



Humboldt Squid (*Dosidicus gigas*) In BC

2011 Update

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Historic Information

- Historic range from California to Tierra del Fuego
 - Some evidence of previous northward incursion in 1930s
- First BC records from mid- to late-1990s
 - Night time observations from Station P surveys
- Relatively consistent occurrence since 2005
 - Captures and strandings in Nootka Sound in 2007
- Extremely abundant in 2009

Biology

- Feed on hake, myctophids, anchovies, sardines, pelagic rockfish (*S. jordanii*), other squid
 - Diet studies from Washington, Oregon and California (Field et al. 2007)
 - Direct evidence of predation on salmon and herring in 2009
 - Otolith from 20 cm Chinook recovered from stomach contents in Juan de Fuca Strait
 - Could affect any salmon species in 10-40 cm range, depending on spatial and temporal overlap
- Preyed on by sharks, billfishes, tuna, whales
- Significant fisheries off Chile, Peru, Costa Rica and in Gulf of California
 - Primarily sold as bait
 - Increasing recreational interest in California

Q: Will Humboldt squid eat salmon?

A: Yes

Chinook jack (262 mm FL) caught in the Columbia River estuary Oct. 2009

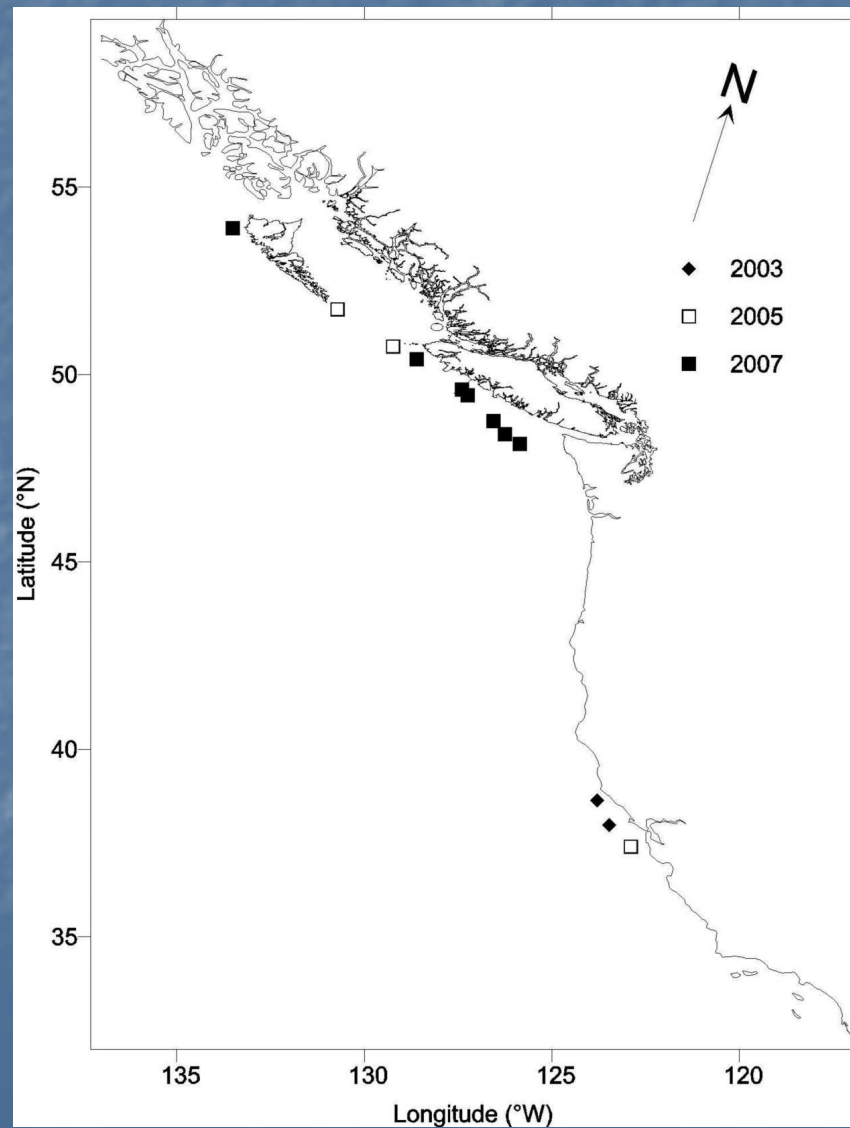
Chinook otolith recovered from stomach contents in Juan de Fuca Strait



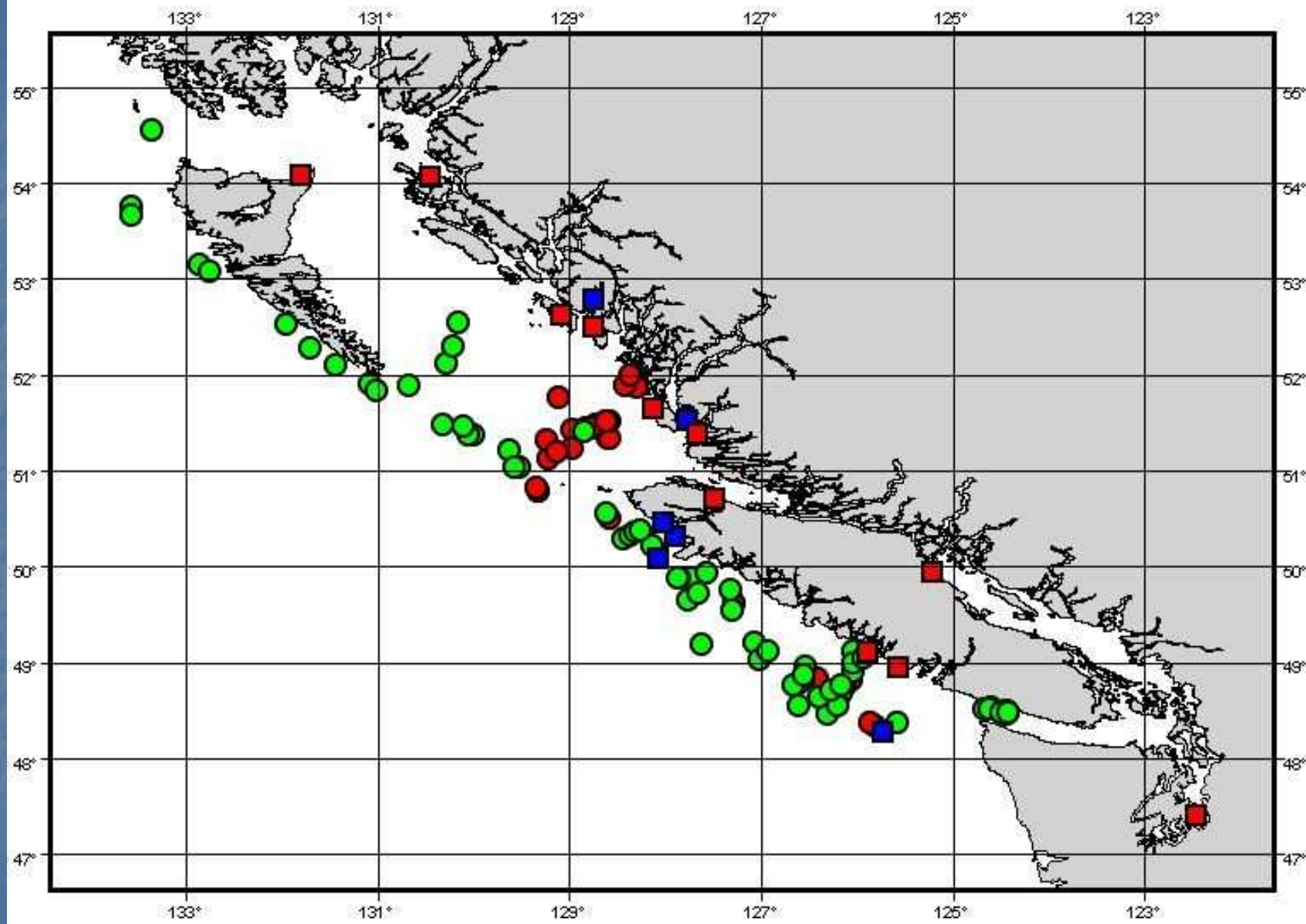
2009 Abundance

- Nine major strandings throughout BC in Summer/Fall
- Two records from inshore water in Winter (Campbell River and Puget Sound)
- Numerous records from commercial fisheries and research surveys

Previous Canada-US Hake Surveys



Holmes et al. 2008



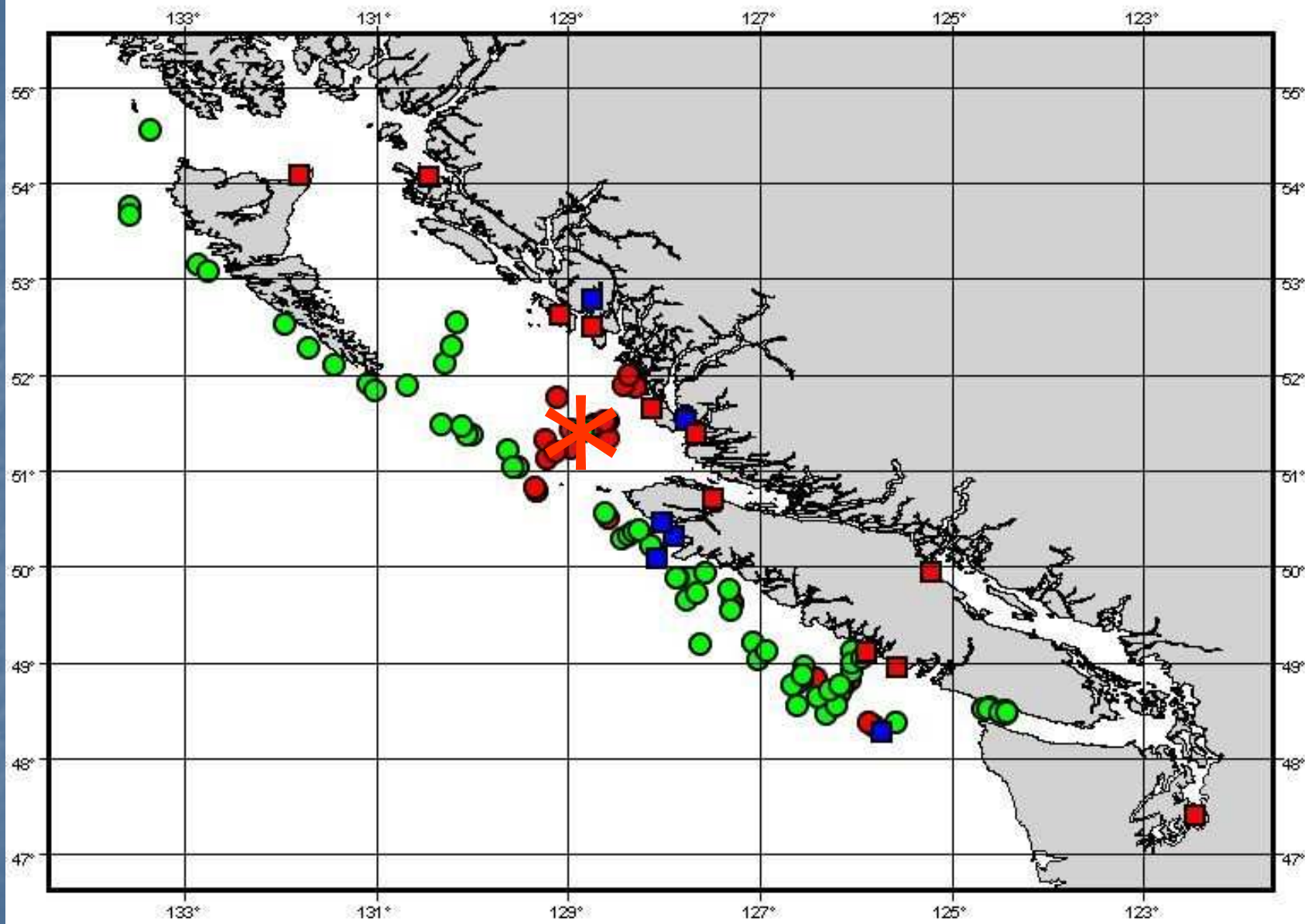
■ Sightings ■ Strandings ● Research ● Commercial Bycatch

2009 Samples

- Humboldt squid collected from trawl catches, automated and hand jigging
- Sampled for morphometrics, weight, gladii, tissues and stomachs
- Stomach samples processed by US collaborators
 - Physical sort for hard structures (otoliths)
 - Genetic examination of tissues and vertebrae

2009 Samples

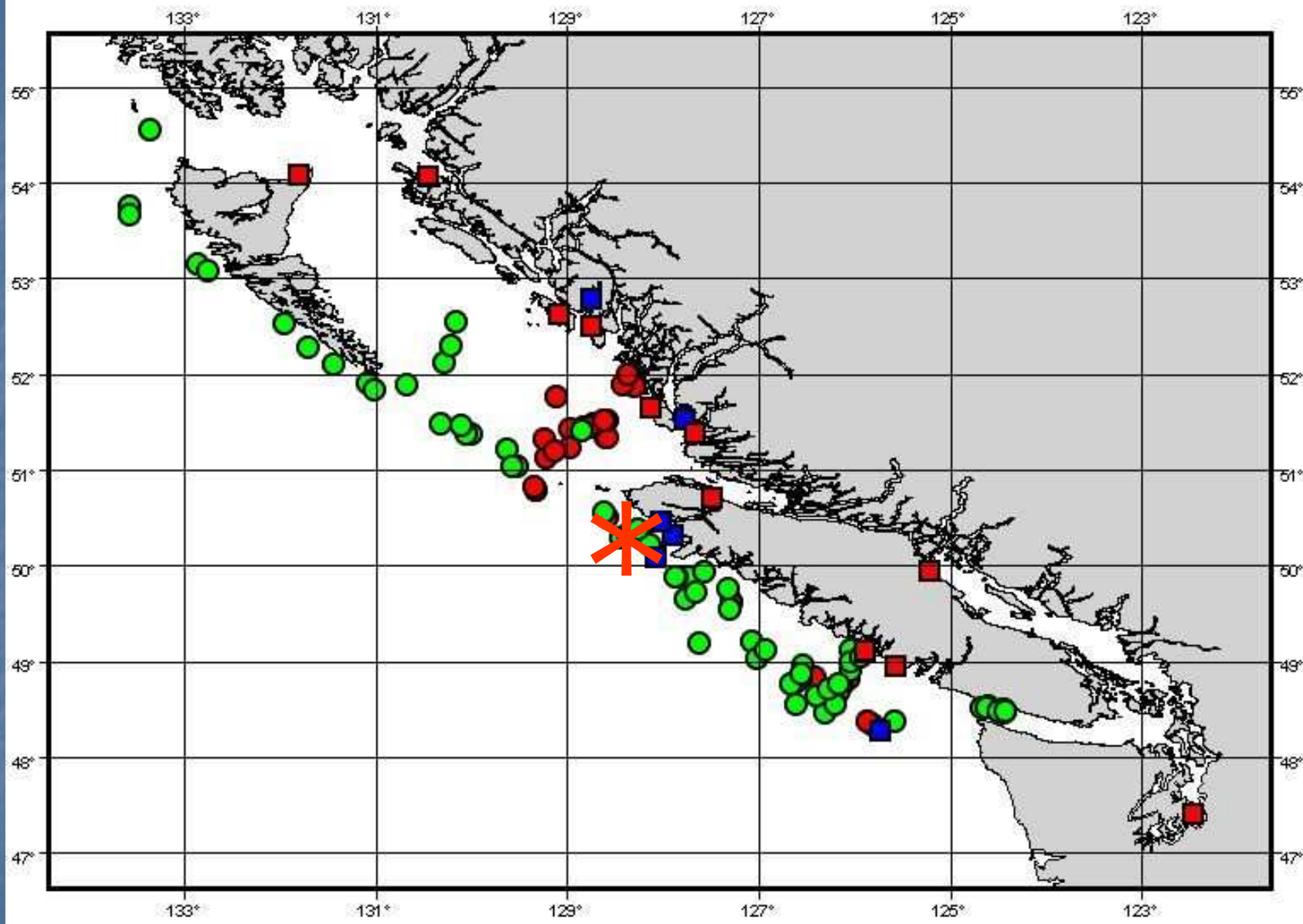
- Approximately 160 BC stomachs examined
 - Only jig caught samples used to avoid bias due to net predation
- Major prey items were gonatid squids, myctophids and coastal pelagic species
- Two stomachs contained salmon remains



■ Sightings ■ Strandings ● Research ● Commercial Bycatch

Station 107

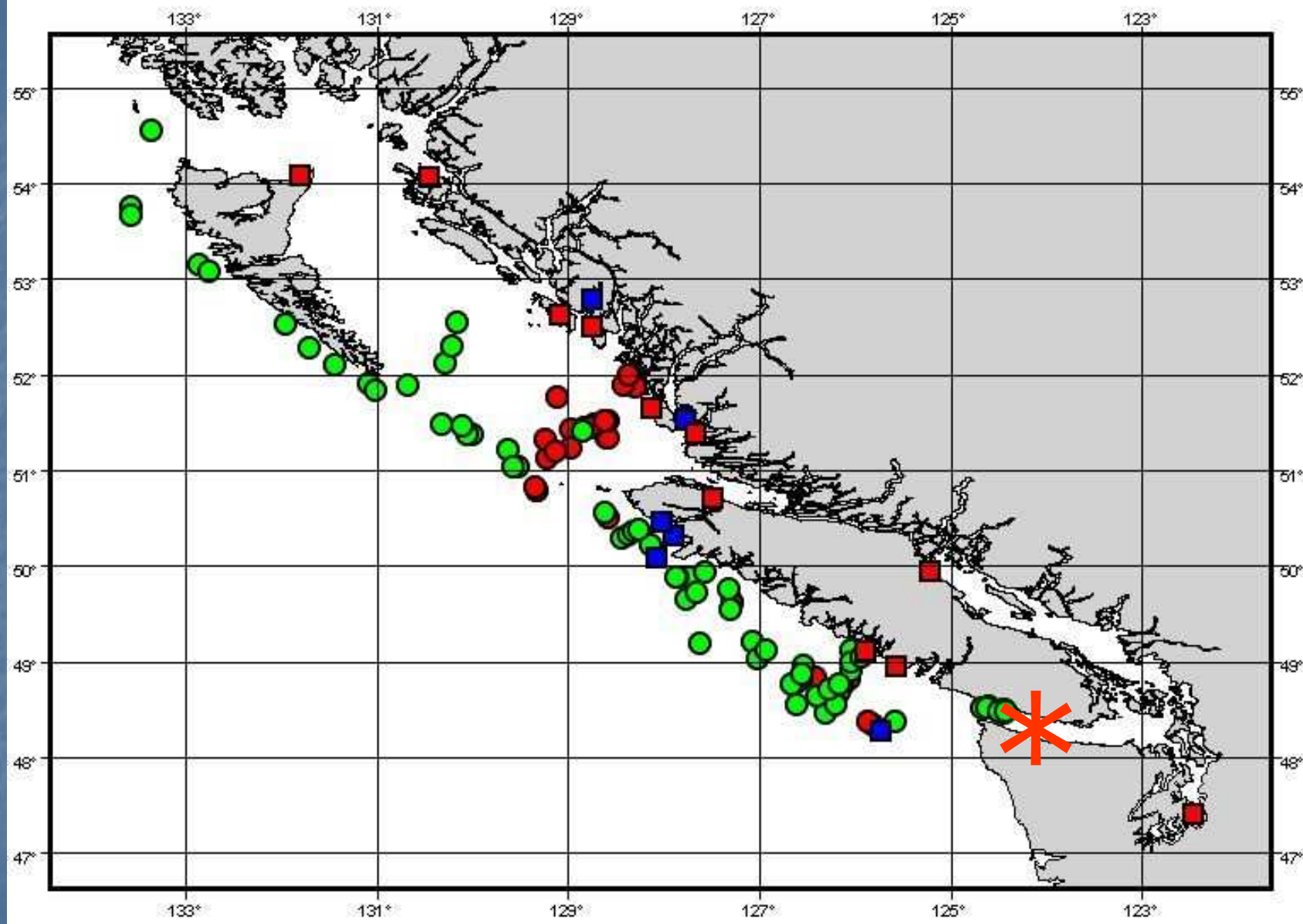
- Sample collected off southeast edge Goose Island Bank, 7 September 2009
- One of four squid contained salmon remains
- Otoliths from at least three salmon
- Morphologically resembled coho, inconclusive
- Genetic sampling of bony material indicated chum (4/16 bones sampled) and pink (1/16 bones sampled)
- All other bones (incl. otoliths) were herring



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Station LN04

- Sample collected off Kwakiutl Point, 16 August 2009
- One of four squid contained salmon remains
- No otoliths
- Genetic sampling of bony material indicated pink (8/8 bones sampled)



■ Sightings ■ Strandings ● Research ● Commercial Bycatch

US samples

- Only three squid from US samples contained salmon remains
- All three from 20 squid sampled in Sekiu Washington (Strait of Juan de Fuca) in September 2009
- Total of three Chinook and two coho
- ID based on otolith morphology validated with genetic methods
- Other prey were literally hundreds of herring, sculpins and other small fish
- No other salmon in samples from Pacific Northwest (N= \sim 140) and California (N= \sim 600)

2010 Abundance

- Did not enter BC waters in 2010
- Nearest record was southern Oregon
- Limited sampling on 2010 hake survey

2011 Projection

- No records from California (as of mid-April)
- Indications that abundance is low off Baja California
- Unlikely to occur in BC waters this year

Summary

- Humboldts unusually abundant throughout BC in 2009
- Did not occur in BC waters in 2010, not predicted to occur in 2011
- Distribution, abundance and behaviour not well documented
- Direct evidence of predation on salmon
 - Two of 160 squid sampled in BC had salmon remains
 - All pink and/or chum
 - Three of more than 740 squid sampled in US waters had salmon remains
 - All Chinook and/or coho, all from one location in Juan de Fuca Strait
- Otolith length/fish length relationship indicates all salmon were 10-15 cm in length

