



Estimates of Rocky Reef Habitat Informing Expansions

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Goals

- Develop rocky reef habitat area estimates for each strata inside and outside of MPAs.
- Consider the coverage of seafloor habitat data and quality within each strata.
 - Specifically, determine the resolution of habitat data available.
- Identify data needs, limitations, and future considerations.

Habitat Data Sources

- California Seafloor Mapping Project (CSMP) Predicted Substrate
- West Coast USA Nearshore Coastal and Marine Ecological Classification Standard (CMECS) Substrate Habitat

California Seafloor Mapping Project Data

- Systematic effort to collect bathymetric and backscatter data for state waters of California during Marine Life Protection Act implementation.
- **93% coverage of state waters** north of Pt. Conception
- Resolution varies due to depth collected:
 - 2 meter: Depths from 10m to 80m
 - 5 meter: Depths from 80m to 200m
 - 10 meter: Depths greater than 200m
 - > 10 meter: Depths from 0 – 10m were interpolated due to inaccessibility.

State Waters Data Coverage

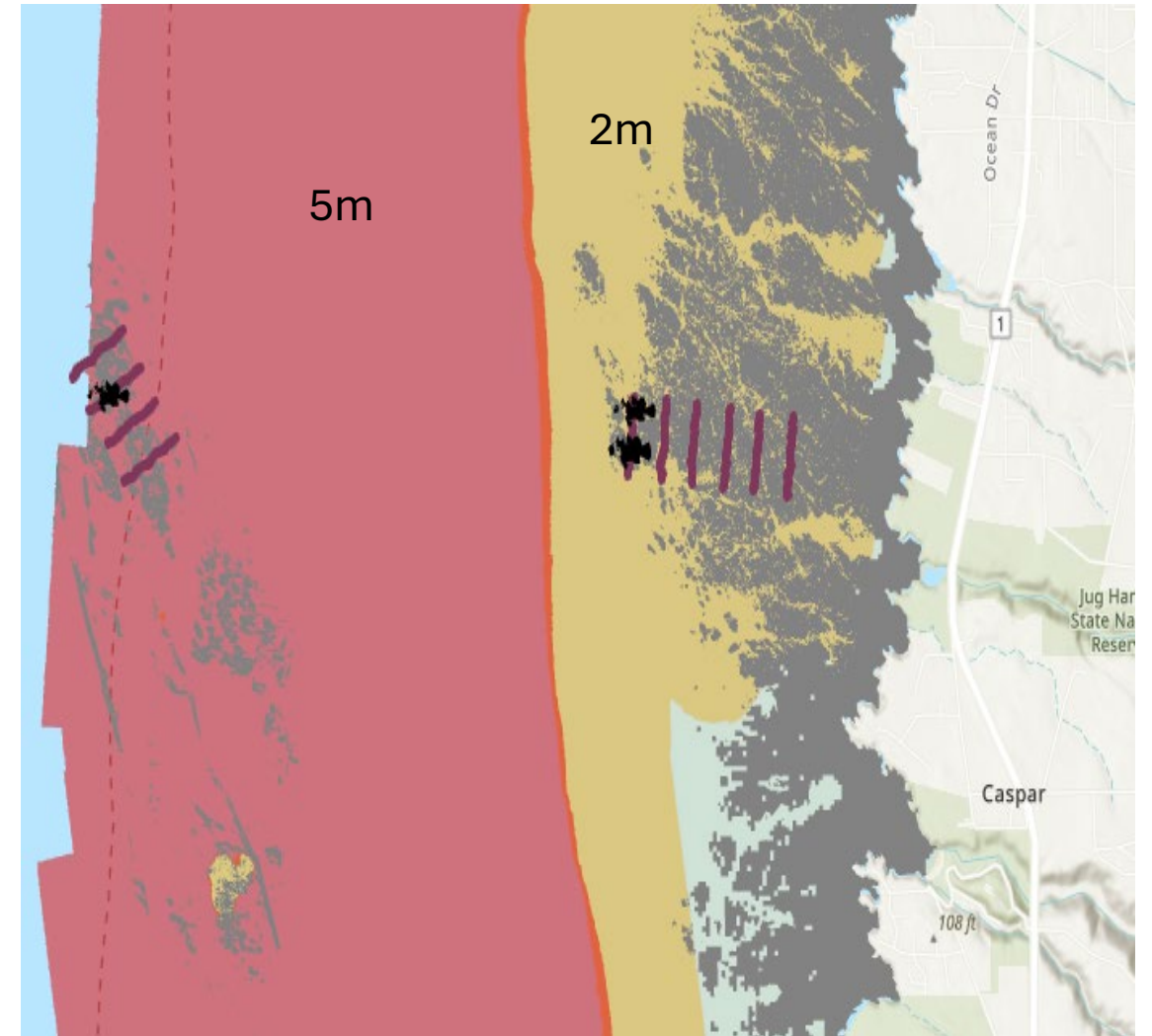
*State waters do not include SF Bay

** Limited white zone calculations due to data gaps

Resolution	N of Conception*	S of Conception	Total
Whitezone (30m)	6% (477)	**	4% (477)
2m	77% (5,811)	22% (1,308)	52% (7,119)
5m	8% (634)	9% (538)	9% (1,172)
10m	2% (179)	9% (539)	5% (718)
No CSMP Coverage	7% (435)	60% (3,708)	30% (4,143)
Total Habitat	7536 sq km	6093 sq km	13,629 sq km

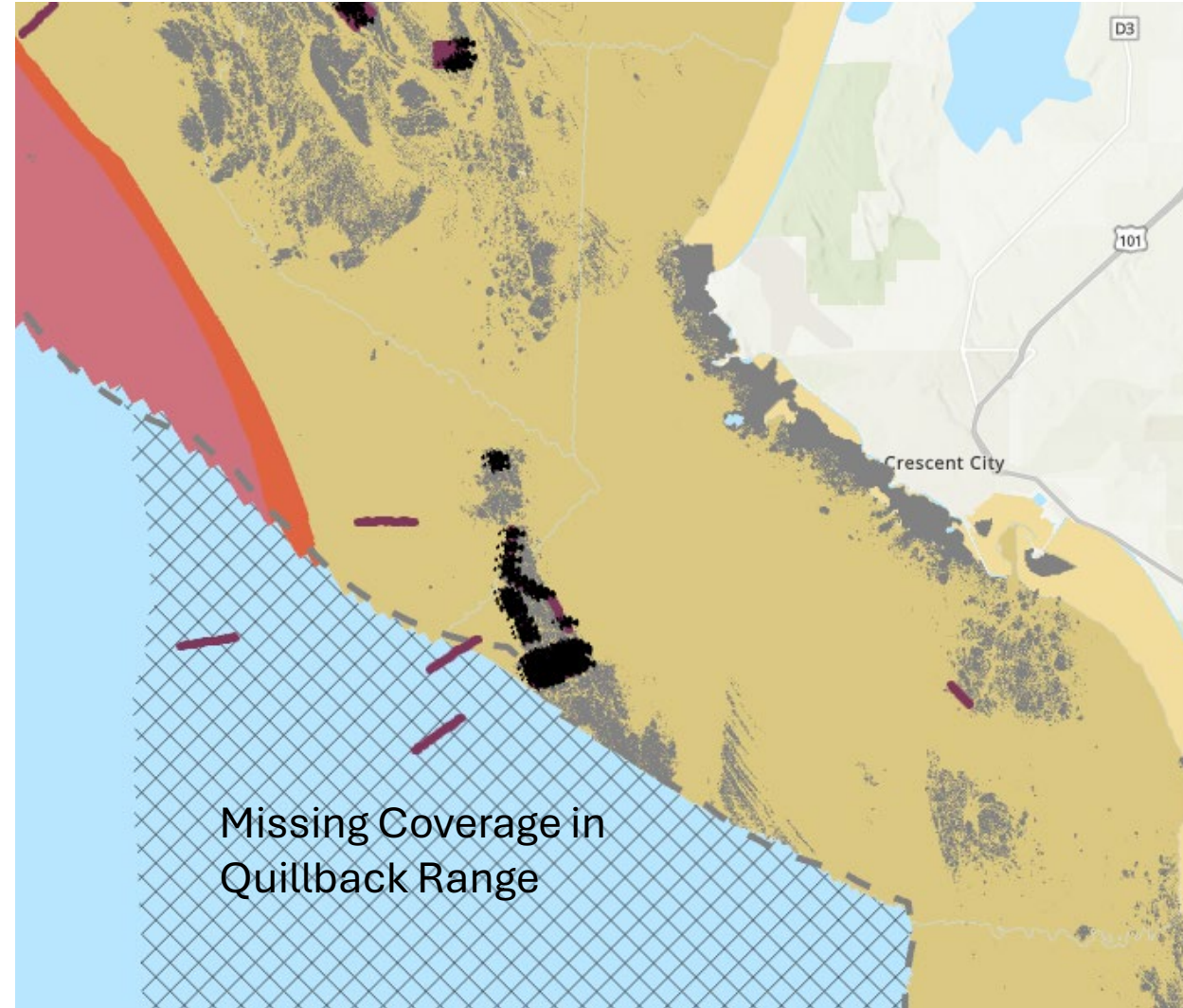
Predicted Substrate from CSMP Data

- Algorithmically defined habitat using seafloor roughness (rugosity analysis) as a proxy for determining areas likely to consist of rocky reef.
- Produces ‘**hard**’ or ‘**soft**’ delineations.



CSMP Limitations

- Only extends to 3 nautical miles
 - Sparse coverage south of Pt. Conception
- Variable resolution
- Limitations to classification method
 - Hard?
 - Rocky bottom may be underestimated in some areas by the “hard” category, including canyon slopes, deep water, and rock that is smooth or covered in sediment.



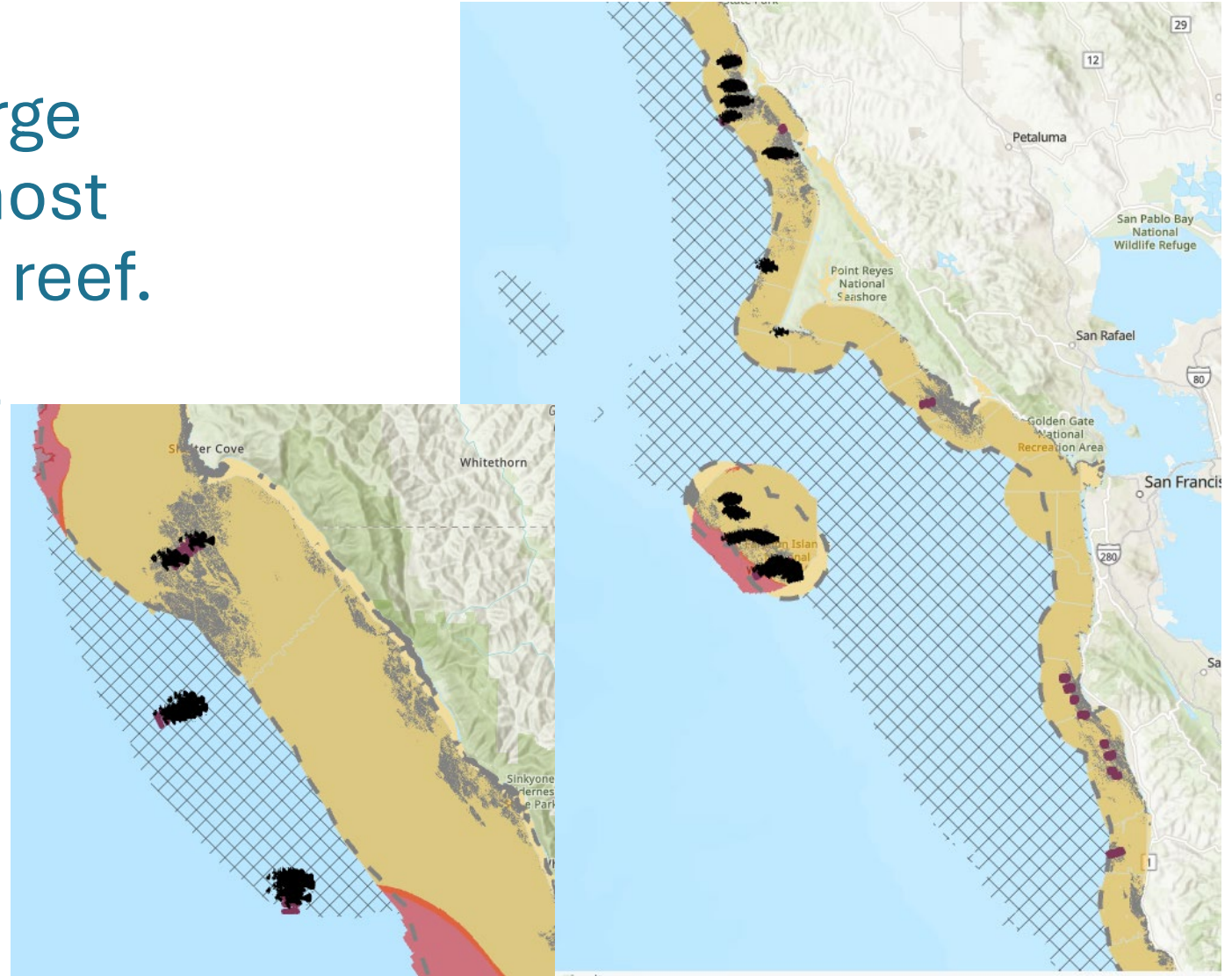
Quillback Rockfish Habitat Data Coverage

Resolution	0 - 100m	18m - 100m
Whitezone (30m)	4% (477)	0.1% (22)
2m	47% (6078)	46% (5289)
5m	3% (402)	4% (402)
10m	0% (0.0003)	0% (0.0003)
No CSMP Coverage*	46% (5,892)	50% (5,892)
<i>Total Habitat</i>	<i>12,842 sq km</i>	<i>11,569 sq km</i>

* Non-CSMP Data. Highly variable.

Review of Missing Coverage

- While 46% seems high, large area around SF Bay that most likely does not have much reef.
- Other areas with potential Quillback rockfish observations:
 - Offshore of Shelter Cove
 - Cordell Bank
 - Offshore Crescent City
 - Offshore Bodega Bay

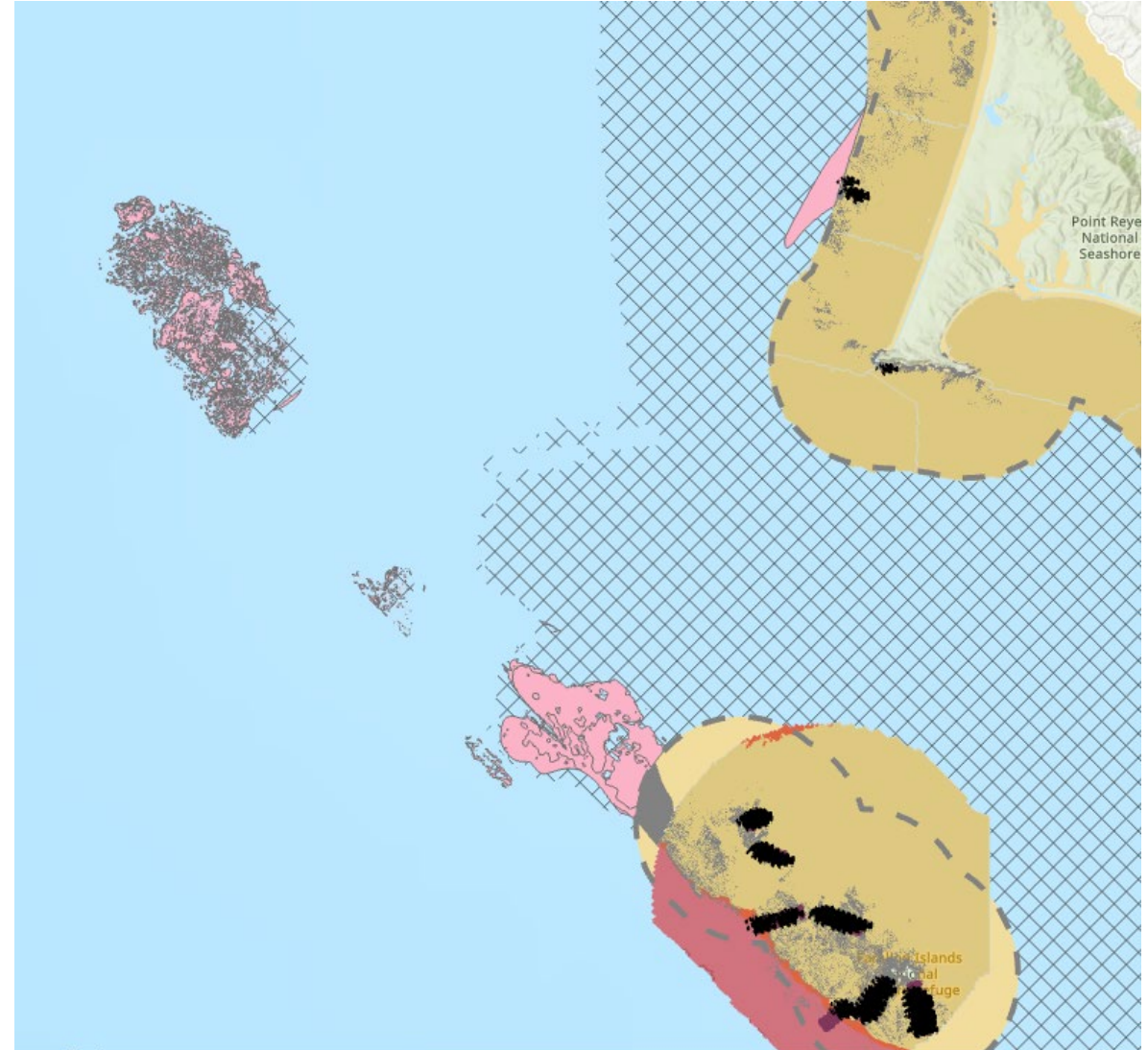


CMECS Data

- Aggregate of habitat data by the Pacific Marine and Estuarine Fish Habitat Partnership.
 - Classified into the Substrate Component.
 - CSMP is included in this dataset.
- **99% coverage of Quillback habitat.**
- Corresponding data quality layer that provides information about ground truthing, resolution, and metadata.
- Compiles habitat into multiple sub-categories.
- **Rocky Reef Habitat Area of Particular concern was used as reef determination.**

CMECS Limitations

- Resolution and data quality is highly variable.
- There is alignment between CSMP hard and CMECS rocky reef but some loss of resolution of interstitial spaces.



Estimating Total Reef Habitat

- Polygons representing various stratifications were created in ArcGIS Pro.
 - Depth contours were created using CSMP data when possible, NOAA's 30m grid when not.
- CSMP and CMECS data was intersected with strata and total area of hard (CSMP) and rocky reef (CMECS) were summed within each strata.
 - Repeated for MPAs
- Areas by resolution (CSMP) and data quality (CMECS) were included.

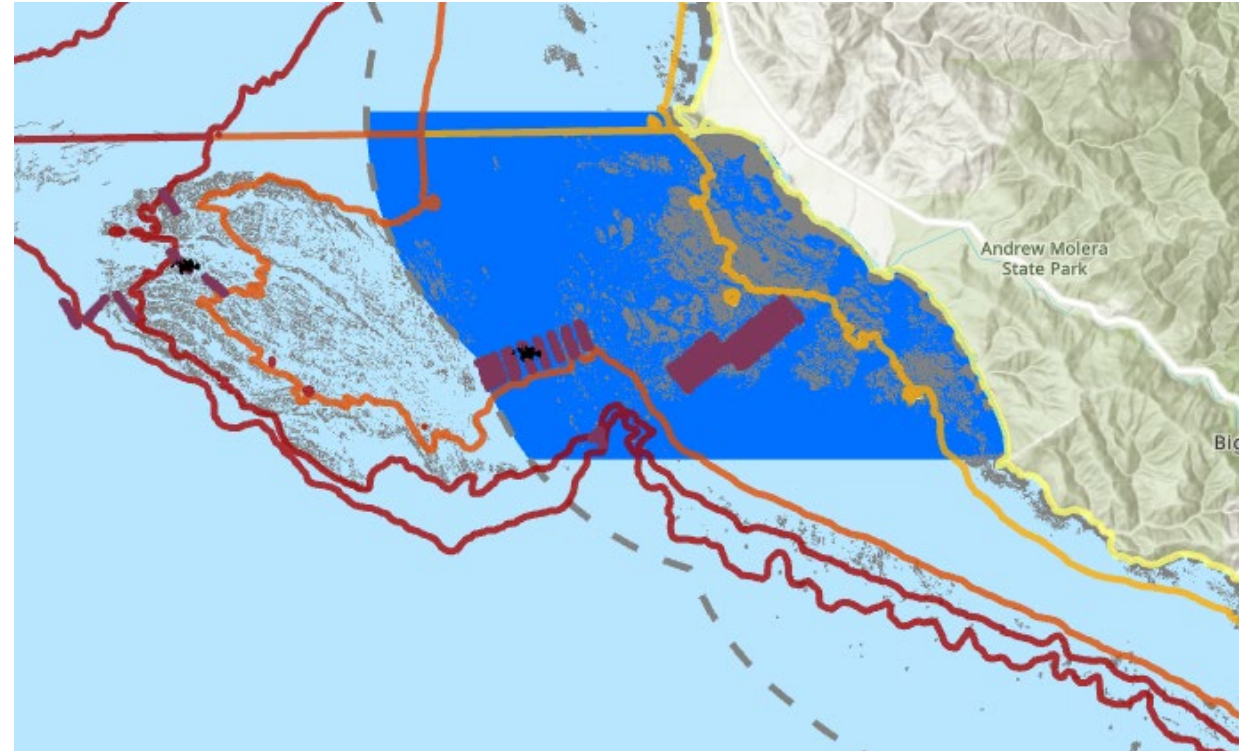
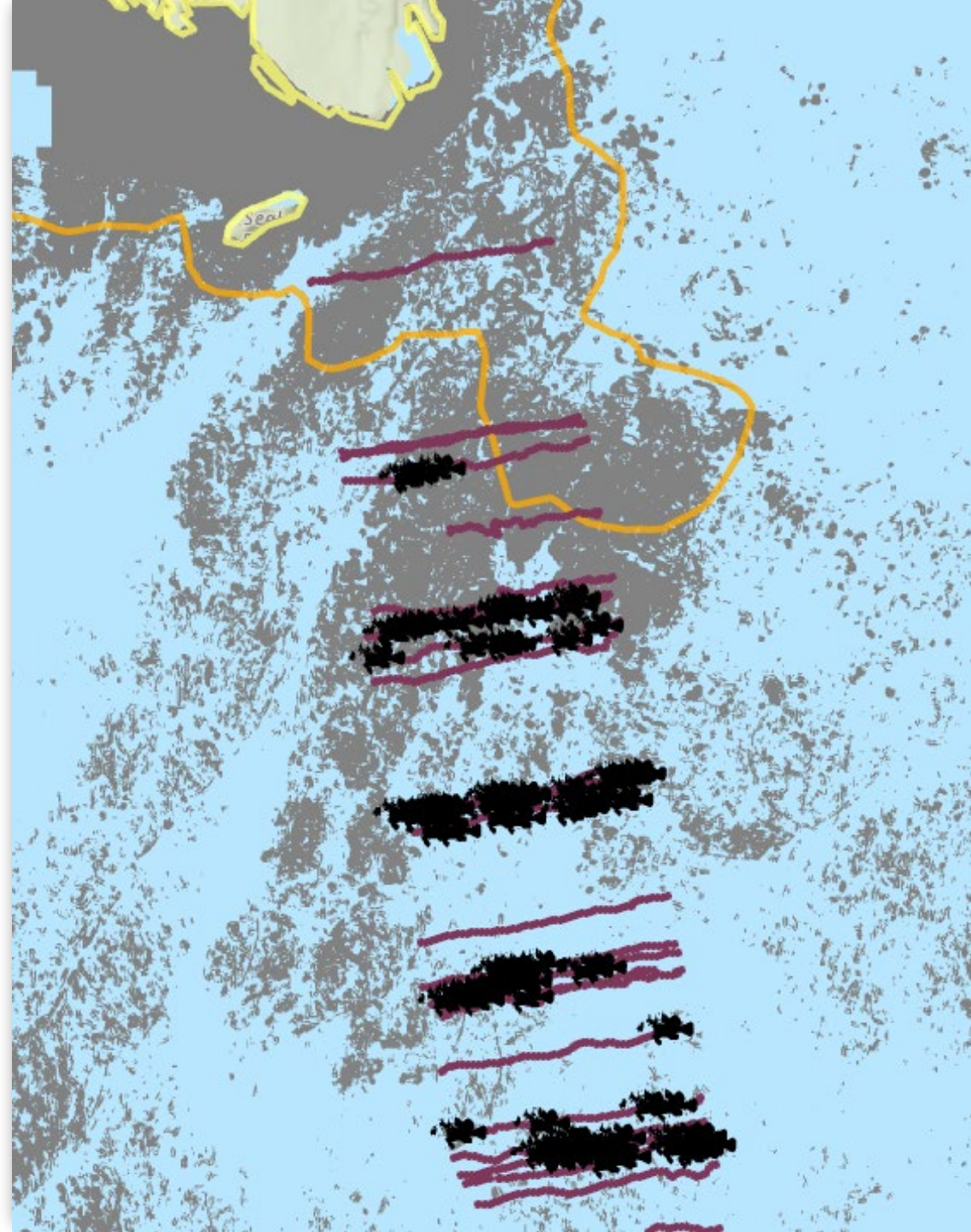


Table C3-3. Example strata habitat totals for CSMP data. Coverage and habitat by resolution is also provided.

Stratification Zone	Stratification Depth	Hard Area	Total MPA Hard	Total Area	Missing Coverage of Habitat Data	Hard (2m)	2m Coverage	Hard (5m)	5m Coverage	Hard (>10m)	>10m Coverage
Above 40 deg 10	0 - 120m	57.26	11.32	1423.73	55%	42.56	38%	2.14	2%	12.56	5%
Farallon	0 - 120m	12.76	5.03	464.7	75%	9.51	18%	0.77	3%	2.48	4%
Pigeon Point to Pt Arena - Coastal	0 - 120m	85.81	20.92	2028.95	67%	65.86	31%	0	0%	19.95	2%
Pt Arena to 40 deg 10	0 - 120m	42.83	6.22	503.99	27%	27.82	47%	0.98	20%	14.03	5%
Pt Conception to Pigeon Point	0 - 120m	127.67	34.23	1586.23	29%	87.42	54%	1.75	7%	38.49	9%

Conclusions

- The CSMP estimates of hard habitat is the best possible data source for habitat expansions. Especially for North of Pt. Conception.
 - Key areas outside of state waters missing coverage.
 - Limitations to classification.
- The CMECS data source was investigated to fill in these data gaps.
 - Data quality and resolution is highly variable.
- Variable resolutions and missing coverage may have a substantial effect on total reef estimates.



Next Steps

- Further investigation can be done to see how the variable resolutions may change total reef area estimates.
- Ground truth the CSMP/CMECS data with the ROV habitat determinations.
- Refine habitat data characterizations to better inform expansions.
 - Further geomorphic classifications or habitat characterizations.

Data Access

CSMP

- Raw Data
 - [Seafloor Mapping Lab at CSUMB: Partners \(otterlabs.org\)](http://otterlabs.org)
 - [California Seafloor Mapping Program | U.S. Geological Survey \(usgs.gov\)](http://usgs.gov)
 - Same bathymetry 'raw' data but different analysis and products
 - Split into ~300 rasters
- Compiled into 'Predicted Nearshore Benthic Substrate of California' by CDFW
 - Available through MarineBIOS
 - Includes other data sources for data gaps within the CSMP
 - Resolution isn't included

CMECS

- [GIS Service](#)
 - [West Coast USA Nearshore CMECS Substrate Habitat | Pacific Marine and Estuarine Fish Habitat Partnership](#)

