

## Seasonal shifts in foraging distribution due to individual flexibility in a tropical pelagic forager, the Ascension frigatebird

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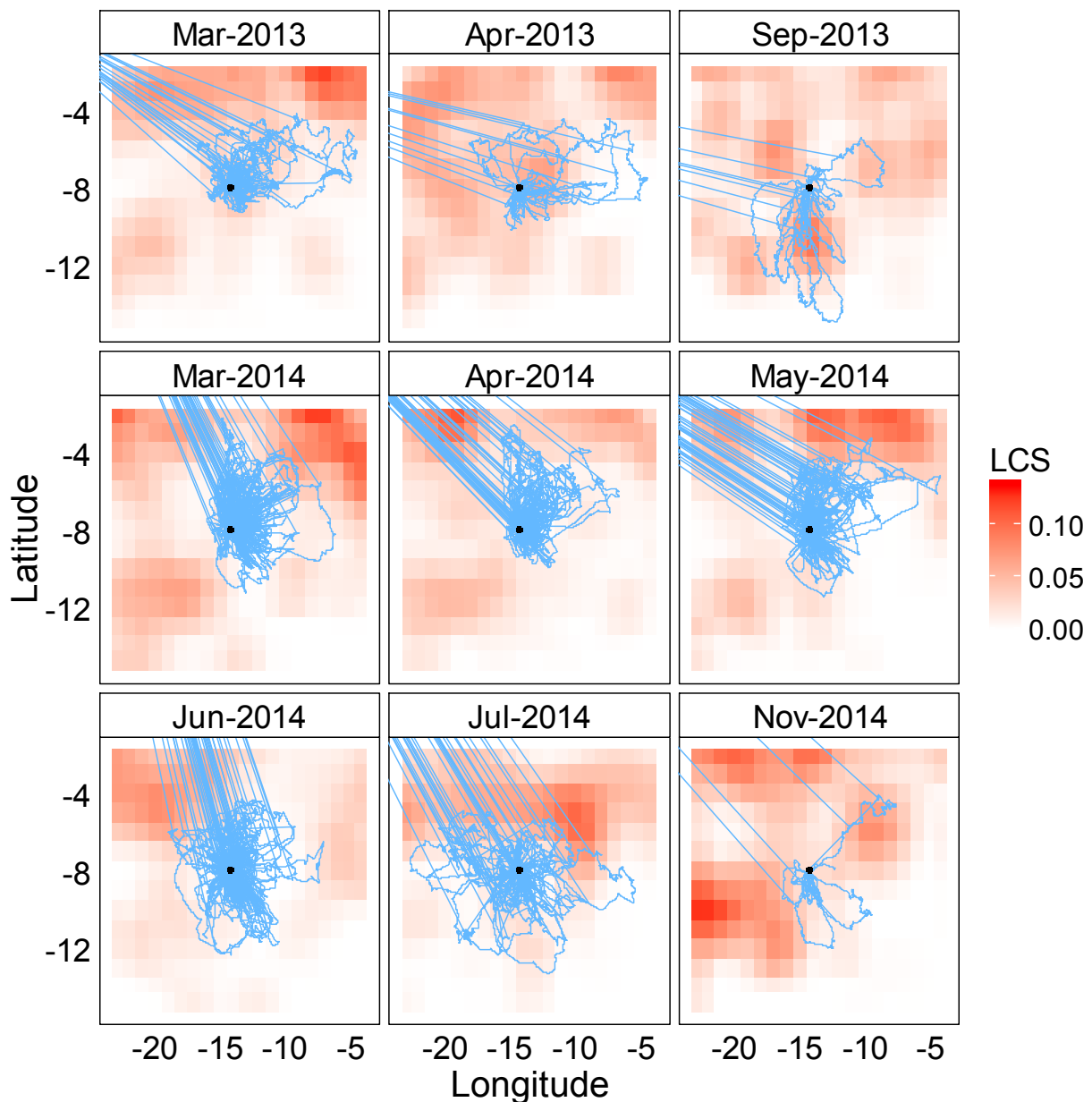


Fig. S1. *Fregata aquila*. Foraging trips of 51 adult Ascension frigatebirds tracked with GPS and PTT from Ascension Island during nine monthly periods in 2013 and 2014 against the frequency of attracting Lagrangian coherent structures (LCS; relative frequency of LCS /  $1^{\circ} \times 1^{\circ}$  grid cell), or ocean “transport fronts”, which have previously been shown to act as

focal points for frigatebird foraging ([Tew Kai et al. 2009](#)). Ascension Island is represented by the black point.

Table S1: *Fregata aquila*. Details of the nine temporal periods during which adult Ascension frigatebirds were tracked with PTT and GPS devices, and during which their temporal distribution was related to environmental conditions. *n* indicates the number of locations used in the analysis.

<b>Period</b>	<b><i>n</i></b>	<b>start</b>	<b>end</b>
Mar-13	20274	22 February 2013	31 March 2013
Apr-13	10119	01 April 2013	03 May 2013
Sep-13	7735	10 September 2013	19 September 2013
Mar-14	36357	06 March 2014	31 March 2014
Apr-14	41543	01 April 2014	30 April 2014
May-14	47809	01 May 2014	31 May 2014
Jun-14	44770	01 June 2014	30 June 2014
Jul-14	30139	01 July 2014	02 August 2014
Nov-14	4818	13 November 2014	03 December 2014

Table S2: *Fregata aquila*. Environmental variables considered to explain the spatio-temporal variation in the use of 1 x 1 degree grid cell areas by Ascension frigatebirds tracked with GPS and PTT devices in 2013 and 2014.

Variable name	Type	Spatial Res	Temporal Res	Source
air pressure	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
air temperature	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
sunshine duration	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
thermal uplift velocity	atmospheric	0.75 deg	6-hourly	<a href="http://www.bioinfo.mpg.de/orn-gateway/variables2.jsp?typeName=ecmwf4/derived">http://www.bioinfo.mpg.de/orn-gateway/variables2.jsp?typeName=ecmwf4/derived</a>
total cloud cover	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
wind speed [E-W]	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
wind speed [N-S]	atmospheric	0.75 deg	6-hourly	<a href="http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc">http://apps.ecmwf.int/datasets/data/interim_full_daily/?levtype=sfc</a>
chlorophyll-a concentration	oceanographic	4.64 km	daily	<a href="http://oceandata.sci.gsfc.nasa.gov/MODIS-Aqua/Mapped/Monthly/4km">http://oceandata.sci.gsfc.nasa.gov/MODIS-Aqua/Mapped/Monthly/4km</a>
current velocity [E-W] at surface	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_025">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_025</a>
current velocity [N-S] at surface	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_026">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_026</a>
eddy kinetic energy	oceanographic	0.25 deg	daily	Calculated from zonal (U) and meridional (V) absolute geostrophic velocities using the formula $EKE = (U^2 + V^2)/2$
finite size Lyapunov exponent (FSLE)	oceanographic	0.04 deg	4-days	<a href="https://www.aviso.altimetry.fr/index.php?id=3156">https://www.aviso.altimetry.fr/index.php?id=3156</a>
frequency of Lagrangian coherent structures	oceanographic	0.04 deg	4-days	Calculated from FSLE as the frequency of cells with $FSLE < -0.1 d^{-1}$ (c.f. Tew Kai et al. 2009)

Variable name	Type	Spatial Res	Temporal Res	Source
mixed layer depth	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_027">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_027</a>
net primary productivity	oceanographic	0.083 deg	monthly	<a href="http://orca.science.oregonstate.edu/data/2x4/monthly/vgpm.r2014.m.chl.m.sst/hdf/">http://orca.science.oregonstate.edu/data/2x4/monthly/vgpm.r2014.m.chl.m.sst/hdf/</a>
salinity at surface	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_030">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_030</a>
sea surface height	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_032">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_032</a>
water temperature at surface	oceanographic	0.25 deg	daily	<a href="http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_026">http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&amp;view=details&amp;product_id=GLOBAL_REANALYSIS_PHY_001_026</a>
distance to colony	physical	1 deg	constant	
ocean depth	physical	0.017 deg	constant	<a href="https://www.ngdc.noaa.gov/mgg/global/etopo1sources.html">https://www.ngdc.noaa.gov/mgg/global/etopo1sources.html</a>
standard deviation of depth (ruggedness)	physical	0.017 deg	constant	<a href="https://www.ngdc.noaa.gov/mgg/global/etopo1sources.html">https://www.ngdc.noaa.gov/mgg/global/etopo1sources.html</a>

## LITERATURE CITED

Tew Kai E, Rossi V, Sudre J, Weimerskirch H, Lopez C, Hernandez-Garcia E, Marsac F, Garçon V (2009) Top marine predators track Lagrangian coherent structures. Proc Natl Acad Sci USA 106:8245-8250