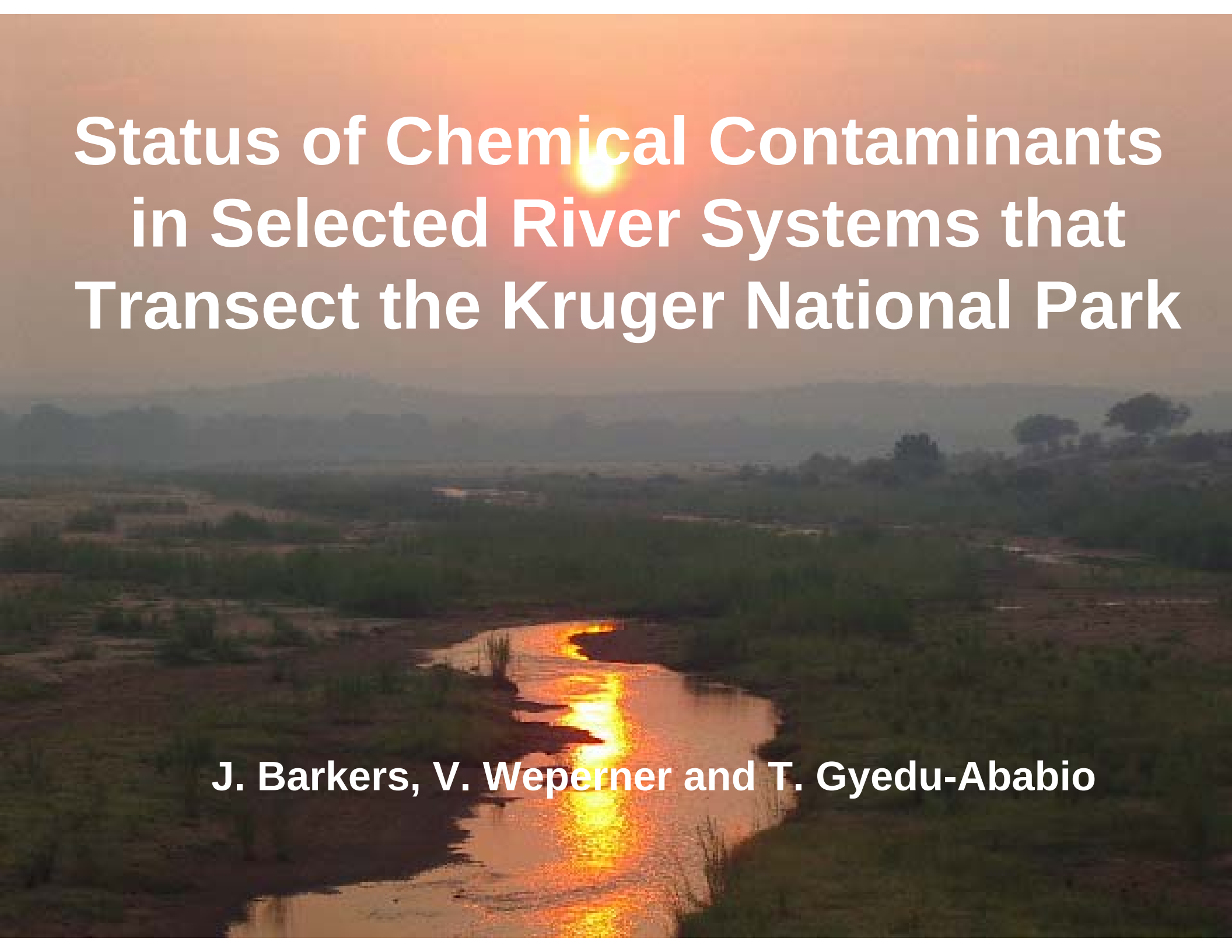
Status of Chemical Contaminants in Selected River Systems that Transect the Kruger National Park



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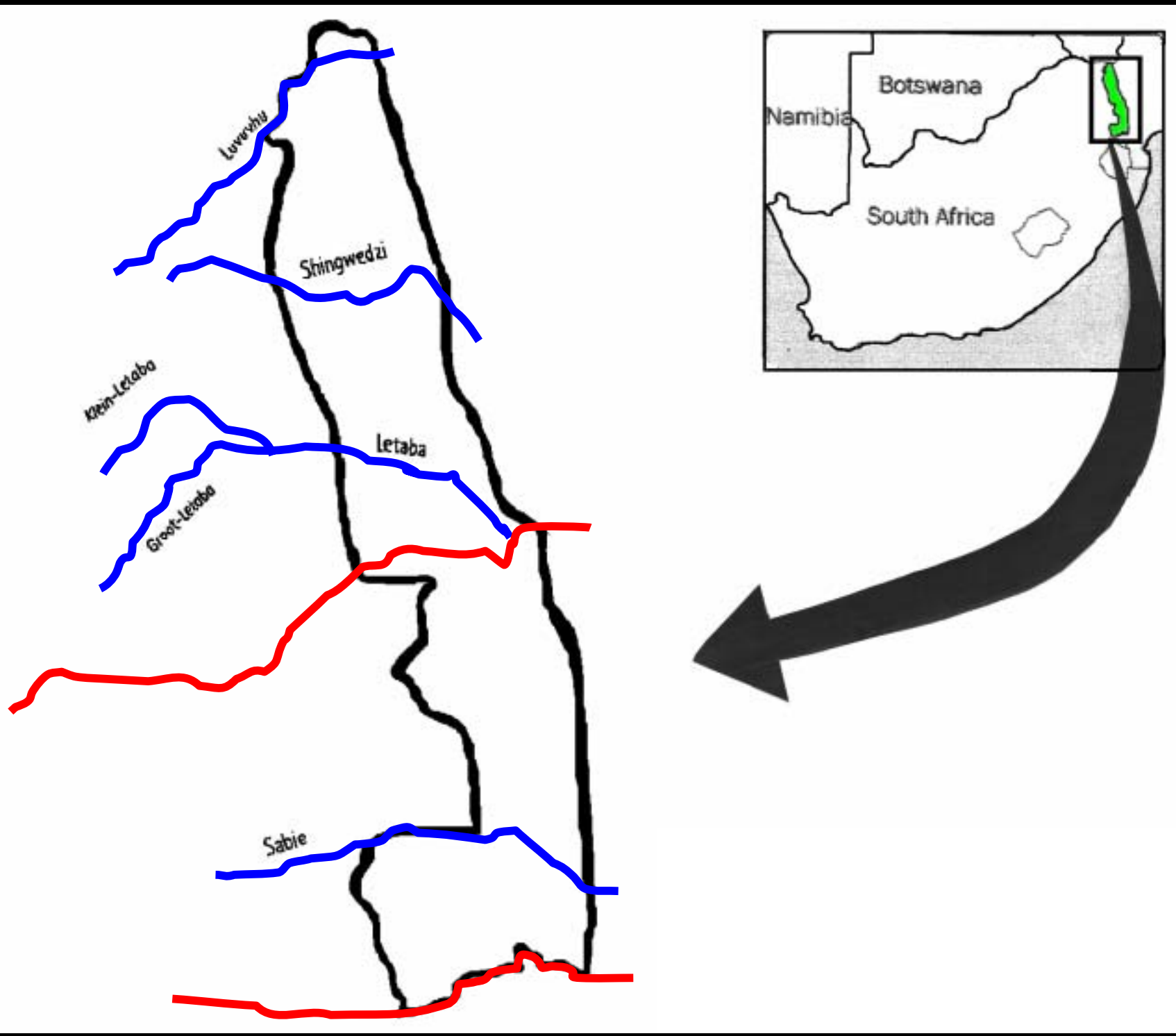
RESEARCH HYPOTHESIS

- Pollution arising outside the borders of the Kruger National Park is having an adverse effect on river systems within.

- River systems found towards the north are less impacted than those in the south.


Luvuvhu
Shingwedzi
Klein-Letaba
Letaba
Groot-Letaba
Sabie
Botswana
Namibia
South Africa

- Extremely limit

METHODS

Abiotic

Water

Sediment

Biotic

Fish

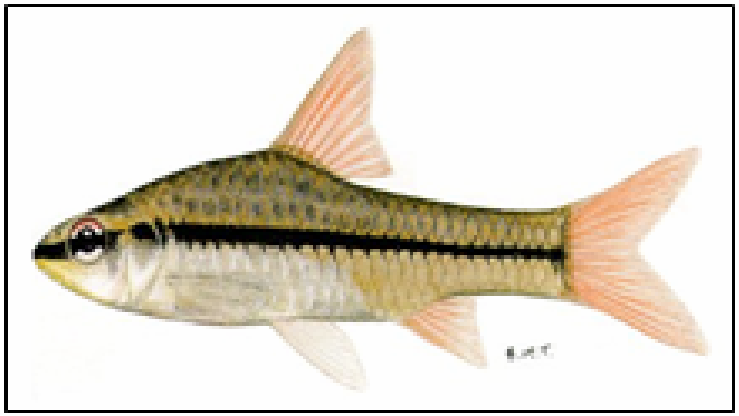
Statistical analysis

Physico-chemical

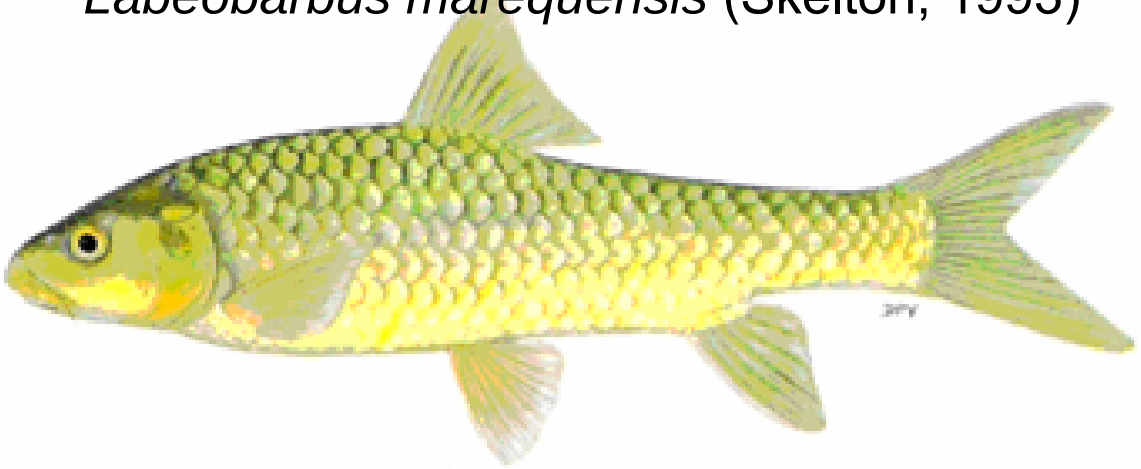
- Conductivity (µS/cm; Cyberscan con 11)
- Dissolved oxygen concentration (mg/l; Ecoscan DO6)
- Percentage oxygen saturation (%, Ecoscan DO6)
- Temperature (°C; Ecoscan DO6)
- pH (Cyberscan pH 110)

Heavy Metals

Barbus radiatus



Labeobarbus marequensis (Skelton, 1993)



Statistical analysis

- Descriptive statistics
- Primer 5
- GraphPad Prism 4
- SPSS 13.0 for windows
- Univariant and Multivariant

Results

- Shingwedzi and Letaba Rivers showed the highest deviations in Physical parameters
- The water in the Luvuvhu River seemed to be well oxygenated
- The Letaba 1a, Letaba 2 and Sabie 1 sites each showed low dissolved oxygen concentrations during the low flow

Nutrient and other chemical variables measured during high and low flow for the four rivers under investigation.

		Nitrates (mg/l)	Nitrites (mg/l)	Ammonium (mg/l)	Phosphates (mg/l)	Chlorides (mg/l)	Sulphates (mg/l)	COD (mg/l)
	H	4.4	0.04	0.12	0.01	5	3	5
Luvuvhu 1	L	<1	0.01	0.06	0.02	8	15	<4
	H	2.1	0.02	0.02	0.01	4	5	49
Luvuvhu 2	L	<1	0.01	0.02	<0.01	8	15	<4
	H	8.1	0.03	0.09	0.01	16	4	7
Shingwedzi 1	L	N/F	N/F	N/F	N/F	N/F	N/F	N/F
	H	3.4	0.04	0.01	0.01	19	2	0
Shingwedzi 2	L	1.20	0.02	2.70	0.41	64	21	13
	H	4.4	0.14	0.01	0.01	75	17	14
Letaba 1a	L	1.20	0.07	0.14	0.01	37	29	<4
	H	2.8	0.05	<0.01	<0.01	12	12	5
Letaba 1b	L	<1	0.01	0.01	0.01	10	17	<4
	H	3.8	0.12	0.01	0.01	14	17	3
Letaba 2	L	<1	0.03	0.24	0.01	100	24	<4
	H	10.2	0.02	0.01	0.01	4	8	<4
Sabie 1	L	<1	0.03	0.01	0.02	<0.01	16	<4
	H	7.4	0.05	0.02	0.02	11	8	8
Sabie 2	L	<1	0.01	0.06	0.01	2	17	<4

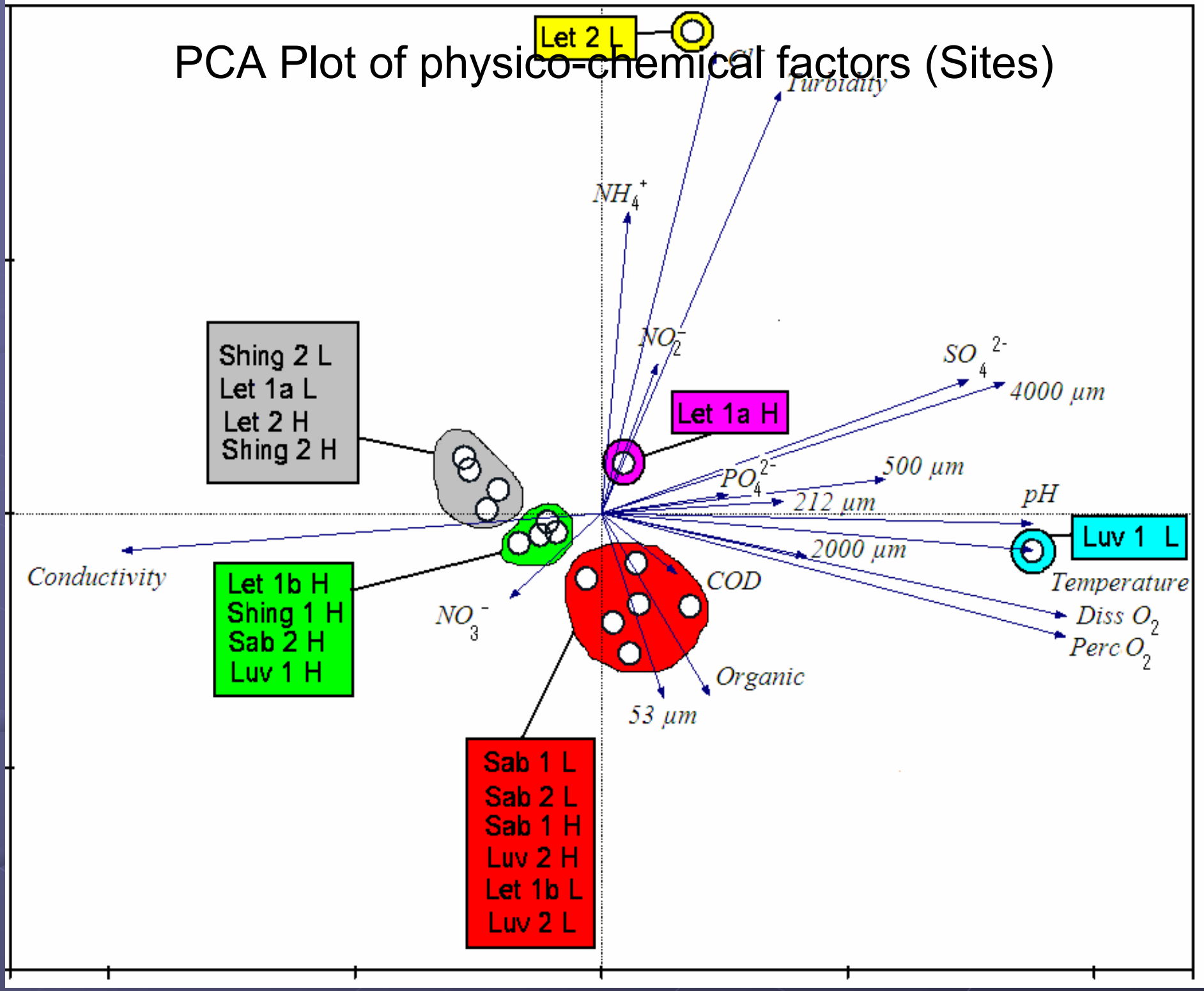
Chromium concentrations

		Water (µg/l)	Sediment (µg/g)	Fish (µg/g)
Luvuvhu 1	H	57.0 ± 6.0	28.6 ± 8.7	19.9 ± 8.3
	L	56.0 ± 2.0	47.9 ± 0.8	1.6 ± 1.0
Luvuvhu 2	H	60.5 ± 2.5	29.7 ± 4.5	12.8 ± 4.8
	L	62.5 ± 0.5	41.2 ± 7.5	0.1 ± 0.1
Shingwedzi 1	H	62.5 ± 1.5	48.2 ± 4.5	15.0 ± 6.0
	L	N/S	N/S	N/S
Shingwedzi 2	H	58.5 ± 2.5	71.6 ± 6.9	0.8 ± 0.6
	L	65.0 ± 3.0	63.5 ± 12.1	0.7 ± 0.2
Letaba 1a	H	55.5 ± 0.5	77.3 ± 6.5	2.8 ± 0.7
	L	69.0 ± 1.0	85.7 ± 32.6	0.3 ± 0.1
Letaba 1b	H	53.5 ± 1.5	22.1 ± 4.8	1.2 ± 0.5
	L	70.0 ± 1.0	25.4 ± 4.8	1.3 ± 0.6
Letaba 2	H	54.0 ± 0.0	47.5 ± 17.2	2.0 ± 0.4
	L	70.0 ± 0.0	27.1 ± 5.1	2.6 ± 0.5
Sabie 1	H	51.0 ± 5.0	20.1 ± 1.9	0.4 ± 0.2
	L	60.5 ± 3.5	20.7 ± 0.0	4.3 ± 1.1
Sabie 2	H	54.0 ± 2.0	6.9 ± 0.5	2.9 ± 2.1
	L	52.5 ± 8.5	5.2 ± 0.0	7.3 ± 1.3

Metals in fish & sediment

- Sabie 2 (low flow), Cr conc. was significantly different to Luvuvhu 2, Shingwedzi 2 and Letaba 1a (low flow)
- The highest Cr concentrations in fish were noted at Luvuvhu 1, Luvuvhu 2 and Shingwedzi 1 over the high flow sampling period
- Letaba 1a recorded the highest sediment Cr concentrations (85.7 µg/g)
- Copper and Zn when compared to Cr exhibited similar trends, especially with regards to fish

PCA Plot of physico-chemical factors (Sites)



Discussion

- The Olifants vs Rhine, Scheldt and Mulde (Knittel *et al*., 2005) - metals.
- Fish bioaccumulation data when compared to a study by Heath and Claassen (1999) were within the same concentration ranges.
- Sabie had relatively lower metal concentrations though not significantly different
- Each system showed a high level of one of the metals at some time or another during the sampling period

Conclusion

- The Luvuvhu and Sabie Rivers are in a more stable condition than the Letaba and Shingwedzi
- There is considerable variation in metal concentrations and that no single river system can be pinpointed as being in a worse condition than the other
- Further research needs to be done in the same area

THANK YOU