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The South African Scoring System (SASS) Version 5 Rapid Bioassessment Method for Rivers

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The assessment of biota in rivers is a widely recognised means of determining the condition or 'health' of rivers. Benthic macroinvertebrates, in particular, are recognised as valuable organisms for bioassessments, due largely to their visibility to the naked eye, ease of identification, rapid life cycle often based on the seasons and their largely sedentary habits. Numerous bioassessment techniques have been developed over the last three decades, varying in complexity and region of implementation. South Africa has an exemplary history in this field, culminating in the refinement of invertebrate and other techniques and their application in a National River Health Programme. The method presented here is a refinement of the highly successful SASS (South African Scoring System) method developed by Chutter (1994), which forms the backbone of this programme. This paper takes the method to a level where it can, and has been, accredited to ISO standards. The principal changes made include the tighter definition of the technique and the sampling and analytical methods, as well as the introduction of quality control procedures. Some changes have also been made to the list of invertebrates used in this method.

Field trials were conducted to test the variability of the method. Of the various indices available to the method, the Average Score per Taxon (ASPT) is the most consistent over all biotopes (lowest CV%). On the other hand, of the biotopes examined the Gravel/Sand/Mud (GSM) combination is the most variable with respect to the SASS Score and number of taxa encountered. The spatial variability on a reach of river with similar water quality characteristics was found to be statistically negligible. However, one generally finds that statistically significant differences occur between the SASS Scores and the number of taxa counted by different operators. The ASPT, on the other hand, is a more consistent and repeatable measure of river health assessment and, within a given reach of river and considering all biotopes, the differences in results produced by different operators were statistically negligible. The results highlight the need for appropriate competency-based training and consistent application of the method.

Keywords: bioassessment, aquatic invertebrates, biotic index, method, health, water quality, rivers, South Africa

Table 1: The SASS Version 5 scoring sheet

SASS Version 5 Score Sheet	**Taxon**		**S**	**Veg**	**GSM**	**TOT**	**Taxon**		**S**	**Veg**	**GSM**	**TOT**	**Taxon**		**S**	**Veg**	**GSM**	**TOT**
Date: / /200__	**PORIFERA**	5					**HEMIPTERA**						**DIPTERA**					
	COELENTERATA	1					Belostomatidae*	3					Athericidae	10				
	TURBELLARIA	3					Corixidae*	3					Blepharoceridae	15				
Collector: . .	**ANNELIDA**						Gerridae*	5					Ceratopogonidae	5				
	Oligochaeta	1					Hydrometridae*	6					Chironomidae	2				
Grid Reference: WGS-84 Cape datum	Leeches	3					Naucoridae*	7					Culicidae*	1				
S: ° ' , " E: ° ' , "	**CRUSTACEA**						Nepidae*	3					Dixidae*	10				
	Amphipoda	13					Notonectidae*	3					Empididae	6				
Site code:	Potamonautidae*	3					Pleidae*	4					Ephydridae	3				
	Atyidae	8					Veliidae/M...veliidae*	5					Muscidae	1				
River:...	Palaemonidae	10					**MEGALOPTERA**						Psychodidae	1				
	HYDRACARINA	8					Corydalidae	8					Simuliidae	5				
Site description:…..……..	**PLECOPTERA**						Sialidae	6					Syrphidae*	1				
	Notonemouridae	14					**TRICHOPTERA**						Tabanidae	5				
Weather Condition:…..……..	Perlidae	12					Dipseudopsidae	10					Tipulidae	5				
	EPHEMEROPTERA						Ecnomidae	8					**GASTROPODA**					
Temp:.....…..°C pH:…….....	Baetidae 1sp	4					Hydropsychidae 1 sp	4					Ancylidae	6				
	Baetidae 2 sp	6					Hydropsychidae 2 sp	6					Bulininae*	3				
DO:……..…mg/l Cond:……mS/m	Baetidae > 2 sp	12					Hydropsychidae > 2 sp	12					Hydrobiidae*	3				
	Caenidae	6					Philopotamidae	10					Lymnaeidae*	3				
Biotopes sampled:	Ephemeridae	15					Polycentropodidae	12					Physidae*	3				
SIC ..... Time.....minutes	Heptageniidae	13					Psychomyiidae/Xiphocen	8					Planorbinae*	3				
SOOC..... Time.....minutes	Leptophlebiidae	9					**Cased caddis:**						Thiaridae*	3				
Average size of stones……cm	Oligoneuridae	15					Barbarochthonidae SWC	13					Viviparidae* ST	5				
Bedrock.....	Polymitarcyidae	10					Calamoceratidae ST	11					**PELECYPODA**					
Aquatic veg'n..... Dom. sp.....	Prosopistomatidae	15					Glossosomatidae SWC	11					Corbiculidae	5				
MvegIC…….. Dom. sp.....	Teloganodidae SWC	12					Hydroptilidae	6					Sphaeriidae	3				
MvegOOC……Dom. sp.....	Tricorythidae	9					Hydrosalpingidae SWC	15					Unionidae	6				
Gravel..... Sand.....	**ODONATA**						Lepidostomatidae	10					**SASS Score**					
Mud.....….....	Calopterygidae ST,T	10					Leptoceridae	6					**No. of Taxa**					
Hand picking/Visual observation…….	Chlorocyphidae	10					Petrothrincidae SWC	11					**ASPT**					
Flow: Low/Medium/High/Flood	Chlorolestidae	8					Pisuliidae	10										
Turbidity: Low/Medium/High	Coenagrionidae	4					Sericostomatidae SWC	13					Sample collection effort exceeds method? …..					
Riparian land use:	Lestidae	8					**COLEOPTERA**											
	Platycnemidae	10					Dytiscidae*	5										
Disturbance in the river: eg. sandwinning,	Protoneuridae	8					Elmidae/Dryopidae*	8					**Other biota including juveniles:**					
cattle drinking point, floods etc.	Aeshnidae	8					Gyrinidae*	5										
	Corduliidae	8					Haliplidae*	5										
	Gomphidae	6					Helodidae	12										
Observations: eg. smell and colour of	Libellulidae	4					Hydraenidae*	8					**Comments:**					
water, petroleum, dead fish, etc.	**LEPIDOPTERA**						Hydrophilidae*	5										
	Pyralidae	12					Limnichidae	10										
							Psephenidae	10										

Procedure: 'Kick SIC & bedrock for 2 mins, max. 5 mins; Kick SOOC & bedrock for 1 min; Sweep marginal vegetation (IC & OOC) for 2m total and aquatic veg 1m^2; Stir & sweep gravel, sand, mud for 1 min total; * = airbreathers; Hand picking & visual observation for 1 min — record in biotope where found; Score for 15 mins/biotope but stop if no new taxa seen after 5 mins; 'Estimate abundances: 1 = 1, A = 2–10, B = 10–100, C = 100–1 000, D = >1 000; S = Stone, rock & solid objects; Veg = All vegetation; GSM = Gravel, sand, mud; SWC = South Western Cape; T = Tropical; ST = Sub-tropical; Rate each biotope sampled: 1 = very poor (i.e. limited diversity), 5 = highly suitable (i.e. wide diversity)