I assembled five size-based indices in the

upper mixed layer (<30 m from the surface) from 39 deployments of an Optical

Plankton Counter. Each deployment (Fig. 2.1)

consisted of a number of undulations between the surface and 120 m (SeaSoar) or

200 m (Triaxus). In this analysis, only the 5- 30 m is included. This is to ensure the data analysed is within the surface mixed layer (Baird et al. 2008, 2011) and

corresponds with remotely sensed observations (White 2018)

During preliminary

model testing, MODIS OC3 measurements

were included from 2002 onwards with missing values

included as random effects and indicator factors

to prevent the model from excluding all the data

when chl *a* was missing (Wood 2006).(Lee et al. 2018)

between 250 and 1100 m from shore (i.e. just beyond the surf zone) within the

coastal boundary layer (CBL)—a region of reduced alongshore flow—and simultaneously quantified

a suite of physical factors that may influence larval distributions (Nickols et al. 2013)

Shark attacks have recently increased in NSW, resulting in fatalities, beach closures,

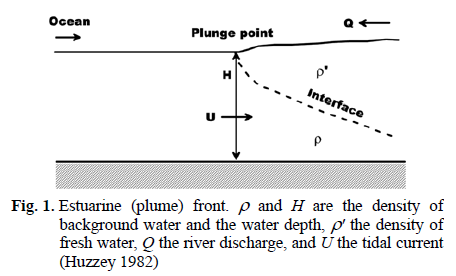
and tourism revenue losses. It remains unclear whether increasing shark attacks are a result of changes in shark or

prey populations and behaviour, or greater human use of nearshore waters. Testing shark behaviour hypotheses

requires tagged shark movements to be mapped which can be accomplished while the new DPI boat collects

oceanographic and bioacoustic data on baitfish prey. These new observations will facilitate the development of

predictive models of shark risk in relation to seasonal and diel signals, oceanography, and baitfish aggregations. (LEIF)

A PLUME: (Sun and Cho 2010)

A central goal of ecology is to understand patterns

of abundance and distribution of organisms. Determining

the key factors that drive population dynamics

requires knowledge of demographic inputs (birth

and immigration) and losses (death and emigration).(Nickols et al. 2013)

(1) what is the spatial pattern

of larval abundance within the CBL, (2) are there

differences in larval assemblages close to shore (i.e.

are different larvae found inshore versus offshore

within the CBL), and (3) do time-dependent or spacede

pendent physical processes tend to dictate variability

in larval abundance?(Nickols et al. 2013)

Size Spectra:

o review of NBSS slopes (Sato et al. 2015, Dai et al. 2016)

 nice summary and refs of upwelling (drivers) and phyto blooms in (Armbrecht et al. 2015)

• Throughout the simulation period, coastal regions south of the OAR received large portions of offshore waters (>100 m isobath) from depths deeper than 30 m, implying that upwelling is a persistent mechanism south of the OAR. This is directly in line with the mean onshore transport found south of the typical EAC separation zone (within the HSM domain), illustrated in Chapter 3. While coastal locations in the northern section of the domain, where the EAC has not separated yet, mainly receive water that originated upstream along the inner shelf [plus more links to supporting refs e.g. (Roughan et al. 2011, Ribbat 2018). (Ribbat 2018)

Seabirds + acoustics (Thayne, from JE)

The correlation between variation in upwelling and copepod biomasses in northern Chile suggested that population dynamics of copepods may depend on intensity of upwelling. Although the underlying mechanisms are unclear, and several hypotheses dealing with bottom-up or top down factors can be put forth, our findings suggest that upwelling intensity operates through an optimal window for copepod abundance and biomass and increasing upwelling in the last decade (2000–2008) may has been unfavorable for copepod populations.(Escribano et al. 2012)

The parameters of the NBSS represent the inherent properties of zooplankton communities or marine ecosystems: a steeper slope of the NBSS indicates high productivity and low energy transfer efficiencies in marine ecosystems (Sprules and Munawar, 1986; Zhou, 2006); higher intercept values reflect higher primary production of a community (Marcolin et al., 2013; Zhou, 2006). Thus, analysis of the NBSS provides insight into the structure of marine ecosystems. (Dai et al. 2016)

Size spectra were used as an indicator to examine zooplankton responses to upwelling and currents. (Dai et al. 2016)

Understanding of physical and biological processes driven by the EAC, particularly in linking circulation to ecosystems, is limited (Suthers et al. 2011)

Thin layers of phytoplankton are well-documented, common features in coastal areas around the world, but little is known about the relationships of these layers to higher trophic levels. (Greer 2013)

Describing the distributions of organisms on scales relevant to individuals (1-100

m) is critical to understanding predator-prey interactions within the plankton. (Greer 2013)

Great example: (Sevadjian et al. 2014)

The continental shelf off southeastern Australia (between 29 and 34 S) is relatively narrow, between 16 and 70 km (mean of 37 km) from the coastline to the 200m isobath. The dynamics on the shelf are influenced both by local coastal processes and the episodic intrusion of the large-scale East Australian Current (EAC) and its eddies (Fig. 1, Schaeffer et al., 2013, 2014a). The EAC is the western branch of the subtropical gyre in the South Pacific. It is a warm and dynamic poleward flowing current, encroaching on the continental shelf of southeastern Australia between around 18 S (Ridgeway and Godfrey, 1994) and usually 30.7–32.4 S (Cetina-Heredia et al., 2014) where it bifurcates eastward, forming the Tasman Front. Further south, eddies are shed (Everett et al., 2012), leading to high variability in the velocity field and water masses on the shelf (Schaeffer et al., 2014b; Schaeffer and Roughan, 2015).(Schaeffer et al. 2016)

The purpose of this study was to further our understanding of the role of the coastal physical oceanographic environment as a dynamic and constantly evolving habitat for plankton (Sevadjian et al. 2014)

The ISwatertypewassampledoffStocktonBight(Fig. 1), anarea

known tobeenrichedinnutrients(Suthers etal.,2011) and

chlorophyll a (Everettetal.,2014) (Henschke et al. 2011)

To test if the division into physical habitats was reflected in the biology of the region, two tests were conducted. (Hobday et al. 2011)

Our goal was to determine zooplankton concentrations in and above newly intruded

waters and in intrusions which had separated from the cold source water (stranded

intrusions). We tested several hypotheses: (1) Zooplankton abundances are higher in particle-rich, low temperature ( <22°C) upwell-ings than in particle poor, high-temperature (>22°C) upwellings. (2) Zooplankton concentrations are higher in and near upwelled water which moved onto the shelf earlier, than in water which was upwelled more recently. (3) In a vertically stratified water column zooplankton are most abundant at depths where particle (food) concentrations are highest (Paffenhofer et al. 1984)

The objective of this study was to determine the vertical distribution of abundant

zooplankton taxa in relation to temperature and the abundance of potential

food, leading to two simple hypotheses: on a vertically stratified subtropical shelf

multicellular zooplankton is (1) most abundant in cooler (intrusion) and least

abundant in warm (surface) waters (Paffenhofer, 1980); (2) most abundant near

high and least abundant near low (jig organic carbon-I"1; mm3 of paniculate

matter-1"\*) concentrations.(Paffenhöfer 1983)

It can be deduced from first principles that patchiness of zooplankton results from the interaction of 3 phenomena. Population dynamics give rise to a local change in numbers of individuals, and those individuals are redistributed by the physical process of advection and the biological process of behavior. These 3 phenomena—population dynamics, advection and behavior— underlie the dynamics of patchiness at all length scales from meters (Davis et al. 1992) to thousands of kilometers (McGowan 1974). However, the one scale where all processes interact most strongly is

dictated by that of population dynamics, the time scale of which is characterized by the time required to complete 1 generation, from egg to adulthood.(Huntley et al. 2000)

We aimed to address:

(i) the major water masses and oceanographic features during summer;

(ii) how the mesozooplankton is regulated by the oceanographic

structure; and (iii) which copepod species and zooplankton taxa characterize

the coastal processes and the shelf ecosystem. (Becker et al. 2018) All

multivariate analyses were performed in the R program using the Vegan

and HH packages ((Becker et al. 2018)

The goals of this study were to (1) quantify temporal fluctuations

and vertical distributions of planktonic larvae inhabiting

inner-shelf waters and (2) develop plausible scenarios

involving physical or biological mechanisms to

explain observed patterns of variation. The null hypothesis

is that larvae are transported like passive particles and, thus,

planktonic dispersion patterns are determined by physical

processes alone. Deviations from passive predictions may be

attributed to biological processes, such as vertical larval

swimming in response to physical or biological signals.(Garland et al. 2002)

In this study, planktonic larvae and physical variables

were sampled at similar time and space scales over 20 d,

during significant wind-driven cross-shelf flows, energetic

along-shore currents, intense wave activity, and intermittent

freshwater intrusions.(Garland et al. 2002)

Armbrecht, L. H., P. A. Thompson, S. W. Wright, A. Schaeffer, M. Roughan, J. Henderiks, and L. K. Armand. 2015. Comparison of the cross-shelf phytoplankton distribution of two oceanographically distinct regions off Australia. Journal of Marine Systems **148**:26-38.

Becker, É. C., C. A. Eiras Garcia, and A. S. Freire. 2018. Mesozooplankton distribution, especially copepods, according to water masses dynamics in the upper layer of the Southwestern Atlantic shelf (26°S to 29°S). Continental Shelf Research **166**:10-21.

Dai, L., C. Li, G. Yang, and X. Sun. 2016. Zooplankton abundance, biovolume and size spectra at western boundary currents in the subtropical North Pacific during winter 2012. Journal of Marine Systems **155**:73-83.

Escribano, R., P. Hidalgo, M. Fuentes, and K. Donoso. 2012. Zooplankton time series in the coastal zone off Chile: Variation in upwelling and responses of the copepod community. Progress in Oceanography **97-100**:174-186.

Garland, E. D., C. A. Zimmer, and S. J. Lentz. 2002. Larval distributions in inner-shelf waters: The roles of wind-driven cross-shelf currents and diel vertical migrations. Limnology and Oceanography **47**:803-817.

Greer, A. 2013. Fine-scale distributions of plankton and larval fishes: Implications for predator-prey interactions near coastal oceanographic features.*in* R. K. Cowen, J. Hare, P. Ortner, M.-L. Shyu, and S. Sponaugle, editors. ProQuest Dissertations Publishing.

Henschke, N., J. D. Everett, M. E. Baird, M. D. Taylor, and I. M. Suthers. 2011. Distribution of life-history stages of the salp Thalia democratica in shelf waters during a spring bloom. Marine Ecology Progress Series **430**:49-62.

Hobday, A. J., J. W. Young, C. Moeseneder, and J. M. Dambacher. 2011. Defining dynamic pelagic habitats in oceanic waters off eastern Australia. Deep Sea Research Part II: Topical Studies in Oceanography **58**:734-745.

Huntley, M. E., A. GonzÃÂ¡lez, Y. Zhu, M. Zhou, and X. Irigoien. 2000. Zooplankton dynamics in a mesoscale eddy-jet system off California. Marine Ecology Progress Series **201**:165-178.

Lee, K. A., M. Roughan, G. Harcourt, and V. M. Peddemors. 2018. Environmental correlates of relative abundance of potentially dangerous sharks in nearshore areas, southeastern Australia. Marine Ecology Progress Series **599**:157-179.

Nickols, K. J., S. H. Miller, B. Gaylord, S. G. Morgan, and J. L. Largier. 2013. Spatial differences in larval abundance within the coastal boundary layer impact supply to shoreline habitats. Marine Ecology Progress Series **494**:191-203.

Paffenhöfer, G.-A. 1983. Vertical zooplankton distribution on the northeastern Florida shelf and its relation to temperature and food abundance. Journal of Plankton Research **5**:15-33.

Paffenhofer, G., B. T. Wester, and N. William. 1984. Zooplankton abundance in relation to state and type of intrusions onto the southeastern United States shelf during summer. Journal of Marine Research **42**:995-1017.

Ribbat, N. 2018. Water Transport Pathways along the Hawkesbury shelf: Quantifying the Source of Water delivered to Sydney’s offshore Artificial Reef. PhD.

Roughan, M., H. S. Macdonald, M. E. Baird, and T. M. Glasby. 2011. Modelling coastal connectivity in a Western Boundary Current: Seasonal and inter-annual variability. Deep-Sea Research Part Ii-Topical Studies in Oceanography **58**:628-644.

Sato, K., K. Matsuno, D. Arima, Y. Abe, and A. Yamaguchi. 2015. Spatial and temporal changes in zooplankton abundance, biovolume, and size spectra in the neighboring waters of Japan: analyses using an optical plankton counter. Zoological Studies **54**:1-15.

Schaeffer, A., M. Roughan, E. Jones, and D. White. 2016. Physical and biogeochemical spatial scales of variability in the East Australian Current separation from shelf glider measurements. Biogeosciences **13**:1967-1975.

Sevadjian, J. C., M. A. McManus, J. Ryan, A. T. Greer, R. K. Cowen, and C. B. Woodson. 2014. Across-shore variability in plankton layering and abundance associated with physical forcing in Monterey Bay, California. Continental Shelf Research **72**:138-151.

Sun, Y.-J., and Y.-K. Cho. 2010. Tidal front and its relation to the biological process in coastal water.

Suthers, I. M., J. D. Everett, M. Roughan, J. W. Young, P. R. Oke, S. A. Condie, J. R. Hartog, A. J. Hobday, P. A. Thompson, K. Ridgway, M. E. Baird, C. S. Hassler, G. B. Brassington, M. Byrne, N. J. Holbrook, and H. A. Malcolm. 2011. The strengthening East Australian Current, its eddies and biological effects - an introduction and overview. Deep-Sea Research Part Ii-Topical Studies in Oceanography **58**:538-546.

White, Z. 2018. The spatial distribution of zooplankton production in the western Tasman Sea: A size-spectra approach. University of New South Wales, Sydney, Australia.