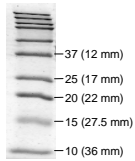
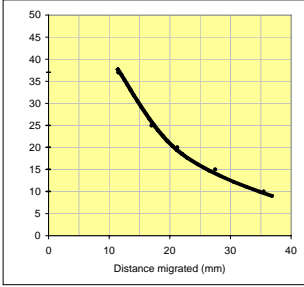




Biotechnology Explorer **BIO RAD**

### Molecular Mass Estimation

Molecular Mass	Distance migrated (mm)
37	12
25	17
20	22
15	27.5
10	36

---

---

---

---

---

---

---

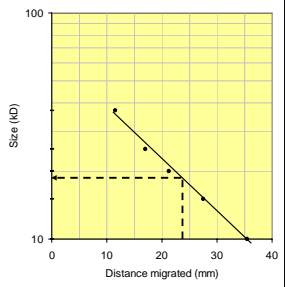
---

---

---

Biotechnology Explorer **BIO RAD**

### Molecular Mass Analysis With Semi-log Graph Paper



Distance migrated (mm)	Size (kD)
12	37
17	25
22	20
27.5	15
36	10

---

---

---

---

---

---

---


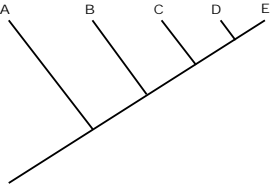
---

---

---

Biotechnology Explorer **BIO RAD**

### Using Gel Data to Construct a Phylogenetic Tree or Cladogram


---

---

---

---

---

---

---

---

---

---

Biotechnology Explorer PROTEOMICS GENOME RESEARCH **BIO RAD**

Each Fish Has a Distinct Set of Proteins

Total # proteins	Shark	Salmon	Trout	Catfish	Sturgeon
	8	10	13	10	12
Distance proteins migrated (mm)	25, 26.5, 29, 36, 36.5, 39, 44, 52	26, 27.5, 29, 32, 34.5, 36.5, 37.5, 40.5, 42, 45	26, 27.5, 29, 29.5, 32, 34.5, 36.5, 37.5, 40.5, 42, 45, 46.5, 51.5	26, 27.5, 29, 32, 36.5, 38, 38.5, 41, 46, 47.5	26, 27.5, 30, 30.5, 33, 35.5, 37, 39, 39.5, 42, 44, 47

---

---

---

---

---

---

---

---

---

---

---

---

Biotechnology Explorer PROTEOMICS GENOME RESEARCH **BIO RAD**

Some of Those Proteins Are Shared Between Fish

Distance (mm)	Size (kD)	Shark	Salmon	Trout	Catfish	Sturgeon
25	32.5	X				
26	31.5		X	X	X	X
26.5	31.0	X				
27.5	30.0		X	X	X	X
28.5	29.1					
29	28.6	X	X	X	X	
30	27.6			X		X
30.5	27.1					X
32	25.6		X	X	X	
33	24.7					X
34.5	23.2		X	X		
35.5	22.2					X
36	21.7	X				
36.5	21.2	X	X	X	X	
37	20.7					X
37.5	20.2		X	X		

---

---

---

---

---

---

---

---

---

---

---

---

Biotechnology Explorer PROTEOMICS GENOME RESEARCH **BIO RAD**

Character Matrix Is Generated and Cladogram Constructed

	Shark	Salmon	Trout	Catfish	Sturgeon
Shark	8	2	2	2	2
Salmon	2	10	10	5	3
Trout	2	10	13	5	4
Catfish	2	5	5	10	2
Sturgeon	2	3	4	2	12

---

---

---

---

---

---

---

---

---

---

---

---

**Biotechnology Explorer** PROTOCOLS FOR MOLECULAR BIOLOGY **BIO-RAD**

## Phylogenetic Tree

Evolutionary tree showing the relationships of eukaryotes. (Figure adapted from the tree of life web page from the University of Arizona ([www.jobweb.org](http://www.jobweb.org)))

---

---

---

---

---

---

---

---

**Biotechnology Explorer** PROTOCOLS FOR MOLECULAR BIOLOGY **BIO-RAD**

## Pairs of Fish May Have More in Common Than to the Others

	Shark	Salmon	Trout	Catfish	Sturgeon	Carp
Shark	8	2	2	2	2	2
Salmon	2	10	10	5	3	5
Trout	2	10	13	5	4	5
Catfish	2	5	5	10	2	8
Sturgeon	2	3	4	2	12	2
Carp	2	5	5	8	2	11

---

---

---

---

---

---

---

---

**Biotechnology Explorer** PROTOCOLS FOR MOLECULAR BIOLOGY **BIO-RAD**

## Extensions

- Independent study
- Western blot analysis

---

---

---

---

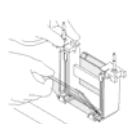
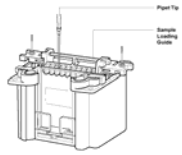
---

---

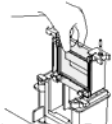
---

---

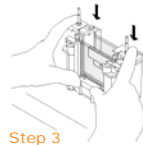
### Ready Gel® Precast Gel Assembly



Step 1



Step 2



Step 3



Step 4

---

---

---

---

---

---

---

---