FISH LARVAE ASSEMBLAGES
DURING CLIMATE ANOMALIES (2014 -2015)

Baja California Peninsula

Transitional area between the temperate and tropical domains at the southern extent of the California Current System.

(Brinton, 1962; Lynn & Simpson, 1987; Moser et al., 1997)
Coastal Assemblages
Southern Complex (Tropical-subtropical)

Oceanic Assemblages

Northern Complex (Subartic-transitional)

Punta Eugenia 28 ° LN

Southern Complex (Tropical-subtropical)

(Loeb et al., 1983; Moser et al., 1987; Aceves-Medina, 2003; Funes-Rodríguez et al., 2011)
Environmental Conditions 2013-16

2013

The Blob
Warm anomalies

2014

2015

(Bond et al. 2015; Di Lorenzo & Mantua, 2016)
The Blob
Warm anomalies stretched from Alaska to Baja California

(Leising et al., 2015; Mcclatchie et al., 2016)
The Blob → El Niño 2015-16

(Schiermeir, 2015; Varotsos et al., 2016)
Cavole et al., 2016; Jacox et al., 2016; McClatchie et al., 2016
http://www.nationalgeographic.com/magazine/2016/09/
Baja California

Poleward coastal countercurrent
Advection of tropical and subtropical waters
Declining phytoplankton production
Low zooplankton volume

Warm Anomalies

(Leising et al. 2015; McClatchie et al. 2016; Durazo et al. 2017; Gómez-Ocampo et al. 2017)
Baja California

2014

Warm Anomalies

2015

El Niño 2015-16
INTENSIFICATION!

(Durazo et al., 2017; Gómez-Ocampo et al., 2017)
Data and Methods
Oceanographic Survey

BIPOCO-1407 (Summer 2014) 185 stations

BIPOCO-1509 (Autumn 2015) 187 stations
Zooplankton Samples

Collection standard method (Smith & Richardson, 1977).
Environmental Data
Conductivity, temperature and pressure (CTD SeaBird).
Environmental Characterization
Summer 2014

Temperature
17.5-30.5°C

Salinity
33.4-35

Chl-a
0.01-1.7 mg·m⁻³

Zooplankton Volume
4.9-490 ml·1000 m⁻³

Superficial Temperature (°C)

Superficial Salinity

Chlorophyll-a (mg·m⁻³)

Zooplankton Volume (ml·1000 m⁻³)
Autumn 2015

Temperature: 21.5-28.7°C
Salinity: 33-34.6
Chl-a: 0.01-1.22 mg·m⁻³
Zooplankton Vol.: 4.7-918 ml·1000m⁻³
Subarctic Water (SAW), Transitional Water (TrW), Subtropical Surface Water (StSW), Tropical Surface Water (TSW), Equatorial Subsurface Water (ESsW), North Pacific Intermediate Water (NPIW) and Pacific Deep Water (PDW).
Biological Characterization
Fish Larvae Composition

403 taxa
68.7% species from CCS

83% Tropical-Subtropical species

89% Mesopelagic species
Fish Larvae Assemblages
Summer Mesopelagic Group 1 (SMG1), Summer Coastal Group 1 (SCG1) and Summer Coastal Group 2 (SCG2)
SMG1: Mesopelagic Mix of Tropical and Temperate Affinity

SCG1: Coastal Subtropical and Temperate Affinity

SCG2: Coastal Tropical-Subtropical Affinity
Autumn Mesopelagic Group 1 (AMG1), Autumn Mesopelagic Group 2 (ACG1) and Autumn Coastal Group 1 (ACG1)
AMG1: Mesopelagic Mix of Tropical and Temperate Affinity

AMG2: Mesopelagic Tropical-Subtropical Affinity

ACG1: Coastal Tropical-Subtropical Affinity

Legend:
- Larvae/10 m²
- Colors:
  - 1 - 10
  - 10 - 100
  - 100 - 1000
  - 1000 - 10000

(Bautista et al. 2018, DOI: 10.1111/fog.12250)
Associations and Environmental Gradient 2014

17.2% variance

$r = 0.63$

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Associations and Environmental Gradient 2015

23.2% variance

\[ r = 0.71 \]

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During the study period, the transitional boundary off Punta Eugenia was maintained even when atypical warming conditions were detected in the oceanic region of Baja California Peninsula. The assemblage of tropical, temperate and transitional mesopelagic species was different to the ones documented for previous warming events.
Acknowledgements

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