

2 Methods

We applied the NOAA Fisheries Fish Stock Climate Vulnerability Assessment Methodology (Morrison et al., 2015), modified for the unique characteristics of the CCLME, to 64 species, most of which are managed under four Fishery Management Plans (FMPs) by the Pacific Fishery Management Council (PFMC, 2022a; PFMC, 2021; PFMC, 2022b; PFMC, 2022c).

2.1 Species selection

We selected species that encompassed the full range of higher taxa, life-history types, habitat associations, and management categories (highly protected to highly exploited). Because many species lack even the full complement of life history and other information needed for this CVA, we did limit the assessment to species with sufficient information to support evaluation based on the

TABLE 1 List of species analyzed in this study.

Functional Group	Species	Scientific Name
Coastal Pelagic Species	Northern Anchovy	<i>Engraulis mordax</i>
	Pacific Chub Mackerel	<i>Scomber japonicus</i>
	Pacific Herring	<i>Clupea pallasii</i>
	Pacific Sardine	<i>Sardinops sagax</i>
	Jack Mackerel	<i>Trachurus symmetricus</i>
	Jacksmelt	<i>Atherinopsis californiensis</i>
	Market Squid	<i>Doryteuthis opalescens</i>
Elasmobranch	Leopard Shark	<i>Triakis semifasciata</i>
	Longnose Skate	<i>Raja rhina</i>
	Pacific Spiny Dogfish	<i>Squalus suckleyi</i>
Flatfish	Arrowtooth Flounder	<i>Reinhardtius stomias</i>
	Dover Sole	<i>Microstomus pacificus</i>
	English Sole	<i>Parophrys vetulus</i>
	Pacific Sanddab	<i>Citharichthys sordidus</i>
	Petrale Sole	<i>Eopsetta jordani</i>
	Rock Sole	<i>Lepidopsetta bilineata</i>
	Starry Flounder	<i>Platichthys stellatus</i>
Highly Migratory Species	Blue Shark	<i>Prionace glauca</i>
	Bluefin Tuna	<i>Thunnus orientalis</i>
	Common Thresher Shark	<i>Alopias vulpinus</i>
	Mola	<i>Mola mola</i>
	North Pacific Albacore	<i>Thunnus alalunga</i>
	Shortfin Mako Shark	<i>Isurus oxyrinchus</i>
	Striped Marlin	<i>Tetrapturus audax</i>
	Swordfish	<i>Xiphias gladius</i>
	White Shark	<i>Carcharodon carcharias</i>
Other Anadromous	Yellowfin Tuna	<i>Thunnus albacares</i>
	Southern Green Sturgeon	<i>Acipenser medirostris</i>
	Southern Eulachon	<i>Thaleichthys pacificus</i>
Other Groundfish	Kelp Greenling	<i>Hexagrammos decagrammus</i>
	Lingcod	<i>Ophiodon elongatus</i>

(Continued)

TABLE 1 Continued

Functional Group	Species	Scientific Name
	Pacific Cod	<i>Gadus macrocephalus</i>
	Pacific Grenadier	<i>Coryphaenoides acrolepis</i>
	Pacific Whiting	<i>Merluccius productus</i>
	Sablefish	<i>Anoplopoma fimbria</i>
	Shortspine Thornyhead	<i>Sebastolobus alascanus</i>
Rockfish	Aurora Rockfish	<i>Sebastes aurora</i>
	Black Rockfish	<i>Sebastes melanops</i>
	Blackgill Rockfish	<i>Sebastes melanostomus</i>
	Bocaccio Rockfish	<i>Sebastes paucispinis</i>
	Bocaccio Rockfish - Puget Sound	<i>Sebastes paucispinis</i>
	Calico Rockfish	<i>Sebastes dalli</i>
	Canary Rockfish	<i>Sebastes pinniger</i>
	Chilipepper Rockfish	<i>Sebastes goodei</i>
	China Rockfish	<i>Sebastes nebulosus</i>
	Cowcod Rockfish	<i>Sebastes levis</i>
	Darkblotched Rockfish	<i>Sebastes crameri</i>
	Gopher Rockfish	<i>Sebastes carnatus</i>
	Honeycomb Rockfish	<i>Sebastes umbrosus</i>
	Pacific Ocean Perch	<i>Sebastes alutus</i>
	Pygmy Rockfish	<i>Sebastes wilsoni</i>
	Rosethorn Rockfish	<i>Sebastes helvomaculatus</i>
	Rougheye Rockfish	<i>Sebastes aleutianus</i>
	Shortbelly Rockfish	<i>Sebastes jordani</i>
	Shortraker Rockfish	<i>Sebastes borealis</i>
	Widow Rockfish	<i>Sebastes entomelas</i>
	Yelloweye Rockfish	<i>Sebastes ruberrimus</i>
	Yelloweye Rockfish - Puget Sound	<i>Sebastes ruberrimus</i>
	Yellowtail Rockfish	<i>Sebastes flavidus</i>
Salmon	Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
	Chum Salmon	<i>Oncorhynchus keta</i>
	Coho Salmon	<i>Oncorhynchus kisutch</i>
	Sockeye Salmon	<i>Oncorhynchus nerka</i>
	Steelhead Salmon	<i>Oncorhynchus mykiss</i>

Abbreviations for functional groups are Coastal Pelagic Species (CPS) and Highly Migratory Species (HMS).

criteria we applied (Table 1). Many species that are infrequently targeted by fisheries lack life history information and a complete understanding of species distributions needed for CVAs. The 64 stocks encompass four functional groups corresponding to the Fishery Management Plans: Coastal and Pelagic Species (CPS) (7 species), Highly Migratory Species (HMS) (10 species), Anadromous Species (7 species), and Groundfish (40 species). Groundfish were

further split into subgroups to reflect the range of life histories: Elasmobranchs (3 species), Rockfish (23 stocks), Flatfish (7 species), and Other Groundfish (7 species). The CPS group included one invertebrate, Market Squid (*Doryteuthis opalescens*), and the Anadromous Species included two species not included in a Fishery Management Plan, but listed as threatened under the U.S. Endangered Species Act and taken as bycatch in other fisheries: