

COMPARISON OF WATER QUALITY AND HABITAT ASSESSMENT
BETWEEN WETLAND AND RIVER

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My special dedication to my family:

My beloved Abah and Mama,

Mokhtar Kamal Muslimina and Rusmina Md Radzi

Thank you for always being there whenever I need you the most

My dearest sisters and brothers

Nurul Izzah

Nurul Asyikin

Mohamad Faiz

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ABSTRACT

River management trend nowadays always concentrate on beautifying and aesthetical improvement along a small stretch that is considered polluted; without taken into consideration the affect of water flowing from the watershed. Previously, the main concern was the functional uses of a stream such as erosion control where quite often the biotic factors of a river are overlooked. Furthermore, wetlands are usually drained as they hold great potentials to be transformed into agricultural land without considering the impact to the wetland values and functions. Thus, this study intends to emphasize on the importance of habitats and fish species to be implemented on river and wetland rehabilitation studies. Three rivers with different physical condition and land uses were selected for habitat assessment; i.e. Sungai Lukah Wetland in Ulu Sedili Kecil, Sungai Tui in Bukit Kepong, and Sungai Mengkibol in Kluang. Sungai Lukah, which is a part of freshwater swamp area of Ulu Sedili Kecil was classified as Class III using Water Quality Index (WQI). Regardless of the water quality, the swampy area of Sungai Lukah provides a suitable environment for swamp fishes that was dominated by Cyprinidae as they exist in abundance. Besides the importance of hydrological and biogeochemical function of Lukah wetland, it also provides food, spawning ground and protection from predators for the aquatic ecosystem. In contrast, Sungai Tui, which is a tributary from Sungai Muar, eventhough classified as Class III in WQI, provides a rich and diverse fish and crustaceans communities with high commercial value such as Udang Galah. On the other hand, Sungai Mengkibol which was classified in Class IV served as main storm drain for Kluang town and is only inhabited by hard and tolerant species.

ABSTRAK

Pengurusan sungai dan saliran masa kini pada kebiasaannya hanya menumpukan pada kerja-kerja pencantikan di sepanjang saliran yang dianggap tercemar tanpa mengambil kira kesan kualiti air yang mengalir daripada kawasan tadahan ke dalam saliran tersebut. Sebelum ini, kepentingan sungai hanya dipandang dari segi fungsinya, di mana kebiasaannya kaedah pemuliharaan yang diutamakan adalah seperti kawalan hakisan tetapi mengabaikan kepentingan biotik sungai tersebut. Tambahan pula, telah menjadi suatu kebiasaan bagi tanah bencah dikeringkan kerana ia berpotensi tinggi untuk dijadikan sebagai kawasan pertanian, tanpa mengambil kira kesan terhadap nilai dan fungsi tanah bencah tersebut. Oleh itu, kajian ini bertujuan untuk menekankan kepentingan peranan sesebuah habitat dan komposisi spesies ikan dalam sesuatu kajian yang melibatkan pemuliharaan sungai dan tanah bencah. Tiga sungai yang berbeza keadaan fizikal serta penggunaan tanah telah dipilih untuk penilaian habitat iaitu tanah bencah Sungai Lukah di Ulu Sedili Kecil, Sungai Tui di Bukit Kepong, dan Sungai Mengkibol di Kluang. Sungai Lukah yang juga merupakan sebahagian daripada kawasan tanah bencah air tawar di Ulu Sedili Kecil, telah diklasifikasikan sebagai Kelas III mengikut Indeks Kualiti Air (WQI). Walaupun kualiti air di kawasan tanah bencah Sungai Lukah berada di dalam Kelas III, ia menyediakan persekitaran yang sempurna untuk spesies ikan di kawasan tersebut yang banyak dijumpai terutamanya dari keluarga Cyprinidae. Selain daripada kepentingan fungsinya dari sudut hidrologi dan biogeokimia, kawasan tanah bencah tersebut juga menyediakan sumber makanan, kawasan pembiakan, dan juga perlindungan daripada pemangsa kepada hidupan akuatik di situ. Sebaliknya, bagi Sungai Tui yang merupakan salah satu anak sungai bagi Sungai Muar, mempunyai banyak spesies ikan dan udang dengan nilai komersil yang tinggi seperti Udang Galah sungguhpun dikelaskan sebagai Kelas III. Walau bagaimanapun, Sungai Mengkibol yang dikelaskan sebagai Kelas IV dan merupakan saliran utama di tengah Bandar Kluang dan hanya mampu menampung spesies ikan yang tahan lasak.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Water is a widespread, life-sustaining substance, comprising some 50-90% of living materials and covering nearly three-fourth of the Earth's surface (Gordon et. al., 2004). However, out of the Earth's total moisture, about 97% comprise of the ocean meanwhile less than 0.0002% are flowing in the streams and rivers. The water is recycled globally, and as the earth warms and cools the relative proportions of ice, water vapour, fresh water and salt water changed.

Freshwater is a renewable but limiting natural resource. As availability of freshwater in freshwater ecosystems decreases, nature restores it through the water cycle in the form of precipitation. Freshwater can only be renewed through the process of the water cycle, where water from seas, lakes, rivers, and dams evaporates, forms clouds, and returns to water sources as precipitation. However, if more freshwater is consumed through human activities than is restored by nature, the result is that the quantity of

freshwater available in lakes, rivers, dams and underground waters is reduced which can cause serious damage to the surrounding environment.

Freshwater is needed not only to fulfill human daily needs such as for drinking and washing but also plays the role in generating electricity, as machines cooler fluid and used for agricultural purposes. Nevertheless, nowadays human seems to treat the freshwater ways as a 'dumping site' for every daily activities. For instance, changing landscape for the use of agriculture creates a great effect on flow of freshwater and surrounding. Reshaping a large scale of landscape to creating lands that are suitable for agriculture changed the flow and sustainability of freshwater which result in effecting the sustainability of the local ecosystem. Changes in landscape through the removal of trees and soils changed the local environments flow of freshwater and also effect the cycle of freshwater. As a result more freshwater are consumed and stored in soil which benefits agriculture. However, since agriculture is the human activity that consumes the most freshwater, freshwater would be used up completely which result in scarcity and destroy of local ecosystem. Redesigning lands for the maximum use of agriculture will certainly bring a great damage to the environment and reduces the available freshwater supply since freshwater is a limiting natural resource.

In the past, wetlands were considered as worthless and only as wasteland and the only themes when considering them are changing and transforming. Wetlands are usually drained as they hold a great potential to be transformed into agricultural land. Apart from that, their flatness, coastal location and apparent worthlessness made them obvious location for large plants, harbours and waste disposal. Even though wetlands were such major landscape, but only since late 1960s that they had engaged the scholar attention to understand their variety and complexity, yet essential unity (Williams, 1990). Unlike other landscapes of comparable size, wetlands are not climatically based although they occupied 6% of earth's surface. Wetlands, as a result do not occupy large contiguous stretches of land.

The most frequent question that the amateur would ask about wetlands is “What is wetland?” or “Is that some kind of swamp?” Since there are so many terms for wetlands, it is often confusing and some are even contradictory. According to Mitsch and Gosselink (2000), during the 19th century during the time where wetland drainage was the norm, a wetland definition was unimportant as it was considered desirable to produce uplands from wetland by draining them. As a matter of fact, the term ‘wetland’ was only commonly used during the mid-20th century. The simplest definition of wetlands is lands with soils that are seasonally inundated. Except Antarctica, wetlands were ubiquitous and found in nearly every climatic zone from the tundra mires of the poles to the tropical mangroves of the equator, and in every continent.

River management and rehabilitation trend nowadays has always concentrating on beautifying and aesthetical improvement along a small stretch that is considered polluted; without taken into consideration the affect of water flowing from the watershed. With increasing knowledge and technology, it appears that in river rehabilitation works there is an urgent need to restore the natural hydrology and morphology simultaneously in order to recover the river ecology (Brookes and Shield, 1996). Therefore, to manage rivers effectively, it is a must to first measure the availability and condition of the resources. In earlier studies, the stream was only evaluated in terms of physico-chemical parameters as to stress on the functional use of the resource. Evidently, physico-chemical parameters are still important, but nowadays the ‘stream health’ is the main importance. The ‘stream health’ measurement takes into consideration the water quality, habitat availability and suitability, energy sources, hydrology and the biota themselves (termed bioassessment) (Gordon et. al., 2004). However, stream and river chemistry and morphology have been altered drastically as a result of wetland loss and visa versa. Thus, in order to achieve the best result in river rehabilitation work, the quality of the catchment area of a stream or river should be improved first. This is because rivers, streams, and wetlands work as integrated ecosystems in maintaining stability and function of a water body.

1.2 Statement of Problem

Previously, stream management has only been focusing on the functional uses of streams where the main factors of concern were the amount of water available, and the quality of water with respect to its suitability for agricultural, industrial, domestic or recreational use. Often overlooked the consequences in terms of habitat loss during the attempt to put the freshwater sources to productive use and to tame and control floodwaters and their pathways. However, the level of environmental awareness has now reach a point where many of the modification of streams and their catchments have been viewed by a large sector of society as undesirable and in need of some alteration. As a result of increasing knowledge on streams many had realized that protection of natural ecological process in streams would be a great aid in protecting the some of their functional values, although there will still be conflicts over the best way to use the resources.

The increasing complexity of water-resource problems and the overwhelming amount of information available had formed a need for a multi-disciplinary team that include zoologist, botanist, microbiologist, geomorphologist, hydrologist, economist, communicators, hydraulic engineers, chemists, anthropologists, and sociologist (King & Brown, 2003). Generally, maximum biotic diversity is maintained in streams by a level of disturbance that creates environmental heterogeneity, yet still allows the establishment of communities.

1.3 Objectives of Study

This research is to identify the composition of fish species and its habitat for its significance as one of the biological factor in the river rehabilitation programme. Hence, the objectives of this research are as listed followed:

- i) To describe and quantify the existing biological aquatic environment in wetland area and river in terms of fish species composition and spatial distribution;
- ii) To differentiate and describe the physical features of wetland and river habitat;
- iii) To assess the wetland and river status according to water quality condition; and
- iv) To describe the relationship between fish species composition, and river/wetland morphological condition

1.4 Scope of Study

This study covered the existing ecological environment of three rivers which display different degree of disturbance, physical conditions and landuse: Sungai Lukah (mildly disturbed/freshwater wetland), Sungai Tui (mildly disturbed / suburban river), and Sungai Mengkibol (highly disturbed/urban river). For the existing environment characterization, it is based on physical characteristics (stream structure, instream habitats, etc), biological characteristics (fish species), and chemical characteristics (water quality parameter). In addition, this study also involves in describing the relationship between physical characteristics of a stream and landuse with the fish assemblages.