



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Marine Region
1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



October 10, 2022

Doug Saucedo
Natural Resources Coordinator II
Humboldt Bay Harbor, Recreation and Conservation District
601 Startare Drive, Eureka, CA 95501
dsaucedo@humboltdbay.org

**SUBJECT: HUMBOLDT BAY MARICULTURE INTERTIDAL PRE-PERMITTING
PROJECT
DRAFT ENVIRONMENTAL IMPACT REPORT
SCH# 2017032068**

Dear Mr. Saucedo:

The California Department of Fish and Wildlife (Department) received a Draft Environmental Impact Report (DEIR) from the Humboldt Bay Harbor, Recreation and Conservation District for the Humboldt Bay Mariculture Intertidal Pre-Permitting Project (Project) pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.¹ The Department previously submitted comments in response to the Notice of Preparation, Draft Mitigated Negative Declaration, and DEIR for previous iterations of the Project.

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife resources. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that the Department, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

DEPARTMENT ROLE

The Department is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the state (FGC §711.7, subd. (a) and §1802; Pub. Resources Code §21070; CEQA Guidelines §15386, subd. (a)). The

¹ CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

Department, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (*Id.*, §1802). Similarly, for purposes of CEQA, the Department is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources. The Department is also responsible for marine biodiversity protection under the Marine Life Protection Act in coastal marine waters of California and ensuring fisheries are sustainably managed under the Marine Life Management Act.

PROJECT DESCRIPTION SUMMARY

Proponent: Humboldt Bay Harbor, Recreation and Conservation District (Harbor District)

Objective: The objective of the Project is to “pre-permit” new intertidal leases at three sites in North Humboldt Bay for the culture of Kumamoto oysters (*Crassostrea sikamea*) and Pacific oysters (*C. gigas*). The Harbor District proposes to grant tideland leases to private shellfish growers (“Lessees”) for discrete portions of the Project’s pre-permitted sites. Methods proposed for oyster aquaculture include rack-and-bag, cultch-on-longline, and basket-on-longline. In total, the Project would cover 46 acres of intertidal habitat. The Project is separate from the Humboldt Bay Mariculture Subtidal Pre-Permitting Project, which “pre-permits” subtidal leases for shellfish and macroalgae aquaculture operations in Humboldt Bay off the Samoa Peninsula.

Location: North Humboldt Bay

MARINE BIOLOGICAL SIGNIFICANCE

Humboldt Bay is California’s second largest Bay, and the largest estuary on the Pacific coast between San Francisco Bay and Oregon’s Coos Bay. The marine and estuarine habitats of Humboldt Bay provide refuge and nursery habitat for more than 300 fish and invertebrate species, many with important commercial and recreational fisheries, and aquaculture value. Humboldt Bay and its wetlands and dunes are habitat for at least 20 State- and federally listed species and numerous California Species of Special Concern (SSC).

COMMENTS AND RECOMMENDATIONS

Pursuant to our jurisdiction, the Department offers the following comments and recommendations below to assist the Harbor District in adequately identifying and/or mitigating the Project’s significant, or potentially significant, direct and indirect impacts on fish and wildlife resources.

Reduced Project Footprint

The Department appreciates the revisions that have been made since previous iterations of the Project to reduce environmental impacts to marine resources. The current proposed Project has reduced the overall Project footprint by removing the previously proposed culture sites in the northwestern portion of the Bay, which substantially reduces impacts to Public Trust resources, including eelgrass and mudflat habitats, and species such as Pacific herring.

Eelgrass Habitat

Comments: Native eelgrass beds (*Zostera marina*) are an important part of the Humboldt Bay ecosystem and are recognized by state and federal statutes as both highly valuable and sensitive habitats. Humboldt Bay holds approximately 31% of the known mapped eelgrass in the state (Merkel & Associates 2017). Eelgrass provides primary production and nutrients to the ecosystem along with spawning, foraging, and nursery habitat for fish and other species. Pursuant to the federal Magnuson-Stevens Fishery Conservation and Management Act, eelgrass is designated as a Habitat of Particular Concern for various federally managed fish species within the Pacific Coast Groundfish and Pacific Coast Salmon Fisheries Management Plans. Eelgrass habitats are further protected under state and federal “no-net-loss” policies for wetland habitats. Additionally, the importance of eelgrass protection and restoration, as well as the ecological benefits of eelgrass, is identified in the California Public Resources Code (PRC §35630).

The Department recognizes that the DEIR has substantially reduced the potential impact to eelgrass habitat since previous iterations of the Project by removing sites within the northwestern portion of Humboldt Bay and siting leases to avoid dense eelgrass habitat (>84% cover). According to mapping done in 2017, approximately 0.02 acres of patchy eelgrass exist within the entire Project area (Table 4.5-2, DEIR). To reduce impacts to patchy eelgrass habitat, the Harbor District will require Lessees to prepare site descriptions to avoid eelgrass impacts from boat traffic (BIO-3), require Lessees to map eelgrass beds prior to installation of culture equipment and create a 30-foot buffer around all eelgrass plants (BIO-4), and minimize deposition of shells (BIO-5). The DEIR does not discuss the methods and timing of pre-installation eelgrass surveys and does not specify how eelgrass habitat will be defined. The DEIR acknowledges that some impacts to eelgrass may still occur from trampling, boat hull and propellers, and changes in circulation patterns and sedimentation but eelgrass monitoring or mitigation for these potential impacts is not proposed.

Eelgrass distribution fluctuates over time, and in some years, beds may extend closer to aquaculture equipment or higher in the intertidal zone than other years. Humboldt Bay has experienced a loss of eelgrass habitat in recent years, with eelgrass receding as much as 25 feet per year near the South Humboldt Bay State Marine Recreational Management Area, possibly due to wasting disease and subsequent mudflat erosion (Gilkerson, pers. comm., 2021). Monitoring along the Mad River Slough transect line (north of the Project area) documented a near complete loss of eelgrass habitat in 2020

(Tyburczy, pers. comm., 2021). In other areas of the Bay, eelgrass habitat has expanded within the intertidal flats (Gilkerson, pers. comm., 2021). The Department is concerned that only requiring Lessees to conduct an initial mapping of eelgrass habitat prior to installation of equipment will fail to capture the spatial and temporal fluctuations of eelgrass habitat within lease areas and will limit eelgrass from returning to its previous distribution. In addition, recent modeling efforts in Humboldt Bay predict a substantial shoreward expansion of eelgrass onto intertidal mudflat habitat over the next 100 years in response to sea level rise inundation, particularly in the North Bay (Shaughnessy et al. 2012; Gilkerson and Leroy 2013; Stillman et al. 2015). The Department is concerned that aquaculture development and operations in the intertidal zone could limit eelgrass from expanding higher onto intertidal mudflats in response to sea level rise.

Recommendations: To ensure no net loss of eelgrass habitat within the Project area, the Department recommends the following mitigation measures are included in the Final Environmental Impact Report (FEIR):

- The Department recommends eelgrass data from previous survey efforts (i.e., 2009, 2016, and 2017 data) be used to plan gear placement and access routes in addition to pre-installation surveys to account for temporal and spatial variability in eelgrass distribution. Previously mapped eelgrass habitat should also be used to determine the placement of the 30-foot buffer around the outermost extent of potential eelgrass habitat. The Department recommends the FEIR provide detailed maps of eelgrass habitat for each culture site that incorporates previous and current survey data and delineates the 30-foot buffer. The Department recommends the 30-foot buffer is setback from eelgrass habitat as defined in the CEMP (any eelgrass within 1m² quadrat and within 1m of another shoot bounded by a 5m wide perimeter of unvegetated area).
- The Department recommends the FEIR include details on pre- and post-installation eelgrass surveys. Surveys should be conducted by a qualified biologist during the high growth season (May-September) and follow the standards of the CEMP. If unexpected impacts to eelgrass occur, Lessees should be required to mitigate for such impacts following the standards of the CEMP. Eelgrass surveys should also include reference sites that can be used to account for natural fluctuations in eelgrass distribution.
- The FEIR should include additional mitigation measures to avoid impacts from trampling and anchoring within eelgrass habitat.
- Given that eelgrass may recruit higher in the intertidal, the Department recommends aquaculture operations be adaptively managed with resource and permitting agencies to avoid impacts to any new eelgrass habitat that may recruit to areas within the Project sites not actively used for cultivation.

Black brant

Comments: Black brant (*Branta bernicla nigricans*) are a species of waterfowl that are important for hunting and are also a State SSC. They occur in Humboldt Bay as spring

and fall migrants and winter visitors. Humboldt Bay is the fourth most utilized staging area in the Pacific Flyway for the species and has historically been the most important area in California for this species, due in part to the health and size of eelgrass habitats found in the Bay. Recent observations by the US Fish and Wildlife Service (USFWS) demonstrate a major shift in brant usage of the North Bay compared to the South Bay, especially during the hunting season (Brendan Leigh, USFWS, per. comm, 2020).

The reliance of black brant on eelgrass for food makes them highly vulnerable to fluctuations in the quality of this habitat (Ganter 2000; Moore et al. 2004; Shuford and Gardali 2008). In addition, black brant are some of the most sensitive waterfowl to disturbance and have among the largest escape distances (ED), defined as: “*the shortest distance at which birds flush when a person or another disturbing stimulus approaches*”, with black brant ED at a maximum of 1000m (Laursen et al 2005). Small boats associated with oyster operations in North Humboldt Bay have been observed to disturb black brant, with the birds being flushed with the first boat in the early mornings and not returning to feed until late evening (Schmidt 1999). Stillman et al. (2015) found that even small decreases in eelgrass abundance and small increases in disturbance can have population-level consequences; a 10% increase in disturbance can increase the stopover duration for black brant and cause large decreases in the amount of weight black brant gain per day. The DEIR states that up to 137 visits per individual culture unit (i.e., single bag, longline, basket) may occur each year and it is expected that groups of units will be visited more frequently (Table 2.7-1, DEIR).

The proposed site along the western shore of Tuluwat Island (Site-3) is a well-known grit site for black brant in North Humboldt Bay. Grit sites are a rare and critical resource for brant during the feeding process. Black brant accumulate grit in their gizzard as an aid to breakdown and digest eelgrass. Accessible grit sites are a requirement of avian herbivores, failure to maintain gizzard grit can result in reduced digestive efficiency and body condition (Moore 1998, Ebbs & Spaans 1995). Black brant tend to visit grit sites when they become available during retreating tides, as they occur higher in the intertidal than eelgrass beds, and then move to eelgrass when tidal elevations are low enough for the birds to access them (Lee et al. 2004, Moore and Black 2006). Studies in Humboldt Bay have shown that black brant favor the eelgrass beds closest to their gritting sites (Moore & Black 2006). In 2021 (January-April), USFWS counted 5,645 black brant at a survey location near Site 2 and Site 3, which accounts for approximately 21% of the brants surveyed in all of Humboldt Bay during that period.

Given the rarity and limited access to grit sites, anthropogenic disturbance and development of these sites have been cited as further limiting factors for black brant populations, with grit sites recognized as important areas for protection (Spragens et al. 2013). The Department is concerned that placing a culture site that overlaps with one of the few known grit sites in North Bay is likely to disproportionately impact brant, in addition to other waterfowl and shorebirds that utilize that area for foraging and are limited by tidal cycles. Additionally, the Department is concerned with potential impacts

to the gritting site itself (grit characteristics) due to the installation of gear and human activity. The DEIR does not adequately address impacts to black brant from Project activities. The potentially significant cumulative impacts from both a loss of foraging habitat at the grit site and an increase in disturbance resulting from the Project should be quantified and evaluated.

Recommendations: The Department recommends the FEIR include the following:

- A comprehensive analysis of impacts to black brant. The Department recommends the FEIR include a map of the gritting, feeding and loafing locations used by black brant in the North Bay along with an analysis of impacts to these locations from lease locations and operations. The Department recommends the FEIR include a quantitative analysis of both the loss of foraging opportunity and the increase in disturbance along with the cumulative impacts to black brant when both stressors occur simultaneously. This analysis should evaluate impacts to the Site 3 grit site from the installation of culture gear in addition to impacts associated with disturbance. Disturbance from culture activities at Site 2 to black brant utilizing the Tuluwat grit site should also be evaluated. The Department recommends the FEIR disclose the anticipated number of site visits per year, rather than visits to each individual culture unit. The Department also recommends the Harbor District consult with the Department, USFWS, and other natural resource agencies to develop a threshold on the maximum number of site visits per year to reduce disturbance to brant, other waterfowl, shorebirds, and marine mammals.
- Black brant avoidance and minimization measures. The Department recommends the Harbor District remove Site 3 due to the ecological importance of this gritting site to black brant, other waterfowl species, and shorebirds.

Shorebirds

Comments: Humboldt Bay is an internationally important site for overwintering and seasonally migrating shorebirds. Recent surveys (2018-2019) estimate that over one million shorebirds from 52 recorded species utilize the Bay throughout the year (Colwell et al. 2020). Many species rely on mudflat habitats for feeding, resting and/or roosting. Approximately two thirds of the shorebirds that utilize the Bay are listed as shorebirds of concern or are on the USFWS Birds of Conservation Concern list (USFWS 2008; U.S. Shorebird Conservation Plan Partnership 2015). Human disturbance and habitat destruction have been noted to impact shorebird populations. Restricting further alteration of mudflats for oyster culture has been identified as a priority shorebird conservation goal for Humboldt Bay (Hickey et al. 2003).

The Project area includes high-quality foraging habitats that are heavily used by shorebirds and waterfowl. Project impacts include alteration of food sources, loss of foraging habitat, and disturbance from oyster culture activity. Specifically, some bird species avoid aquaculture areas that would otherwise utilize bare mudflats, substantially reducing the habitat available for feeding and resting. Also, the alteration of bird

foraging habitats by aquaculture structures and activities changes the quality of the environment, favoring some species over others (Quintino 2012). Of particular concern are Project impacts to long-billed curlews (*Numenius americanus*) that have known territories on Tuluwat Island. Curlew are more sensitive than other wading species to disturbance, with a maximum ED of 650m (Laurson et al. 2005). The DEIR states that the Project may permanently displace 5% of the Humboldt Bay curlew population.

Recommendations: The Department recommends the FEIR include the following:

- A comprehensive analysis of impacts to shorebirds. The Department recommends the FEIR include a quantitative analysis of both the loss of foraging opportunity and the increase in disturbance, and the cumulative impacts to shorebirds when both stressors occur simultaneously.
- Shorebird avoidance and minimization measures. The Department recommends avoidance, minimization and mitigation measures be developed with the Department and other natural resource agencies to reduce the impacts to shorebirds from disturbance and habitat modification. As noted in the black brant comments above, the Department recommends the Harbor District consult with natural resource agencies to develop a threshold regarding the maximum number of site visits per year and a discussion on how the Harbor District plans to enforce site visit thresholds to reduce disturbance to shorebirds.

Green Sturgeon

Comment: Green sturgeon are a State SSC that are known to occupy the Project area. The intertidal mudflats provide habitat and foraging opportunities for green sturgeon, in addition to other Humboldt Bay inhabitants, such as longfin smelt, elasmobranchs, leopard sharks, shorebirds, and waterfowl. The Department is concerned with potential impacts to green sturgeon as they utilize the intertidal mudflat area for foraging, such as entanglement with culture gear. Previously permitted intertidal longline operations, including the Coast Seafoods Expansion Project and Hog Island Oyster Company Project, implemented a 10-foot buffer between culture plots and subtidal channels to minimize risks to sturgeon and other species foraging on intertidal mudflats.

Recommendation: To reduce impacts to green sturgeon, the Department recommends a buffer distance of at least 10-feet between culture gear and subtidal channels. This buffer would also provide benefits to eelgrass and other fish species foraging along the subtidal and mudflat interface.

Pacific Herring

Comments: The Harbor District will require shellfish farmers to inspect culture equipment from December through February to determine if herring have spawned. If herring spawning has occurred, then the harvesting, planting or maintenance will be postponed for two weeks (BIO-6). The Department has developed a thorough herring egg monitoring and consultation process from previous projects, such as the Coast

Seafoods Expansion Project, that provides further protection than the proposed mitigation measure.

Recommendations: The Department recommends that the following measures are included within the FEIR:

- Herring egg monitoring and consultation with the Department. The Department recommends the Harbor District ensure that all employees who supervise work on the tidelands are trained to conduct pre-work herring spawn surveys. During the months of December through March, trained employees should perform a pre-work herring spawn survey at each location where work is scheduled to take place to determine whether herring have spawned on eelgrass, culture materials, or substrate. If herring spawn is observed, shellfish farmers should: (1) notify the Department's Eureka Marine Region office within 24 hours (see contact information below), and (2) postpone activities on those beds until all eggs have hatched. In addition, the Department recommends Lessees work with the Department during spawning surveys to sample and identify whether herring are spawning within culture gear.

Additional Concerns and Recommendations

Naturalization of cultured species. The Department is concerned with the potential for cultured shellfish to naturalize outside of cultivation areas and impact native marine species. Contrary to what is stated within the DEIR, Pacific oysters have been detected in the North Bay outside of culture areas by Department staff. The Department recommends the FEIR include updated information regarding detections of cultured species outside of cultured areas within the Bay, the potential for increased naturalization from this Project, and the ecological impacts naturalization could have on the natural community. The Department also recommends the FEIR include avoidance, minimization, and mitigation measures to reduce the potential for naturalization of cultured species, such as culturing triploid oysters.

Marine debris. The Department is concerned that additional aquaculture operations in the Bay could result in an increased presence of marine debris. Derelict gear from aquaculture operations in Humboldt Bay is consistently found along the shore during local beach cleanup events. The DEIR assures site cleanup will occur if a culture area is abandoned. However, there is no mention of how marine debris will be minimized or managed during culture operations. The Department recommends the FEIR include avoidance, minimization, and mitigation measures to reduce the amount of marine debris resulting from aquaculture operations. All culture gear should be marked or branded with the Lessee's contact information. The Department also recommends the Harbor District provide an annual report to the appropriate resource and permitting agencies regarding the volume and type of shellfish gear collected during cleanup events. If consistent discoveries of certain gear types are made during cleanup events by Lessee's or the public, those Lessees should evaluate (and if feasible, implement

use of) alternative gear types or practices that would reduce these consistent sources of debris.

Culture characteristics. The Department recommends the FEIR include detailed figures of the three different gear types that are proposed for culture. Diagrams should include the equipment dimensions and proposed spacing between racks, lines, and rows.

Enforcement and compliance. The DEIR does not provide sufficient detail regarding the tools and methods the Harbor District plans to use to enforce lease requirements and enforce non-compliance issues. The Department recommends that Harbor District work with the resource and permitting agencies prior to issuing the FEIR to develop an enforcement plan. The Department recommends the enforcement plan include alerting regulatory agencies of all non-compliance issues and providing regular reports regarding gear activities such as installation, inspection, clean-up, and removal.

Closely Related Past, Present, and Reasonably Foreseeable and Probable Future Projects

There are approximately 301 acres of existing intertidal aquaculture in Humboldt Bay, an additional 27 acres of intertidal habitat Hog Island Oyster Company Project is permitted to install, and 46 acres of intertidal habitat proposed by this Project. Cumulatively, these future projects will increase the number of acres used for intertidal aquaculture purposes in Humboldt Bay by 24% to approximately 374 acres. The cumulative impacts from the expansion of intertidal aquaculture in North Bay needs to be more thoroughly evaluated in the FEIR and should include all current intertidal and subtidal aquaculture leases, as well as other foreseeable projects in Humboldt Bay. Foreseeable projects in the North Bay include Nordic Aquafarms, Humboldt Bay Master Seawater Intakes, Mad River Slough Shellfish Nursery, and the Offshore Wind Multipurpose Marine Terminal. As part of the cumulative impacts analysis, the Humboldt Bay Mariculture Carrying Capacity study should be updated to reflect all current and foreseeable projects.

CONCLUSION

The Department appreciates the opportunity to comment on the Humboldt Bay Intertidal Mariculture Pre-Permitting Project DEIR to assist the Harbor District in identifying and mitigating Project impacts on biological resources. For further information regarding waterfowl, please contact Melanie Weaver, Senior Environmental Scientist at 916-373-8828 or Melanie.Weaver@wildlife.ca.gov; all other questions regarding this letter or further coordination should be directed to Corianna Flannery, Environmental Scientist at 707-499-0354 or Corianna.Flannery@wildlife.ca.gov.

Doug Saucedo, Natural Resources Coordinator II
Humboldt Bay Harbor, Conservation and Recreation District
October 10, 2022
Page 10

Sincerely,



Becky Ota,
Habitat Program Manager
Marine Region

cc: Office of Planning and Research, State Clearinghouse
1400 10th St. #12, Sacramento, CA 95814

ec: Craig Shuman, Marine Regional Manager
California Department of Fish and Wildlife
Craig.Shuman@wildlife.ca.gov

Eric Wilkins, Senior Environmental Scientist Supervisor
California Department of Fish and Wildlife
Eric.Wilkins@wildlife.ca.gov

Corianna Flannery, Environmental Scientist
California Department of Fish and Wildlife
Corianna.Flannery@wildlife.ca.gov

Sara Briley, Environmental Scientist
California Department of Fish and Wildlife
Sara.Briley@wildlife.ca.gov

Randy Lovell, Aquaculture Coordinator
California Department of Fish and Wildlife
Randall.Lovell@wildlife.ca.gov

Melanie Weaver, Senior Environmental Scientist
California Department of Fish and Wildlife
Melanie.Weaver@wildlife.ca.gov

Cassidy Teufel, Senior Environmental Scientist (Specialist)
California Coastal Commission
Cassidy.Teufel@coastal.ca.gov

Amanda Cousart, Environmental Scientist
California Coastal Commission
Amanda.Cousart@coastal.ca.gov

Doug Saucedo, Natural Resources Coordinator II
Humboldt Bay Harbor, Conservation and Recreation District
October 10, 2022
Page 11

Eric Nelson, Refuge Manager - Humboldt Bay National Wildlife Refuge
U.S. Fish and Wildlife Service
Eric.T.Nelson@fws.gov

Jason Storlie, Deputy Project Leader
Humboldt Bay National Wildlife Refuge
U.S. Fish and Wildlife Service
Jason.Storlie@fws.gov

Matt Goldsworthy, Fisheries Biologist
National Marine Fisheries Service
Matt.Goldsworthy@noaa.gov

Kasey Sirkin, Lead Biologist
U.S. Army Corps of Engineers
L.K.Sirkin@usace.army.mil

Elizabeth Pope, Senior Environmental Scientist Specialist
North Coast Regional Water Quality Control Board
Elizabeth.Pope@waterboards.ca.gov

REFERENCES

- Bjerre, E.R., 2007. Optimal grit: investigating grit acquisition and site use by Black Brant (Master's thesis, Humboldt State University).
- Colwell, M.A., C. Polevy & H. LeWinter. 2020. Humboldt Bay, California, USA Hosts A Globally Important Shorebird Community Year-Round. In press.
- Ebbing, B.S. and Spaans, B., 1995. The importance of body reserves accumulated in spring staging areas in the temperate zone for breeding in dark-bellied brent geese *Branta b. bernicla* in the high Arctic. *Journal of Avian Biology*, pp.105-113.
- Ganter, B. 2000. Seagrass (*Zostera* spp.) as food for brent geese (*Branta bernicla*): an overview. 9-17-0646 (Coast Seafoods Company) 78 *Helgoland Marine Research*. 54(2-3): 63-70.
- Gilkerson, W. and Leroy, T. 2013. Modeling Relative Sea-Level Change and its impacts to Eelgrass and Salt Marsh Distribution within Humboldt Bay, Northern California. Presentation for the 31st Annual Salmonid Restoration Conference, March 13-16, 2013, Fortuna, California.

Doug Saucedo, Natural Resources Coordinator II
Humboldt Bay Harbor, Conservation and Recreation District
October 10, 2022
Page 12

Hickey, C., Shuford, W., Page, G., & S. Warnock. 2003. The southern Pacific shorebird conservation plan: a strategy for supporting California's central valley and coastal shorebird populations. *PRBO Conservation Science*.

Laursen, K., Kahlert, J. & J. Frikke. 2005. Factors affecting escape distances of staging waterbirds. *Wildlife Biology*. 11(1): 13-19

Lee, D.E., Hamman, M.G. and Black, J.M., 2004. Grit-site selection of black brant: particle size or calcium content? *The Wilson Bulletin*, 116(4), pp.304-313.

Merkel & Associates. 2017. Humboldt Bay eelgrass comprehensive management plan. Prepared for Humboldt Bay Harbor, Recreation, and Conservation District, Eureka, California. Prepared by Merkel & Associates, Arcata, California. #14-102-01.

Moore, S.J. 1998. Use of an artificial gizzard to investigate the effect of grit on the breakdown of grass. *Journal of Zoology, London* 246: 119–124.

Moore, J., Colwell, M., Mathis, R. & J. Black. 2004. Staging of Pacific flyway brant in relation to eelgrass abundance and site isolation, with special consideration of Humboldt Bay, California. *Biological Conservation*. 115(3): 475-486.

Moore, J.E. and Black, J.M., 2006. Slave to the tides: spatiotemporal foraging dynamics of spring staging Black Brant. *The Condor*, 108(3), pp.661-677.

NMFS, 2014. California Eelgrass Mitigation Policy, National Marine Fisheries Service, https://archive.fisheries.noaa.gov/wcr/publications/habitat/california_eelgrass_mitigation/Final%20CEMP%20October%202014/cemp_oct_2014_final.pdf.

Quintino, V., Azevedo, A., Magalhães, L., Sampaio, L. Freitas, R., Rodrigues, A., and M. Elliott. 2012. Indices, multispecies and synthesis descriptors in benthic assessments: Intertidal organic enrichment from oyster farming. *Estuarine, Coastal and Shelf Science*. 110:190-201.

Schmidt, P. 1999. Population counts, time budgets, and disturbance factors of black brant (*Branta bernicla nigricans*) at Humboldt Bay, California. Master's Thesis. Humboldt State University. 58 pps.

Shaughnessy, F. J., W. Gilkerson, J. M. Black, D. H. Ward, and M. Petrie. 2012. Predicted eelgrass response to sea level rise and its availability to foraging black brant in Pacific coast estuaries. *Ecological Applications* 22: 1743–1761.

Shuford, W.D. and Gardali, T.H.O.M.A.S., 2008. California bird species of special concern. *Studies of western birds*, 1.

Doug Saucedo, Natural Resources Coordinator II
Humboldt Bay Harbor, Conservation and Recreation District
October 10, 2022
Page 13

Spragens, K.A., Bjerre, E.R. and Black, J.M., 2013. Black Brant *Branta bernicla nigricans* grit acquisition at Humboldt Bay, California, USA. *Wildfowl*, pp.104-115.

Stillman, R. A., K. A. Wood, W. Gilkerson, E. Elkington, J. M. Black, D. H. Ward, and M. Petrie. 2015. Predicting effects of environmental change on a migratory herbivore. *Ecosphere* 6(7):1–19.

U.S. Fish and Wildlife Service. 2008. *Birds of Conservation Concern 2008*. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp.

U.S. Shorebird Conservation Plan Partnership. 2015. *U.S. Shorebirds of Conservation Concern – 2015*.