State of Pacific sand lance research in British Columbia

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Pacific sand lance *Ammodytes (Greek: sand diver) personatus*

- Needle fish (sandeel)
- Lack pelvic fins and NO swim bladder; S-shaped swimming; schooling

- Depends on low silt, medium coarse sand burying habitat; uncommon and patchy
- Water column feeders when light sufficient (~Mar-Oct); bury few h/day
- Remain buried in sand ~Oct-Feb;
- Spawn ~mid Nov-Feb; larvae 60-90days
- High inter-annual abundance variability

Examples of PSL in Chinook diets

1) Out-migrating chinook:

- DFO unpublished data for SoG 1998-2010;
- YOY PSL (40-50mm) can make up 3-45% by wt of the diet (July/Sept - av 15-20%);
- Highly variability: in 5 yrs: 20-30%, and in 5 other years <3% PSL in diet

2) Returning chinook:

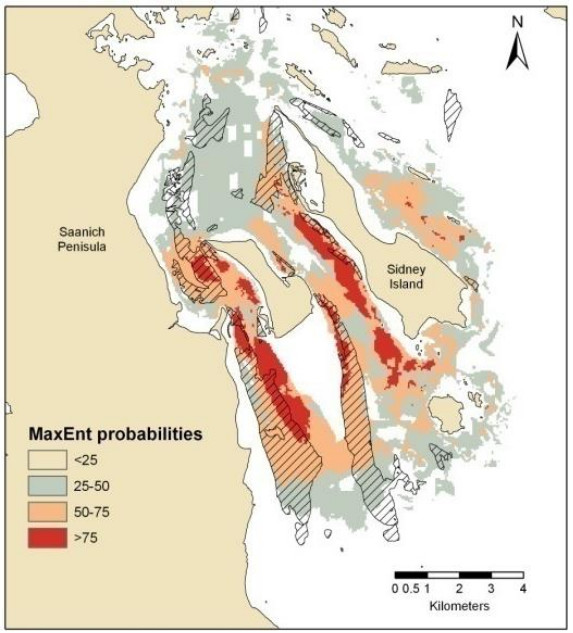
- Older age classes of PSL can also be important diet components of returning Chinook

Chinook from Kyuquot Reef;
Photo courtesy Jeremy Maynard

1) Modeling the distribution and quantity of PSL burying subtidal habitat

(ESD, CHS, NRCAN, ECCC, CWS, SeaDoc Society, SFU, UVIC)

1. Grab sampling
2. Seabed mapping (acoustic backscatter)
3. Habitat distribution modeling
4. Field validation of model results



2) Burying and spawning habitat validation using environmental DNA

(MABRI (VIU), WWF, PW, DFO Quebec)

Collecting water and sand samples in spawning and burying habitats and analyzing for traces of PSL (and other forage fish) DNA.

Additional evidence of habitat use; validate habitat and occupancy models; development of frequency of occurrence indices.

3) Micro-fibers in PSL diets and habitats

(ECCC, SFU, UVIC, Oceanwise)

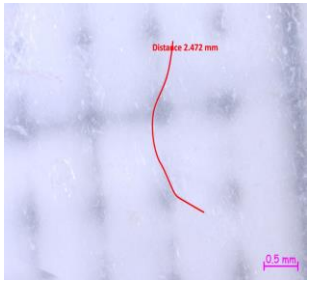
1) Prevalence of micro-fibres in PSL diets and water column (ECCC)

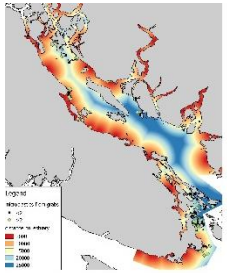
2) Occurrence of micro-fibres in PSL burying habitats (SFU)

3) Prevalence of micro-fibres in PSL from chinook (UVIC)

4) FTIR analysis of micro-fibers (natural or man-made; Oceanwise)

5) Modeling the distribution of micro-fibers in Salish Sea PSL and their habitats

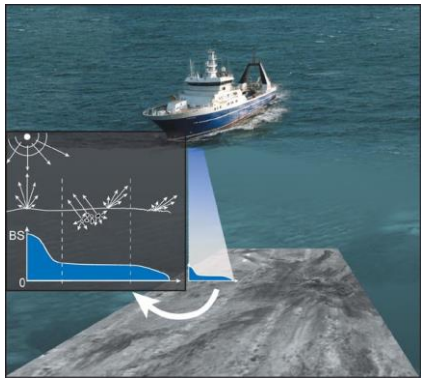




4) Developing hydro-acoustic tools and methods for identifying PSL foraging habitats

(OSD, PCA, ECCC, DFO Quebec)

- Lack a swim bladder making detection by acoustics challenging
- Tend to school with other small pelagics (eg Pacific herring)
- Return to same burying patches over summer
- Persistent re-use of same water column areas over several years
- Spatial relationships between burying and foraging areas need to be better understood



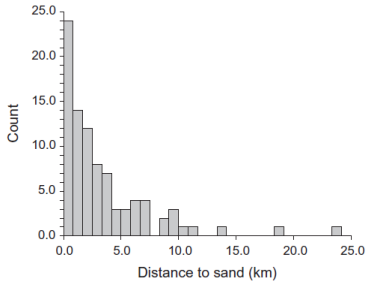
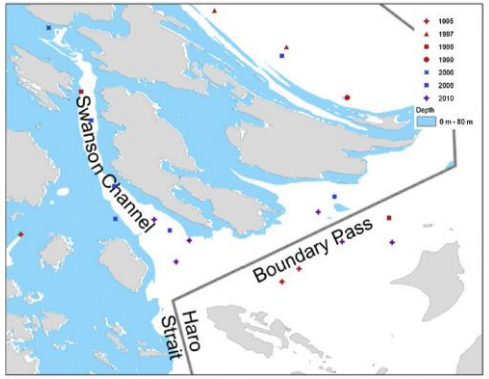


Fig. 4. The distribution of distances (in km) of 88 Pacific sand lance foraging schools to the edge of a nearest coarse sand patch. Median distance was 2.0 km and 75th percentile was 4.9 km.

C.L.K. Robinson et al. / Progress in Oceanography 115 (2013) 119–128



Canada

5) Coastal food web models – PSL (and euphausiid) abundance variation implications

(ECCC, PCA, UVIC, ESD, OSD)

Because PSL are not commercially fished – data deficient.

Ongoing assembly of coast-wide data into GIS:

- Bottom and midwater trawl by-catch (commercial and research),
- beach seine data,
- fish and seabird predator diet data,
- spawning habitat info, seabed substrate data, environ info.

Working towards developing: 1) annual PSL abundance indices for several coastal regions; 2) investigating climate variations and implications for PSL

Coast-wide PSL Knowledge Gaps

- Spatial overlap between PSL burying/spawning habitats with nearshore activities (eg dredging)
- Nearshore sand dynamics (sources, transport) and implications of shoreline hardening, etc
- Influence of ocean warming and hypoxia on PSL overwintering survival
- PSL sub tidal spawning habitats
- Importance of PSL to chinook; influence of chinook predation on PSL