



Taihoro Nukurangi

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Freshwater fish of Te Waihora – recruitment, important habitats, and changes in fish communities.

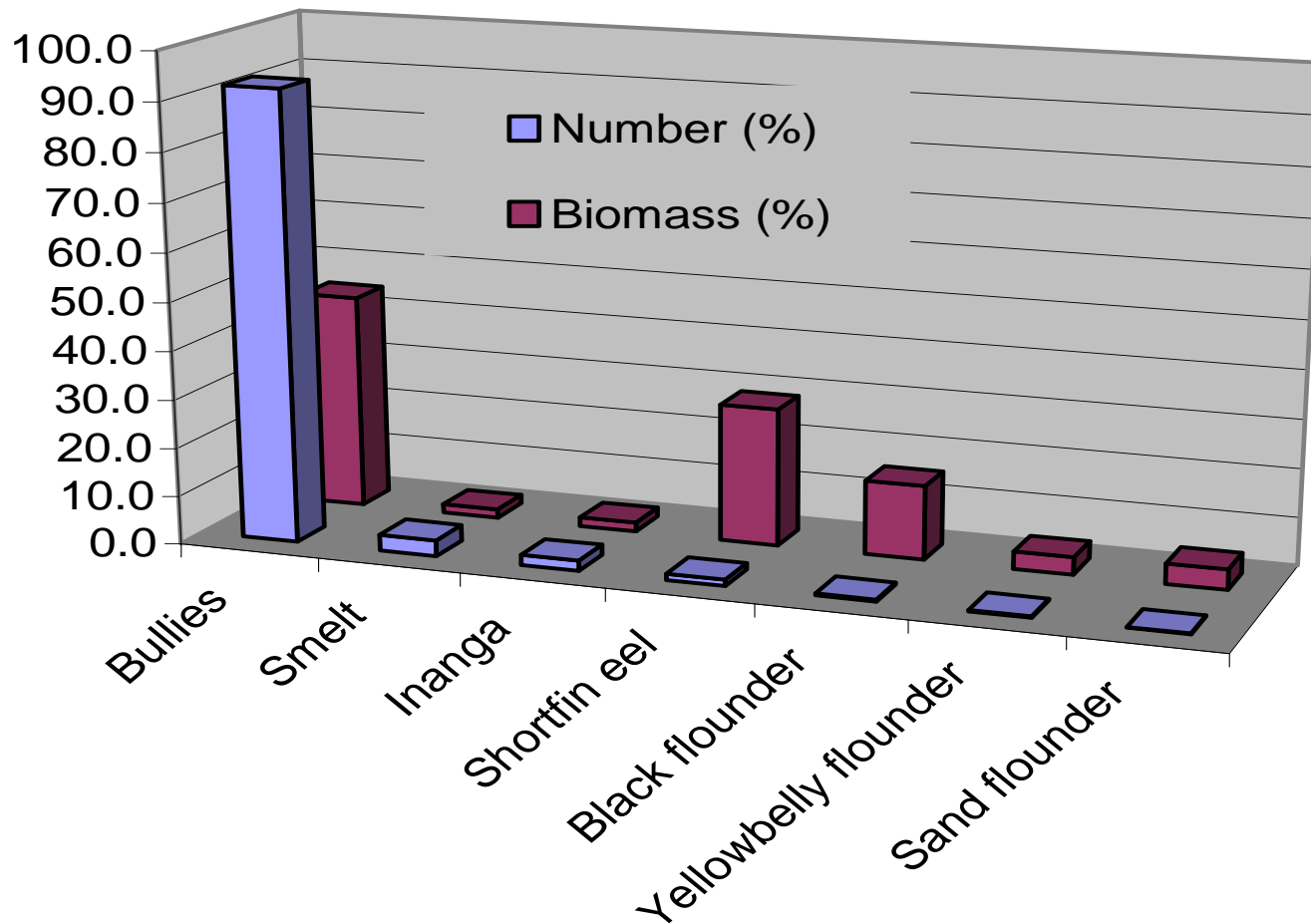
Don Jellyman
NIWA
Christchurch

Main sampling methods

- electric fishing
- trawling
- fyke netting
- seine netting



Percentage (by number and weight) of
Te Waihora fish
(Glova and Sagar 2000; n = 170 021 fish)



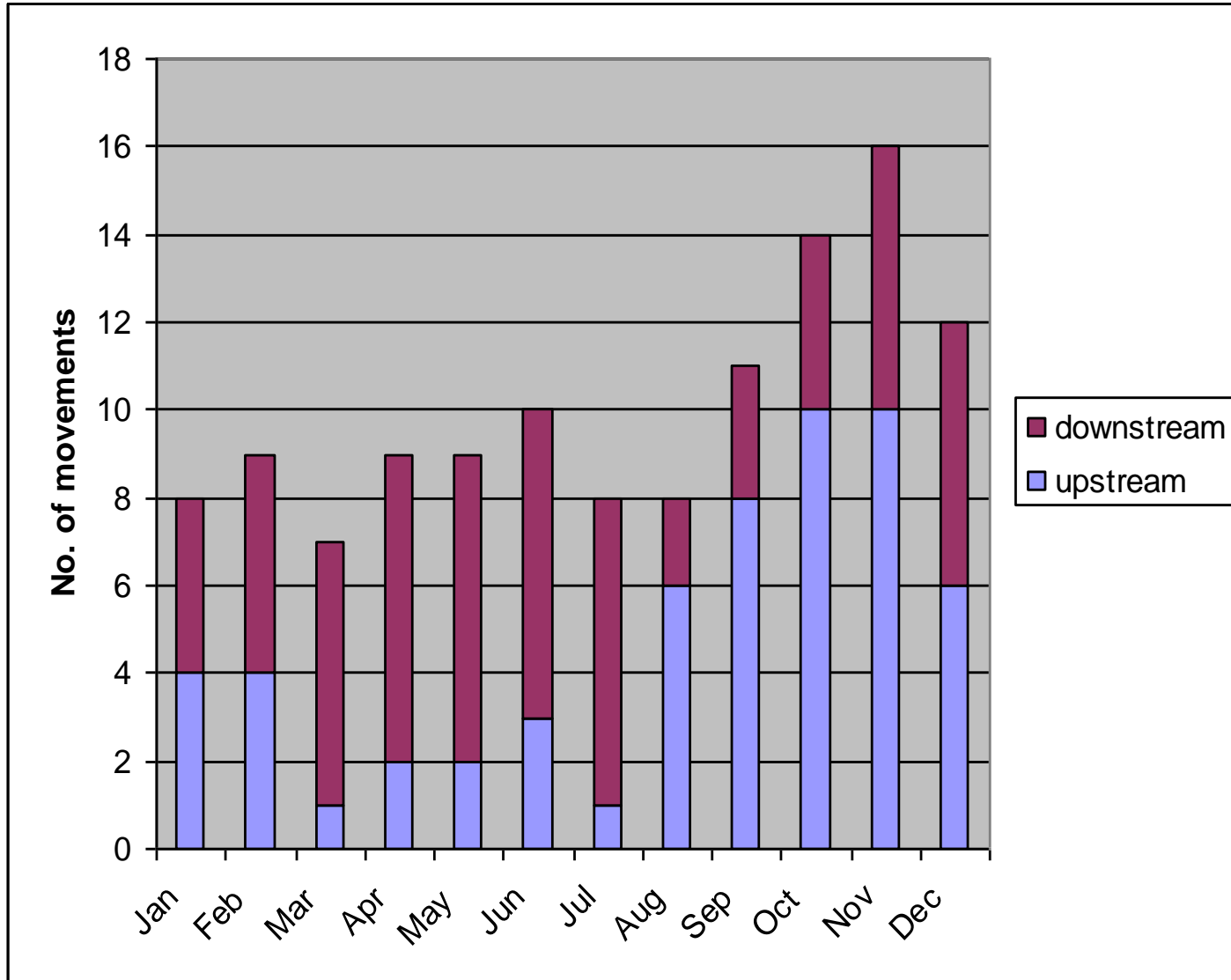
Recruitment

Fish migrations per season

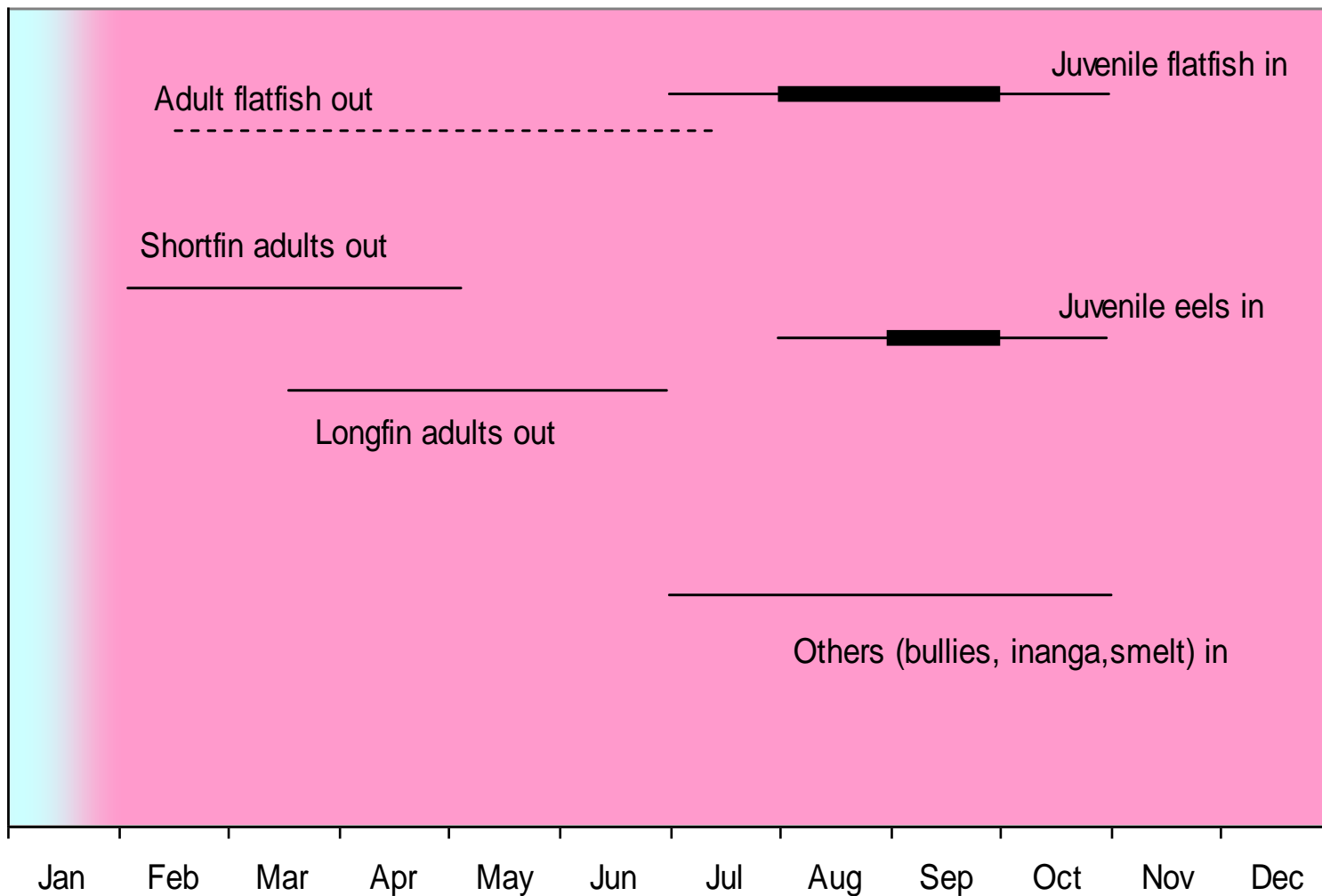
Table 2 Summary of migration periods of New Zealand's diadromous freshwater fish species (■ probable main periods of migration; ■ ■ periods of less intense migratory activity; ? migration period uncertain).

Species	Direction	Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lamprey	Up	Adult						■	■	■	■			
	Down	Juvenile			?	■	■	■	■	■	■			
Longfinned eel	Up	Juvenile				■	■			■	■	■		
	Down	Adult				■	■	■						
Shortfinned eel	Up	Juvenile								■	■	■		
	Down	Adult		■	■	■	■							
Common smelt	Up	Adult										■	■	■
	Down	Larva	■	■	■	■	■	■	■					■
Stokell's smelt	Up	Adult	■	■									■	■
	Down	Larva	■	■	■	■								■
Inanga	Up	Juvenile	■	■	■	■	■	■	■	■	■	■	■	■
	Down	Larva	■	■	■	■	■	■	■					
Giant kokopu	Up	Juvenile										■	■	?
	Down	Larva					?	■	■	■				
Banded kokopu	Up	Juvenile								■	■	■	■	?
	Down	Larva					■	■	■	■				
Shortjawed kokopu	Up	Juvenile												
	Down	Larva									?	?		
Koaro	Up	Juvenile									■	■	■	
	Down	Larva			■	■	■	■	■					
Torrentfish	Up	Juvenile				■	■	■	■	■	■	■	■	■
	Down	Larva		■	■	■	■	■	■					
Redfinned bully	Up	Juvenile	■										■	■
	Down	Larva								■	■	■	■	■
Common bully	Up	Juvenile	■	■	■									■
	Down	Larva										■	■	■
Bluegilled bully	Up	Juvenile	?										■	■
	Down	Larva	■	■	■						■	■	■	■
Giant bully	Up	Juvenile	?	?									?	?
	Down	Larva											■	■
Black flounder	Up	Juvenile									■	■	■	
	Down	Adult						■	■	■				

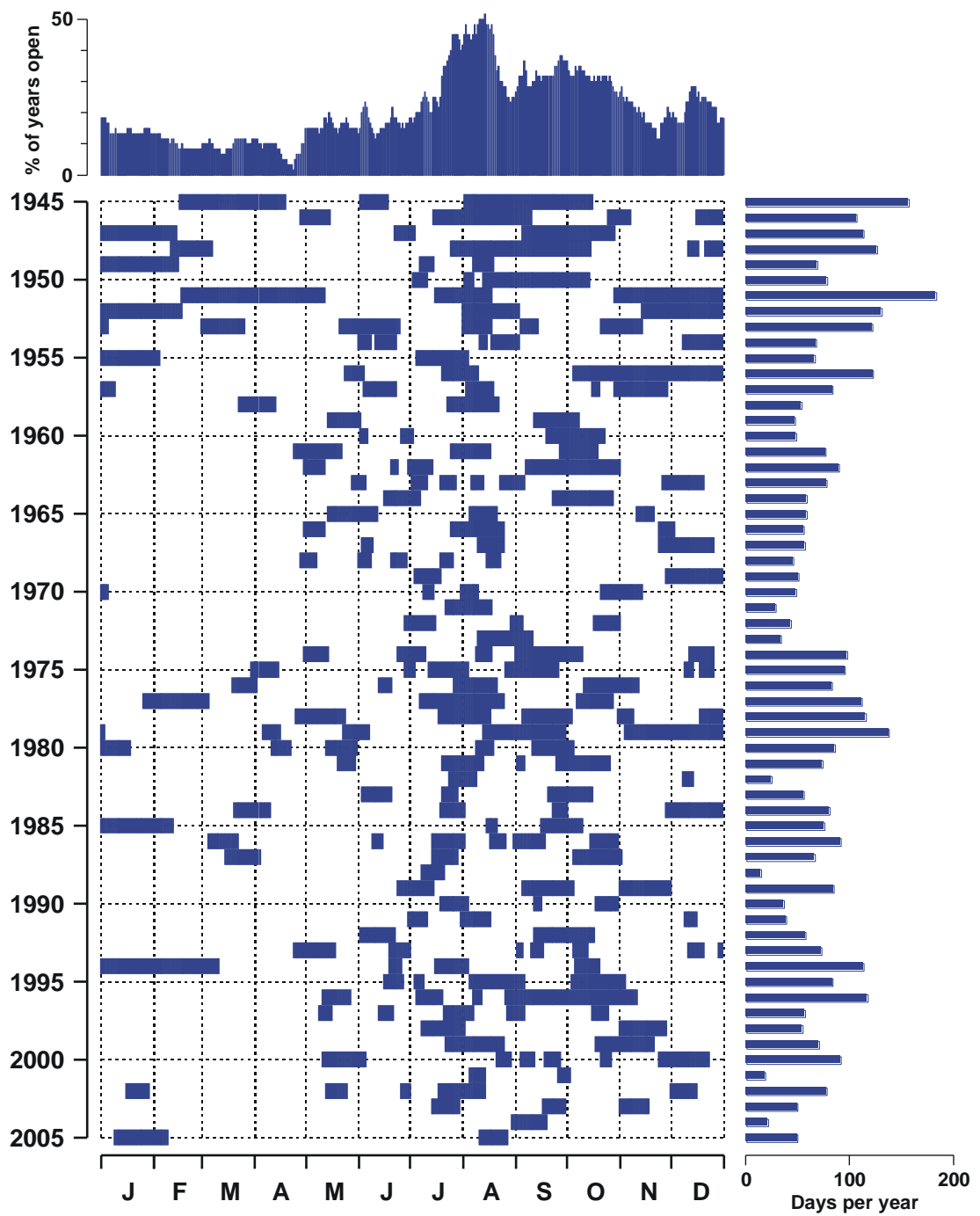
Number of native fish species migrating through river mouths per month



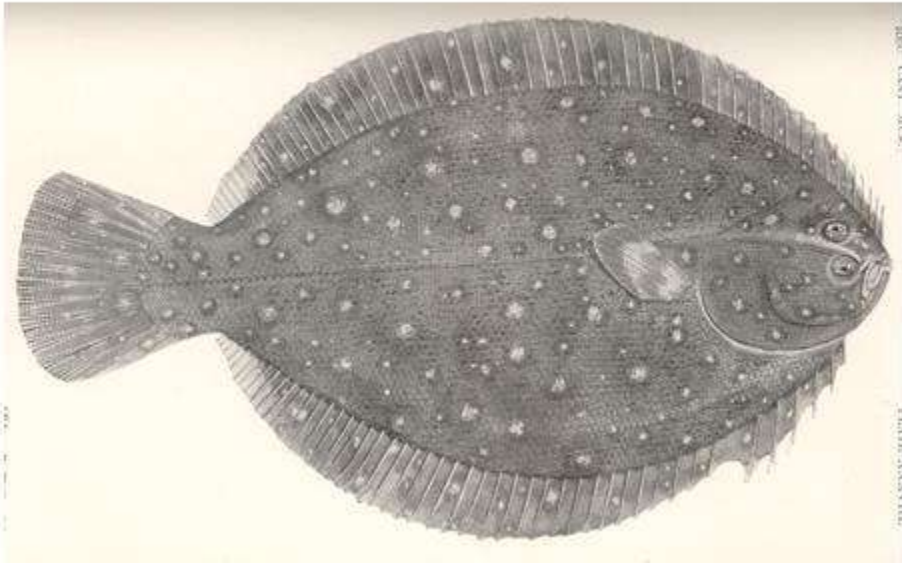
Te Waihora migration seasons – to and from the sea



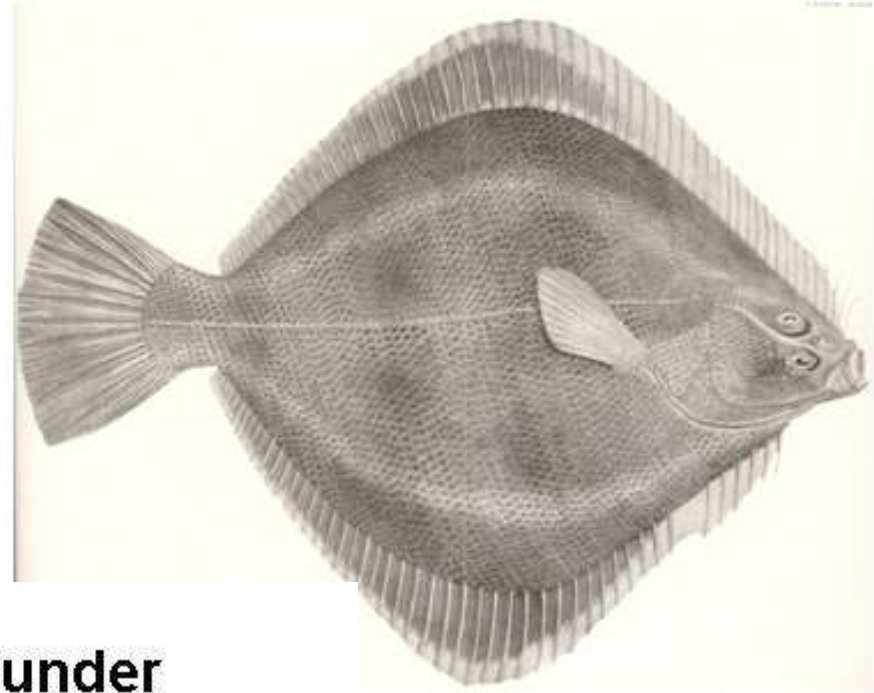
Lake openings 1945 - 2005



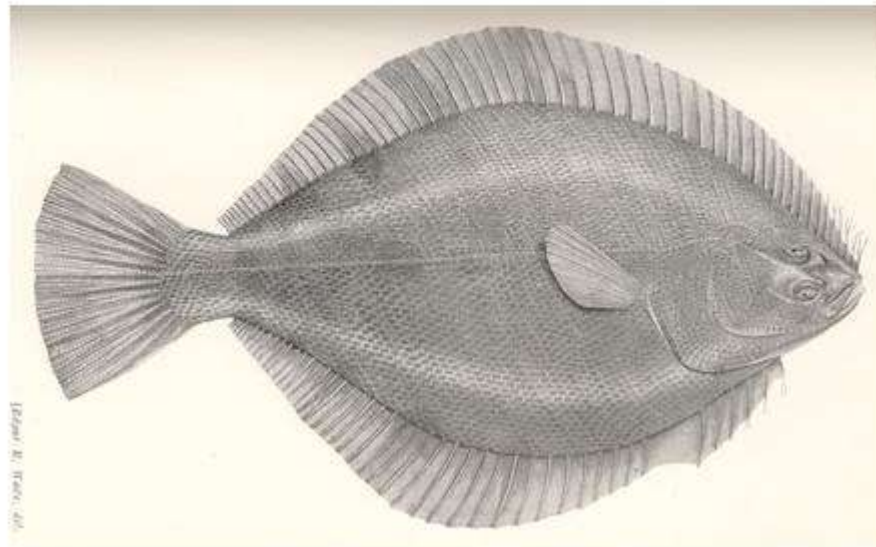
Black flounder



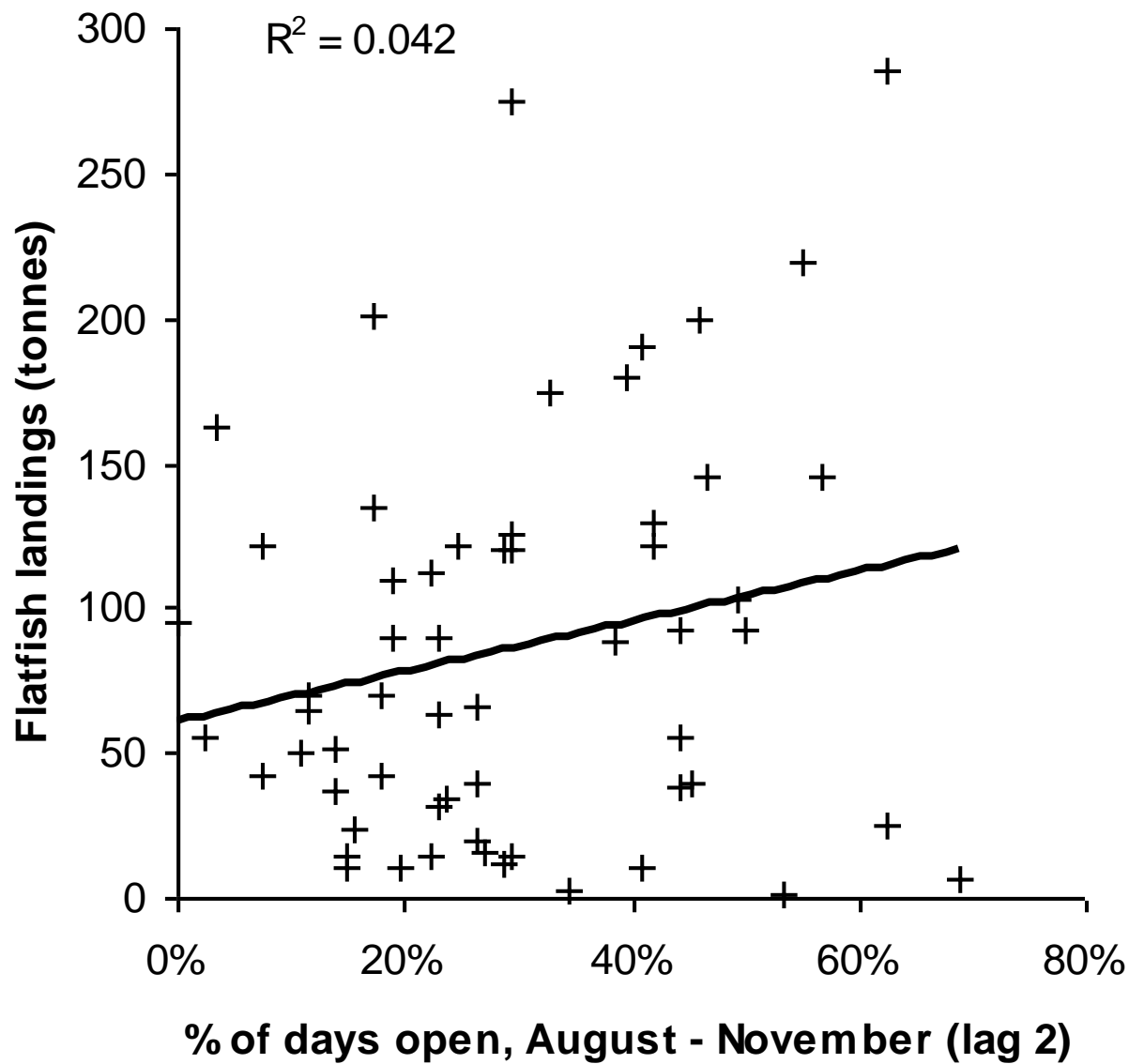
Sand flounder



Yellowbelly flounder



Best relationship between lake opening times and flatfish catches



Relationship (P values) between flatfish catches in Te Waihora flatfish and elsewhere

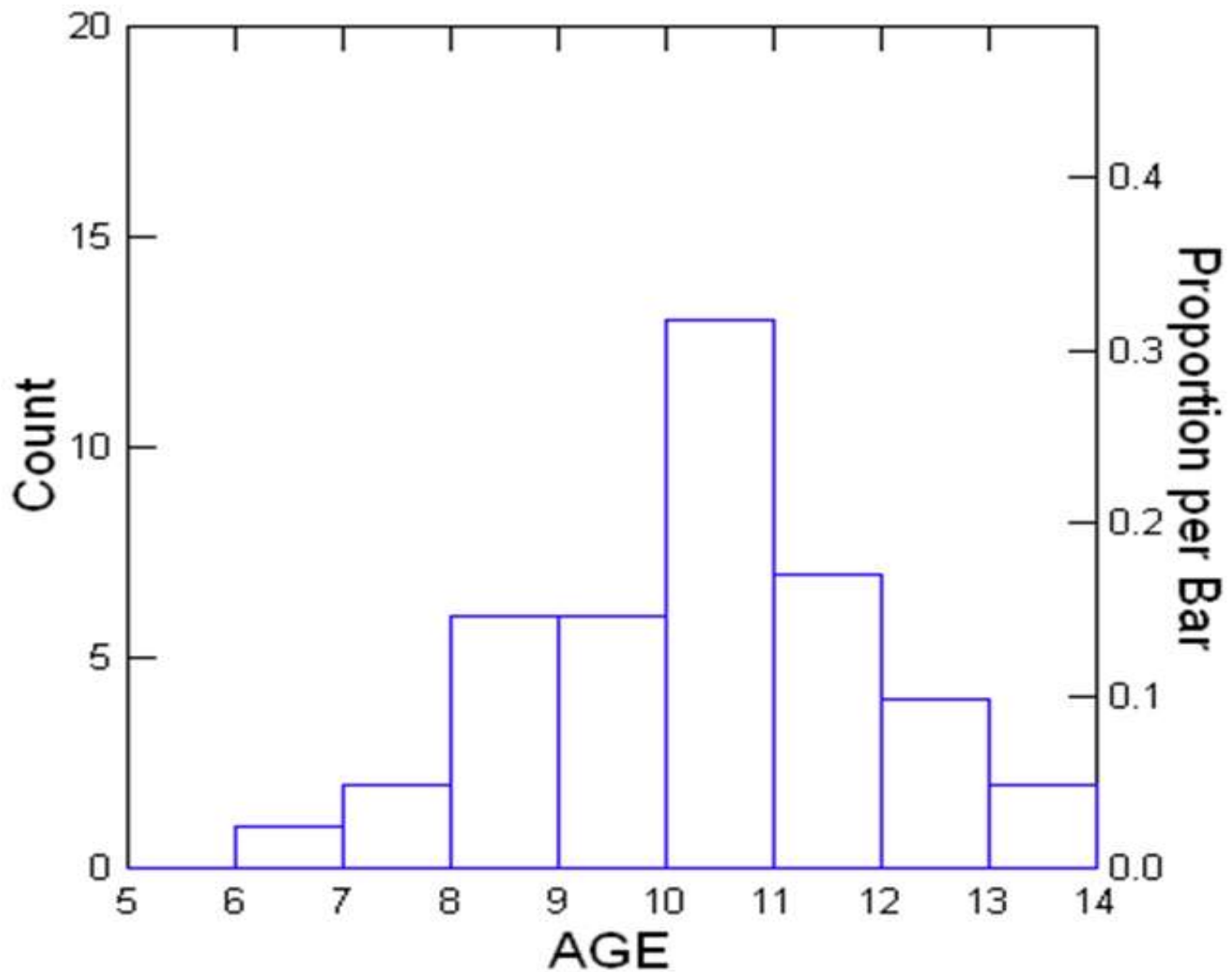
(bold values, $P \leq 0.05$, are significant). Figures in brackets are Te Waihora catches as a % of total New Zealand catch

	Canterbury Bight catches	All New Zealand catches
Black flounder	0.00 (95 %)	0.00 (63 %)
Sand flounder	0.02 (14 %)	0.42 (3 %)
Yellowbelly flounder	0.00 (30 %)	0.05 (3 %)

Flatfish recruitment -summary

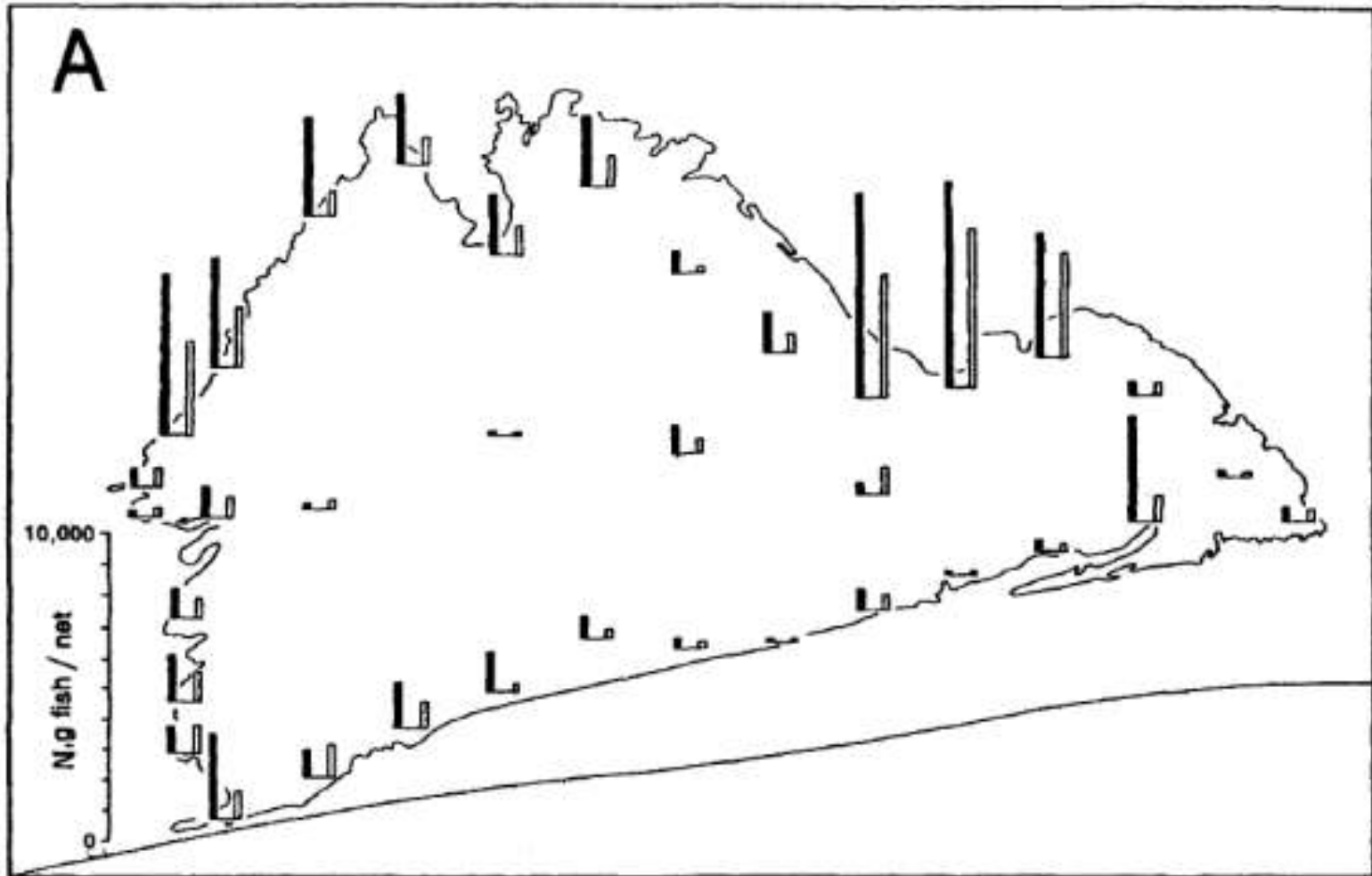
- A weak predictive relationship between days open in spring and commercial catch 2 years later
- Strong relationships between Te Waihora flatfish catches and regional and national catches
- So, extent of recruitment into Te Waihora depends on lake being open, but also on what species are available in inshore areas.

Age distribution of shortfin eels at entry into Te Waihora fishery (220 g)

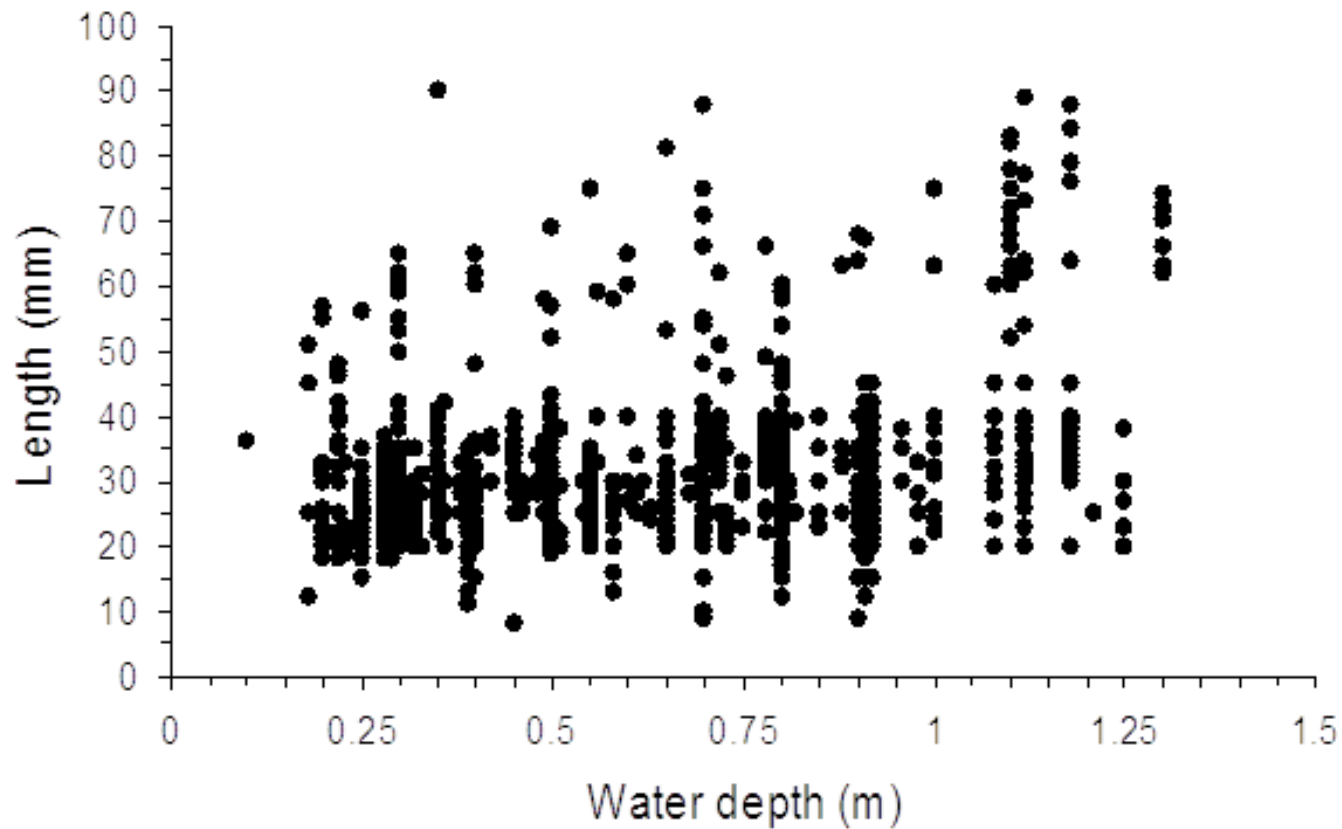


Important habitats

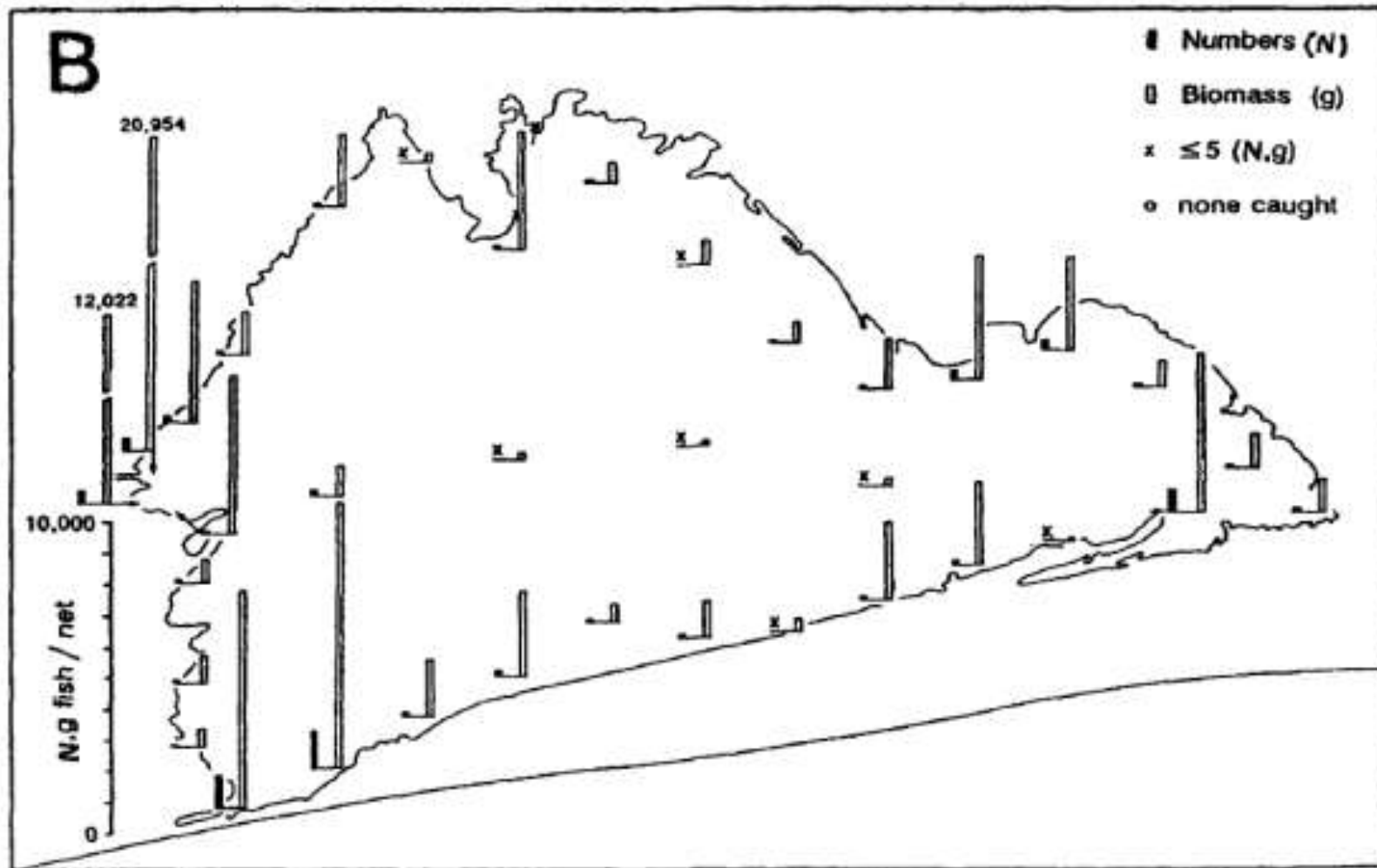
Common bullies



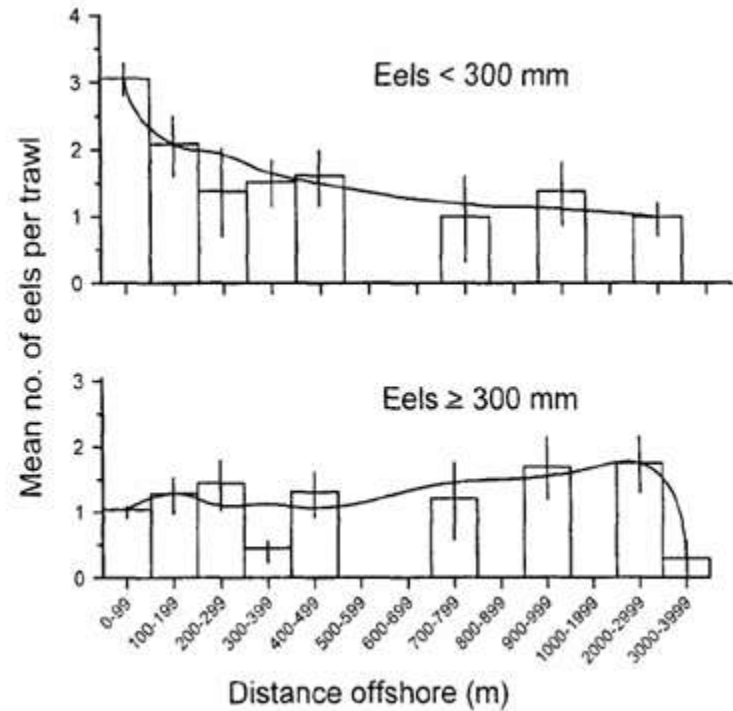
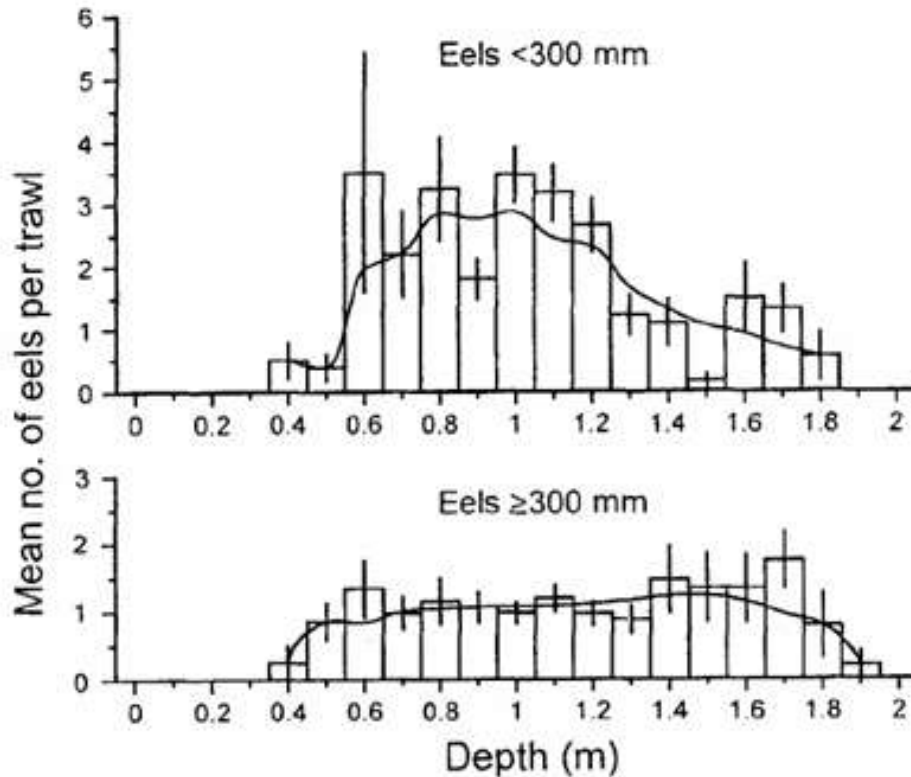
Relationship between catches of common bullies and depth

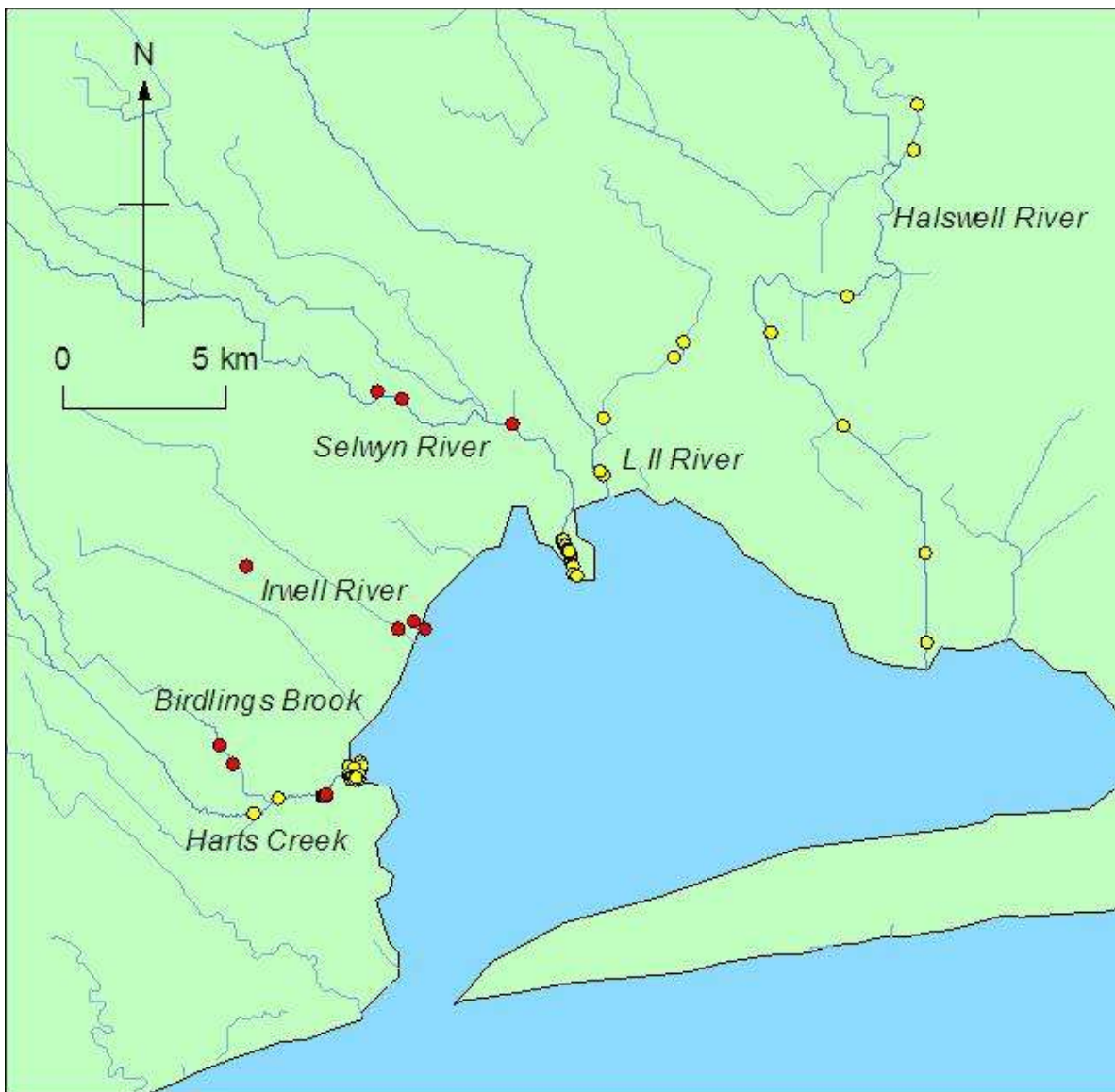


Shortfin eels



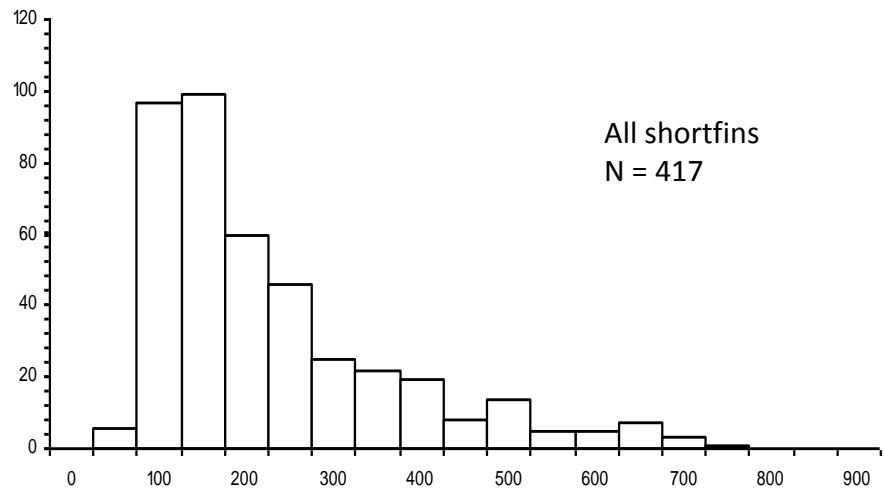
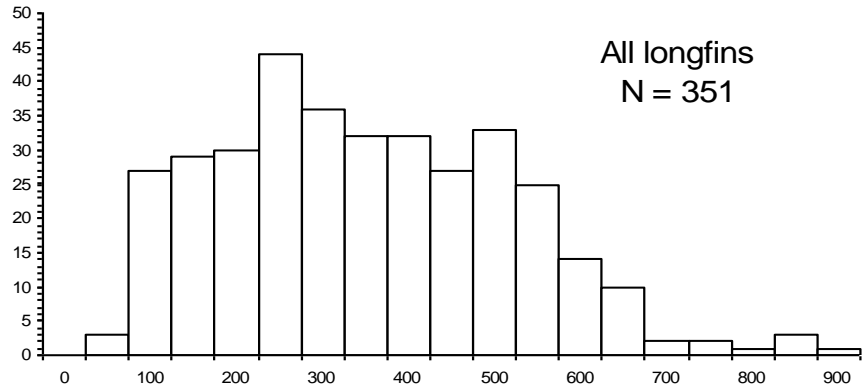
The mean number of juvenile shortfin eels caught per trawl at various depths and distances (Timberyard Point, Te Waihora)



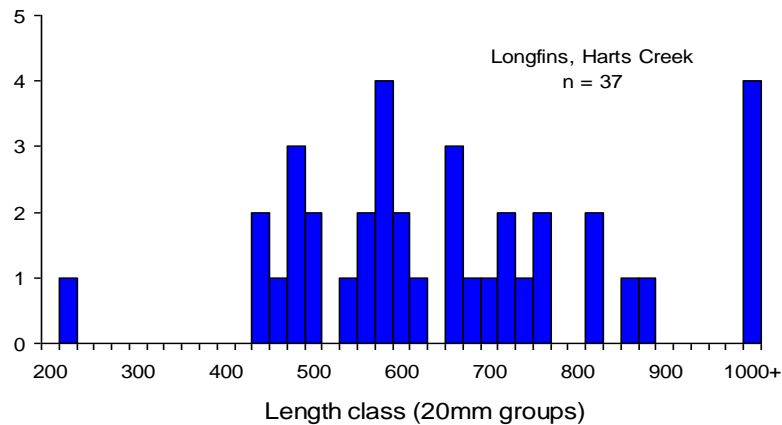
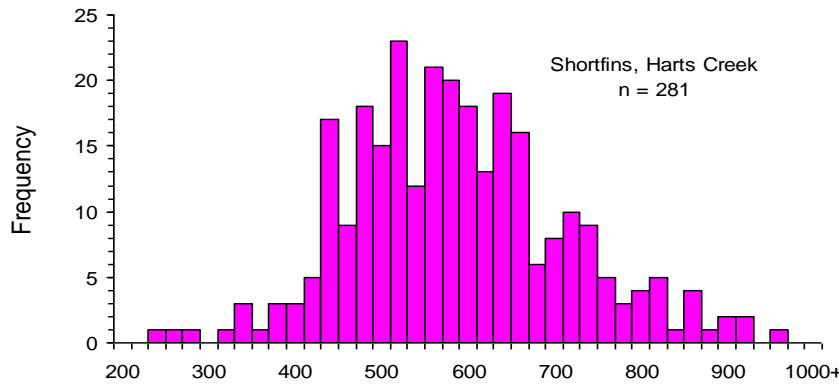
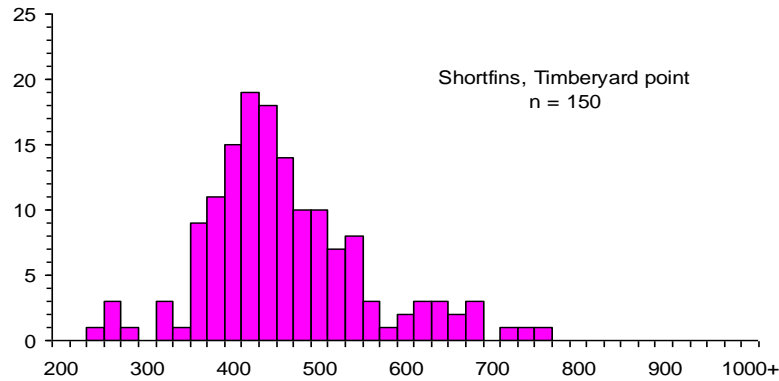


Sampling sites:
red = electric fishing; yellow = fyke net

Length distributions of all longfins (top) and all shortfins (bottom) caught by electric fishing in tributaries



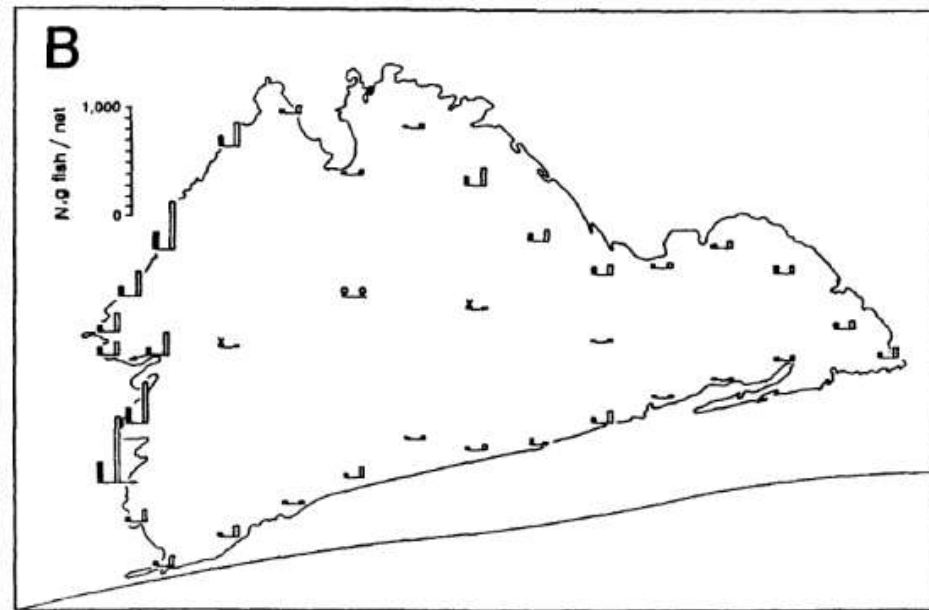
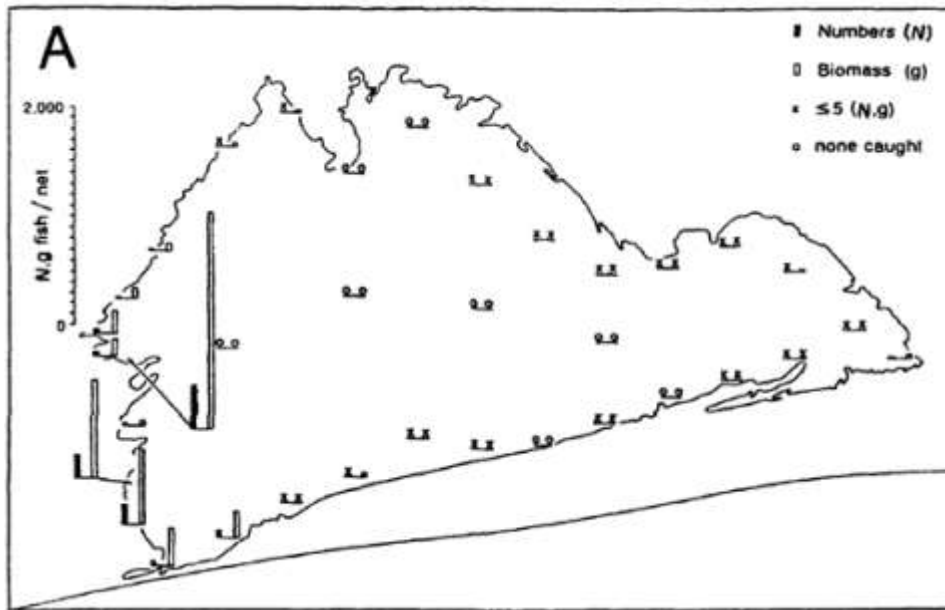
Sizes and species of tuna from Harts Creek reserve area and Timberyard Point



Eels - summary

- Longfin eels largely gone from Te Waihora itself
- Tributaries had high densities of both species, but especially longfins
- As eels are long-term residents in such areas, tributaries provide important refuge habitats (as do reserve areas in the lake itself)
- Concerns about lack of juvenile longfins

Inanga (A) and smelt (B)



The relative importance of generalised habitats to the main fish species of the lake.

- = seldom occurs, * = minor importance; ***** = major importance

Species	Lake-inshore areas	Lake – offshore areas	Vegetated lake margins	Tributaries – lower reaches	Tributaries – upper reaches
Shortfin eel	*****	**	**	**	-
longfin eel	***	*	**	*****	*****
flatfish	*****	**	**	*	-
bullies	*****	*	***	*****	*
smelt	*****	-	*****	*****	-
inanga	*****	-	*****	*****	-

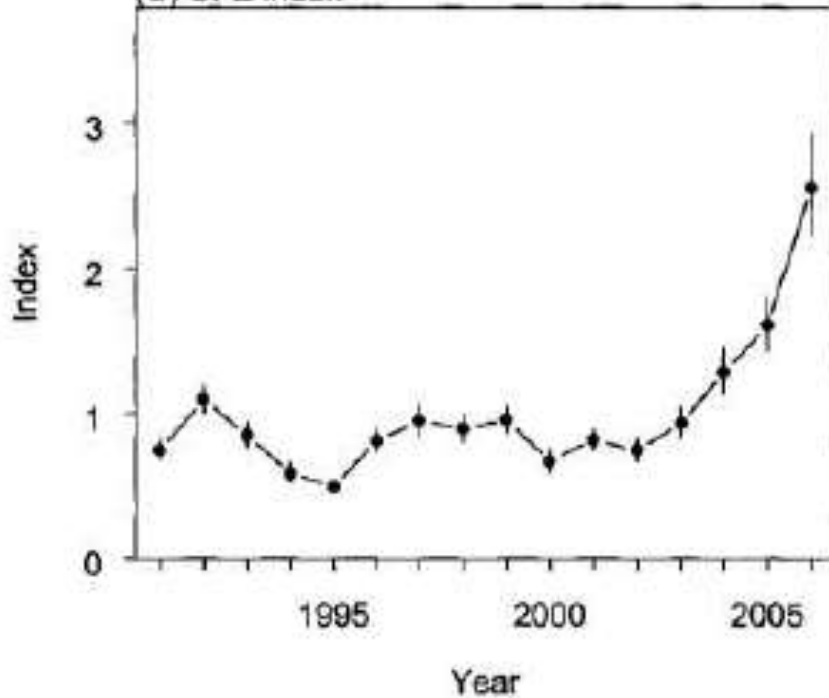
Overall changes in fish communities of Te Waihora

Brown trout - Selwyn River trap

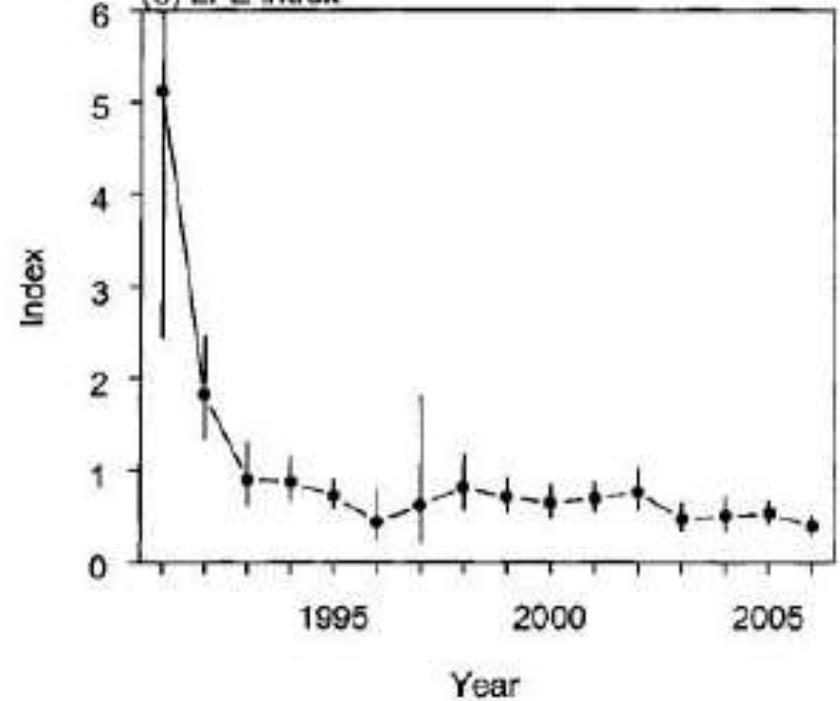
Year	No. of weeks operating	No. of trout trapped	Estimated run size
1941	10	12 430	37 000
1949	17+	12 105	65 367
1956	9	12 142	15 560
1958	15+	4 779	15 600 – 19 800
1960	8+	12 177	
1966	10	14 247	
1970	14+	13 280	
1985		309	
1987		562	
2004		87	

CPUE (commercial catches) for shortfin and longfin eels, Te Waihora

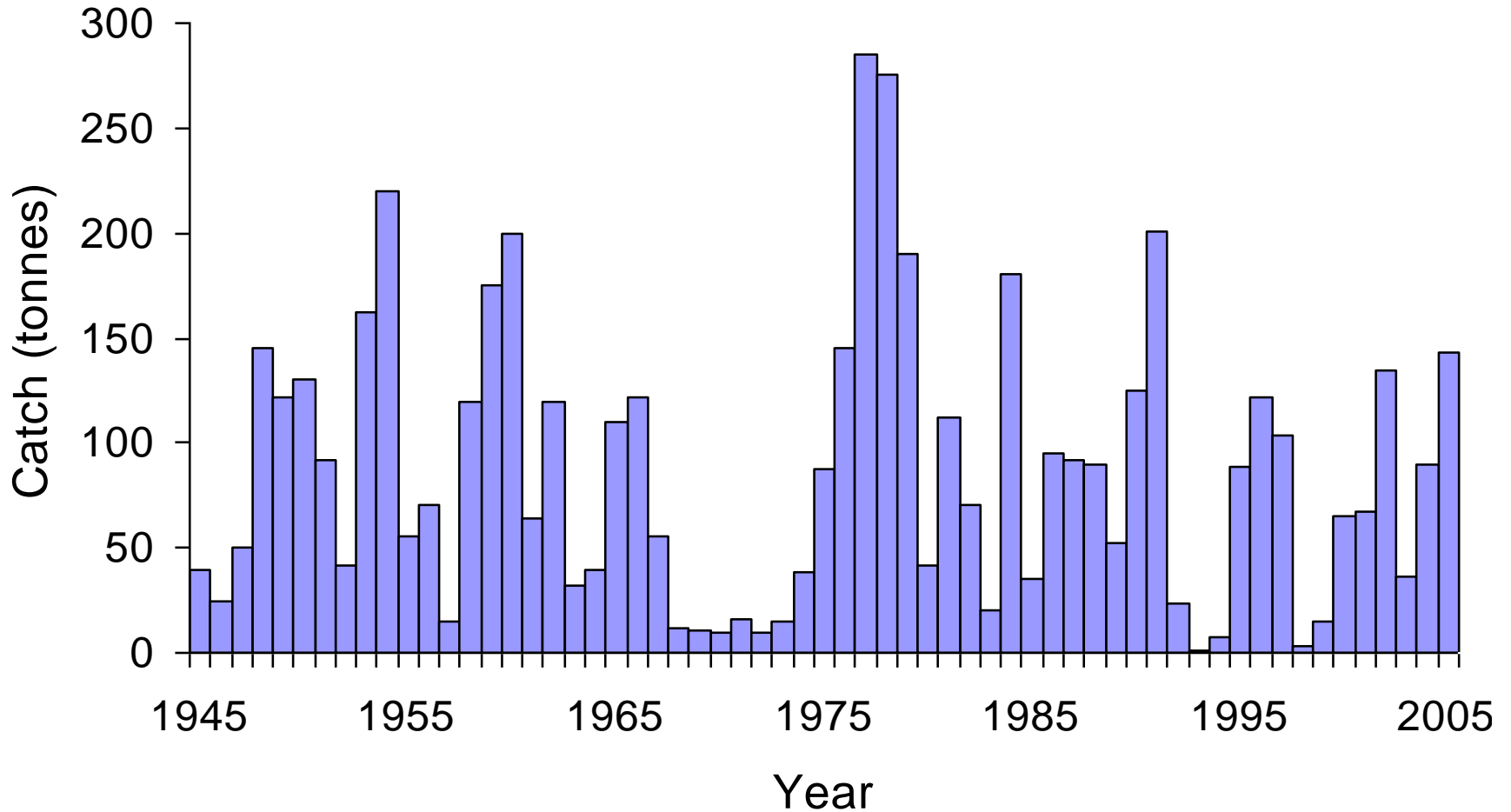
(b) SFE index



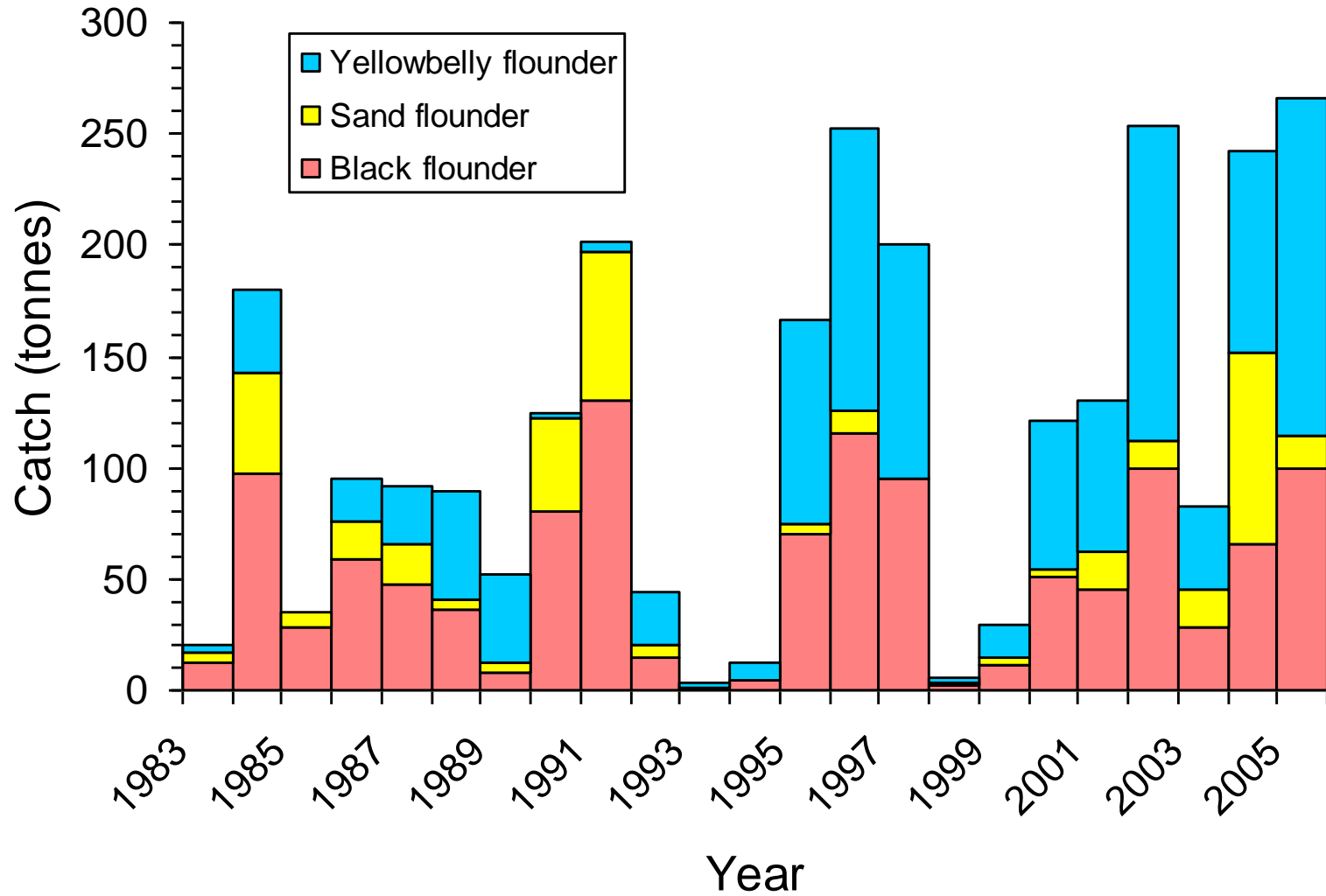
(c) LFE index



Annual commercial flounder catch



Species composition of flounders



Summary of overall changes in fish communities

- Brown trout = serious decline
- Longfin eels = serious decline
- Shortfin eels = OK
- Flatfish = fluctuations depend on lake openings and regional/national recruitment
- Inanga, smelt, common bullies = some lake – limited stocks have formed

Characteristics and concerns of the fisheries of Te Waihora

- Relatively high production
- No fish kills
- No weed to clog nets
- Varying lake levels enable enhanced feeding opportunities (especially eels in spring)
- Potential for blue-green algae problems?
- Shallow summer depths (water temperatures, climate change effects?)
- “Stable” commercial eel fishery, flatfish vary
- Customary fisheries = lack of access to sufficient fish and of large enough size