*Photo credit: Ocean Network Canada*

# ANNUAL REPORT

2023

## Endeavour Hydrothermal Vents Marine Protected Area

Fisheries and Oceans Canada
Pêches et Océans Canada

Canada

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## At-a-glance

**Date of designation:**
2003

**Size:**
97 km²

**Contribution towards the marine conservation targets:**
<0.01%

**Location:**
This MPA is located along the Juan de Fuca Ridge in the Offshore Pacific Bioregion; Pacific Ocean.

**Managed by:**
Fisheries and Oceans Canada (DFO)

**Acknowledgement:**
The Endeavour Hydrothermal Vents (EHV) MPA falls within the statement of intent area of the Nuu-chah-nulth Tribal Council (NTC) Treaty claim.

**Zones:**
Although there are no identified zones in the Regulations, the management areas for the Endeavour Hydrothermal Vents (EHV) MPA correspond to the 5 principal hydrothermal vent fields

1. High Rise
2. Main Endeavour
3. Mothra
4. Salty Dawg
5. Sasquatch

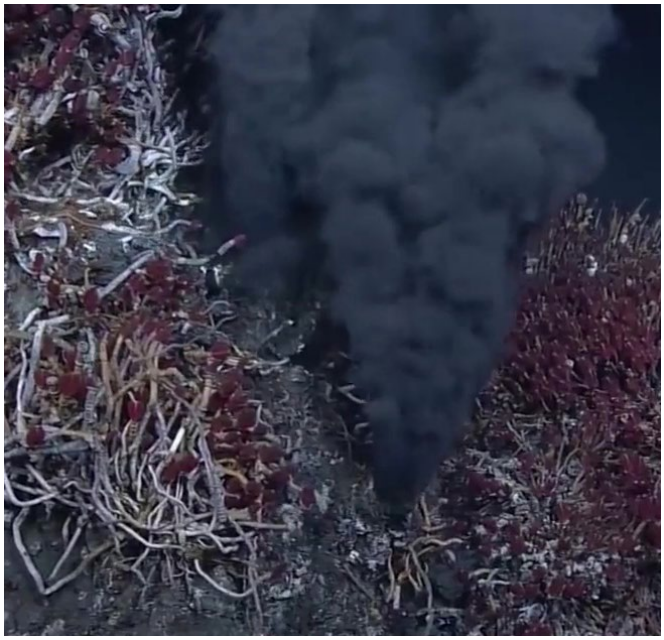
## Key highlights

The Endeavour Hydrothermal Vents (EHV) were designated as the first Marine Protected Area (MPA) under Canada's *Oceans Act* in 2003. Canadian and international scientists have focused their research on the EHV since they were discovered in 1982.

Hydrothermal vents in the Endeavour area consist of large hot black smokers, chimney-like structures, and surrounding lower temperature sites. Temperatures associated with black smokers are typically more than 300°C and their associated plumes rise rapidly about 300 metres into the overlying water column. The 5 main vent fields on the Endeavour Segment of the Juan de Fuca ridge span a wide range of conditions which are characterized by:

- varying water temperatures and salt content;
- sulphide structure morphologies; and
- animal abundance.

There are at least 60 distinct species living on the Juan de Fuca Ridge. Many of these species were first described from the EHV MPA and 12 species do not exist anywhere else in the world.



*Active black-smoker hydrothermal vent at Endeavour populated with Ridgeia piscesae tubeworms.*

*Photo credit: Fisheries and Oceans Canada, CSSF ROPOS.*

# In the spotlight: benefits

| Ecological | Socio-cultural | Economic |
|---|---|---|
| The EHV MPA protects hydrothermal vents and the unique ecosystems found within. By protecting the ecosystem in its natural state, scientists are able to study the ecological processes of this unique environment. In the global context, hydrothermal vent ecosystems are increasingly threatened by deep-sea mining. Neufeld et al. (2022) found that inactive vents support communities dominated by suspension feeding taxa. These taxa are fragile and sensitive to impacts from deep-sea mining. The ecological benefits of the MPA extend beyond biodiversity protection because the area provides many ecosystem services. | Hydrothermal vents were first discovered in 1977 and the EHV hydrothermal vents were discovered in 1982.<br><br>Canada was the first country to protect hydrothermal vents. For many decades, scientists used the area to study chemosynthetic food webs, the origins of life on our planet, and perhaps its origins on others. When scientists discovered these chemosynthetic ecosystems, the long-held belief that life could not exist without sunlight was abandoned.<br><br>This MPA continues to provide research opportunities to advance the conservation, protection and understanding of the area. It also contributes to public awareness of the value of marine ecosystems and the need to protect them. | Since its discovery, the EHV ecosystem has been the focus of Canadian and international scientific research. Discoveries within the MPA hold interests to pharmaceuticals and other global industries. At a more local scale, decades of expenditures on research, as well as jobs that support scientific expeditions, data collection, and analysis resulted in economic benefits.<br><br>Hydrothermal vent ecosystems also provide other economic benefits associated with ecosystem services such as ocean chemistry and circulation regulation. |

# Education and outreach

DFO's EHV MPA display toured around various locations such as the Royal British Columbia Museum and Vancouver Aquarium. The exhibit increased public awareness of Canada's first MPA and improved the understanding of the hydrothermal venting system.

Footage of the hydrothermal vents has been featured:

- in the BBC series Blue Planet II (episode: The Deep)
- through online media produced by DFO (on YouTube) and Ocean Networks Canada (ONC)

Many scientific publications and presentations (DFO, University of Victoria (UVIC), etc.), and outreach classroom content (DFO, ONC, National Geographic, Canadian Network for Ocean Education and other organizations) have featured the EHV MPA. ONC streams the dives of the EHV MPA to a global audience via their website and Seatube.

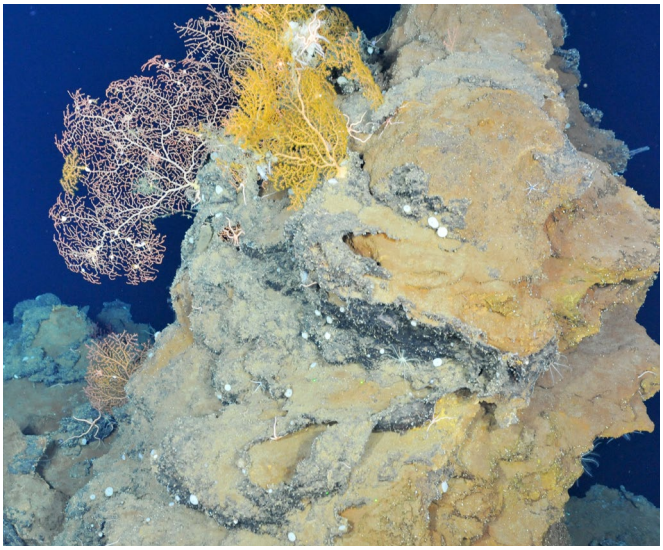
## Research and monitoring

The EHV MPA has been a popular research site for both Canadian and international researchers for more than 40 years. Areas of study include:

- unique biota
- venting processes and chemistry
- seismic and magmatic activity

DFO Science continues to conduct research at the ONC cable observatory sites (est. as NEPTUNE in 2009). In 2016, DFO led an expedition to the MPA in partnership with the UVIC and Memorial University of Newfoundland. A remotely operated vehicle (ROV) was used to:

- collect imagery in areas with no previous baseline habitat data (Sasquatch, Raven, Clam Bed and Middle Valley)
- sample different tubeworm habitats to study functional traits of animal and microbial communities
- collect geological samples to investigate the evolution of hydrothermal chimneys after they cease to be active
- initiate an experiment to compare invertebrate recruitment patterns among vent fields and in the EHV MPA microhabitats (Grupe and Norgard 2018)

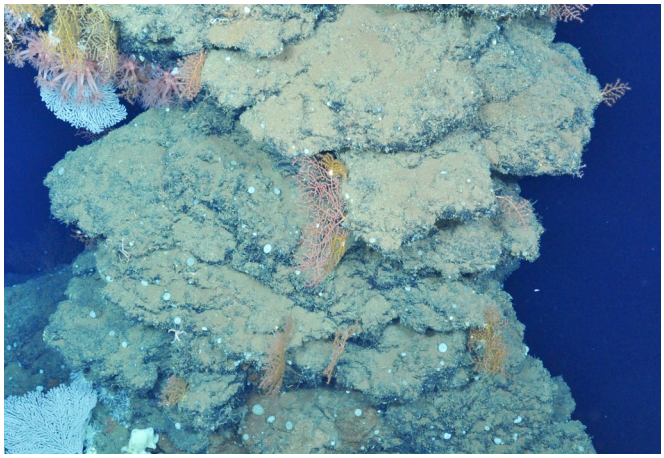


*Inactive sulfide deposits at Endeavour populated with diverse assemblage of cold-water corals, sponges, and other invertebrates (Neufeld et al. 2022).*

*Photo credit: Fisheries and Oceans Canada, CSSF ROPOS.*

The data from this expedition contributed to the ongoing understanding of hydrothermal vents and was used to describe the non-vent megafaunal communities of hydrothermal vent ecosystems (Neufeld et al. 2022).

ROV surveys also recorded plastic waste and other land-based refuse within the MPA. Further work is required to determine how pervasive plastic waste is within this deep ocean MPA and its impacts.



*Inactive sulfide deposits at Endeavour populated with diverse assemblage of cold-water corals, sponges, and other invertebrates (Neufeld et al. 2022).*

*Photo credit: Fisheries and Oceans Canada, CSSF ROPOS.*

## Collaborations and partnerships

ONC and DFO collaborated in the development of remote monitoring tools for the EHV MPA. A real-time cabled observatory, NEPTUNE (North-East Pacific Time-Series Underwater Networked Experiments) Canada, was installed at the site in 2010.

Every year, the NEPTUNE observatory collects around 100 terabytes of scientific data. The time-series data gathered allows scientists to study long-term changes over the life of the project. The data has policy applications in the areas of:

- climate change
- hazard mitigation (earthquakes and tsunamis)
- ocean management
- ocean pollution
- port security and shipping
- resource development
- sovereignty and security

Recent examples of database queries to support MPA management include:

(1) using GIS spatial analysis tools to create kernel density 'heat maps' to quantify the intensity of sampling and survey activity within the MPA.

(2) quantifying high-frequency variability in vent fauna and habitat using sensor and fixed camera data (Juniper et al. 2019)

*Photo credit: Ocean Network Canada*

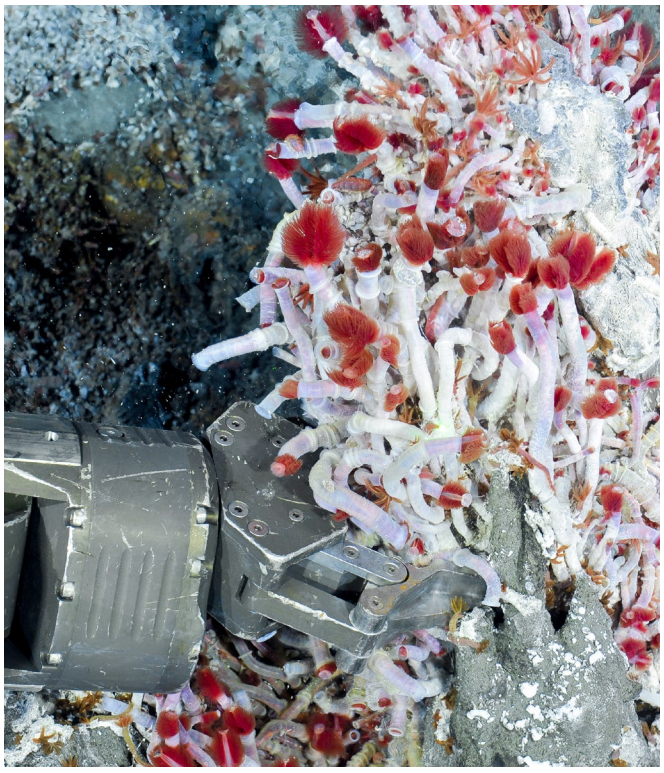


*Photo credit: Ocean Network Canada*

## Surveillance and enforcement

In 2023, Conservation and Protection's Fisheries Aerial Surveillance and Enforcement Program flew over the MPA for 1.63 hours with 2 commercial vessels detected during those flights.

The Marine Security Operations Center monitors the MPA using Radar Satellite II and analyzes acquisitions and detections with any Automatic Identification System associations.

No fisheries violations were detected from audits to Electronic Monitoring data aboard fishing vessels.

Future monitoring efforts will benefit from the approval to leverage the Dark Vessel Detection program in domestic waters as it will specifically target coverage of Pacific Region MPAs.

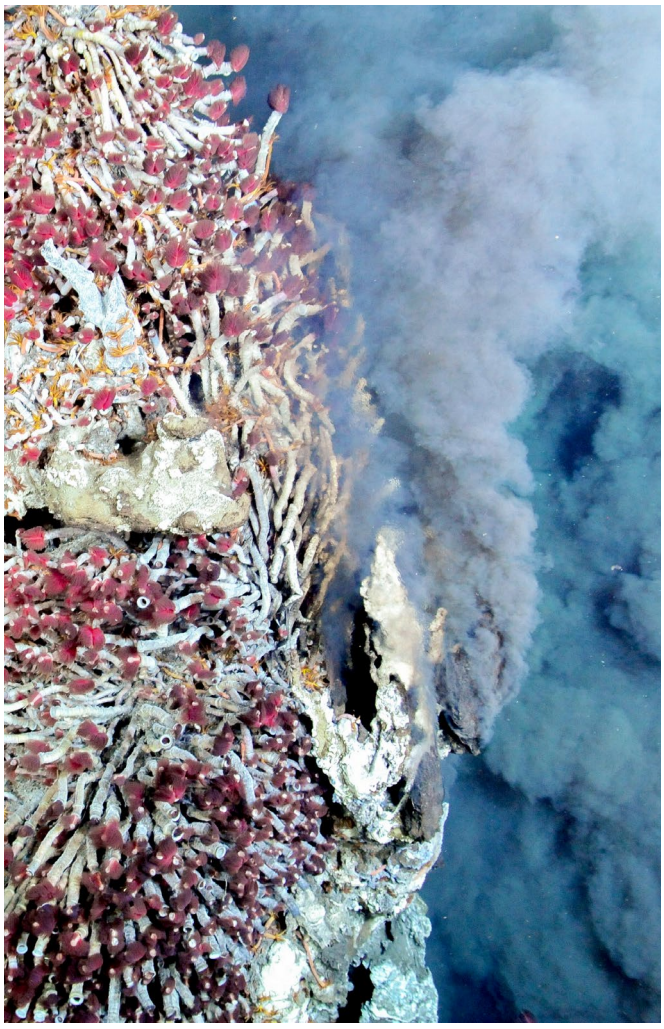


*Photo credit: Ocean Network Canada*

# Management and governance

The EHV MPA management aims to:

- oversee that human activities contribute to the conservation, protection and understanding of the natural diversity, productivity and dynamism of the ecosystem
- verify that responsible procedures are followed (e.g. sampling, instrument deployment and retrieval, data sharing and appropriate debris disposal)
- provide research for the conservation, protection and understanding of the area
- contribute to public awareness by communicating the values of marine ecosystems and the need to protect them

The Endeavour Technical Advisory Committee (TAC) was formed to provide advice and recommendations to DFO on the conservation and management of the MPA.

Members represent government and non-government interests and have skills, knowledge and expertise related to the:

- ecology
- management
- conservation
- use of the area

DFO and the Endeavour TAC collaborated in the development of the designation, a management framework, and the MPA management plan. The EHV MPA management plan was published in 2010 and established the management regime for the MPA. It provides guidance to DFO, other regulators, marine users and the public on achieving conservation objectives and protecting and managing the MPA. The management plan serves as the long-term framework upon which more detailed or additional operational plans for the MPA can be developed to address specific issues.

## Looking to the year ahead

On June 19, 2024, the EHV MPA Regulations were repealed with the designation of the Tang. ɢwan – ḥačxwiqak – Tsigis MPA (ThT MPA). The ThT MPA covers approximately 133,017 km² of Canada's EEZ and includes the entire area that was previously protected by the EHV MPA.

In 2023 a memorandum of understanding (MoU) was reached with:

- the Nuu-chah-nulth Tribal Council
- the Council of the Haida Nation
- Pacheedaht First Nation
- Quatsino First Nation
- the Government of Canada

The MoU outlines how the parties will work together to cooperatively share in the planning, operation, management, and use of the ThT MPA.

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