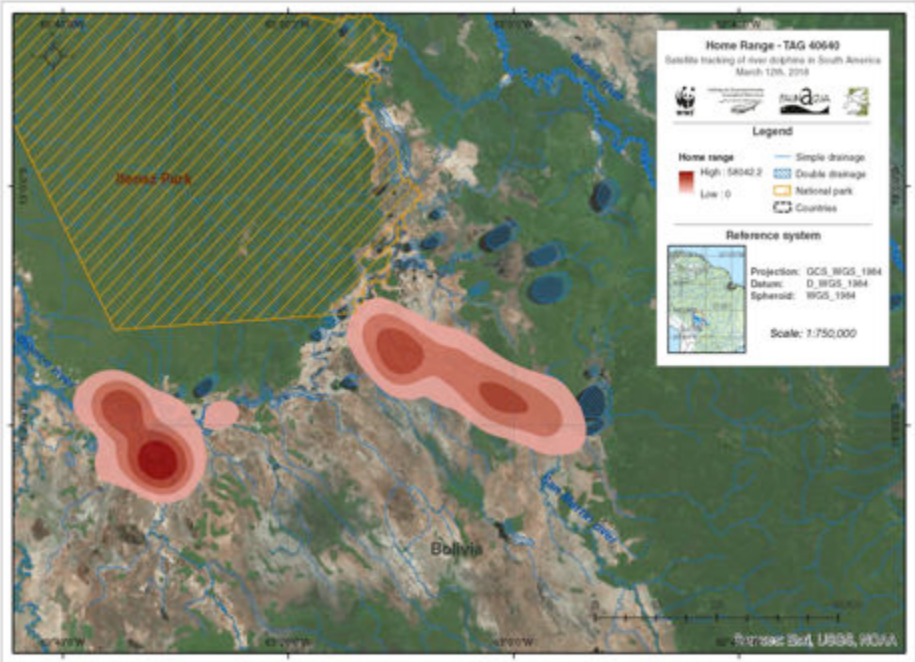


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Bolivia	40644	4,8	1/12/17	1/12/17	15

Results

Bolivia

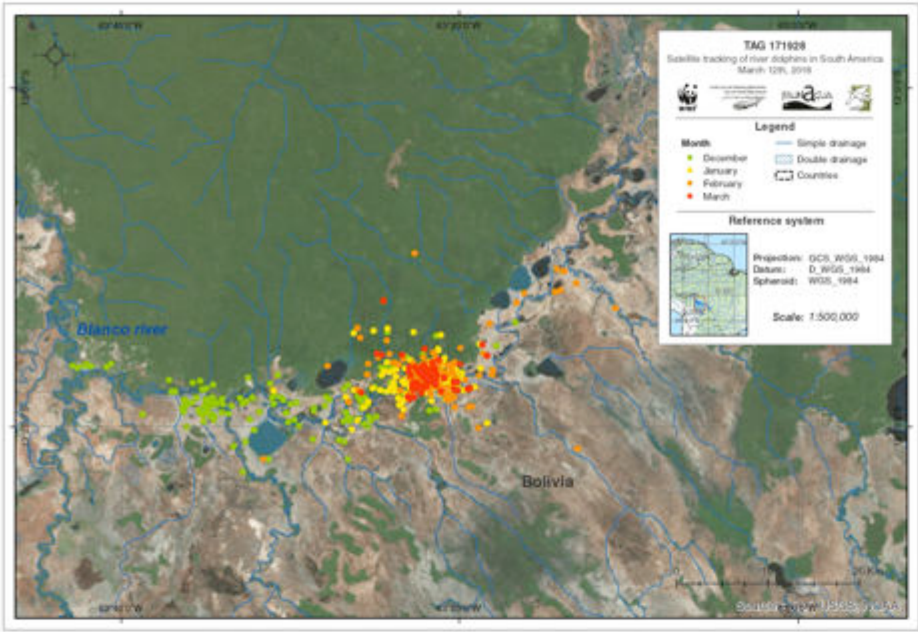


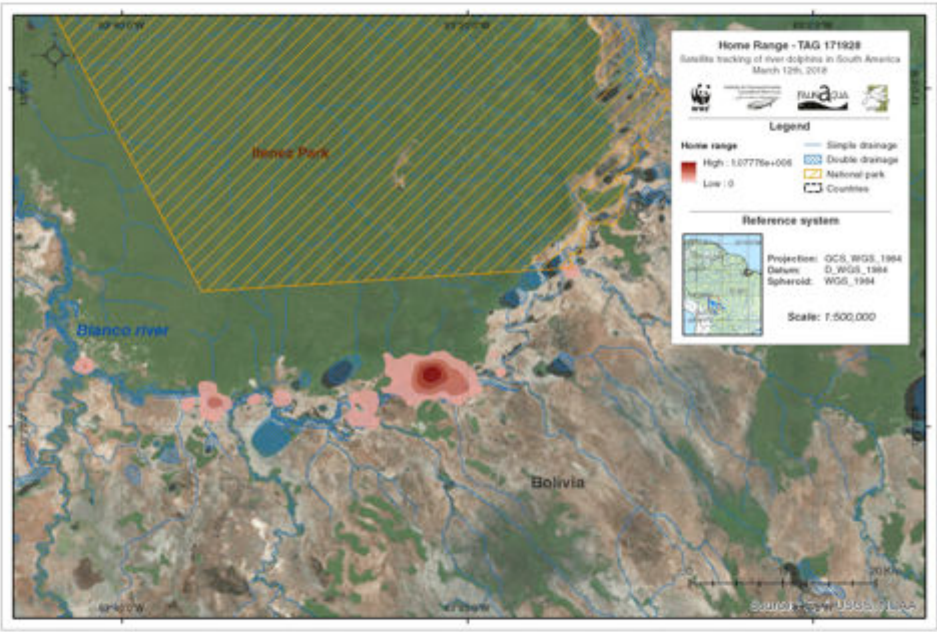


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Bolivia	40640	192,3	14/01/18	26/01/18	1057

Results

Bolivia

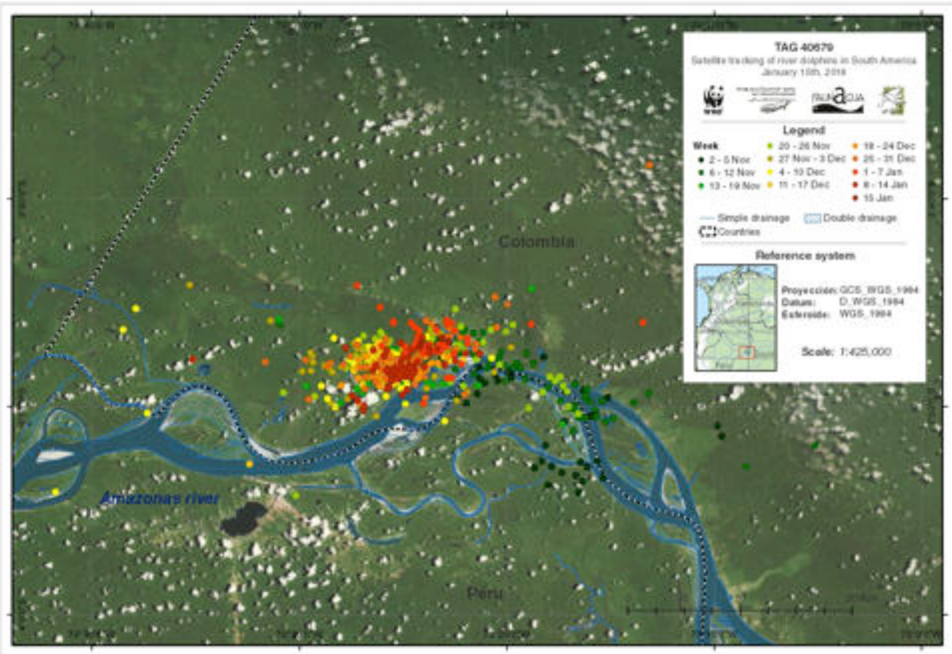


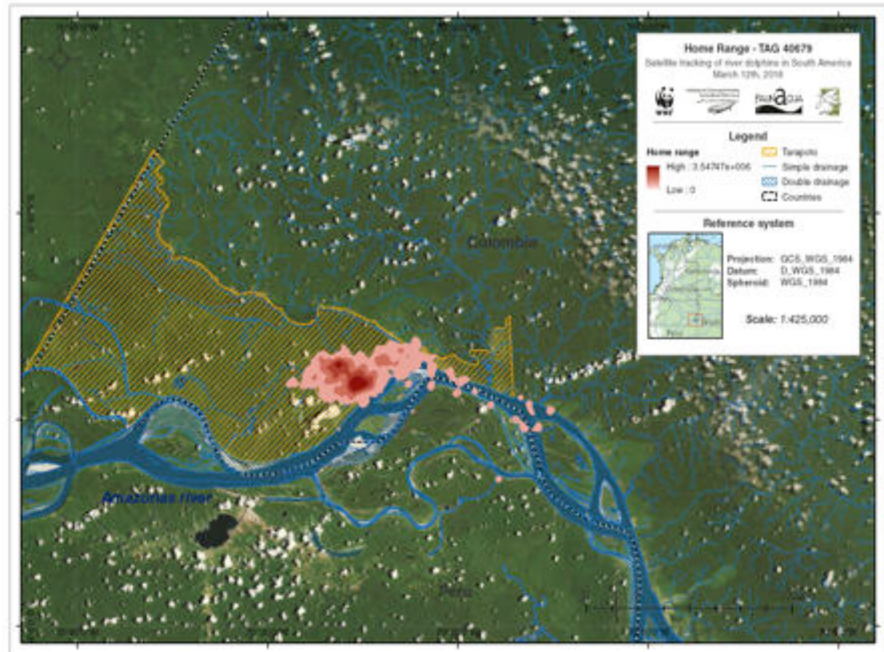


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Bolivia	171928	113,1	2/12/17	15/02/18	1060

Results

Colombia

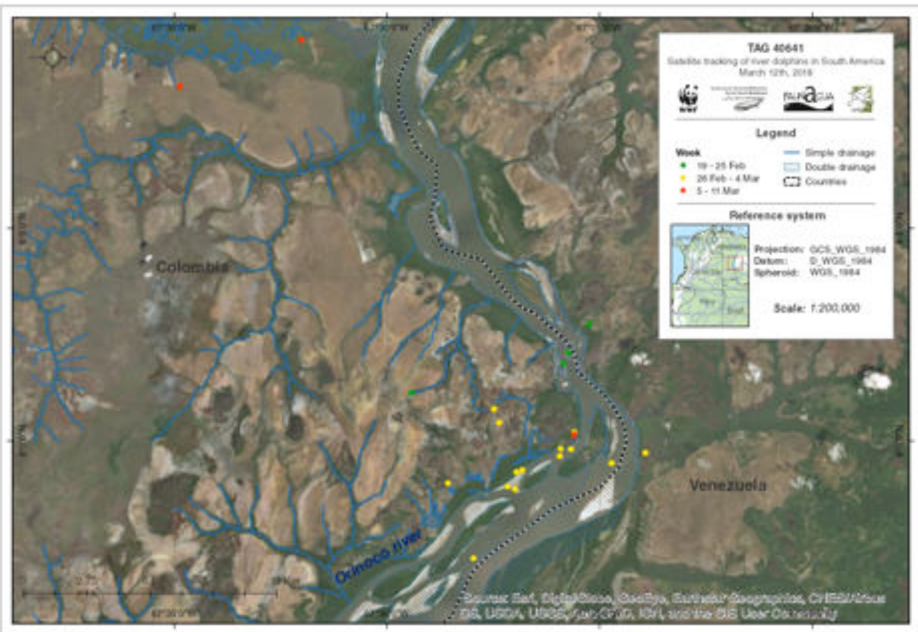


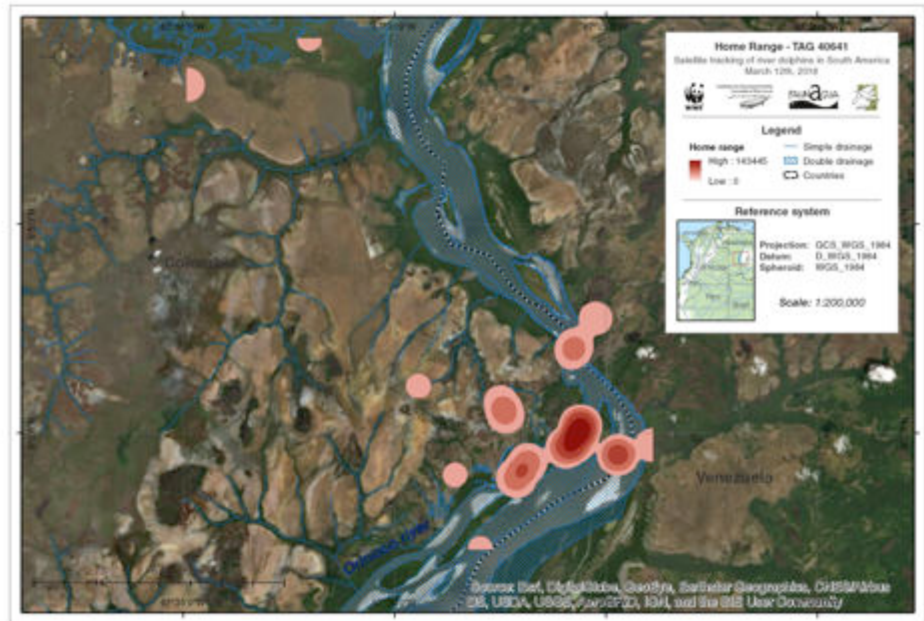


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Colombia	40679	78,8	10/11/17	4/12/17	2567

Results

Colombia

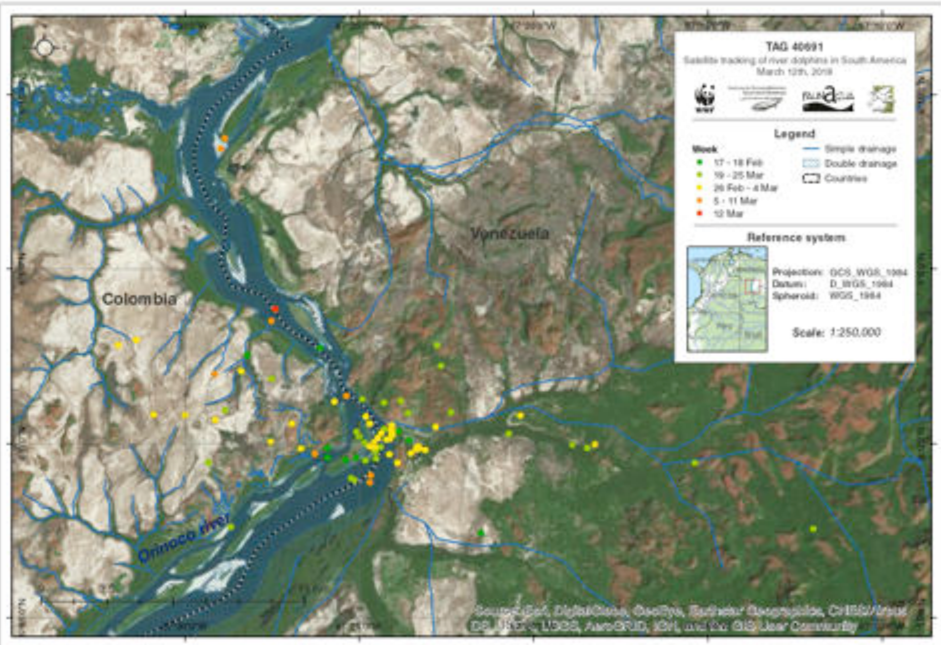


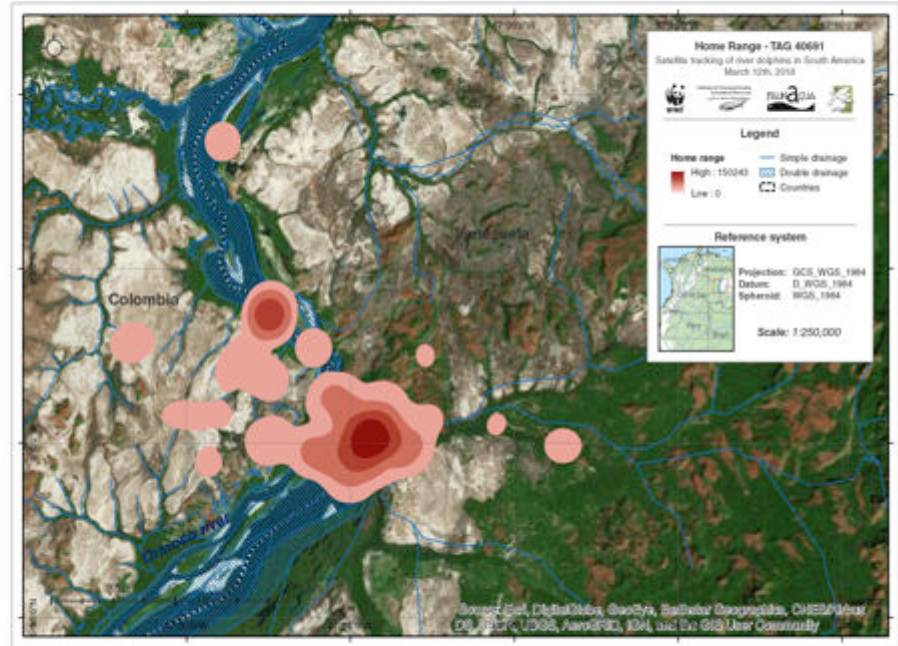


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Colombia	40641	48,8	27/02/18	9/03/18	57

Results

Colombia

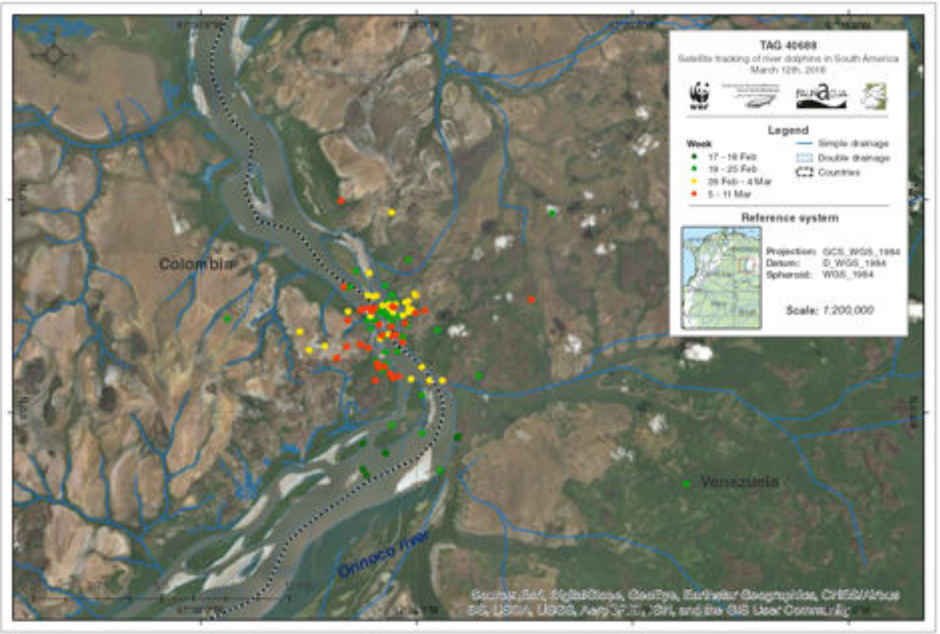


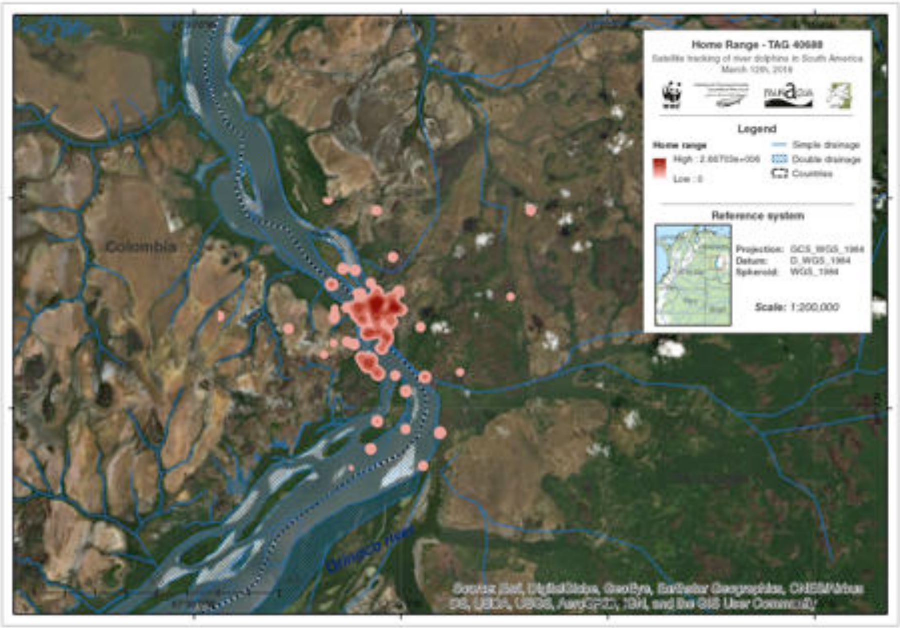


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Colombia	40691	12,9	20/02/18	12/03/18	199

Results

Colombia

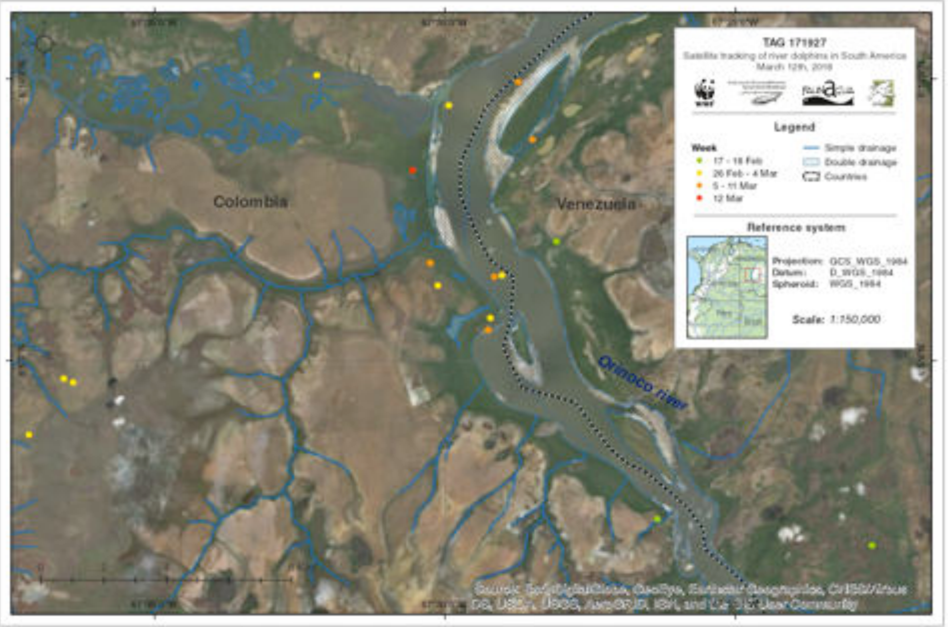


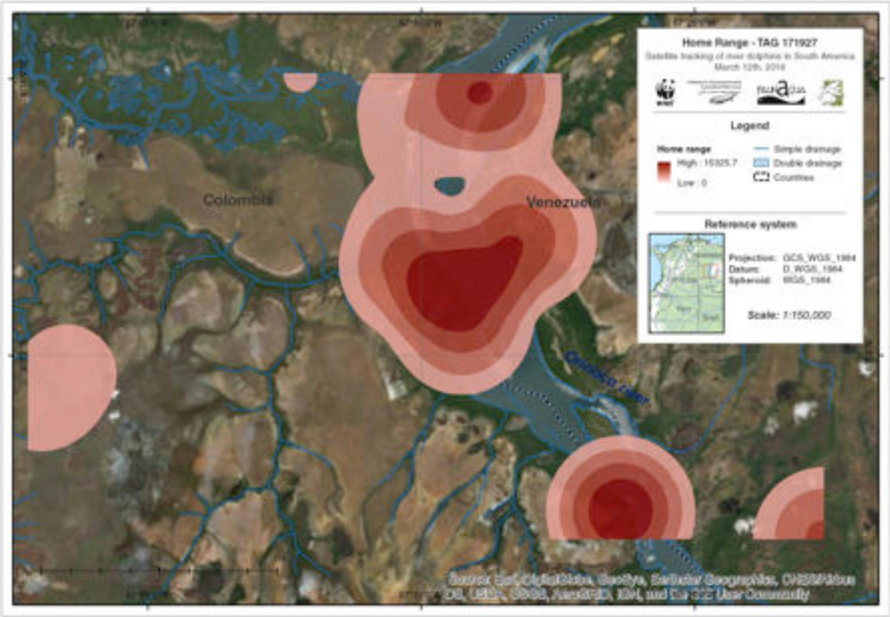


Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Colombia	40688	19,9	17/02/18	25/02/18	399

Results

Colombia

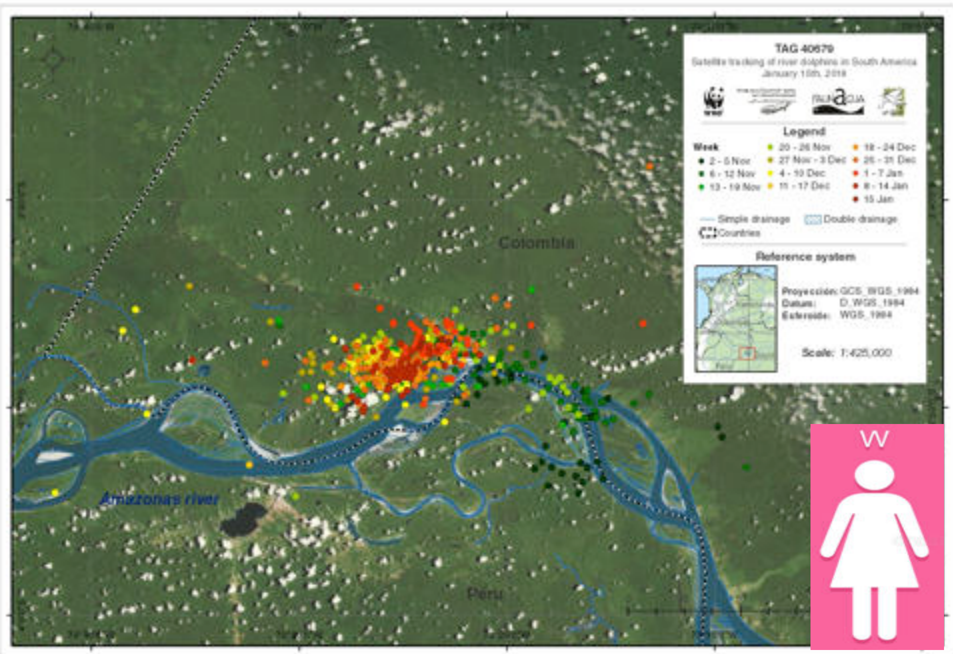




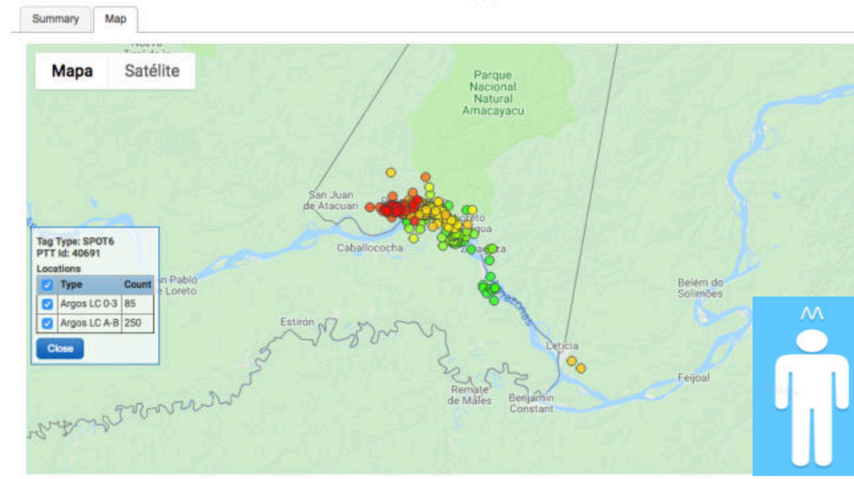
Country	PTT ID	Length Km	First emission	Last emission	Number of emissions
Colombia	171929	14,3	4/03/18	9/03/18	59

Results

Colombia

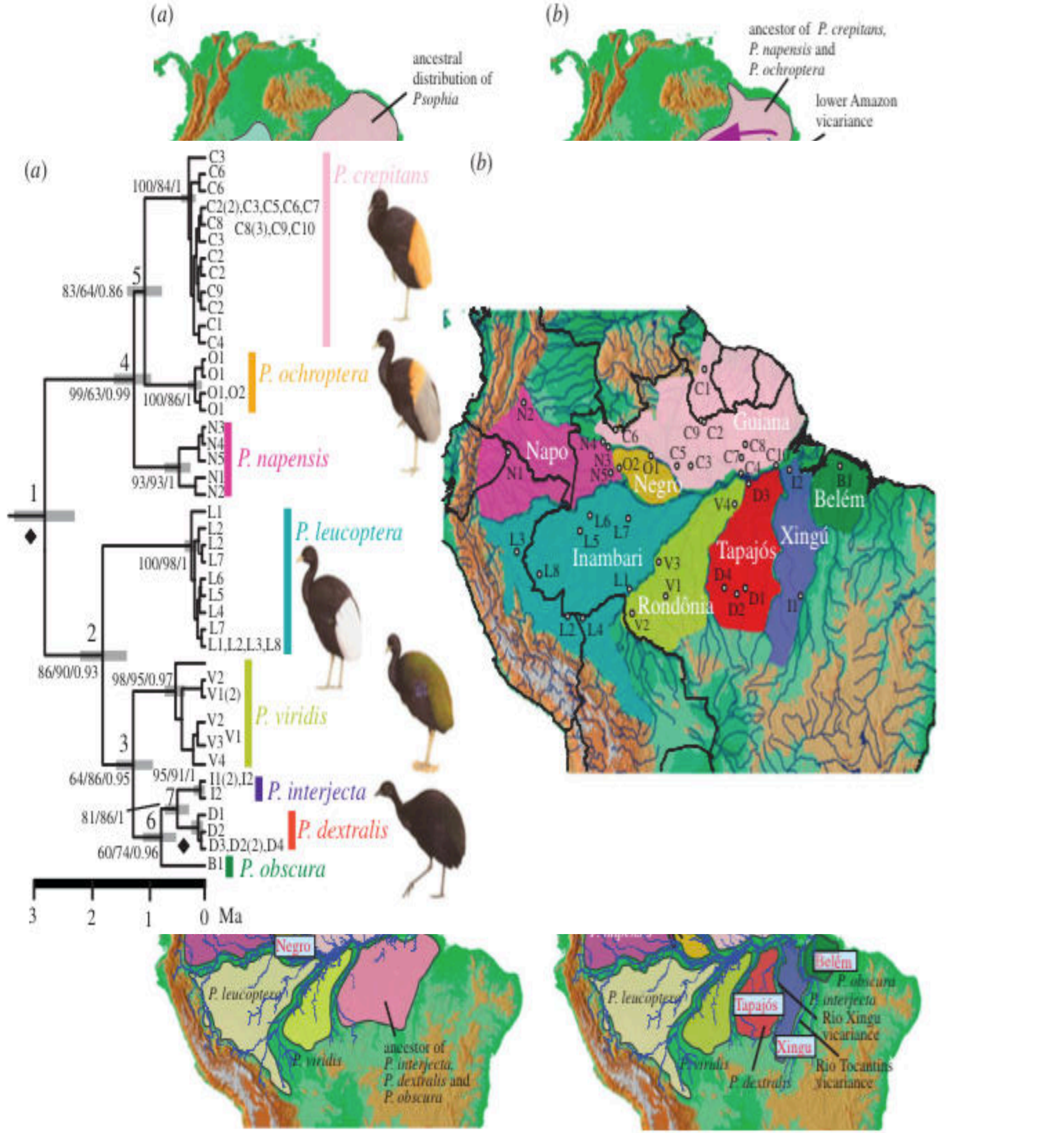


78.8 km ascent waters

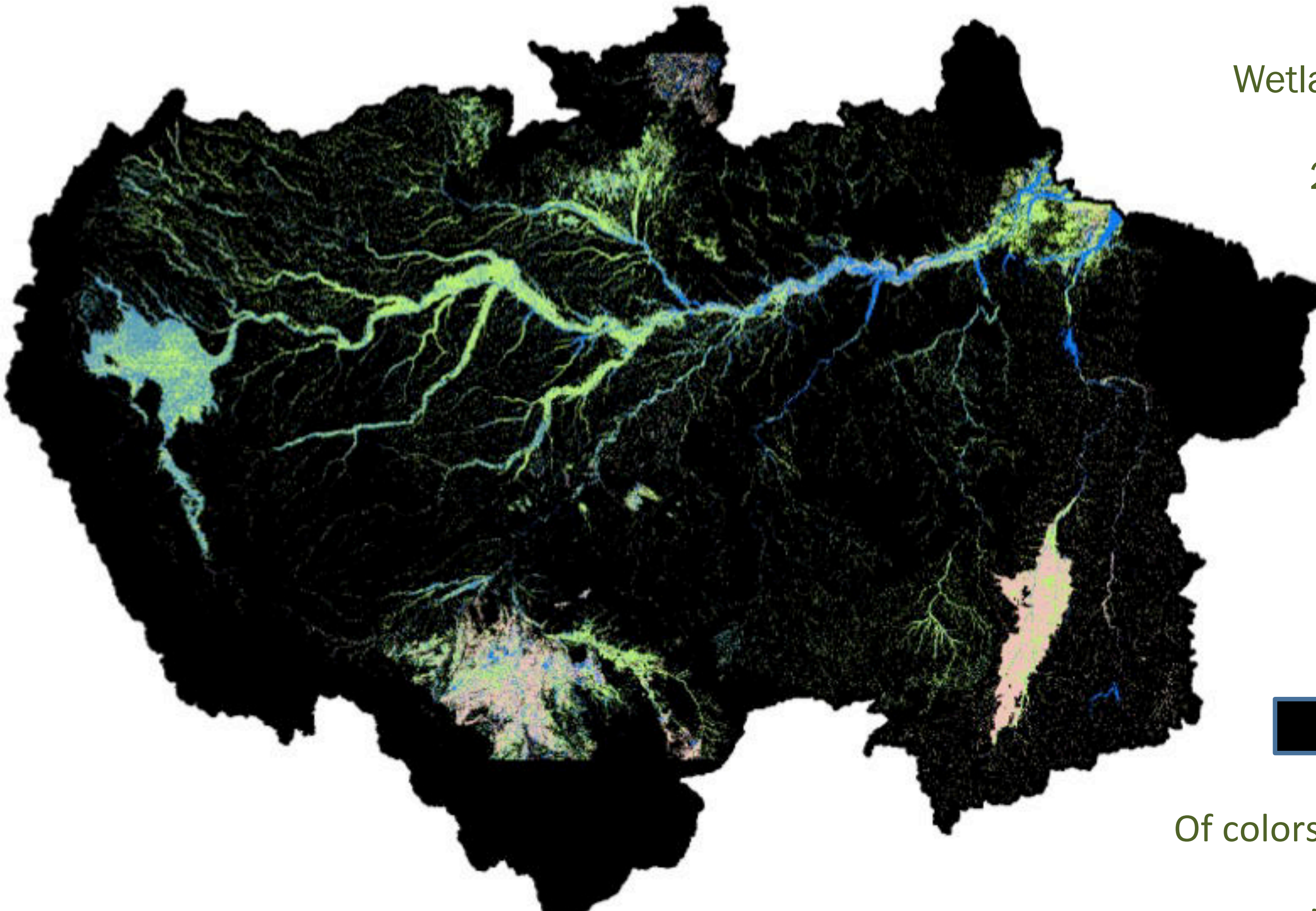


110.3 km descent waters

The rivers Motors of the Diversity of Species in the Amazon



Discussion

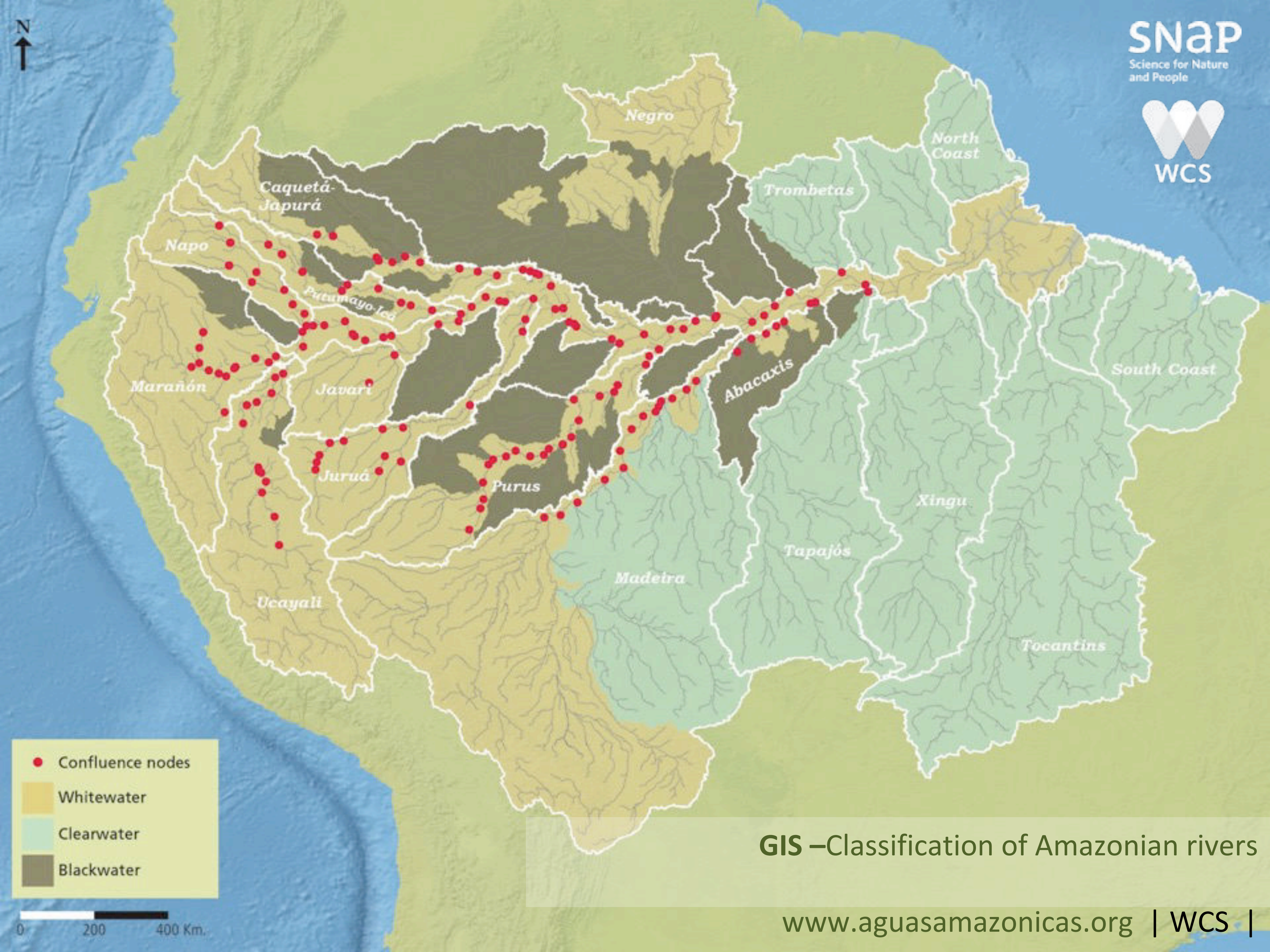


Wetlands in Amazon
1980 = 2-4%
2015 = 12-14%
980.000 km2

Mainland

Of colors = Wetlands


N
ATLANTIC
SNAP
Science for Nature and People
WCS
GUYANA
VENEZUELA
SURINAME
GUYANE
COLOMBIA
ECUADOR
Caquetá-Japurá
Negro
Trombetas
Napo
Putumayo-Içá
Javari
Abacaxis
Marañón
Juruá
Purus
Xingu
PERU
Madeira
Tapajós
Ucayali
Tocantins
PACIFIC
BRAZIL
Madeira
Amazon Main Stem
BI2 Basin
BOLIVIA
PARAGUAY
CHILE
0
200
400 Km.
ARGENTINA



GIS –Classification of Amazonian rivers

Conclusions

Large movements inter-borders different between the species due to the territory heterogeneity, biomass, water types and different use of the habitats and genre.

More movement of *I boliviensis* (black waters), then of *Inia geoffrensis* (white water, Amazon) and less of *Inia geoffrensis* (clear waters, Tapajos).

Frequent use of the protected areas with focus on conservation (PNN and Ramsar sites).

The river dolphin needs clean, trans-borders, connected and protected habitats.

Protected areas are very important for the conservation.

Acknowledgments

This research was conducted as part of the South America River Dolphins Conservation Programme, sponsored by the Whitley Fund for Nature, Foundation Segré, and Colciencias through the National Doctorate Scholarship 785. It is part of the strategic plan set by the South American River Dolphin Initiative, supported by WWF offices in Brazil, Colombia, Peru, Ecuador and Bolivia. Special gratitude goes to Saulo Usma, Diego Amorocho, Daphne Willems, Lila Sainz, Jorge Rivas, Jose Luis Mena, and Karina Berg from the WWF network. The authors would also like to express their gratitude to the fishing communities, and the local and national authorities who participated and gave their aid and attention to the strandings and the process of capture of river dolphins during the satellite tracking programme, aiming to study the ecology of movement in the Amazon and Orinoquia river basins.

Thanks for your attention