LIST OF FIGURES

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APPENDIX A DETAILED COMPARISON OF PHASE III WITH PHASE IV DENSITY ESTIMATES

The following sections provide a species-by-species comparison of the density estimates used in Phase III to the updated estimates described in this report for Phase IV. For each species, three plots are provided to enable a visual comparison of the density estimates: (1) density estimates used for Phase III; (2) density estimates presented in this report and used for Phase IV; and (3) a plot showing the difference in density (Phase IV – Phase III) for the areas of geographic overlap. Absolute values were not used in the difference plots but instead, areas where densities changed are characterized as either an increase or a decrease or a substantial increase or a substantial decrease. Any change in density, no matter how small, is shown as ether an increase or a decrease to provide a concise visual comparison. A change greater than a rough order of magnitude is considered substantial and is emphasized on the plots with a darker color. The formula used to determine whether a change is substantial is:

Rough Order of Magnitude = Log_{10} (Phase IV Density / Phase III Density), rounded to the nearest integer.

For example, if the Phase IV density estimate = 0.00184 and the Phase III density estimate = 0.00024, the Log_{10} (Phase IV Density / Phase III Density) would = 0.8846 and rounded to the nearest integer = 1.0. This would thus be considered a substantial increase from Phase III to Phase IV, although the Phase IV estimate is not 10 times larger than the Phase III estimate.

The density ranges used in the Phase III and Phase IV plots are data-specific to enable a comparison of representative species distribution patterns (i.e., the density values shown in the legend of each figure is unique to that figure so that the same color on the Phase III and Phase IV maps does not mean that the density is the same). In all cases, the Phase IV density data described in this report supersede the density data for all species described and used for the Phase III analyses.

For the HRC portion of the HSTT and HCTT Study Areas, for those species for which a habitat-based density model was used to provide data for both Phase III and Phase IV, spatially explicit density predictions for the entire Hawaiian Islands EEZ are presented. For those species for which uniform density estimates were used, density is only presented for the acoustic modeling areas.

A.1 CETACEANS

For most cetacean species, densities throughout the Hawaiian Islands EEZ increased from Phase III to Phase IV due to improved methods that better accounted for variation in detection probabilities and the use of calibrated group size estimates which were not used in previous assessments.

For the California portion of the HCTT Study Area, cetacean density differences from Phase III to Phase IV varied by species, as updated species distribution models (SDMs) for the California Current Ecosystem (CCE) for summer/fall captured both increases and decreases in species-specific population numbers during the span of these analyses. For example, increases in population have been documented for both fin whale (Moore & Barlow, 2011; Nadeem et al., 2016) and humpback whale (Barlow et al., 2011), while notable shifts in distribution over the last few decades have resulted in a decline in the number of blue whales (Monnahan et al., 2015), and an increase in the number of short-beaked common dolphins in the CCE study area (Barlow, 2016; Becker et al., 2020; Becker et al., 2018).

Given that many cetacean species exhibit substantial seasonal variability in abundance and distribution in the CCE (e.g., Becker et al., 2017; Forney & Barlow, 1998), and the limited systematic survey data available for winter/spring, existing habitat-based density models were used to derive separate winter and spring estimates for waters off the U.S. West Coast using techniques designed to avoid spatial and temporal extrapolation (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when typically stratified uniform density estimates were used, or summer/fall estimates were used to represent annual species distributions. For many species, the model predictions represent the first spatially resolved density estimates for winter and spring in this study area, and density differences between Phase III and Phase IV are evident for the species for which the spatially explicit model predictions replace the uniform density estimates used previously.

For the portion of the HCTT Study Area that includes waters off Mexico, new SDMs for the Southern California Current provided major improvements to the density estimates previously used for this area, because they provide finer-scale density predictions (9 km x 9 km grid resolution vs. the 5° X 5° grid resolution available for density estimates used in Phase III), which better account for spatial variation in species distribution patterns (Becker et al., 2022a). Density differences between Phase III and Phase IV are evident for the 10 species for which Southern California Current SDMs were developed, since the spatially explicit model predictions replace the uniform density estimates used previously. For example, for Phase III a uniform density estimate of 0.00020 animals/km^2 for humpback whale was used for summer and fall based on analyses by Ferguson and Barlow (2003). For Phase IV the model-based predictions were used which captured this species' largely nearshore distribution along the Baja California Peninsula. Since the model-based density estimates account for spatial variation in humpback whale distribution that previous density estimates did not, a comparison of Phase III and Phase IV values, i.e., (Phase IV – Phase III), shows an increase in density values along the coast and a decrease in density values offshore (See Section A.1.1.7, *Megaptera Novaeangliae*, Humpback Whale).

Consistent with the main body of the HCTT Density Technical Report, throughout this appendix "HRC" refers to the Hawaii portion of the HCTT Study Area and "CAL/BCPM" refers to the California and Baja, California Peninsula Mexico portion of the HCTT Study Area.

A.1.1 BALEEN WHALES

A.1.1.1 *BALAENOPTERA ACUTOROSTRATA*, COMMON AND DWARF MINKE WHALE

HRC. Due to a lack of systematic sighting data, a design-based estimate for minke whale was not available for Phase III. Instead, the best available estimate was acoustically derived from hydrophones at the Pacific Missile Range Facility off the northwest coast of Kauai (Martin, 2015; Martin & Matsuyama, 2015). Additional systematic survey data collected subsequent to Phase III allowed for the derivation of an updated Hawaiian Islands EEZ abundance estimate using design-based analyses (Bradford et al., 2021). The Phase IV design-based estimate is lower than that used for Phase III. In the summer, minke whales are likely absent from low productivity tropical waters, so a density of zero was used for summer in HRC and the western portion of the transit corridor for both Phase III and Phase IV.

CAL/BCPM. In support of the Navy's Phase IV NMSDD, improved methods were used to develop a new set of CCE habitat-based density models that included two additional sets of survey data collected in 2014 and 2018, which provided sufficient sample sizes to develop the first model-based density estimates for minke whale in this study area (Becker et al., 2020). Model predictions yielded spatially explicit density estimates for minke whale off the U.S. West Coast for summer and fall, thus providing a major improvement to the uniform density estimate used for Phase III. Since the model-based density estimates account for spatial variation in minke whale distribution that the previous uniform density estimates did not, for Phase IV there is an increase in density values along the coast and a decrease in density values offshore and in the representative transit corridor.

To produce density estimates for the cool season, the CCE minke whale model was used to derive separate winter and spring estimates for waters off the U.S. West Coast using techniques designed to avoid spatial and temporal extrapolation (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when stratified uniform density estimates based on aerial line-transect data collected in winter and spring of 1991 and 1992 were used (Forney et al., 1995). The new model-based analyses provide spatially explicit estimates which better capture species distribution patterns, reflecting an increase in density values along the coast and a decrease in density values offshore and in the representative transit corridor.

For waters off BCPM, density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a slightly lower minke whale density estimate than that used in Phase III (0.00054 vs. 0.00061 animals/km^2).

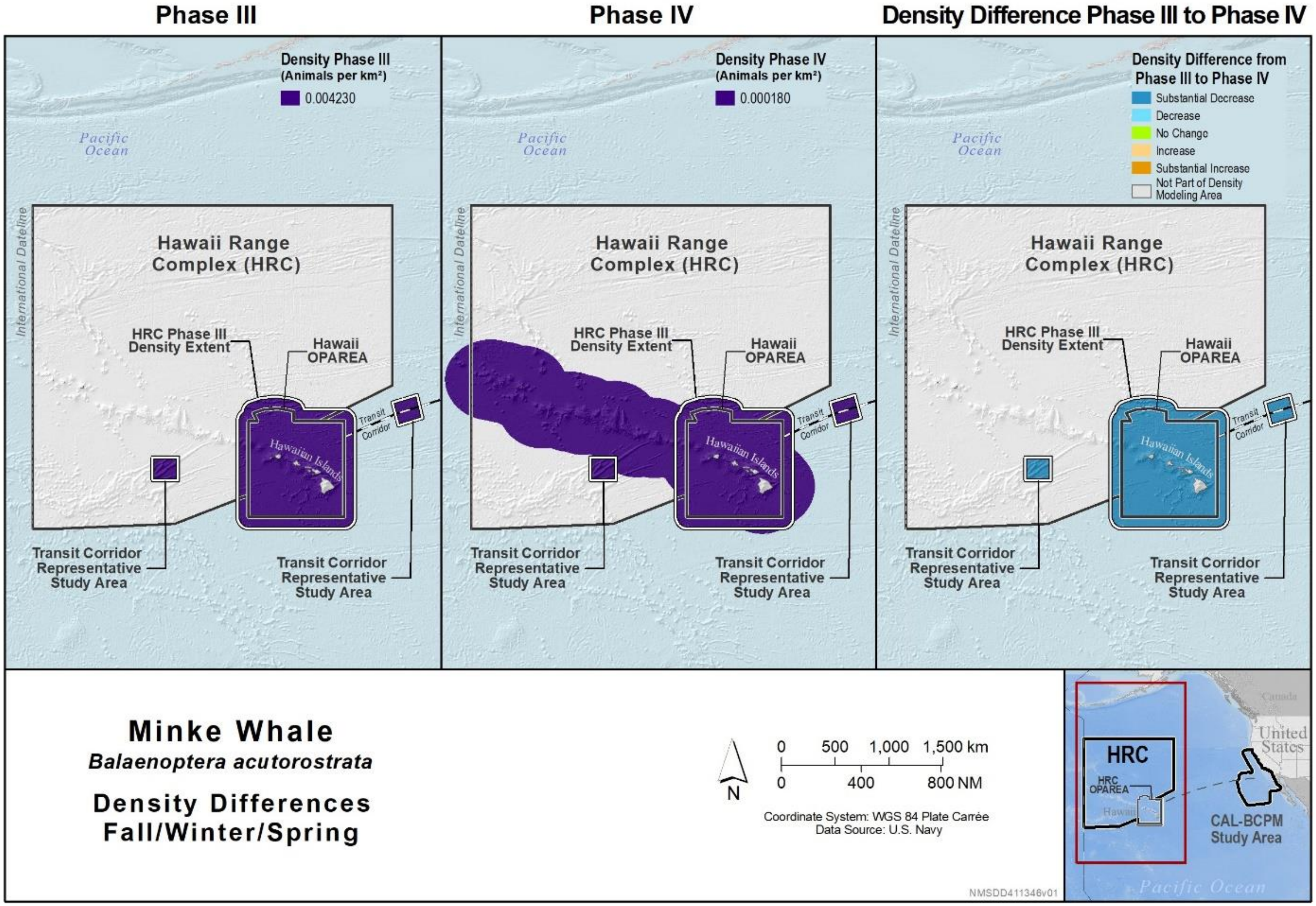

Figure A-1: Minke Whale Fall/Winter/Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

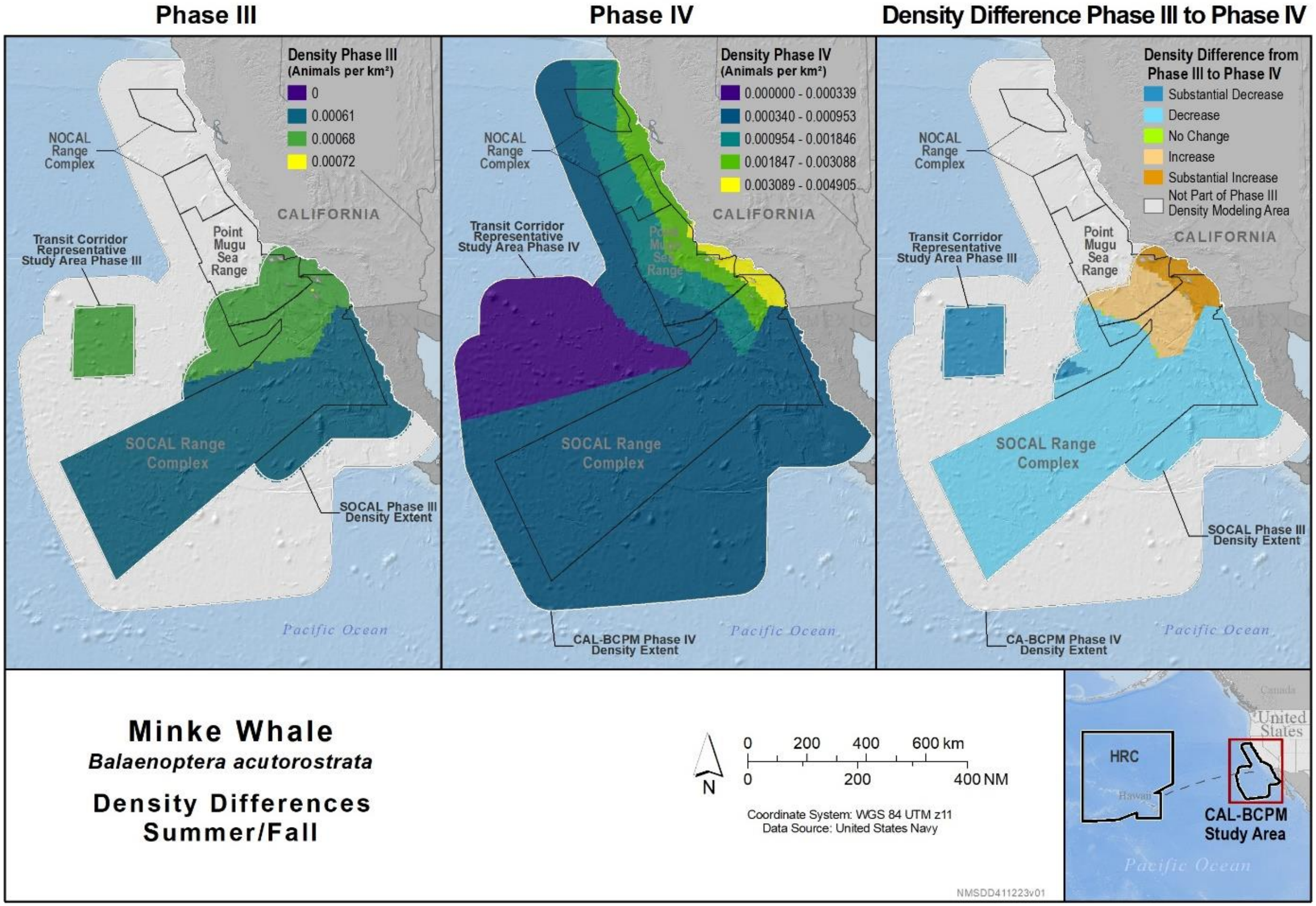

Figure A-2: Minke Whale Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

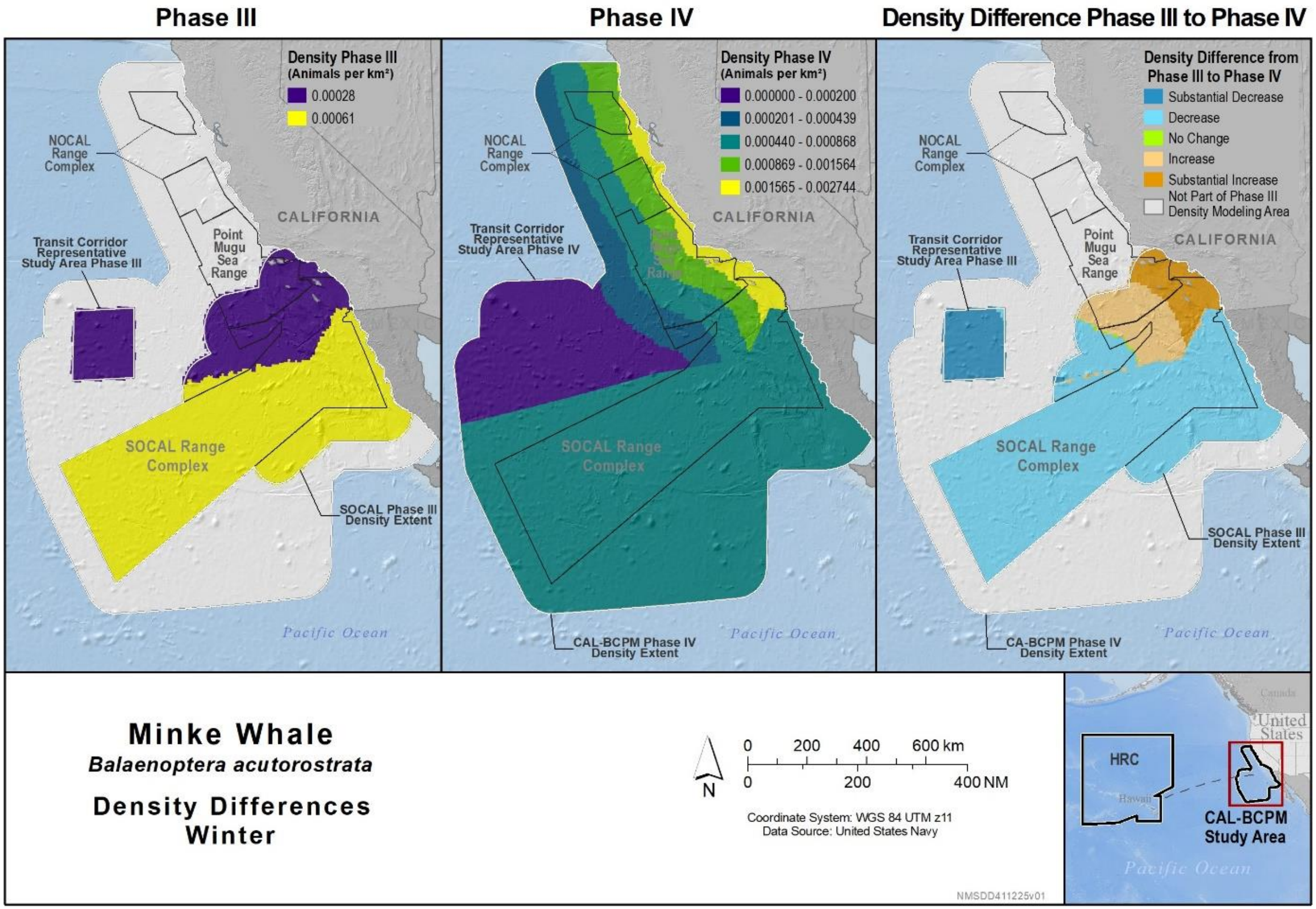

Figure A-3: Minke Whale Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

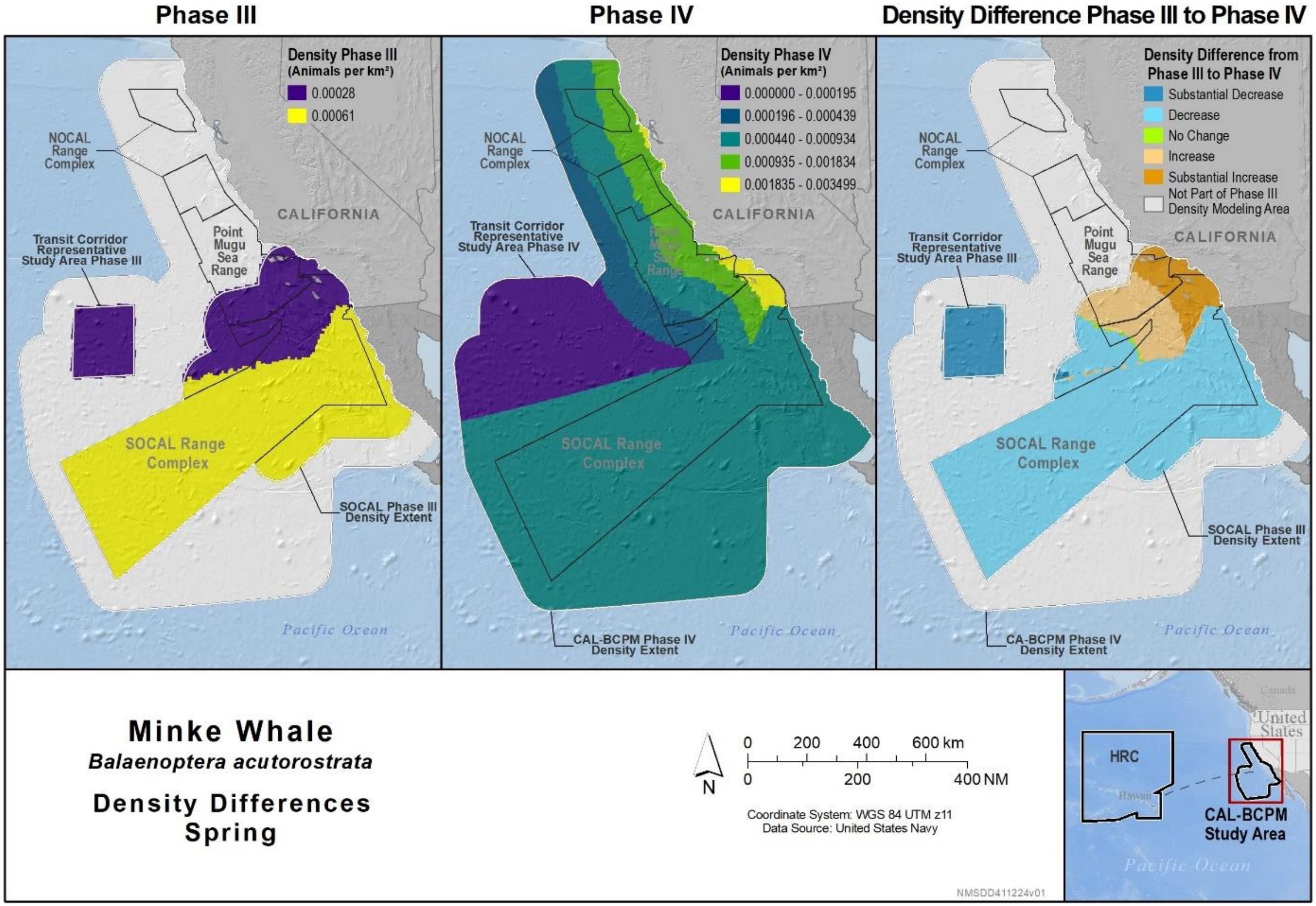

Figure A-4: Minke Whale Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.2 *BALAENOPTERA BOREALIS*, SEI WHALE

HRC. The same density estimate for sei whale was used in the Navy's Phase III and Phase IV analyses, so there was no difference in density, but the Phase IV estimate was more precise (i.e., lower CV) because it was based on a more current detection function and new estimates of trackline detection probabilities that considered the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. The abundance estimate used in Phase III for HSTT and Phase IV for HCTT were both based on Barlow (2016), who provided a sei whale density estimate of 0.0001 animals/km^2 (CV = 1.05) for waters off central California based on survey data collected between 1991 and 2014. For Phase III, the central California estimate was re-calculated based on the area of both the SWFSC central and southern California strata, yielding a density estimate of 0.00005 animals/km^2. For Phase IV, the central California estimate was applied directly to CAL/BCPM, resulting in an increase in density throughout the HSTT Study Area.

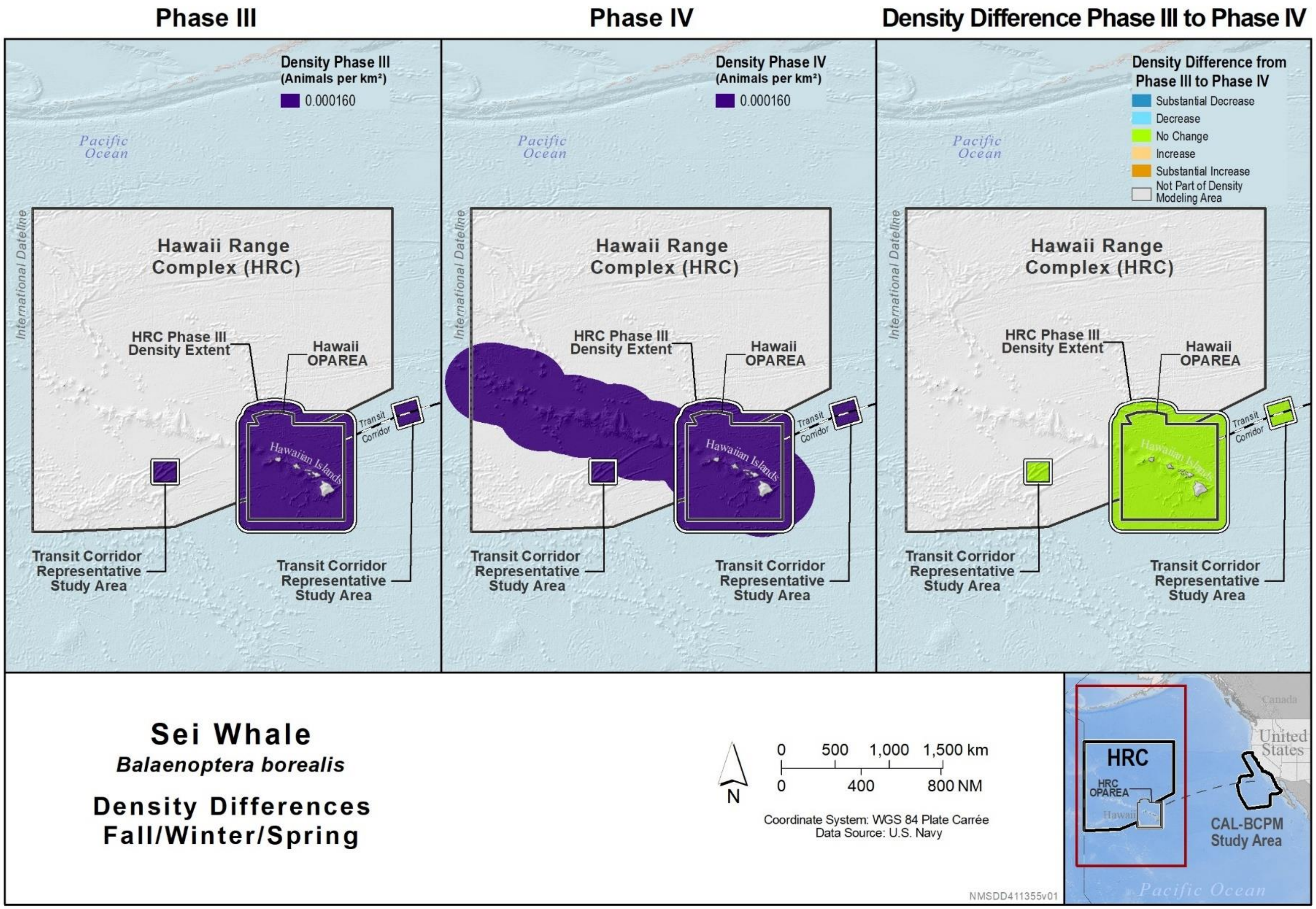

Figure A-5: Sei Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

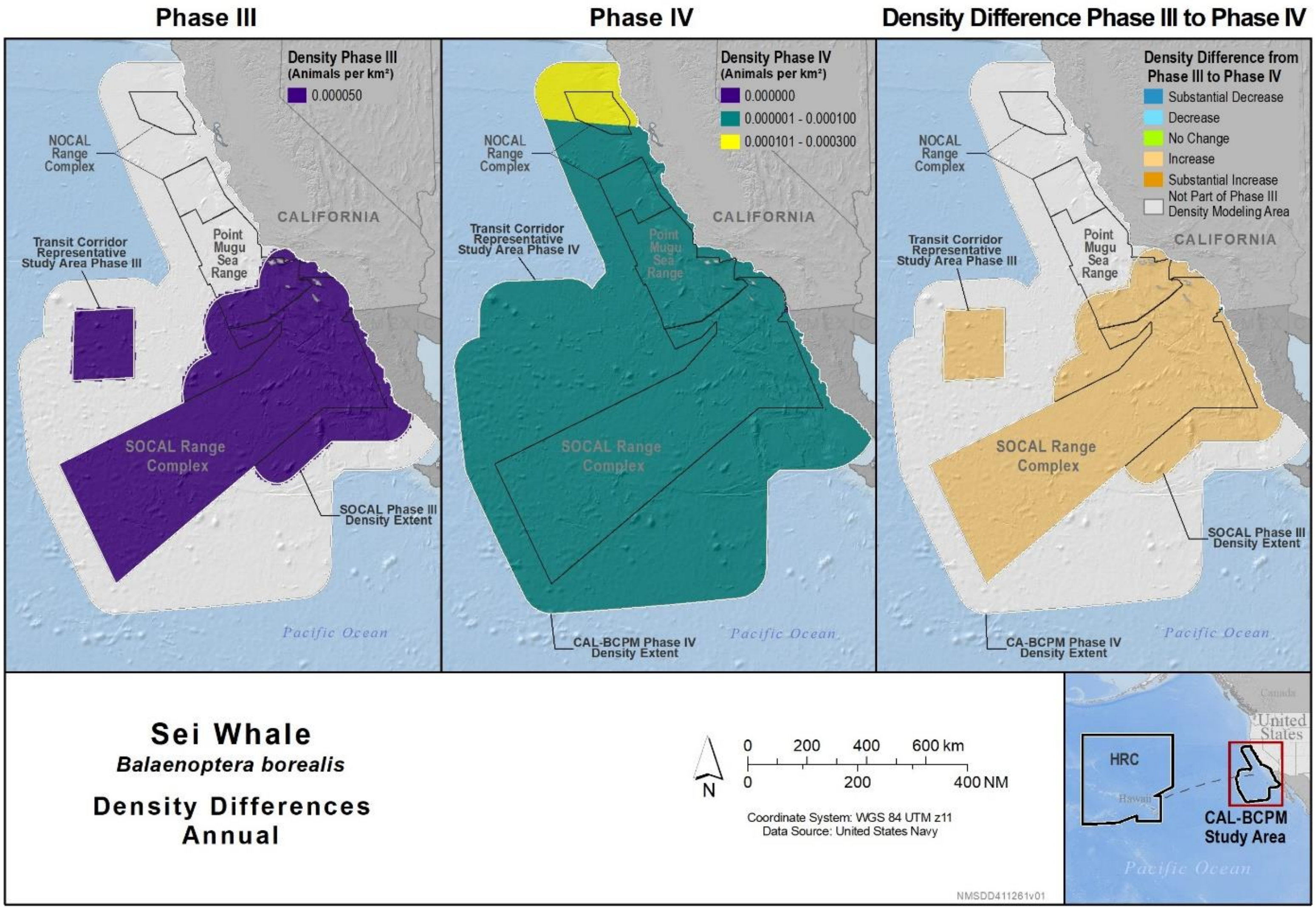

Figure A-6: Sei Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.3 *BALAENOPTERA EDENI*, BRYDE'S WHALE

HRC. The Hawaiian Islands EEZ abundance estimates derived from recent SDMs (Becker et al., 2022b) and used in Phase IV were greater than those used for Phase III (Forney et al., 2015), in part because they more accurately accounted for variation in detection probabilities and calibrated group size estimates were used in the more recent analysis. The habitat-based models of cetacean density used in Phase IV also provided finer-scale density predictions than Phase III (~9 km x 9 km vs. ~25 km x 25 km grid resolution). The greatest increase in density is evident in the northeastern portion of the Hawaiian Islands EEZ. Within the Hawaiian Islands EEZ, the region of highest predicted density shifted north from Phase III to Phase IV, consistent with observed annual variability in Bryde's whale distribution patterns documented in previous studies (Becker et al., 2021; Forney et al., 2015).

CAL/BCPM. The abundance estimate used in Phase III and Phase IV were both based on Barlow (2016), who provided a Bryde's whale abundance estimate of 12 whales for waters off central California (density estimate of 0.00005 animals/km^2, CV= 1.05) based on one sighting from systematic surveys conducted between 1991 and 2014. For Phase III, the central California estimate was used to represent both the SWFSC central and southern California strata, yielding a density estimate of 0.00002 animals/km^2. For Phase IV, the central California estimate was applied directly to the CAL/BCPM study area, resulting in a slight increase in density throughout the HSTT Study Area.

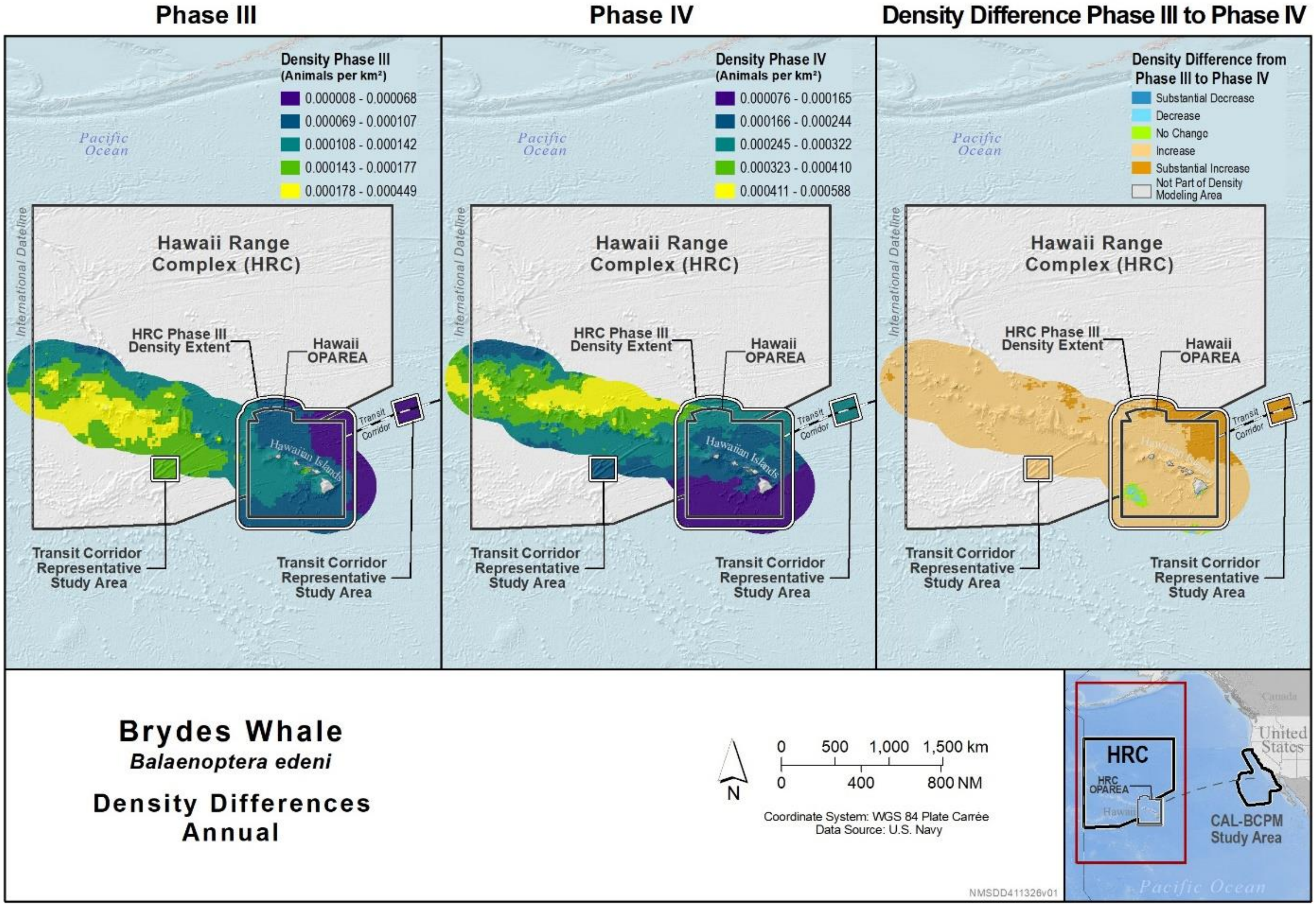

Figure A-7: Bryde's Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

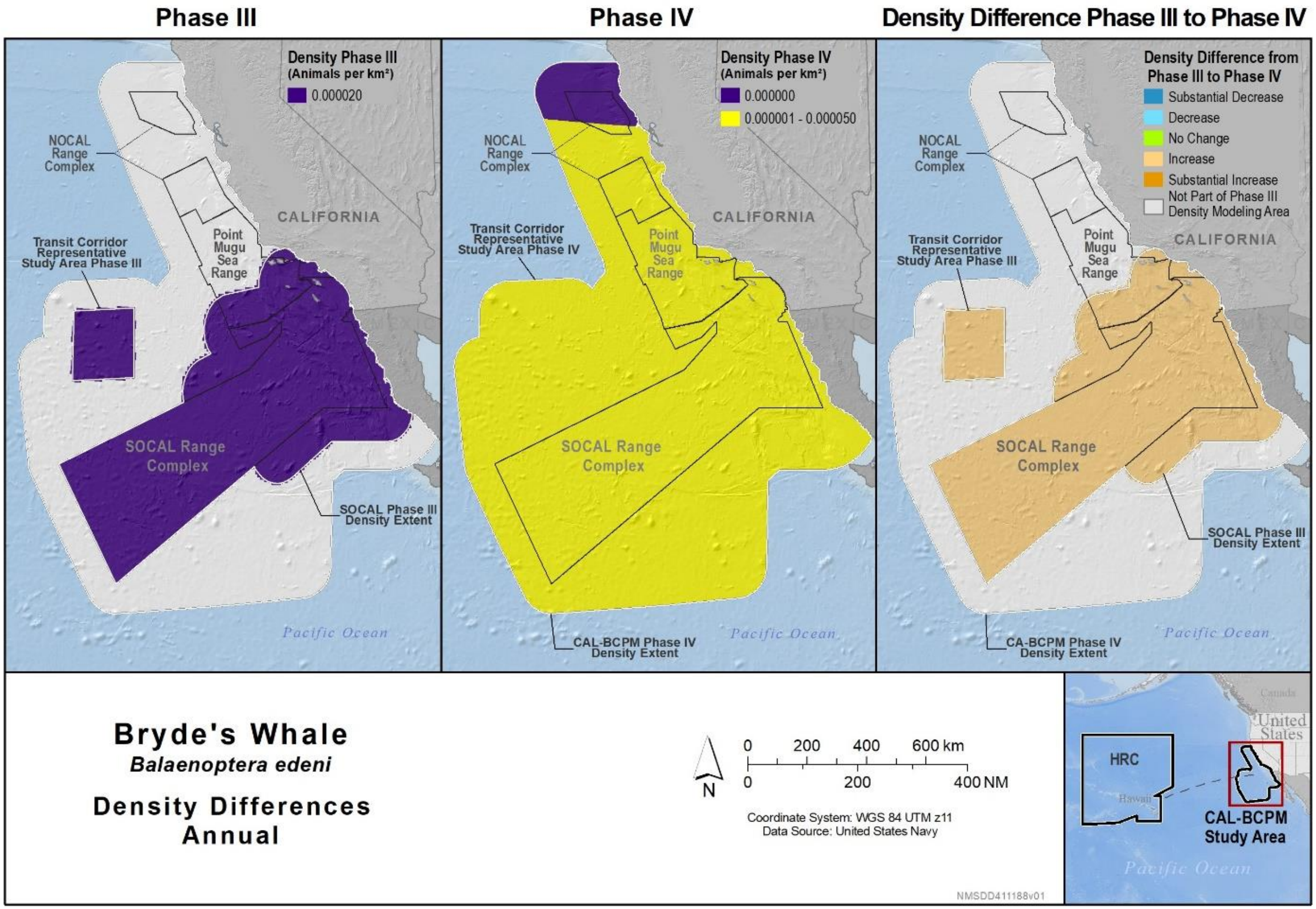

Figure A-8: Bryde's Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.4 *BALAENOPTERA MUSCULUS*, BLUE WHALE

HRC. The design-based density estimate used in Phase IV was slightly higher (0.00006 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00005 animals/km^2), but it is based on a more current detection function and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021). In the summer, blue whales are likely absent from low productivity tropical waters, so a density of zero was used for summer in HRC and the western portion of the transit corridor for both Phase III and Phase IV.

CAL/BCPM. Notable shifts in distribution over the last few decades have resulted in a decline in the number of blue whales in the CCE study area (Monnahan et al., 2015), particularly in the southern regions due to observed northern shifts in the relative distribution of this species (Barlow, 2016; Becker et al., 2018). Differences in model-based predictions used from Phase III (Becker et al., 2016) to Phase IV (Becker et al., 2020) have thus resulted in a decrease in density in waters of the Southern California Bight and the eastern portion of the transit corridor. For waters off the BCPM, a uniform density estimate for blue whale of 0.00161 animals/km^2 was used for summer and fall in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV, which captured this species largely nearshore distribution along the Baja California Peninsula (Becker et al., 2022a). Since the model-based density estimates account for spatial variation in blue whale distribution that the previous uniform density estimates did not, for Phase IV there is an increase in density values along the coast and a decrease in density values offshore.

For winter/spring, a uniform design-based estimate of 0.00007 animals/km^2 (CV = 1.20) derived by Campbell et al. (2015) for Southern California waters was used to represent density in waters off CAL/BCPM for Phase III. For Phase IV, spatially explicit estimates for winter and spring were used based on an ensemble model by Abrahms et al. (2019), resulting in higher density throughout waters within the California portion of HSTT and in the eastern portion of the transit corridor. For waters off the BCPM, the spatially explicit model predictions from Becker et al. (2022) used for Phase IV resulted in higher densities throughout the SOCAL Range Complex.

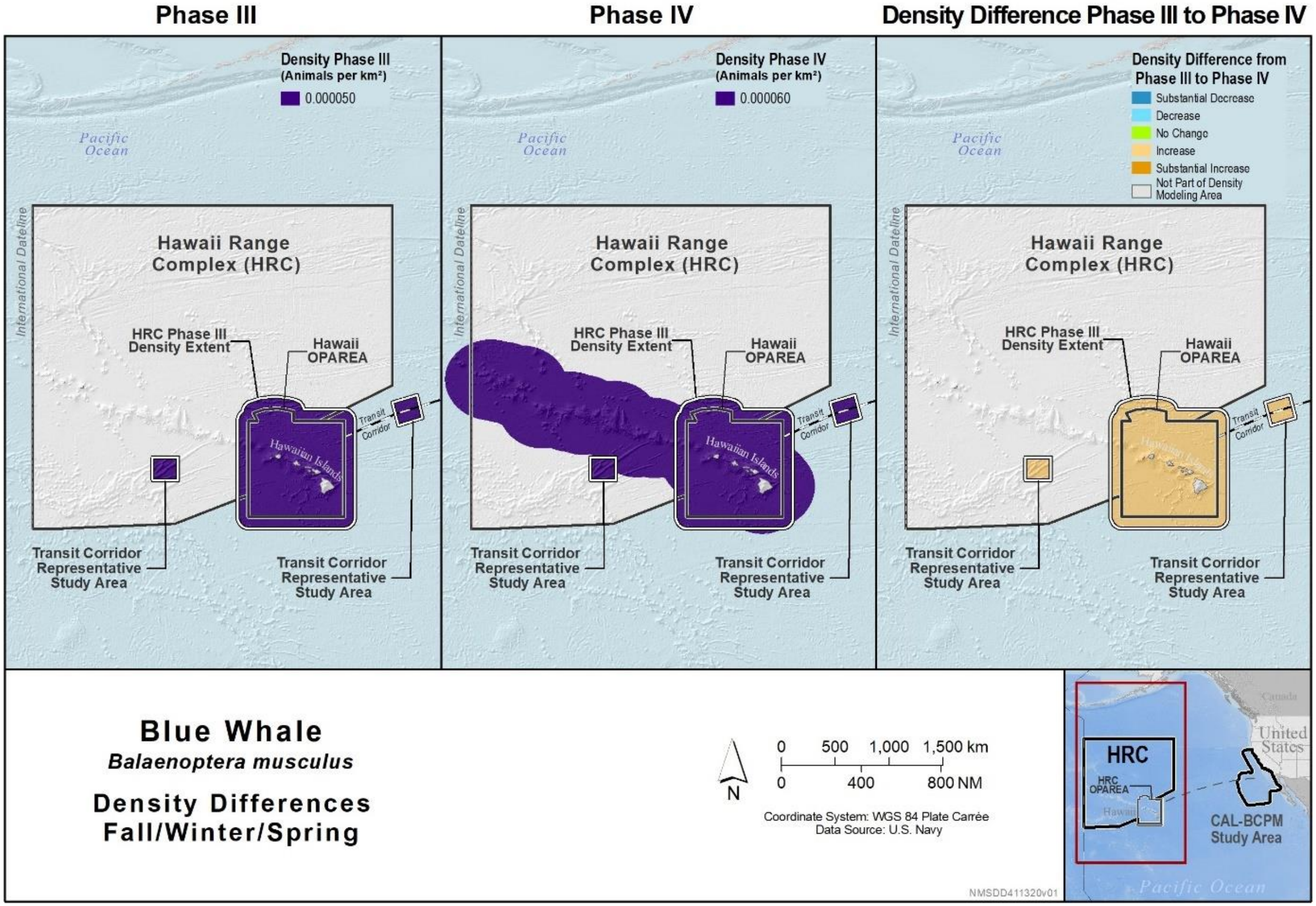

Figure A-9: Blue Whale Fall/Winter/Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

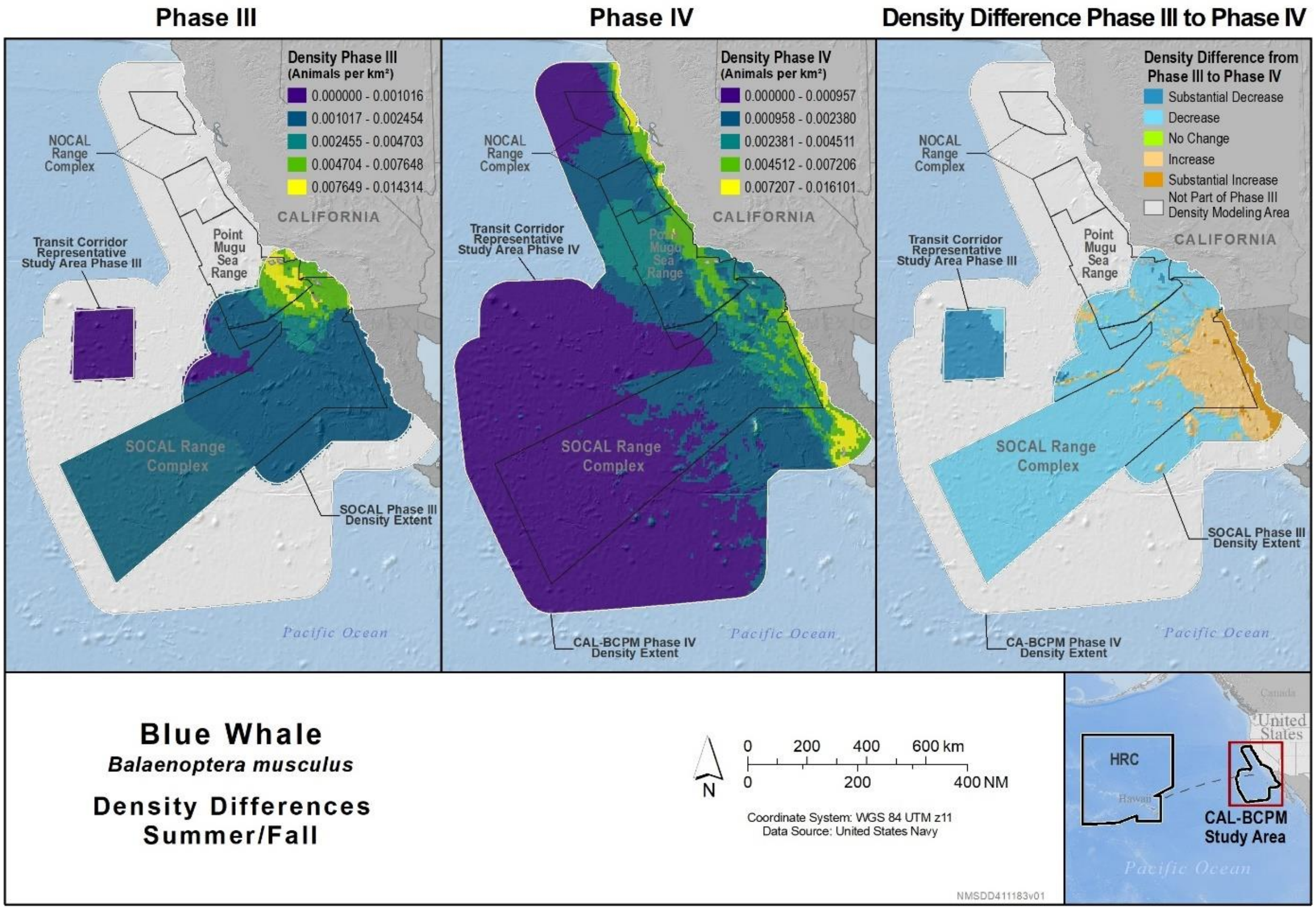

Figure A-10: Blue Whale Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

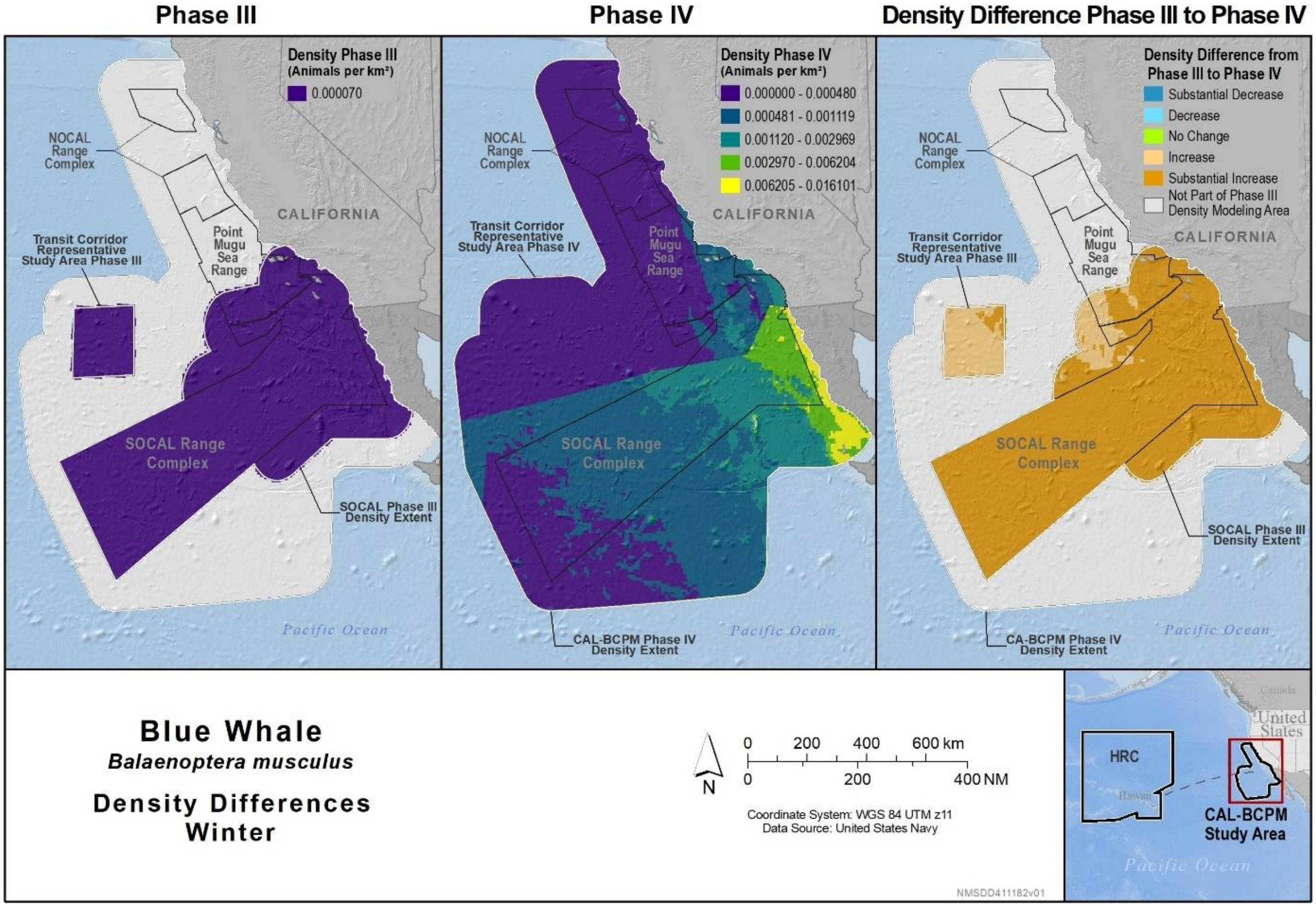

Figure A-11: Blue Whale Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

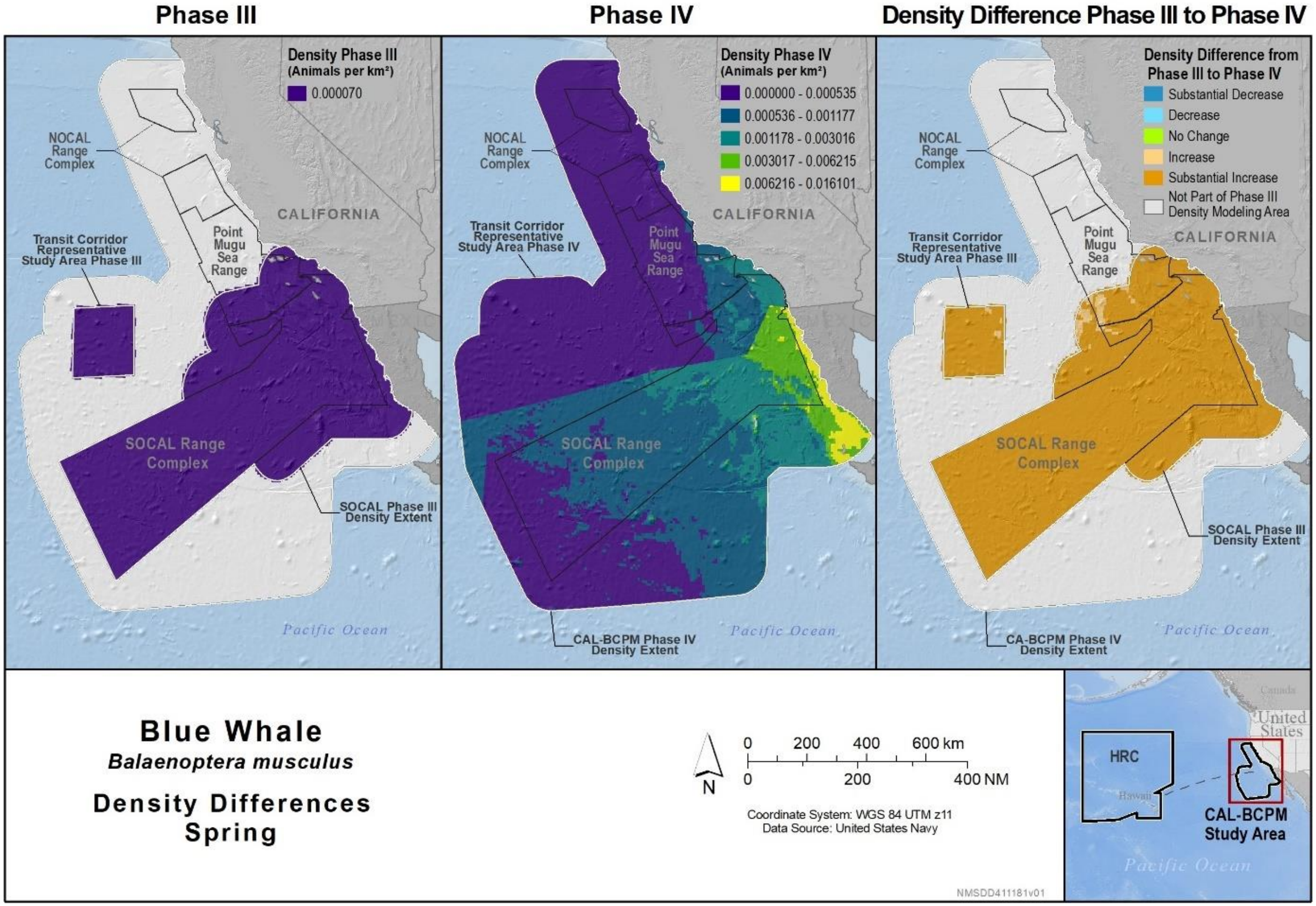

Figure A-12: Blue Whale Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.5 *BALAENOPTERA PHYSALUS*, FIN WHALE

HRC. The design-based density estimate used in Phase IV was slightly higher (0.00008 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00006 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021). In the summer, fin whales are likely absent from low productivity tropical waters, so a density of zero was used for summer in HRC and the western portion of the transit corridor for both Phase III and Phase IV.

CAL/BCPM. There was an overall increase in summer/fall fin whale density derived from model-based analyses used for Phase III (Becker et al., 2016) to Phase IV (Becker et al., 2020) within waters of the CCE, consistent with the documented increase in population for this species (Moore and Barlow 2011, Nadeem et al. 2016). While there was an overall increase in density in waters of the Southern California Bight, there was a decrease in density in the eastern portion of the transit corridor. In waters off the Baja California Peninsula, there was an overall decrease in density in offshore waters and an increase in nearshore waters, due to the ability of the recent model-based estimates to better account for this species' spatial distribution (Becker et al., 2022a) as compared to the uniform density estimate used for Phase III.

For Phase III, uniform design-based estimates of 0.00065 animals/km^2 for winter and 0.00181 animals/km^2 for spring derived by Campbell et al. (2015) for Southern California waters were used to represent density in waters off CAL/BCPM. For Phase IV, spatially explicit estimates for winter and spring were used based on habitat model predictions (Becker et al., In Prep.), resulting in higher density within much of the Southern California Bight, particularly the nearshore waters, and lower density offshore and in the eastern portion of the transit corridor, thus better reflecting distribution patterns than the uniform estimates used for Phase III. For waters off the BCPM, the spatially explicit model predictions from Becker et al. (2022a) used for Phase IV resulted in higher density nearshore, and lower density offshore than the estimates used for Phase III.

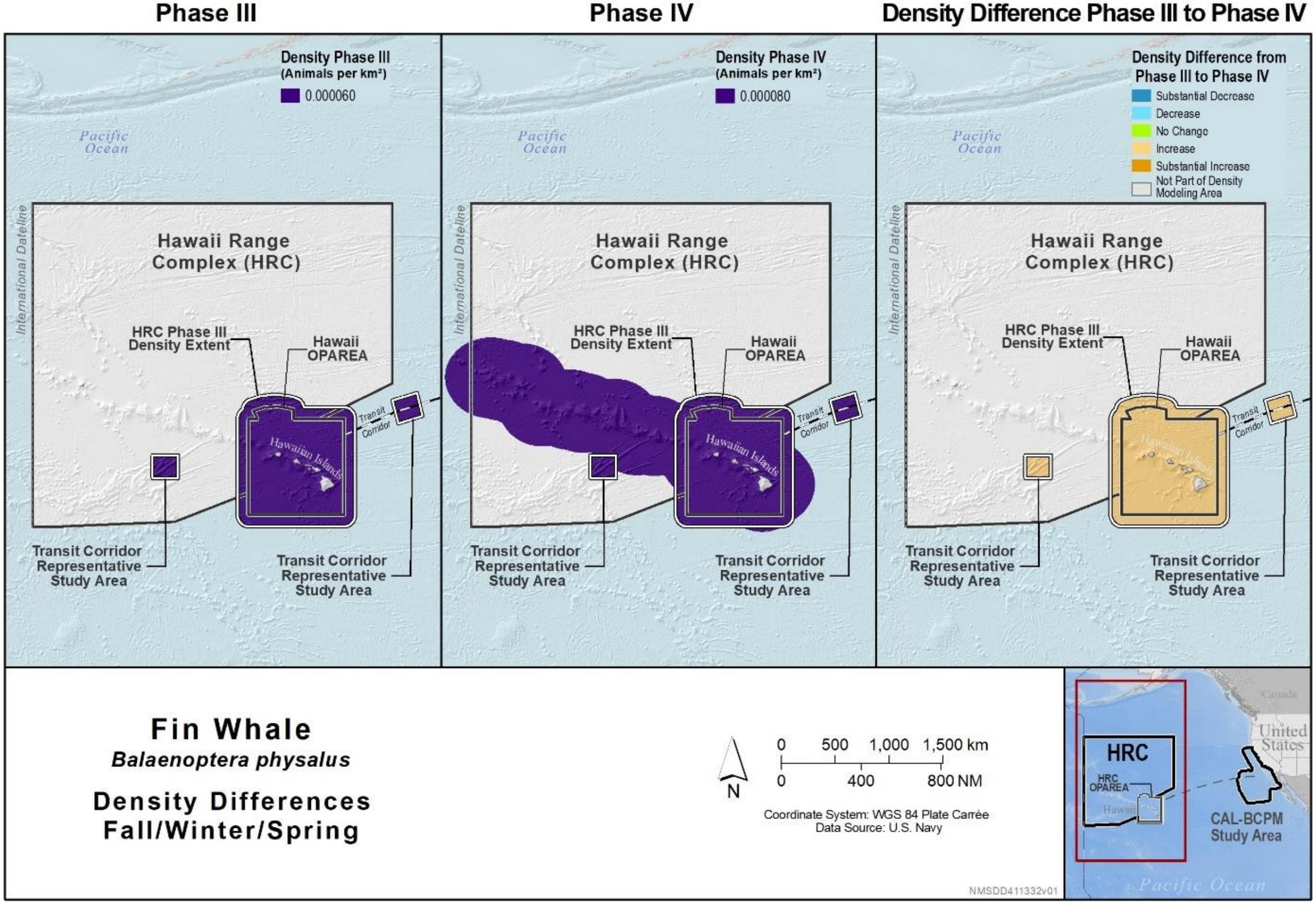

Figure A-13: Fin Whale Fall/Winter/Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

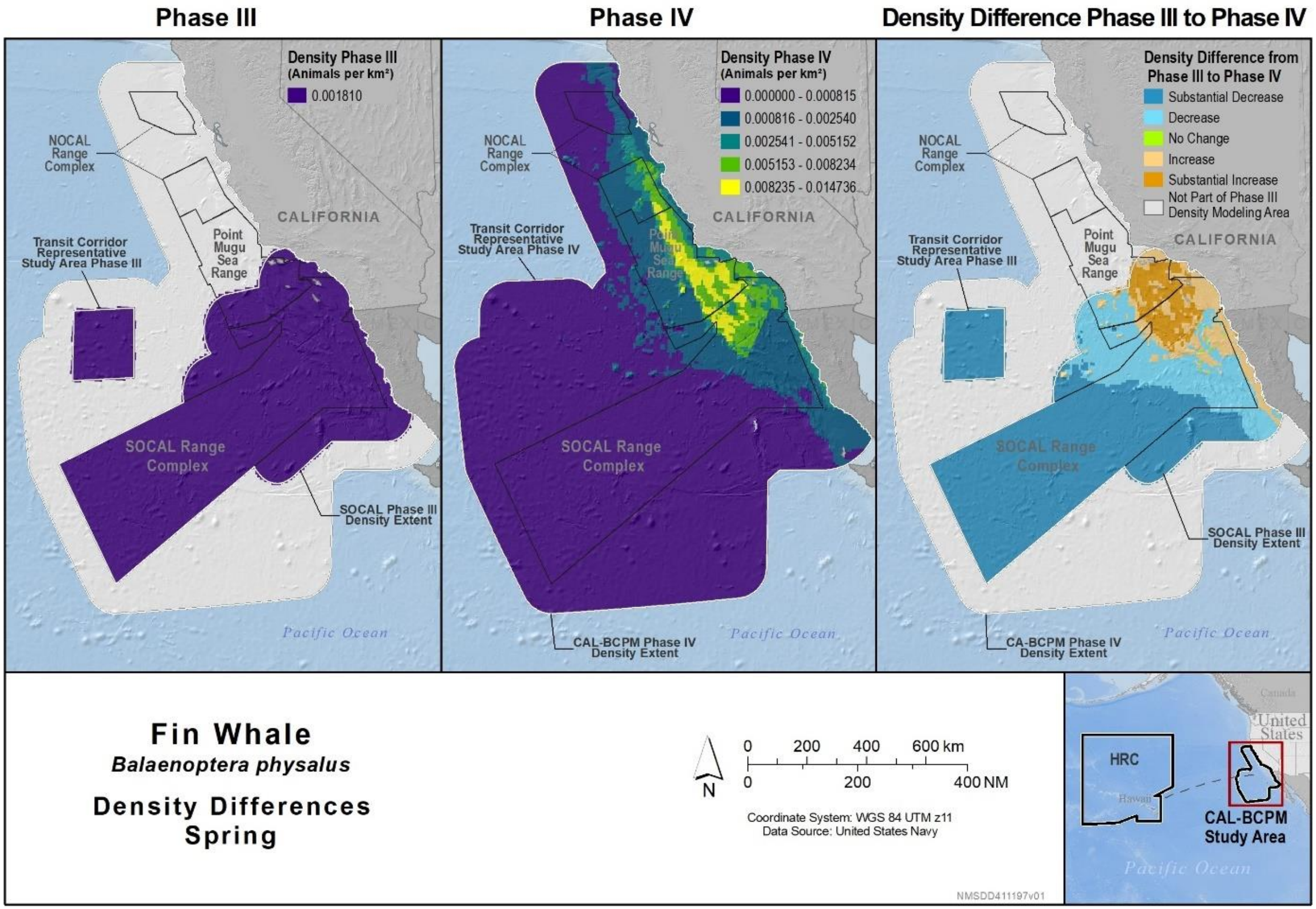

Figure A-14: Fin Whale Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

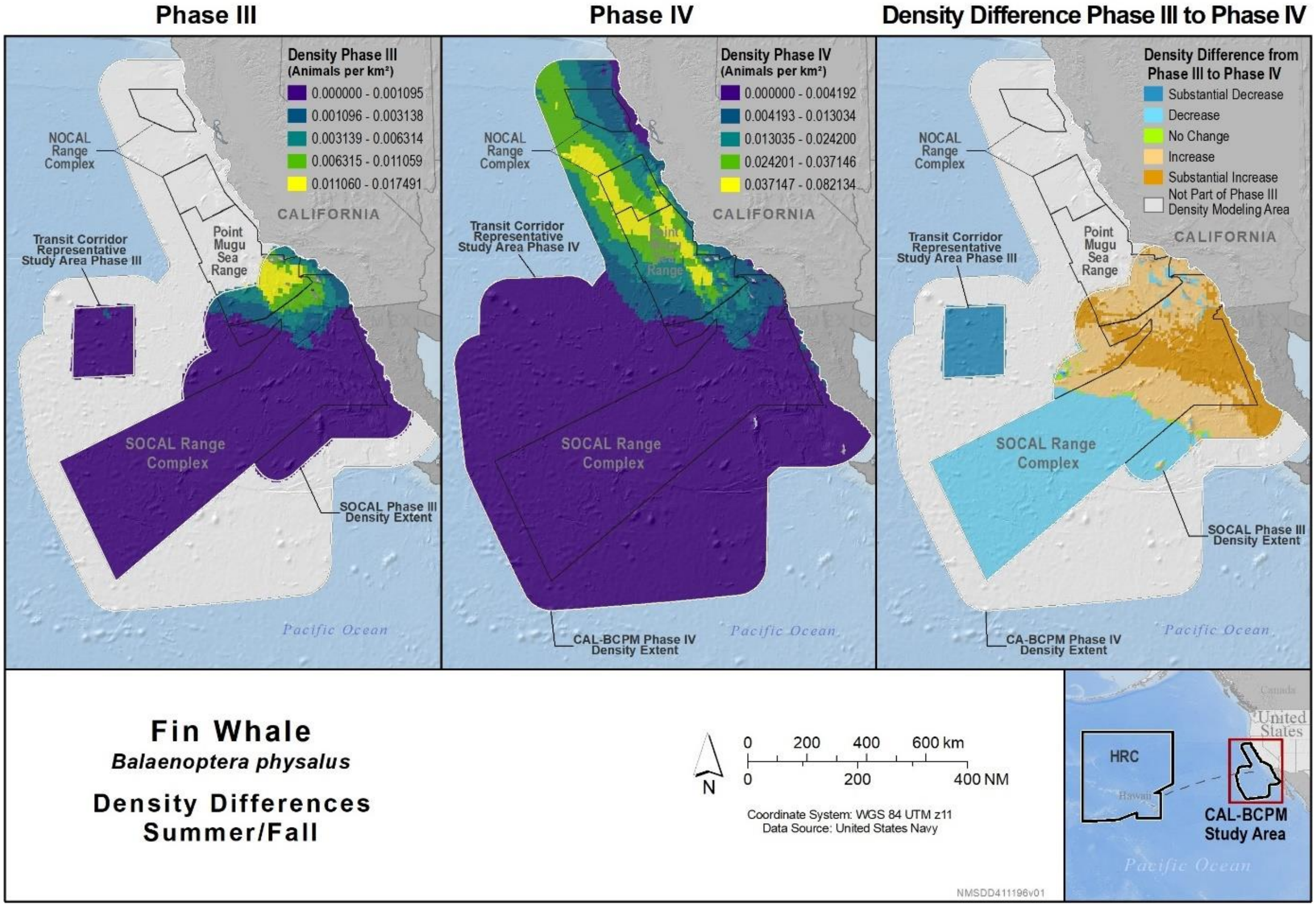

Figure A-15: Fin Whale Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

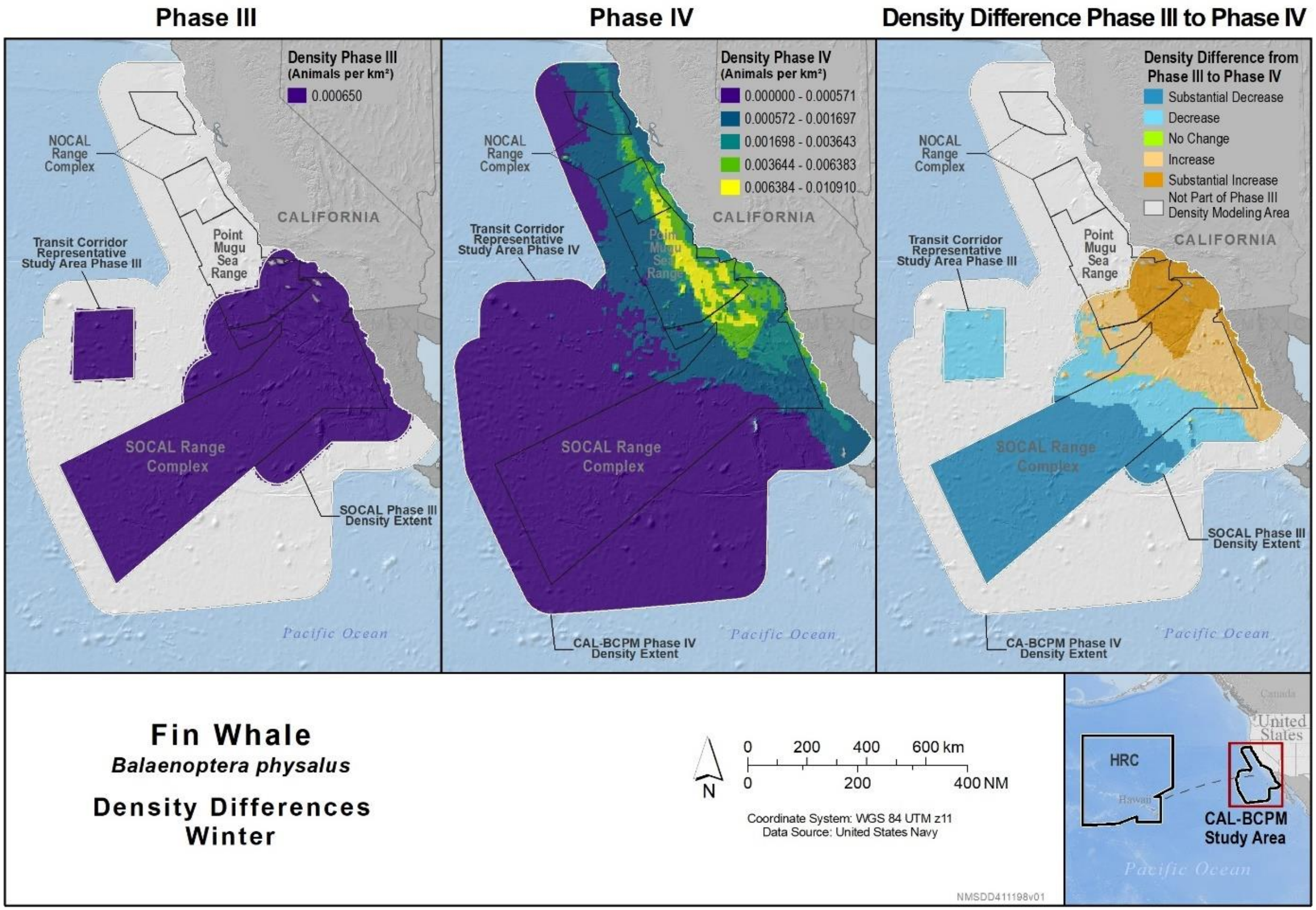

Figure A-16: Fin Whale Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.6 *ESCHRICHTIUS ROBUSTUS*, GRAY WHALE

HRC. This species is not expected to occur regularly in HRC or in the western portion of the transit corridor.

CAL/BCPM. For Phase III, separate summer/fall (June-November) and winter/spring (July-December) density estimates were developed for gray whales based on published migration routes (e.g., distance from shore) and seasonal density data provided by Jefferson et al. (2014). This resulted in two sets of "inshore" and "offshore" routes along the CAL/BCPM coast, inclusive of waters within the Southern California Bight where gray whales occur during their migration periods (Jones & Swartz, 2002). For Phase IV, monthly, spatially explicit predictions of gray whale abundance along the U.S. West Coast from December through June based on a migration model (DeAngelis et al., 2011) were used. Given that the December through June Phase IV estimates are spatially explicit, changes in density from Phase III to Phase IV are regionally variable for these months, although generally higher in Phase IV within the main migration corridor. For waters south of Point Conception from July through November, seasonal density data provided by Jefferson et al. (2014) were used for both Phase III and Phase IV. In coastal waters off the BCPM, the same seasonal density data were also used in both Phase III and Phase IV.

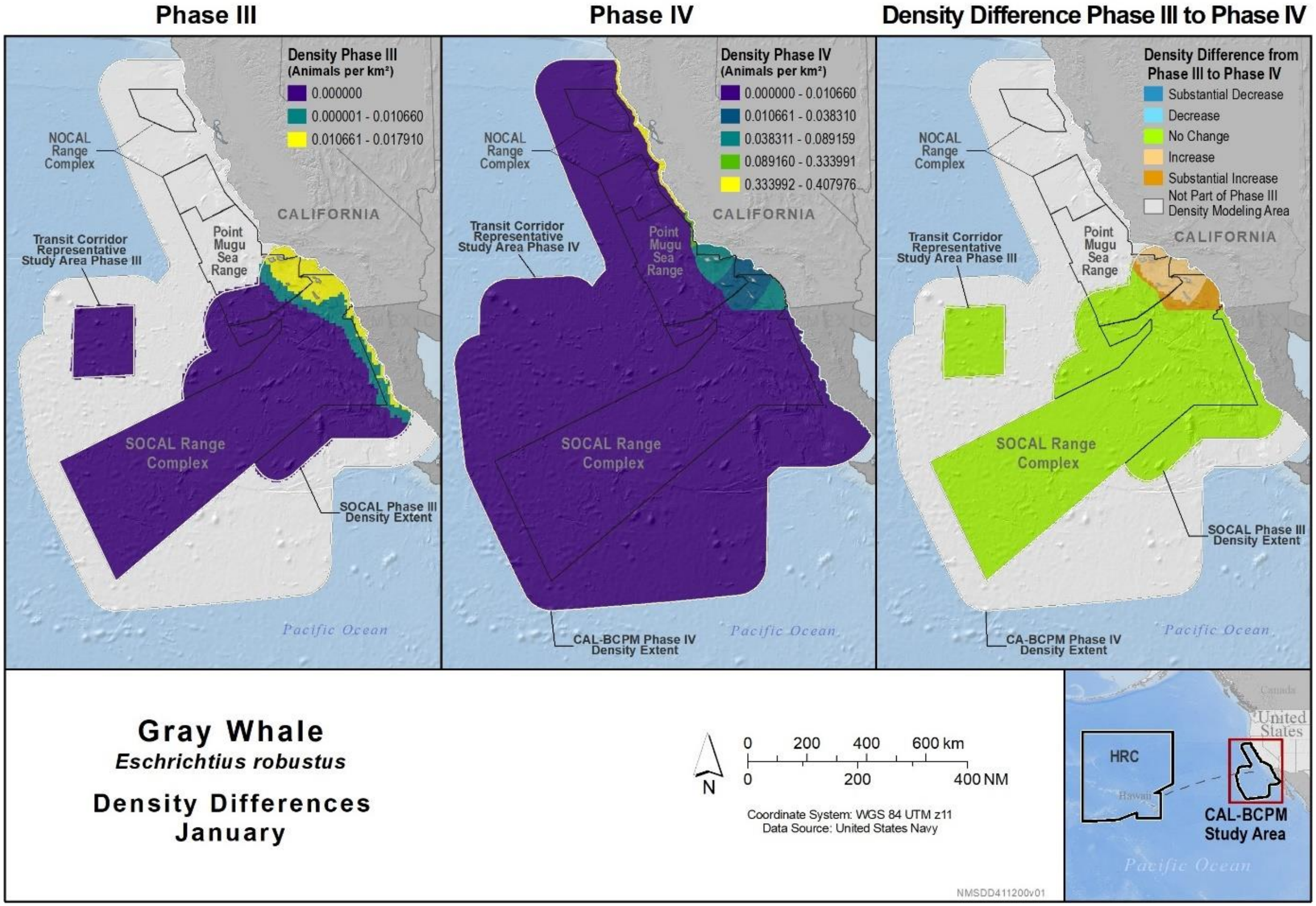

Figure A-17: Gray Whale January Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

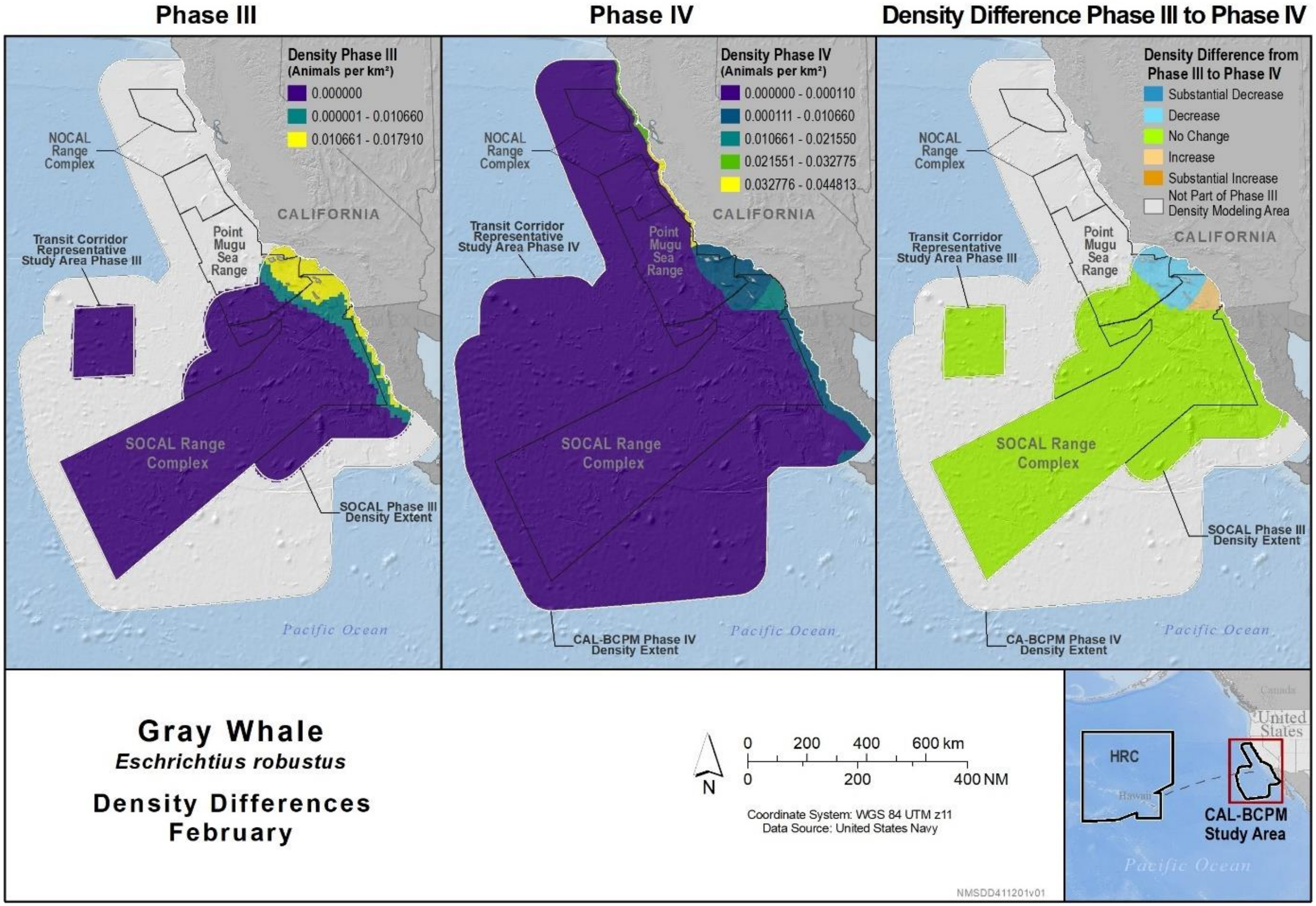

Figure A-18: Gray Whale February Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A “substantial” difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

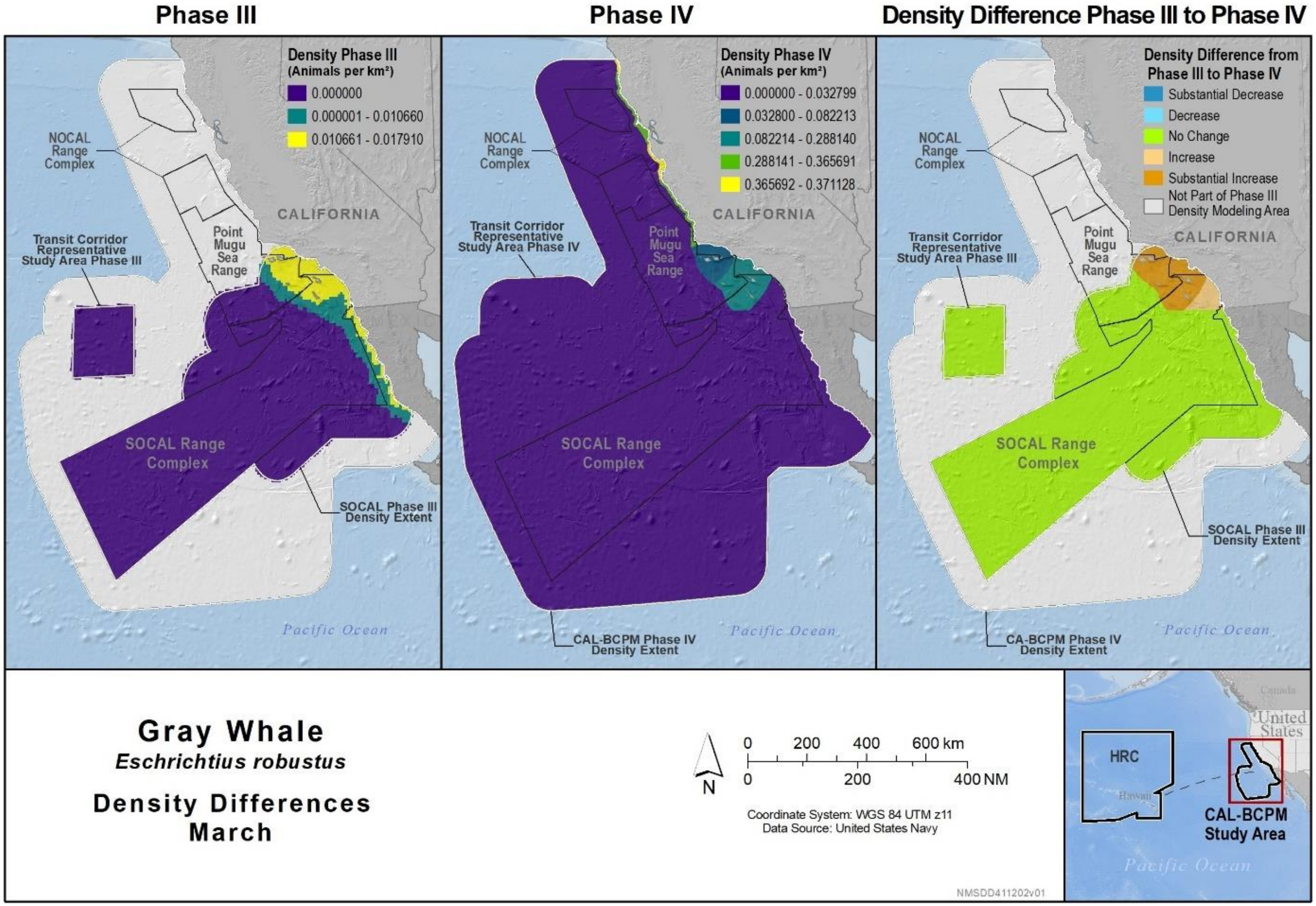

Figure A-19: Gray Whale March Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

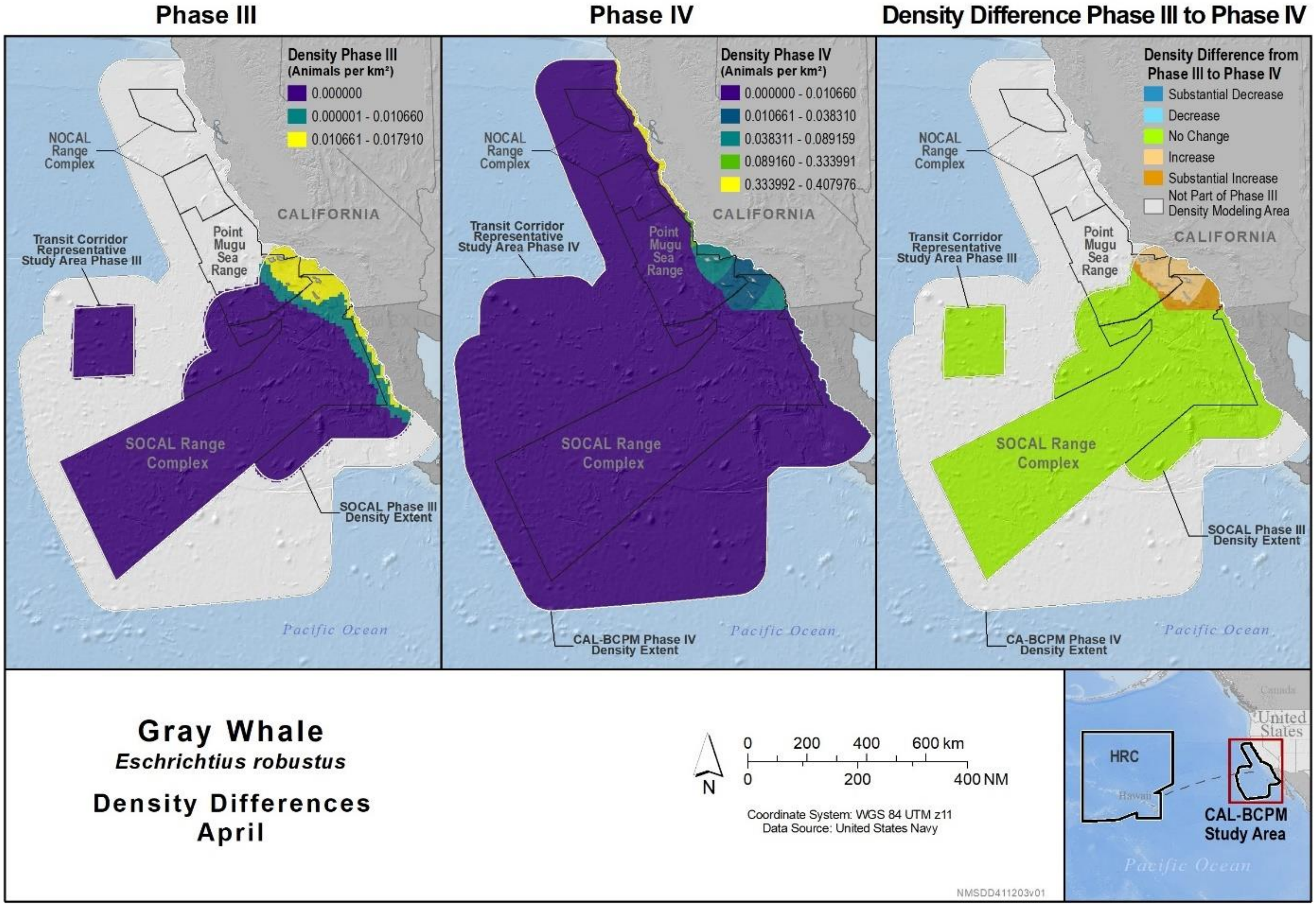

Figure A-20: Gray Whale April Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

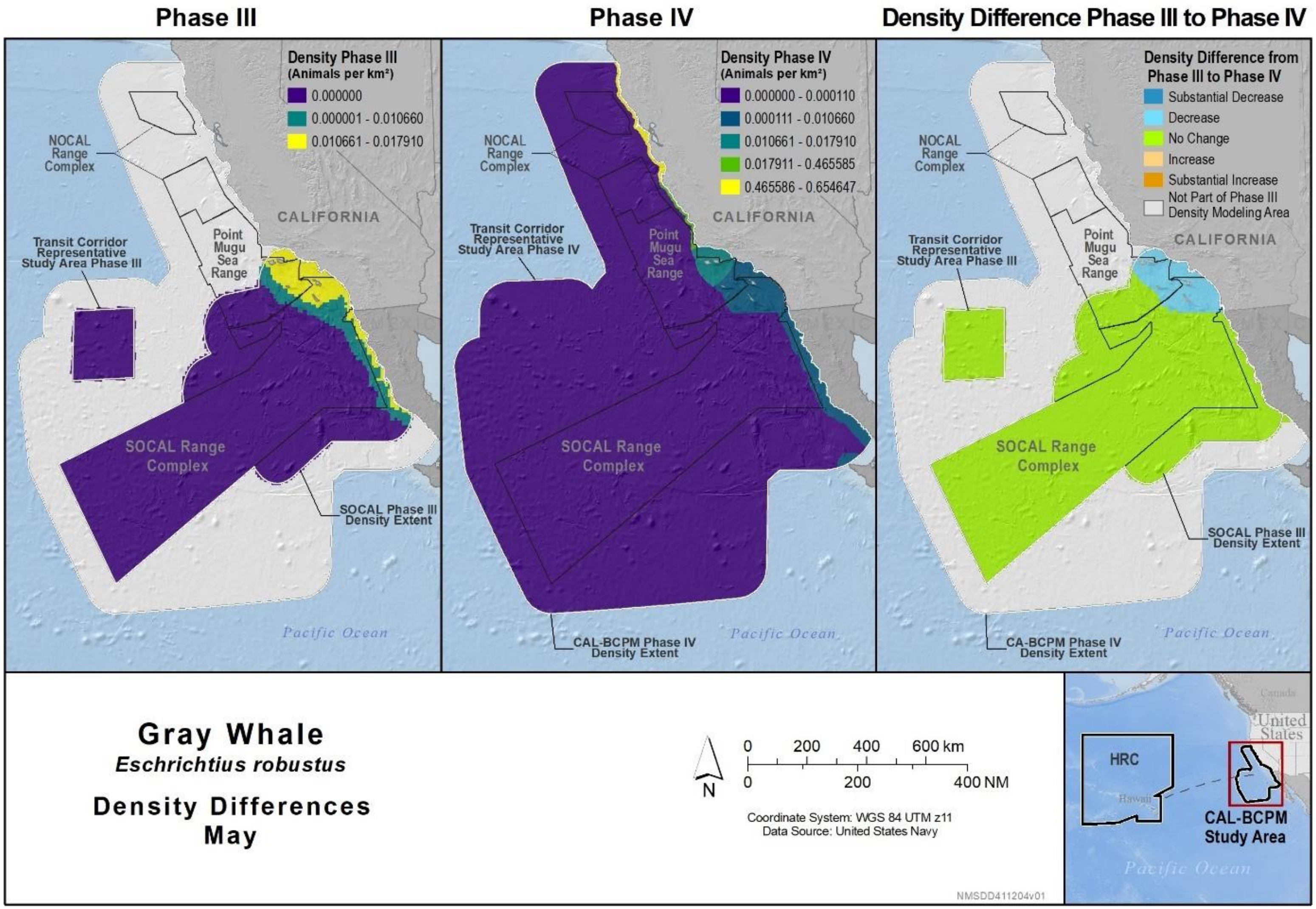

Figure A-21: Gray Whale May Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

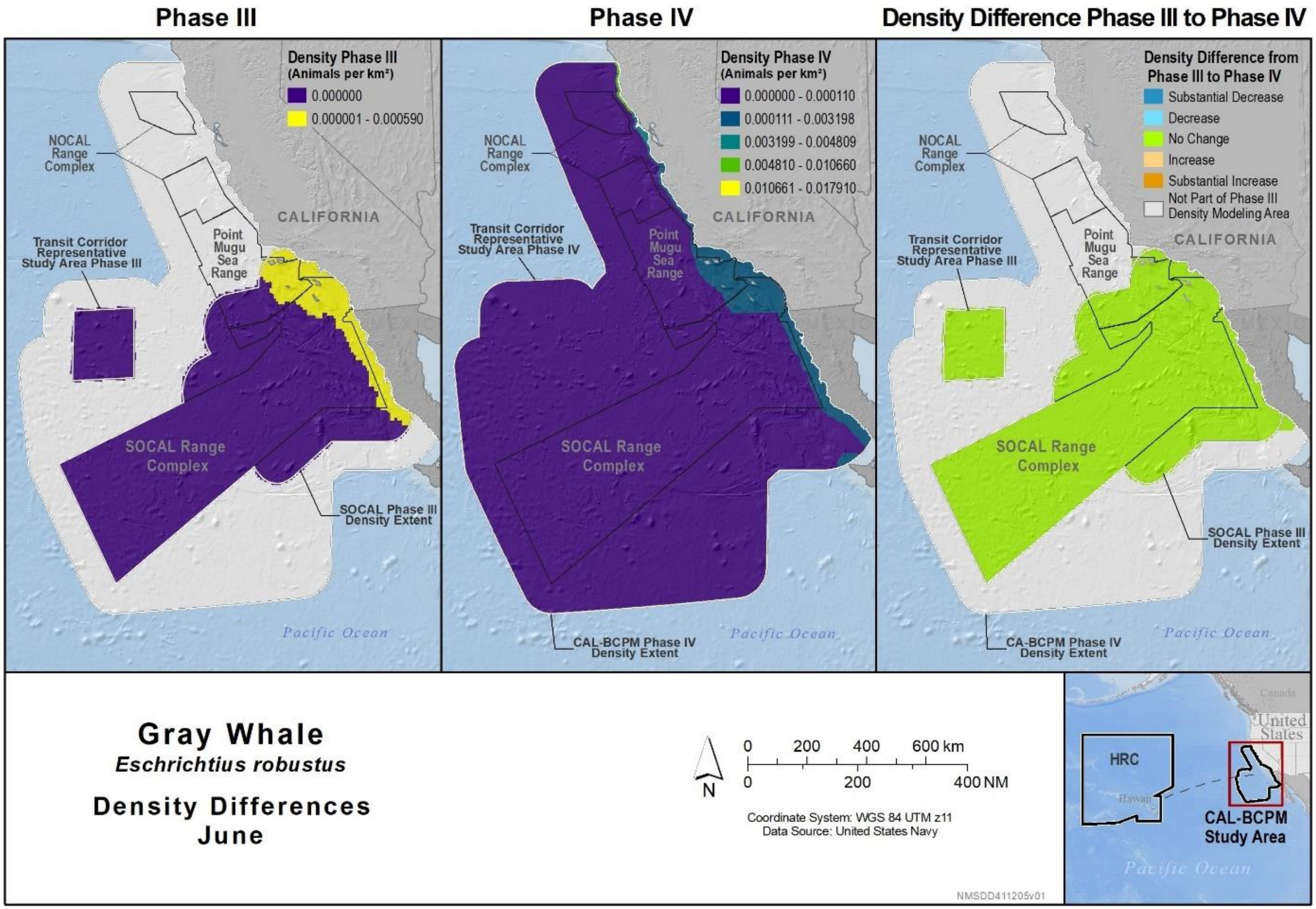

Figure A-22: Gray Whale June Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

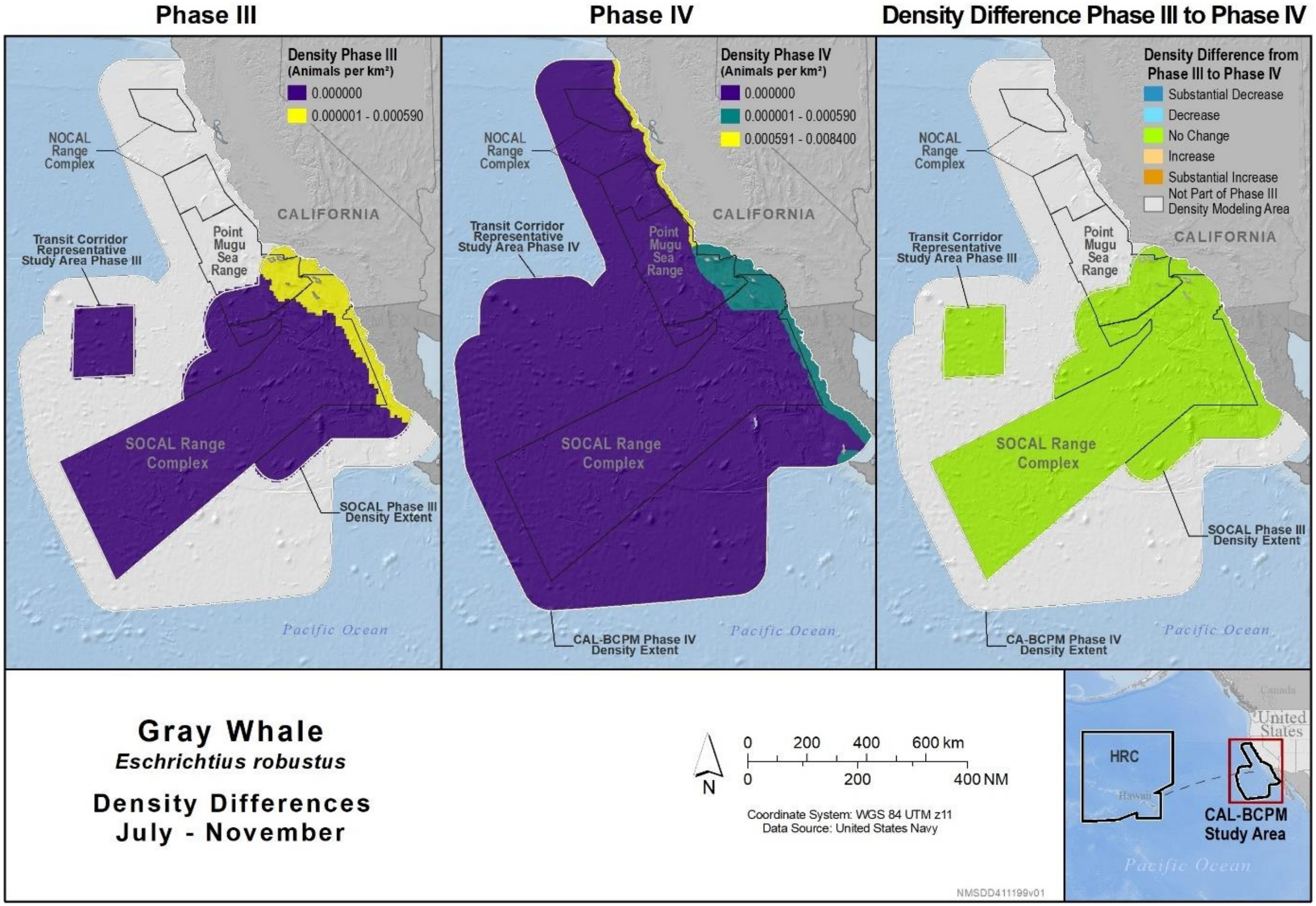

Figure A-23: Gray Whale July-November Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

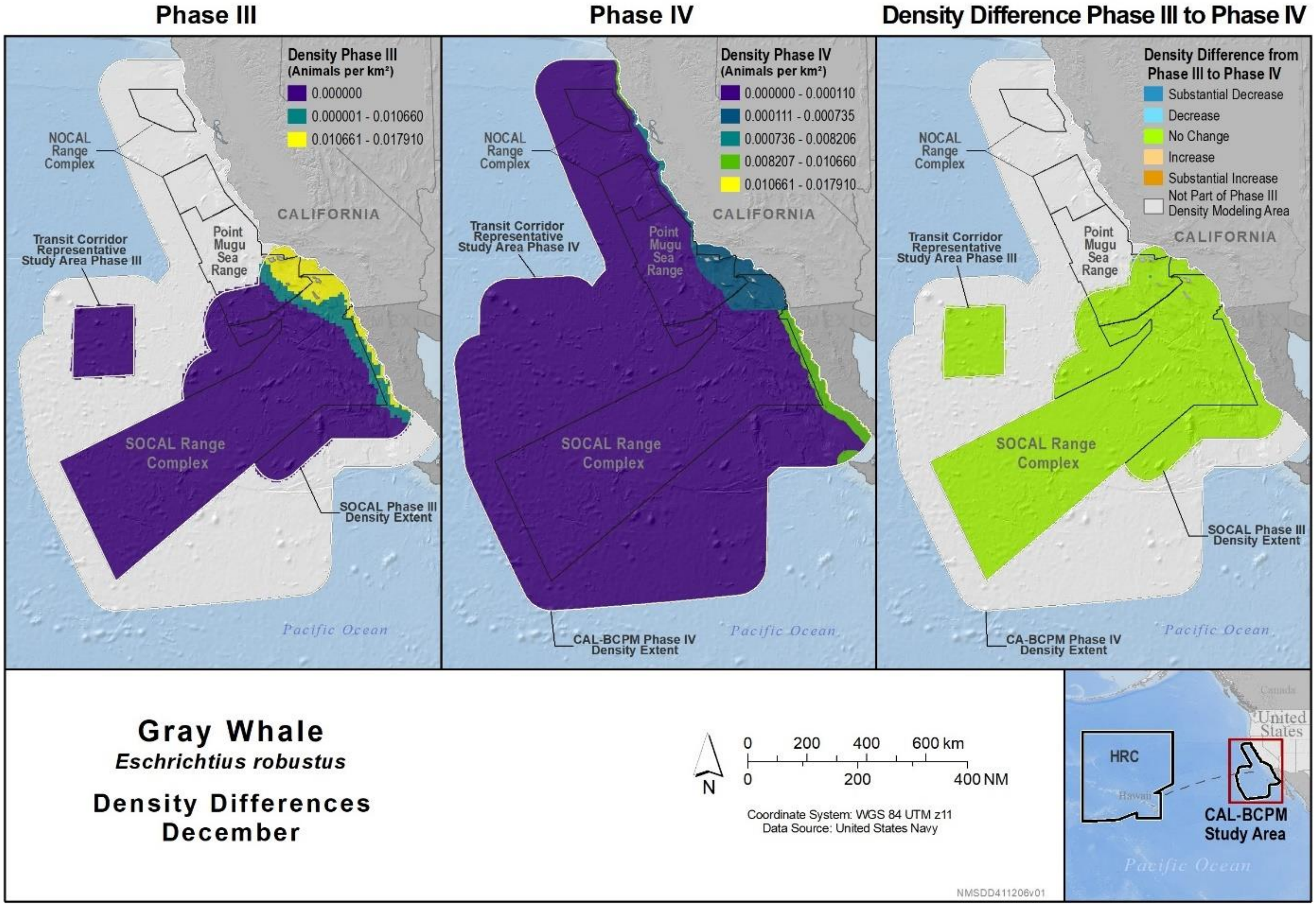

Figure A-24: Gray Whale December Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.1.7 *MEGAPTERA NOVAEANGLIAE*, HUMPBACK WHALE

HRC. For Phase III, abundance estimates for humpback whale derived by Mobley et al. (2001) were used to define density for both a Main Hawaiian Islands stratum and a stratum covering the rest of the Hawaiian Islands EEZ for fall through spring. For Phase IV, new survey data collected by NMFS within the Hawaiian Islands EEZ during the winter of 2020 enabled the development of a new habitat-based density model for humpback whale that provided monthly density predictions for this species (Becker et al., 2022b). Given that the Phase IV estimates are spatially explicit, changes in density from Phase III to Phase IV are regionally variable for those months when humpback whales are expected to occur within the Hawaiian Islands EEZ (November through May).

CAL/BCPM. There has been a documented increase in the population of humpback whales in the CCE (Barlow et al., 2011), and the model-predicted estimates used for Phase IV (Becker et al., 2020) captured this, resulting in an overall increase in humpback whale density from Phase III to Phase IV in waters of the Southern California Bight and in the eastern portion of the transit corridor. For waters off the Baja California Peninsula, a uniform density estimate for humpback whale of 0.00020 animals/km^2 was used for summer and fall in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV, which captured this species largely nearshore distribution along the Baja California Peninsula. Since the model-based density estimates account for spatial variation in humpback whale distribution that the previous uniform density estimates did not, for Phase IV there is an increase in density values along the BCPM coast and a decrease in density values offshore.

Becker et al. (2017) provided the first winter/spring habitat-based density model for humpback whale in Southern California waters, and predictions from this model were used in Phase III. For Phase IV, humpback whale habitat model predictions from two separate models were merged (Forney et al., In Prep. for nearshore waters and Becker et al. (In Prep) for offshore waters) and applied to the portion of the Navy's CAL/BCPM acoustic modeling study area that overlaps the SWFSC's CCE study area, as well as the eastern portion of the transit corridor for winter and spring. The more recent model predictions resulted in higher density estimates within much of the Southern California Bight for winter and spring, with a decrease in density in the eastern portion of the transit corridor. For waters off the BCPM, the spatially-explicit model predictions from Becker et al. (2022a) used for Phase IV resulted in higher densities along the coast and lower densities offshore, reflecting this species nearshore distribution that was not captured by the uniform density estimates derived by Campbell et al. (2015) that were used in Phase III.

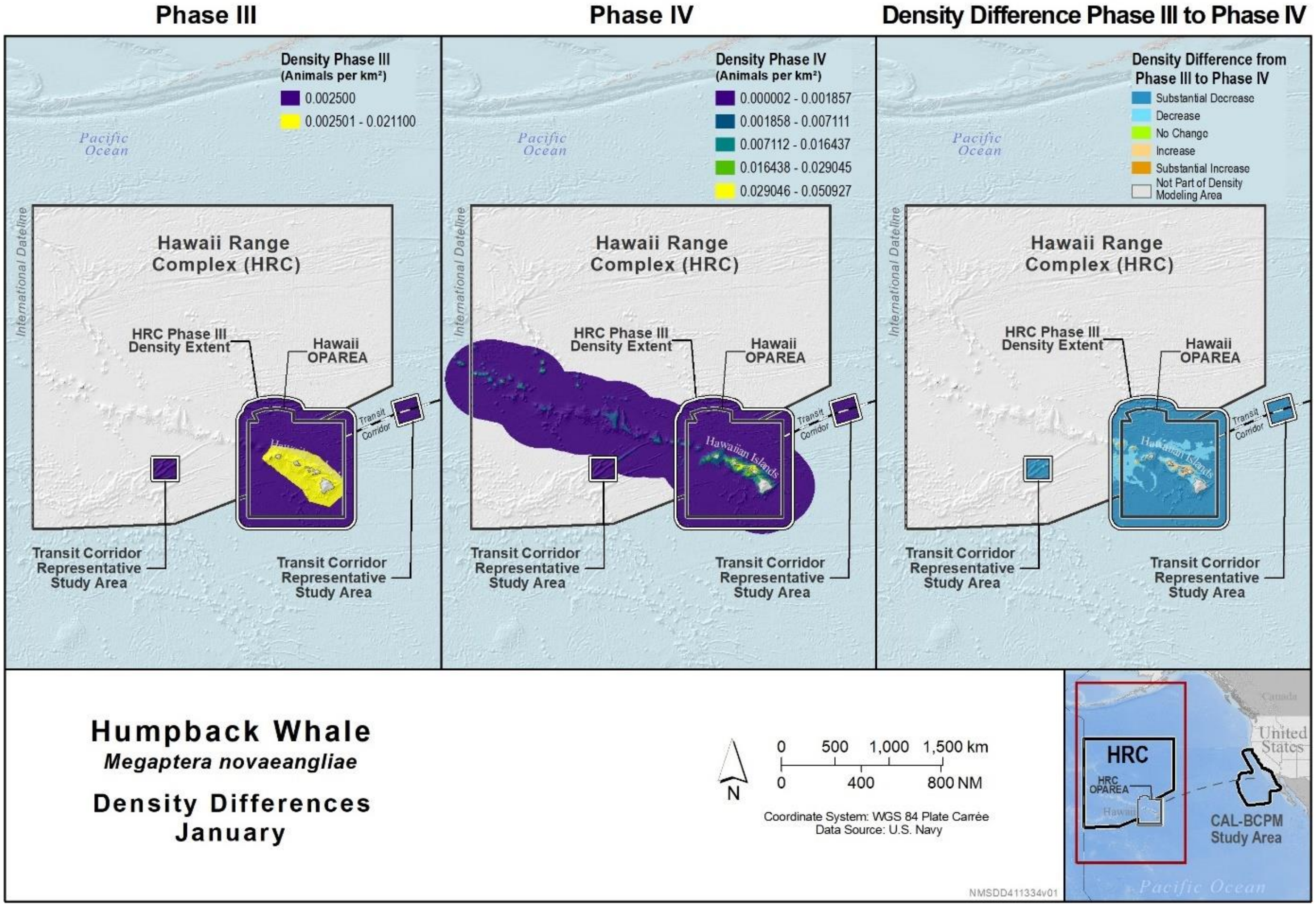

Figure A-25: Humpback Whale January Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

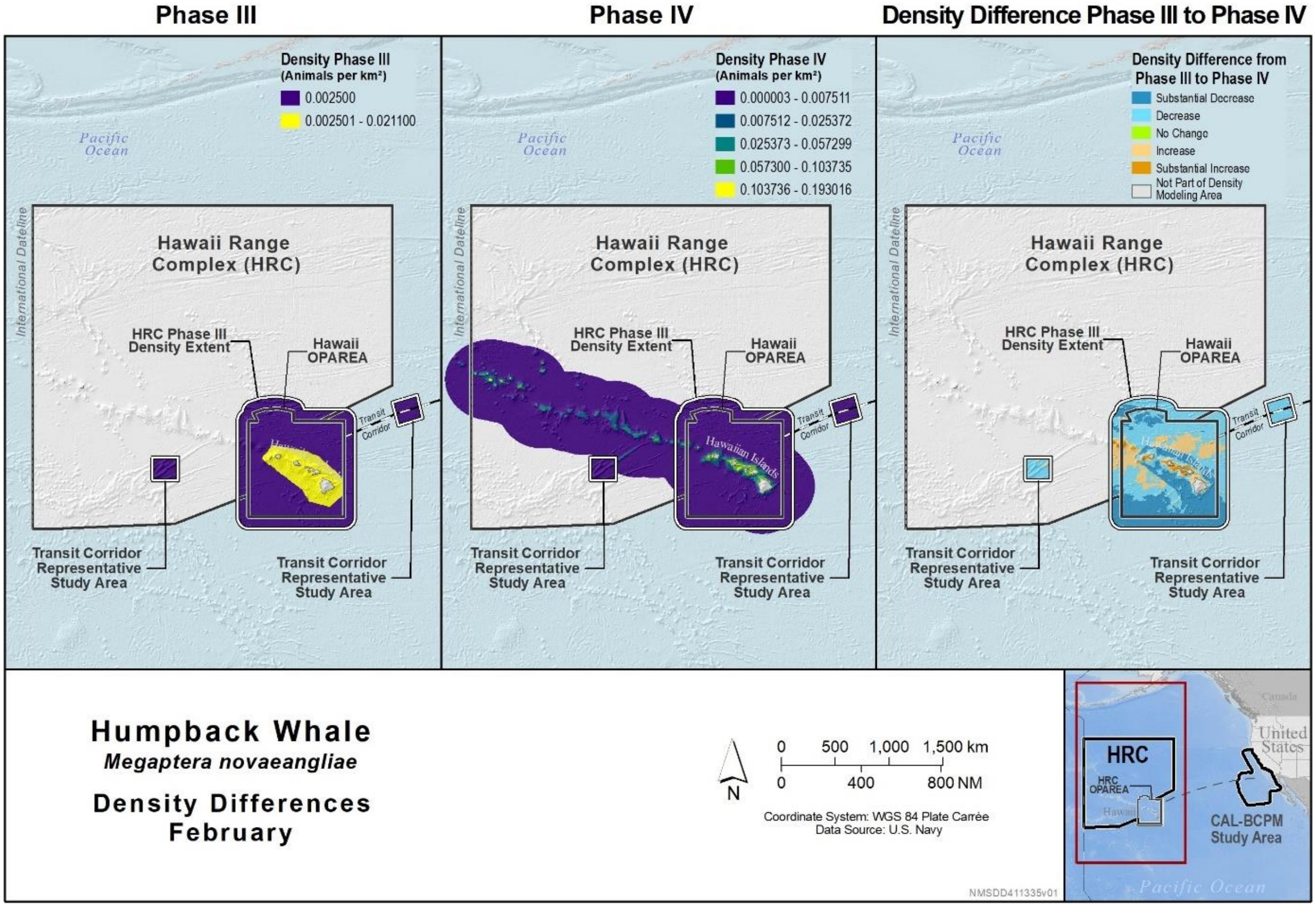

Figure A-26: Humpback Whale February Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

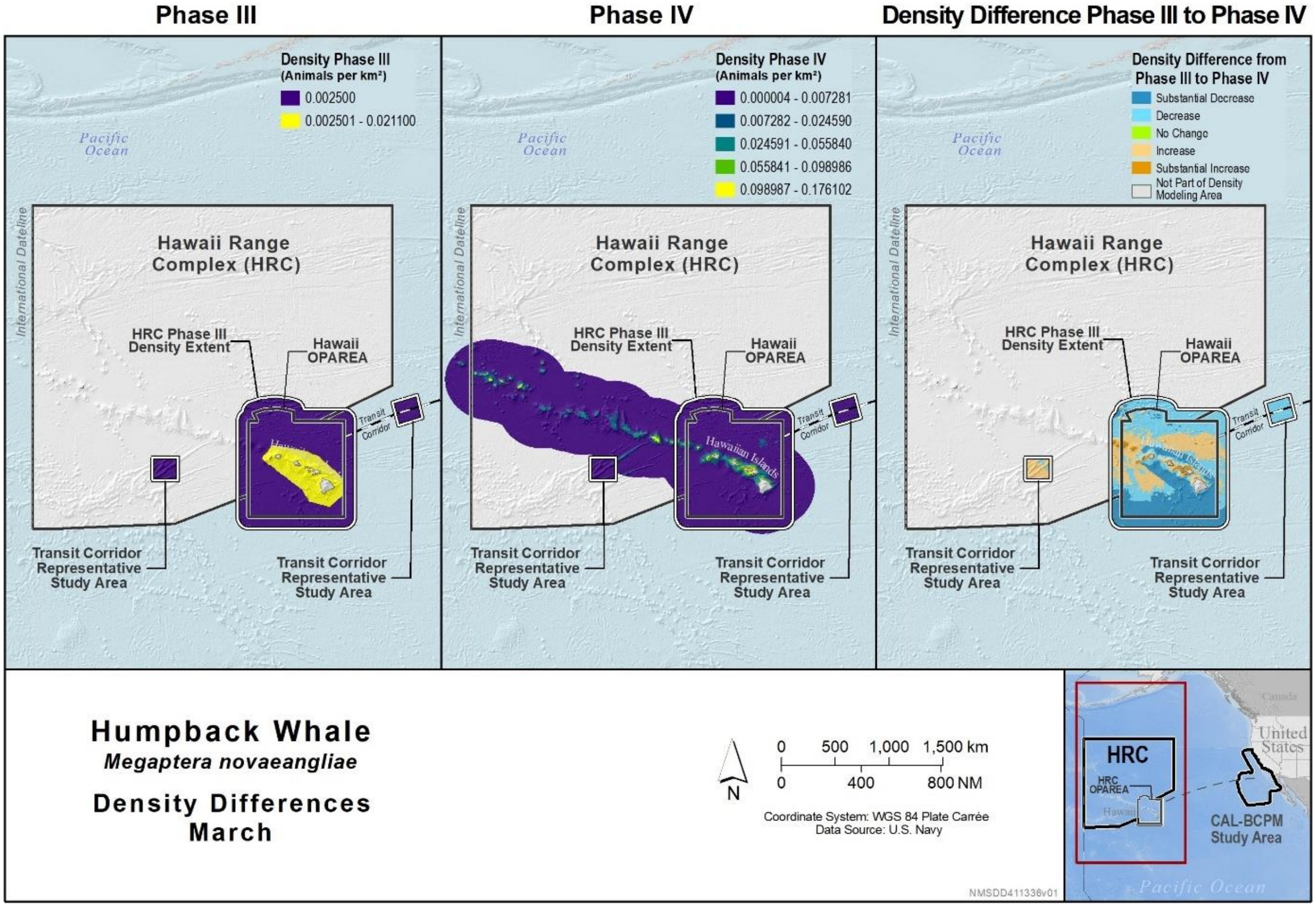

Figure A-27: Humpback Whale March Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A “substantial” difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

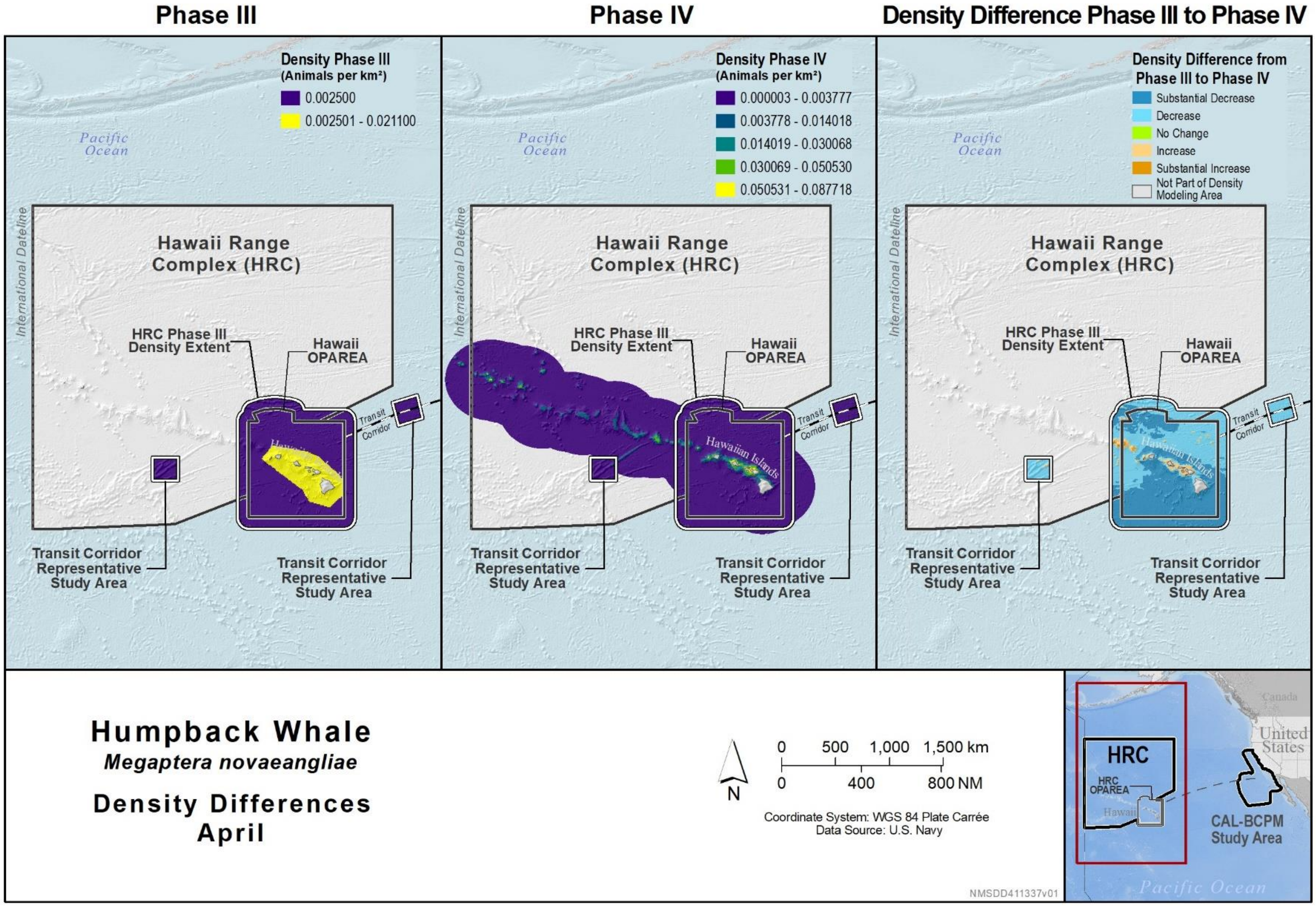

Figure A-28: Humpback Whale April Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

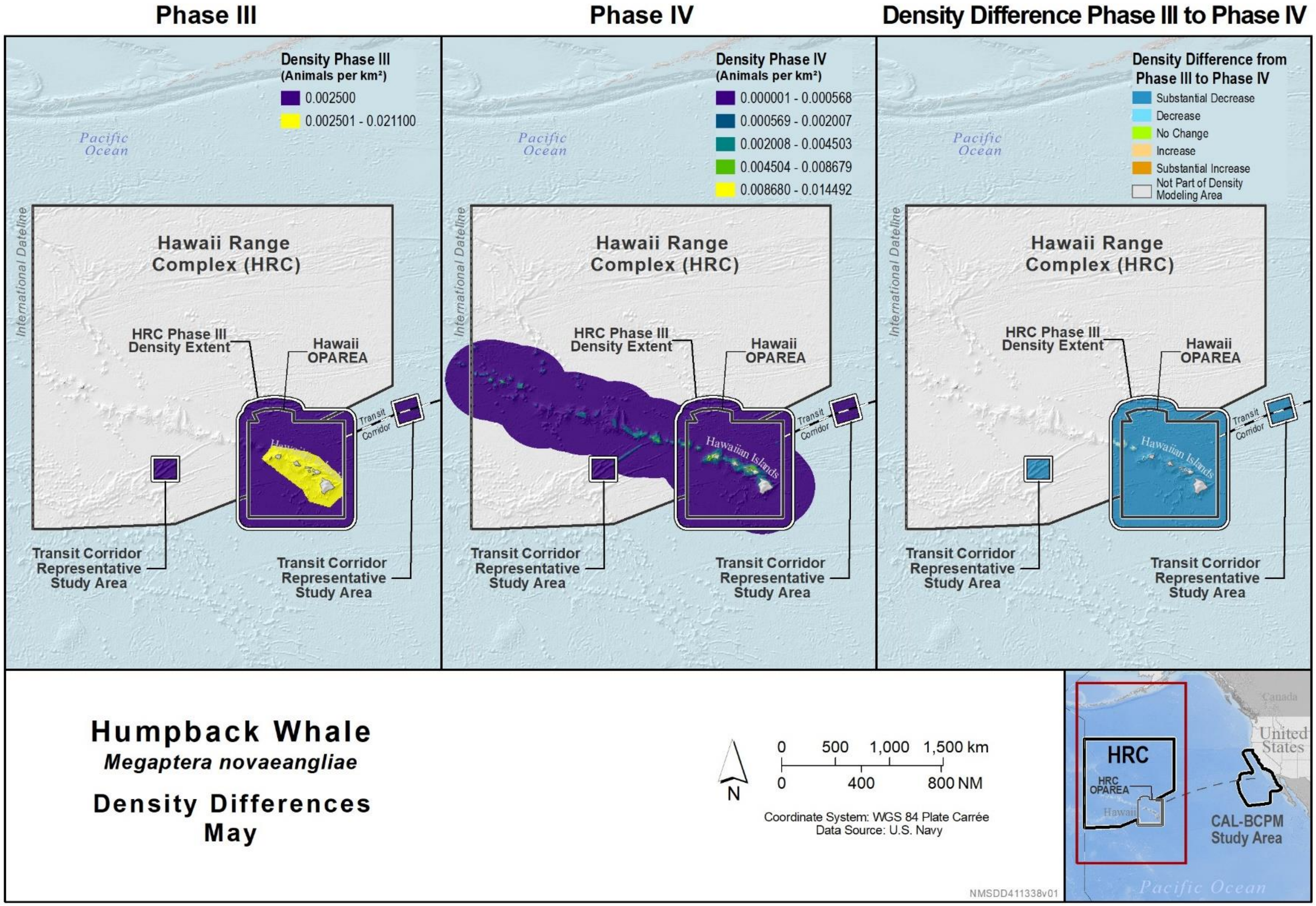

Figure A-29: Humpback Whale May Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

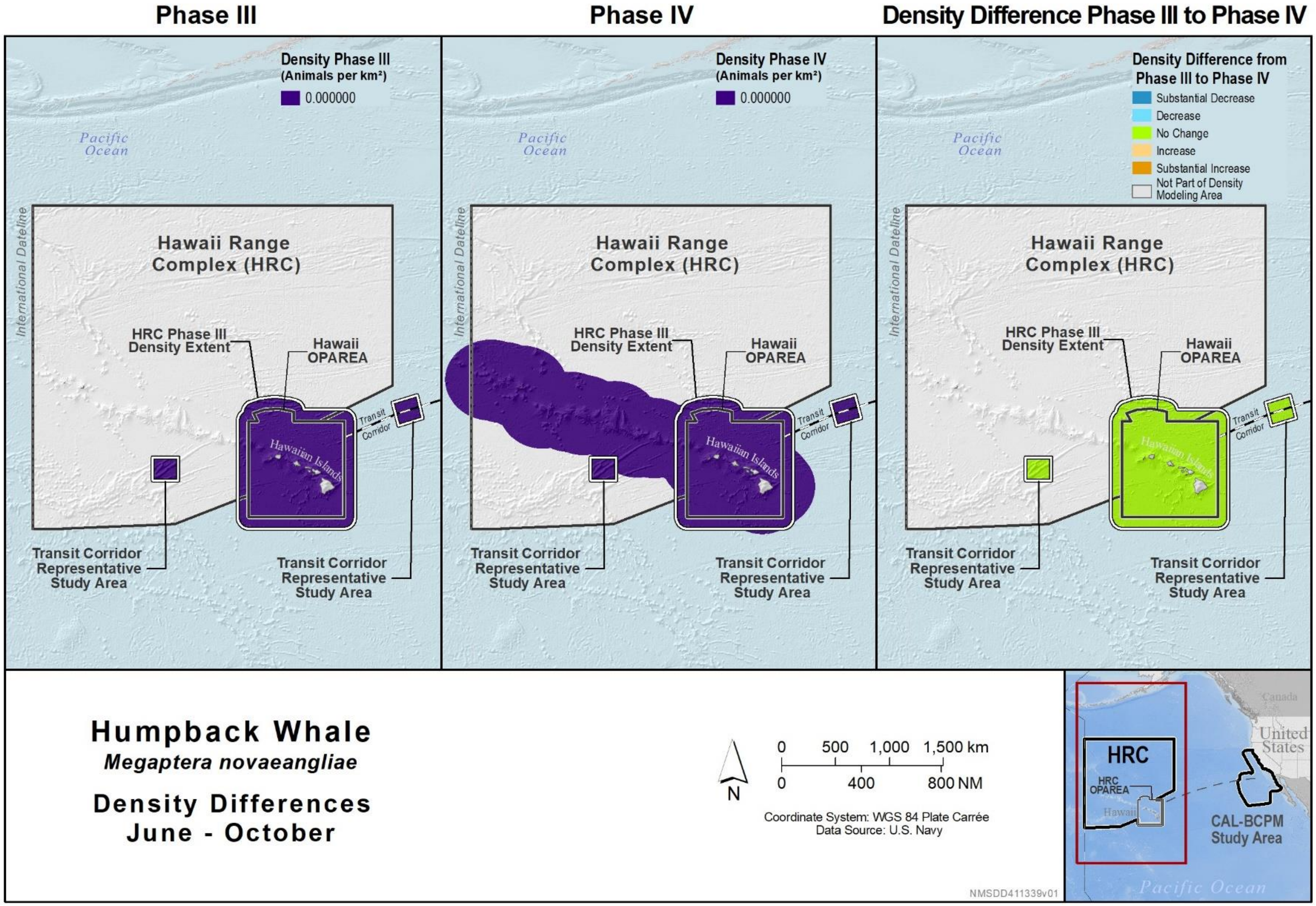

Figure A-30: Humpback Whale June-October Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

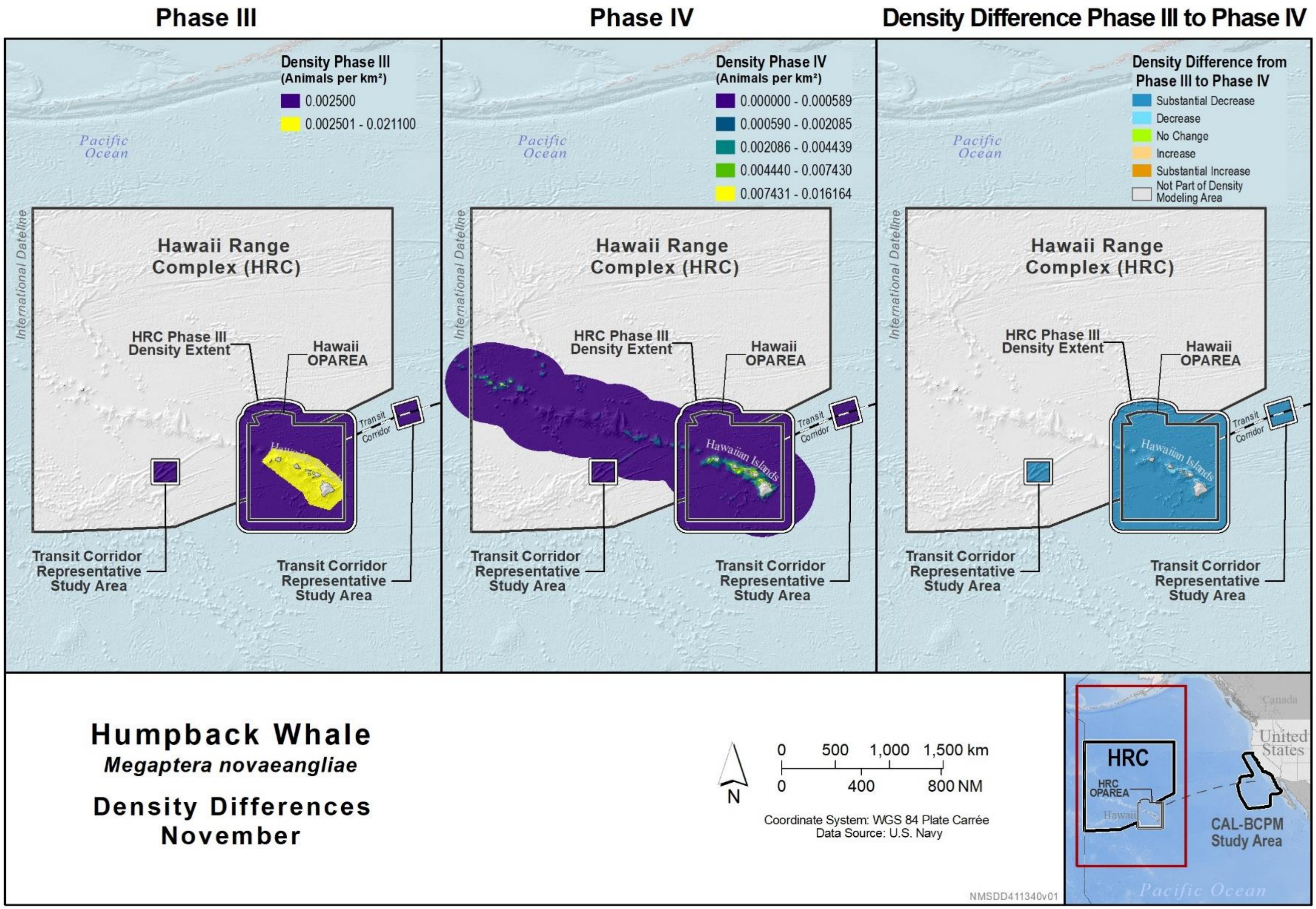

Figure A-31: Humpback Whale November Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

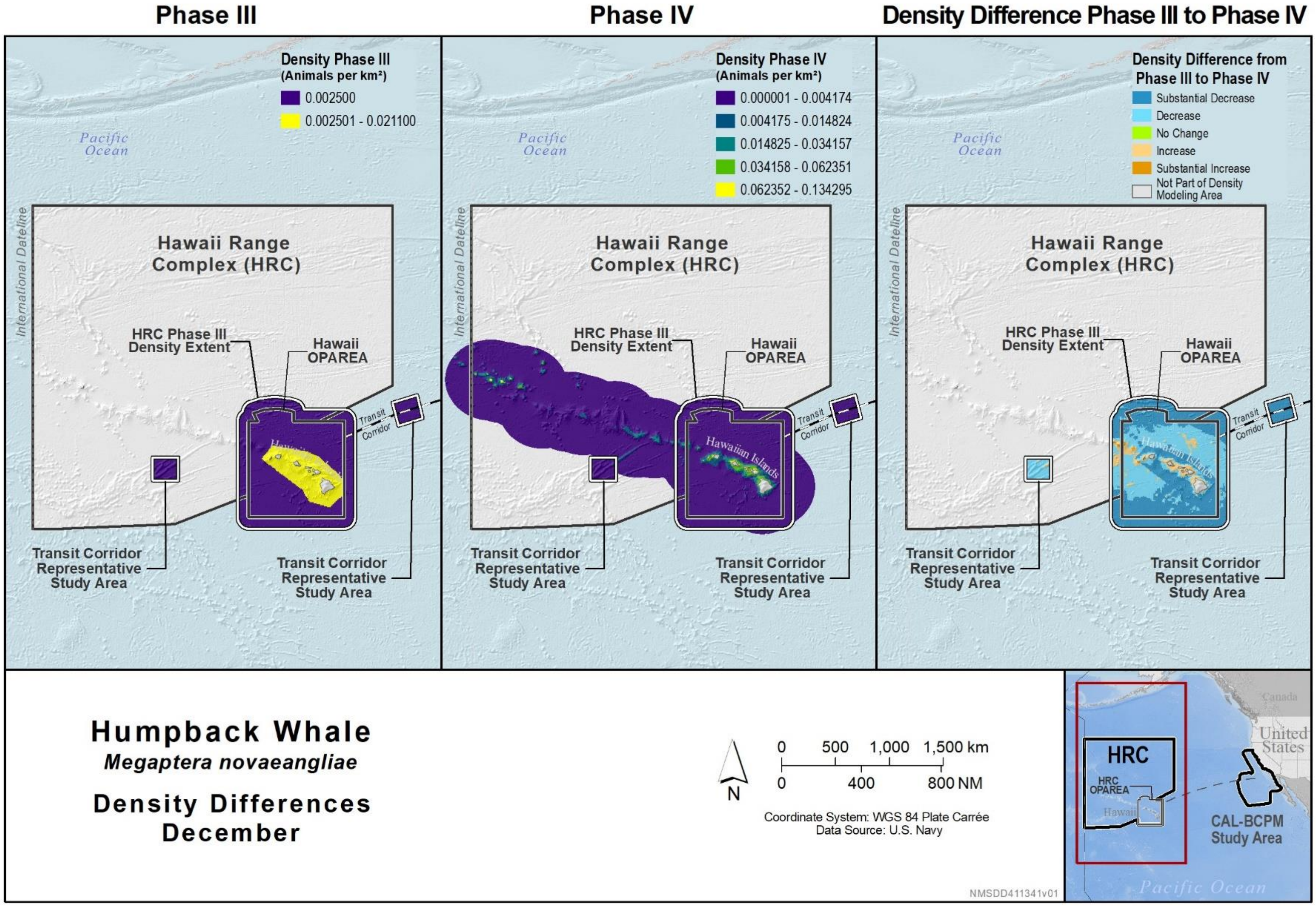

Figure A-32: Humpback Whale December Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

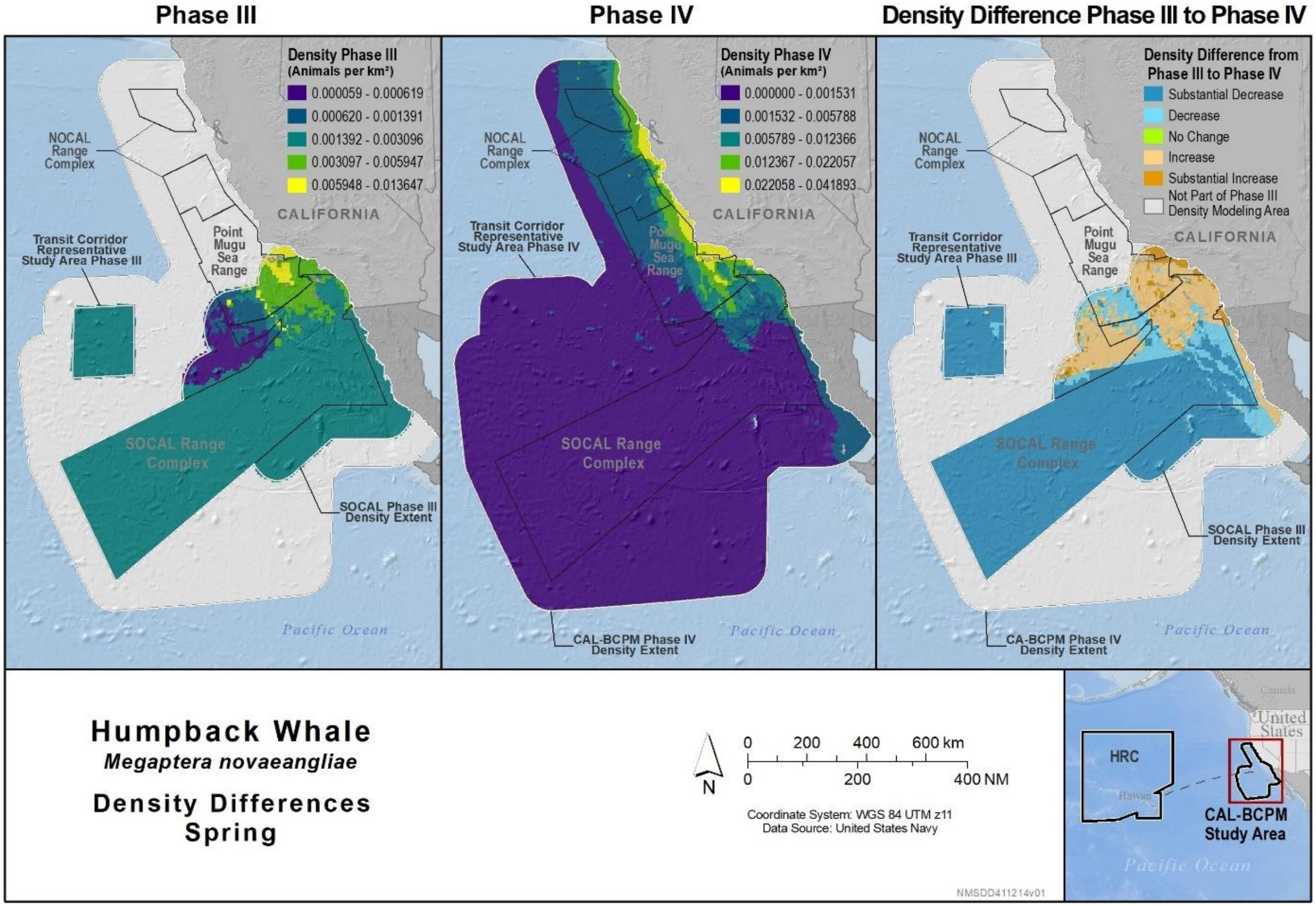

Figure A-33: Humpback Whale Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel

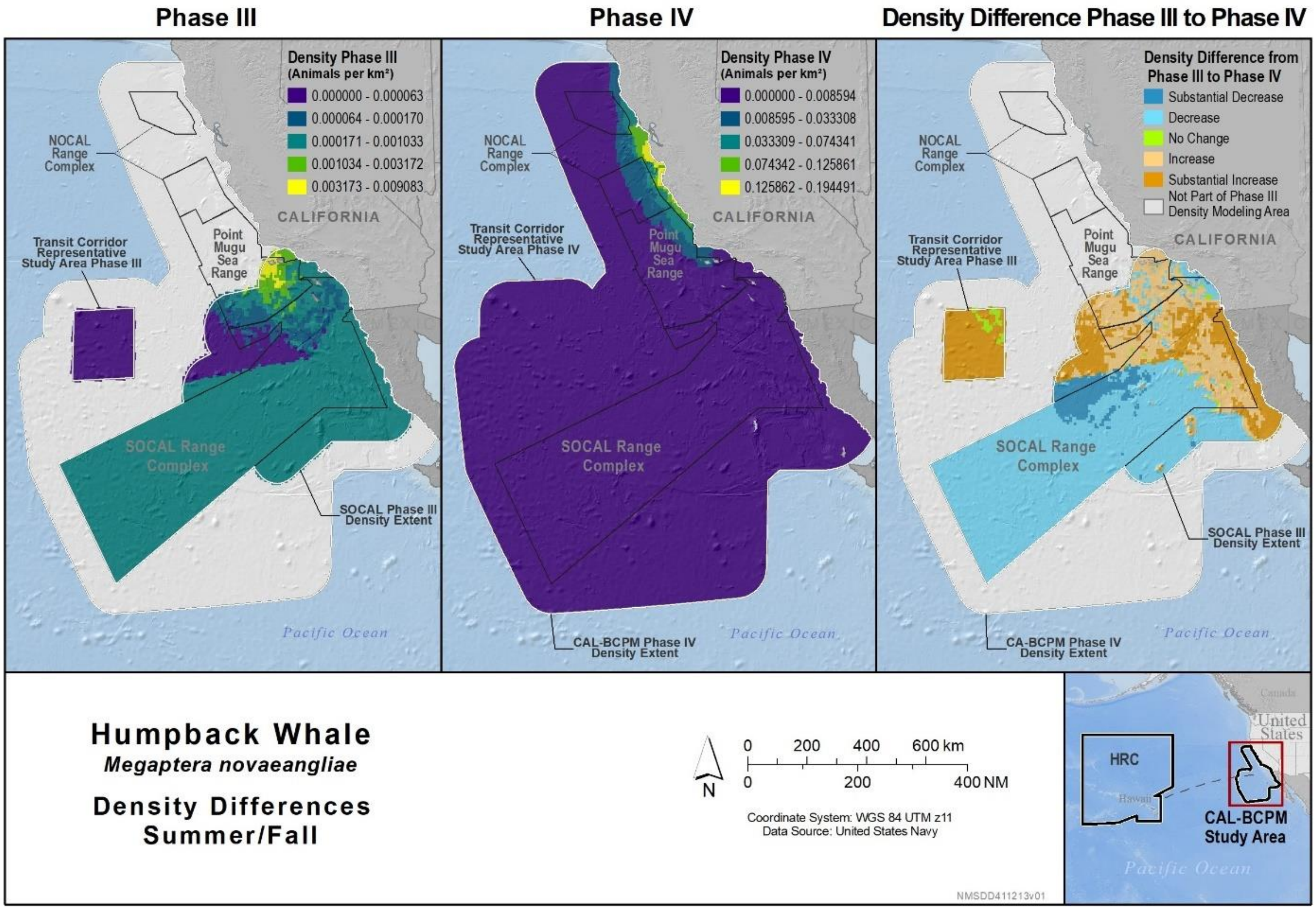

Figure A-34: Humpback Whale Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

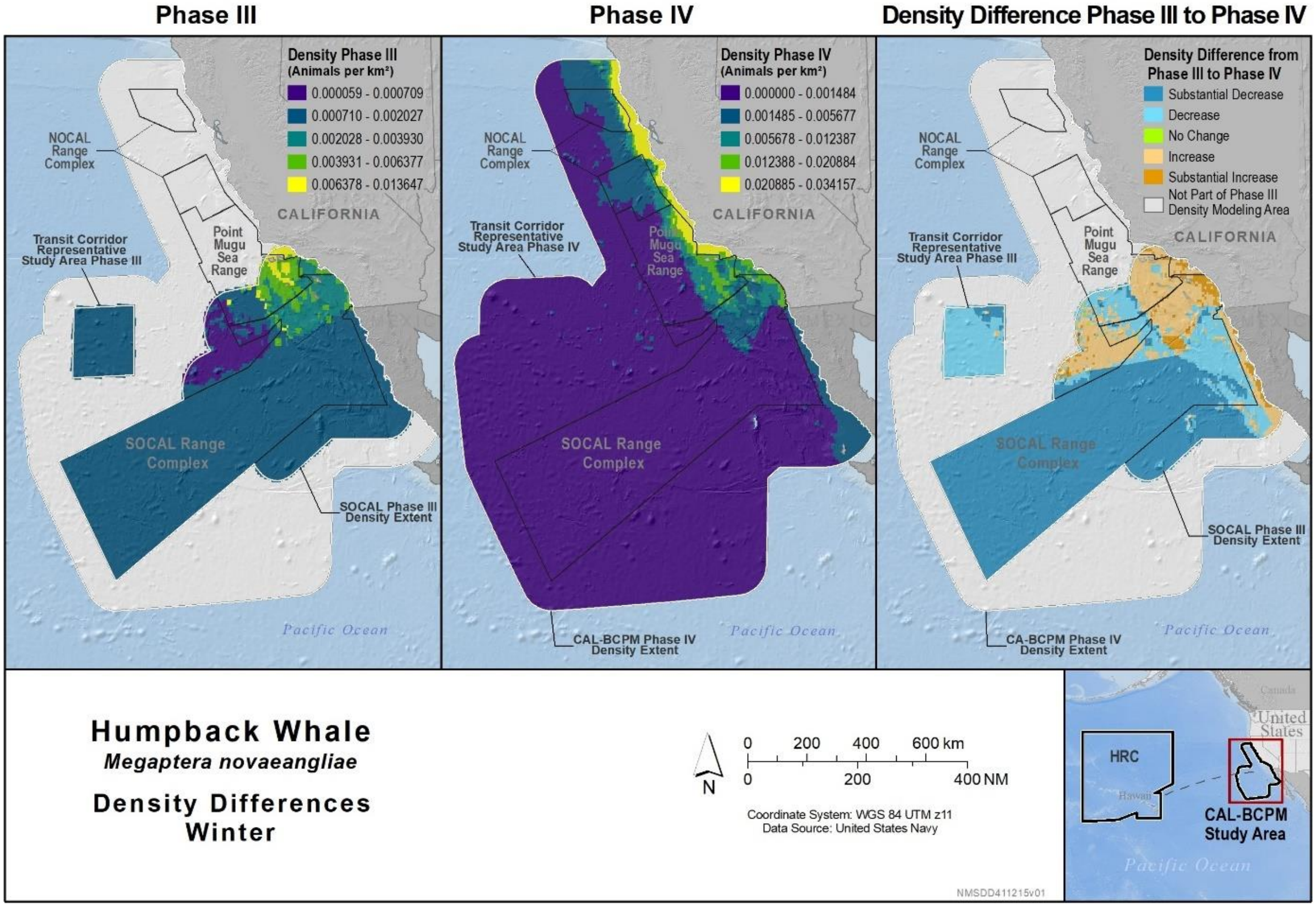

Figure A-35: Humpback Whale Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.2 SPERM WHALES

A.1.2.1 *KOGIA BREVICEPS*, PYGMY SPERM WHALE

HRC*.* The design-based density estimate used in Phase IV was higher (0.01719 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00291 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. *Kogia* species are treated as a genus in the CCE by scientists who have published species density estimates for this study area. Barlow (2016) provides a stratified uniform density estimate for *Kogia* of 0.00159 animals/km^2 (CV = 1.21) for waters off Southern California and this estimate was used annually within the CAL portion of the HSTT Study Area for both Phase III and Phase IV.

Ferguson and Barlow (2003) provide *Kogia* density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a *Kogia* density estimate of 0.00405 animals/km^2, slightly higher than that derived based on the extent of the HSTT acoustic modeling footprint (0.00366 animals/km^2).

Since density values for CAL/BCPM are provided for *Kogia* as a genus, the difference figure for this portion of the study area is presented following the density difference summaries for dwarf sperm whale in the next subsection.

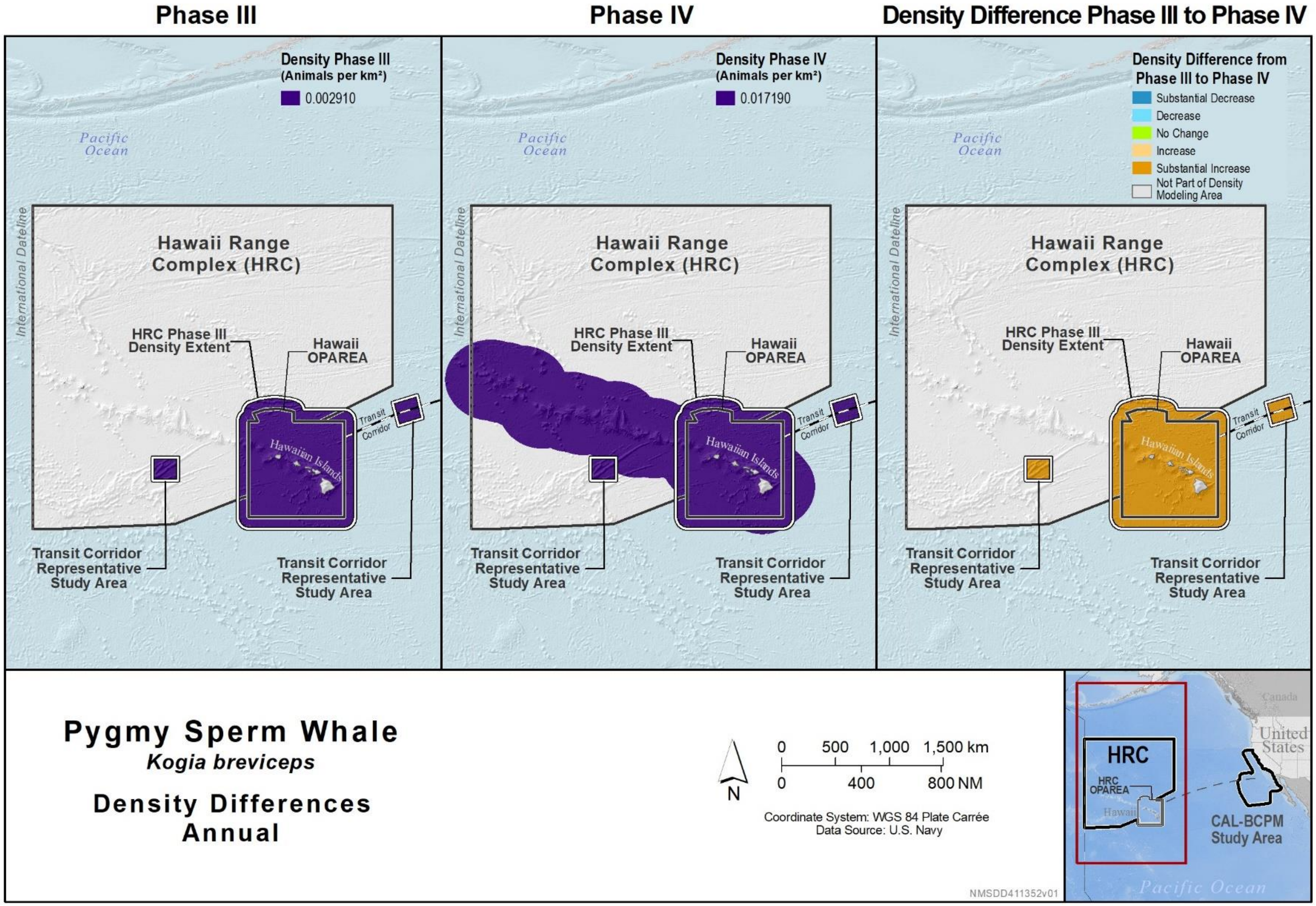

Figure A-36**: Pygmy Sperm Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).**

A.1.2.2 *KOGIA SIMA*, DWARF SPERM WHALE

HRC. The design-based density estimate used in Phase IV was higher (0.0153 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00714 animals/km^2), but it is based on a more current detection function and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. *Kogia* species are treated as a genus in the CCE by scientists who have published species density estimates for this study area. Barlow (2016) provides a stratified uniform density estimate for *Kogia* of 0.00159 animals/km^2 (CV = 1.21) for waters off Southern California and this estimate was used annually within the CAL portion of the HSTT Study Area for both Phase III and Phase IV.

Ferguson and Barlow (2003) provide *Kogia* density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a *Kogia* density estimate of 0.00405 animals/km^2, slightly higher than that derived based on the extent of the HSTT acoustic modeling footprint (0.00366 animals/km^2).

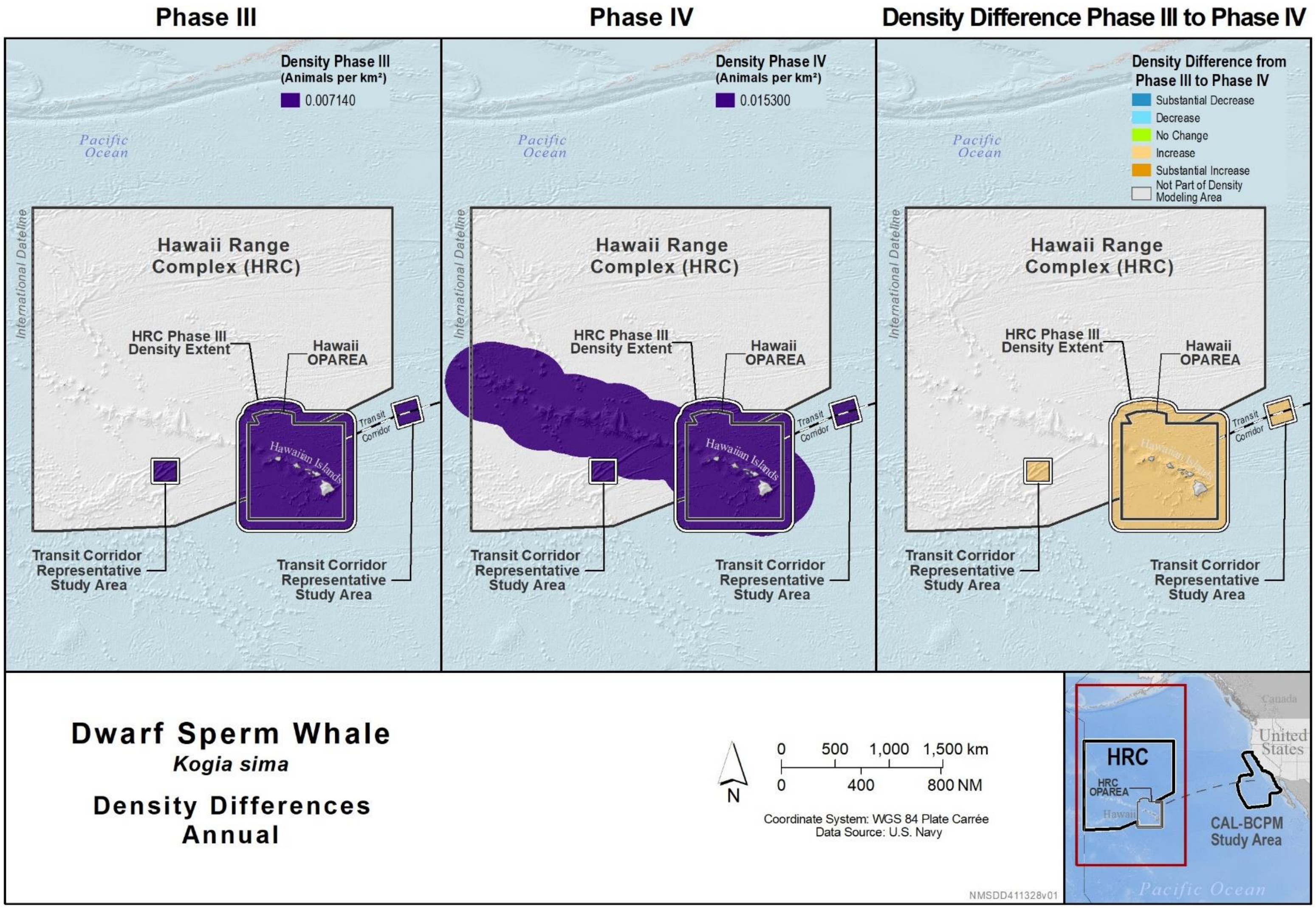

Figure A-37: Dwarf Sperm Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

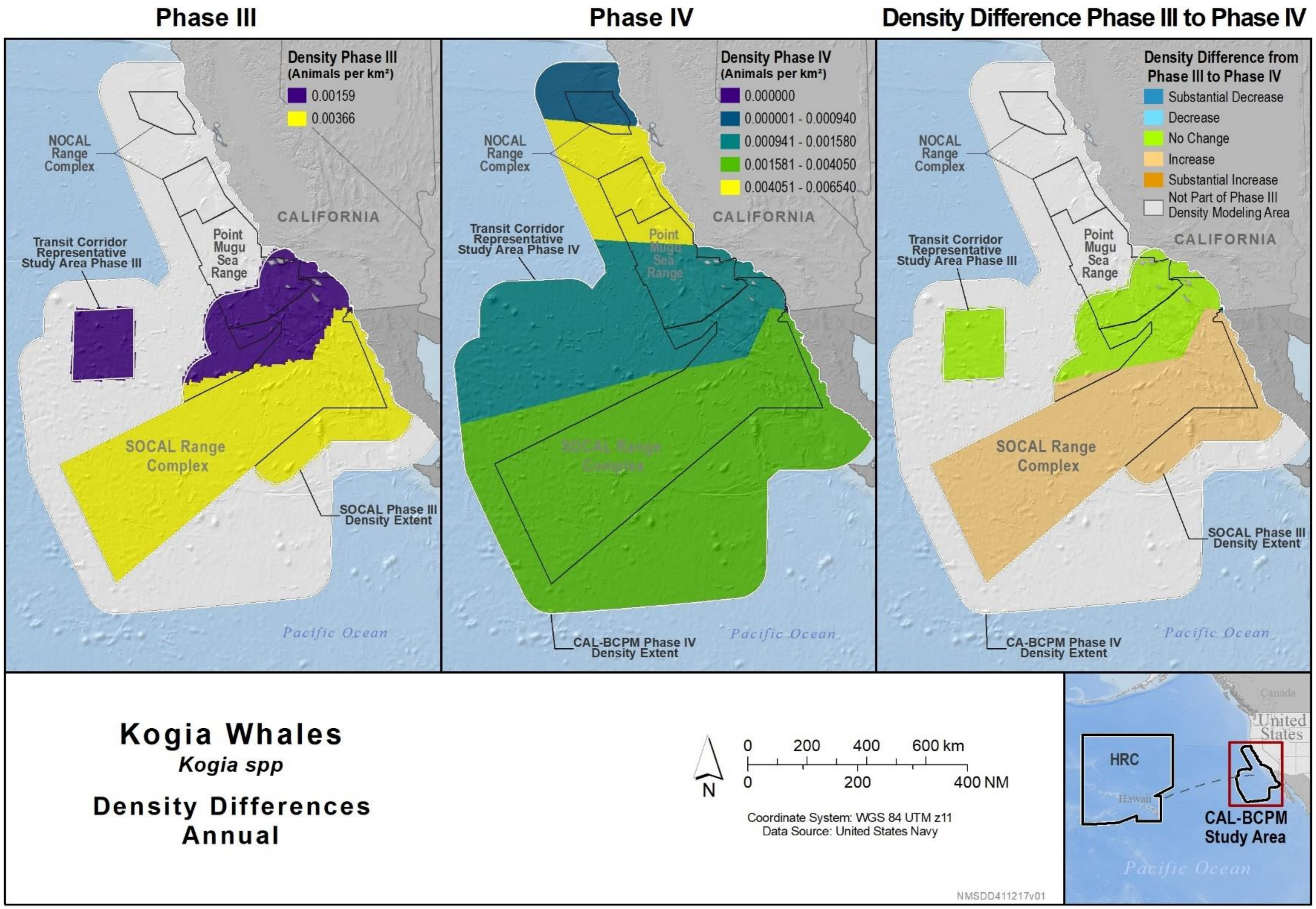

Figure A-38: *Kogia* spp. Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A “substantial” difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.2.3 *PHYSETER MACROCEPHALUS*, SPERM WHALE

HRC. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of updated sperm whale density estimates from model-based analyses (Becker et al., 2021). The new habitat-based density model for sperm whale used in Phase IV represents an improvement to the model available for Phase III (Forney et al., 2015) because it was based on more recent survey data, it more accurately accounted for variation in detection probabilities, and provided finer-scale density predictions (~9 km x 9 km resolution vs. the previous ~25 km x 25 km resolution). The greatest increase in density from Phase III to Phase IV is evident in the northwestern portion of the Hawaiian Islands EEZ. There was a decrease in density around the Main Hawaiian Islands and in the southeastern portion of the Hawaiian Islands EEZ.

CAL/BCPM. The Phase III NMSDD included data from a CCE habitat-based density model for sperm whales based on systematic survey data collected from 1991 to 2009 (Becker et al., 2012). For Phase IV, an updated CCE habitat-based density model for sperm whale was used that was developed using additional systematic survey data collected in summer and fall of 2014. Differences in model-based predictions used from Phase III to Phase IV are regionally variable in waters off Southern California, with a decrease in density within the eastern portion of the transit corridor. The greatest increase in density was along coastal waters of the Southern California Bight, but these waters are where density values are the lowest overall (see the left and middle panels of Figure A-39). For example, an individual 10 km X 10 km grid cell estimate increased from 0.00003 animals/km^2 in Phase III to 0.000200 animals/km^2 in Phase IV, resulting in the designation of a “substantial increase” in density, although both estimates are relatively very low for this species.

For waters off the Baja California Peninsula, a uniform density estimate for sperm whale of 0.00036 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which account for spatial variation in sperm whale distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV resulted in an overall increase in density in BCPM waters, particularly along the coast.

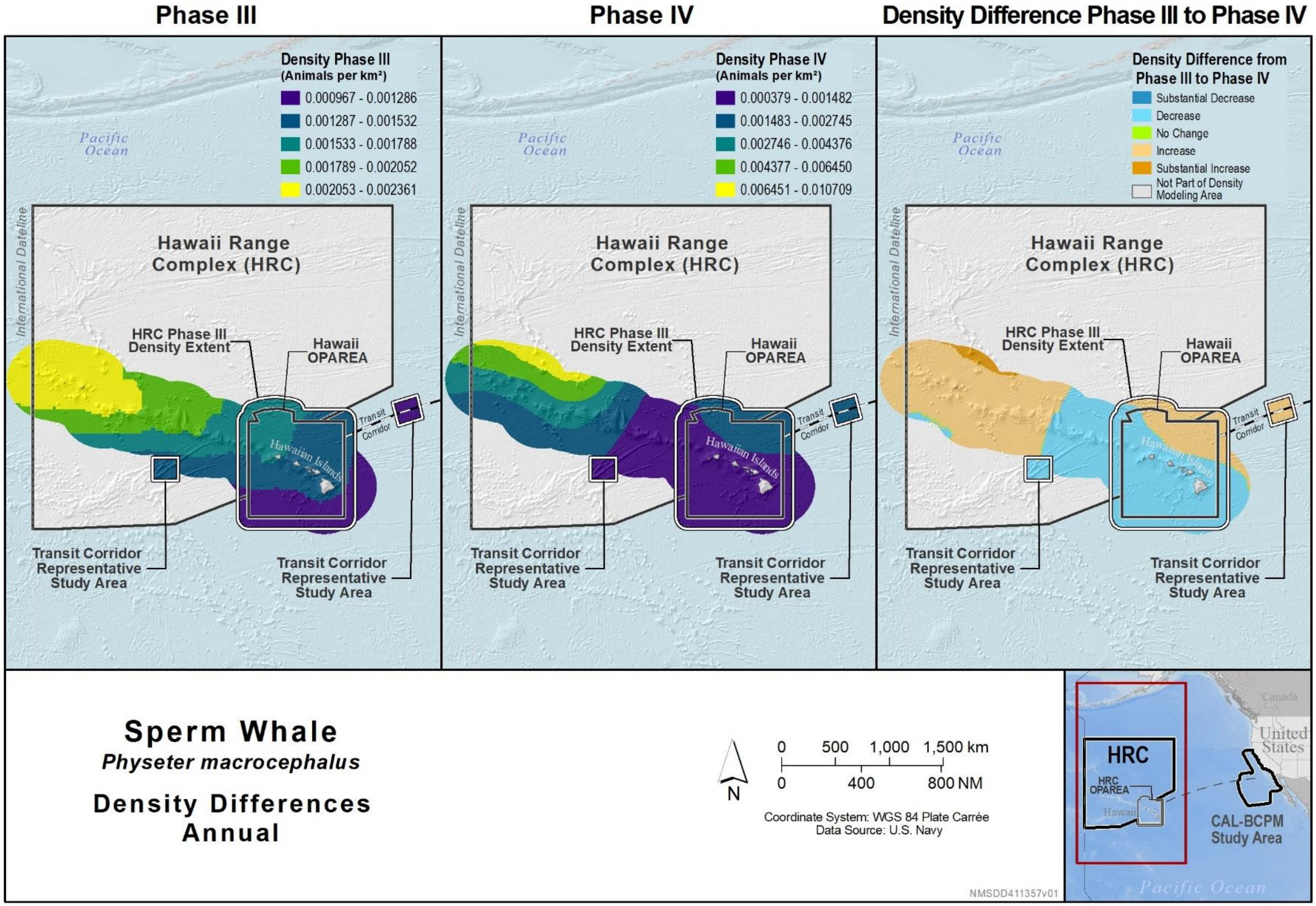

Figure A-39: Sperm Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

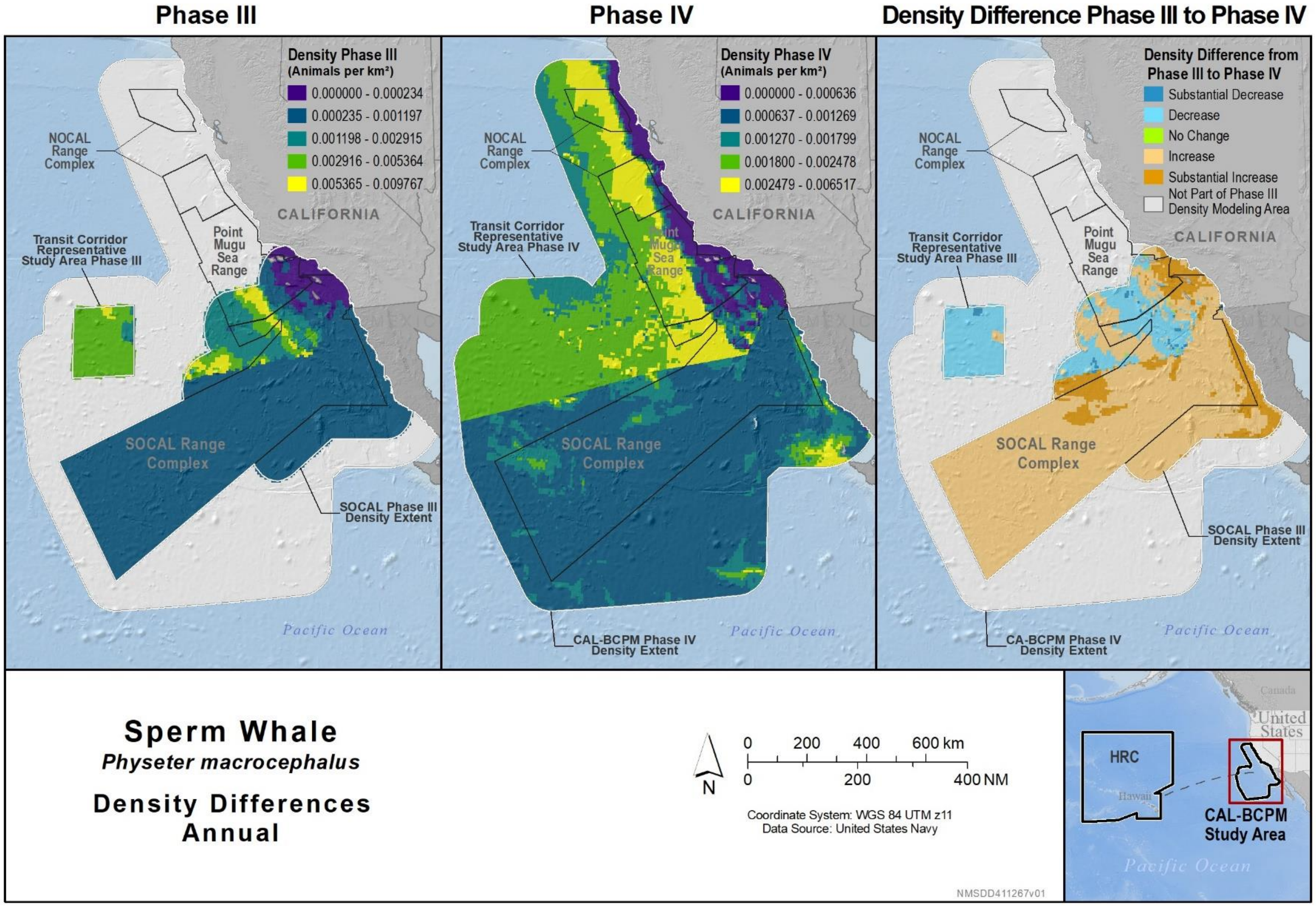

Figure A-40: Sperm Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3 DELPHINIDS (DOLPHINS)

A.1.3.1 *DELPHINUS DELPHIS BAIRDII*, LONG-BEAKED COMMON DOLPHIN[1]

HRC. This species is not expected to occur within the HRC study area or western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall model-based predictions for long-beaked common dolphin used from Phase III (Becker et al. 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. For Phase IV, some higher density estimates are predicted offshore, but given this species predominately nearshore distribution, these waters are where density values are the lowest overall (see the left and middle panels of Figures A-40 to A-42). For example, an individual 10 km X 10 km grid cell estimate increased from 0.00005 animals/km^2 in Phase III to 0.00010 animals/km^2 in Phase IV, resulting in the designation of a “substantial increase” in density, although both estimates are relatively very low for this species.

For Phase III, the Becker et al. (2016) model-based predictions were used to represent density year-round in waters of the Southern California Bight. For Phase IV, seasonally specific estimates for winter and spring were used based on habitat model predictions (Becker et al., In Prep.), resulting in lower density in waters over the continental shelf and some higher density estimates offshore, but as noted above, these offshore waters are where density values are lowest overall.

For waters off the Baja California Peninsula, a habitat model based on depth was used to represent annual density for Phase III (Gerrodette and Eguchi, (2011), which predicted that long-beaked common dolphins occur primarily inshore of the 250 meter isobath. For Phase IV, model-based predictions from Becker et al. (2022) were used to represent annual density in these waters. The Becker et al. (2022) models also included depth and captured this species largely nearshore distribution along the Baja California Peninsula. The recent model also included dynamic habitat predictors, which resulted in regionally variable density differences when compared to Phase III. In general, density estimates along the coast decreased, with an increase in density in deeper waters.

[1] The Society for Marine Mammalogy’s Committee on Taxonomy currently recognizes all common dolphins as a single species, *D. delphis*. Long-and short-beaked common dolphins are still recognized as separate subspecies, *D. delphis bairdii* and *D. delphis delphis*, respectively. In the future it is possible that they will again be recognized as separate species, but additional taxonomic analyses are required.

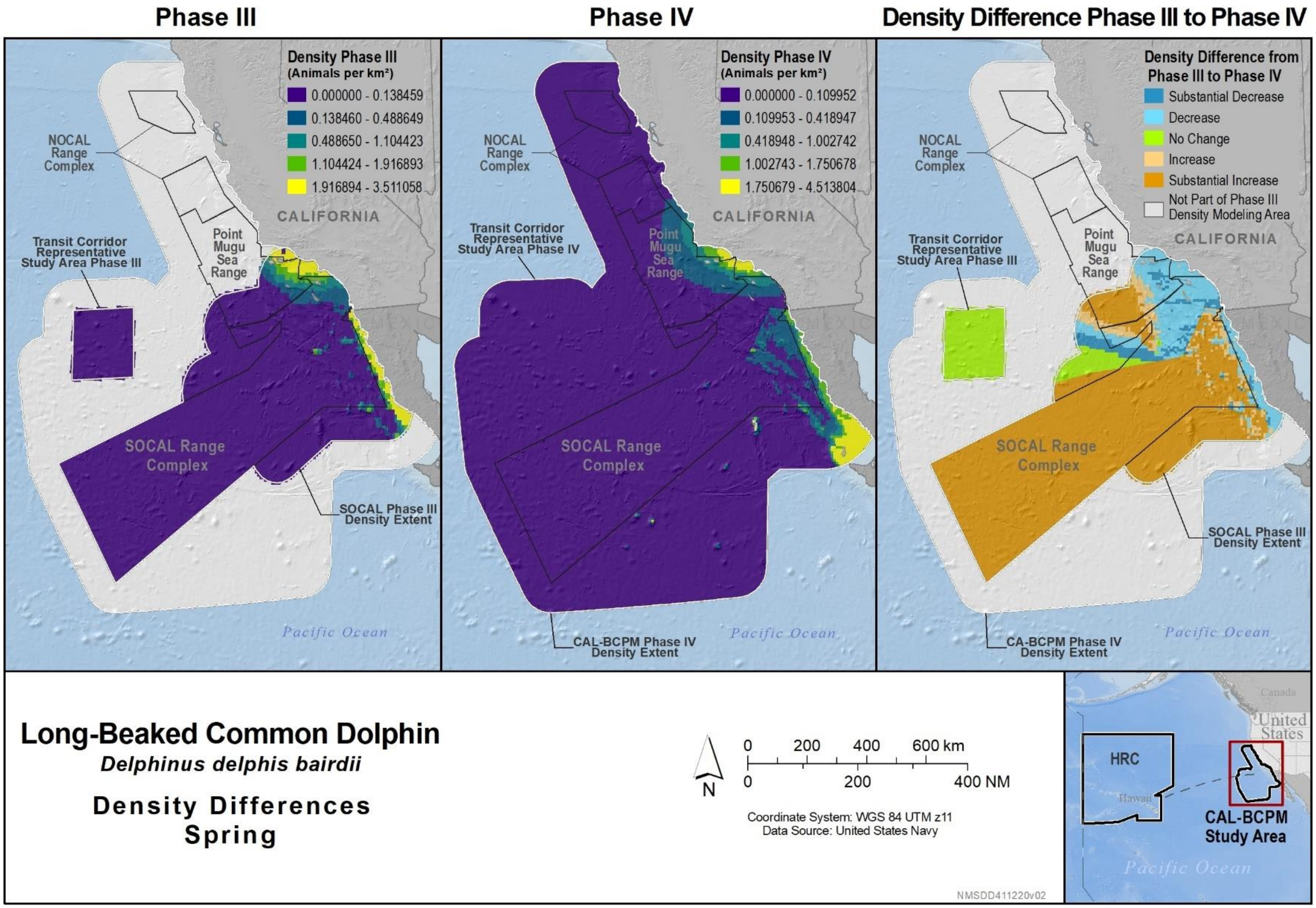

Figure A-41: Long-Beaked Common Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

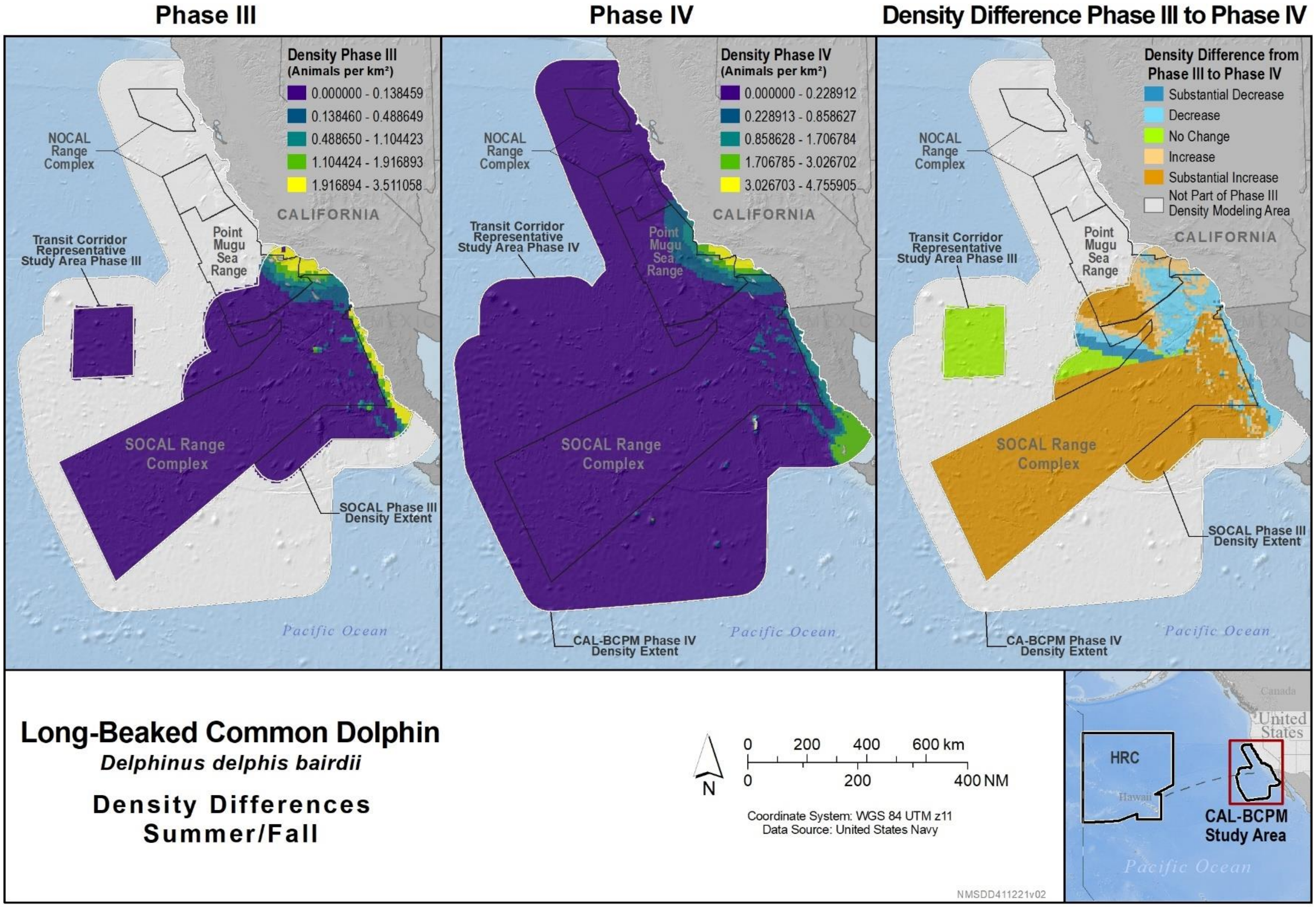

Figure A-42: Long-Beaked Common Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

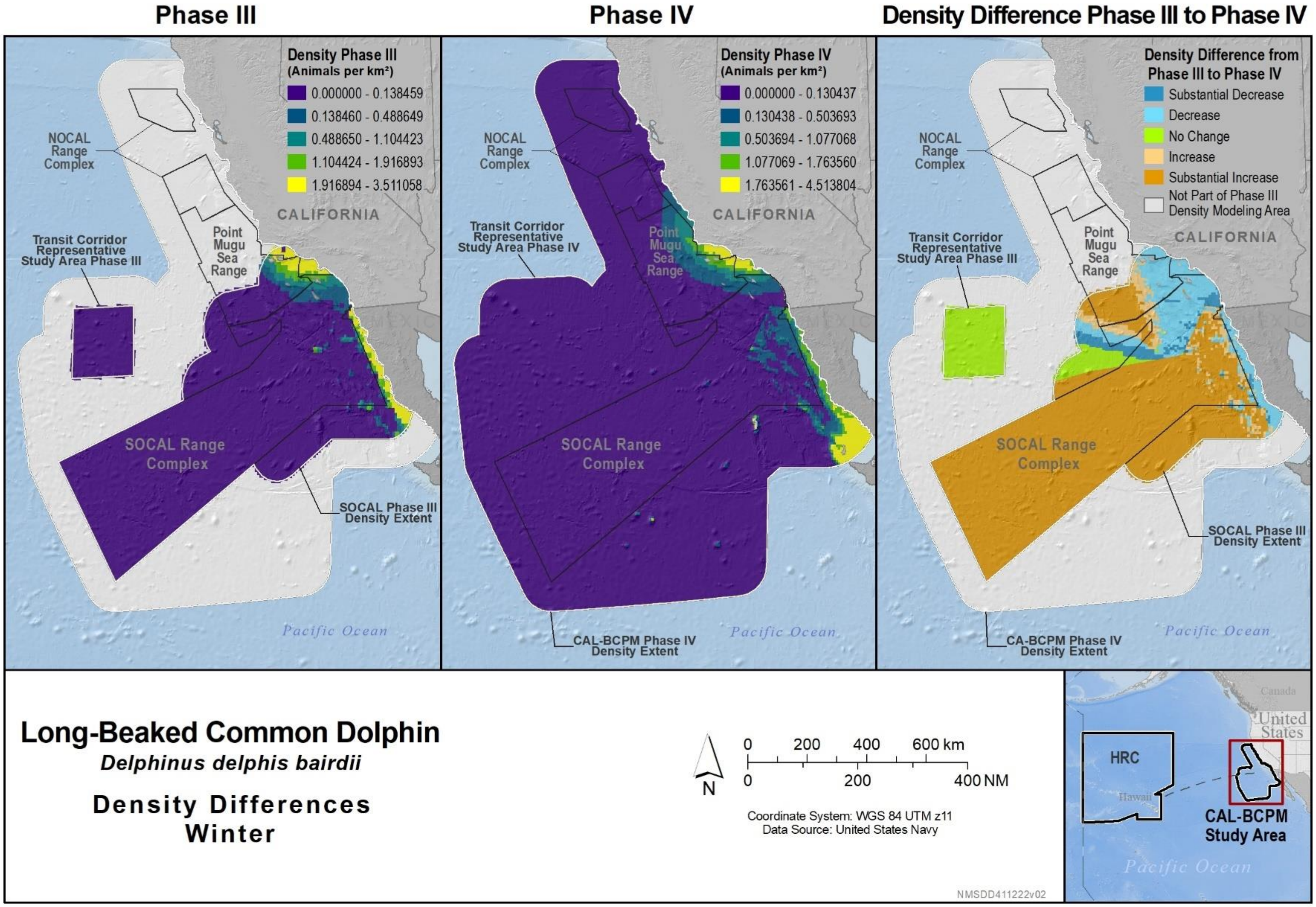

Figure A-43: Long-Beaked Common Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A “substantial” difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.2 *DELPHINUS DELPHIS DELPHIS*, SHORT-BEAKED COMMON DOLPHIN[2]

HRC. This species is not expected to occur within the HRC study area or western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Notable shifts in distribution over the last few decades have resulted in an increase in the number of short-beaked common dolphins in the CCE study area (Barlow, 2016; Becker et al., 2020; Becker et al., 2018). This increase is reflected in the differences in summer/fall model-based predictions used in Phase III (Becker et al., 2016) and Phase IV (Becker et al., 2020), as increases in density are predicted throughout the majority of the Southern California Bight and the eastern portion of the transit corridor.

Becker et al. (2017) provided the first winter/spring habitat-based density model for short-beaked common dolphin in Southern California waters, and predictions from this model were used in Phase III. For Phase IV, the Becker et al. (2017) Southern California habitat model was updated with more recent survey data, and the resulting model was used to make separate winter and spring predictions for the CCE study area (Becker et al., In Prep). Similar to the summer/fall model predictions, the more recent model predictions for winter and spring resulted in increases in density throughout the majority of the Southern California Bight and eastern portion of the transit corridor.

For waters off the Baja California Peninsula, a uniform density estimate for short-beaked common dolphin of 0.45049 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which account for spatial variation in short-beaked common dolphin distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV were used to represent density in BCPM waters year-round, and resulted in an increase in density in nearshore waters, particularly along the coast, and a decrease in density offshore.

[2] The Society for Marine Mammalogy's Committee on Taxonomy currently recognizes all common dolphins as a single species, *D. delphis*. Long-and short-beaked common dolphins are still recognized as separate subspecies, *D. delphis bairdii* and *D. delphis delphis*, respectively. In the future it is possible that they will again be recognized as separate species, but additional taxonomic analyses are required.

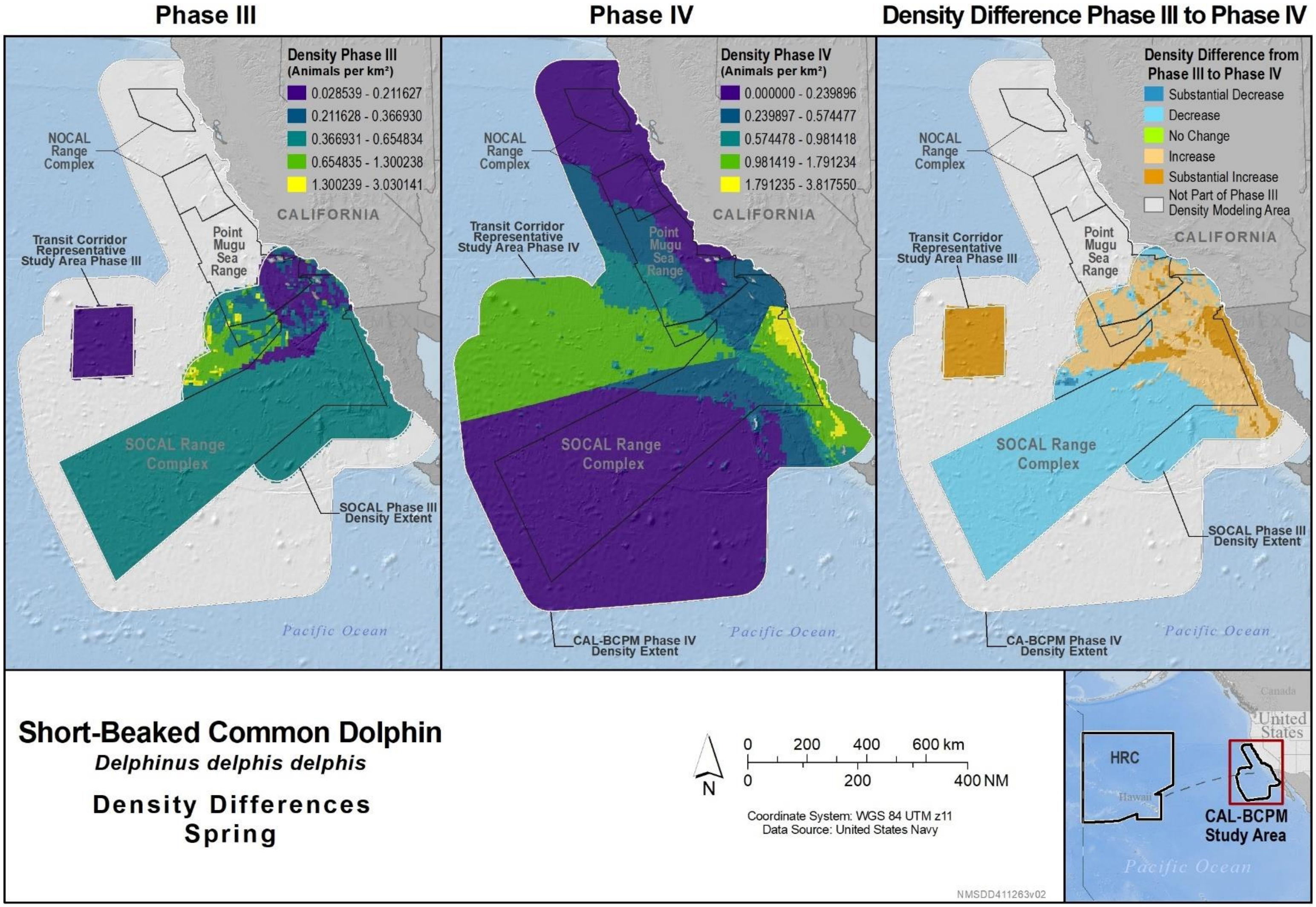

Figure A-44: Short-Beaked Common Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

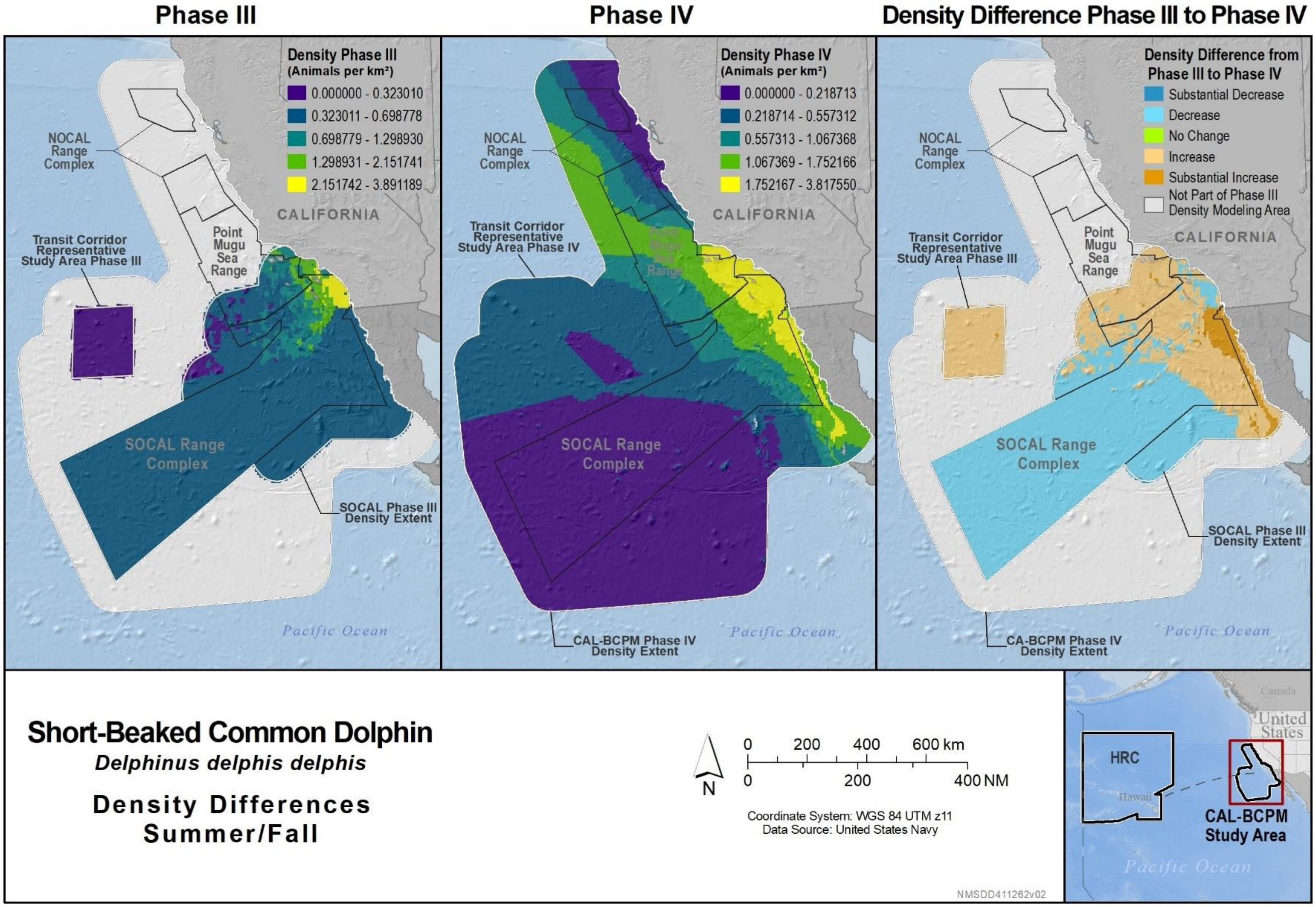

Figure A-45: Short-Beaked Common Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A “substantial” difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

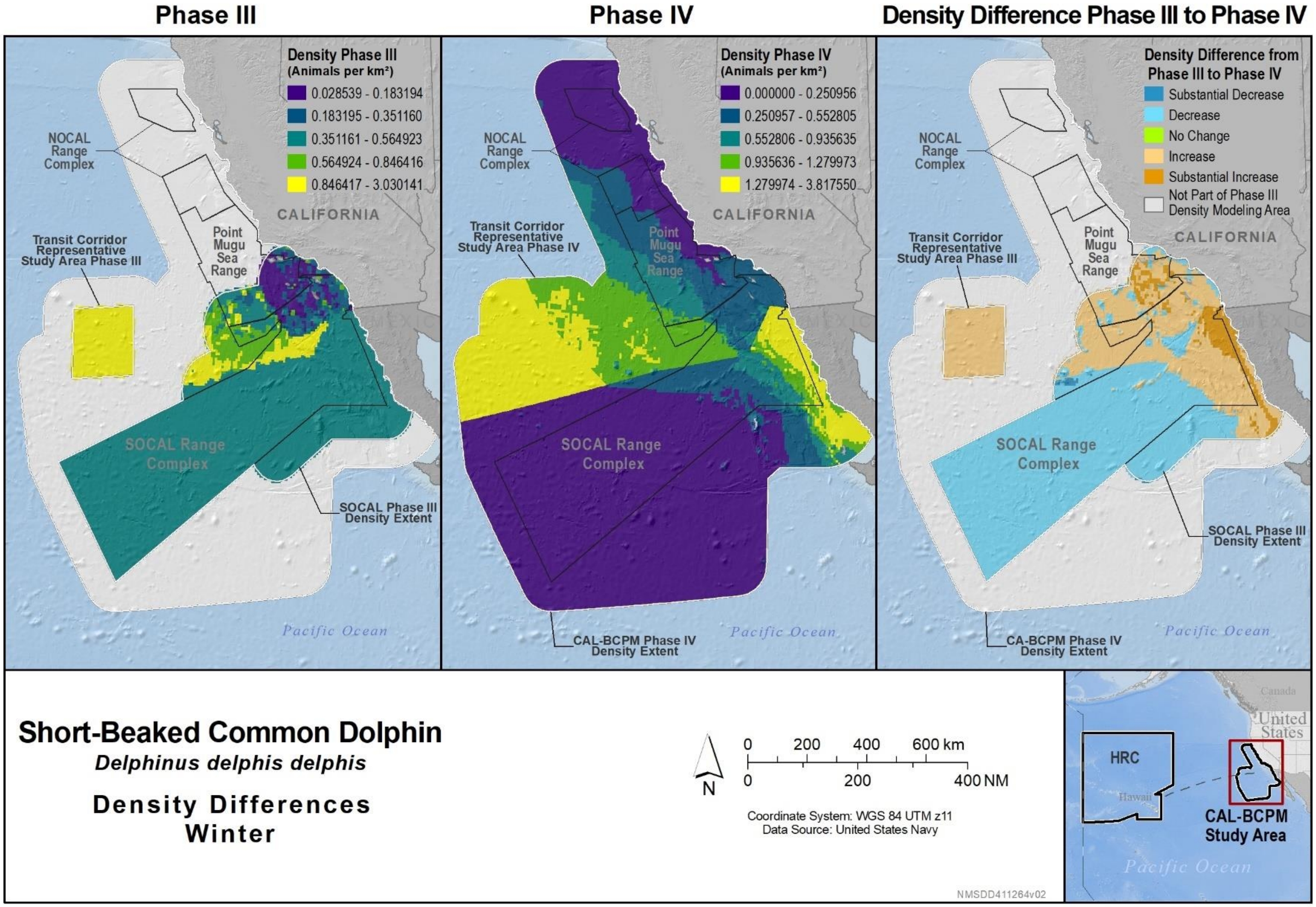

Figure A-46: Short-Beaked Common Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.3 *Feresa attenuata*, Pygmy Killer Whale

HRC*.* The design-based density estimate used in Phase IV was slightly lower (0.0042 animals/km^2) than that used previously in the Navy's Phase III analyses (0.0044 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. The same uniform density estimate of 0.00072 animals/km^2 for summer and fall (Barlow, 2016) was used in both the Phase III and Phase IV analyses.

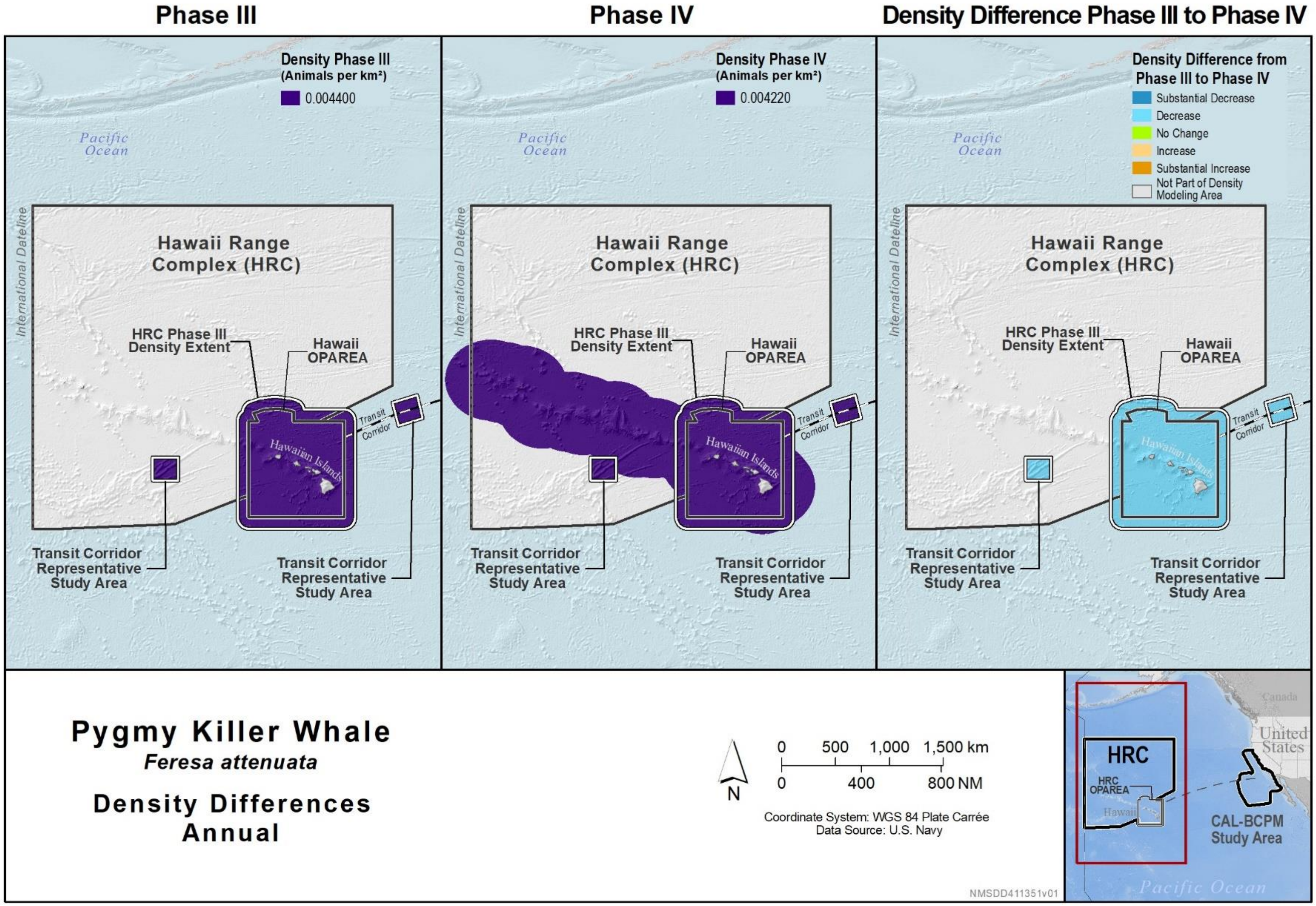

Figure A-47: Pygmy Killer Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

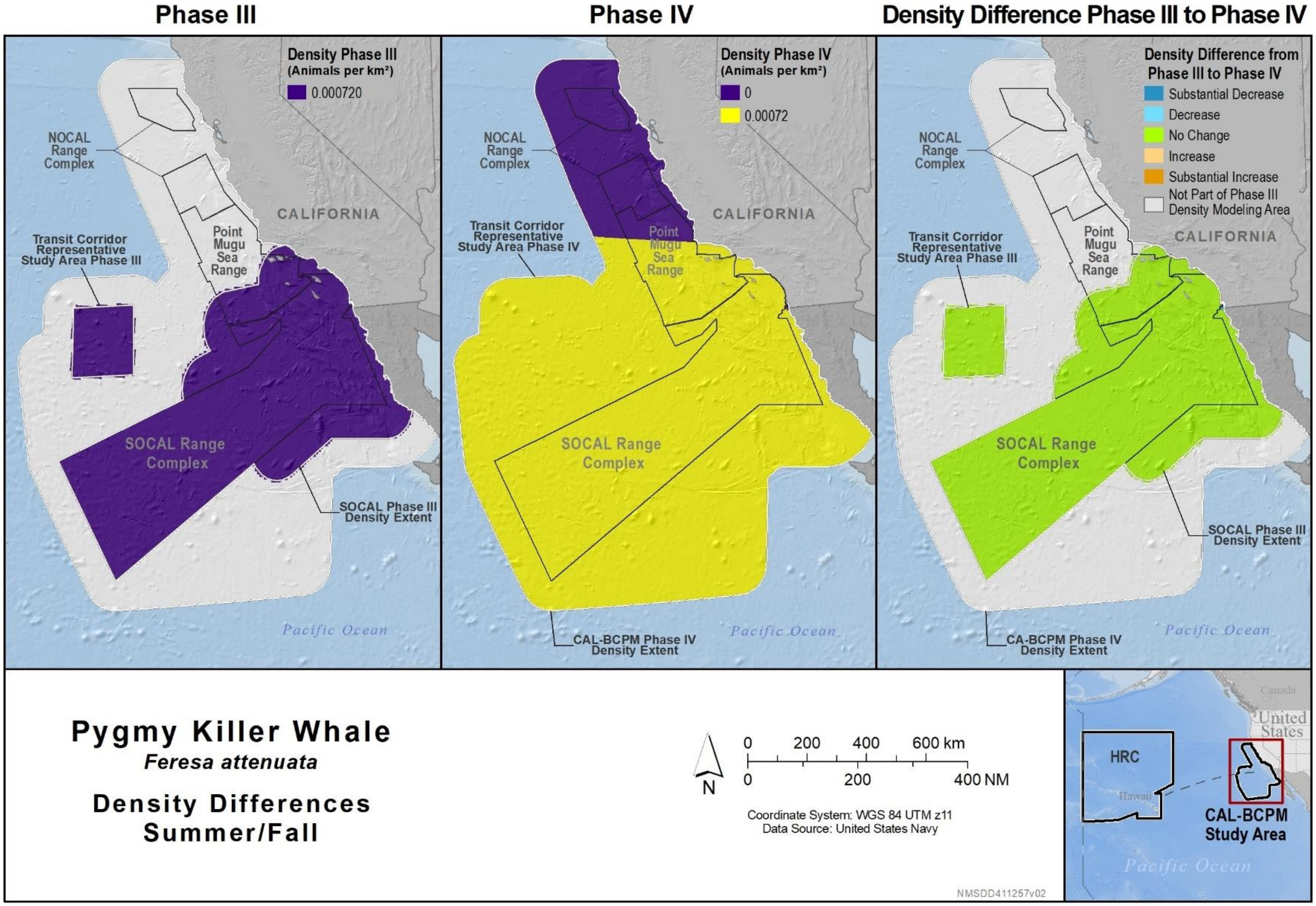

Figure A-48: Pygmy Killer Whale Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.4 *GLOBICEPHALA MACRORHYNCHUS*, SHORT-FINNED PILOT WHALE

HRC. The Hawaiian Islands EEZ abundance estimates derived from recent SDMs (Becker et al., 2022b) and used in Phase IV were generally greater than those used for Phase III (Forney et al., 2015), in part because they more accurately accounted for variation in detection probabilities and calibrated group size estimates were used in the more recent analysis. The habitat-based models of cetacean density used in Phase IV also provided finer-scale density predictions than Phase III (~9 km x 9 km vs. ~25 km x 25 km grid resolution). The greatest increase in density is evident around the Main and Northwestern Hawaiian Islands.

CAL/BCPM. Barlow (2016) provided a stratified uniform density estimate for short-finned pilot whale of 0.00126 animals/km^2 for waters off Southern California and this estimate was used in both the Phase III and Phase IV analyses.

Ferguson and Barlow (2003) provided short-finned pilot whale density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a short-finned pilot whale density estimate of 0.00021 animals/km^2 that was slightly lower than the 0.00038 animals/km^2 estimate used for Phase III.

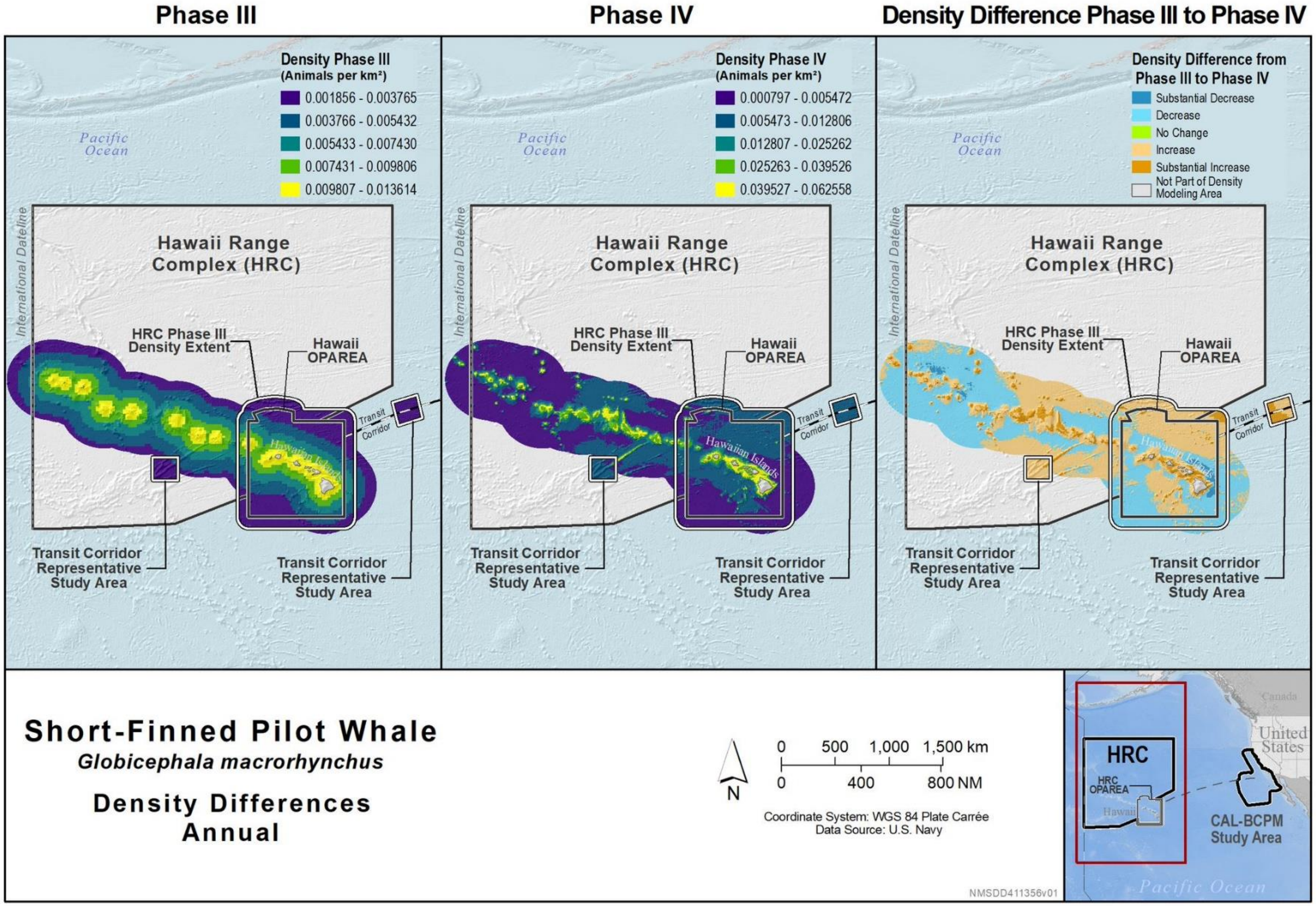

Figure A-49: Short-Finned Pilot Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

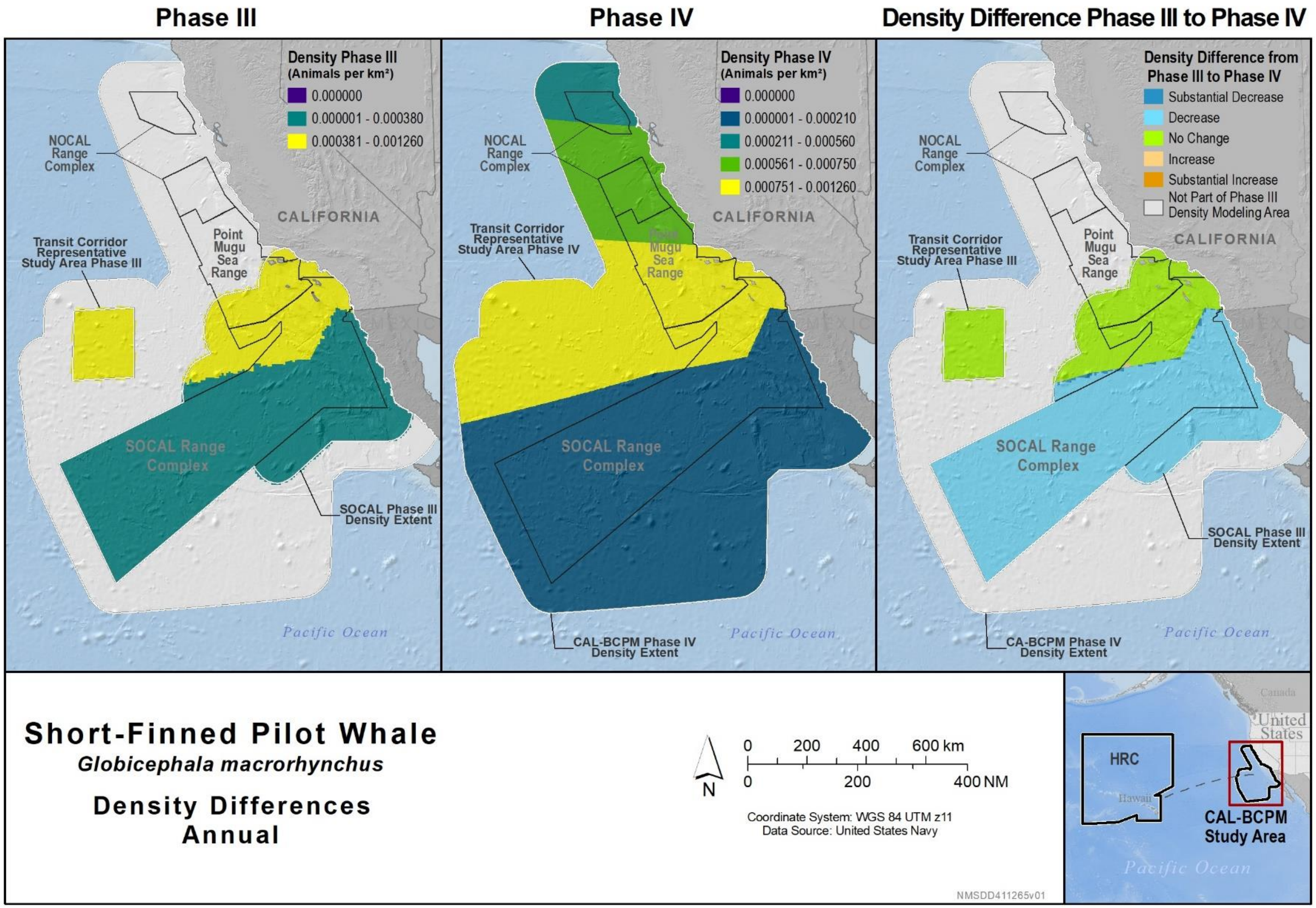

Figure A-50: Short-Finned Pilot Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.5 *GRAMPUS GRISEUS*, RISSO'S DOLPHIN

HRC. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of the first habitat-based density models for Risso's dolphin in this study area (Becker et al., 2022b; Becker et al., 2021). The new habitat-based density model for Risso's dolphin accounts for spatial variation in Risso's dolphin distribution that the previous uniform density estimate did not (Bradford et al., 2017), resulting in regionally variable differences in density estimates from Phase III to Phase IV.

CAL/BCPM. To improve density estimates for Phase IV, the Navy funded an analysis to develop habitat-based density models for the Southern California Current, an ecologically meaningful study area that extends from Point Conception to the tip of the Baja California Peninsula. Resulting models provide the first spatially explicit estimates of Risso's dolphin density for waters off the Baja California peninsula (Becker et al., 2022a), and were applied to the HCTT study area south of Point Conception. The new model resulted in regionally variable density differences in waters of the Southern California Bight compared to the CCE model used in Phase III (Becker et al., 2016). Density increased within the eastern portion of the transit corridor in summer/fall; however, these waters are where density values are the lowest overall (see the left and middle panels of Figure A-52). For example, an individual 10 km X 10 km grid cell estimate increased from 0.00100 animals/km^2 in Phase III to 0.00300 animals/km^2 in Phase IV, resulting in an increase in density, although both estimates are relatively very low for this species.

For waters off the Baja California Peninsula, a uniform density estimate for Risso's dolphin of 0.00532 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which accounted for spatial variation in Risso's dolphin distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV were used to represent density in BCPM waters year-round, and resulted in a general increase in density, particularly along the coast.

To produce density estimates for the cool season, the most recent CCE Risso's dolphin model was used to derive separate winter and spring estimates for waters off the U.S. West Coast (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when stratified uniform density estimates based on aerial line-transect data collected in winter and spring of 1991 and 1992 were used (Forney et al., 1995). The new model-based analyses provide spatially explicit estimates which better capture species distribution patterns, resulting in a general decrease in density within the Southern California Bight and waters further offshore, including those within the eastern portion of the transit corridor.

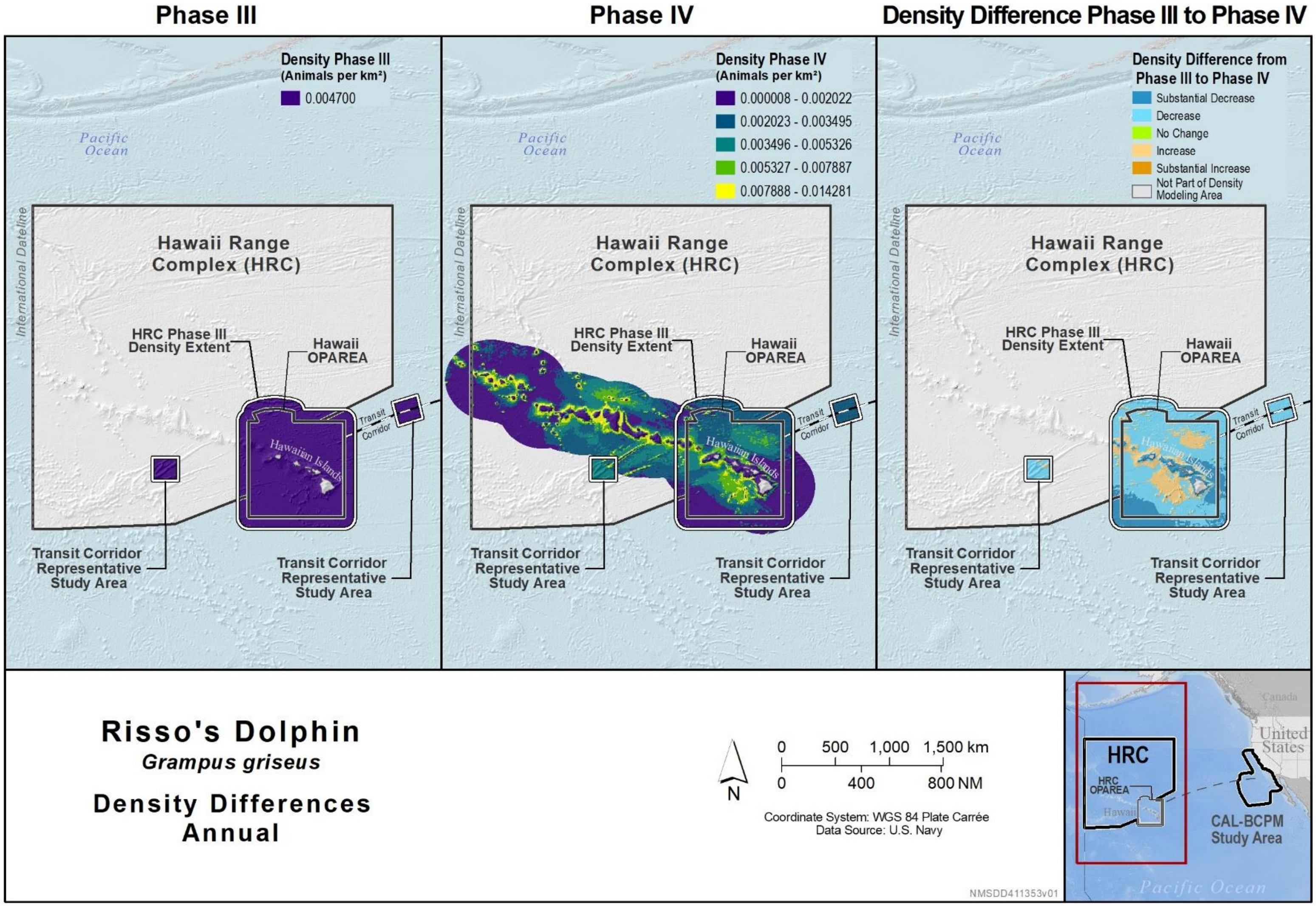

Figure A-51: Risso's Dolphin Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

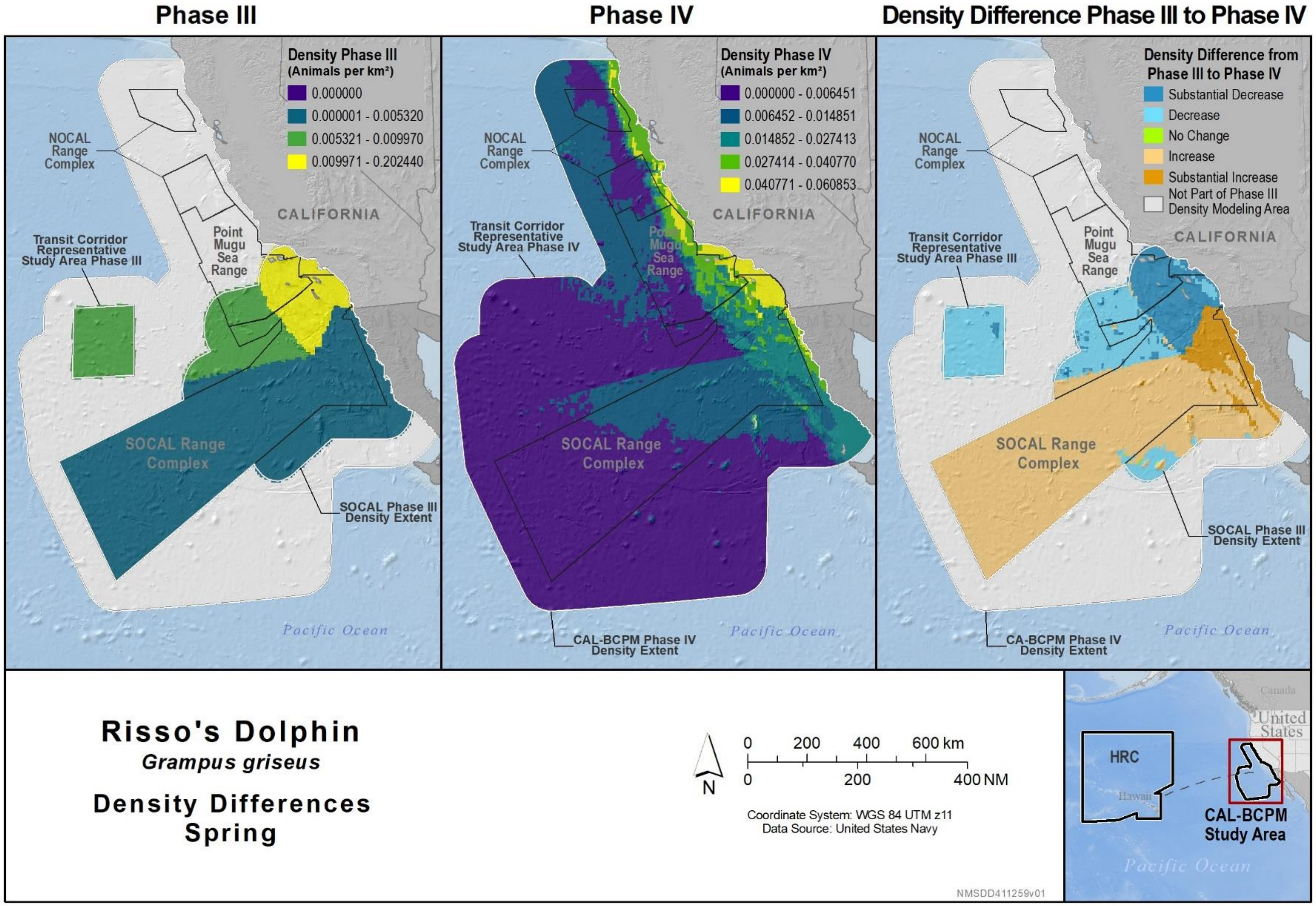

Figure A-52: Risso's Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

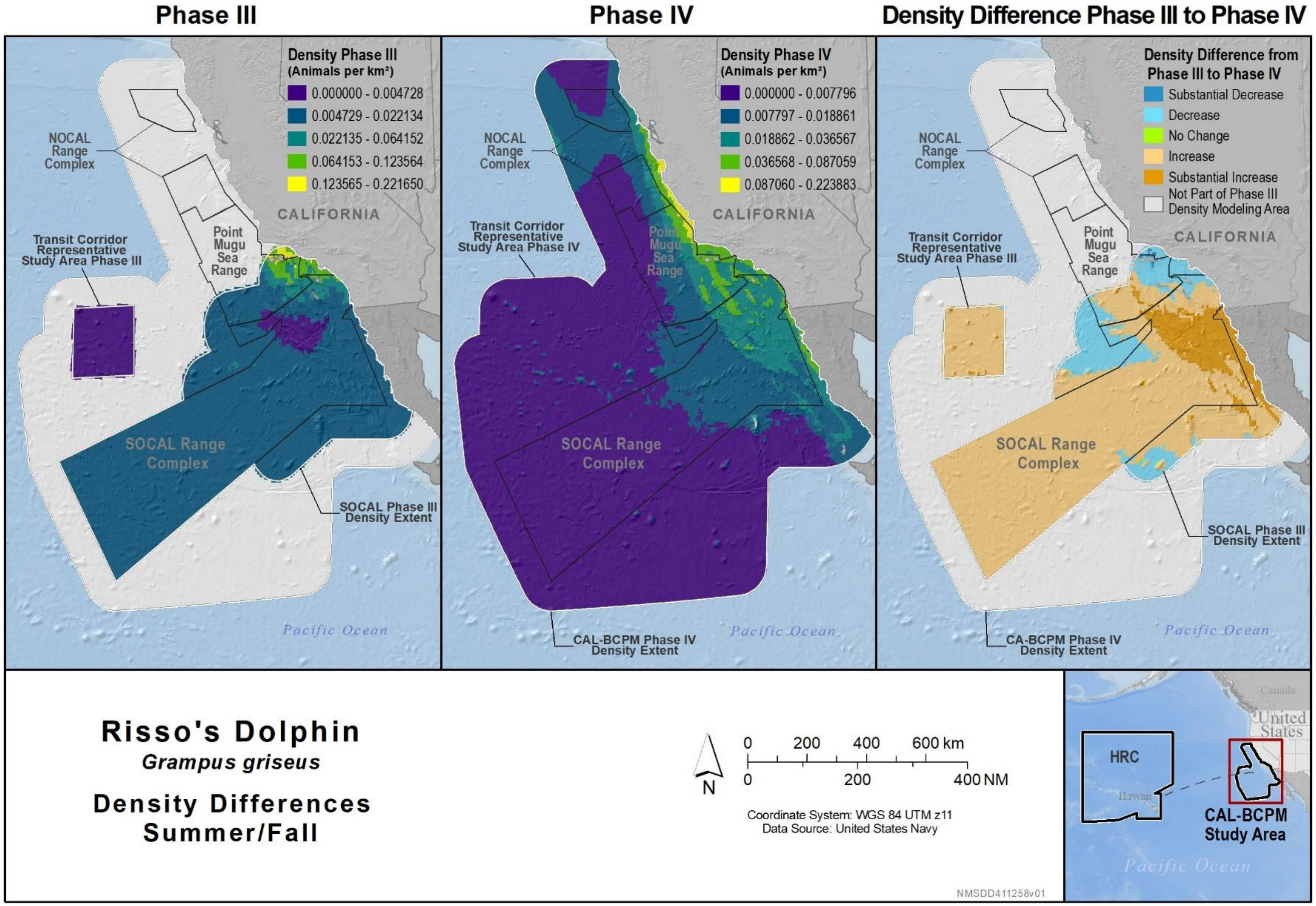

Figure A-53: Risso's Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

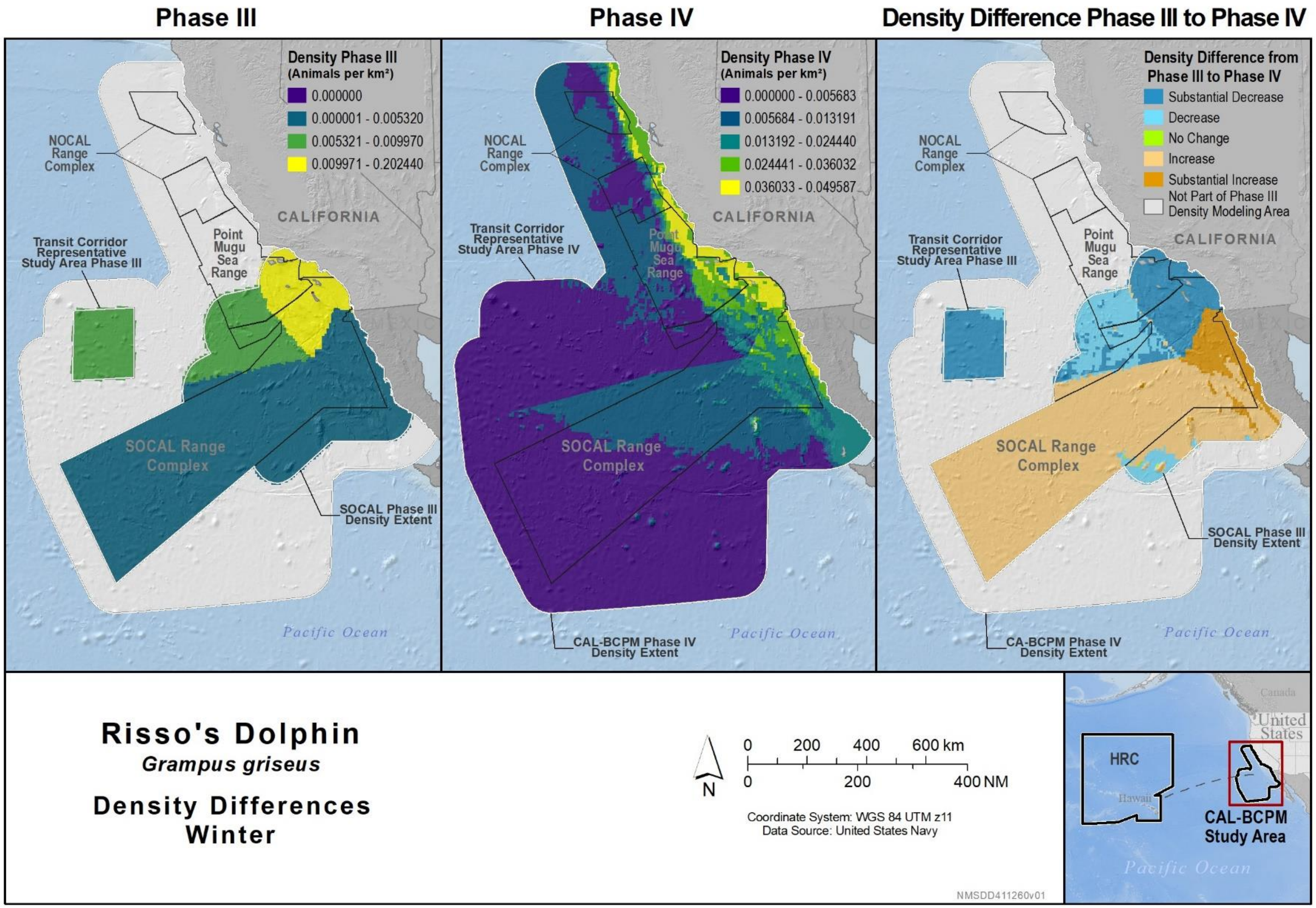

Figure A-54: Risso's Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.6 *Lagenodelphis hosei*, Fraser's Dolphin

HRC. The design-based density estimate used in Phase IV was slightly lower (0.01673 animals/km^2) than that used previously in the Navy's Phase III analyses (0.0210 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. This species has not been observed on NMFS surveys in the CAL/BCPM area (Barlow, 2016; Hamilton et al., 2009) and they are not expected to occur there or in the eastern portion of the transit corridor.

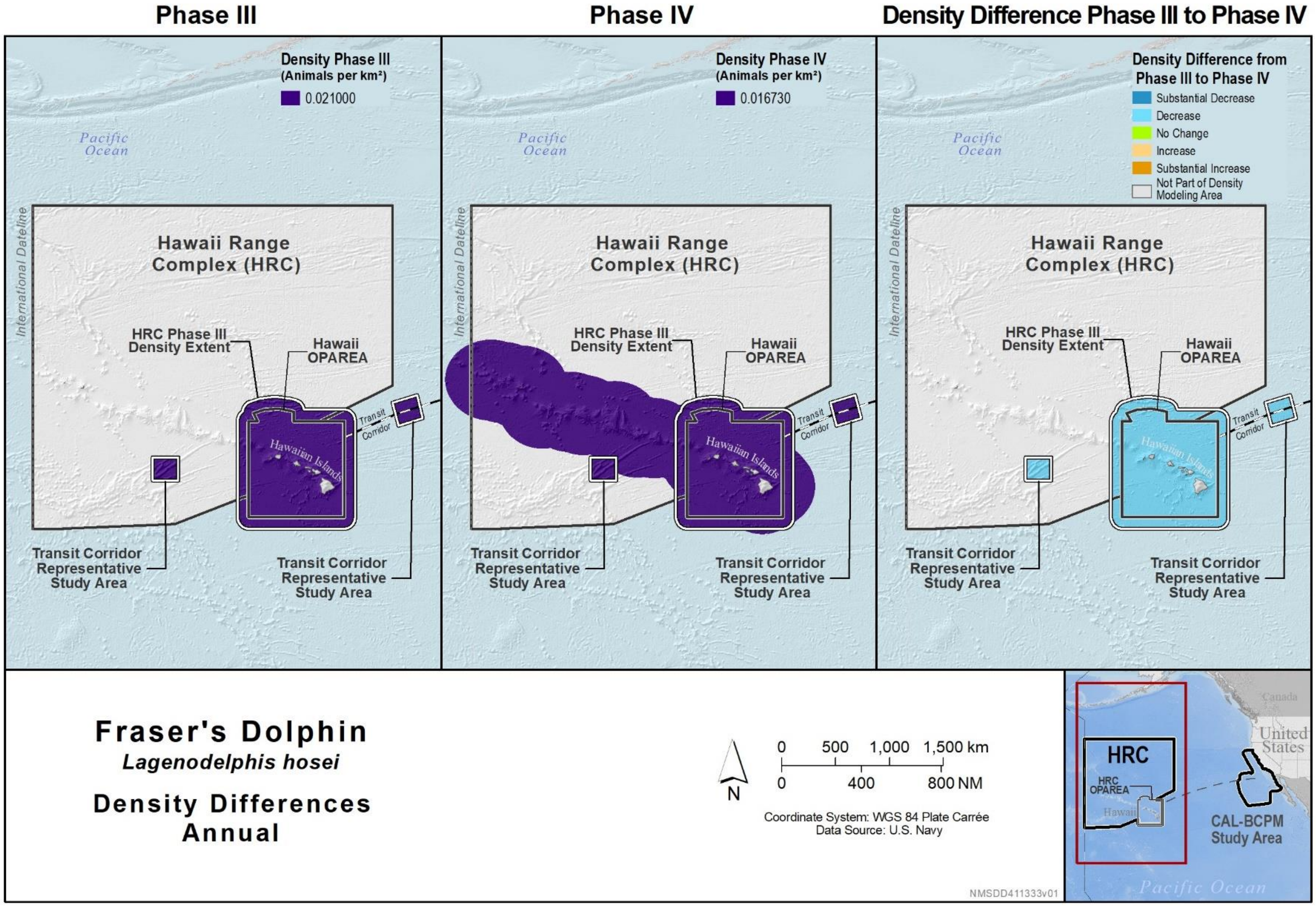

Figure A-55: Fraser's Dolphin Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.7 *LAGENORHYNCHUS OBLIQUIDENS*, PACIFIC WHITE-SIDED DOLPHIN

HRC. This species is not expected to occur within the HRC study area or western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall model-based predictions used from Phase III (Becker et al. 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. For Phase IV, density estimates increased around the Channel Islands and in some areas over the continental shelf and decreased in offshore waters and within the eastern portion of the transit corridor.

To produce density estimates for the cool season, the most recent CCE Pacific white-sided dolphin model was used to derive separate winter and spring estimates for waters off the U.S. West Coast (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when seasonally stratified uniform density estimates were used (Campbell et al., 2015). The new model-based analyses provide spatially explicit estimates which better capture species distribution patterns, resulting in a general increase in density within nearshore waters of the Southern California Bight, particularly in spring, and a decrease in waters further offshore and within the eastern portion of the transit corridor.

For waters off the Baja California Peninsula, a uniform density estimate for Pacific white-sided dolphin of 0.00690 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which accounted for spatial variation in Pacific white-sided dolphin distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV were used to represent density in BCPM waters year-round, and resulted in an increase in density along the coast and a decrease in offshore waters.

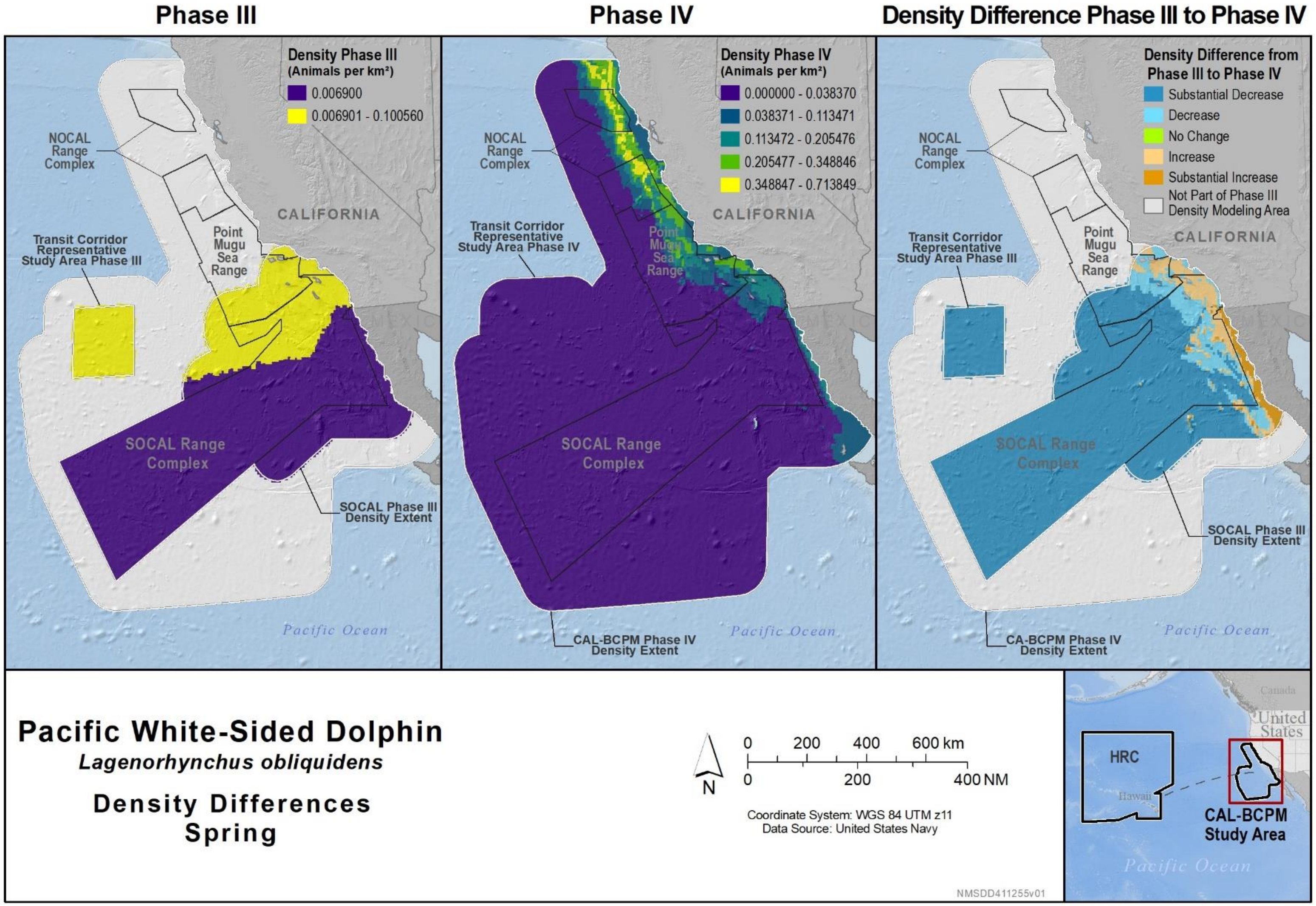

Figure A-56: Pacific White-Sided Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

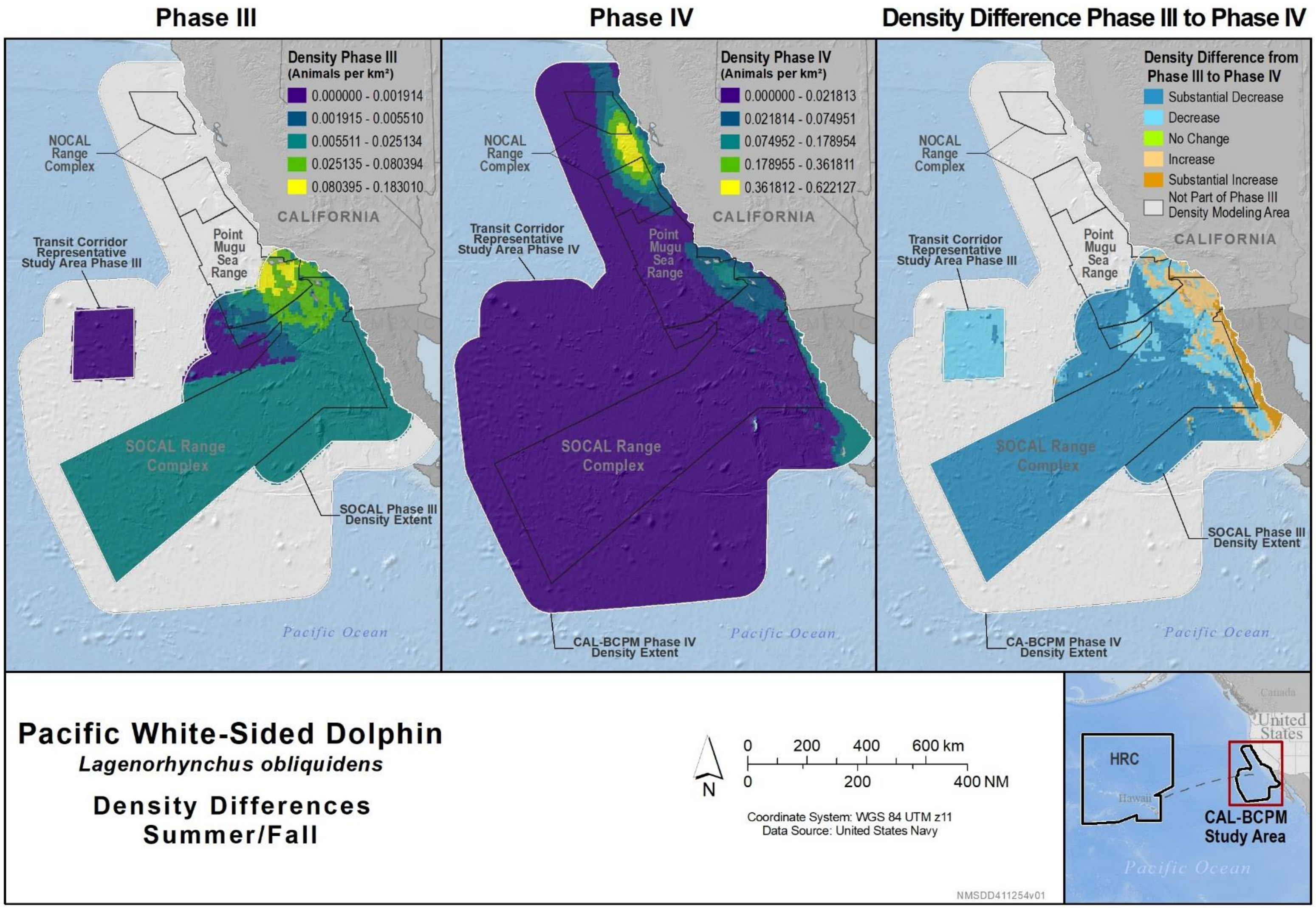

Figure A-57: Pacific White-Sided Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

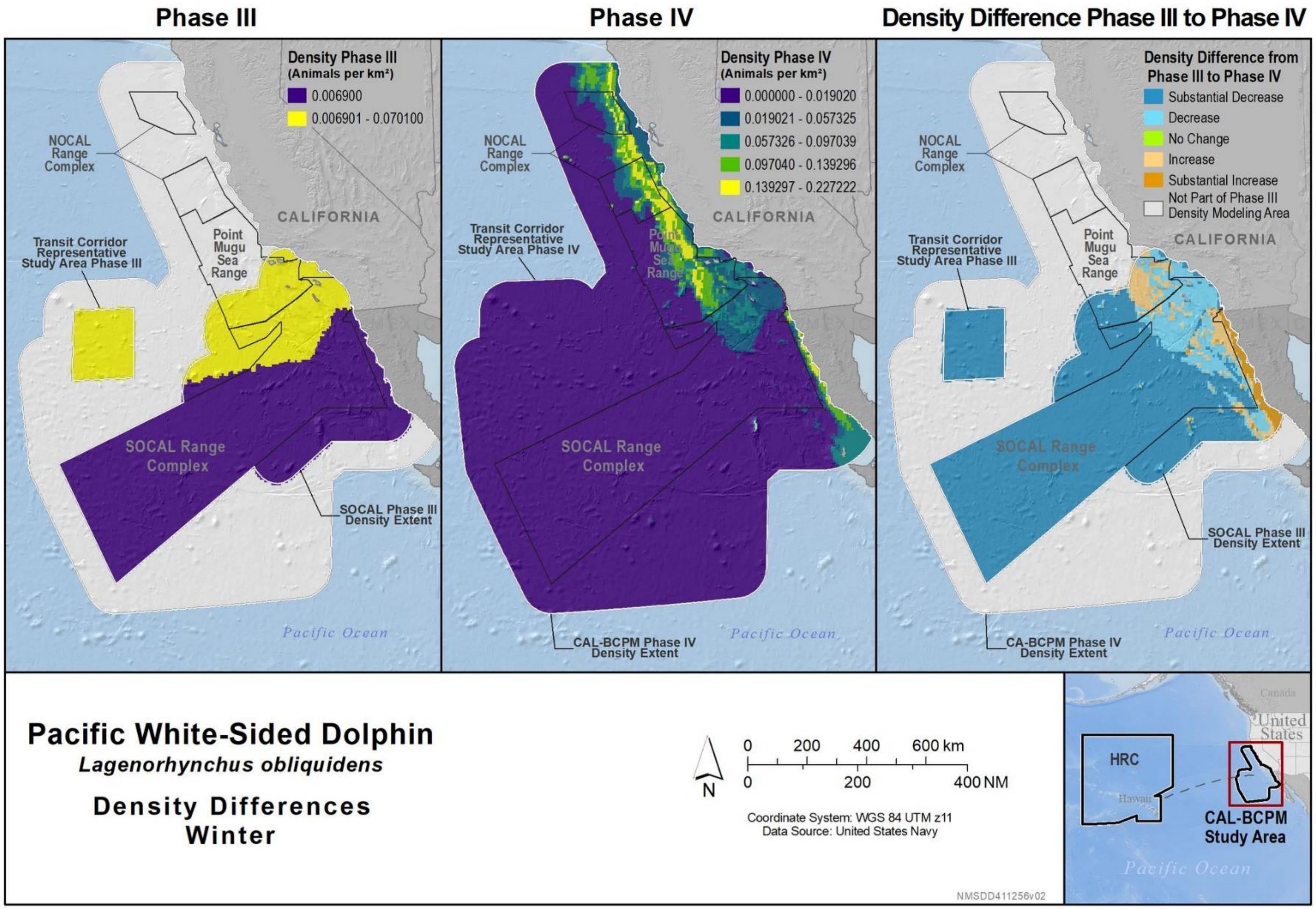

Figure A-58: Pacific White-Sided Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.8 *LISSODELPHIS BOREALIS*, NORTHERN RIGHT WHALE DOLPHIN

HRC. This species is not expected to occur within the HRC study area or western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall model-based predictions used from Phase III (Becker et al. 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. For Phase IV, density estimates generally decreased in waters over the continental shelf and offshore waters within the eastern portion of the transit corridor and increased in a small swath between these regions.

To produce density estimates for the cool season, the most recent CCE northern right whale dolphin model was used to derive separate winter and spring estimates for waters off the U.S. West Coast (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when stratified uniform density estimates based on aerial line-transect data collected in winter and spring of 1991 and 1992 were used (Forney et al., 1995). The new model-based analyses provided spatially explicit estimates which better capture species distribution patterns and resulted in a decrease in density within the Southern California Bight and the eastern portion of the transit corridor.

Ferguson and Barlow (2003) provided northern right whale dolphin density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a northern right whale dolphin density estimate of 0.00357 animals/km^2 that was slightly lower than the 0.00645 animals/km^2 estimate used for Phase III.

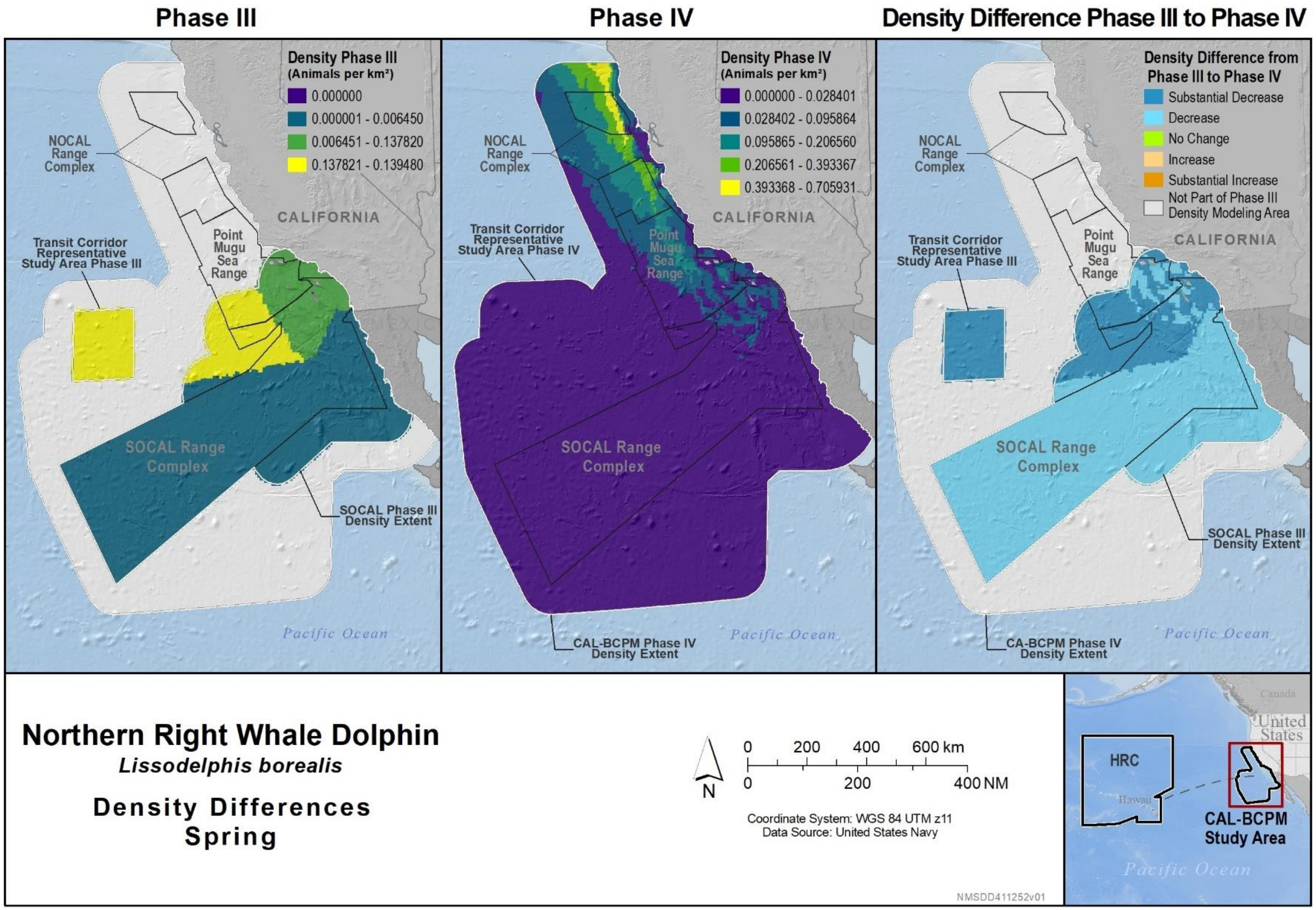

Figure A-59: Northern Right Whale Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

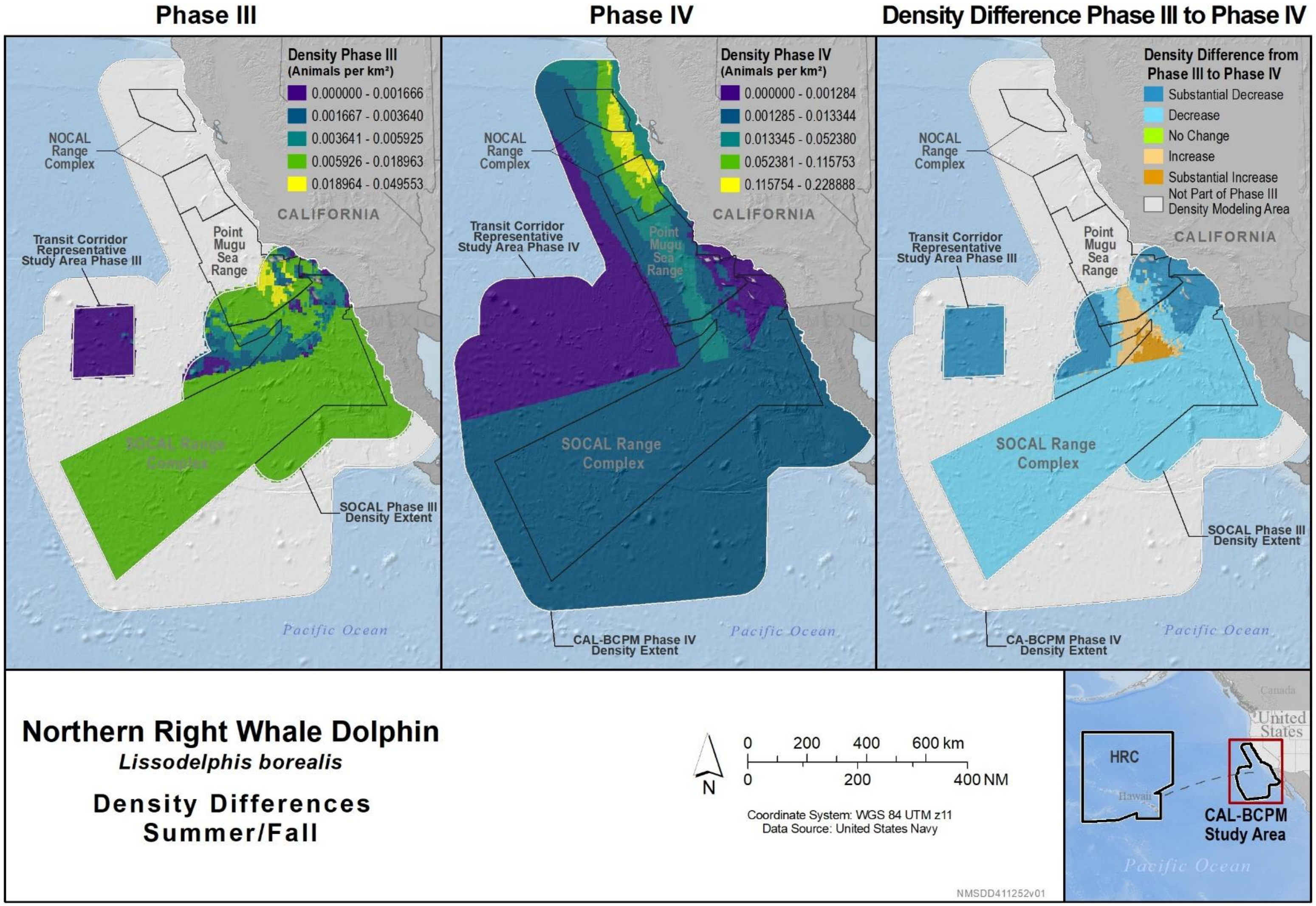

Figure A-60: Northern Right Whale Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

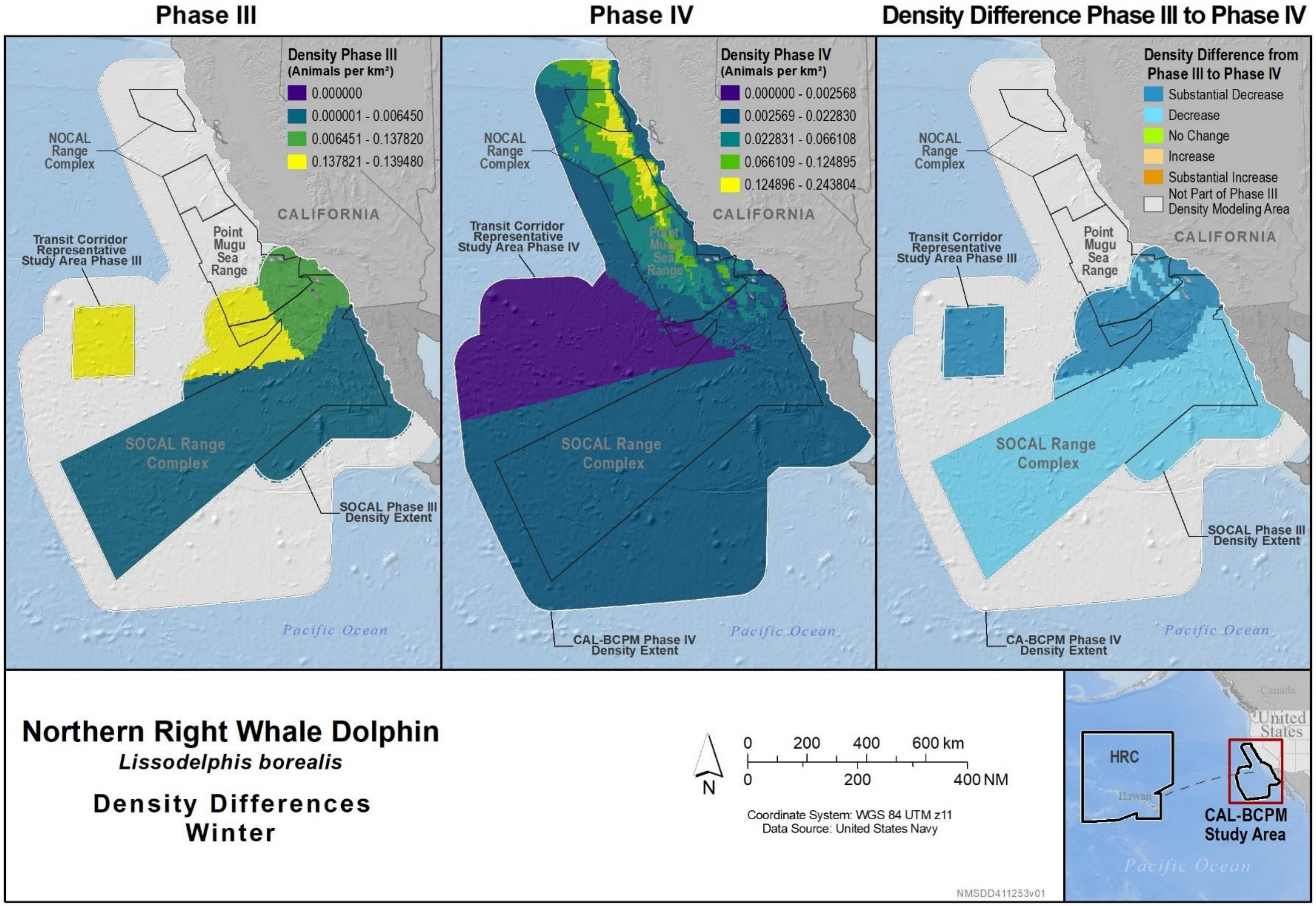

Figure A-61: Northern Right Whale Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.9 *ORCINUS ORCA*, KILLER WHALE

HRC. The design-based density estimate used in Phase IV was slightly higher (0.00007 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00006 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. The range of the Eastern North Pacific Southern Resident Stock of killer whales does not typically extend south of Monterey Bay (Carretta et al., 2019; Ford et al., 2000; Hanson et al., 2018), so density estimates for this stock were not included in the Phase III analyses for the HSTT Study Area.

Due to the difficulties associated with reliably distinguishing the different stocks of killer whales from at-sea sightings, density estimates for the rest of the stocks were treated as a whole (i.e., includes the Offshore and West Coast Transient stocks). Barlow (2016) provided a stratified uniform density estimate for killer whale of 0.00013 animals/km^2 for waters off Southern California, and this value was used to represent density year-round for both the Phase III and Phase IV analyses.

Ferguson and Barlow (2003) provided killer whale density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a killer whale density estimate of 0.00005 animals/km^2 that was slightly lower than the 0.00009 animals/km^2 estimate used for Phase III.

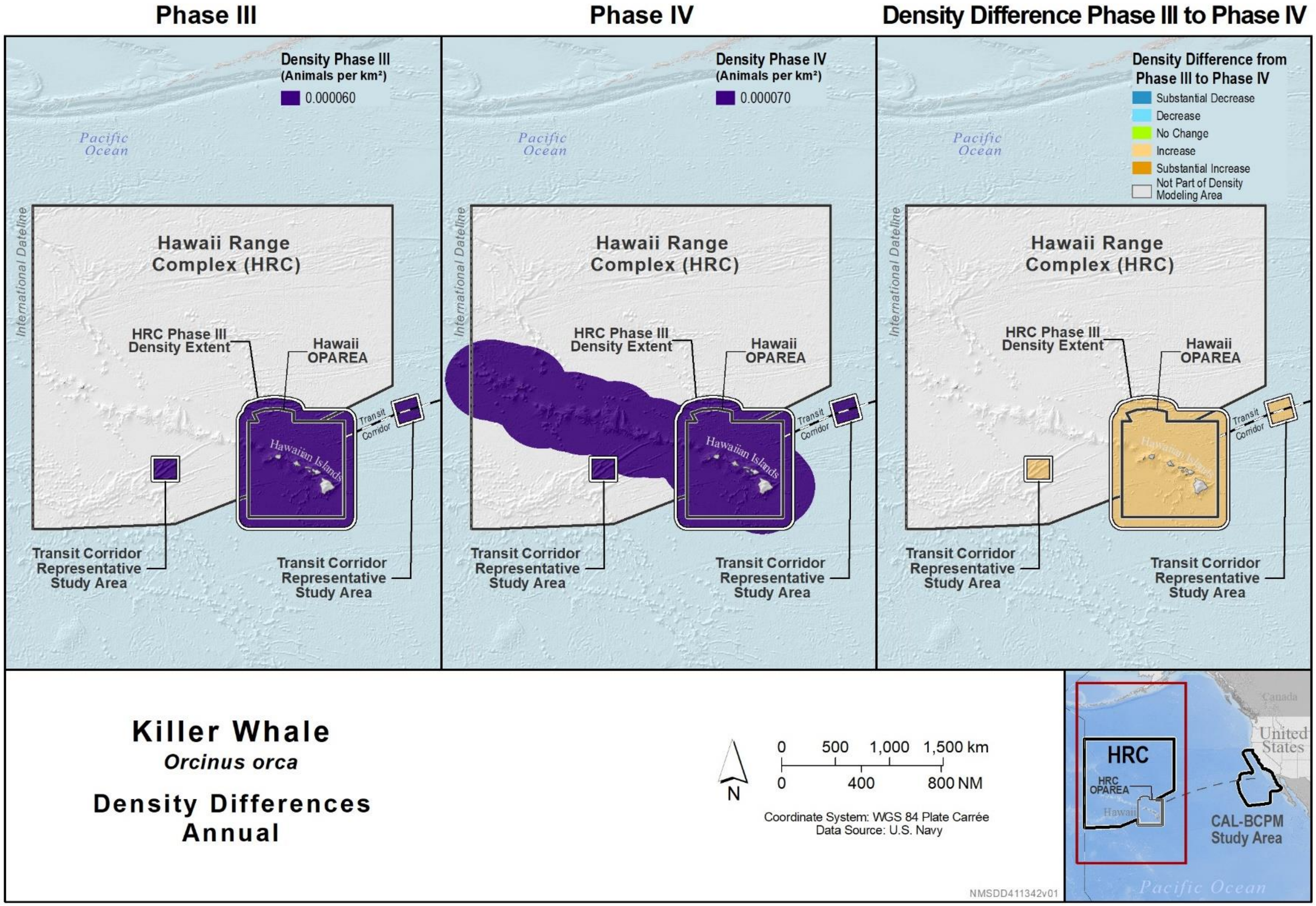

Figure A-62: Killer Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

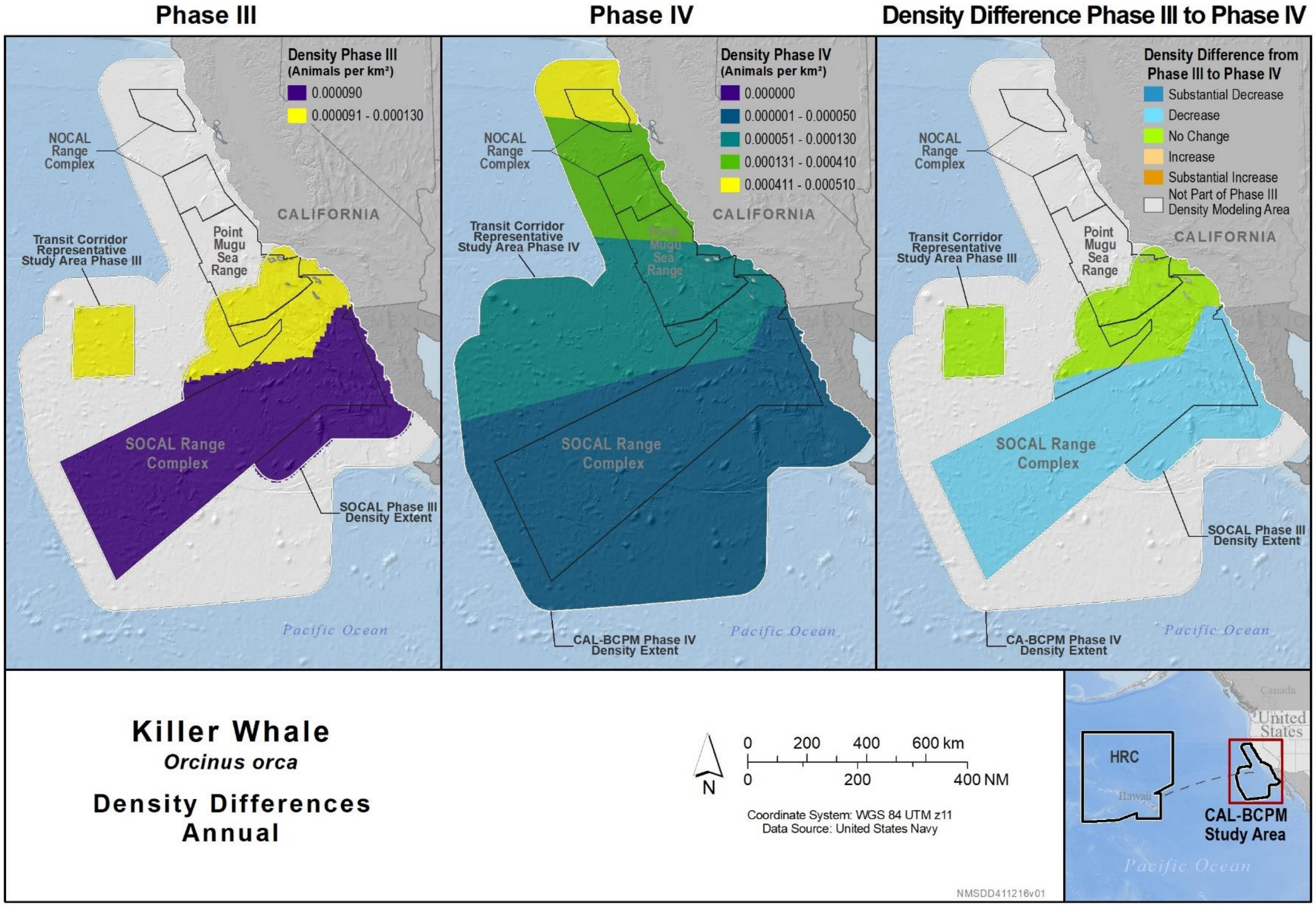

Figure A-63: Killer Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.10 *PEPONOCEPHALA ELECTRA*, MELON-HEADED WHALE

HRC: Kohala Resident Stock. A density estimate of 0.100 animals/km^2, based on analyses by Aschettino (2010), was applied to the area encompassing the range of the Kohala Resident stock for both Phase III and Phase IV.

HRC: Hawaiian Islands Stock. The design-based density estimate for the Hawaiian Islands Stock of melon-headed whale used in Phase IV (0.0166 animals/km^2) is an order of magnitude higher than the mark-recapture estimate used previously in Phase III (0.002 animals/km^2). The more recent Phase IV estimate is considered an improvement because it is based on multiple-covariate line-transect analyses of sighting data collected on three surveys of waters within the Hawaiian Islands EEZ in 2002, 2010, and 2017 (Bradford et al., 2021).

CAL/BCPM. This species is not expected to occur within CAL/BCPM or the eastern portion of the transit corridor (Barlow, 2016; Hamilton et al., 2009).

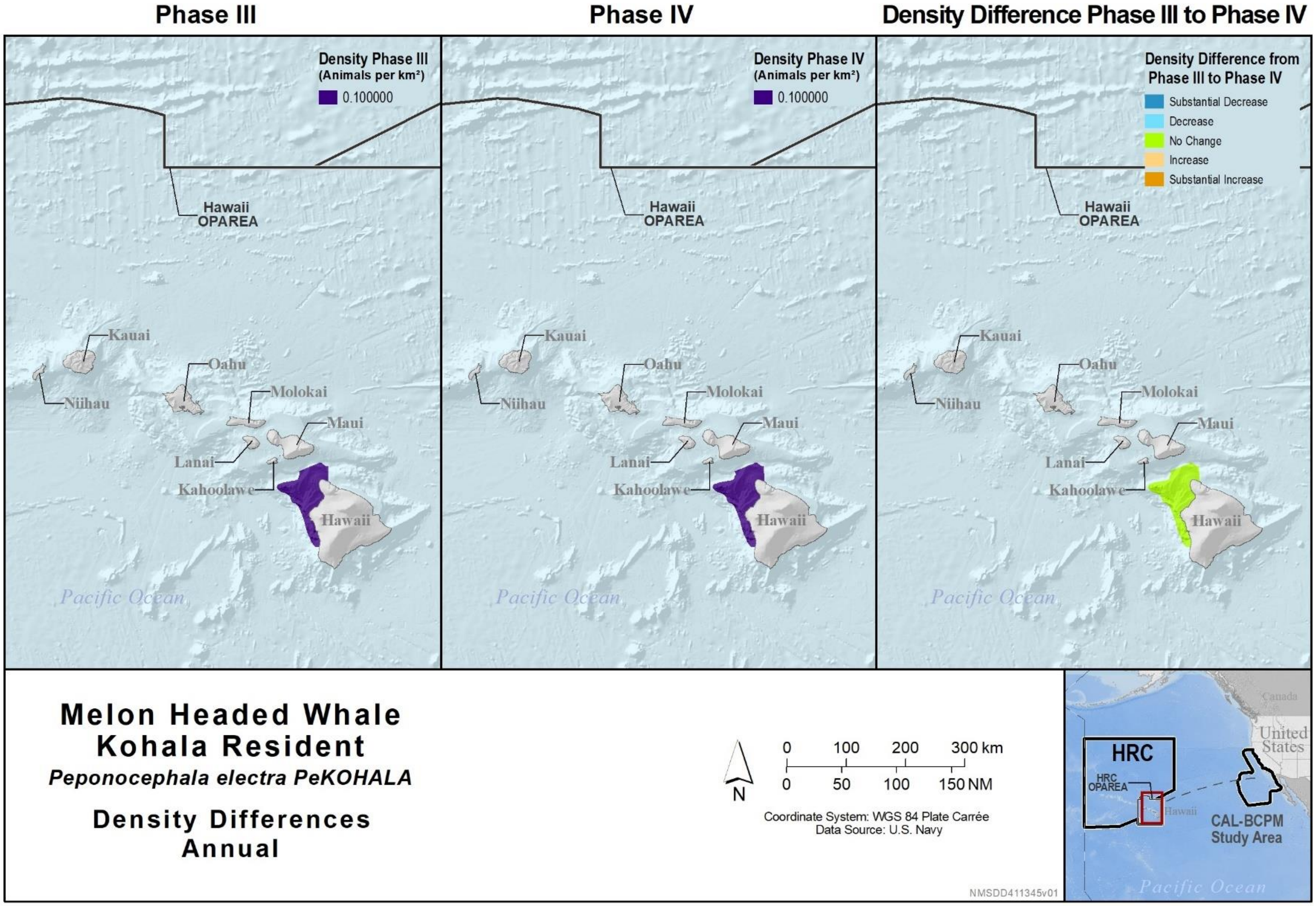

Figure A-64: Melon Headed Whale Kohala Resident Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

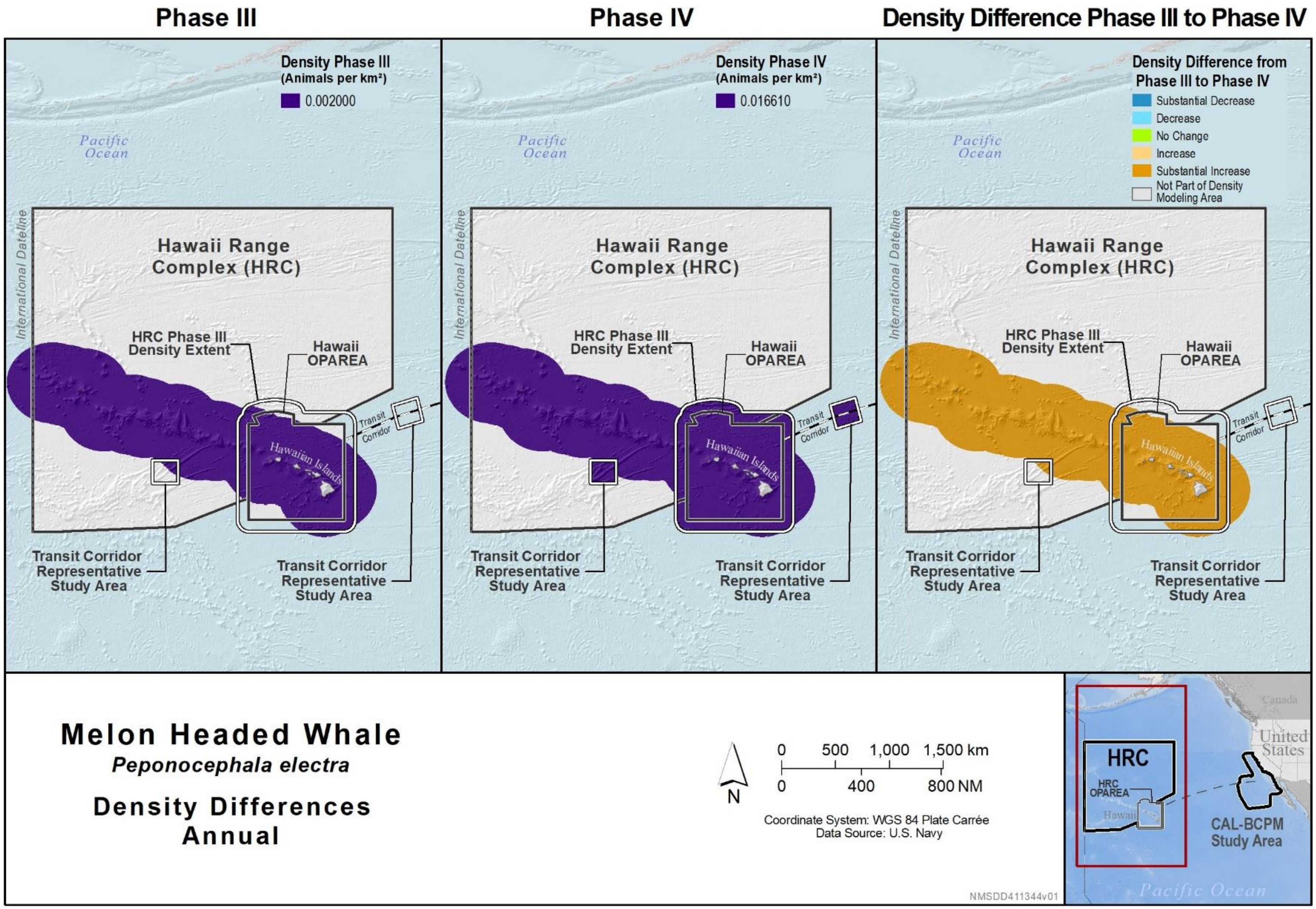

Figure A-65: Melon Headed Whale Hawaiian Islands Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.11 *PSEUDORCA CRASSIDENS*, FALSE KILLER WHALE

HRC: Main Hawaiian Islands Insular Stock. The density estimate for the Main Hawaiian Islands Insular Stock of false killer whale used in Phase IV was slightly lower (0.00057 animals/km^2) than that used previously in the Navy's Phase III analyses (0.000796 animals/km^2). The density estimate used for Phase IV was based on photo-identification and mark-recapture methods using data collected from dedicated and opportunistic surveys around the Main Hawaiian Islands from 2000 to 2015 (Bradford et al., 2018).

HRC: Northwestern Hawaiian Islands Stock. The design-based density estimate for the Northwestern Hawaiian Islands Stock of false killer whale used in Phase IV (Bradford et al., 2020) represents a substantial improvement from Phase III, when density estimates for the Northwestern Hawaiian Islands and Hawaii Pelagic stocks were combined into a single habitat model and used to represent density for both stocks. The estimates used for Phase III were lower than the more recent design-based estimate throughout the range of the Northwestern Hawaiian Islands stock.

HRC: Hawaii Pelagic Stock. As noted above, for Phase III the density estimates for the Northwestern Hawaiian Islands and Hawaii Pelagic stocks were combined (Forney et al., 2015). For Phase IV, density estimates were based on a habitat-based density model specific to the Hawaii Pelagic Stock of false killer whale (Becker et al., 2021; Bradford et al., 2020). Differences in the model-based predictions used from Phase III to Phase IV resulted in regionally variable density differences in waters of the Hawaiian Islands EEZ.

CAL/BCPM. Strandings and sightings of false killer whales have been recorded in Southern California and north, but these have generally been considered extralimital and a zero density was assigned to waters off California for both Phase III and Phase IV.

For Phase III, a zero density was also assigned to waters off the Baja California Peninsula. As part of the expansion of the Southern California portion of the Phase III HSTT Study Area, additional areas adjacent to the existing SOCAL Range Complex were included in the Phase IV HCTT Study Area, including waters further south along the peninsula and offshore waters to the southwest. False killer whales have been sighted in waters off the BCPM within the HCTT Study Area (Hamilton et al., 2009), and a density estimate based on Ferguson and Barlow (2003) was included in the NMSDD for Phase IV.

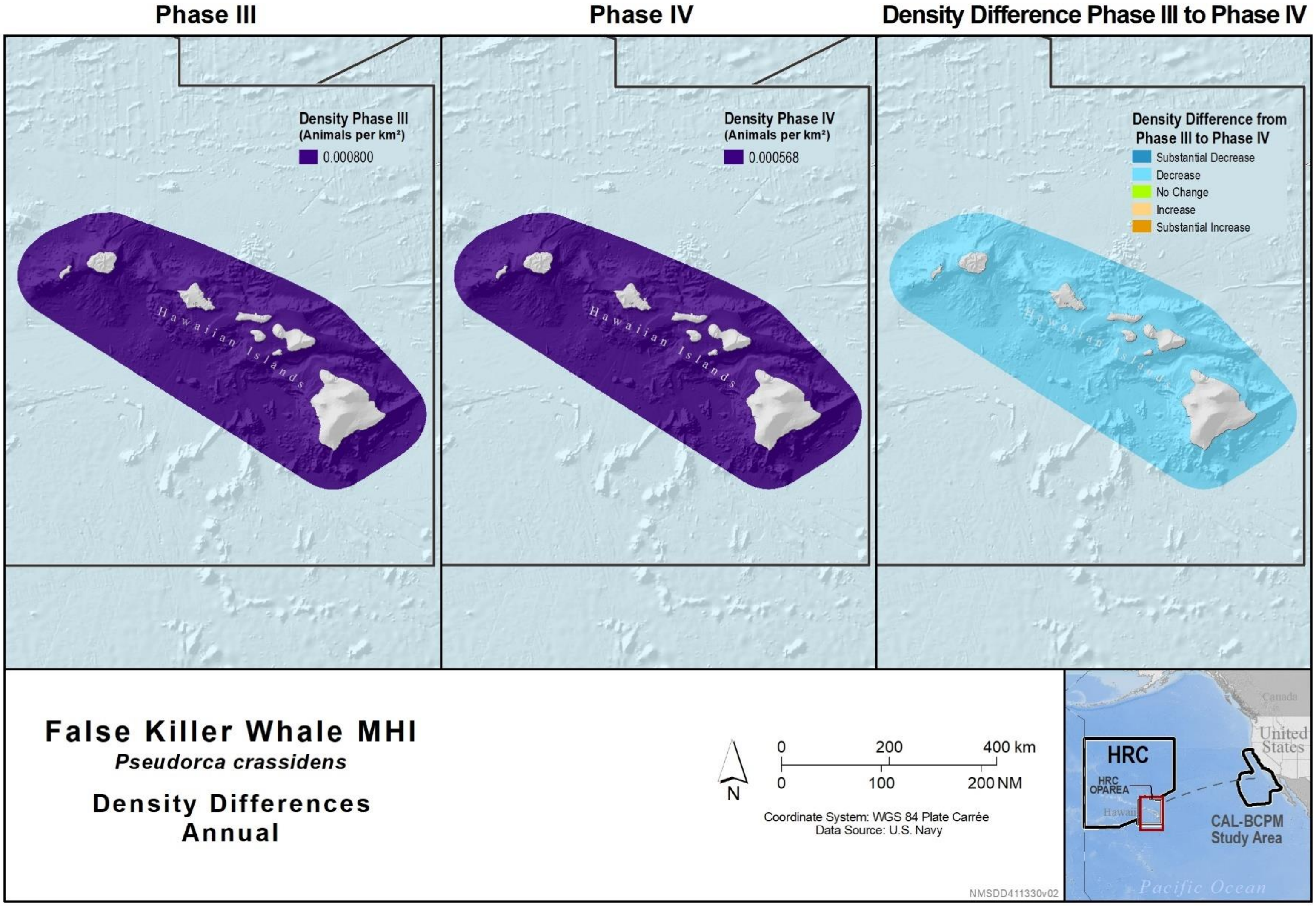

Figure A-66: False Killer Whale Main Hawaiian Islands Insular Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

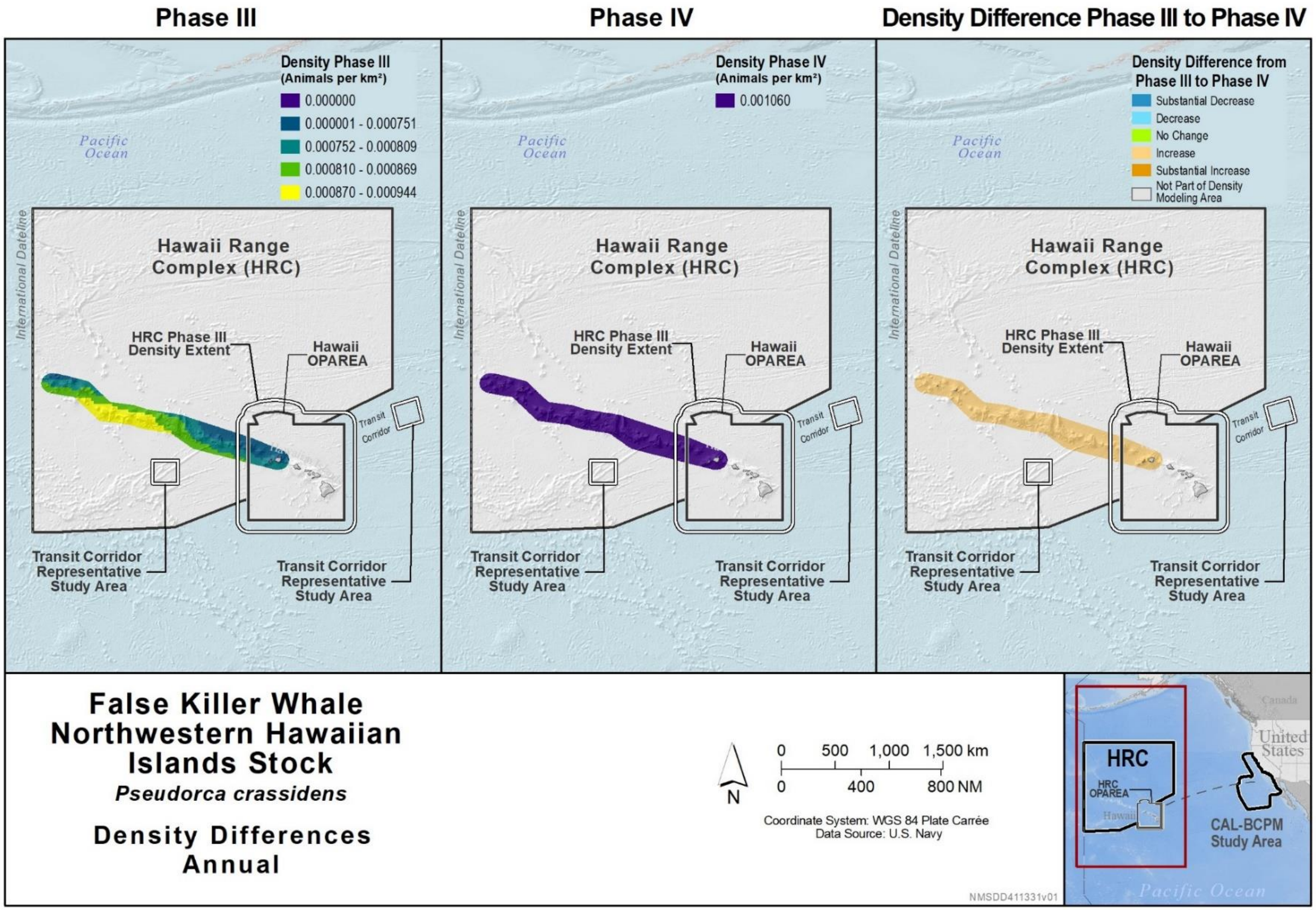

Figure A-67: False Killer Whale Northwestern Hawaiian Islands Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

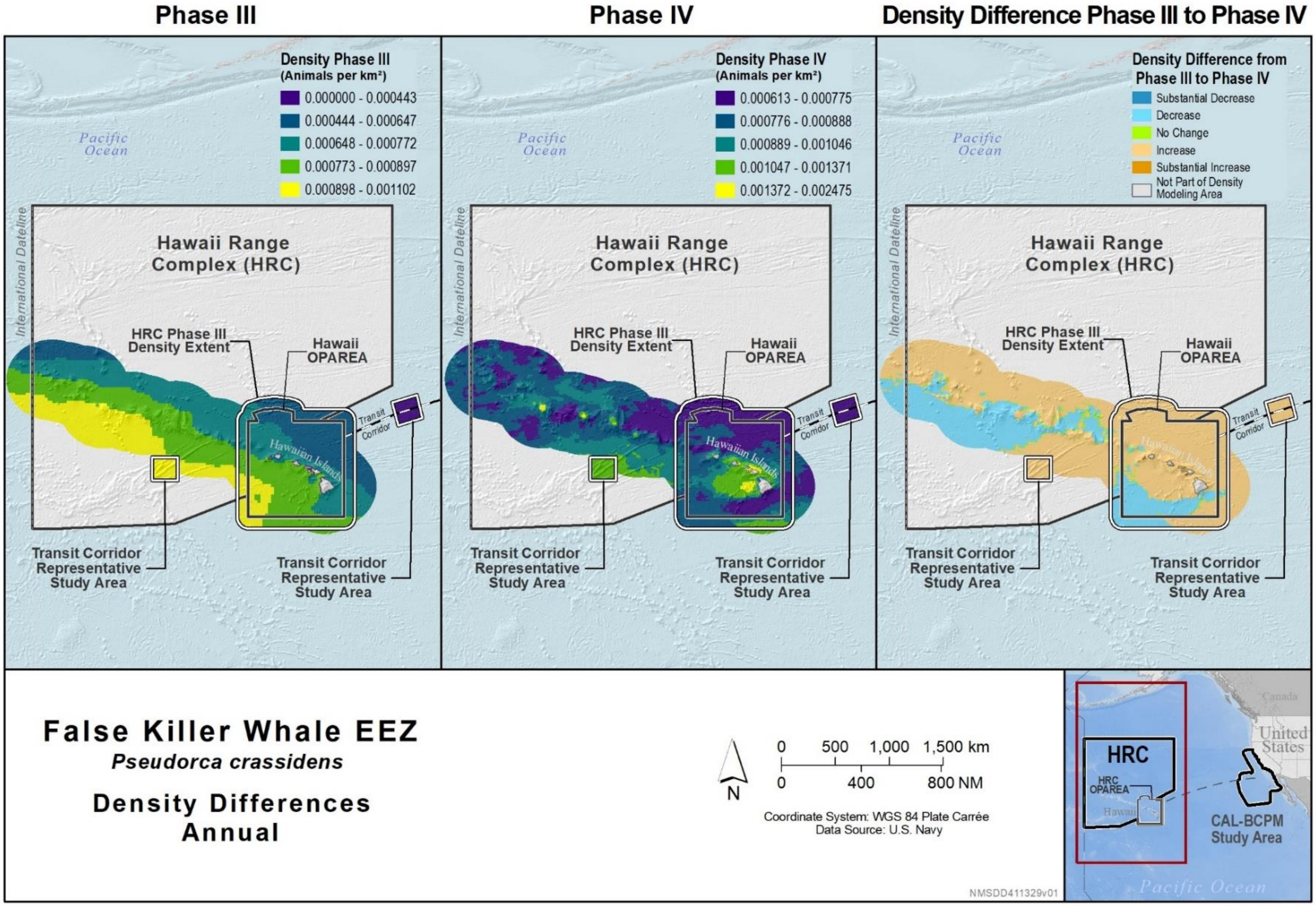

Figure A-68: False Killer Whale Hawaii Pelagic Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.12 *Stenella attenuata*, Pantropical Spotted Dolphin

HRC: Oahu/4-Islands/Hawaii Island Stocks. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of the first habitat-based density model for the insular stocks of spotted dolphin in this study area (Becker et al., 2022b). The new habitat-based density model for the insular stocks of spotted dolphin provided spatially-explicit density estimates for each of the three stocks that are generally higher than the uniform estimates used for Phase III.

HRC: Hawaii Pelagic Stock. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of updated density estimates for the Hawaii Pelagic Stock of pantropical spotted dolphin from model-based analyses (Becker et al., 2021). The new habitat-based density model used in Phase IV represents an improvement to the model available for Phase III (Forney et al., 2015) because it was based on more recent survey data, it more accurately accounted for bias in group size estimates and variation in detection probabilities, and provided finer-scale density predictions (~9 km x 9 km resolution vs. the previous ~25 km x 25 km resolution). In addition, the new spotted dolphin model is specific to the pelagic stock, while the previous models were based on all spotted dolphin sightings. There was an overall increase in density from Phase III to Phase IV.

CAL/BCPM. This species is not expected to occur within SOCAL or the eastern portion of the transit corridor (Barlow, 2016; Hamilton et al., 2009). For Phase III, a zero density was also assigned to waters off the Baja California Peninsula. As part of the expansion of the Southern California portion of the Phase III HSTT Study Area, additional areas adjacent to the existing SOCAL Range Complex were included in the Phase IV HCTT Study Area, including waters further south along the peninsula and offshore waters to the southwest. Pantropical spotted dolphins have been sighted in waters off the BCPM within the HCTT Study Area (Hamilton et al., 2009), and a density estimate based on Ferguson and Barlow (2003) was included in the NMSDD for Phase IV.

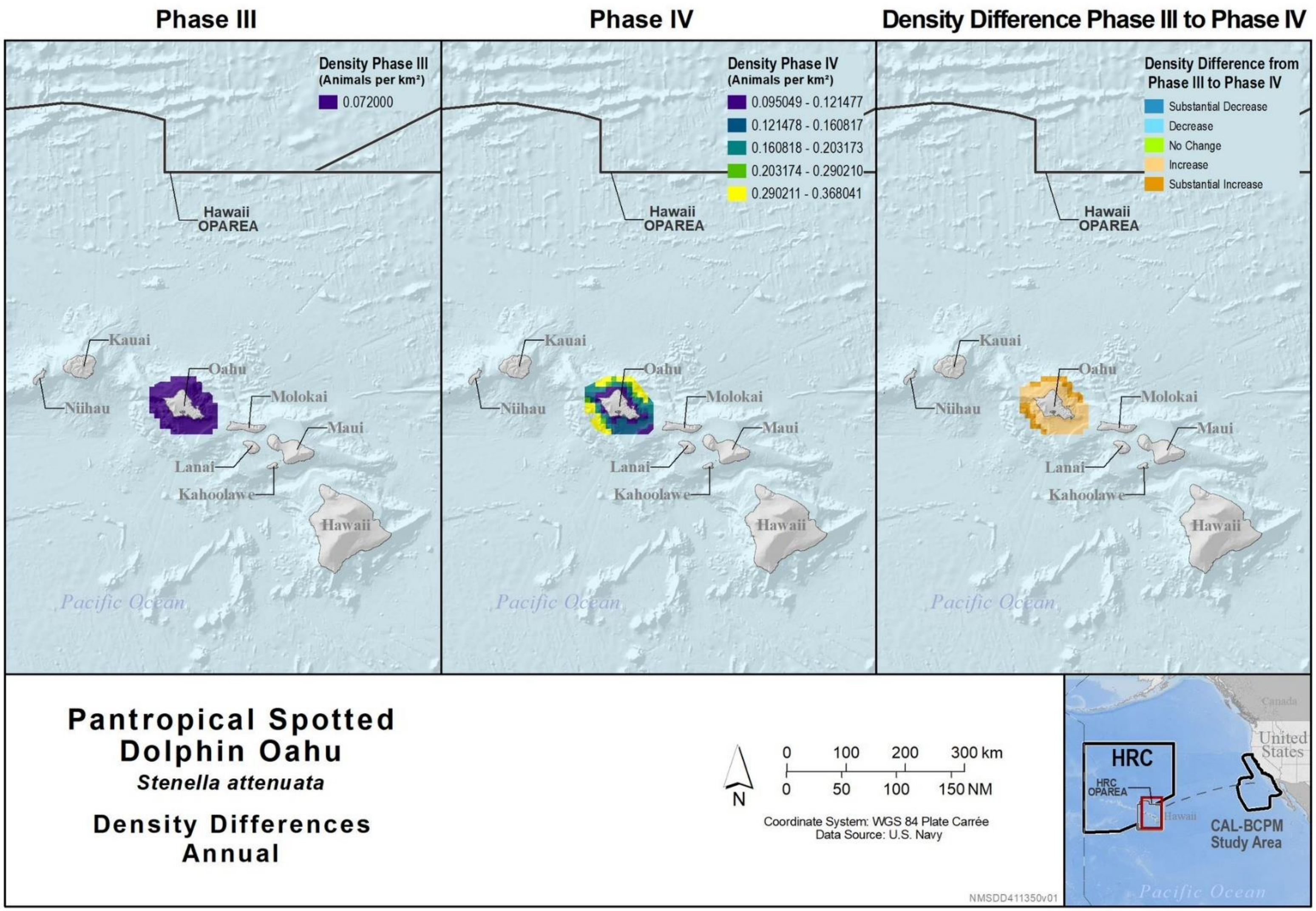

Figure A-69: Pantropical Spotted Dolphin Oahu Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

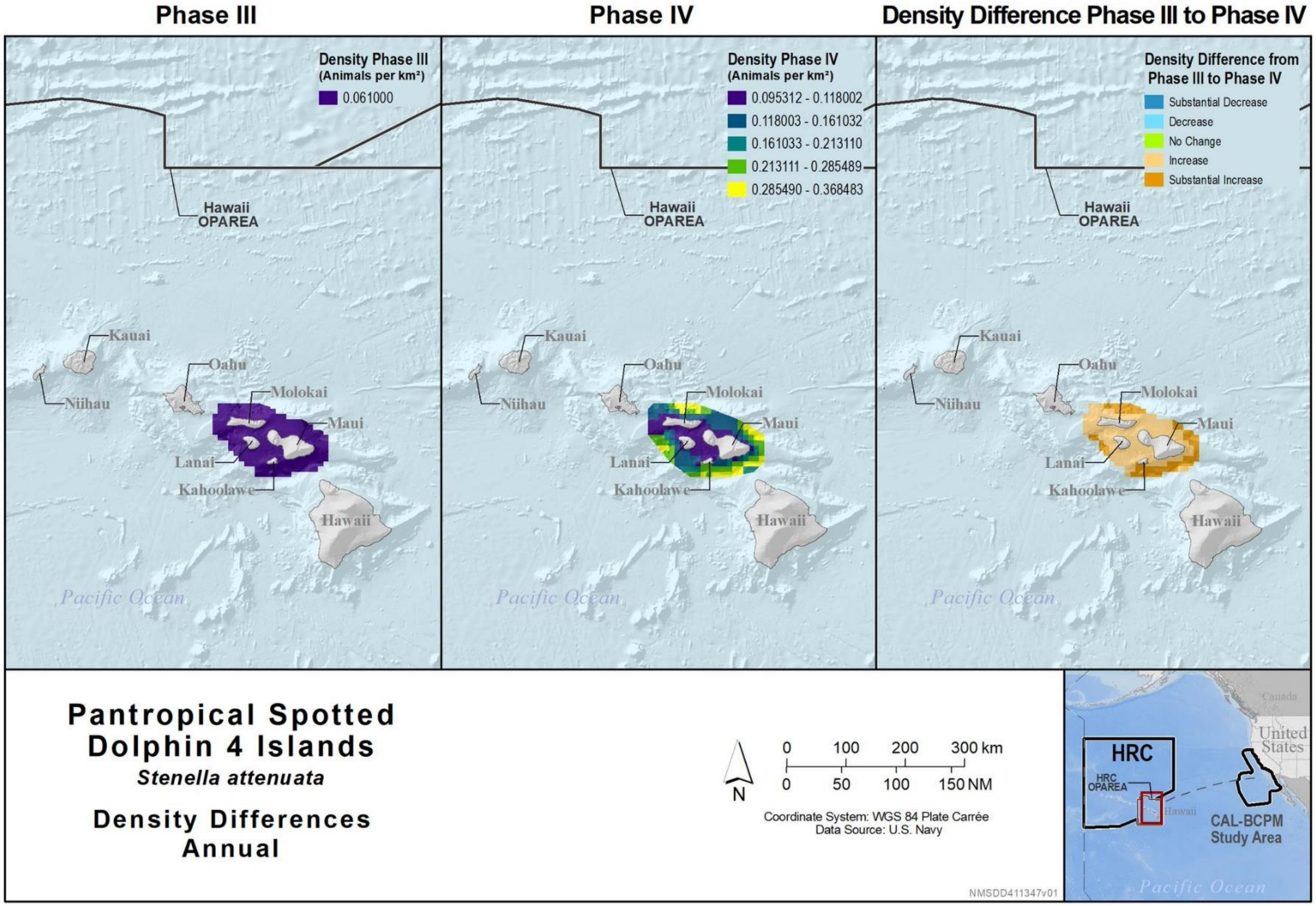

Figure A-70: Pantropical Spotted Dolphin 4-Islands Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

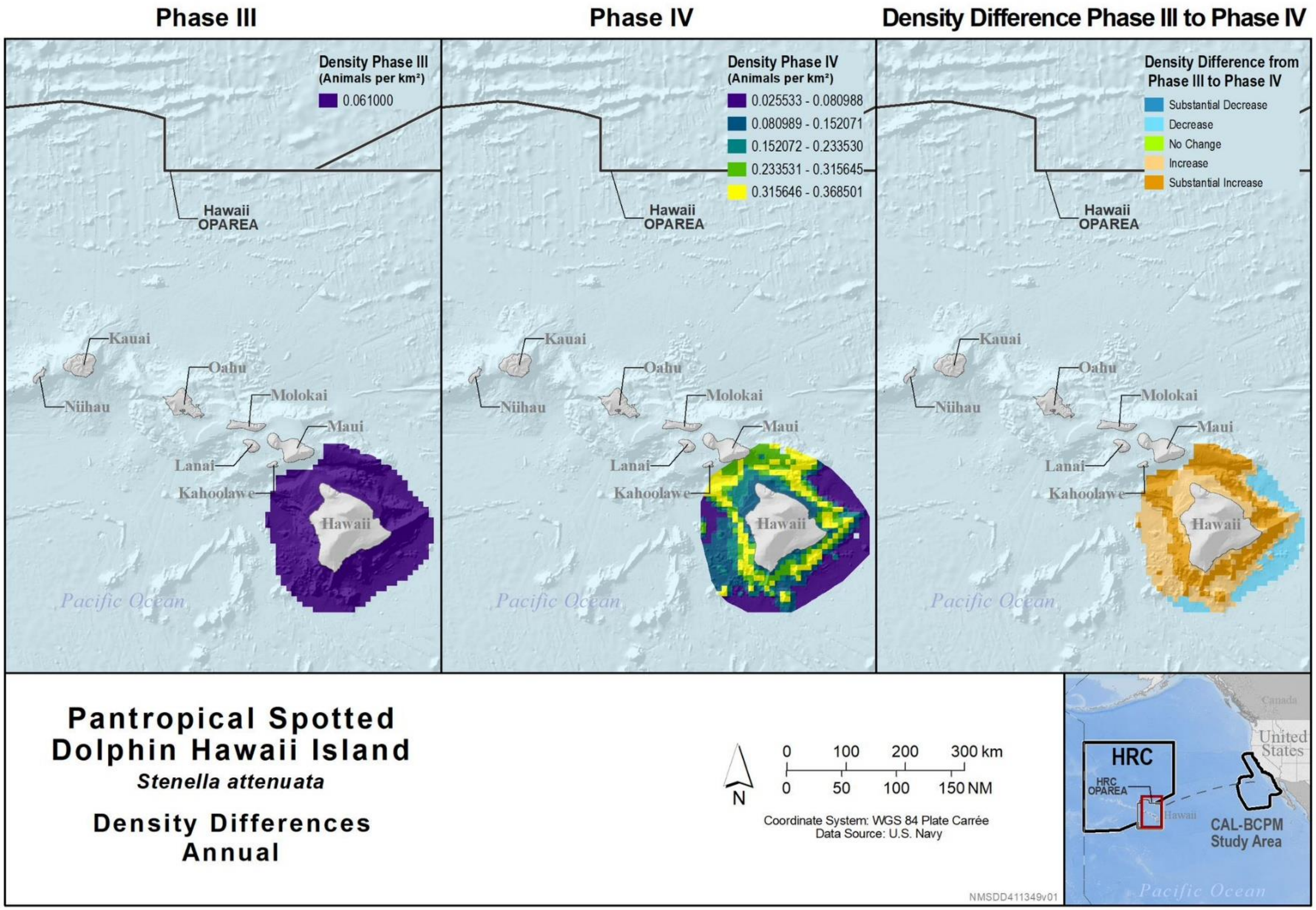

Figure A-71: Pantropical Spotted Dolphin Hawaii Island Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

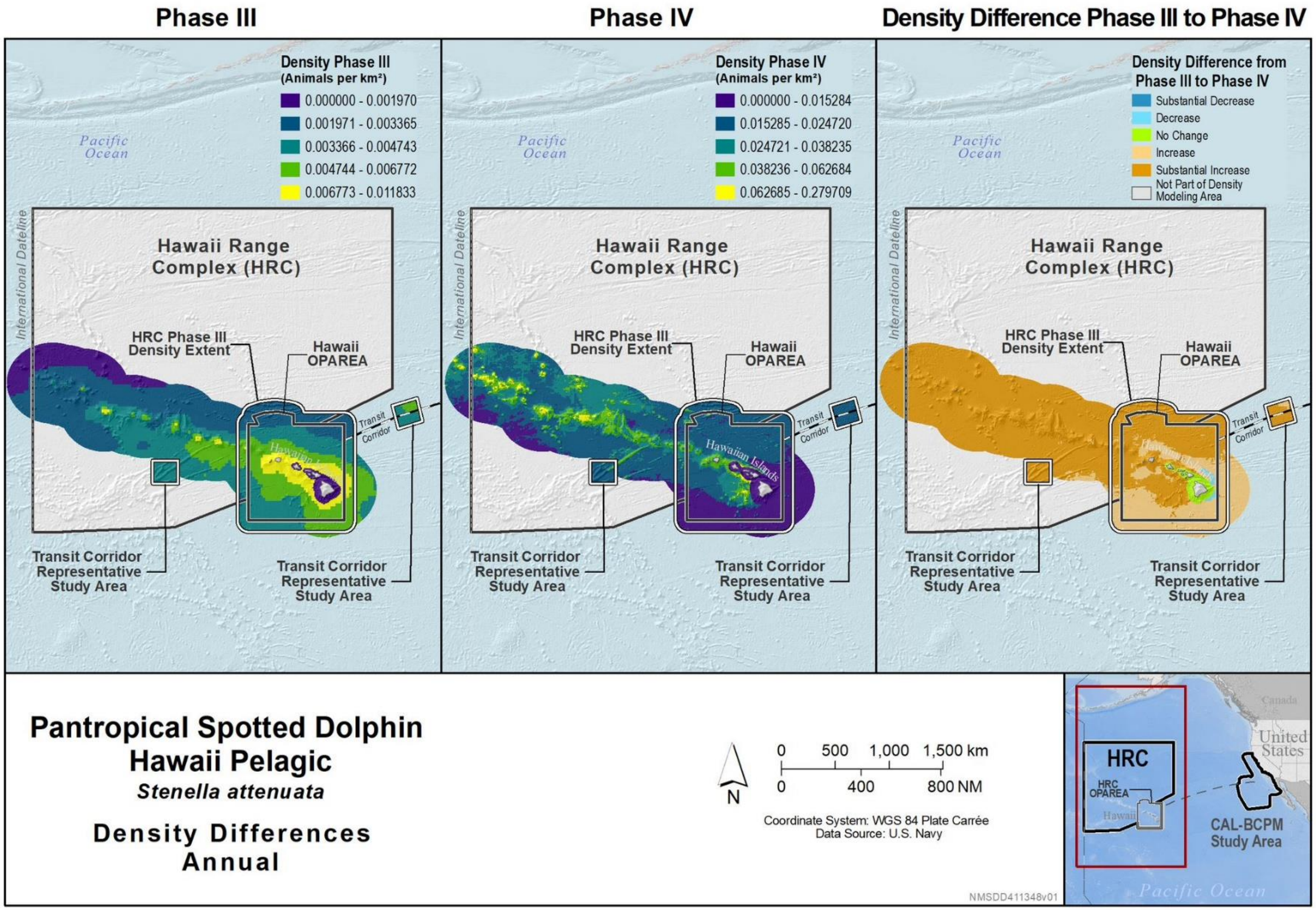

Figure A-72: Pantropical Spotted Dolphin Hawaii Pelagic Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.13 *STENELLA COERULEOALBA*, STRIPED DOLPHIN

HRC. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of updated density estimates for the Hawaii Pelagic Stock of pantropical spotted dolphin from model-based analyses (Becker et al., 2021). The new habitat-based density model for striped dolphin represents an improvement to the model available for Phase III (Forney et al., 2015) because it was based on more recent survey data, it more accurately accounted for bias in group size estimates and variation in detection probabilities, and provided finer-scale density predictions (~9 km x 9 km resolution vs. the previous ~25 km x 25 km resolution). The updated model predictions resulted in a decrease in density in nearshore waters of the Main and Northwestern Hawaiian Islands, and an overall increase in density throughout the rest of the Hawaiian Islands EEZ.

CAL/BCPM. To improve density estimates for Phase IV, the Navy funded an analysis to develop habitat-based density models for the Southern California Current, an ecologically meaningful study area that extends from Point Conception to the tip of the Baja California Peninsula. Resulting models provide the first spatially explicit estimates of striped dolphin density for waters off the Baja California peninsula (Becker et al., 2022a), and were applied to the HCTT study area south of Point Conception. The new model resulted in regionally variable density differences in waters of the Southern California Bight compared to the CCE model used in Phase III (Becker et al., 2016). For summer/fall, density estimates increased throughout the majority of the Bight, with the exception of more shallow waters over the continental shelf, particularly near the Channel Islands, where density estimates decreased. For Phase IV, some higher density estimates are predicted in coastal and nearshore waters off Southern California, but these waters are where density values are the lowest overall (see the left and middle panels of Figure A-74). For example, an individual 10 km X 10 km grid cell estimate increased from 0.00010 animals/km^2 in Phase III to 0.00107 animals/km^2 in Phase IV, resulting in the designation of a "substantial increase" in density, although both estimates are relatively very low for this species.

For Phase III, the Becker et al. (2016) model-based predictions for summer/fall were used to represent striped dolphin density year-round in waters of the Southern California Bight. For Phase IV, seasonally specific estimates for winter and spring were used based on habitat model predictions (Becker et al., In Prep.), resulting in lower density estimates throughout the majority of the Southern California Bight.

For waters off the Baja California Peninsula, a uniform density estimate for striped dolphin of 0.13823 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which accounted for spatial variation in striped dolphin distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV were used to represent density in BCPM waters year-round and resulted in a decrease in density throughout the BCPM Study Area.

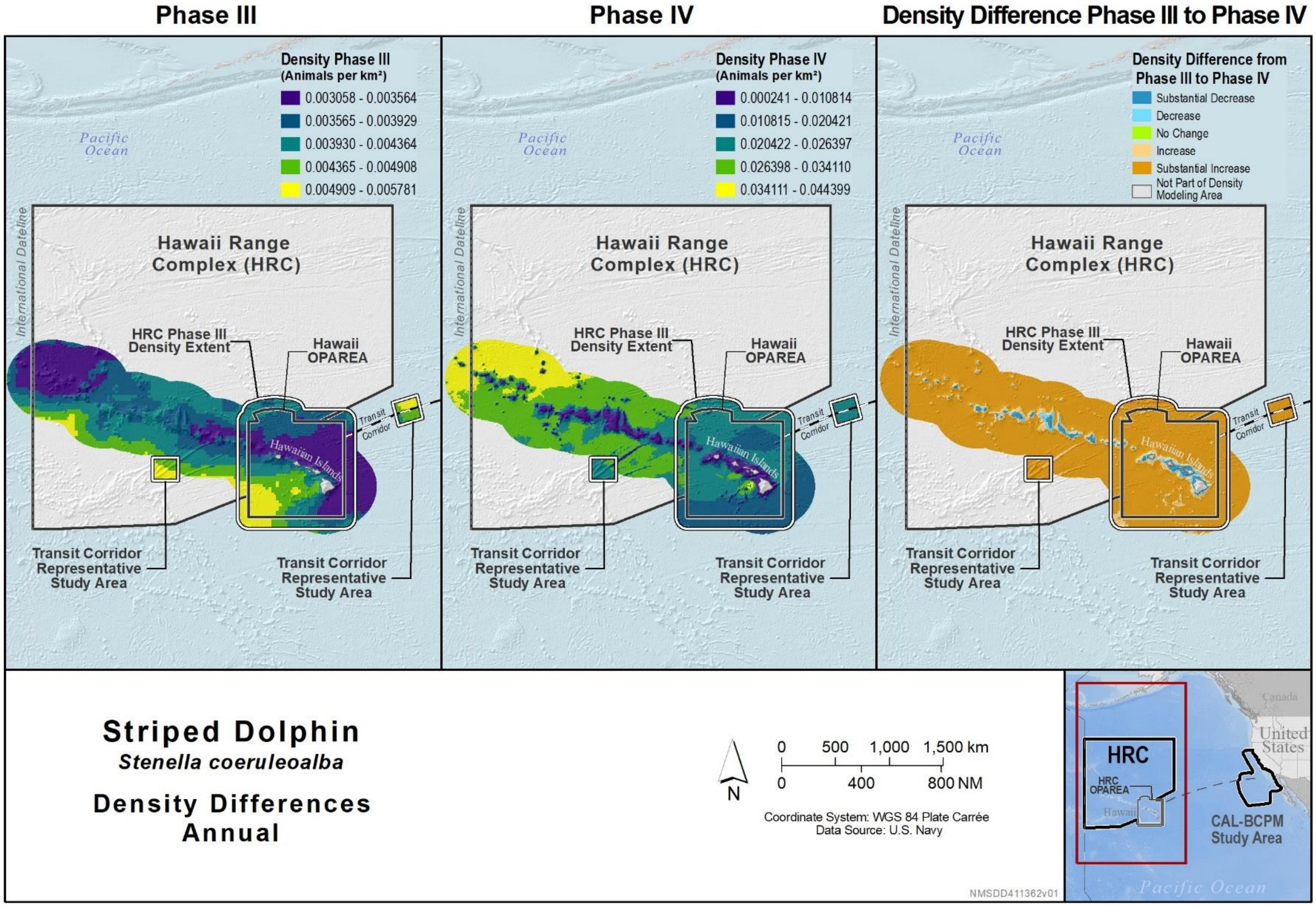

Figure A-73: Striped Dolphin Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

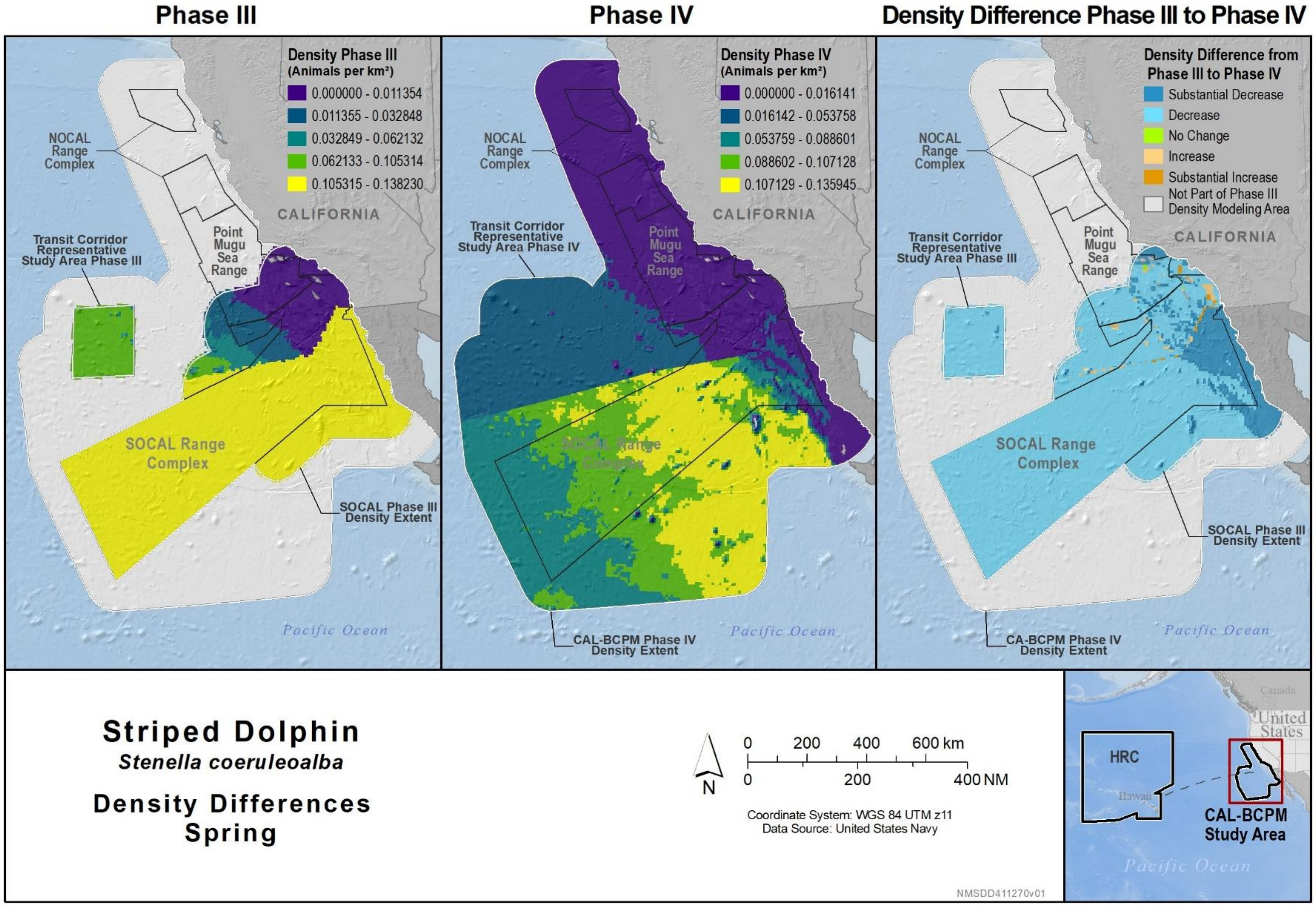

Figure A-74: Striped Dolphin Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

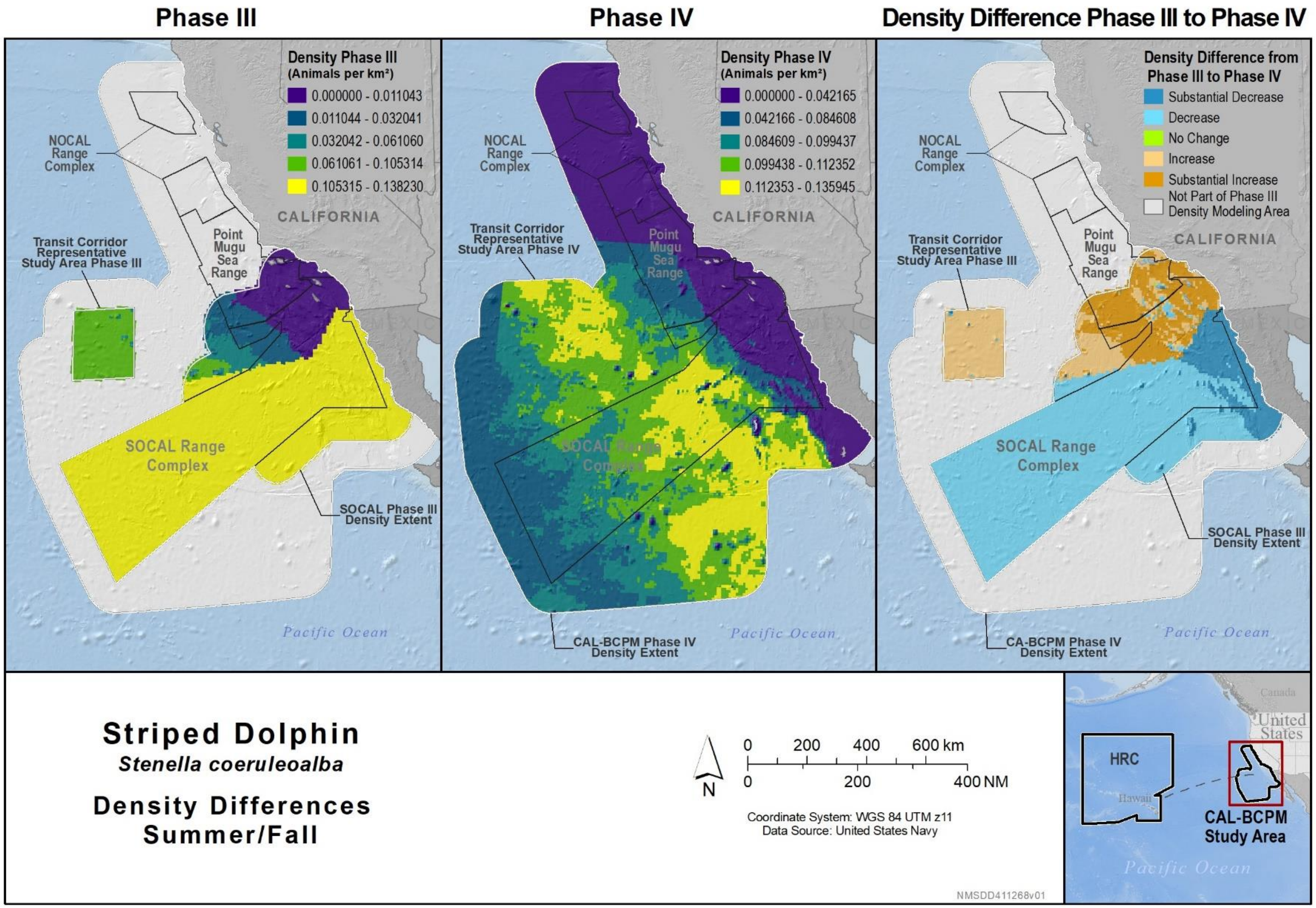

Figure A-75: Striped Dolphin Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

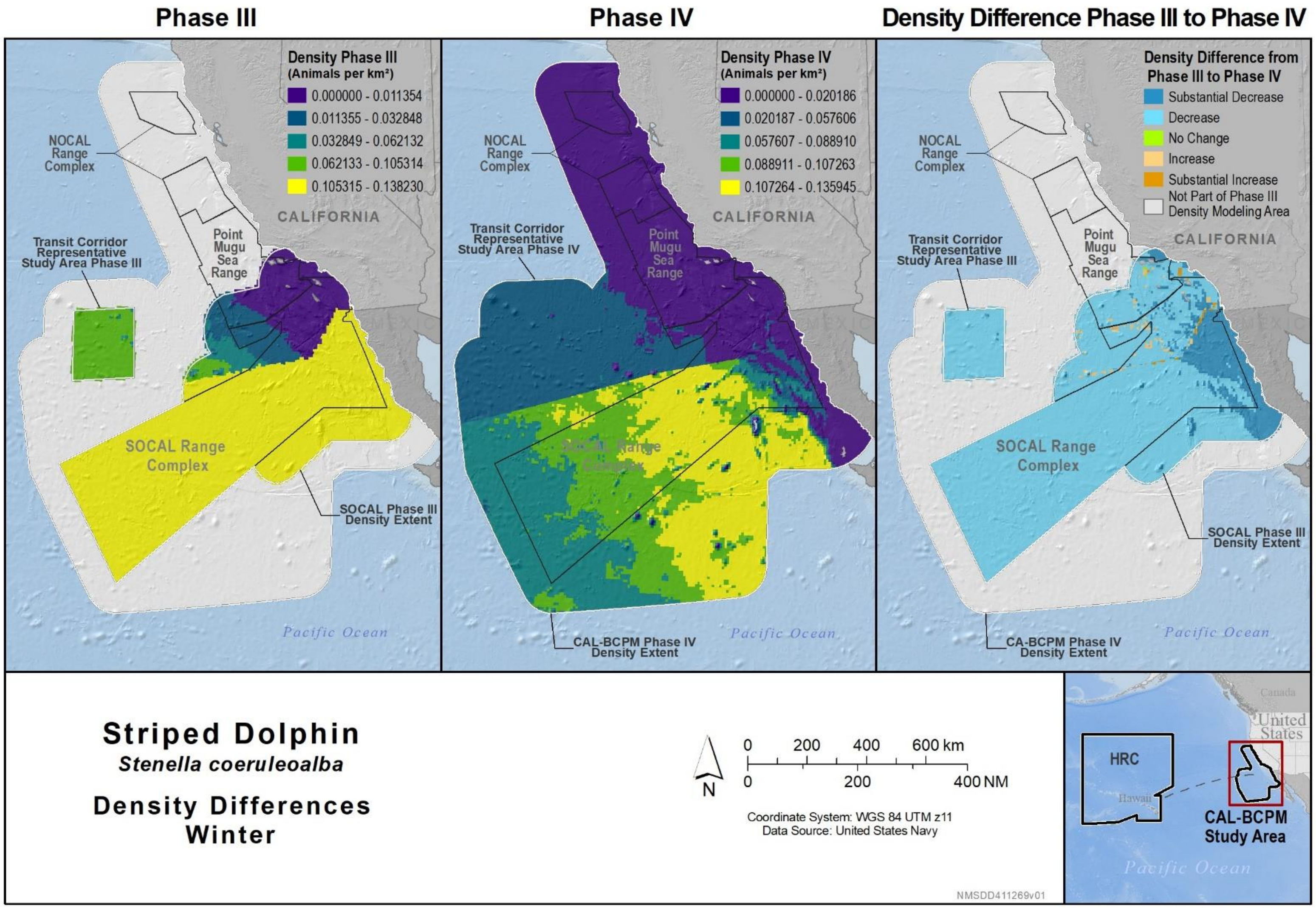

Figure A-76: Striped Dolphin Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.14 *STENELLA LONGIROSTRIS*, SPINNER DOLPHIN

HRC: Hawaii Island Stock. A density estimate for the Hawaii Island Stock of spinner dolphins of 0.066 animals/km^2 based on photo-identification studies (Tyne et al., 2014) was used for Phase III. This estimate was subsequently updated (Tyne et al., 2016), and the resulting density estimate of 0.070 animals/km^2 was used for Phase IV, resulting in a slight increase in density throughout this stock's range.

HRC: Oahu/4-Islands Stock. The most recent density estimate available for the Oahu/4-Islands Stock of spinner dolphins is that used for Phase III (0.023 animals/km^2), which was based on analyses by Hill et al. (2011).

HRC: Kauai/Niihau Stock. The most recent density estimate available for the Kauai/Niihau Stock of spinner dolphins is that used for Phase III (0.097 animals/km^2), which was based on analyses by Hill et al. (2011).

HRC: Hawaii Pelagic Stock. The limited number of on-effort sightings of spinner dolphins during ship surveys conducted by NMFS within the Exclusive Economic Zone of the Hawaiian Islands (12 total for the 2002–2017 surveys) did not support the development of an updated habitat-based density model for this species (Becker et al., 2021). Forney et al. (2015) developed a habitat-based model for spinner dolphins using survey data collected within the central North Pacific from 1997 to 2012, and density predictions from this model were incorporated into the NMSDD for Phase III and Phase IV.

SOCAL. This species is not expected to occur within SOCAL or the eastern portion of the transit corridor (Barlow, 2016; Hamilton et al., 2009).

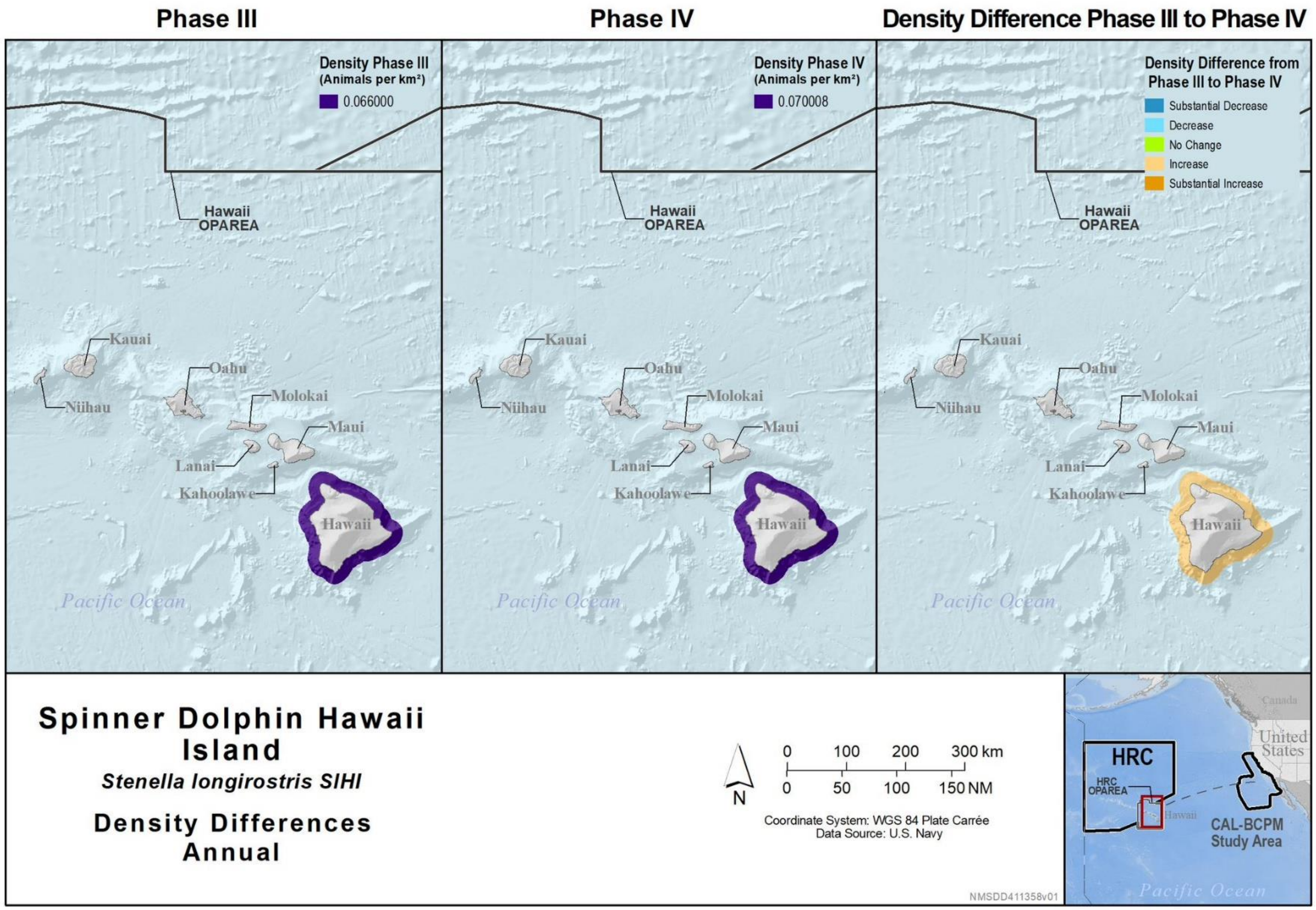

Figure A-77: Spinner Dolphin Hawaii Island Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

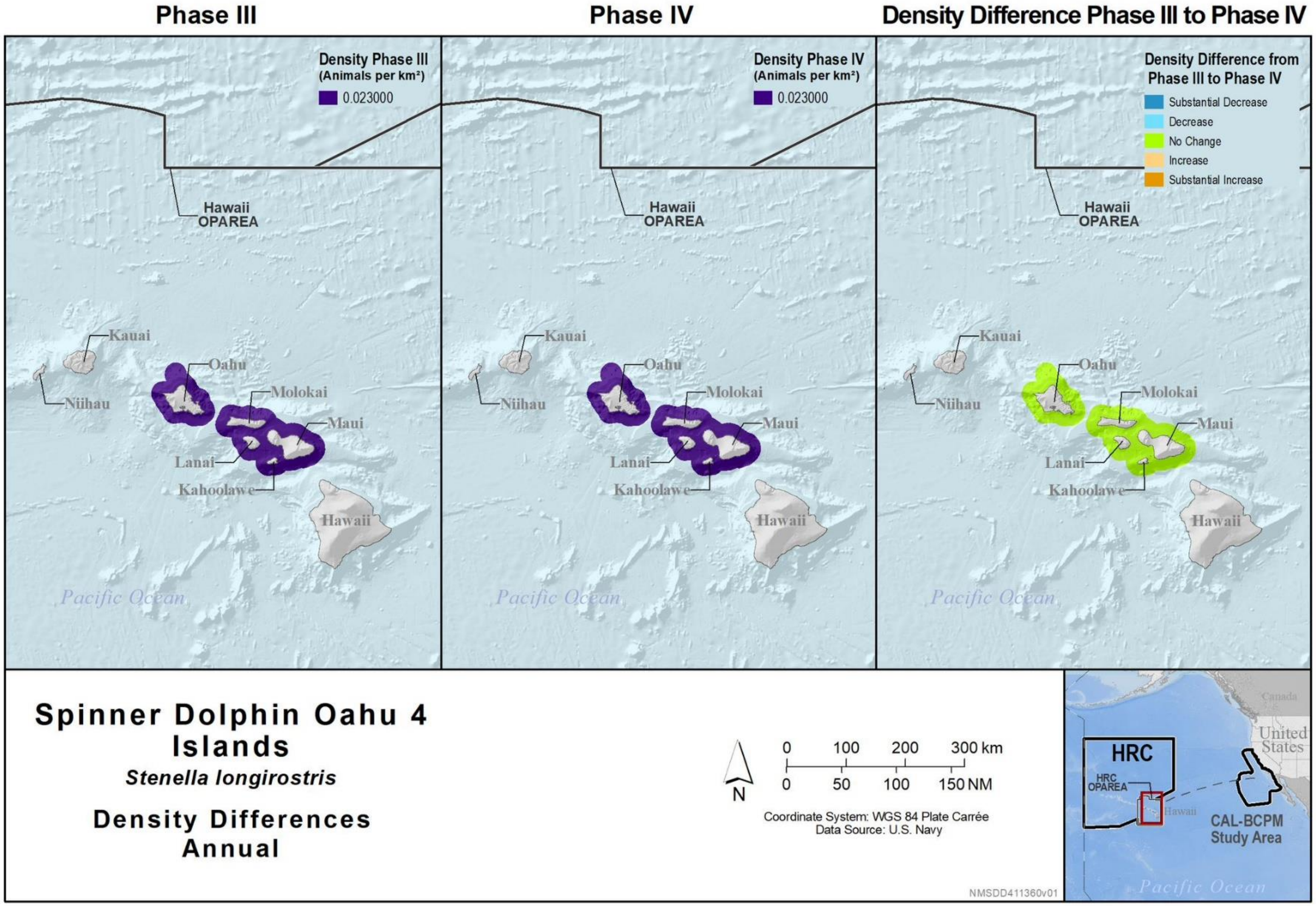

Figure A-78: Spinner Dolphin Oahu/4-Islands Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel)

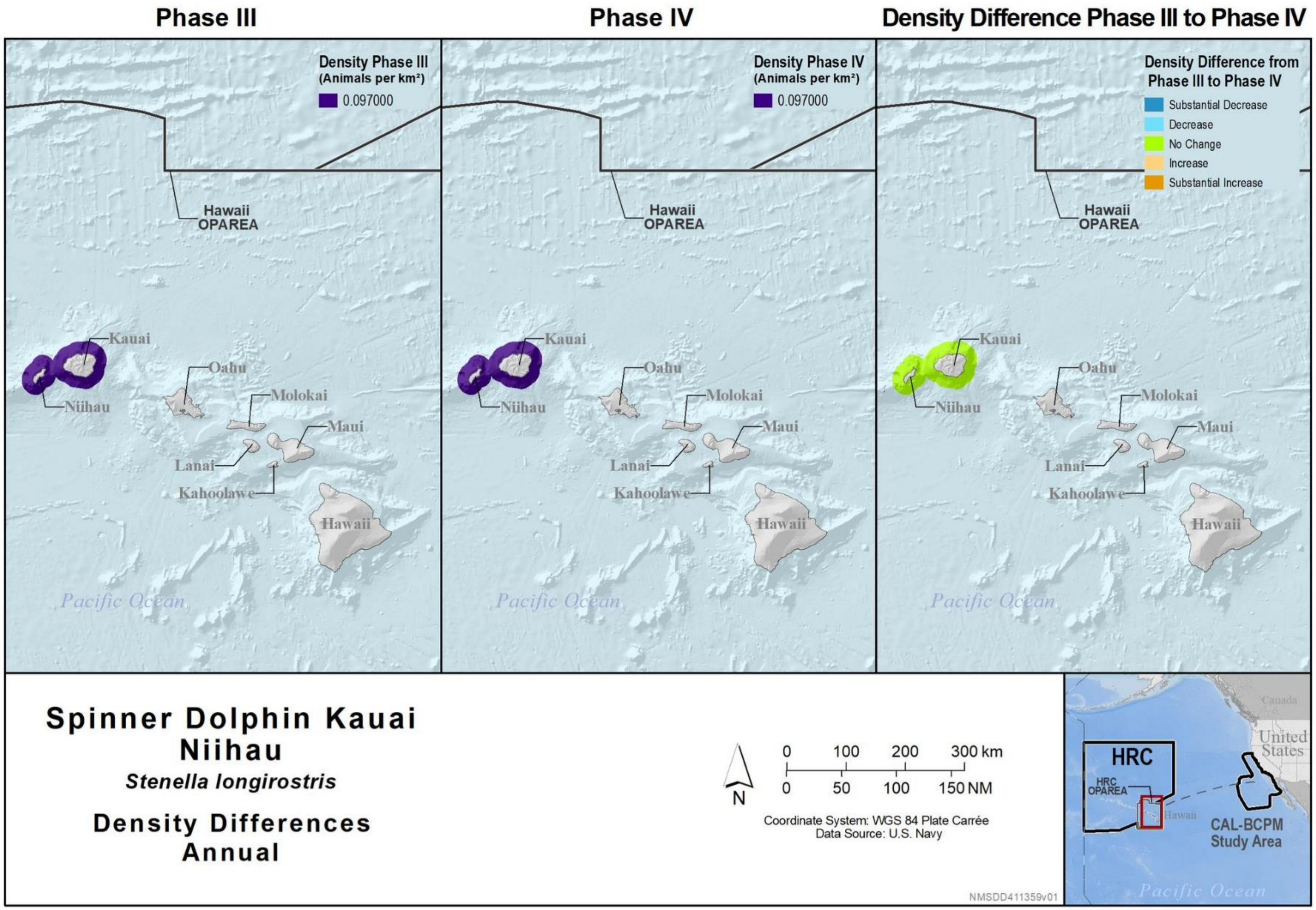

Figure A-79: Spinner Dolphin Kauai/Niihau Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A “substantial” difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel)

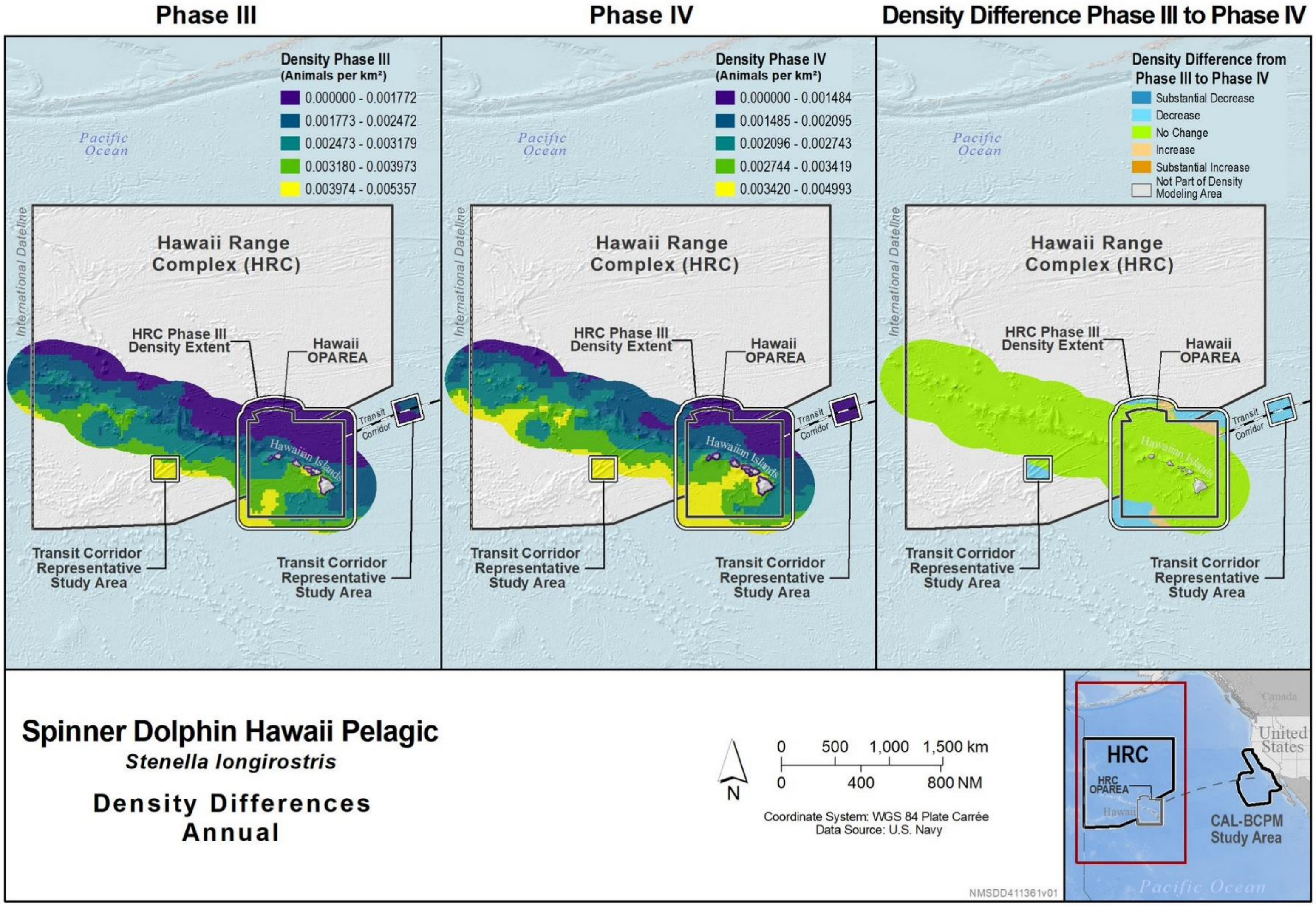

Figure A-80: Spinner Dolphin Hawaii Pelagic Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel)

A.1.3.15 *STENO BREDANENSIS*, ROUGH-TOOTHED DOLPHIN

HRC. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of updated density estimates for rough-toothed dolphin from model-based analyses (Becker et al., 2021). The new habitat-based density model for rough-toothed dolphin represents an improvement to the model available for Phase III (Forney et al., 2015) because it more accurately accounted for bias in group size estimates and variation in detection probabilities, and provided finer-scale density predictions (~9 km x 9 km resolution vs. the previous ~25 km x 25 km resolution). The updated model predictions show an increase in density in waters throughout the Hawaiian Islands EEZ.

CAL/BCPM. This species is not expected to occur within SOCAL or the eastern portion of the transit corridor (Barlow, 2016; Hamilton et al., 2009).

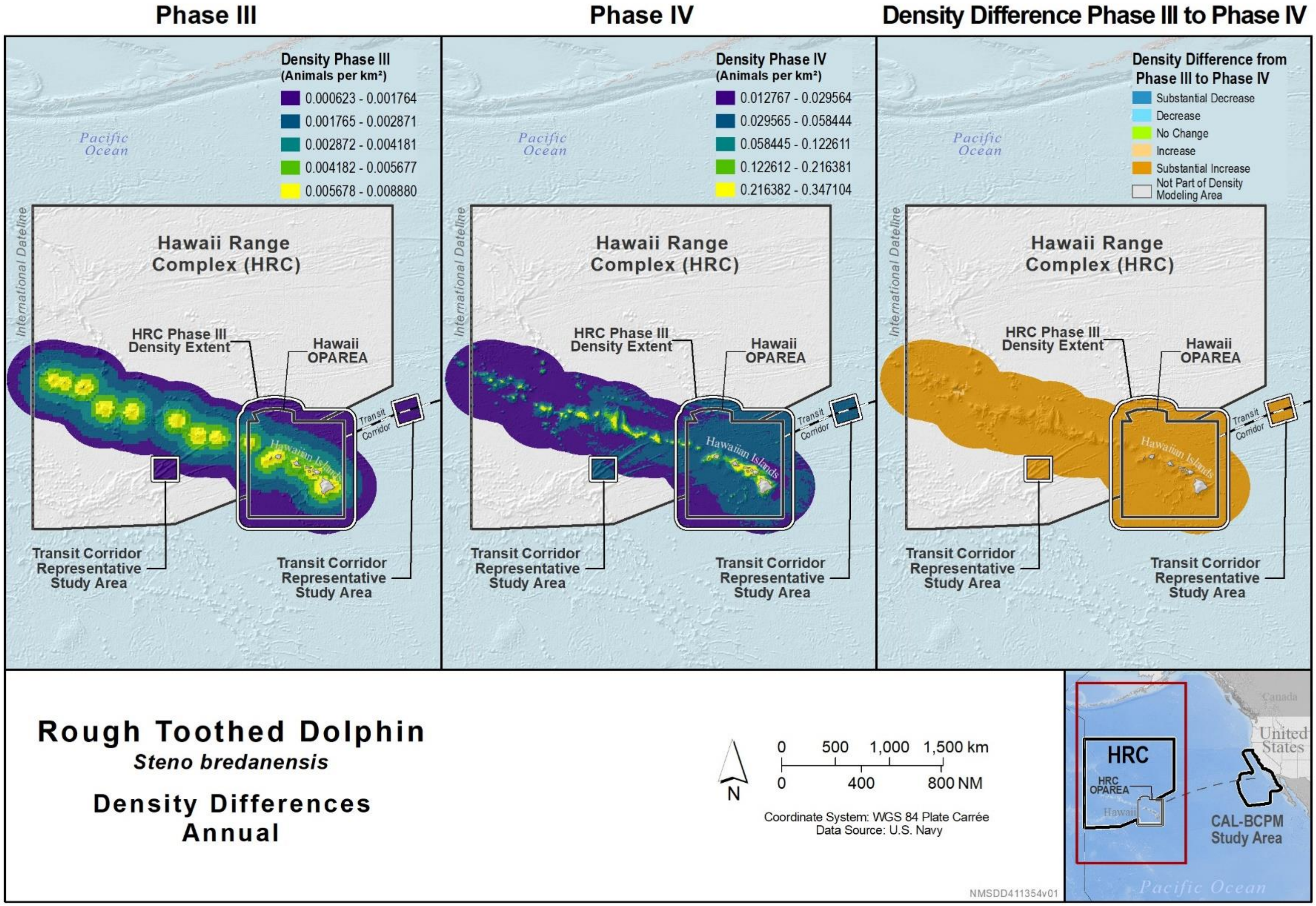

Figure A-81: Rough Toothed Dolphin Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.3.16 *TURSIOPS TRUNCATUS*, COMMON BOTTLENOSE DOLPHIN

HRC: Oahu Stock. The most recent density estimate available for the Oahu Stock of common bottlenose dolphins (of 0.0282 animals/km^2) is based on analyses by Van Cise et al. (2021). This estimate is lower than that previously estimated by (Baird et al., 2009) and used in Phase III (0.187 animals/km^2).

HRC: 4-Islands Stock. The most recent density estimate available for the 4-Islands Stock of common bottlenose dolphins (0.0058 animals/km^2) is based on analyses by Van Cise et al. (2021). This estimate is lower than that previously estimated by (Baird et al., 2009) and used in Phase III (0.017 animals/km^2).

HRC: Kauai/Niihau Stock. The most recent abundance available for the Kauai/Niihau Stock of common bottlenose dolphins (0.0397 animals/km^2) is based on analyses by Van Cise et al. (2021). This estimate is slightly lower than that previously estimated by (Baird et al., 2009) and used in Phase III (0.065 animals/km^2).

HRC: Hawaii Island Stock. The most recent abundance available for the Hawaii Island Stock of common bottlenose dolphins (0.0292 animals/km^2) is based on analyses by Van Cise et al. (2021). This estimate is slightly higher than that previously estimated by (Baird et al., 2009) and used in Phase III (0.028 animals/km^2).

HRC: Hawaii Pelagic Stock. New survey data collected by NMFS within the Exclusive Economic Zone of the Hawaiian Islands supported the derivation of updated density estimates for the Hawaii Pelagic Stock of common bottlenose dolphin from model-based analyses (Becker et al., 2021). The new habitat-based density model used in Phase IV represents an improvement to the model available for Phase III (Forney et al., 2015) because it was based on more recent survey data, it more accurately accounted for bias in group size estimates and variation in detection probabilities, and provided finer-scale density predictions (~9 km x 9 km resolution vs. the previous ~25 km x 25 km resolution). In addition, the new common bottlenose dolphin model is specific to the pelagic stock, while the previous models were based on all common bottlenose dolphin sightings. Changes in density from Phase III to Phase IV were regionally variable, with a general increase in nearshore waters of the Main and Northwestern Hawaiian Islands. There was an overall decrease in density in the western portion of the Hawaiian Islands EEZ and an increase in the eastern portion.

CAL/BCPM: **California/Oregon/Washington Offshore Stock.** In order to improve density estimates for Phase IV, the Navy funded an analysis to develop habitat-based density models for the Southern California Current, an ecologically meaningful study area that extends from Point Conception to the tip of the Baja California Peninsula. Resulting models provide the first spatially explicit estimates of common bottlenose dolphin density for waters off the Baja California peninsula (Becker et al., 2022a), and were applied to the HCTT study area south of Point Conception. The new model resulted in regionally variable density differences in waters of the Southern California Bight compared to the CCE model used in Phase III (Becker et al., 2016). For Phase IV in summer and fall, density estimates decreased in waters over the continental shelf, increased in deeper waters, and decreased within the eastern portion of the transit corridor.

To produce density estimates for the cool season, the most recent CCE common bottlenose dolphin model was used to derive separate winter and spring estimates for waters off the U.S. West Coast (Becker et al., In Prep.). These estimates represent an improvement from Phase III, when stratified uniform density estimates based on aerial line-transect data collected in winter and spring of 1991 and 1992 were used (Forney et al., 1995). The new model-based analyses provide spatially explicit estimates which better captured species distribution patterns, and resulted in a decrease in density within the Southern California Bight and the eastern portion of the transit corridor.

For waters off the Baja California Peninsula, a uniform density estimate for common bottlenose dolphin of 0.00843 animals/km^2 was used in Phase III, based on analyses by Ferguson and Barlow (2003). In contrast, model-based predictions were used for Phase IV (Becker et al., 2022a), which accounted for spatial variation in common bottlenose dolphin distribution that the previous uniform density estimates did not. The spatially explicit estimates used for Phase IV were used to represent density in BCPM waters year-round, and resulted in regionally variable density differences in the BCPM Study Area, with greatest increases right along the coast.

CAL/BCPM: **California Coastal Stock.** Carretta (2012) developed spatially-explicit density estimates for the California Coastal stock of common bottlenose dolphin that the Navy applied to both Phase III and Phase IV for all seasons. For waters off the Baja California Peninsula, a uniform density estimate of 0.3612 dolphins/km^2 was applied to waters within 1 km of the coast based on analyses by Dudzik et al. (2006). This value was applied to the BCPM waters for both Phase III and Phase IV.

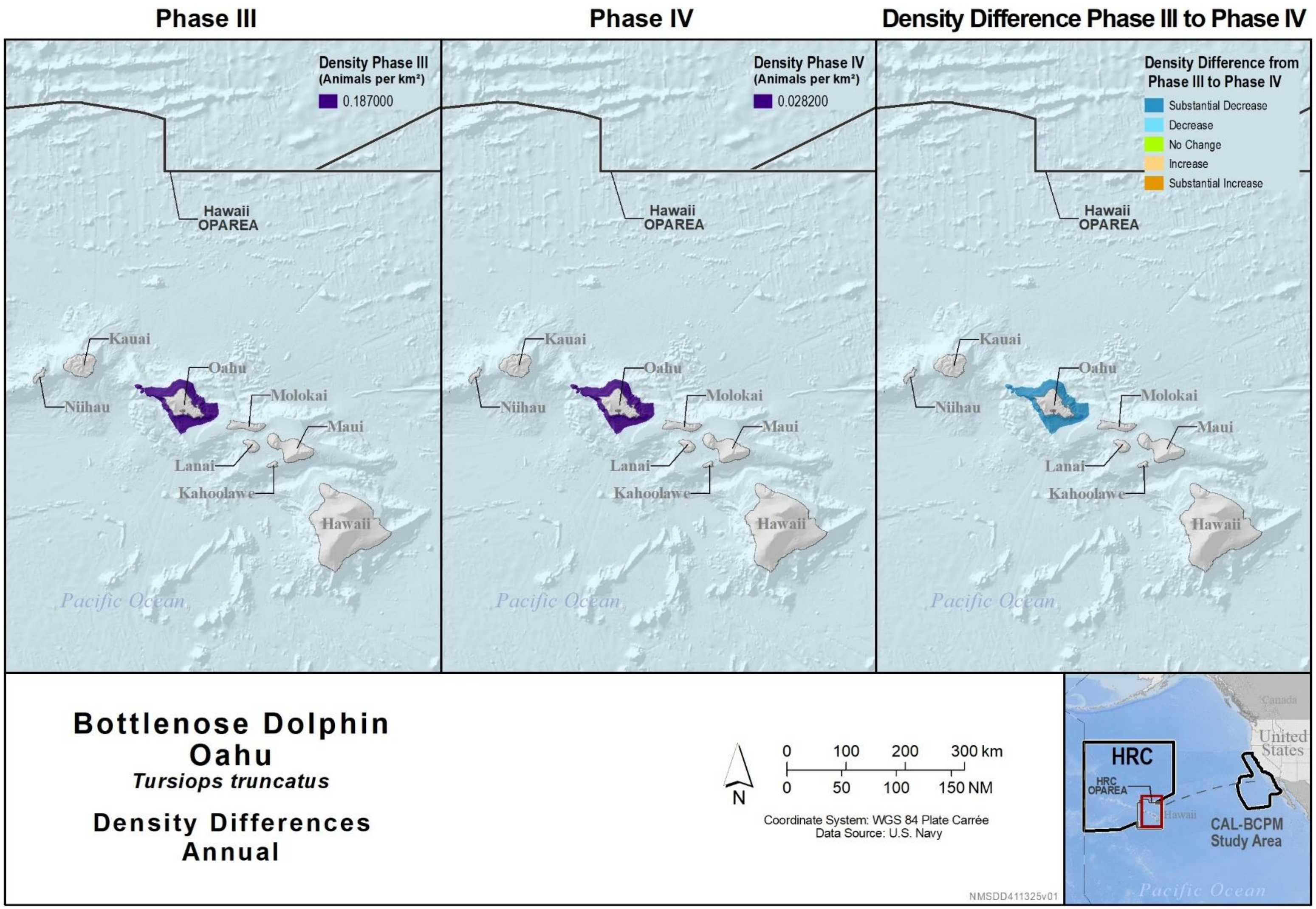

Figure A-82: Bottlenose Dolphin Oahu Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

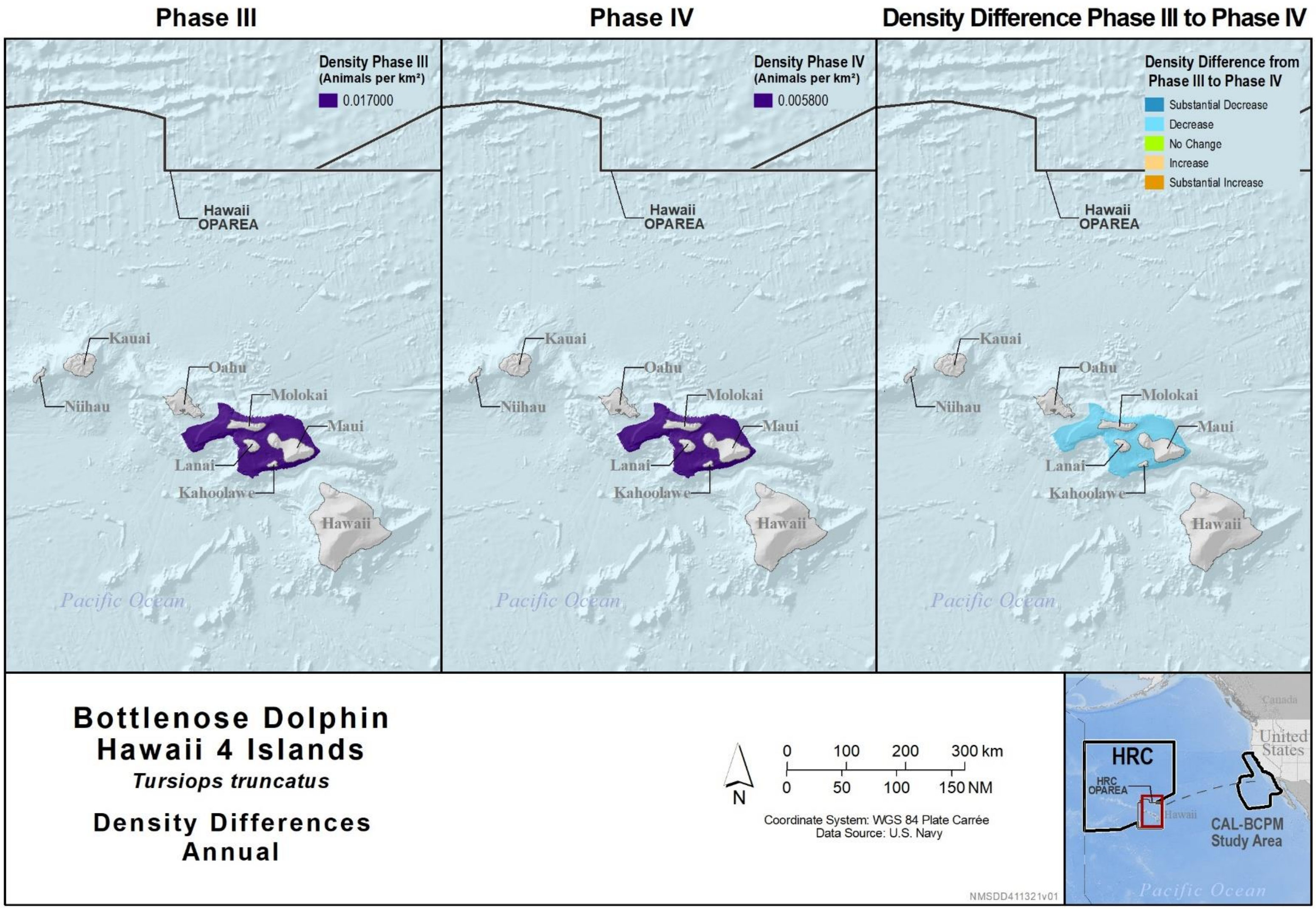

Figure A-83: Bottlenose Dolphin 4-Islands Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

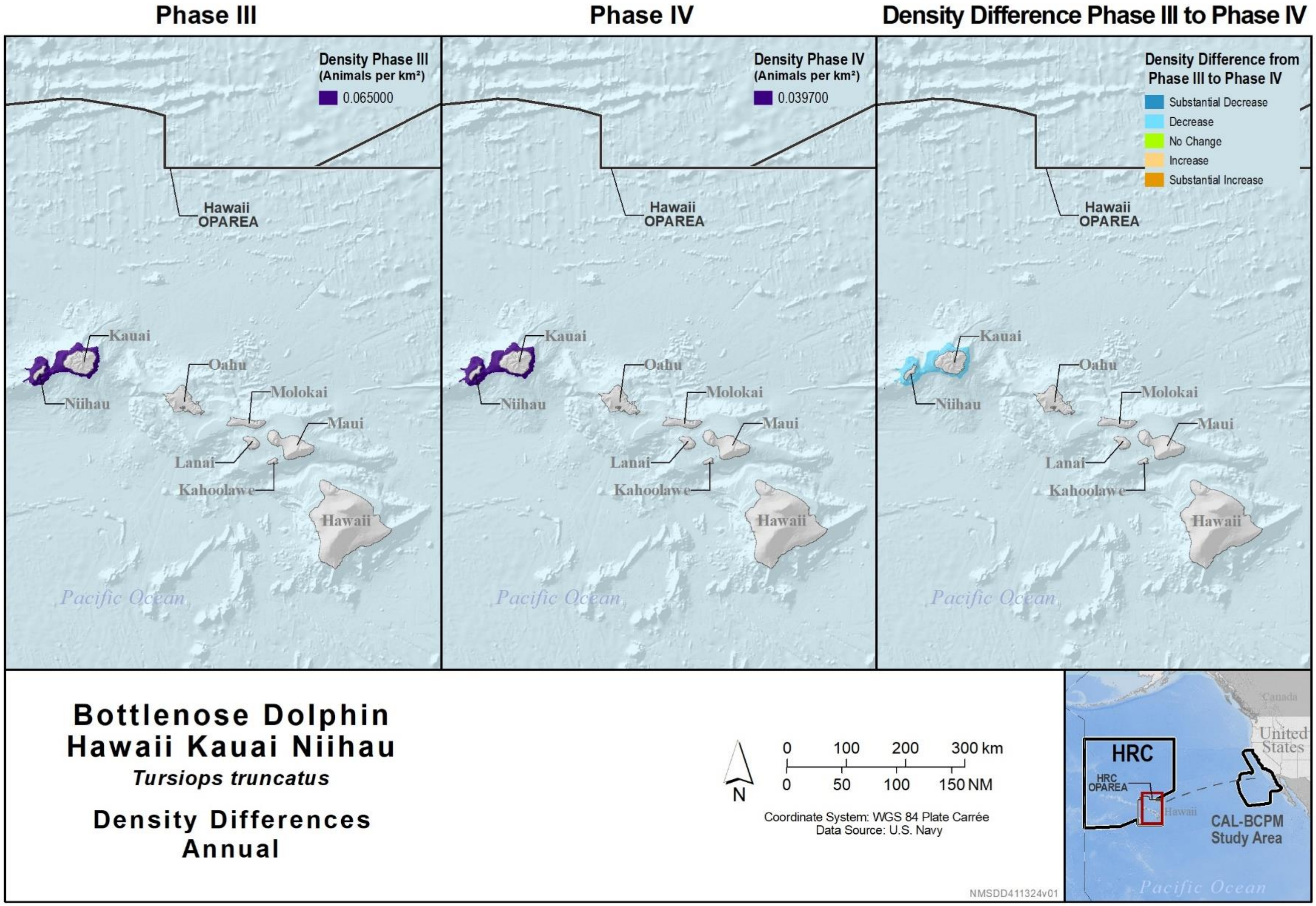

Figure A-84: Bottlenose Dolphin Hawaii Kauai/Niihau Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

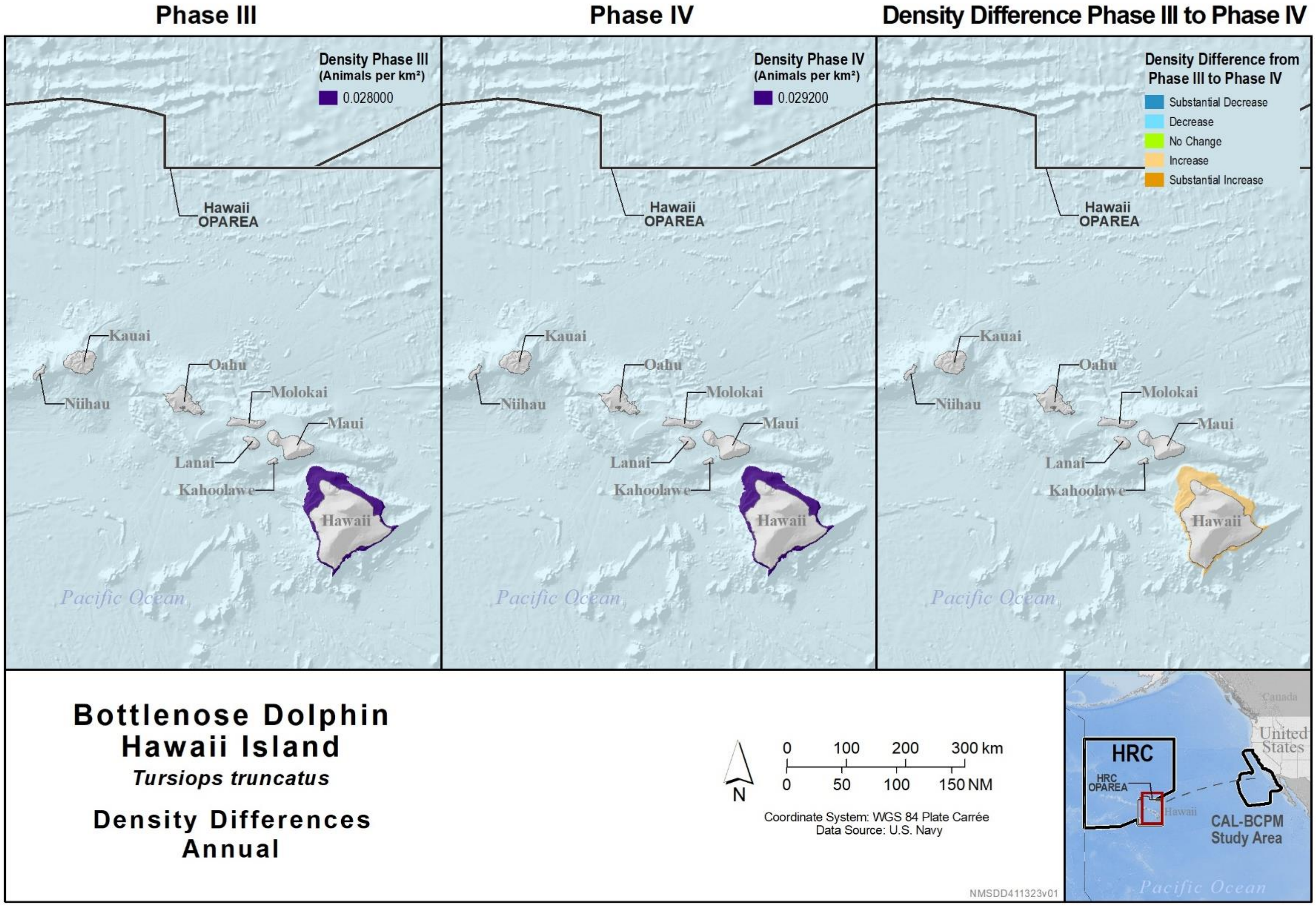

Figure A-85: Bottlenose Dolphin Hawaii Island Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

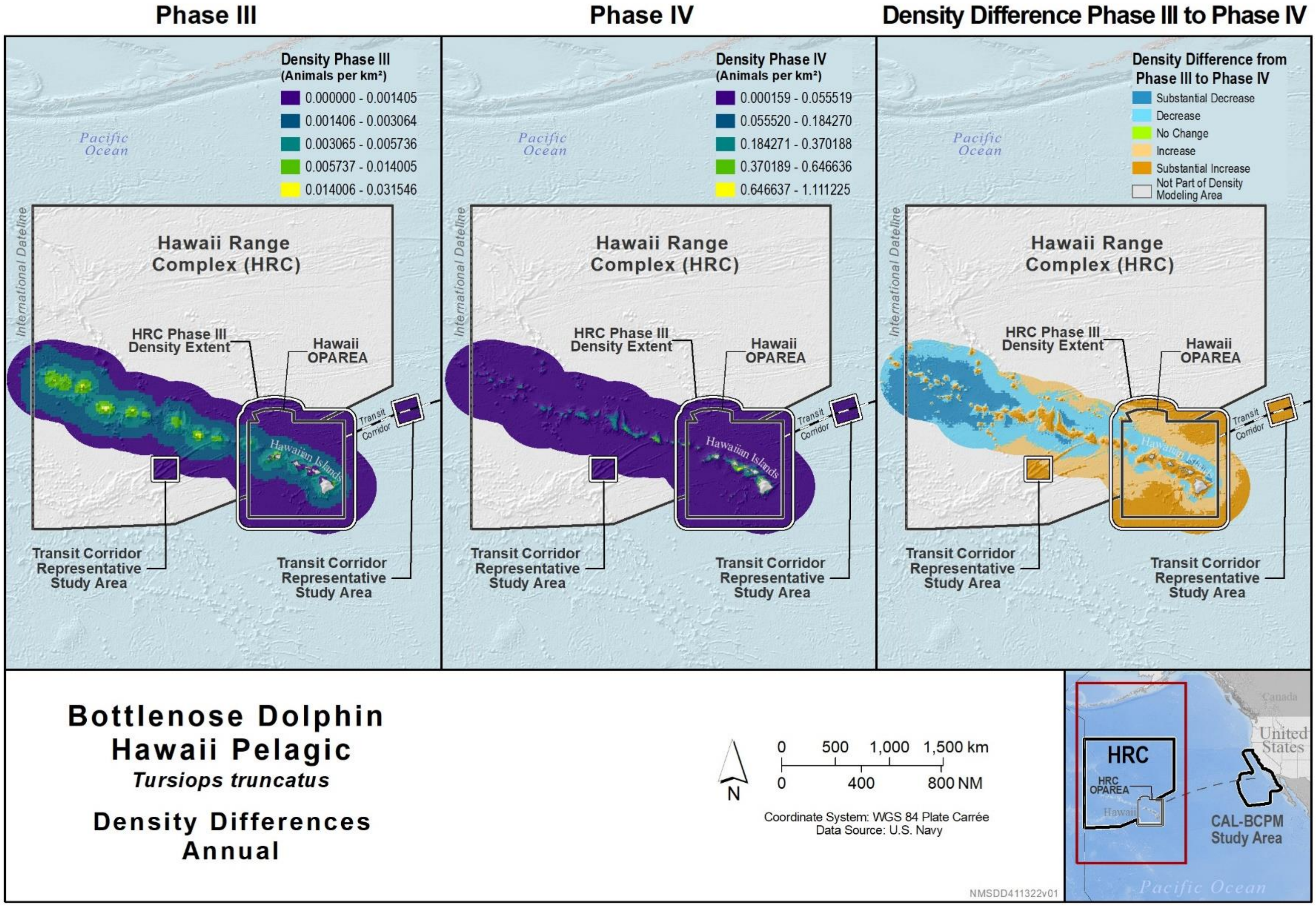

Figure A-86: Bottlenose Dolphin Hawaii Pelagic Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

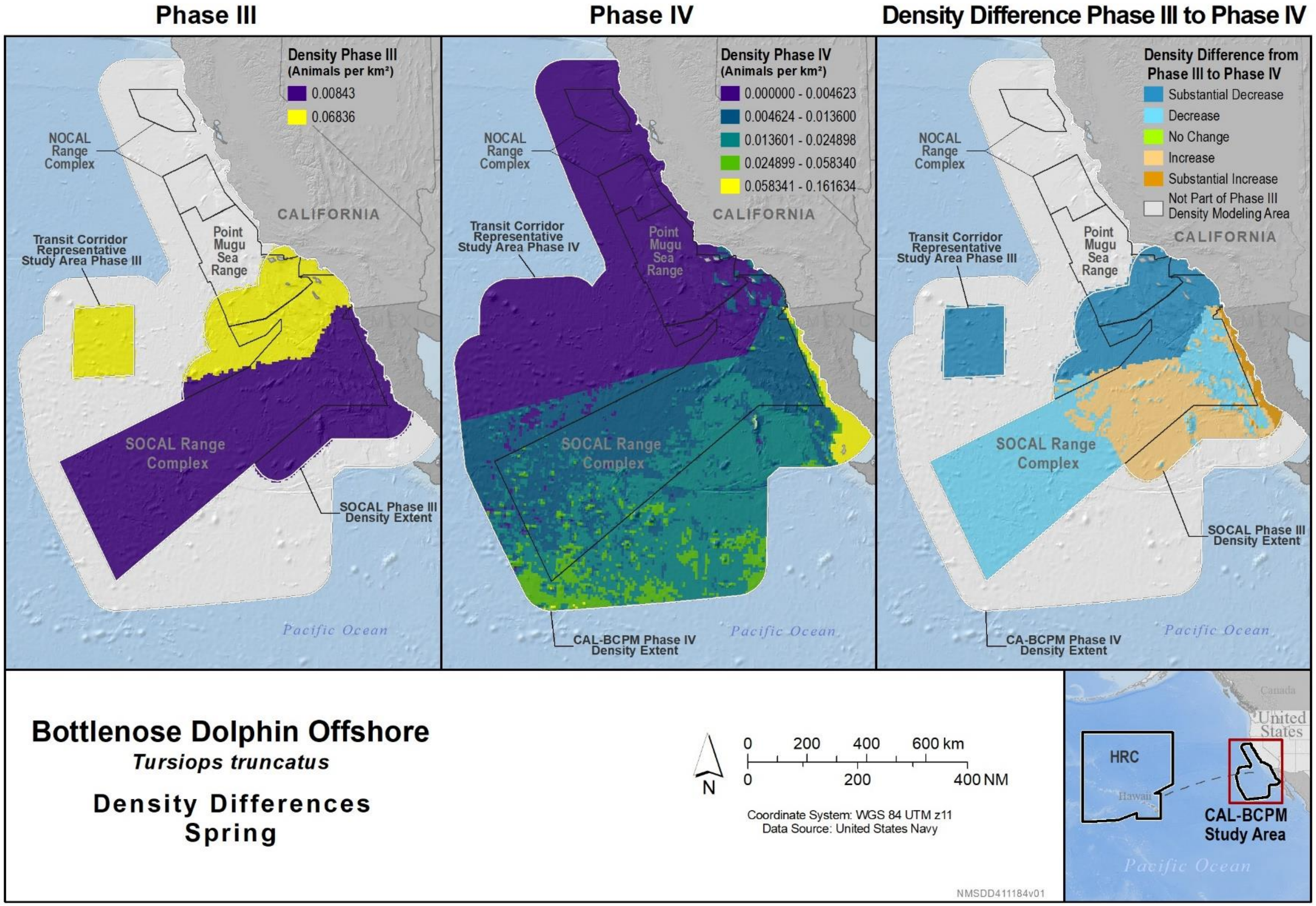

Figure A-87: Bottlenose Dolphin Offshore Stock Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

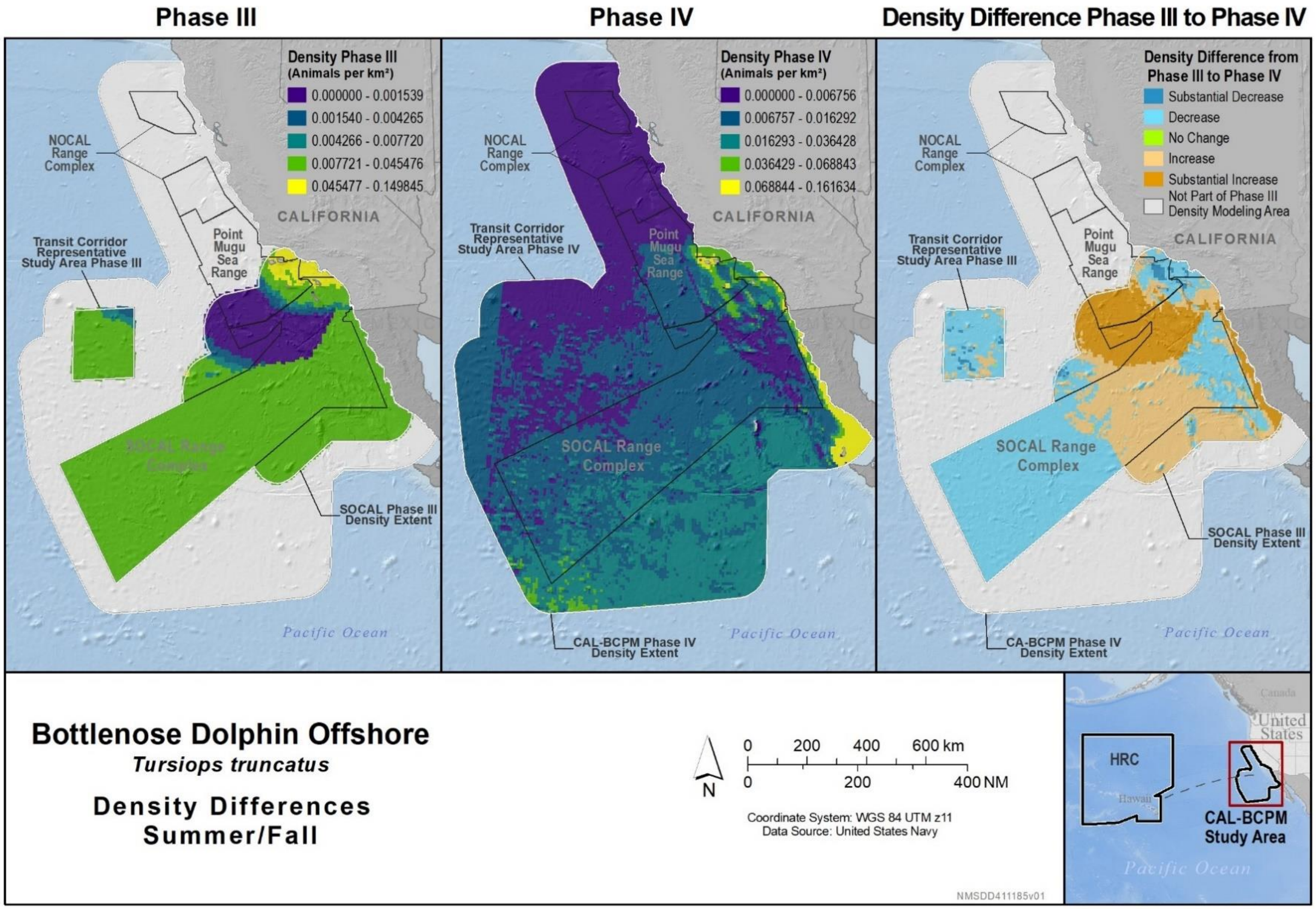

Figure A-88: Bottlenose Dolphin Offshore Stock Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

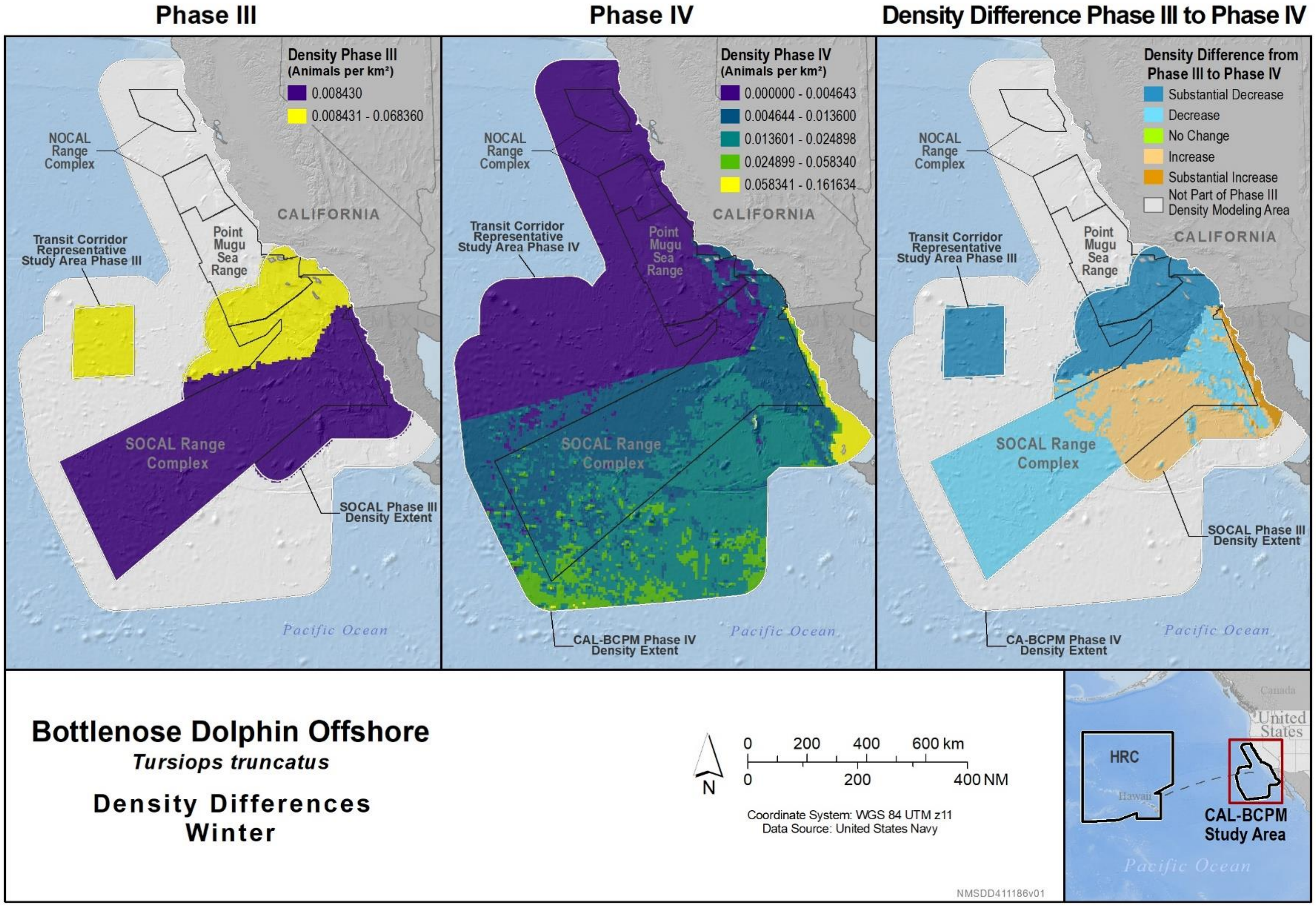

Figure A-89: Bottlenose Dolphin Offshore Stock Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

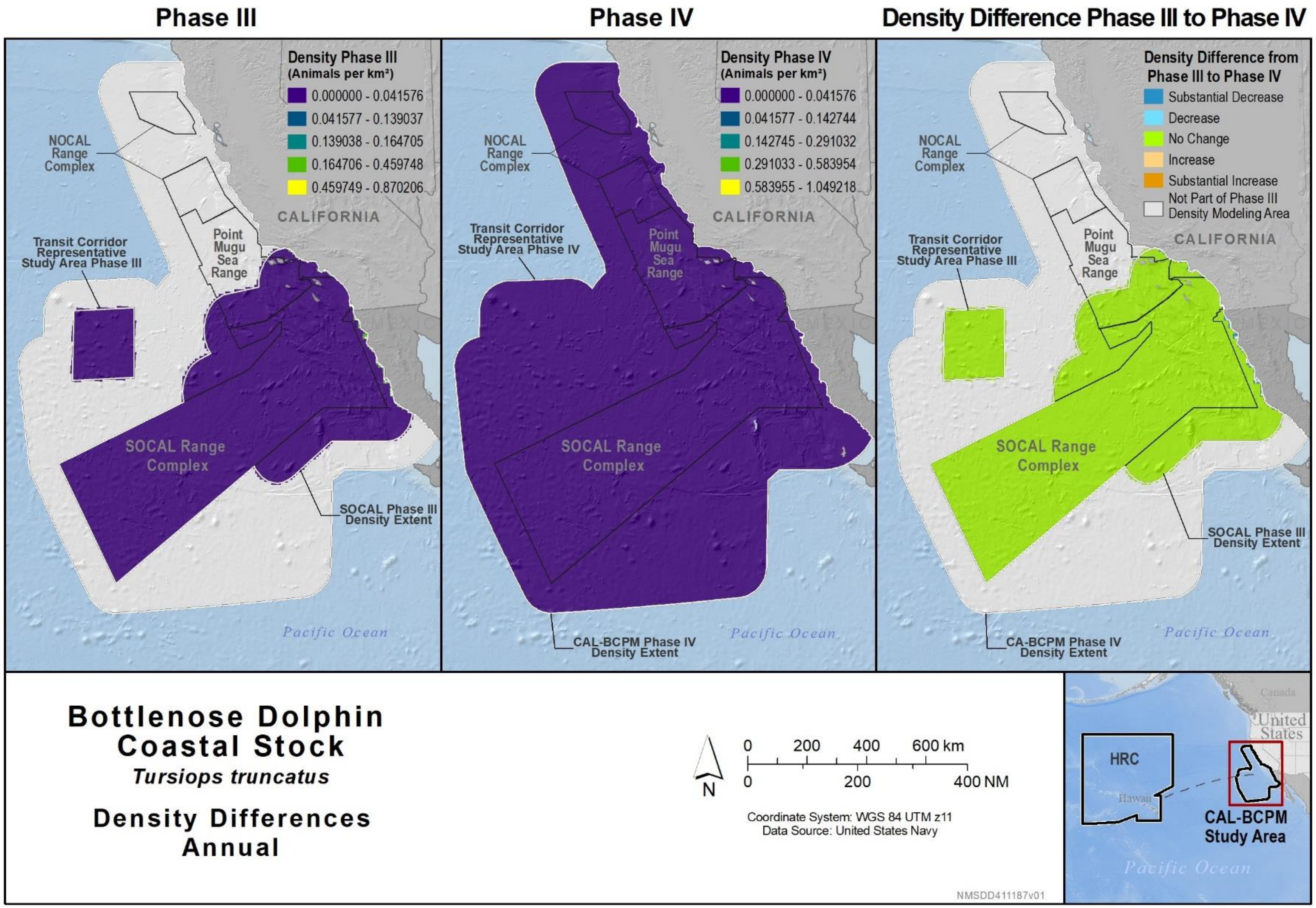

Figure A-90: Bottlenose Dolphin Coastal Stock Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.4 PORPOISES

A.1.4.1 *PHOCOENOIDES DALLI*, DALL'S PORPOISE

HRC. This species is not expected to occur within HRC or the western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall Dall's porpoise model-based predictions used from Phase III (Becker et al. 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. For Phase IV, density estimates decreased in waters within the Southern California Bight and the eastern portion of the transit corridor and increased in nearshore coastal waters of Southern California.

Becker et al. (2017) provided the first winter/spring habitat-based density model for Dall's porpoise in Southern California waters, and predictions from this model were used in Phase III. For Phase IV, the most recent CCE Dall's porpoise model was used to derive separate winter and spring estimates for waters off the U.S. West Coast (Becker et al., In Prep.). The new model-based analyses provide spatially explicit estimates which capture species distribution patterns throughout the SWFSC CCE study area, they are based on more recent survey data, and they better accounted for trackline detection probabilities (Becker et al., In Prep.). The new model-based analyses resulted in regionally- and seasonally variable differences from Phase III, with overall decreases in density in winter, and some increases in density over the continental shelf in spring.

Ferguson and Barlow (2003) provided Dall's porpoise density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a Dall's porpoise density estimate of 0.0047 animals/km^2 that was slightly higher than the 0.0042 animals/km^2 estimate used for Phase III.

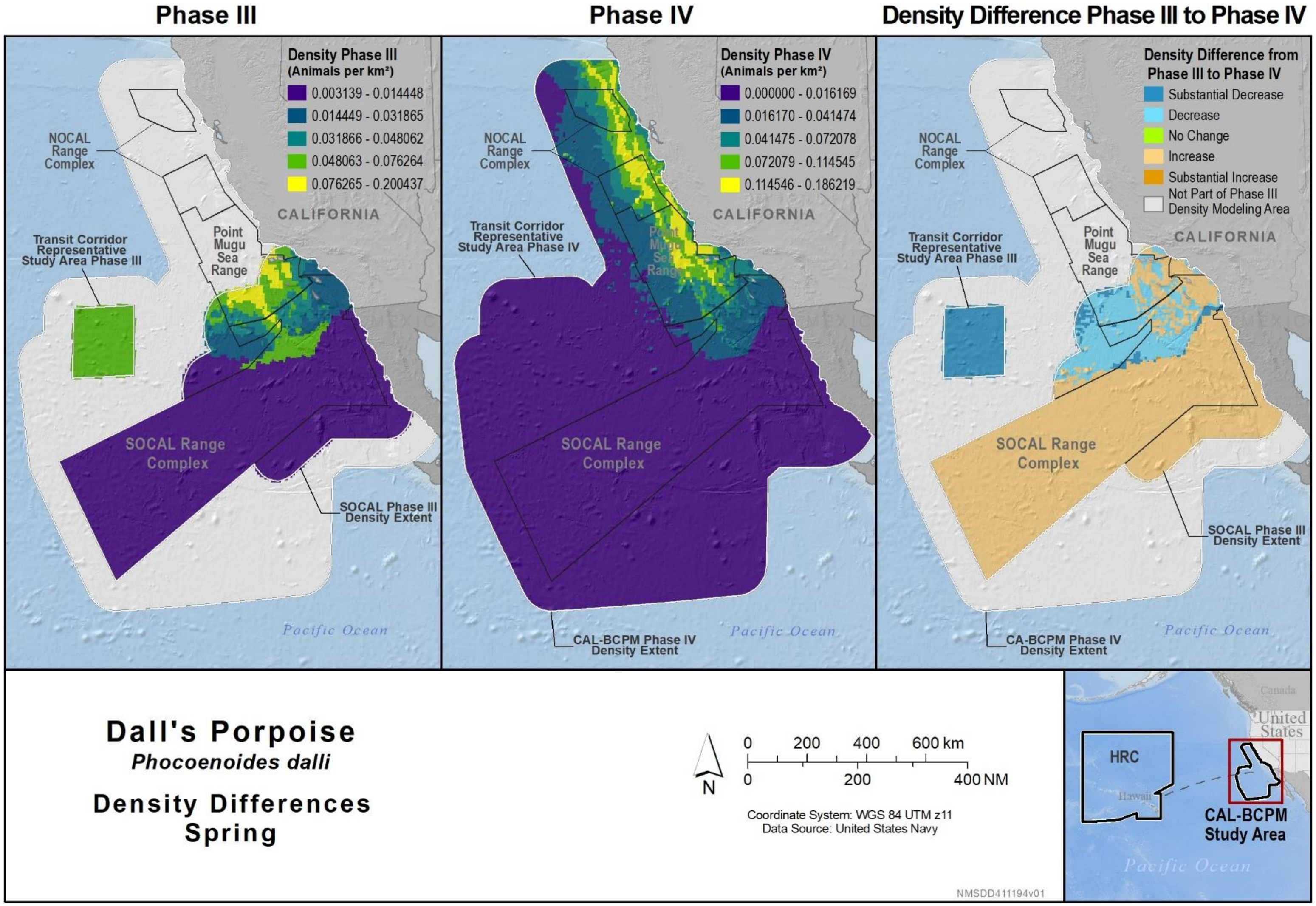

Figure A-91: Dall's Porpoise Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

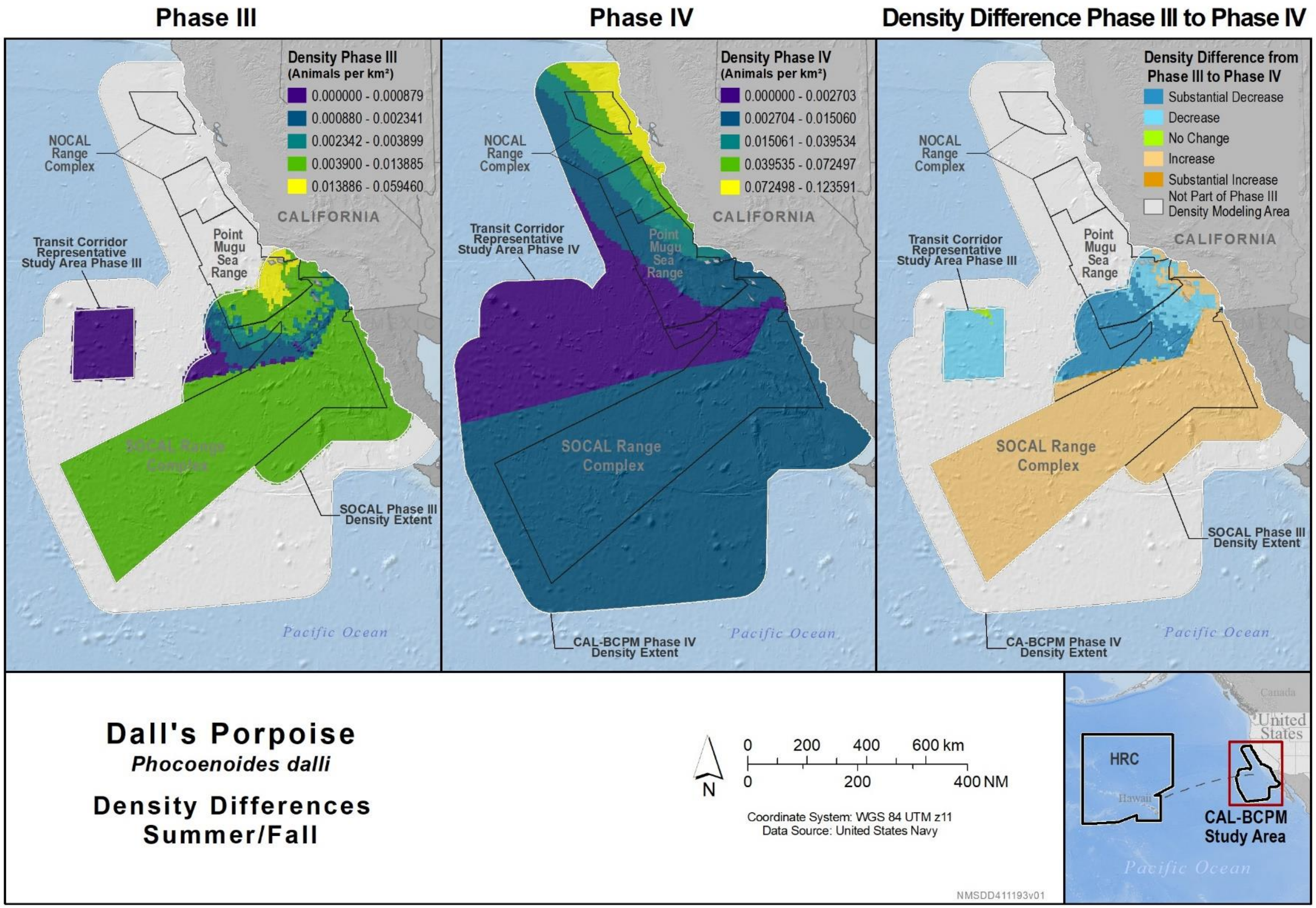

Figure A-92: Dall's Porpoise Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

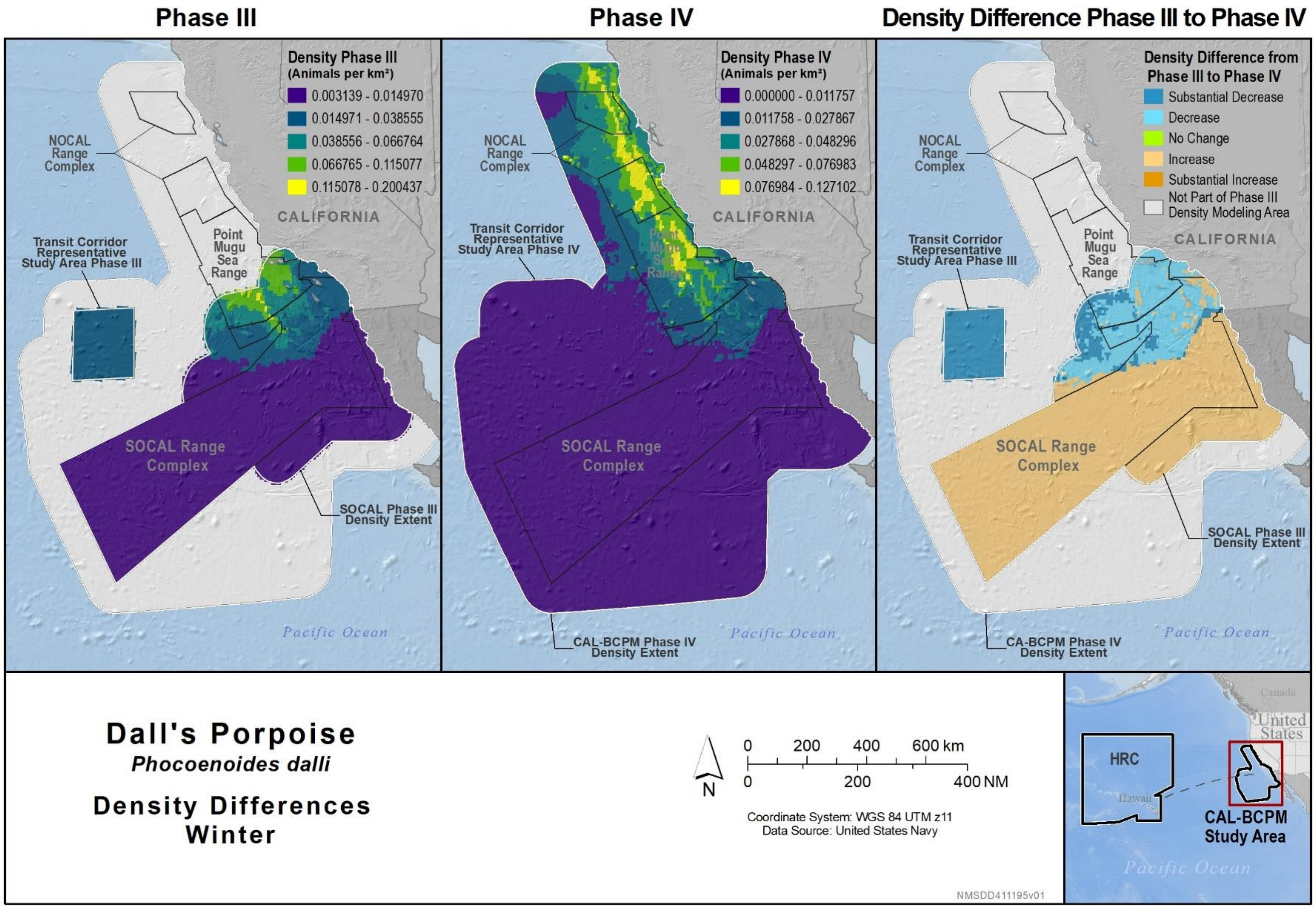

Figure A-93: Dall's Porpoise Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.4.2 *PHOCOENA PHOCOENA*, HARBOR PORPOISE

Harbor porpoise was not included in the Phase III density analyses because this species is not expected to occur within HRC or the western portion of the transit corridor, and the southern limit of its range along the California coast is Point Conception, north of the HSTT Study Area boundary (Hamilton et al., 2009).

A.1.5 BEAKED WHALES

A.1.5.1 *BERARDIUS BAIRDII*, BAIRD'S BEAKED WHALE

HRC. This species is not expected to occur in HRC or the western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall Baird's beaked whale model-based predictions used from Phase III (Becker et al., 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. Given the lack of quantitative seasonal information on this species, these estimates were applied year-round for Phase IV (as was done for Phase III).

Ferguson and Barlow (2003) provided Baird's beaked whale density values for waters off the Baja California Peninsula. For the Navy's Phase IV analyses, the Ferguson and Barlow (2003) density estimates and CVs were recalculated based on the extent of the HCTT acoustic modeling footprint and resulted in a Baird's beaked whale density estimate of 0.00003 animals/km^2 that was slightly lower than the 0.00008 animals/km^2 estimate used for Phase III.

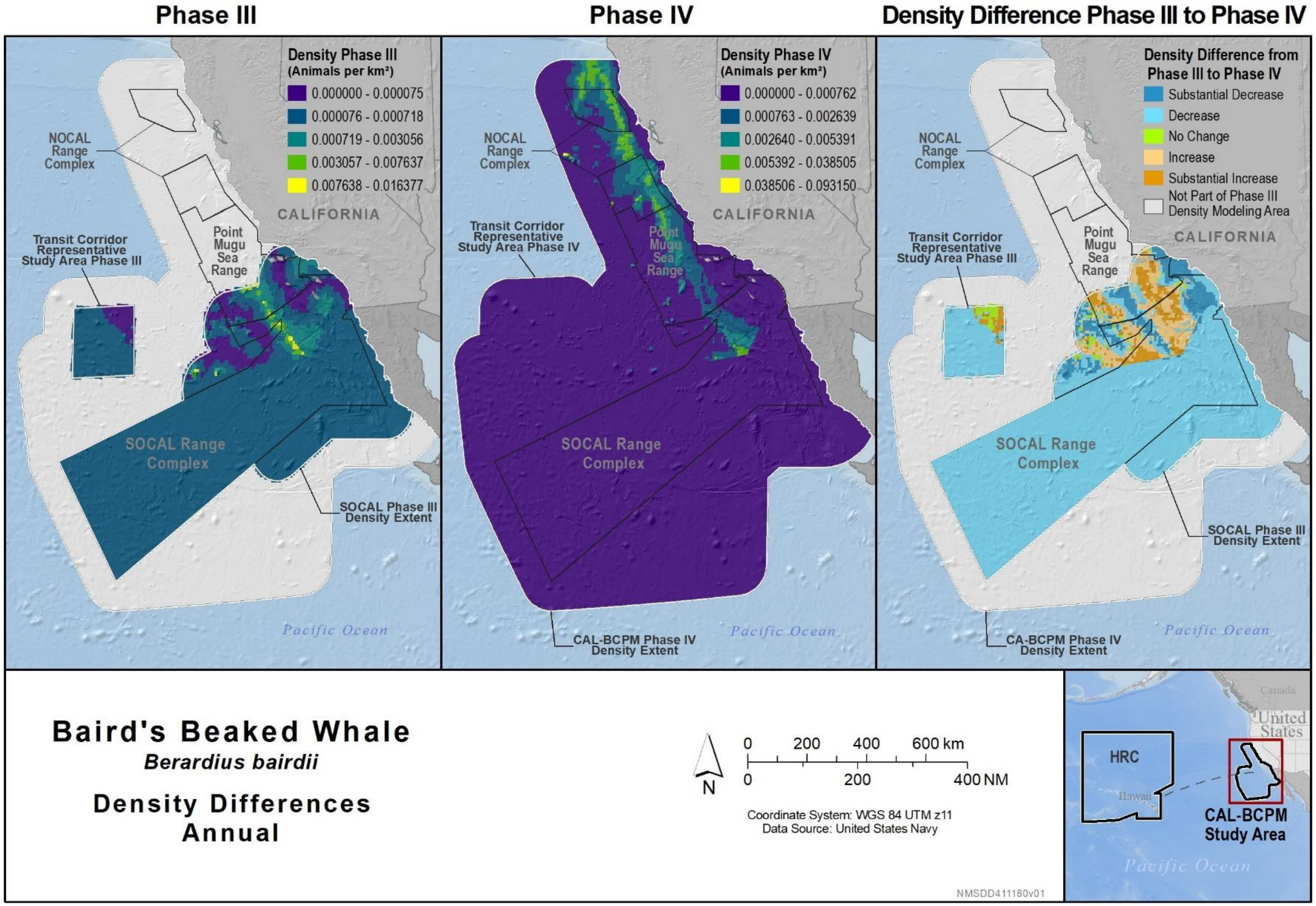

Figure A-94: Baird's Beaked Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.5.2 *Indopacetus pacificus*, Longman's Beaked Whale

HRC. The design-based density estimate used in Phase IV was slightly lower (0.00104 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00310 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. This species is not expected to occur within CAL/BCPM or the eastern portion of the transit corridor (Barlow, 2016; Hamilton et al., 2009).

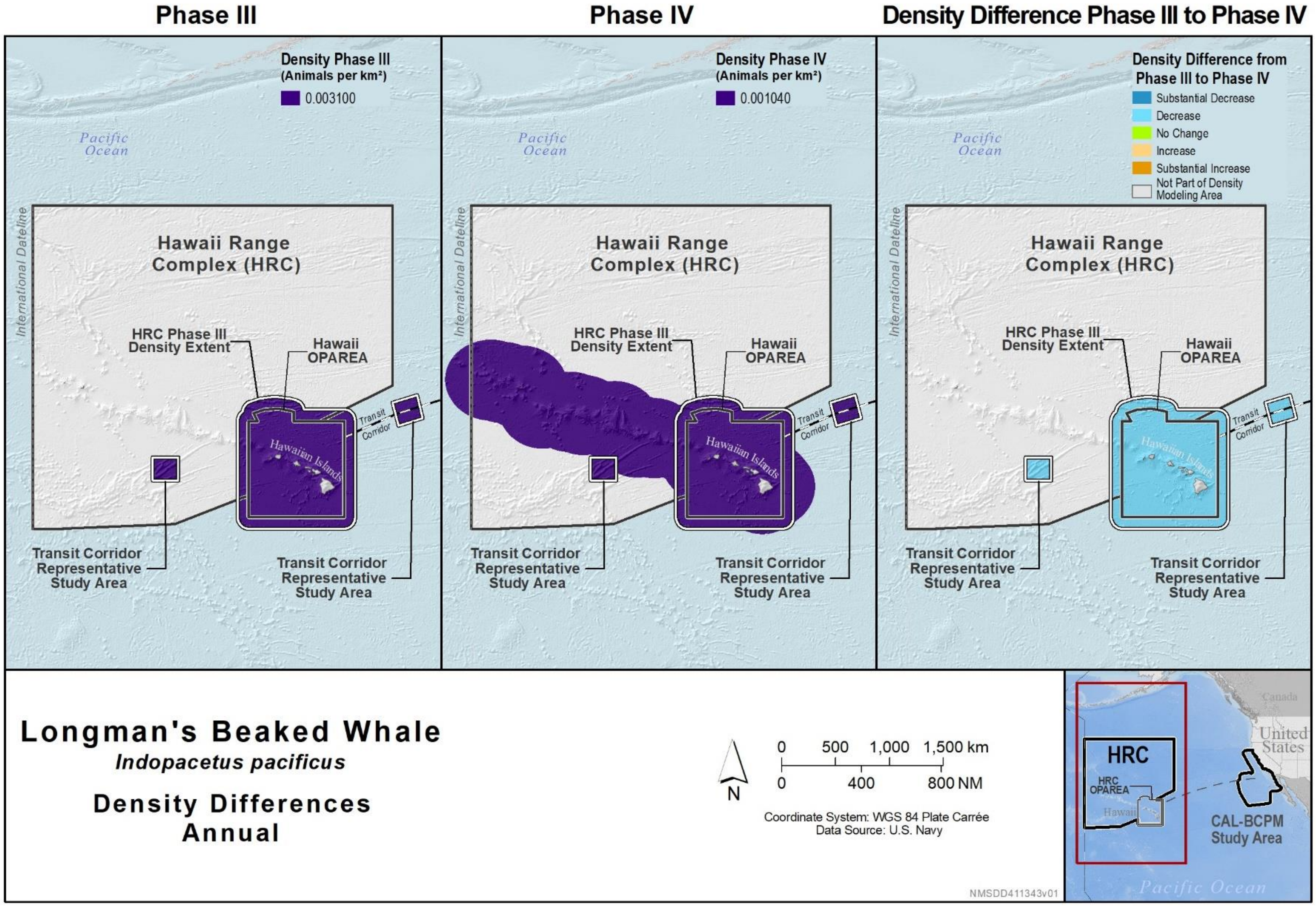

Figure A-95: Longman's Beaked Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.5.3 *MESOPLODON DENSIROSTRIS*, BLAINVILLE'S BEAKED WHALE

HRC. The design-based density estimate used in Phase IV was slightly lower (0.00046 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00086 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. This species is addressed in the small beaked whale guild for CAL/BCPM and the eastern portion of the transit corridor (Section A.1.5.7).

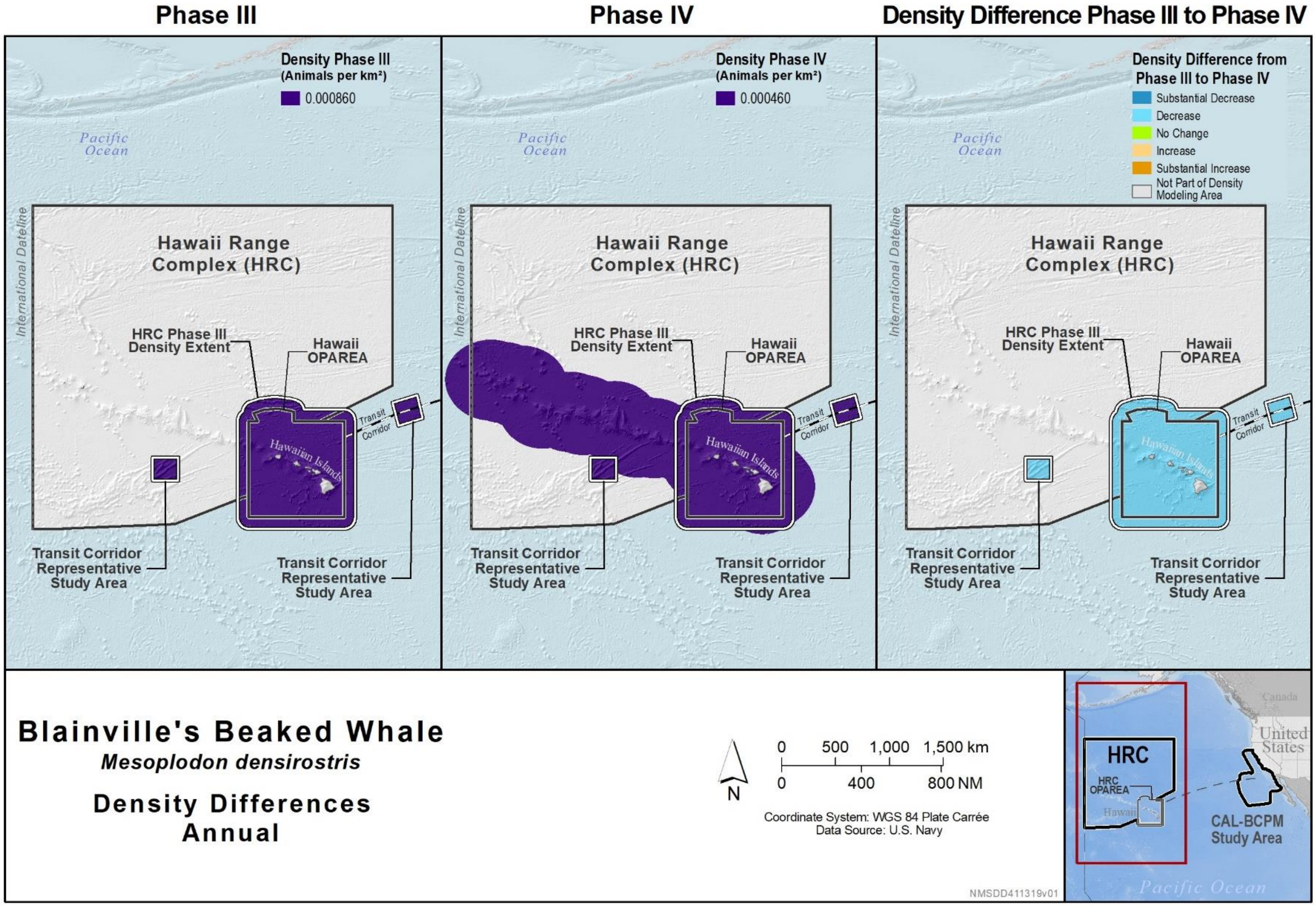

Figure A-96: Blainville's Beaked Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.5.4 *MESOPLODON GINKGODENS*, GINKGO-TOOTHED BEAKED WHALE

HRC. This species is not expected to occur within HRC or the western portion of the transit corridor (Hamilton et al., 2009; Taylor et al., 2008).

CAL/BCPM. This species is addressed in the small beaked whale guild for CAL/BCPM and the eastern portion of the transit corridor (Section A.1.5.7).

A.1.5.5 *MESOPLODON STEJNEGERI*, STEJNEGER'S BEAKED WHALE

HRC. This species is not expected to occur in HRC or the western part of the transit corridor (Muto et al., 2017).

CAL/BCPM. This species is addressed in the small beaked whale guild for CAL/BCPM and the eastern portion of the transit corridor (Section A.1.5.7).

A.1.5.6 *ZIPHIUS CAVIROSTRIS*, CUVIER'S BEAKED WHALE

HRC. The design-based density estimate used in Phase IV was higher (0.00181 animals/km^2) than that used previously in the Navy's Phase III analyses (0.00030 animals/km^2), but it is based on more recent survey data, a more current detection function, and new estimates of trackline detection probabilities that consider the effect of survey sighting conditions (Bradford et al., 2021).

CAL/BCPM. For Phase IV, a new habitat-based density model for Cuvier's beaked whale (Fiedler et al., In Press) was available that provided density predictions at 25 km x 25 km spatial resolution for the SWFSC CCE Study Area. Since this species was addressed in the small beaked whale guild for Phase III, a direct comparison of density differences is not available.

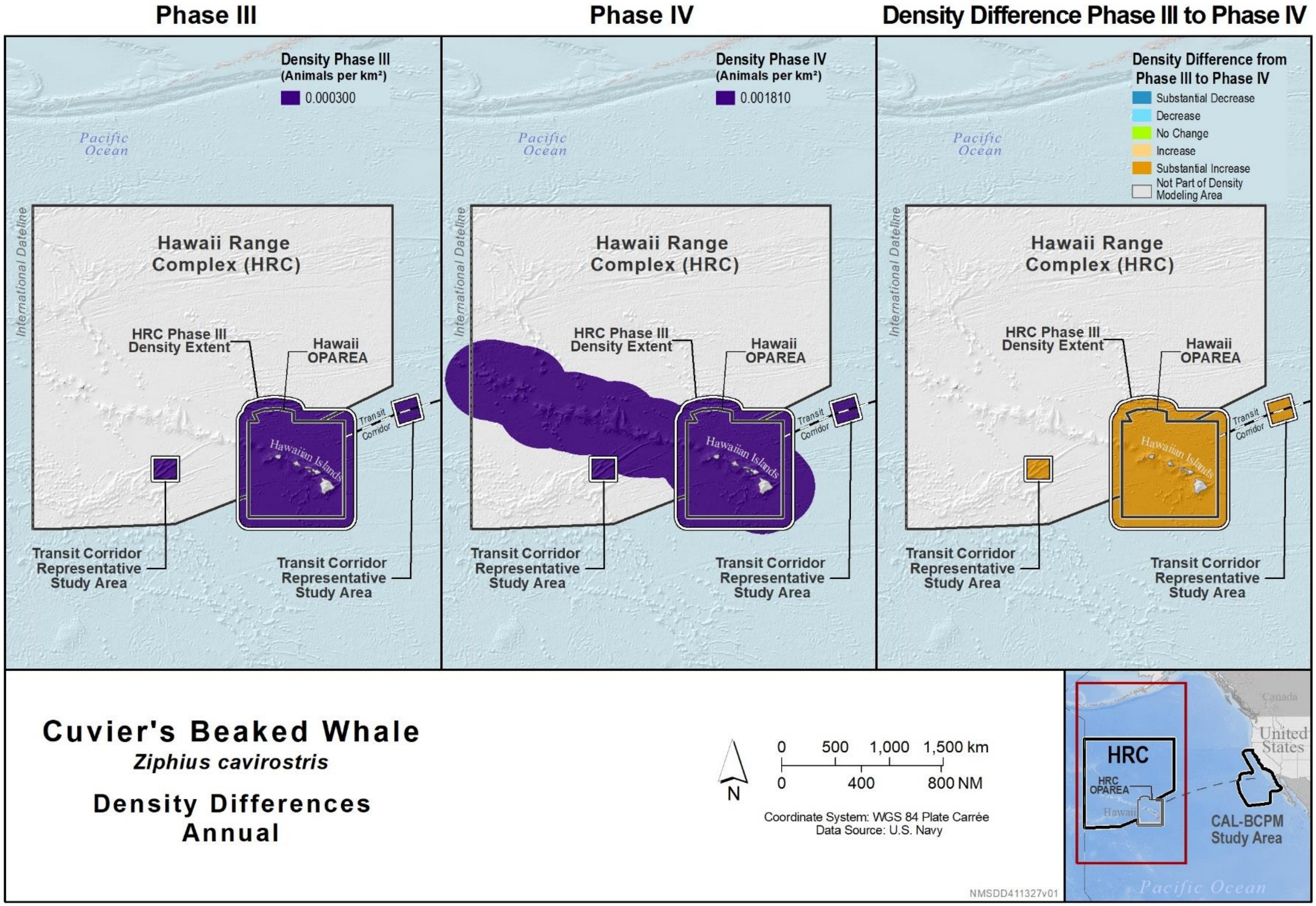

Figure A-97: Cuvier's Beaked Whale Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.1.5.7 SMALL BEAKED WHALE GUILD

HRC. Of the seven species included in the small beaked whale guild, Blainville's and Cuvier's beaked whale occur in HRC and are addressed as individual species in their respective sections. The other five beaked whale species are not expected to occur in HRC or the western portion of the transit corridor (Hamilton et al., 2009).

CAL/BCPM. Differences in the summer/fall small beaked whale guild model-based predictions used from Phase III (Becker et al. 2016) to Phase IV (Becker et al., 2020) resulted in regionally variable density differences in waters of the Southern California Bight. Given the lack of quantitative seasonal information on this species, these estimates were applied year-round for Phase IV (as was done for Phase III).

Barlow (2016) provided a uniform density estimate for *Mesoplodon* spp. of 0.00217 animals/km^2 for waters off Southern California. Since this estimate is based on line-transect survey data that included sightings of Mesoplodont species within the Navy's acoustic modeling study area, it was applied to the BCPM portion of the HCTT Study Area for all seasons for both Phase III and Phase IV.

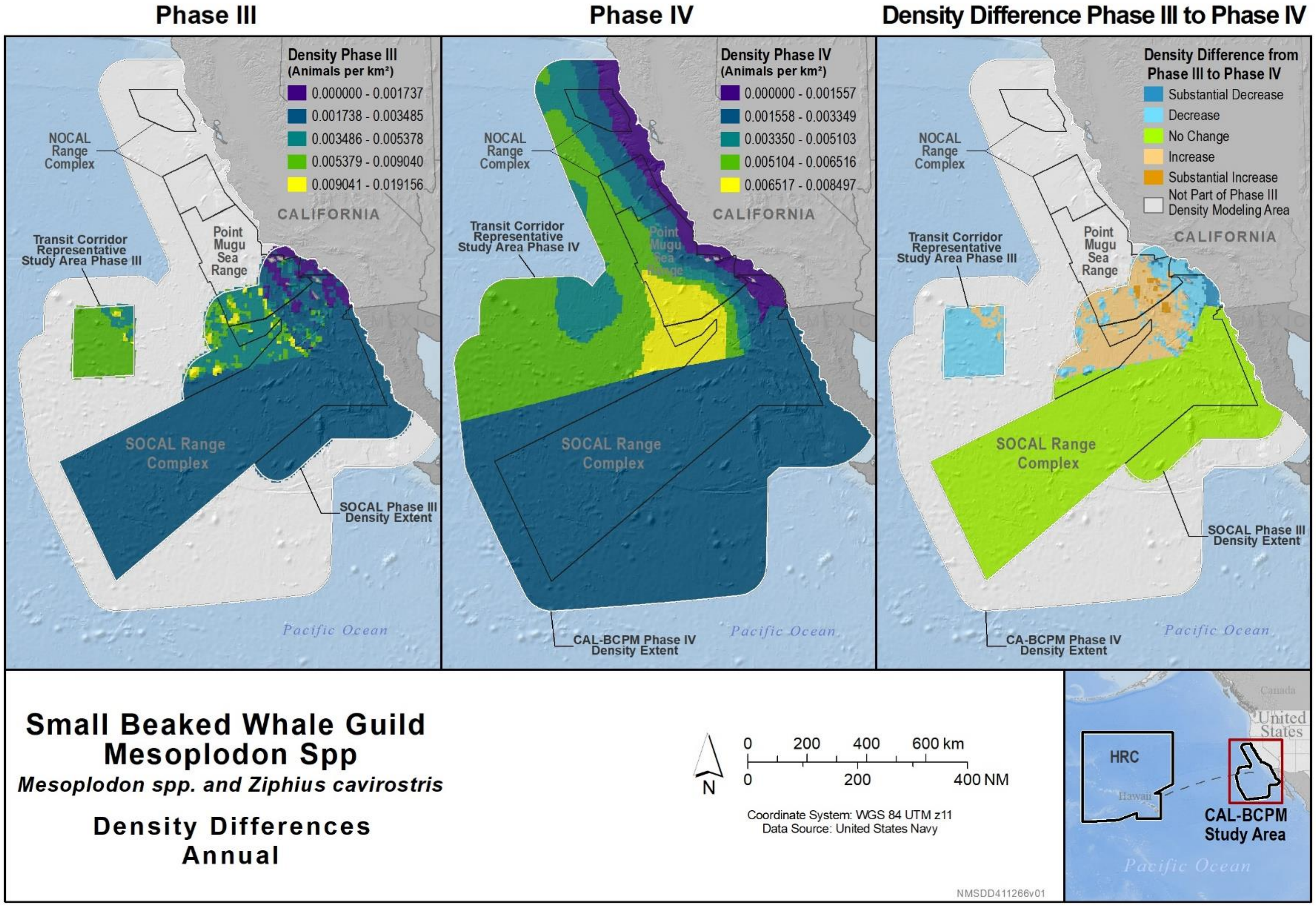

Figure A-98: Small Beaked Whale Guild Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the CAL/BCPM Study Area. A "substantial" difference (either decrease or increase) in density is defined as a change that is roughly an order of magnitude or greater different from Phase III to Phase IV (Right Panel).

A.2 PINNIPEDS AND MUSTELIDS

For Phase IV, adjustments were made to pinniped density estimates to better capture seasonal distributions, migratory behavior, and haulout cycles. Occurrence for several species was limited to nearshore waters, consistent with habitat preferences, rather than extrapolated as uniform densities to areas farther offshore as was done in Phase III. These adjustments tended to result in an increase in densities closer to shore or in preferred habitat or migratory routes and a decrease in offshore densities, compared with Phase III density estimates.

A.2.1 PINNIPEDS (SEALS, SEA LIONS, AND FUR SEALS)

A.2.1.1 *CALLORHINUS URSINUS*, NORTHERN FUR SEAL

HRC. Northern fur seals are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. The density for northern fur seal decreased in Phase IV for nearly all of the SOCAL portion of the HSTT Study Area used in Phase III. The only area where density increased was in the northeast corner of the SOCAL Phase III density extent where the newly defined Phase IV San Miguel stratum overlaps with the Phase III density extent (Figure A-99). The density changes, both increases and decreases, are due to a change in the way the distribution of northern fur seals was represented. In Phase III, a single uniform density was calculated based on the abundance of northern fur seals from the California Stock in the Channel Islands and extrapolated across the density extent to facilitate modeling in the entire SOCAL portion of the HSTT Study Area. In Phase IV, the southernmost distribution of northern fur seals was limited to about 40 km south of San Miguel Island. This change more accurately represents the movements of female northern fur seals from the California Stock, recognizing that they disperse north and northeast following the breeding season, with limited movement south of San Miguel Island (Antonelis et al., 1990; Melin, 2022). Historical data indicate that males from the California Stock also move north after breeding (Kajimura, 1984). In addition, a portion of juvenile and adult female northern fur seals from the larger Eastern Pacific Stock, referred to as coastal migrators, make seasonal migrations to the Pacific Northwest and Northern California waters that extend into the northern portion of the HCTT Study Area (Pelland, 2022; Pelland et al., 2014). However, only a very small percentage of coastal migrators from the Eastern Pacific Stock migrate as far south as San Miguel Island and do not contribute to density changes in the SOCAL portion of the HSTT Study Area. These revisions that more accurately characterize the distribution of northern fur seals along the U.S. West Coast result in a zero density in nearly all of the Phase III density extent.

Density changes are shown only for May in this appendix (Figure A-99) because the density difference panel showing changes from Phase III to Phase IV (the right panel in Figure A-99) is identical for all months.

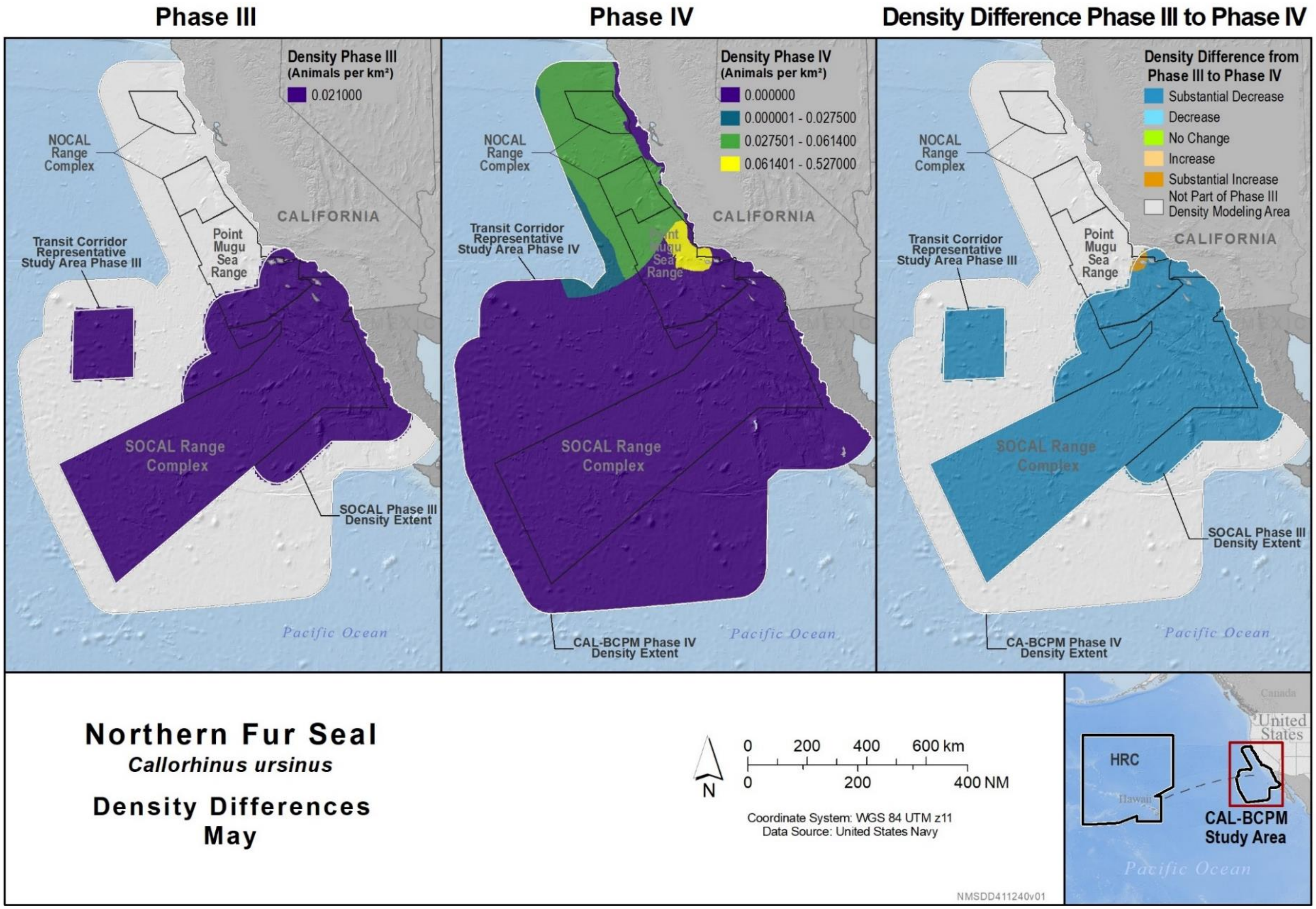

Figure A-99: Northern Fur Seal May Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.2 *Mirounga angustirostris*, Northern Elephant Seal

HRC. Northern elephant seals are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. The density for northern elephant seal decreased in Phase IV for most of the SOCAL portion of the HSTT Study Area used in Phase III. The only area where densities increased was in the northern portion of the SOCAL Phase III density extent and primarily from late fall through early spring (November – March). The density changes, both increases and decreases, were due to a change in the way the distribution of northern elephant seals was represented. In Phase III, a winter/spring density and a summer/fall density were calculated based on the abundance of northern elephant seals breeding in the Channel Islands, and those seasonal densities were extrapolated across the density extent to facilitate modeling in the entire SOCAL portion of the HSTT Study Area. In Phase IV, the southernmost distribution of northern elephant seals was limited to the Channel Islands where breeding and molting take place. Following the breeding and molting seasons, northern elephant seals disperse widely to the north and northeast as far as the Aleutian Islands and central North Pacific, and do not move south of the Channel Islands (Peterson et al., 2015; Robinson et al., 2012). This change more accurately represents the movements of northern elephant seals from the U.S. Stock and resulted in a zero density for most of the offshore portion of the Phase III density extent.

Northern elephant seals from the Mexico breeding population also migrate north following breeding and molting on islands off the BCPM, which takes them through the SOCAL portion of the HSTT Study Area. Robinson et al. (2012) estimated that 20 percent of elephant seals remain over the shelf and slope off the BCPM and SOCAL and 80 percent continue north through the Southern California Bight and have a distribution similar to elephant seals in the U.S. Stock. Estimating a density off the BCPM based on the abundance of only the Mexico breeding population resulted in a lower density in Phase IV off the BCPM and in the southern half of the Southern California Bight.

The density difference map (right panel in Figure A-100) for January – February is identical to the difference maps for March, November, and December, so maps for those three months are not shown in this appendix. Density difference maps for April through October are shown in Figure A-101 through Figure A-106.

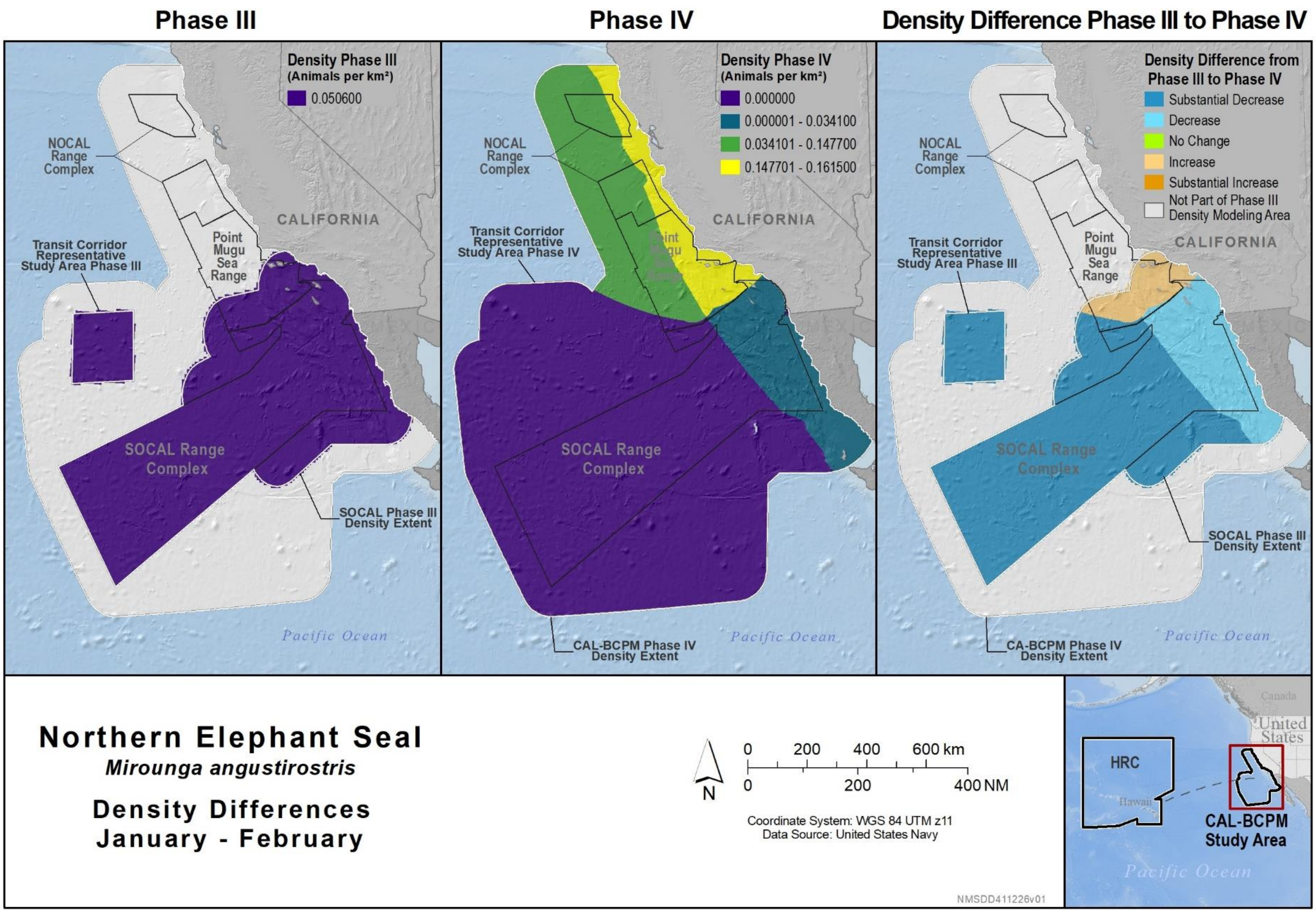

Figure A-100: Northern Elephant Seal January – February Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A “substantial” difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

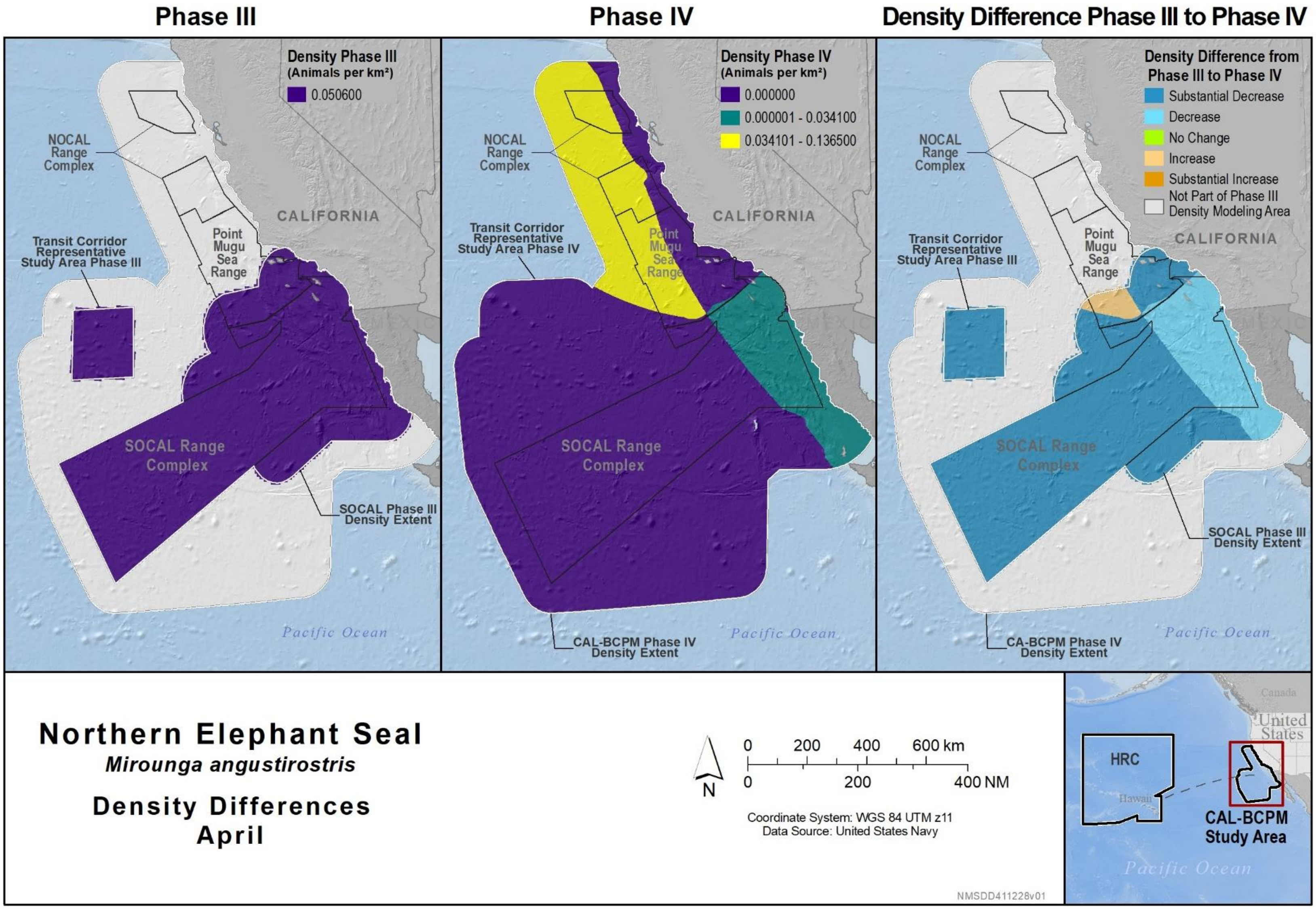

Figure A-101: Northern Elephant Seal April Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

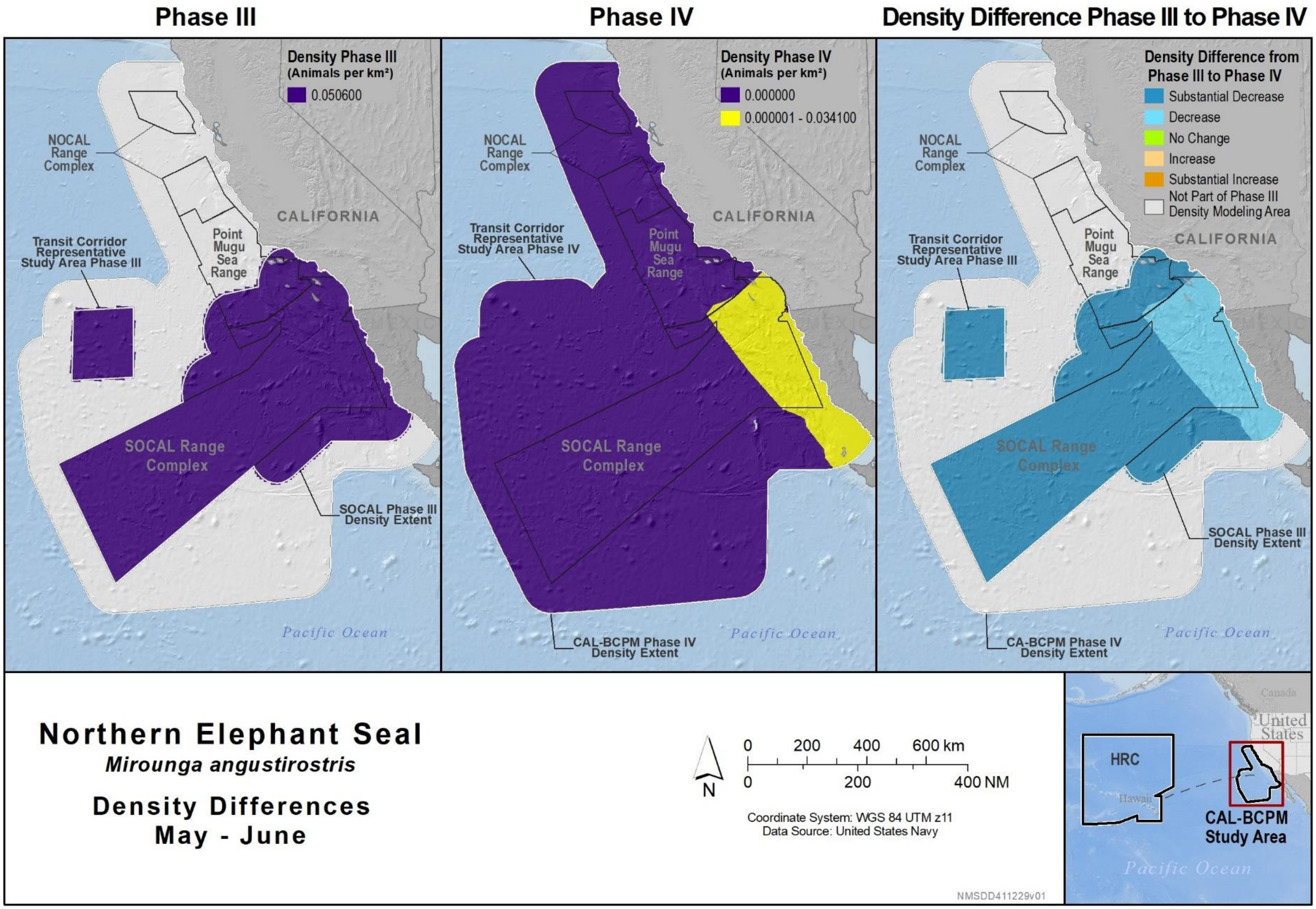

Figure A-102: Northern Elephant Seal May – June Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A “substantial” difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

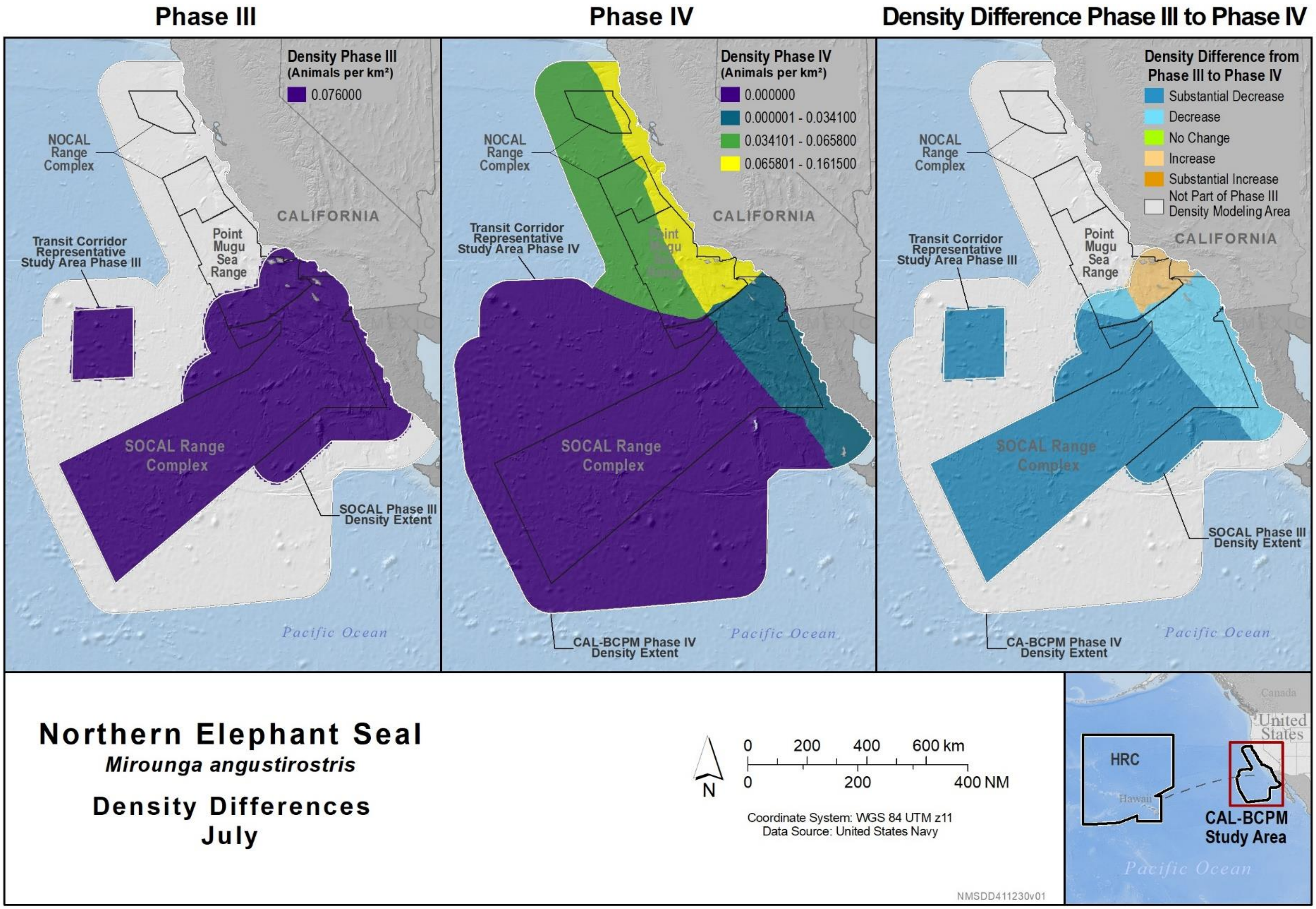

Figure A-103: Northern Elephant Seal July Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

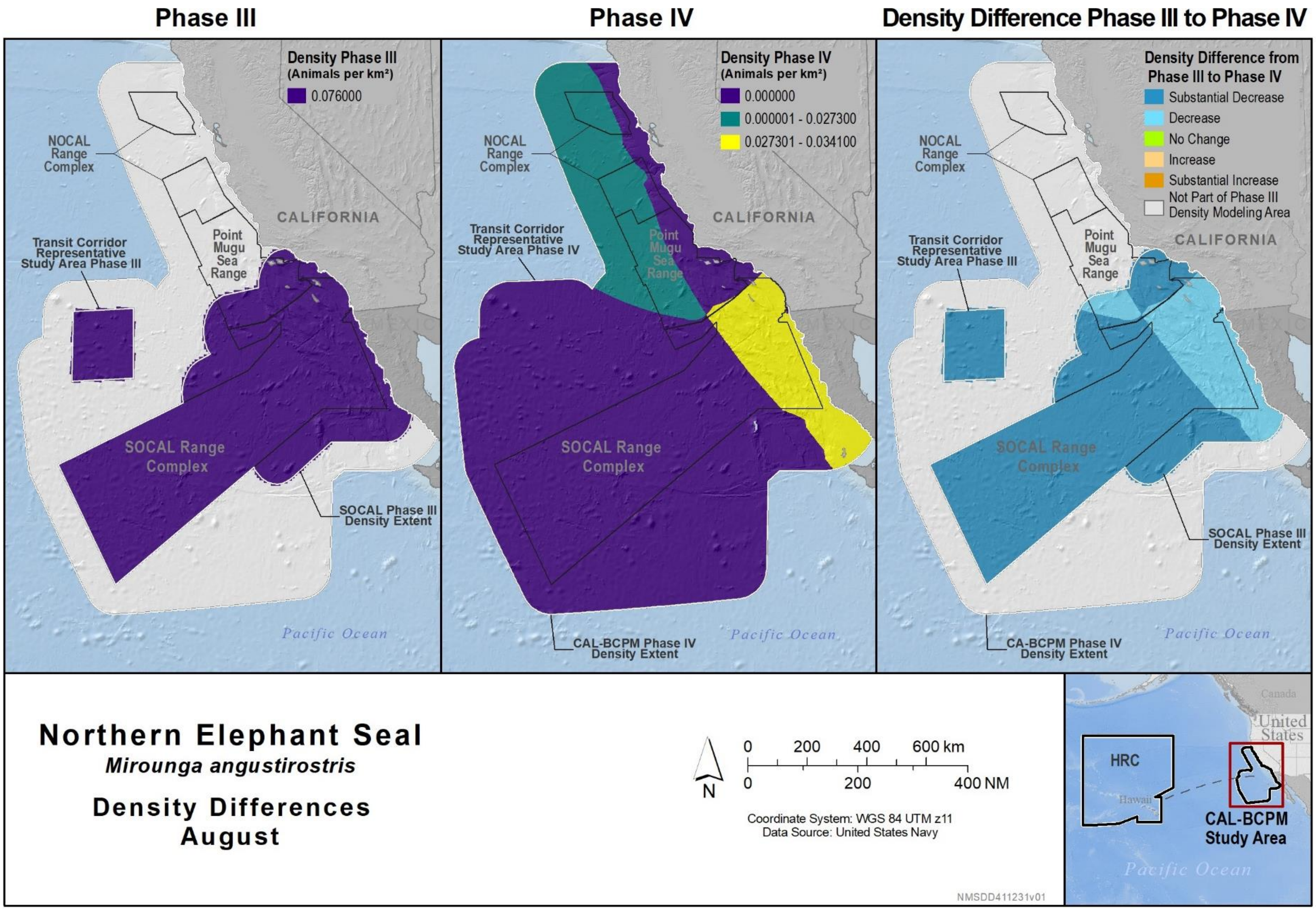

Figure A-104: Northern Elephant Seal August Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

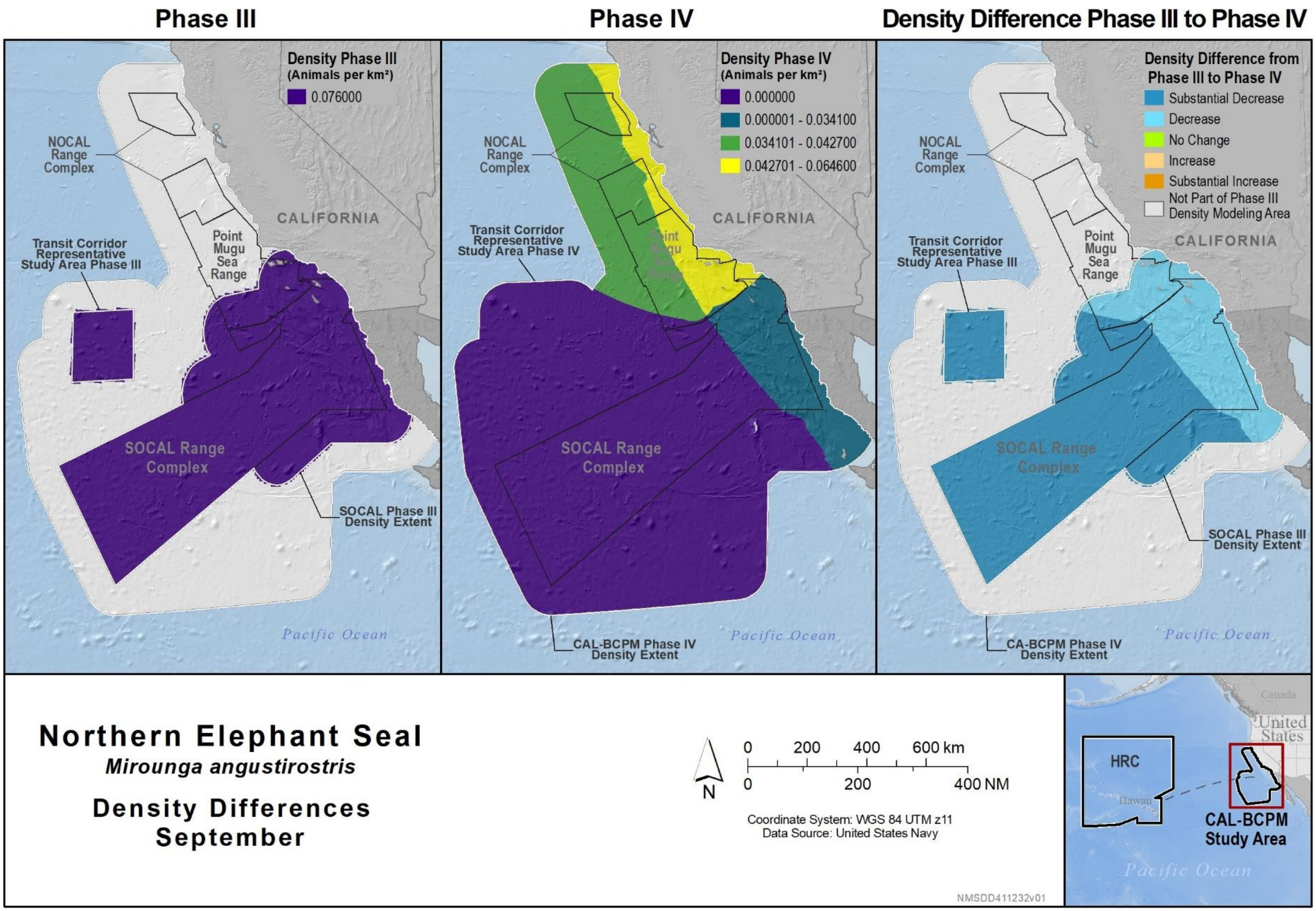

Figure A-105: Northern Elephant Seal September Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

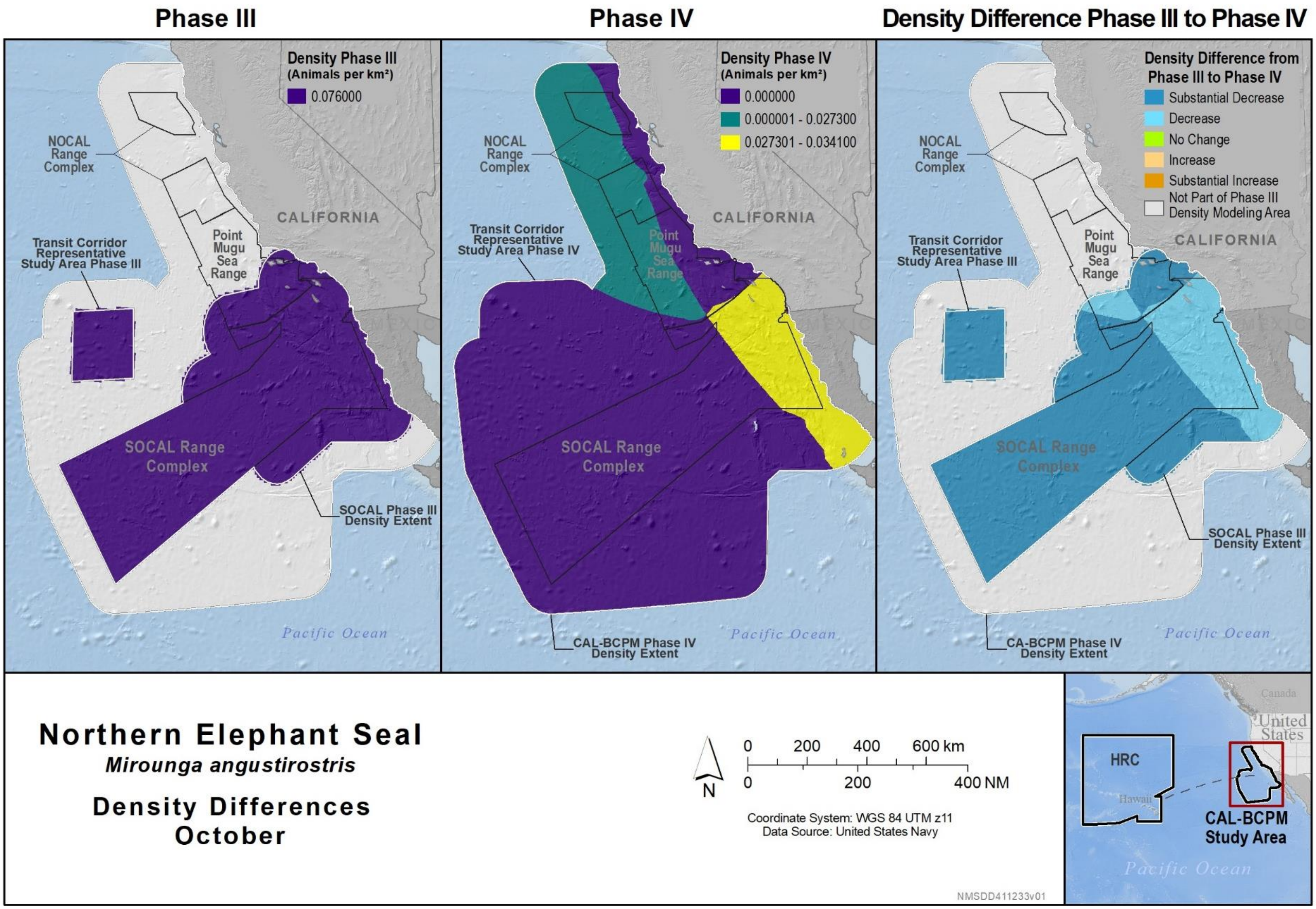

Figure A-106: Northern Elephant Seal October Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.3 *Neomonachus schauinslandi*, Hawaiian Monk Seal

HRC. The density for Hawaiian monk seal increased around all of the Hawaiian Islands, with the exception of Lisianski and Necker, due to an increase in the monk seal population abundance (Figure A-107). In Phase III, separate nearshore (shore to the 200 m depth contour) density estimates were used for the two island chains, the Main Hawaiian Islands and the Northwestern Hawaiian Islands, and a single offshore density estimate was used from the 200 m depth contour to the U.S. EEZ around both island chains. In Phase IV nearshore densities were estimated for individual islands using island-specific abundances (Carretta et. al., 2021), and offshore densities were calculated separately for the two island chains, which resulted in a slight increase in the offshore density for the Northwestern Hawaiian Islands, because the portion of the EEZ used in the calculation was smaller than the area used in Phase III.

CAL-BCPM. Hawaiian monk seals are not expected to occur in the CAL-BCPM or the eastern portion of the transit corridor.

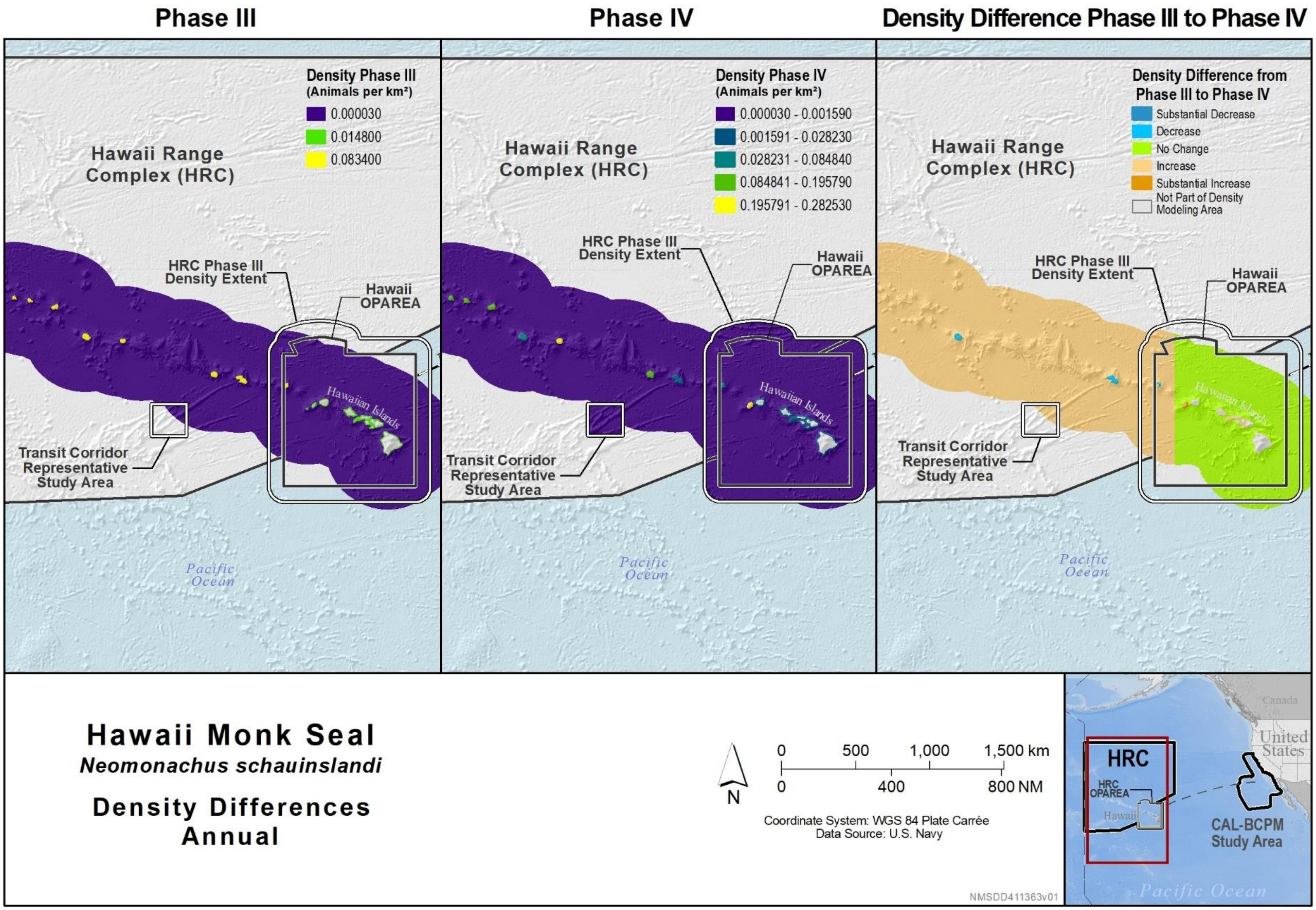

Figure A-107: Hawaiian Monk Seal October Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.4 *Phoca vitulina*, Harbor Seal

HRC. Harbor seals are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. For Phase IV, island-specific density estimates were calculated based on recent survey counts for the Channel Islands and islands off the BCPM. Additional areas along the mainland coast where harbor seals are known to haul out were also included. The more precise island-specific abundance estimates and distribution areas replaced a uniform density estimate that was extrapolated into the Southern California Bight to a distance of 50 NM from shore. Phase IV densities increased in nearshore waters off the Channel Islands, mainland coast, and off the BCPM because harbor seal distributions were limited to within the 120 m depth contour, which is more representative of their typical range than a 50 NM buffer (Figure A-108 and Figure A-109). Phase IV densities decreased to zero beyond the 120 m isobath and within the Phase III 50 NM buffer. No densities were estimated beyond the 50 NM buffer in Phase III; however, in Phase IV, a zero density was estimated for those same offshore areas, consistent with the preference of harbor seals to remain close to haulout locations.

The Phase IV densities also used seasonal- and site-specific haulout factors to estimate in-water occurrence, where available. Phase III density estimates were based on a percentage of the population occurring in Southern California waters in a cold and a warm season and did not incorporate a haulout factor.

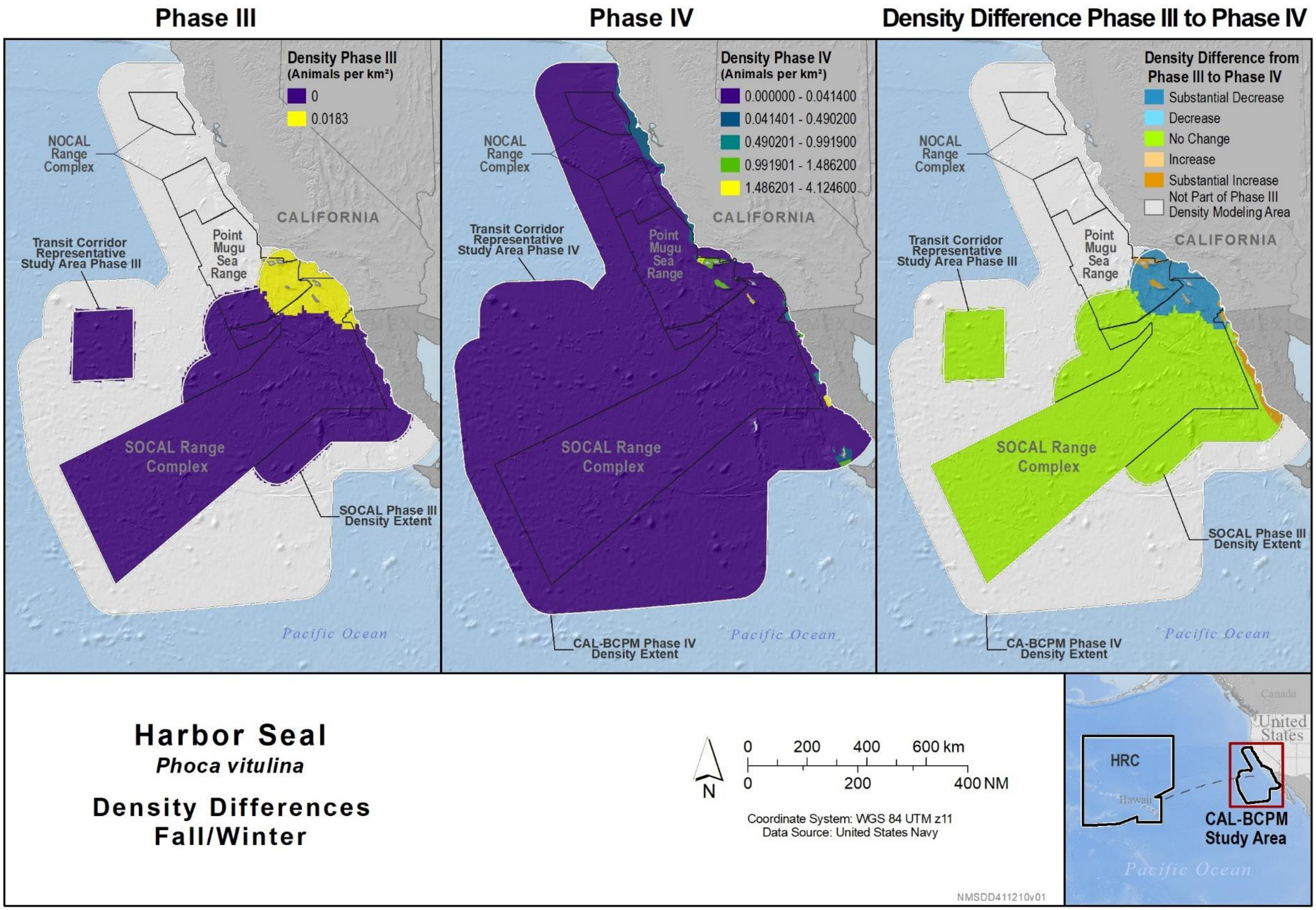

Figure A-108: Harbor Seal Fall/Winter Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

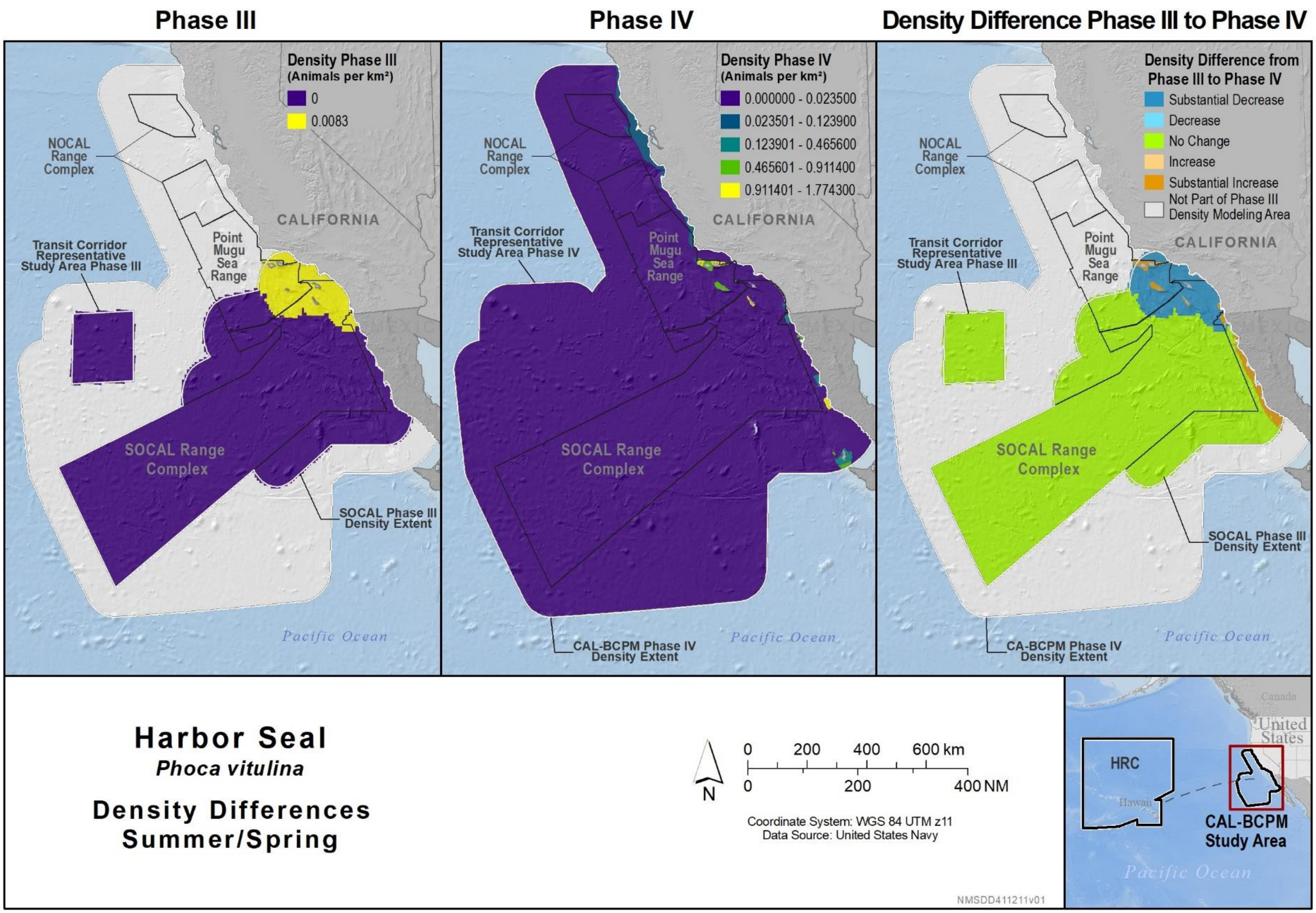

Figure A-109: Harbor Seal Summer/Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.5 *ZALOPHUS CALIFORNIANUS*, CALIFORNIA SEA LION

HRC. California sea lions are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. For Phase IV, densities increased in the eastern third of the Phase III density extent due to two changes: 1) New spatial strata were developed based on estimated ranges published by Laake et al. (2018), and 2) the estimated in-water abundance increased in both the breeding and non-breeding seasons. The combination of higher abundances and smaller strata resulted in higher densities in both seasons. The Phase IV strata are more representative of the distribution of California sea lions and are consistent with published geographic ranges. The Phase IV densities reflect the preference for California sea lions to remain close to haulout locations in the Channel Islands and along the mainland coast and that the sea lions are unlikely to occur in the western two thirds of the Phase III density extent. For Phase IV, a zero density is estimated in those areas, resulting in a substantial decrease in the density in the western offshore portion of the Study Area.

Only the non-breeding season August to April map is shown (Figure A-110) because the difference map (right panel in Figure A-110) for the May to July breeding season is identical.

Densities calculated for San Diego Bay and off the Silver Strand Training Complex in Phase III did not change in Phase IV, so no comparison figure is shown.

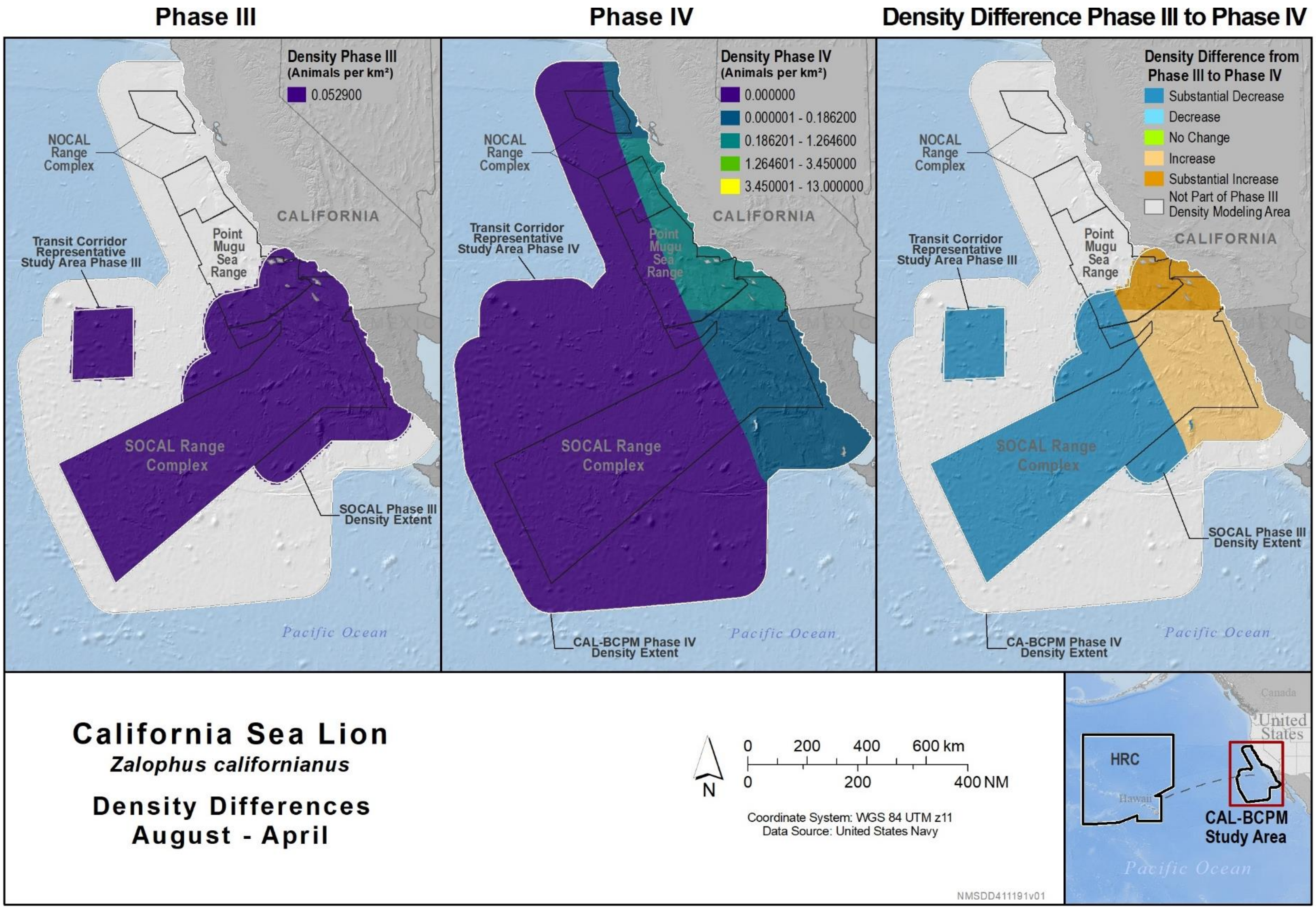

Figure A-110: California Sea Lion August – April Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.6 *ARCTOCEPHALUS TOWNSENDI*, GUADALUPE FUR SEAL

HRC. Guadalupe fur seals are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. The decrease in Phase IV densities in the nearshore and far offshore areas of the Study Area is due primarily to an increase in the size of the distribution area used in the density calculations. This occurred despite an increase in species abundance. Based on the migratory behavior of satellite-tagged fur seals and related unpublished data, researchers have recently defined a “core range” and a broader “geographic range” representing Guadalupe fur seal breeding and non-breeding seasonal distributions, respectively. Both ranges extend north and south of the HCTT Study Area (Norris, 2022). The Navy used these ranges as the spatial strata for the Phase IV density calculations. The geographic range, the larger of the two ranges, extends from Canada to the Pacific coast off central Mexico, and substantially expanded the distribution area for Phase IV, resulting in a decrease in density throughout the year where the geographic range overlapped with the Phase III density extent (Figure A-111 and Figure A-112). The geographic size of the core range was smaller than the size of the area used in the Phase III density calculation, contributing to an increase in density where the core range overlaps the Phase III density extent. As noted above, the abundance estimate for the population also increased between Phase III and IV, which contributed to the density increase in the core range.

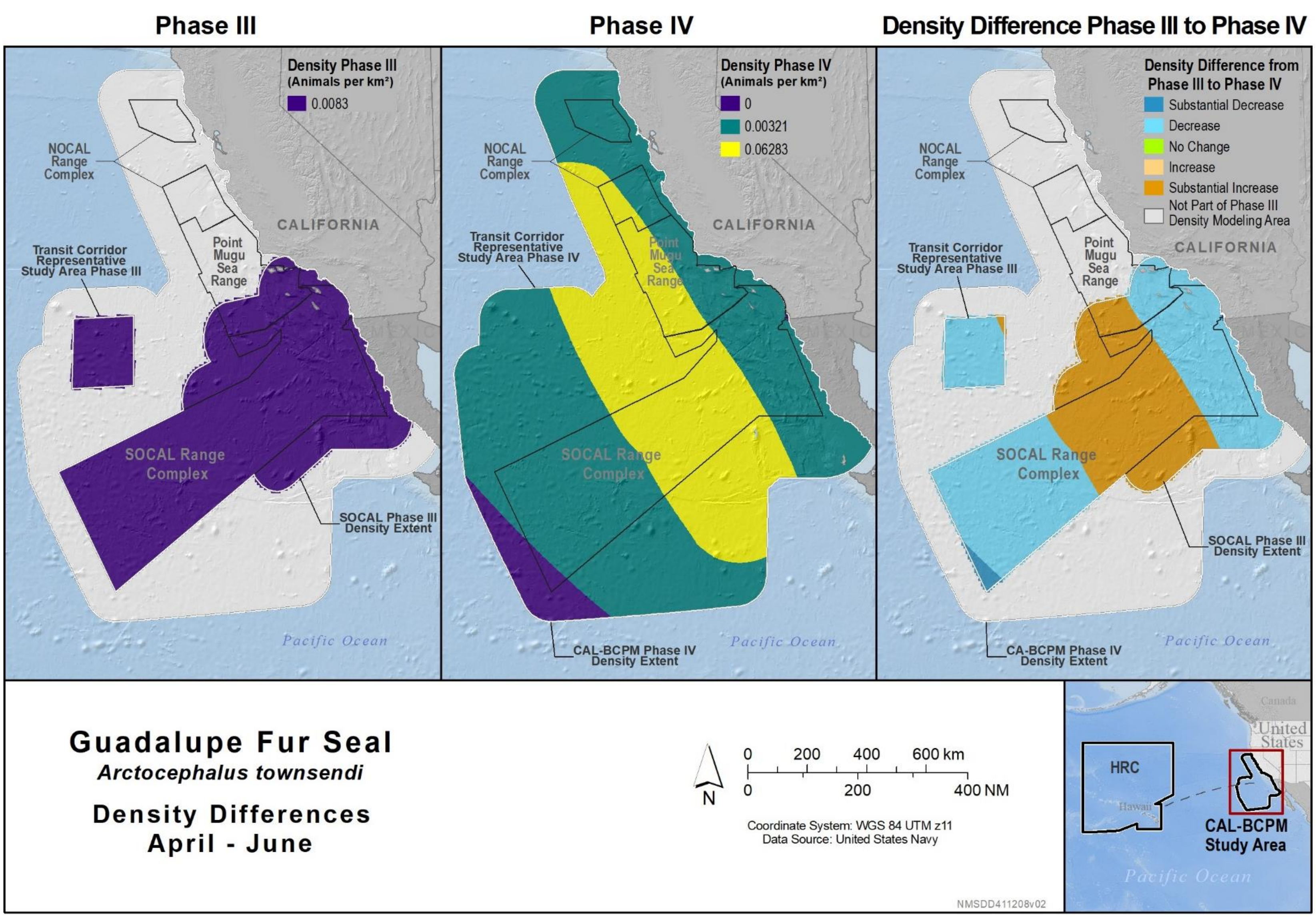

Figure A-111: Guadalupe Fur Seal April – June Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

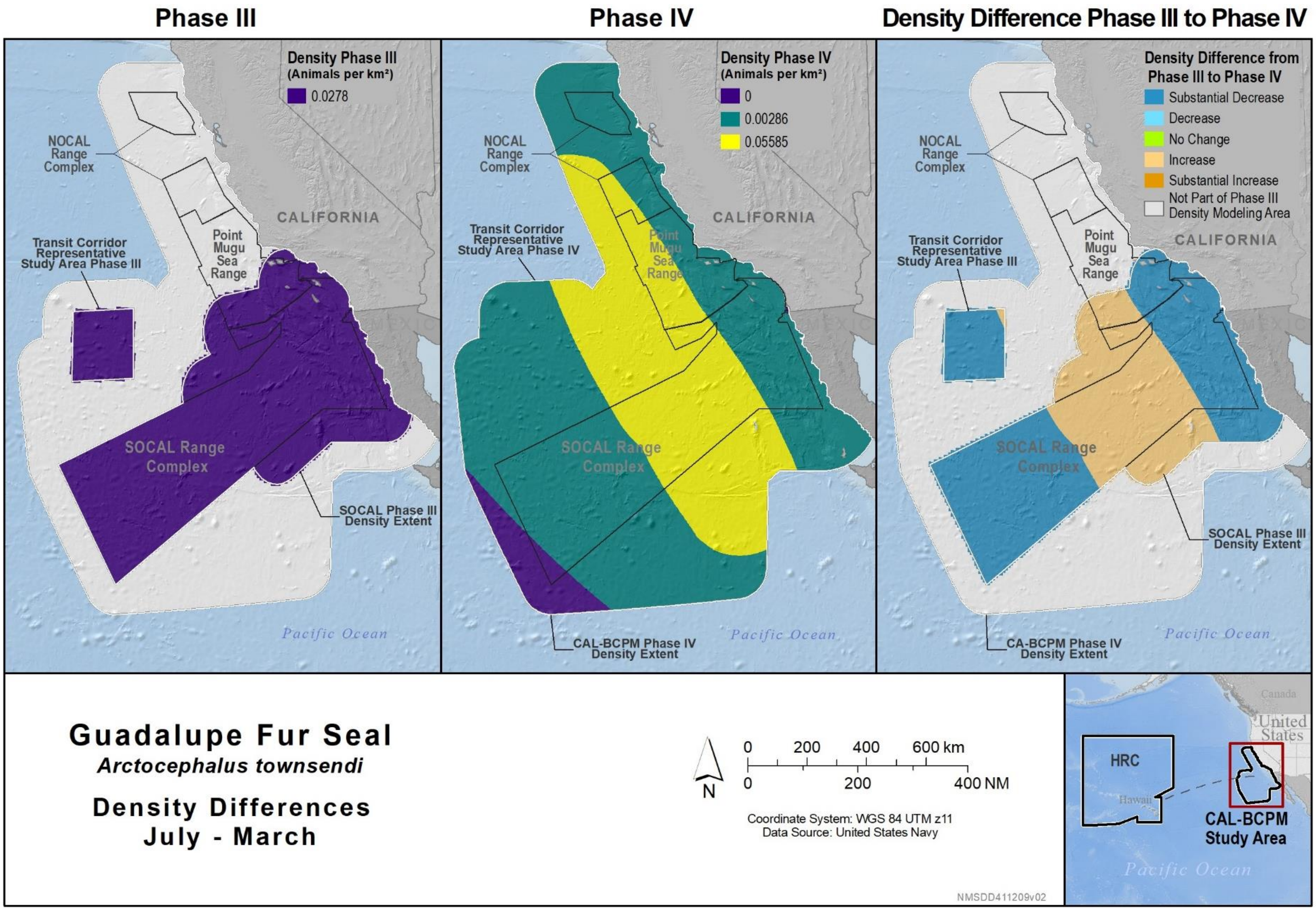

Figure A-112: Guadalupe Fur Seal July – March Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.2.1.7 *EUMETOPIAS JUBATUS*, STELLER SEA LION

HRC. Steller sea lions are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. Steller sea lions occur predominantly north of the Southern California portion of the HSTT Study Area and the Phase III density extent, so no Phase III density was required. Counts by Lowry et al. (2021), Lowry et al. (2020), and (Gallo-Reynoso et al., 2020) indicated that a few Steller sea lions may occur in nearshore areas of Southern California, including the Channel Islands, so densities were estimated for Phase IV in nearshore areas of the Phase III density extent. This change effectively resulted in an increase in density in those nearshore areas; however, a map is not provided in this appendix because no densities were calculated for Phase III.

A.2.2 MUSTELIDS

A.2.2.1 *ENHYDRA LUTRIS NERIS*, SOUTHERN SEA OTTER

HRC. Southern sea otters are not expected to occur in the HRC or the western portion of the transit corridor.

CAL-BCPM. No Phase III density was estimated for the southern sea otter. Sea otters along the mainland coast occur north of Point Conception and the Phase III density extent. A small population of sea otters occurs in nearshore waters around San Nicolas Island, which was part of the “overlap” area in the HSTT Study Area shared with the Point Mugu Sea Range. Activities occurring in the overlap area did not require modeling so no density for southern sea otter at San Nicolas Island was needed for Phase III. Since densities were estimated for Phase IV around San Nicolas Island (and along the mainland coast of Central California), there is effectively an increase in density around the island. No map is provided because no densities were calculated for Phase III.

A.3 SEA TURTLES

For sea turtles in Hawaii, offshore densities changed in part because fisheries interaction data used to estimate the percentage of each species occurring in deep (>100 m) offshore waters were updated. In nearshore waters < 100 m, the Phase III density estimates for the sea turtle guild were distributed between individual species, with green sea turtles attributed 99 percent, hawksbills 0.9 percent, and olive ridleys 0.1 percent of the Phase III guild density. A zero density was assumed for loggerhead and leatherback sea turtles, based on survey results that found predominantly green and a few hawksbill sea turtles in nearshore waters, and no other species. Although no olive ridley sea turtles were observed in the nearshore survey data, the potential for the olive ridley turtles to occur in nearshore waters is acknowledged with a small percentage.

A.3.1 CHELONIIDS

A.3.1.1 *CHELONIA MYDAS*, GREEN SEA TURTLE

HRC. The sea turtle guild density used for Phase III was distributed between species for Phase IV, consistent with post modeling breakouts applied to the number of acoustic impacts estimated for Phase III. The density for green sea turtles decreased slightly (by 1 percent) in waters less than 100 m compared with the guild density. Density in offshore waters greater than 100 m decreased by 95 percent (i.e., 5 percent of the guild density was allocated to green sea turtles in offshore waters). The density for green sea turtles in Pearl Harbor was based on the same survey results used for Phase III, and was also 99 percent of the Phase III guild density. A map showing the differences between the Phase III and Phase IV densities is not provided, because comparing individual species densities to the guild density does not necessarily represent changes in species densities.

CAL-BCPM. For Phase III, densities were only estimated for San Diego Bay. For Phase IV, a single uniform density off the BCPM was used based on research reported by Seminoff et al. (2014). The density occurs within the southeastern portion of the Phase III density extent and is represented as an increase (Figure A-113). As described in Section 11.2 (*Chelonia mydas*, Green Sea Turtle) of the Density Technical Report, tagging data show that green sea turtles migrate in nearshore waters between Seal Beach, CA and the BCPM. However, there is currently insufficient data to calculate a density in this area; therefore, the density difference is reported as “no change” in Figure A-113.

There were both increases and decreases in densities for southern San Diego Bay due to changes in the strata used to calculate densities. For Phase III, a straight line was drawn across the Bay to delineate the southern and northern part of San Diego Bay. For Phase IV, core areas defined by Eguchi et al. (2020) based on tagging studies were used to more accurately represent occurrence in the South Bay stratum. Species abundance remained the same, but the new stratum resulted in changes in densities in San Diego Bay (Figure A-114 and Figure A-115).

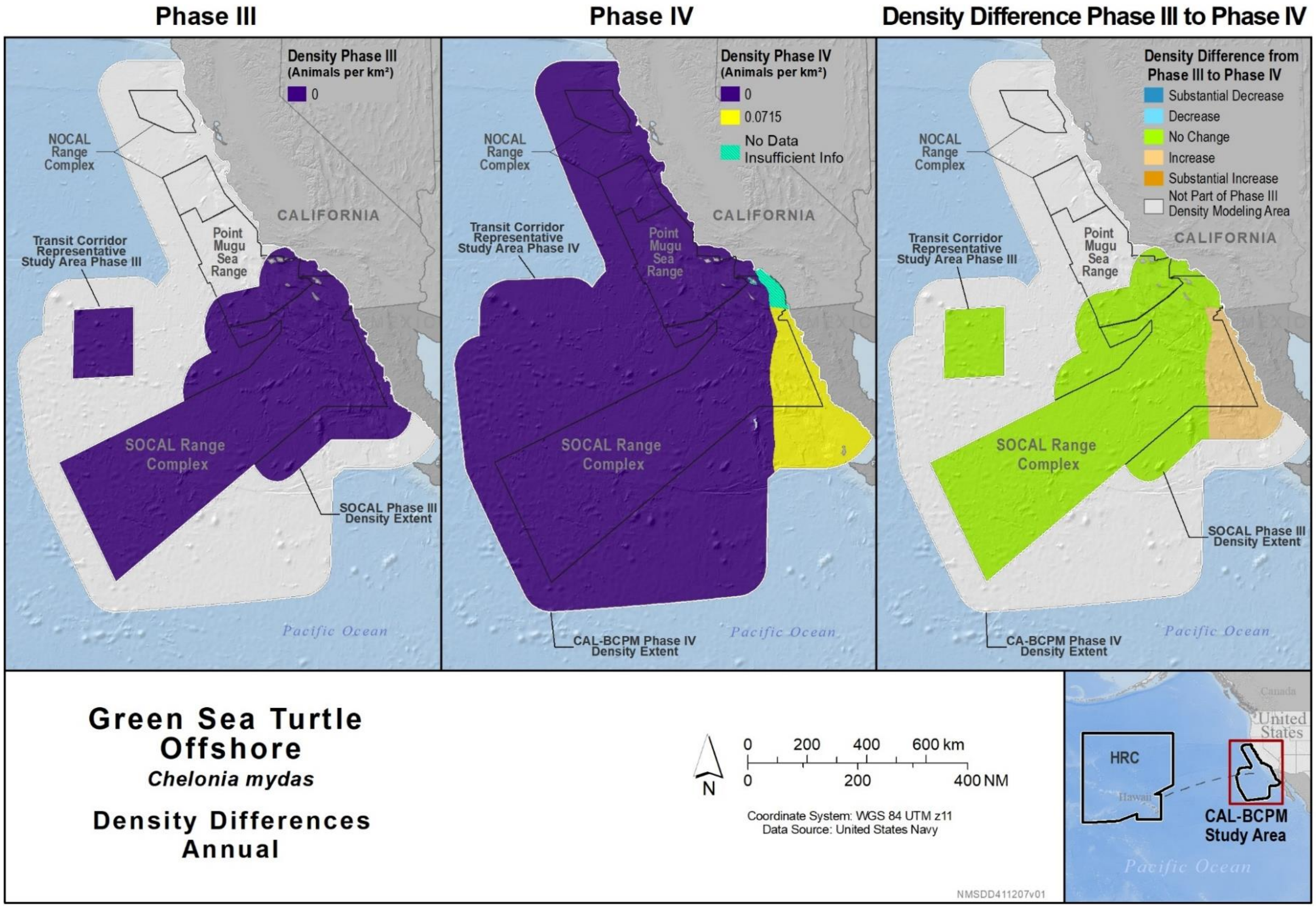

Figure A-113: Green Sea Turtle Annual Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

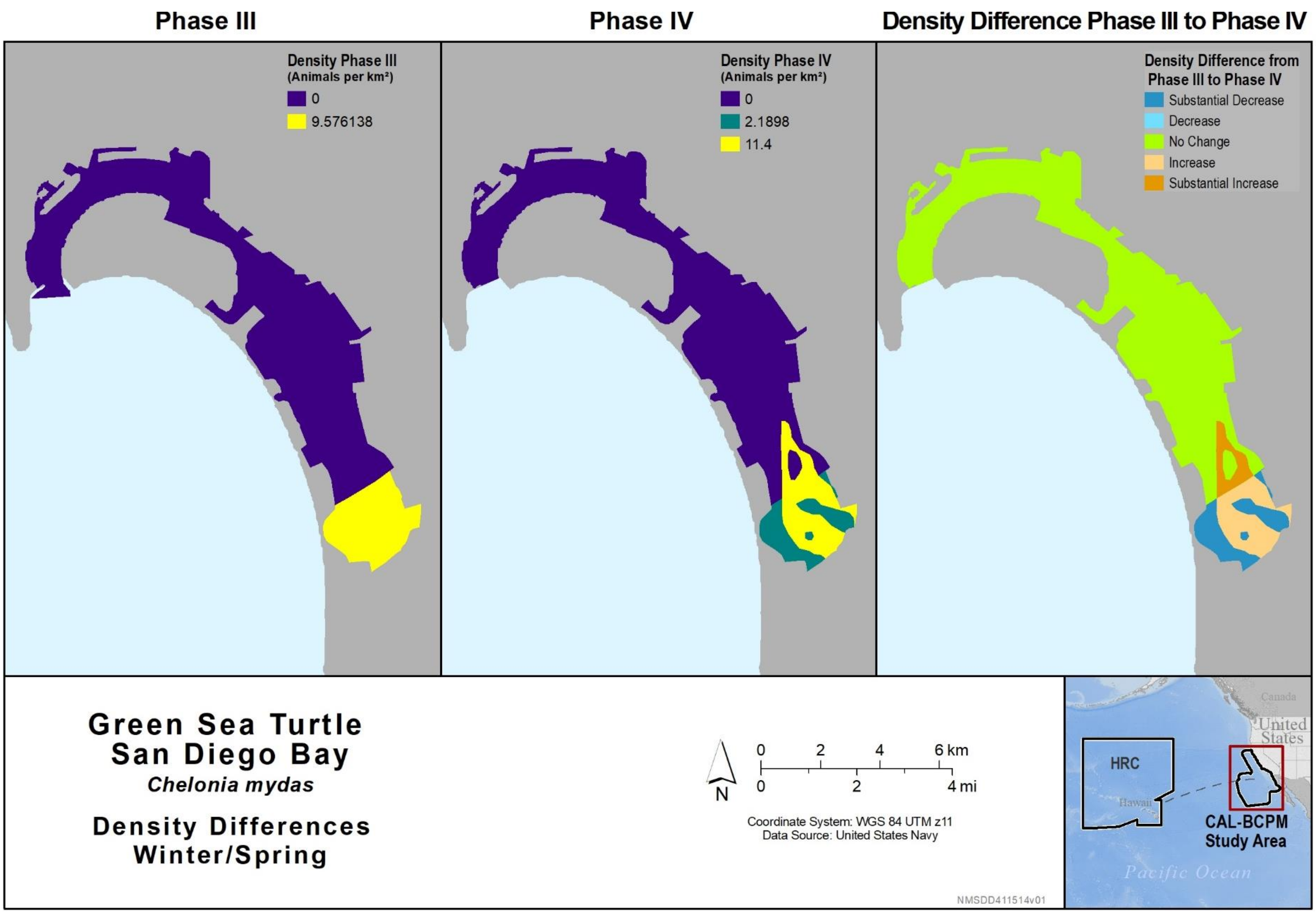

Figure A-114: Green Sea Turtle Winter/Spring Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

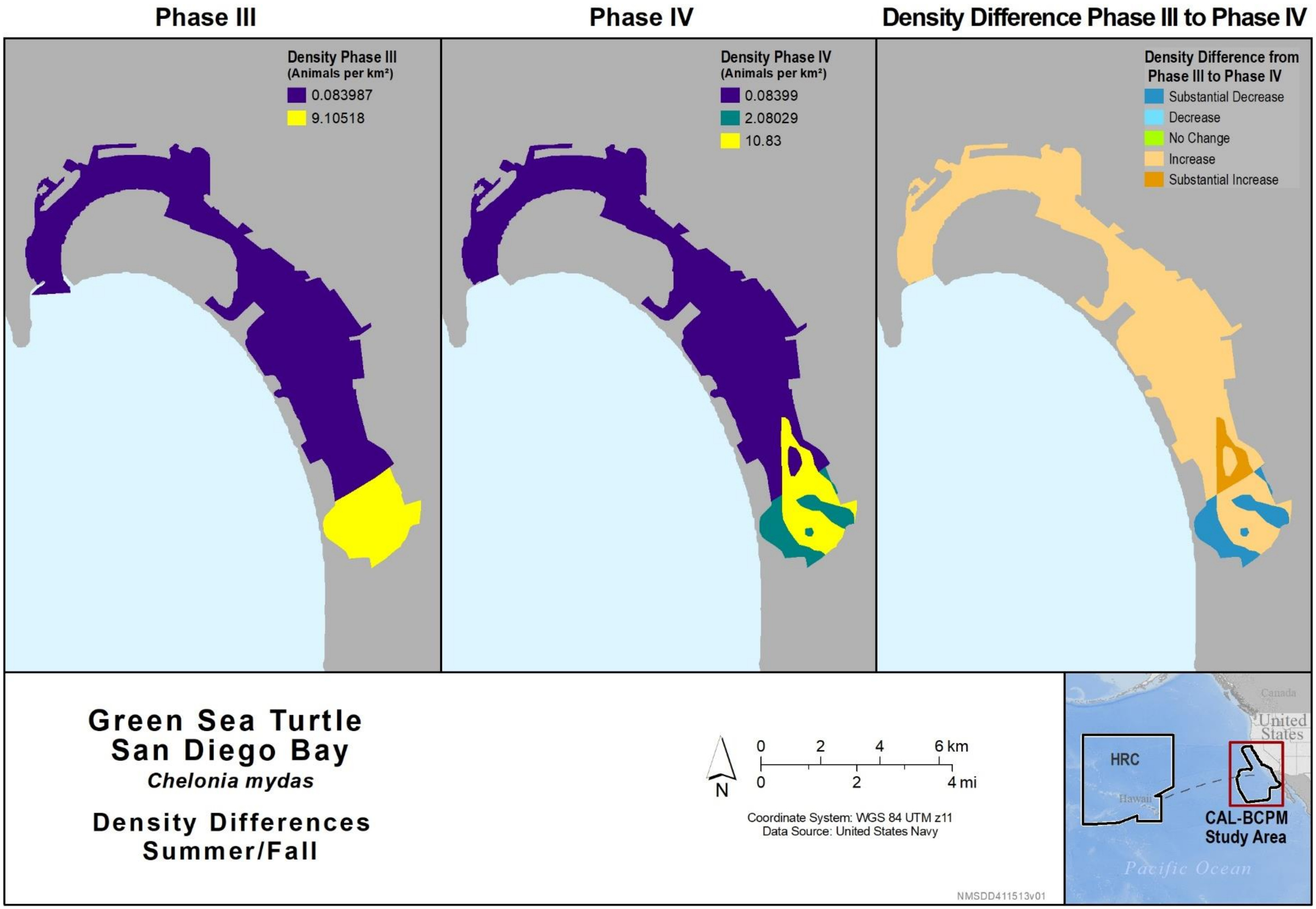

Figure A-115: Green Sea Turtle Summer/Fall Density Comparison Between Phase III (Left Panel) and Phase IV (Middle Panel) for the HRC Study Area. A "substantial" difference in density (either decrease or increase) is defined as a change that is roughly an order of magnitude or greater from Phase III to Phase IV (Right Panel).

A.3.1.2 *ERETMOCHELYS IMBRICATA*, HAWKSBILL SEA TURTLE

HRC. The sea turtle guild density used for Phase III was distributed between species for Phase IV, consistent with post modeling breakouts applied to the number of acoustic impacts estimated for Phase III. The density for hawksbill sea turtles decreased (by 99.1 percent) in waters less than 100 m compared with the guild density. Density in offshore waters greater than 100 m decreased by 99 percent (i.e., 1 percent of the guild density was allocated to hawksbill sea turtles in offshore waters) compared with the guild density. The density for hawksbill sea turtles in Pearl Harbor was based on the same survey results used for Phase III, and was also 1 percent of the Phase III guild density. A map showing the differences between the Phase III and Phase IV densities is not provided, because the comparison is not species-specific.

CAL-BCPM. Hawksbill sea turtles are not expected to occur in the CAL-BCPM or the eastern portion of the transit corridor.

A.3.1.3 *CARETTA CARETTA*, LOGGERHEAD SEA TURTLE

HRC. The sea turtle guild density used for Phase III was distributed between species for Phase IV, consistent with post modeling breakouts applied to the number of acoustic impacts estimated for Phase III. The density for loggerhead sea turtles decreased to zero in waters less than 100 m. Density in offshore waters greater than 100 m decreased by 63 percent (i.e., 37 percent of the guild density was allocated to loggerhead sea turtles in offshore waters) compared with the guild density. A map showing the differences between the Phase III and Phase IV densities is not provided, because the comparison is not species-specific.

CAL-BCPM. No density for loggerhead sea turtles was calculated for Phase III. Eguchi et al. (2018) published a density for anomalously warm conditions off Southern California, effectively resulting in an increase in density for Phase IV. The Navy will only use a non-zero density to predict acoustic impacts for 2 out of the 7 modeled years to simulate the non-annual cycle of elevated sea surface temperatures off Southern California, typically coinciding with El Niño conditions, and only for August and September, the timeframe when the survey and sightings occurred. A map showing the differences between the Phase III and Phase IV densities is not provided, because a Phase III density was not calculated.

A.3.1.4 *LEPIDOCHELYS OLIVACEA*, OLIVE RIDLEY SEA TURTLE

HRC. The sea turtle guild density used for Phase III was distributed between species for Phase IV, consistent with post modeling breakouts applied to the number of acoustic impacts estimated for Phase III. The density for olive ridley sea turtles decreased (by 99.9 percent) in waters less than 100 m compared with the guild density. Density in offshore waters greater than 100 m decreased by 65 percent (i.e., 35 percent of the guild density was allocated to olive ridley sea turtles in offshore waters) compared with the guild density. A map showing the differences between the Phase III and Phase IV densities is not provided, because the comparison is not species-specific.

CAL-BCPM. Olive ridley sea turtles are not expected to occur in the CAL-BCPM or the eastern portion of the transit corridor.

A.3.2 DERMOCHELYIDS

A.3.2.1 *DERMOCHELYS CORIACEA*, LEATHERBACK SEA TURTLE

HRC. The sea turtle guild density used for Phase III was distributed between species for Phase IV, consistent with post modeling breakouts applied to the number of acoustic impacts estimated for Phase III. The density for leatherback sea turtles decreased to zero in waters less than 100 m. Density in offshore waters greater than 100 m decreased by 77 percent (i.e., 23 percent of the guild density was allocated to leatherback sea turtles in offshore waters) compared with the guild density. A map showing the differences between the Phase III and Phase IV densities is not provided, because the comparison is not species-specific.

CAL-BCPM. No density for leatherback sea turtles was calculated for Phase III, because leatherbacks were only expected to occur north of the HSTT Phase III density extent. A uniform density was estimated in Phase IV for offshore waters overlapping the Southern California portion of the HSTT Study Area and the BCPM based on input from NMFS (Benson, 2022). A map showing the differences between the Phase III and Phase IV densities is not provided, because a Phase III density was not calculated.

A.4 REFERENCES

Antonelis, G. A., B. S. Stewart, and W. F. Perryman. (1990). Foraging characteristics of female northern fur seals (*Callorhinus ursinus*) and California sea lions (*Zalophus californianus*). *Canadian Journal of Zoology, 68*, 150–158.

Aschettino, J. M. (2010). *Population size and structure of melon-headed whales (Peponocephala electra) around the main Hawaiian Islands: Evidence of multiple populations based on photographic data.* (Master of Science Master's thesis). Hawaii Pacific University.

Baird, R. W., A. M. Gorgone, D. J. McSweeney, A. D. Ligon, M. H. Deakos, D. L. Webster, G. S. Schorr, K. K. Martien, D. R. Salden, and S. D. Mahaffy. (2009). Population structure of island-associated dolphins: Evidence from photo-identification of common bottlenose dolphins (*Tursiops truncatus*) in the Main Hawaiian Islands. *Marine Mammal Science, 25*(2), 251–274. DOI:10.1111/j.1748-7692.2008.00257

Barlow, J. (2016). *Cetacean Abundance in the California Current Estimated from Ship-based Line-transect Surveys in 1991–2014.* (NOAA Administrative Report NMFS-SWFSC-LJ-1601). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Barlow, J., J. Calambokidis, E. A. Falcone, C. S. Baker, A. M. Burdin, P. J. Clapham, J. K. B. Ford, C. M. Gabriele, R. LeDuc, D. K. Mattila, T. J. Quinn, II, L. Rojas-Bracho, J. M. Straley, B. L. Taylor, J. Urbán R, P. Wade, D. Weller, B. H. Witteveen, and M. Yamaguchi. (2011). Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. *Marine Mammal Science, 27*(4), 793–818. DOI:10.1111/j.1748-7692.2010.00444

Becker, E., K. Forney, D. Miller, P. Fiedler, J. Barlow, and J. Moore. (2020). *Habitat-based density estimates for cetaceans in the California Current Ecosystem based on 1991-2018 survey data* (Technical Memorandum NMFS-SWFSC-638). Silver Spring, MD: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Becker, E. A., K. A. Forney, M. C. Ferguson, J. Barlow, and J. V. Redfern. (2012). *Predictive Modeling of Cetacean Densities in the California Current Ecosystem based on Summer/Fall Ship Surveys in 1991–2008* (NOAA Technical Memorandum NMFS-SWFSC-499). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Becker, E. A., K. A. Forney, P. C. Fiedler, J. Barlow, S. J. Chivers, C. A. Edwards, A. M. Moore, and J. V. Redfern. (2016). Moving Towards Dynamic Ocean Management: How Well Do Modeled Ocean Products Predict Species Distributions? *Remote Sensing, 8*(2), 149. DOI:10.3390/rs8020149

Becker, E. A., K. A. Forney, D. L. Miller, J. Barlow, L. Rojas-Bracho, J. Urbán R., and J. E. Moore. (2022a). Dynamic habitat models reflect interannual movement of cetaceans within the California Current ecosystem. *Frontiers in Marine Science, 9*. DOI:10.3389/fmars.2022.829523

Becker, E. A., K. A. Forney, E. M. Oleson, A. L. Bradford, R. Hoopes, J. E. Moore, and J. Barlow. (2022b). *Abundance, distribution, and seasonality of cetaceans within the U.S. Exclusive Economic Zone around the Hawaiian Archipelago based on species distribution models*. Honolulu, HI: National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

Becker, E. A., K. A. Forney, E. M. Oleson, A. L. Bradford, J. E. Moore, and J. Barlow. (2021). *Habitat-based density estimates for cetaceans within the waters of the U.S. Exclusive Economic Zone around the Hawaiian Archipelago* (NOAA Technical Memorandum NMFS-PIFSC-116). Honolulu, HI: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

Becker, E. A., K. A. Forney, J. V. Redfern, J. Barlow, M. G. Jacox, J. J. Roberts, and D. M. Palacios. (2018). Predicting cetacean abundance and distribution in a changing climate. *Diversity and Distributions, 2018*, 1–18. DOI:10.1111/ddi.12867

Becker, E. A., K. A. Forney, B. J. Thayre, A. J. Debich, G. S. Campbell, K. Whitaker, A. B. Douglas, A. Gilles, R. Hoopes, and J. A. Hildebrand. (2017). Habitat-Based Density Models for Three Cetacean Species off Southern California Illustrate Pronounced Seasonal Differences. *Frontiers in Marine Science, 4*(121), 1–14. DOI:10.3389/fmars.2017.00121

Becker, E. A., K. A. Forney, B. J. Thayre, A. Giddings, K. A. Whitaker, J. E. Moore, and J. A. Hildebrand. (*In Preparation*). Evaluating seasonal vs. spatial extrapolation in the California Current Ecosystem for species distribution models of diverse cetaceans.

Benson, S. (2022, 1/4/2022 and 3/30/2022). Personal communication between Scott Benson (NMFS) and Mike Zickel (ManTech International) on the occurrence of leatherback sea turtles in California waters and Baja California, Mexico.

Bradford, A. L., R. W. Baird, S. D. Mahaffy, A. M. Gorgone, D. J. McSweeney, T. Cullins, D. L. Webster, and A. N. Zerbini. (2018). Abundance estimates for management of endangered false killer whales in the main Hawaiian Islands. *Endangered Species Research, 36*, 297–313.

Bradford, A. L., E. A. Becker, E. M. Oleson, K. A. Forney, J. E. Moore, and J. Barlow. (2020). *Abundance Estimates of False Killer Whales in Hawaiian Waters and the Broader Central Pacific* (NOAA Technical Memorandum NMFS-PIFSC-104). Honolulu, HI: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

Bradford, A. L., K. A. Forney, E. M. Oleson, and J. Barlow. (2017). Abundance estimates of cetaceans from a line-transect survey within the U.S. Hawaiian Islands Exclusive Economic Zone. *Fishery Bulletin, 115*(2), 129–142. DOI:10.7755/fb.115.2.1

Bradford, A. L., E. M. Oleson, K. A. Forney, J. E. Moore, and J. Barlow. (2021). *Line-transect Abundance Estimates of Cetaceans in U.S. Waters around the Hawaiian Islands in 2002, 2010, and 2017* (NOAA Technical Memorandum NMFS-PIFSC-115). Honolulu, HI: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

Campbell, G. S., L. Thomas, K. Whitaker, A. B. Douglas, J. Calambokidis, and J. A. Hildebrand. (2015). Inter-annual and seasonal trends in cetacean distribution, density and abundance off southern California. *Deep Sea Research Part II: Topical Studies in Oceanography, 112*, 143–157. DOI:10.1016/j.dsr2.2014.10.008

Carretta, J. V. (2012). *Spatially explicit density estimates for the California Coastal Stock of bottlenose dolphin, Tursiops truncatus*. Unpublished raw data.

Carretta, J. V., K. A. Forney, E. M. Oleson, D. W. Weller, A. R. Lang, J. Baker, M. M. Muto, B. Hanson, A. J. Orr, H. Huber, M. S. Lowry, J. Barlow, J. E. Moore, D. Lynch, L. Carswell, and R. L. Brownell Jr. (2019). *U.S. Pacific Marine Mammal Stock Assessments: 2018* (NOAA Technical Memorandum). La Jolla, CA: U.S. Department of Commerce.

DeAngelis, M., L. Saez, J. MacNeil, B. Mate, T. Moore, D. Weller, and W. Perryman. (2011). Spatio-temporal Modeling of the Eastern Pacific Gray Whale's (*Eschrichtius robustus*) Migration Through California, Oregon, and Washington. La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Dudzik, K. J., K. M. Baker, and D. W. Weller. (2006). *Mark-Recapture Abundance Estimate of California Coastal Stock Bottlenose Dolphins: February 2004 to April 2005* (NOAA Administrative Report LJ-06-02C). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Eguchi, T., J. Bredvik, S. Graham, R. LeRoux, B. Saunders, and J. A. Seminoff. (2020). Effects of a power plant closure on home ranges of green turtles in an urban foraging area. *Endangered Species Research, 41*, 265-277.

Eguchi, T., S. McClatchie, C. Wilson, S. R. Benson, R. A. LeRoux, and J. A. Seminoff. (2018). Loggerhead turtles (*Caretta caretta*) in the California current: Abundance, distribution, and anomalous warming of the North Pacific. *Frontiers in Marine Science, 5*(452), 1–15.

Ferguson, M. C. and J. Barlow. (2003). *Addendum: Spatial Distribution and Density of Cetaceans in the Eastern Tropical Pacific Ocean Based on Summer/Fall Research Vessel Surveys in 1986–96* (U.S. Department of Commerce NOAA Administrative Report LJ-01-04). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Fiedler, P. C., E. A. Becker, K. A. Forney, J. Barlow, and J. E. Moore. (In Press). Species Distribution Modeling of Deep-diving Cetaceans. *Marine Mammal Science*.

Ford, J. K. B., G. M. Ellis, and K. C. I. Balcomb. (2000). *Killer Whales: The Natural History and Genealogy of Orcinus Orca in British Columbia and Washington State (Updated Edition)*. Seattle, WA: University of Washington Press.

Forney, K. A. and J. Barlow. (1998). Seasonal patterns in the abundance and distribution of California cetaceans, 1991–1992. *Marine Mammal Science, 14*(3), 460–489.

Forney, K. A., J. Barlow, and J. V. Carretta. (1995). The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. *Fishery Bulletin, 93*, 15–26.

Forney, K. A., E. A. Becker, D. G. Foley, J. Barlow, and E. M. Oleson. (2015). Habitat-based models of cetacean density and distribution in the central North Pacific. *Endangered Species Research, 27*, 1–20. DOI:10.3354/esr00632

Forney, K. A., J. V. Redfern, S. M. Woodman, E. A. Becker, J. A. Santora, I. D. Schroeder, J. Calambokidis, D. Palacios, J. Samhouri, and N. Black. (*In Preparation*). Evaluating the capabilities of a dynamic humpback whale spatial model for assessing whale entanglement risk along the U.S. West Coast.

Gallo-Reynoso, J. P., A. L. Figueroa-Carranza, I. D. Barba-Acuña, D. Borjes-Flores, and I. J. Pérez-Cossío. (2020). Stellar sea lions (*Eumetopias jubatus*) along the western coast of Mexico. *Aquatic Mammals, 46*(4), 411–416. DOI:https://doi.org/10.1111/mms.12953

Gerrodette, T. and T. Eguchi. (2011). Precautionary design of a marine protected area based on a habitat model. *Endangered Species Research, 15*, 159–166.

Hamilton, T. A., J. V. Redfern, J. Barlow, L. T. Ballance, T. Gerrodette, R. S. Holt, K. A. Forney, and B. L. Taylor. (2009). *Atlas of Cetacean Sightings for Southwest Fisheries Science Center Cetacean and Ecosystem Surveys: 1986–2005* (NOAA Technical Memorandum NMFS-SWFSC-440). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Hanson, M. B., E. J. Ward, C. K. Emmons, and M. M. Holt. (2018). *Modeling the occurrence of endangered killer whales near a U.S. Navy Training Range in Washington State using satellite-tag locations to improve acoustic detection data*. Seattle, WA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center.

Hill, M., A. D. Ligon, M. H. Deakos, U. Adam, E. Norris, and E. M. Oleson. (2011). *Cetacean Surveys of Guam and CNMI Waters: August–September, 2011* (MIRC Survey Report FY2011). Honolulu, HI: Pacific Islands Fisheries Science Center.

Jones, M. L. and S. L. Swartz. (2002). Gray whale, *Eschrichtius robustus*. In W. F. Perrin, B. Wursig, & J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (pp. 524–536). San Diego, CA: Academic Press.

Kajimura, H. (1984). *Opportunistic Feeding of the Northern Fur Seal, Callorhinus ursinus, in the Eastern North Pacific Ocean and Eastern Bering Sea*. Washington, DC: National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Laake, J. L., M. S. Lowry, R. L. DeLong, S. R. Melin, and J. V. Carretta. (2018). Population Growth and Status of California Sea Lions. *Journal of Wildlife Management, 82*(3), 583–595. DOI:10.1002/jwmg.21405

Lowry, M. S., E. M. Jaime, and J. E. Moore. (2021). Abundance and distribution of pinnipeds at the Channel Islands in southern California, central and northern California, and southern Oregon during summer 2016–2019. DOI:https://doi.org/10.25923/6qhf-0z55

Lowry, M. S., E. M. Jaime, S. E. Nehasil, A. Betcher, and R. Condit. (2020). *Winter Surveys at the Channel Islands and Point Conception Reveal Population Growth of Northern Elephant Seals and Residence Counts of Other Pinnipeds* (NOAA-TM-NMFS-SWFSC-627). La Jolla, CA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Martin, S. W. (2015). Personal communication with Stephen W. Martin, National Marine Mammal Foundation, Shelter Island, San Diego, CA.

Martin, S. W. and B. Matsuyama. (2015). *Suspected Bryde's Whales Detected, Localized, and Tracked using Recorded Data from the Pacific Missile Range Facility, Hawaii*. U.S. Navy Pacific Fleet.

Melin, S. (2022, April 12, 2022). Personal communication via emall between S. Melin (National Marine Fisheries Service) and M. Zickel (ManTech International) on status, abundance, and haulout behavior of pinnipeds off California.

Mobley, J. R., S. Spitz, and R. Grotefendt. (2001). *Abundance of Humpback Whales in Hawaiian Waters: Results of 1993–2000 Aerial Surveys*. Honolulu, HI: Hawaiian Islands Humpback Whale National Marine Sanctuary, Department of Land and Natural Resources, State of Hawaii.

Monnahan, C. C., T. A. Branch, and A. E. Punt. (2015). Do ship strikes threaten the recovery of endangered eastern North Pacific blue whales? *Marine Mammal Science, 31*(1), 279–297. DOI:10.1111/mms.12157

Moore, J. E. and J. Barlow. (2011). Bayesian state-space model of fin whale abundance trends from a 1991–2008 time series of line-transect surveys in the California Current. *Journal of Applied Ecology, 48*(5), 1195–1205. DOI:10.1111/j.1365-2664.2011.02018.x

Muto, M. M., V. T. Helker, R. P. Angliss, B. A. Allen, P. L. Boveng, J. M. Breiwick, M. F. Cameron, P. J. Clapham, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, R. G. Towell, P. R. Wade, J. M. Waite, and A. R. Zerbini. (2017). *Alaska Marine Mammal Stock Assessments, 2016* (NOAA Technical Memorandum NMFS-AFSC-323). Seattle, WA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center.

Nadeem, K., J. E. Moore, Y. Zhang, and H. Chipman. (2016). Integrating population dynamics models and distance sampling data: A spatial hierarchial state-space approach. *Ecology, 97*(7), 1735–1745.

Norris, T. (2022, Junuary 20, 2022). Personal communication via email between Tenaya Norris (The Marine Mammal Center) and Michael Zickel (ManTech International) regarding updated abundance estimate for Guadalupe fur seals off California.

Pelland, N. (2022). Personal Communication Between N. Pelland (National Marine Fisheries Service) and M. Zickel (ManTech International) on Northern Fur Seal Occurrence Off California.

Pelland, N. A., J. T. Sterling, M.-A. Lea, N. A. Bond, R. R. Ream, C. M. Lee, and C. C. Eriksen. (2014). Fortuitous Encounters between Seagliders and Adult Female Northern Fur Seals (*Callorhinus ursinus*) off the Washington (USA) Coast: Upper Ocean Variability and Links to Top Predator Behavior. *PLoS ONE, 9*(8), e101268.

Peterson, S. H., J. T. Ackerman, and D. P. Costa. (2015). Marine foraging ecology influences mercury bioaccumulation in deep-diving northern elephant seals. *Proceedings of the Royal Society B: Biological Sciences, 282*(20150710), 10. DOI:10.1098/rspb.2015.0710

Robinson, P. W., D. P. Costa, D. E. Crocker, J. P. Gallo-Reynoso, C. D. Champagne, M. A. Fowler, C. Goetsch, K. T. Goetz, J. L. Hassrick, L. A. Huckstadt, C. E. Kuhn, J. L. Maresh, S. M. Maxwell, B. I. McDonald, S. H. Peterson, S. E. Simmons, N. M. Teutschel, S. Villegas-Amtmann, and K. Yoda. (2012). Foraging behavior and success of a mesopelagic predator in the northeast Pacific Ocean: Insights from a data-rich species, the northern elephant seal. *PLoS ONE, 7*(5), e36728. DOI:10.1371/journal.pone.0036728

Seminoff, J. A., T. Eguchi, J. Carretta, C. D. Allen, D. Prosperi, R. Rangel, J. W. Gilpatrick, K. Forney, and S. H. Peckham. (2014). Loggerhead sea turtle abundance at a foraging hotspot in the eastern Pacific Ocean: Implications for at-sea conservation. *Endangered Species Research, 24*(3), 207–220.

Taylor, B. L., R. Baird, J. Barlow, S. M. Dawson, J. Ford, J. G. Mead, G. Notarbartolo di Sciara, P. Wade, and R. L. Pitman. (2008). *Mesoplodon ginkgodens*. *IUCN Red List of Threatened Species, Version 2011.2*.

Tyne, J. A., N. R. Loneragan, D. W. Johnston, K. H. Pollock, R. Williams, and L. Bejder. (2016). Evaluating monitoring methods for cetaceans. *Biological Conservation, 201*, 252–260.

Van Cise, A. M., R. W. Baird, A. E. Harnish, J. J. Currie, S. H. Stack, T. Cullins, and A. M. Gorgone. (2021). Mark-recapture estimates suggest declines in abundance of common bottlenose dolphin stocks in the main Hawaiian Islands. *Endangered Species Research, 45*, 37-53. DOI:10.3354/esr01117

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