Early **HABs** species detection in the Tumaco Bay – Colombia

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Abstract: The economy of the municipality of San Andrés de Tumaco (Nariño) is based on tourism and hydrobiological resources (fishing, crustaceans and mollusks extraction). These resources are affected by the influence of the ocean-atmospheric dynamics of the Colombian Pacific basin, the transfer of microorganisms by ballast water, and allochthonous deposits from rivers, favoring toxic HABs that generate negative impacts on marine-coastal ecosystems, public health, and tourism activities.

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Introduction

For decades, global coastal waters have experienced events known as "Harmful Algae Blooms (HABs)"[1]. In more case, the HABs is beneficial for the aquaculture and wild fisheries operations. However, in a situation where negative impacts are causing severe economic losses to aquaculture, fisheries, tourism operations, and having major environmental and human health impacts [1], early HABs detection studies are a useful tool for predicting future algal bloom events.

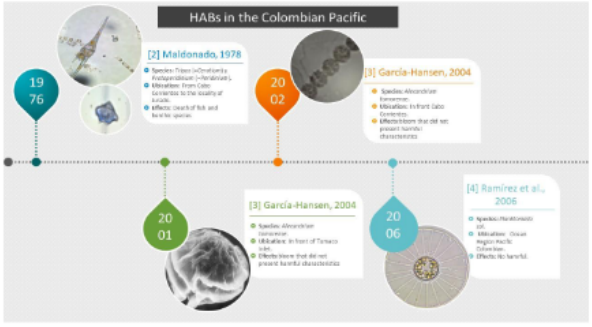

Figure 1. Timeline of HABs in the Colombian Pacific [3]

Figure 2. Harmful Algae Bloom by *Alexandrium tamarense* in the Tumaco Bay [3]

Figure 3. Tumaco Bay fishing and tourism site (Photos by : Alberto Murillo).

Objective: Identify the HABs forming species, as well as the richness, distribution, and abundance in Tumaco Bay.

Materials and Methods

Tumaco Bay is located in the **Southwest of Colombia, on The Pacific coast,** in the department of Nariño, bounded by latitudes 1°45'00" and 2°05'00" N and longitudes 78°30'00" and 78°46'00" W. the climate of this zone is influenced by the movement of the Intertropical Convergence Zone (ITCZ), which regulates the rainfall and climatological systems of the region [5, 6]. With moderate rainfall. Average temperature 25.6 °C, average annual rainfall 2647 mm, with variations between 84-87 % average relative humidity. Sediment discharges come from Curay, Colorado, Chagüi, and others Rivers [4] (Figure 4).

Figure 4. Study area

A total of 1L of water was obtained in each sampling station using Niskin bottle. surface samples were colleted in March 2020, and others to different deep between December 2020 to May 2021. fixed with Lugol´s Solution [7]

50 mL were sedimented in Uthermöhl chamber for 24 hours [7].

Morphological identification and quantitative analysis were performed with a Leica Dmi1 inverted microscope and photographs were taken with a Leica MC170 HD camera [7]

Preliminary results

Forty-five species HABs were recorded which: 18 harmful and 27 potentially toxic. **Eight of the most representative species are shown** (Figure 5).

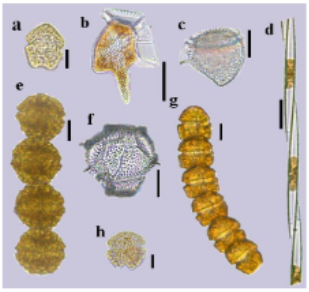

Figure 5. Potentially toxic species. a. *Akashiwo sanguinea*, b. *Dinophysis caudata*, c. *Phalacroma mitra*, d. *Pseudo-nitzschia* sp2, e. *Alexandrium* sp, f. *Pyrodinium* cf *bahamense*, g *Gymnodinium catenatum*, h. *Karlodinium* cf *digitatum*. Scale, bars : 20 µms in Fig. a, c, d, e, f, g; 50 µms in Fig. b and 10 µms in Fig. h.

Dinophysis caudata and *Pseudo-nitzschia* sp2 species were **found in seven of the 15 stations sampled**, showing low abundance at each station.

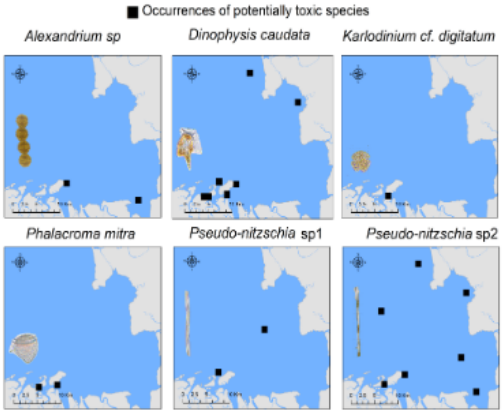

Figure 6. Maps of the occurrences Potentially toxic species in Tumaco Bay

References

[1] Hallegraeff, G. 1993. Review of harmful algal blooms and their apparent global increase. Phycologia 32: 79–99.

[2] Maldonado, J. 1978. Observaciones realizadas sobre el fenómeno de las mareas rojas en aguas del Pacífico Colombiano en los meses de julio a septiembre. Rev. Divulg. Pesq 12: 1-8.

[3] García-Hansen, I., Cortés-Altamirano, R., & Sierra-Beltrán, A. 2004. Primeros registros de *Gymnodinium impudicum* como formadora de mareas rojas en la costa Pacífica Colombiana. Rev. Biol. Trop. 53 (1): 59-68.

[4] Ramírez, D & Giraldo, A. 2006. Estructura comunitaria del fitoplancton de la cuenca Pacífica Colombiana durante la campaña Oceanográfica Pacífico XXXIX EPEPA XXXVI. Boletín Científico CCCP 13: 65-86.

[5] Garay-Tinoco, J.A., D.J. Gómez-López and J. D. Ortiz-Galvis (Eds). 2006. Integral diagnosis on the biophysical and socioeconomic impact related to the effect of pollution from land-based activities on the pacific coastal zone Tumaco bay, Colombia and basic guidelines for a management plan. Project of The United Nations Environment Programme (UNEP), The Global Plan Of Action (GPA), and The South Pacific Permanent Commission (SPPC). The Institute of Marine and Coastal Research "Jose Benito Vives De Andreis" - INVEMAR, Pacific Pollution Control Centre - CCCP, The Regional Autonomous Corporation of Nariño - CORPONARIÑO, Santa Marta, 290 .

[6] Devis-Morales, A. 2008. Análisis de las condiciones oceanográficas y meteorológicas de la bahía de Tumaco y su relación con eventos de escala global. Boletín Científico CCCP 15: 1-21.

[7] Andersen P, Throndsen J (2004) Estimating cell numbers. In Hallegraeff GM, Anderson DM, Cembella AD (eds). Manual on Harmful Marine Microalgae. Monogr Oceanogr Method 33, UNESCO, Paris. 99-129 .

Acknowledgments

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