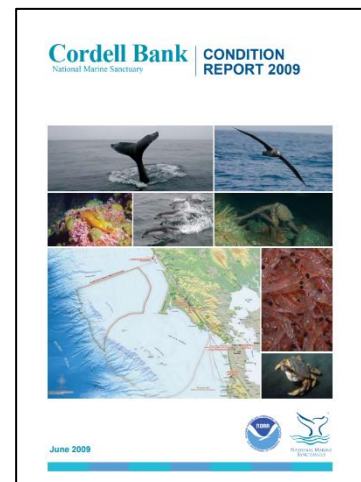


## 2020 Sanctuary Science

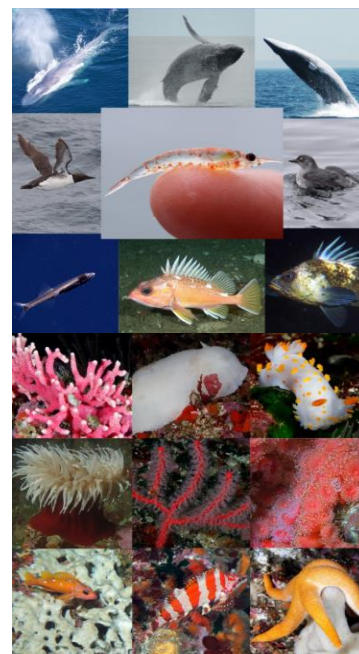
The Conservation Science program at Cordell Bank National Marine Sanctuary (CBNMS) works to understand the ecosystem of the sanctuary and monitor the conditions of the habitat and organisms to inform management decisions that can better protect sanctuary resources. While most field work was cancelled in 2020 due to COVID-19, we focused on producing data products and reports and began updating our condition report.

### Projects:

- **Condition Report:** CBNMS began the development of the condition report in February 2020. The condition report is a comprehensive summary of status and trends of resources in the sanctuary and will update the previous report published in 2009. CBNMS and Office of National Marine Sanctuaries staff facilitated virtual workshops in November 2020 to identify data indicators and data sources, which will be used to rate the status and trends of resources at workshops in 2021. Over 70 data indicators were identified to use for rating these sections. Staff will continue working on this report in 2021 with a final report expected in 2022, which will inform the future management plan revision process.
- **Species Inventory:** CBNMS staff updated the sanctuary's species inventory that documents all species with a verified observation in the sanctuary. Thirteen sources of data were examined, including scientific reports, raw data sets, databases, and scientific papers to identify species that have been observed in CBNMS. Staff identified 408 new species from 19 phyla and added them to the database, resulting in a total of 1820 species observed in CBNMS (an increase of 28%). Two notable additions were the coral *Chromoplexaura cordellbankensis* and the sponge *Farrea cordelli*, both of which were collected during remotely operated vehicle (ROV) cruises in 2017 and 2018, and were described and identified as a result. This species inventory will support management efforts, such as the development of the condition report and management plan, and will be used in education and outreach materials.
- **New Species:** Research into deep-sea sponges collected on a 2017 E/V *Nautilus* expedition to CBNMS identified one previously undescribed species and several depth and range extensions for four other species. Dr. Henry Reiswig, a sponge expert, described and named the previously unknown sponge *Farrea cordelli*. Four other sponge species were observed for the first time in CBNMS and were determined to be significant range or depth extensions. These species were *Cladorhiza bathyrcrinoides*, *Rhabdocalyptus dawsoni*, *Caulophacus schulzei*, and *Staurocalyptus pamelaturnerea*. The analyses of these specimens contribute to the species inventory and characterization of deep-sea communities in CBNMS.



CBNMS and ONMS staff are currently working to update the CBNMS Condition Report published in 2009. Credit: NOAA



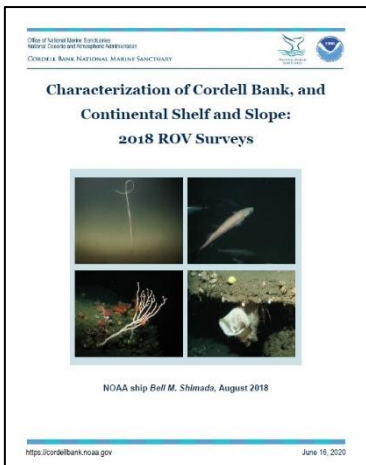
Some of the 1820 species that have been observed in CBNMS and documented in the updated species inventory. Photos: ONMS/NOAA



*Farrea cordelli*, a previously unknown sponge, was observed on a 2017 E/V *Nautilus* cruise and was subsequently described and named. Photo: OET/ONMS



*Staurocalyptus pamelaturnerea*, a sponge observed during a 2017 E/V *Nautilus* cruise, was collected for only the second time. Photo: OET/ONMS



One of many recent publications by CBNMS staff and their collaborators. Credit: NOAA

- **Seven years of Hypoxia Monitoring:** An oceanographic mooring was maintained at CBNMS for the seventh consecutive year in 2020, through a partnership between UC Davis, Bodega Marine Laboratory (BML), CBNMS, and funding from the Cordell Marine Sanctuary Foundation. In 2020, BML performed all the field work for the project because COVID-19 restrictions prevented CBNMS staff from participating. The mooring is deployed year-round to measure oceanographic conditions, such as low oxygen. Low oxygen conditions can be stressful to organisms and can lead to death. Results from previous years show variability within and between years, with low oxygen events occasionally present for short durations. CBNMS and BML will continue to monitor conditions for changes and any impacts on marine life on the bank.
- **Science Reports:** CBNMS researchers completed a comprehensive characterization report describing the analysis of ROV video collected on the E/V *Nautilus* in 2017 in the sanctuary. These dives were the first explorations of the deep depths (744-2737 meters) of Bodega Canyon and slope habitat, and have greatly expanded our knowledge of deep-sea organisms in the deepest parts of the sanctuary. A second report describing the analysis of ROV imagery collected in CBNMS on the NOAA ship *Bell M. Shimada* in 2018 was also completed. This mission explored new areas, surveyed areas undergoing management changes, and monitored sites over time. These surveys targeted previously unexplored areas on the slope between 400-600 meters deep to fill a data gap about community zonation. To further this work in exploration, characterization and monitoring, CBNMS, in partnership with Greater Farallones National Marine Sanctuary (GFNMS), was awarded funds from the National Oceanographic Partnership Program (NOPP), NOAA's Office of Exploration and Research, and NOAA's Deep Sea Coral Research and Technology Program West Coast Initiative in 2020. CBNMS and GFNMS will use these funds for a joint cruise in 2021.

**Publications from CBNMS and Collaborators:**

Graiff, K., and Lipski, D. 2020. Characterization of Cordell Bank, and Continental Shelf and Slope: 2018 ROV Surveys. NOAA Cordell Bank National Marine Sanctuary. 33 pp.

Graiff, K., and Lipski, D. 2020. First characterization of deep sea habitats in Cordell Bank National Marine Sanctuary: E/V *Nautilus* 2017. NOAA Cordell Bank National Marine Sanctuary. 39 pp.

Haver, S., Rand Z., Hatch L., Lipski, D., Dziak, R., Gedamke, J., Haxel, J., Heppell, S., Jahncke, J., McKenna, M., Mellinger, D., Oestreich, W., Roche, L., Ryan, J., and Van Parij, S. 2020. Seasonal trends and primary contributors to the low frequency soundscape of the Cordell Bank National Marine Sanctuary. *The Journal of the Acoustical Society of America*. 148(2). pp. 845-858.

Raineault, N.A., and Flanders, J. Eds. 2020. New frontiers in ocean exploration: The E/V *Nautilus*, NOAA Ship *Okeanos Explorer*, and R/V *Falkor* 2019 field season. *Oceanography* 33(1). 122 pp. <https://doi.org/10.5670/oceanog.2020.supplement.01>.

Reiswig, H. M. 2020. Report of *Cladorhiza bathyrcrinoides* Koltun (Demospongiae) from North America and a new species of *Farrea* (Hexactinellida) among sponges from Cordell Bank, California. *Zootaxa* 4747 (3). pp. 562-574.

**Partners:** Cordell Marine Sanctuary Foundation, Point Blue Conservation Science, Greater Farallones National Marine Sanctuary, Greater Farallones Association, UC Davis Bodega Marine Lab, California Academy of Science, United States Geological Survey, Oregon State University, Pacific Marine Environmental Lab, Ocean Exploration Trust, NOAA Deep Sea Coral Research and Technology Program.

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