**Marine heatwaves and mystery of the dead puffers**

Albertus J. Smit1,2, Tommy Bornman2, Neville Sweijd3, Daneeja Mahwen4, Amieroh Abrahams1, Steven Lamberth5

1 Department of Biodiversity and Conservation Biology, University of the Western Cape, Private Bag X17, Bellville 7535, South Africa

2 South African Environmental Observation Network, Elwandle Coastal Node, Port Elizabeth, South Africa

3 Alliance for Collaboration on Climate and Earth Systems Science (ACCESS) c/o Council for Scientific and Industrial Research (CSIR), Pretoria, 0001, South Africa

4 South African Environmental Observation Network, Egagasini Node, Cape Town, South Africa

5 Department of Environment, Forestry and Fisheries, Cape Town, South Africa

Keywords: Agulhas Current, dead fish, extreme event, South Western Indian Ocean, marine heatwave, pufferfish

***Allocation of tasks:***

AJS: calculate MUR MHW dynamics, make maps, wite, coordinate, obtain KZNSB, SAWS, etc. *in situ* data, etc.

Amieroh: calculate OISST MHW dynamics, calculate *in situ* temperature data (MHWs)

Daneeja: process AVISO SSH data, provide insights into presence of Natal Pulse and the SIOD

Tommy: obtain gully probe data

Steve L: obtain the fish data

Steve W: ?

Neville: write

**Abstract**

Fish died because of a marine heatwave in the Agulhas Current and maybe the marine heatwave can be attributed to the SIOD and a Natal Pulse.

**Introduction**

*Objectives*

* define the dynamics of SSH, and find evidence for a Natal Pulse
* find link to SIOD
* calculate properties of marine heatwaves
* link MHW dynamics to SSH dynamics and presence of Natal Pulse
* define sites of fish kills
* link fish kills with MHWs, or rapid changes in SST

**Methods**

Chart, surface chart

Description automatically generated

**Figure 1:** Map of study region around southern Africa, including portions of the South Western Indian Ocean and South East Atlantic Ocean. The large grey rectangle (-36.25 to -27.5°S and 20 to 35°E) indicate the larger region for which OISST and AVISO data were obtained. The smaller lightly-shaded rectangles indicate the St. Helena Bay to Cape Agulhas region (-34.9 to -32.3°S and 17.6 to 20.0°E), a region from East London to Cape St. Francis (-34.5 to -32.8°S and 24.6 to 28.1°E), and a region on the south of the Natal Bight extending from Durban to Port Edward (-31.2 to -29.8°S and 30.1 to 31.7°E). The pink-shaded polygon is the area of long-term mean kinetic energy, and hence it indicates the mean path of the Agulhas Current. The turquoise-outlined polygon indicates the area of most intense eddy kinetic energy, which can generally be taken as the area where the Agulhas Current meanders, the inception of the Agulhas retroflection, and where eddies spinning off the mean current originate.