The Assess of Pools and Small Lakes as Wetland Sites in Zalingei Area, Darfur, Sudan

Abdallah Mohamed Abdallah Ahmed Korssi¹, Dawi Musa Hamad²

¹Department of Wildlife, University of Zalingei, Zalingei City, Sudan
²Department of Zoology, University of Khartoum, Khartoum City, Sudan

Email address: korssi22@yahoo.com (A. M. A. A. Korssi)

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Abstract: The study was conducted at Zalingei area Central Darfur state-Sudan, to assess the technical aspect of wetlands (water in the area, its availability, depth) in Zalingei area, during the period from 2013 to 2014. The methods used to data collected were included; metric tape (50m) and pole made by Jebel Marra Rural development project, and string (50m), coordinates of Each wetlands points were recorded using a GPS. The result showed that the Wetlands in Zalingei area, can take many forms as Wadis (Streams), water Pools (Permanent and temporary) and small lakes, Eight water pools and two lakes were established in the dry season, these pools are: Adam-gola, Fawzei, Hamidia, Saa4, Tarei, Zour, Rejl-aldafa, and Sarei-olmaly. The lakes as: Zour Lake, and Dudei Lake. The study was recommended that to further surveys of wetland should be made in Zalingei area and registrar in Wetland convention as Ramsar site and important bird's area.

Keywords: Wetland, Birds Habitats, Zalingei, Wadi Azoom, Zalingei Pools and Lakes

1. Introduction

According to Ramsar convention [13]; Wetlands are definite as areas of marsh, fen, whether natural or artificial, permanent or temporary, with water that isstatic or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide doesnot exceed six meters. Wetlands include marshes, swamps, vales, pans, bogs, ponds, reed beds and estuaries. One of the best known functions of wetlands is to provide a habitat for birds [14]. Wetlands are important bird habitats, and birds use them for breeding, nesting, and rearing young. Birds also use wetlands as a source of drinking water and for feeding, shelter, and social interactions. Some waterfowl, such as Pelicans, have been adapted to wetlands to such an extent that their survival as individual species depends on the availability of certain types of wetlands within their geographic range. Other species like spoon bell, Abdim's Stork, Sacred Ibis use wetlands only during some parts of their lives [9].

2. Materials and Methods

2.1. Study Area

Zalingei area lies in the western sparts of Jebel Marra (Hunting technical serves [8]. It covers about 4480 square kilometers in the poor savanna zone between latitudes 12°30 and 13°30 North, and longitudes 22°20 and 23°45 East according to Hunting Technical Services [8]. The study area covers alluvial channels, flood plains and terraces forming the drainage basins of the seasonal streams known locally as Wadis such as Wadi Areebou and Wadi Azoom. The altitude ranges from 500 to 1200 meters above sea level. The annual rainfall varies between 350 and 750 millimeters. The mean average temperature ranges between 20° and 30° C. The flatlands and mountain slopes are traversed by many seasonal Wadis and Khors coming from the higher reaches of Jebel Marra (Wadi Azoom, Wadi Areebou). These pass through the Zalingei area, but in dry season they leave many permanent water pools in the Wadi, [8, 11]. These wetlands are important habitats for migratory and resident birds, specially waterbirds, for drinking, nesting, resting and feeding.
In the present study, the study area was divided into four sites due to their water persistence and topography, these selected sites were surveyed for identifying and quantifying as far as possible the avifauna. These sites were Zalingei site, Wadi Azoom site, Shawa site and Terij site (Figure 1).

2.2. Tools and Methods

The levels of water at different sites were measured using 50 meter tape and string (50 meter) coordinates of each wetlands site were recorded using a GPS.

![Figure 1. National Indicative Wetlands Map of Sudan [11].](image1)

![Figure 2. Map of Zalingei Locality.](image2)

3. Results

3.1. Water Pools

There are seven water pools in the study area:

3.1.1. Adam-golapool and Fawzeipool

Coordinates: 12°54'765N 23°29'063E

This pool was situated in the western bank of Wadi Areebou, near to Areebou Bridge. It was perennial and, very small size (145*20), (154*20m) in the first season and (136*20m) in the second season. It had some water sheds. The maximum water depths were in August 2.48m (first season), and 2.32m (second season). The maximum water depths was meanly (2.40m) in August. (Table 1 and Figure 3).

3.1.2. Hamidiapool

Coordinates: 12°54'806N 23°29'211E

This pool was found on the northern bank of Wadi Areebou (near to Areebou Bridge), it was perennial, and very small size, 1600* 400meters in August meanly of the two seasons (Table 1 and Figure 3).

It had a maximum water depth (2.54m) in August of first season and 2.38m second season. Hamidia pool had maximum water depth meanly in August (2.46m). The pool was completely dried during dry season (March, April and May) (Table 1 and Figure 3). The perennial pool flora were Ceratophyllum deinersuni, and Najaspectinata (covering surface water), the following fishes were identified, Clarias lazera and Tilapia zillii. Some species of birds were identified during two seasons.

3.1.3. Sa4pool

Coordinates: 12°54'537N 23°29'891E

The pool falls on the northern bank of Wadi Areebou, near to Um-Zeafa village; the pool was perennial, and of very small size, 1600* 400meters in August meanly of the two seasons (Table 1 and Figure 3).

It had a maximum depth of about (3.20m). The following fishes were identified. Clarias lazera and Tilapia zillii. There was an artisanal fishery. Waterbirds were hunted by local villagers. The pool is awatering point for wildlife (small mammals and birds). There are seven water pools in the study area:

3.1.4. Tareipool

Coordinates: 12°55'638N 23°28'053E

This pool falls in the western bank of Wadi Areebou, near to Tarei village; the pool was perennial and very small size, (15* 30m) in August (two seasons) (Table 1 and Figure 3).

The pool was recorded flooded during the rainy season. The maximum water depth was (3.46m) in the wet season. The following species of fish were identified as, Grmot (Clarias lazera) and Bulty (Tilapia zillii). 41 birds species were identified.

3.1.5. Sarei-olmalypool

Coordinates: 12°53'606N 23°29'978E

This lake falls in the eastern bank of Wadi Areebou, near to Yathreeb village; the pool was perennial, and had size of (388* 236m) in the wet season. In August the water covered 386* 242m (first season), and 390* 230m (second season) (Table 1 and Figure 3).

The pool submerged during the rainy season, and fed seasonally by Khor Umzeafa. The water depth was (2.42m) in August the wet season. In August water depth was 4.39m (first season), and 3.15m (second season). There was an artisanal fishery. 49 birds species were identified.

3.1.6. Rejl-aldafapool

Coordinates: 12°57'200N 23°35'680E

This pool was falls on the bed of Wadi-Dhab-Sharow, near to Shawa village; the pool was temporary, and of very small size, (15* 20m) in the wet season, 15* 10m in August (first season) and 15* 30m (second season) (Table 1 and Figure 3).

The amaximum water depth (1m) in the two seasons and dried during dry season (from January to May). 41of birds species were recorded.

3.1.7. Gugoldongapool

Coordinates: 12°53°606N 23°29°798E

This pool falls in the southern Slope of Jebel kasara, the lake was perennial, and it had size of (425*213m) in the two season (Table 1 and Figure 3).

The pool flooded during the rainy season; it was fed seasonally by some Khors come down from Jebel kasara. The maximum water depth was (3.15m) in August of the wet season. In August the water depth was 3.20m (first season), and 3.15m (second season). Fifty-one birds species were recorded. The pool was a watering point for wildlife (small mammals), birds and cattle of nomadic herders.

3.2. Small Lakes

3.2.1. Zour Lake

Coordinates: 12°57°295N 23°31°785E

The pool was falls in the northern bank of Wadi Azoop, the pool was not dried all months of the year, and very big size, (2000*500m) in August of two season (Table 1 and Figure 3).

The pool flooded during the rains; it’s feeding seasonally by wadi Azoop. The maximum water depth (1.50m) in August (wet season) (Table 1 and Figure 3).

The pools flooded during the rains; it’s feeding seasonally by wadi Azoop. The maximum water depth (1.50m) in August the wet season (Table 1 and Figure 3). Grmot (Clarias lazera) and Bulty (Tilapia zillii) were identified as fish species. 46 species of birds were recorded. The pool was a watering point for wildlife (small mammals and birds), and cattle of nomadic herders.

3.2.2. Dodei Lake

Coordinates: 12°54°017N 23°28°053E

The pool was falls in the bed of Wadi-Glabat, near to Glabat Hill; the pool was perennial, and of very big size, (3000* 500m) in August of two season. (Table 1 and Figure 3).

The pool was flooded during the rainy season; it was fed seasonally by Wadi-Glabat. The maximum water depth was
(3.20m) in August of two season, 3.14m in August (first season) and 3.26m (second season). The following species of fish was recorded as, Grmot (*Clarias lazera*) and Bulty (*Tilapia zillii*). 49 birds species were recorded. The pool was a watering point for wildlife (small mammals), birds.

### Table 1. Compared the lake sand Lakes measurement of two season (2013-2014).

<table>
<thead>
<tr>
<th>StudySite</th>
<th>Pools and Lakes</th>
<th>Water depth (meters)</th>
<th>Area (meters)</th>
<th>Availability of water (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zalingei</td>
<td>Adam-golapool</td>
<td>2.40</td>
<td>145*20</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Fawzei pool</td>
<td>2.50</td>
<td>20*20</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Hamidia pool</td>
<td>2.46</td>
<td>600*40</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Saa4pool</td>
<td>3.20</td>
<td>11.92*216</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Sarei-olmalypool</td>
<td>2.42</td>
<td>388*236</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Gugoldonga pool</td>
<td>3.15</td>
<td>425*213</td>
<td>12</td>
</tr>
<tr>
<td>Wadi-Azoom</td>
<td>Tarei pool</td>
<td>3.46</td>
<td>15*30m</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Zourlake</td>
<td>1.50</td>
<td>2000*500</td>
<td>12</td>
</tr>
<tr>
<td>Shawa</td>
<td>Rejl-aldafapool</td>
<td>1</td>
<td>15*20</td>
<td>7</td>
</tr>
<tr>
<td>Terij</td>
<td>Dodeilake</td>
<td>3.20</td>
<td>3000*500</td>
<td>12</td>
</tr>
</tbody>
</table>

![Figure 3. Wetlands measurements were calculated in both seasons (2013-2014).](image)

## 4. Discussion

In this study, the Wetlands in Zalingei area, can take many forms as Wadis (Streams), water Pools (Permanent and temporary) and small lakes. Ramsar convention [13] was including these three types in Wetland definition. Eight water pools and two small lakes were established in the dry season, these pools are: Adam-gola, Fawzei, Hamidia, Saa4, Tarei, Gugoldonga, Rejl-aldafa, and Sarei-olmaly. The small lakes are Dodei and Zour.

The maximum water depth in Pools and small lakes was recorded in August of the two wet seasons. These pools are provided water in dry season to use by various species of birds for drinking, feeding and nesting [10].

The availability of water in these wetlands tells all months of the years, except Hamidia and Rejl-aldafa (ninemonths, seven months respectively). Because Hamidia was more used in horticultural irrigated, for this reason it was drought (from March to May), while Rejl-aldafa was temporary, and of very small size and low water depth so that it was drought during the dry season (from January to May). This study was the first work in the field of the wetland habitats for birds in the Sudan.

A wide variety of habitat types, in the Sudan, are classified as wetlands; these were; The Nile, Blue Nile, White Nile and their flood plains and Sunut Forests. Seasonal streams (Khores): Khor Abu Habil. Seasonal rivers: Atbara, Rahad, Dinder, Gash and Baraka are among the largest. Mountain streams: Khor Arbat in the eastern Sudan, Wadi Gallol in Darfur [1, 6]. Fresh water lakes: Examples are Er Rahad, Kundi, Keilak and Abyad, in western Sudan [3]. Seasonal lakes: These are found in different regions and include Um Badir, ElFula, Ras’Amir, Um Baggara [12]. Crater lakes: Two volcanic lakes are found in Jebel Marra (Dariba) and Malha in the Medub Hills [4]. Hot Springs: Perhaps Akasha hot springs, at the tail of Lake Nubia are the most accessible [4]. Others are found in Quella (Jebel Marra), Al Harra (wadi Azoom) and in the Meidoub Hills [4]. Oasis: Nukhaila Oasis, Selima Oasis, Atroun Oasis, el Bashiri Oasis [4]. Mayaas: They are either fed from rivers or by sheet flow or both. They frequently border or rential rivers like Dinder and Rahad [5, 7]. The Red Sea: Important wetlands habitats have been listed by [12] such as Coral reefs, mangrove Creeks, bays and lagoons, seagrass beds,
small off-shoreislands and other coastal sites significant for birds and other terrestrial wildlife Senganeb. Dams on the Nile: Lake Nasser/Nubia, Semmar, Jebel Aulia, Roseires, Khashm-elGirba, and Meraowe [2, 17].

According to these studies [10, 15, 16], Zalingei area is traversed by many seasonal streams and khors. These seasonal streams come down from Jebel Marra and flow westwards. Wadi Azoom and Wadi Areebou are the most important seasonal streams. In the dry season these two Wadis stop running and many permanent water pools are left in their bed.

5. Conclusion

Zalingei area is qualified to be listed as one of Ramsar site in the Sudan. According to [13] there were three types of Wetland were defined in Zalingei area. The availability of water in these wetlands tells all months of the years, except Hamidia and Rejl-aldafa (nine months, seven months respectively).

Wadi Azoom and Wadi Areebou are the most important seasonal streams, the seasonal streams come down from Jebel Marra and flow westwards.

References