SBCLTER Quadrat Protocol

General Notes

General site descriptions and GPS coordinates are detailed in files "SBC-LTER Arroyo Quemado Site Description.xls", "SBC-LTER Carpinteria Site Description.xls", "SBC-LTER Naples Site Description.xls" or "SBC-LTER Satellite Site Descriptions.xls" in the "Site Description" folder. The permanent transects at each of the three core sites and six satellite sites are sampled annually in the late-summer to monitor the kelp forest community. Each site has 2-8 permanent 40 meter (m) transects marked at the beginning by either subsurface buoys or tygon tubing. Each transect has six permanent markers (eyebolts or rebar stakes) placed at distances of 0, 8, 16, 24, 32, and 40 meters along the transect. Hereafter, the permanent markers (bolts or rebar) will be referred to as bolts. Most transects run parallel to shore from west to east, generally at headings of 80° or 90°. Before sampling is begun, a surveyors transect tape is attached to the 0 m bolt, swum through the eyes of 8, 16, 24, 32,and 40 m bolts of the transect, pulled taut, and attached to the 40 m bolt. Sampling is then begun.

Quadrat Sampling

The purpose of Quadrat sampling is to determine the abundance of small cryptic and/or abundant common invertebrates and algae. At each of the six permanent bolts along each transect a diver places a three-sided 1 square meter PVC frame on the bottom such that the transect tape forms the fourth side of the PVC frame. The diver then records the number of all target species within the 1 m^2 area defined by the PVC frame and transect tape. Substrate beneath understory algae is searched, however, neither the substrate nor the organisms attached to it are removed to facilitate sampling of organisms hidden from view.

Quadrats are oriented along the transect in the following manner: at the 8 m, 24 m and 40 m bolts the PVC frame is placed on the onshore side of the transect, at the 0 m 16 m and 32 m bolts the frame is placed on the offshore side of the transect. The PVC frame is positioned such that the bolt is located in the corner closest to the 0 m end of the transect for all distances except the 40 m bolt; at the 40 m bolt, the frame is positioned in the corner furthest from the 0 m end of the transect (Figure 1). Thus the 0 m quadrat samples the 1 m^2 area between 0 m and 1 m on the offshore side of the transect, while the 40 m quadrat samples the 1 m^2 area between 39 m and 40 m onshore of the transect.

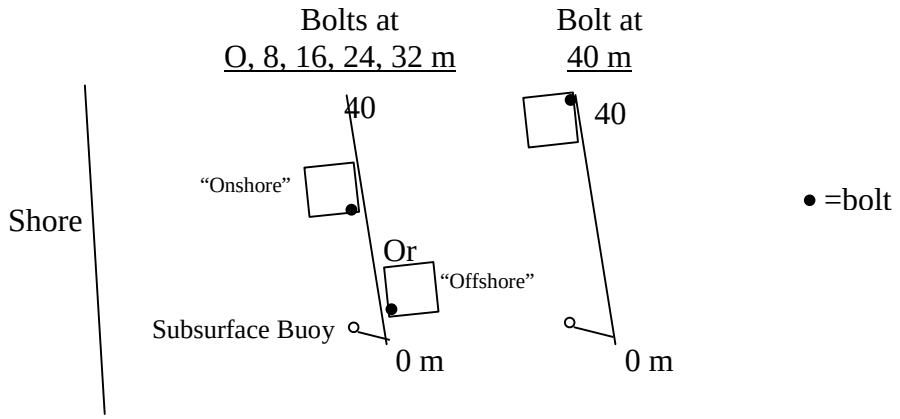

Figure 1. Diagram of quadrat orientation on bolts for permanent transects.

Quadrat Species List

The following species are commonly counted in the quadrat sampling.

Multiple species codes are used for several species to aid in distinguishing size/age categories for the purpose of estimating the young-of-year class. The following size categories used in quadrat sampling are: *Macrocystis pyrifera* juvenile = individual < 1 m tall, *Pterygophora californica* juvenile = individual < 25 cm tall, *Egregia menziesii* juvenile = individual < 1 m tall, *Laminaria farlowii* juvenile = blade width < 15 cm, *Cystoseira osmundaceae* juvenile = blade length < 3 cm. Species code BLD refers to the small single blade stage of a kelp that cannot be identified to species. Juvenile *Strongylocentrotus franciscanus, S. purpuratus, Pisaster ochraceus, P. giaganteus, P. brevispinus, Asterina miniata, Dermasterias imbricata , Orthosterias koehleri, Pycnopodia helianthoides* are individuals < 25 mm in diameter.

SP_CODE	GENUS	SPECIES	SIZE
AMS	*Asterina*	*miniata*	small (<25mm)
ANAR	*Anthopleura*	*artemisia*	.
ANSP	*Anthopleura*	spp.	.
ASAR	*Astropecten*	*armatas*	.
BAEL	*Balanophyllia*	*elegans*	.
BLD	*Blade Unidentified kelp juveniles*	.	.
CHOV	*Chaceia*	*ovoidea*	.
COCA	*Conus*	*californicus*	.
CUMI	*Cucumaria*	*miniata*	.
CUSA	*Cucumaria*	*salma*	.
CYJ	*Cystoseira*	*osmundacea*	juvenile (<10cm height)
CYSP	*Cypraea*	*spadicea*	.
DIOR	*Diopatra*	*ornata*	.
DIS	*Dermasterias*	*imbricata*	small (<25mm)
EGJ	*Egregia*	*menziesii*	juvenile (<1m height)
EUQU	*Eupentacta*	*quinquesemita*	.
LA	*Lytechinus*	*anamesus*	.
LFJ	*Laminaria*	*farlowii*	juvenile (<15cm bld width)
LIGS	*Lithopoma*	*gibberosum*	small (<25mm)

MIID	*Mitra*	*idea*	.
MPJ	*Macrocystis*	*pyrifera*	juvenile (<1m height)
NONO	*Norrisia*	*norrisi*	.
OCTO	*Octopus*	spp.	.
OKS	*Orthasterias*	*koehleri*	small (<25mm)
OPES	*Ophioplocus*	*esmarki*	.
OPSP	*Ophiothrix*	*spiculata*	.
PACA	*Parapholas*	*californica*	.
PAFI	*Pachycerianthus*	*fimbratus*	.
PAST	*Paracyathis*	*stearnsi*	.
PBS	*Pisaster*	*brevispinus*	small (<25mm)
PGS	*Pisaster*	*giganteus*	small (<25mm)
PHS	*Pycnopodia*	*helianthoides*	small (<25mm)
POPL	*Polyclinum*	*planum*	.
POS	*Pisaster*	*ochraceus*	small (<25mm)
PTJ	*Pterygophora*	*californica*	juvenile (<20 cm stipe length)
PTTR	*Pteropurpura*	*trilata*	.
SABW	*Sabellid Worm*	*.*	.
SFL	*Strongylocentrotus*	*franciscanus*	large (>25mm)
SFS	*Strongylocentrotus*	*franciscanus*	small (<25mm)
SKE	*Small Kelletia*	*.*	.
SPL	*Strongylocentrotus*	*purpuratus*	large (>25mm)
SPS	*Strongylocentrotus*	*purpuratus*	small (<25mm)
STMO	*Stylela*	*montereyensis*	.
TEAU	*Tethya*	*aurantia*	.
TESP	*Tegula*	spp.	.
URLO	*Urticina*	*lofotensis*	.
URPI	*Urticina*	*piscivora*	.