BIOTILIK GUIDE SHEET
FOR HEALTH MONITORING OF RIVER FLOW

"SAVE OUR RIVER FROM NOW"

Republic of Indonesia

G20 INDONESIA 2022

WATER BUGS CENSUS

Growing Awareness and Community Participation in River Conservation

BIOTILIK comes from word "Bio" which means biota, and "Tilik" means careful observation. It is an environmental monitoring method using river biota indicator which is related with biological monitoring. Most of the biota observed was macroinvertebrates such as aquatic insects, crabs, shrimp, snails, and worms. This activity should be done during dry season, when the river water discharge is stable and not too heavy. BIOTILIK has been implemented in the Brantas watershed to raise awareness and concern of community to participate in preserving the river ecosystem. River damage condition already increases in the Watershed (DAS) due to reduced water catchment areas and riverbanks, pollution and exploitation of natural resources that do not pay attention from carrying environment capacity. Through BIOTILIK's observation result, it provides an indication of unbalancing environmental in the river ecosystem, so that necessary countermeasures can be determined. Every citizen is obliged to maintain river sustainability and restoration because it is source of our water, then water is source of our life.

River health monitoring component consists of a river habitat observation and a BIOTILIK observation, followed by procedure outlined below.

I. River habitat and banks

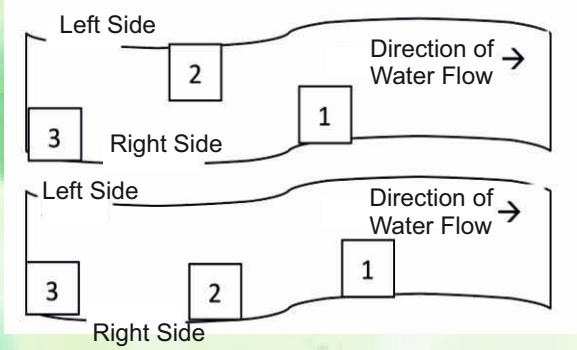
River habitat inspection parameters include riverbed substrate condition, riverbank vegetation, sedimentation rate, river modifications, and human activities around the river. Habitat observations are carried out within 100 meters of visibility and including general description then assign a score for each habitat parameter. The results are recorded in Table 1 to determine level of habitat health.

I. Macroinvertebrates

Macroinvertebrates observation is described as follows:

1. Parameters for monitoring macroinvertebrates are family species diversity, EPT species diversity, EPT abundance percentage, BIOTILIK Pollution Index

2. Determine river location to be inspected using guide as shown bellows. It can be also done on the opposite side. Avoid steep river side, fast current and large rocks which can endanger the safety.



3. Sampling starts from site 1 (most downstream) for 1 minute, then continues to site 2 and 3 towards river upstream. Do it by combination of kicking and jabbing techniques on the river banks that are not too heavy, not deep and overgrown with aquatic plants. Each site should have different basic substrate conditions and vegetation types to obtain various types of BIOTILIK biotas.

4. The kicking technique is carried out in the shallow river. Put a net in the river water with mouth position facing upstream or opposite from current, then stirring substrate in front of net for 1 to 5 minutes. Kick or move your leg in a circle to stimulate biotas come out and trapped into net.

5. The jabbing technique is carried out on the banks of shallow or deep rivers by putting a net on the surface river water, then moving forward towards upstream or opposite from current while sweeping until it touches the riverbed for 5 meters, especially under water plants.

6. After sampling, lift it out of river water and dip it several times on the surface of water until clear and not sludgy. Sludge will bother sorting and identification.

7. Pour the sample from it into a tray and rinse with clean water. Sorting and taking biota that move in the tray and placing them in insulated boxes according to their type. Release back to river if you found fish, tadpoles and land insects because they are not part of BIOTILIK biotas. Try to take all BIOTILIK biotas, especially small ones and groups of Ephemeroptera, Plecoptera and Trichoptera (EPT) insects which are sensitive biota of water pollution.

8. Total minimum of biota that must be identified is 100 individuals. If it is less than that, repeat sampling activity by following on the above procedural.

9. Identify macroinvertebrates using the BIOTILIK guide sheet, calculate and note the total of individuals from each type according to Table 2.

10. River water quality assessment is carried out by calculating 4 BIOTILIK parameters, namely family species diversity, EPT species diversity, EPT abundance percentage, and BIOTILIK index, which are assigned an assessment score based on the assessment criteria for 4 water quality categories. The average calculation results indicate river water quality condition during observation by following the table.

TABLE 1. RIVER HABITAT HEALTH OBSERVATION

No.	PARAMETER	SCORE			SCORE (example)
		3	2	1	
1.	Substrate composition in the river side	More than 50% of substrate consists: sand combination and rock in various sizes, suitable for invertebrate and diatom colonies; there are pieces of weathered wood in body water with a mixture of stable rock substrates.	10-50% of substrate consists: stones combination in various sizes; some parts of them are disturbed, eroded or removed from the river.	>90% of substrate is dominated by padas, sand or silt; Most of them is eroded or moved from the river, habitat for invertebrate and diatom colonies is very little.	3
2.	Riverbank substrate submerged in sedimentary silt	<25% rock buried or covered with fine silt; rocks can be lifted easily from the riverbed	25-75% of substrate is buried in fine mud; rock must be pulled to lift it from the riverbed	More than 75% of substrate is buried in fine silt; rock must be pryed to lift it from the riverbed	3
3.	River water discharge fluctuation	In the upstream there are no dams or river drainage, even if there are small scales; difference in cross-sectional river width that flowed by water and water level height during rainy and dry seasons <25%	The difference in cross-sectional river width that flowed by water and water level height during rainy and dry seasons > 25%-75%	The difference in cross-sectional river width that flowed by water and water level height during rainy and dry seasons >75%, in dry season the river dries up leaving water puddles in several parts	2
4.	Is there a change in flow due to river dredging or straightening?	There is no straightening or dredging of rocks and sand from the riverbed	The straightening is wide enough, 20-50% already slabs; or riverbed material dredging was disturbs until 10% in there	River banks are limited by concrete slabs, more than 50% is slabs; or riverbed material dredging was disturbs more than 10% in there	2
5.	How is stability of the river bank on the LEFT?	Stable; there are no or there are few traces of erosion or landslide cliffs on the river bank; less than 30% are eroded	Less stable; 30-60% of the river bank is eroded, there is a high probability of erosion during rainy season	Unstable; many parts of the river bank are eroding, it can be seen on the straight and winding of the river, the scour marks form a basin on the cliff, >60% has erosion marks	2
6.	How is stability of the river bank on the RIGHT?	See number 5	See number 5	See number 5	1
7.	How wide is vegetation in the LEFT river border?	River border width >15 meters; human activities have no significant impact on natural river boundaries	River border width is 6-15 meters; Human activities have an impact on river boundaries	River border width is < 6 meters, there are no or few natural plants on the river border due to high human activities	1
8.	How wide is vegetation in the RIGHT river border?	See number 7	See number 7	See number 7	1
9.	What are human activities around the river and how big is their impact?	Very little activity around rivers and riverbanks; no or little agricultural activity, livestock grazing, harvesting of vegetation for animal feed, sand and stone mining, liquid waste disposal, domestic waste disposal, boat activities, etc.	There is quite a lot of human activity on rivers and riverbanks; around <5% are damaged due to the impact of agricultural activities, livestock, waste disposal, sand and stone mining, domestic waste disposal, boat activities, etc.	There is a lot of human activity on rivers and riverbanks; > 5% are damaged due to the impact of agricultural activities, livestock, domestic waste disposal, shipping, etc	1
10.	Is there any human activity in a radius of 2-10 km upstream of the observation site?	Few human activities cause disturbance in the upstream area; less than 5% area have large-scale sand and stone mining activities, industrial waste disposal activities, settlements, forest logging, domestic waste disposal, etc.	Quite a lot of human activities that cause disturbance in the upstream area; 5-20% area have large-scale sand and stone mining activities, industrial waste disposal activities, settlements, tree cutting, domestic waste disposal, etc.	There are so many human activities that cause disturbance in the upstream area; more than 20% area have large-scale sand and stone mining activities, industrial waste disposal activities, settlements, tree cutting, domestic waste disposal, etc.	1
				Total Score	17
				AVERAGE HABITAT HEALTH SCORE (Total Score / 10)	1,7

Source : Vincent H. Resh, 2010, Biomonitoring Methods for the Lower Mekong Basin

River and Bank Habitat Health Assessment

Average Score	Habitat Health Level
2,4 – 3,0	Healthy, providing diverse and stable habitat conditions to support biota life
1,7 – 2,3	Less healthy, providing less varied and less stable habitat to support biota life
1,0 – 1,6	Unhealthy, providing habitat that is not varied and unstable to support biota life

TABLE 2. EXAMPLE OF CALCULATION OBSERVATION RESULT USING BIOTILIK

No.	Family Name	BIOTILIK Score (ti)	Amount of Individuals (ni)	ti x ni	Information
EPT					
7	Heptageniidae	3	5	15	
10	Baetidae	3	20	60	
16	Perlidae	4	5	20	
Subtotal EPT (n EPT)			30	95	
Non EPT					
91	Tubificidae	1	16	16	
60	Atyidae	2	17	34	
49	Mesovellidae	3	8	24	
82	Thiaridae	2	12	24	
87	Corbiculidae	2	14	28	
25	Coenagrionidae	2	3	6	
Subtotal EPT (n EPT)			70	186	
TOTAL			N = 100	X = 281	
EPT Abundance Percentage (n EPT/ N x 100%)			30%		
INDEX OF BIOTILIK (X / N)			**2,8**		

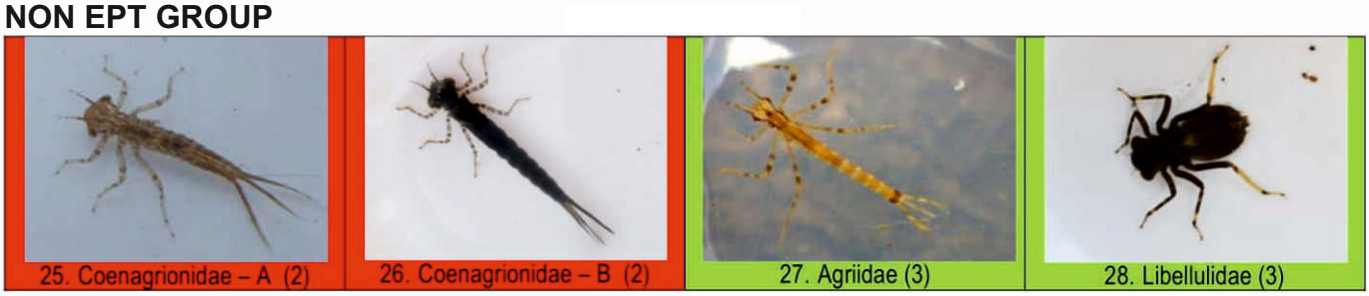
River Water Quality Assessment with BIOTILIK

Parameter	Score				Score of Assessment (example)
	4	3	2	1	
Family Diversity	>13	10 - 13	7 - 9	<7	2
EPT Family Diversity	>7	3 - 7	1 - 2	0	3
% EPT Abundance	>40%	>15 – 40%	>0 – 15%	0%	3
Index of BIOTILIK	3,3 – 4,0	2,6 – 3,2	1,8 – 2,5	1,0 – 1,7	3
	Total Score				11
	Average Score (Total Score / 4)				11 / 4 = 2,77
Water Quality Criteria	Unpolluted	Lightly Polluted	Medium Polluted	Heavy Polluted	Lightly Polluted
Average SCORE	3,6 – 4,0	2,8 – 3,5	1,8 – 2,7	1,0 – 1,7	

BIOTILIK IDENTIFICATION GUIDE SHEET

EPT GROUP

NON EPT GROUP




29. Corduliidae – A (3)
30. Cordulidae – B (3)
31. Corduliidae – C (3)
32. Platycnemididae (3)
33. Amphipterygidae (4)
34. Chlorocyphidae (4)
35. Gomphidae – A (4)
36. Gomphidae – B (4)
37. Lampyridae – larva (3)
38. Gyrinidae - larva (3)
39. Noteridae – larva (3)
40. Hydrophilidae –Larva (3)
41. Scirtidae (3)
42. Noteridae (3)
43. Dytiscidae (3)
44. Gyrinidae (3)
45. Hydrophilidae (3)
46. Naucoridae (3)
47. Corixidae – A (3)
48. Corixidae – B (3)
49. Mesovellidae (3)
50. Vellidae (3)
51. Nepidae (2)
52. Hydrometridae (2)
53. Gerridae (2)
54. Pyralidae (3)
55. Noctuidae (3)
56. Scyomizidae (3)
57. Simuliidae (2)
58. Tipulidae – A (3)
59. Tipulidae – B (3)
60. Tipulidae – C (3)

ATTENTION: The number in parenthesis is the BIOTILIK Score for the BIOTILIK Index assessment. Tolerance levels are grouped by color: BLUE is very sensitive to pollution; GREEN is sensitive; RED is pollution tolerant and GRAY is very pollution tolerant. When conducting a BIOTILIK identification, select the largest one then observe special characteristics it has, such as shape and color of their head, tail, legs and body segments total. If you need help around BIOTILIK identification, we can be reached at Facebook: ECOTON, e-mail: ecoton@ecoton.or.id, Phone: +62 821 5000 9012, Address : Wringinanom Village Gg.3 RT 1 RW 5 Wringinanom Sub-district, Gresik Regency, East Java Province, Indonesia.