Sum Up article of the expedition

A group of 7 people, 2 adults a 5 teenagers or young adults, have done a participatory research in an expedition in Northern Australia and mainly in the National Park of Kakadu. They were accompanied by 3 organizers including a research leader Anne Kerle. The expedition has lasted 14 days and included a lot of road trips, walks, observations, discussions and … camping in different places. The global objective was not only to collect data on a specific scientific target explained here-under and hopefully used and interpreted over the years to come, but also educational for the participants.

**A. Scientific target**

Our main goal was to understand the impact of the tourism on the water quality. In that purpose, we got to focus on three elements: water, birds and, bugs. Through observation, testing analysis and deep watching we aim to understand more thoroughly to what extent these elements are linked to their environment and to each other.

**B. Objects of analysis**

More precisely, our scientific research was divided into several steps. First, we observed birds with binoculars. Second, we analysed water quality. Third, we analysed some water bugs thanks to the microscope.

**C. Methodologies of analysis**

*a) Bird observation*

Observation of the birds is done with the help of binoculars. A specific place is chosen either like an observatory made for that purpose, or another place into the nature like close to Billabongs so that the concentration of birds is high at the same place. The objective is then to observe within a specific time (the same time for the same place in order to be able to compare from one observation to another in time) and to spot as many different types of birds as possible. And then to count how many individuals of each species found.

This inventory added to water quality tests will help us to better understand the impact of tourism on the bird’s ecosystem in Kakadu.

*b) Water quality*

The water quality analysis proposed is twofold:

1. Measurements with a specific device of 6 criteria that are pH (7 is neutral, below the water is acid, above 7 until 14 the water is alkaline), Conductivity (ability to conduct the electricity permitted by the presence of ions in the water, the more there are the more conductive the water is), TDS (Total Dissolved Solid, meaning how much solid has been dissolved into water), Salinity (to measure the quantity of salt NaCl in the water, which makes the difference between “fresh water” of rivers and “salt water” of the seas or oceans), Temperature, and Turbidity (how deep can we see through the water). In all measurements done the turbidity will have been “all clear” so that we do not quote this criterion as a differentiation for the study. Therefore, we will keep only the first 5 criteria presented.
2. Collection of bugs with a dip net. The bugs found are then classified according to a list counting around 20 species from the very sensitive ones (they will be given a value of 8) down to the very tolerant ones (they will be given a value of 1). The existence of these bugs must be first established, then counted. Then a specific “weight factor” must be taken into consideration to then evaluate a “Stream Pollution Index” by dividing the total of “Bug Value” divided by the total of the respective “Weight Factor” given for each kind of bug.

The values obtained must be compared to a reference to assess the quality of the water as this method gives a relative value.

For more details, the purpose of this mission was based on the following steps :

* To precisely map locations where water is present (no matter the size nor the origin) through the trail. The coordinates (latitude and longitude) are to be recorded with a GPS tool.
* For each site, small portions of water have to be carefully analysed with the specific device tool. Then the measurements of pH, temperature, salinity, TDS, and conductivity (as already said we left aside the turbidity) are recorded onto a specific template document.
* Once it’s done, the waterbody has to be described. What is its size? Is this a lake surrounded by stones? A swamp? A river (flowing water)? Waterfalls (high or low)? How about the aquatic plants?
* Is the wetland the prey of external nuisances? Such as feral animals, erosion or human activities?
* If possible, precise what kind of birds and insects we can easily spot on.
* All the observations must be correlated with the data collected by the probe. And compared.
* At the end, we may be capable of finding a pollution index for each.

**D. Results**

*a) Bird observation*

We have done mainly 3 bird observations.

Bird observation in the bird observatory at Mamukala wetlands on Wednesday August 7th:

In the morning we woke up at 6.30 a.m. to get to Mamukala wetland. The goal was to watch and learn more about the different types of birds at the sunrise - Mamukala wetland being a very prosperous place for the Australian biodiversity. To begin with, Anne introduced us to some Aboriginal knowledge, such as the fact that they identify six seasons instead of the four we are accustomed to.

Then she explained to us the changes the ecosystem is going through in function of the change of season. After the theory, the practice came with the observation of birds with the help of binoculars. The objective was to spot as many different types of birds as possible. Most of us reported seeing three or four. Among them were a lot of cormorans, about the same amount of plumed whistling ducks, few magpie gooses and egrets.

This bird observation is the very first glimpse in the scientific work we are going to do in Kakadu. As Anne explained to us, during this trip we will have to identify and count the number of birds in each bird species. This inventory added to water quality tests will help us to better understand the impact of tourism on the birds ecosystem in Kakadu.

Bird observation at NAWURLANDJA on Thursday August 8th:

We made groups of 2 and observed 20 minutes in a billabong. Most of the groups have found 8 species, of which 5 living in the water; Ann, the researcher with us has found 10 as she can find details we cannot see. Among the 5 species, our group has found the ducks as the most abundant specie at a number of hundreds, the pelicans as the least abundant specie with a couple only, then 2 types of Ibis with white and black feathers, a long beak curved down in number of 7 for the “straw-naked ibis” and in number of 15 for the “Australian white ibis”. Then another beautiful big bird, all white with a long yellow beak: the “intermediate egret” in number of 6.

Then 3 other species have been observed but out of the water: an eagle the “fork tail kite” or “black kite” flying in the sky, a small bird flying in trees, and more than a dozen of corellas flying and singing loudly.

Bird observation on the Yellow River from Cooinda dock on Friday August 9th:

On this Friday 9th of August, after a restful night, we decided to wake up earlier than usual (at 5:30 AM), in order to explore the river and its ecosystem at some hours a typical tourist would potentially find unusual.

In order to proceed, we decided to get a tour on a cruise boat departing from Cooinda dock, stars were still visible at this moment. A lot of other peoples and families from a whole range of nationalities were also there, waiting for such a rare opportunity.

The whole tour on the river lasted a long portion of the morning, when we got the chance to enjoy the first glares of the dawn lights carefully touching the clouds, while checking for known and unknown animals during their normal August’s lifestyle on the mud.

Of course, with the sun rising, the emerging crocodiles quickly stole the show, as their reputation as aggressive and vicious behemoths preceded them. But our mission didn’t stop here, and we also made the following observations from other interesting animals.

* Kingfisher, a little blue bird capable of catching its prey down the river in a very rapid manner.
* Whistling Duck, living in huge communities at very close range. Unsurprisingly, their noises sounded like something which would have come from a whistle. Some of these colonies were at reasonable distance (20 meters) of crocodiles laying on the mud, which obviously were seeming to carefully check their potential preys for this day.
* A bunch of white parrots which seemed to speak to each other in an unintelligible language to us (from now) before leaving their tree to another.
* At some point, we were able to catch a glimpse of a compilation of 3 different species : 2 Brolga birds, which were parading (due to the distance, we couldn’t perceive if it was either a male trying to impress a female, 2 males fighting for the same female, or 2 youngsters, casually playing and showing off), one Jabiru, located next to them with a characteristic picky black beak, and one spoonbill, located a little apart from the others. The latter mentioned has a characteristic profile, with a wider beak, used to literally “trap n’ fish” small animals under the water.
* As we approached the end of our journey, we came across a swimming, thin snake, coming straight from the shores, and aiming for our boat. Hopefully, it was unable to climb our impenetrable fortress, and we returned safely to our base.

*b) Water quality*

A total of 9 sites of waterbodies were analysed:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Place** | **Waterbody description** | **Date** | **Latitude****Longitude** | **pH** | **Cond** | **TDS** | **Salinity** | **Temp** |
| Gunlom | Big pool, waterfall, deepCrocodile, lot of bugs and plants | 08/11 | S13.26°E132.24° | 6.76 | 16.5 | 11.6 | 15.9 | 25 |
| Motorcar Falls | Rocky and deep pool, moving water.Lot of fishes, no birds and a big beehive. | 08/11 | XX | 7 | 20.3 | 14.5 | 19.7 | X |
| Edith Falls Inside waters | Shallow waters, no flow, big human presence, some fringing vegetation | 08/11 | S14.181°E132.19° | 7.5 | 13.5 | 10 | 14.7 | 23.1 |
| Edith Falls Open waters | Rocky pool, close to a beach and directly open tp the large waters, big human presence. | 08/13 | S14.182°E132.18° | 7.2 | 13.5 | 9.6 | 14.7 | 24.1 |
| Edith Falls Above Pool | Big rocky pool, not deep, moving water, not lots of plants, no fishes and big human presence. | 08/12 | S14.18°E132.20° | 6.8 | 13.1 | 9.3 | 14.7 | 23.5 |
| Edith RiverAbove Waterfall | The stream is running, lot of algae, lily ponds, plenty of fishes, insects. Dead organic matter | 08/13 | S14.18°E132.20° | 6.5 | 13 | 9.3 | 13.8 | 21.2 |
| Downstream Edith River | Small stagnant pool rocky river bed. A lot of algae and water weed decaying material in the water. Some pine trees around. Water depth at most 20cm. Not disturbed at all | 08/13 | S14.187°E132.21° | 5.93 | 11 | 7.8 | 12.7 | 20 |
| Sweetwater pool | Medium size water hole, low flow, no aquatic plants, one water birdNo feral animals, no erosion, low human activity | 08/13 | S14.19°E132.22° | 6.65 | 12.6 | 8.9 | 14 | 22.2 |
| Sweetwater pool | Medium size water hole, low flow, no aquatic plants, one water birdNo feral animals, no erosion, low human activity | 08/13 | S14.19°E132.22 ° | 6.53 | 12.2 | 7.9 | 13.8 | 21.7 |

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**E. Result Analysis**

*a) Bird observation*

The objective of the study:

It is understanding the factors influencing the bird life. We saw few feral animals such as pigs, cane toads and buffalos. Research has shown that these feral animals have a significant impact on the Billabong and water holes water quality and the animals that use them.

*b) Water quality*

For each site, our measurements were all comparable, although we realize some key differences compared to our previous measurements down Edith Falls (where we obtained a higher pH).

*Temperature*

The differences in temperatures between all the measurements are maybe the consequence of measuring the temperature of the water in different time of the day. For example, in Gunlom, we measured the temperature of the water later in the day and we can also see that temperature of the water in Gunlom was the highest of the table (25°).

*Conductivity*

All values are in the range between 12 and 14 except 2 values : in Gunlom (16.5) and in Motorcar Falls (20.3).

*pH*

The pH is also constant between 6.5 and 7.5 except in Downstream Edith River where pH is equal to 5.93. A closer look to the data shows that pine trees which are only present there might be the cause of this acidity.

*TDS*

They are all in the range of 7.8 – 14.5. At second sight, there also appears to be a correlation with the values of the conductivity (the higher the conductivity, the higher the TDS).

*Salinity*

The values are in the range of 12.7 – 19.7, like the TDS, there appears to be some kind of correlation with the values of the conductivity.

**F. Conclusions**

- pH can result in the disappearance of some species – the 8 ones. Only one pH below 6.5, which can be explained by a pool drying up. The healthy range being between 6.5 to 8.

- TDS results show that water is extremely healthy in the places analysed.

- salinity results are way lower than the average, which is again a sign of good health of the water.

- Temperature here has no standard, so we cannot draw any conclusion from the results.

- Conductivity (numbers don’t match up??)

 In conclusion, in the water holes where we did all the measurements, water quality results show that the water has a very good quality. However, this cannot be said for the Billabongs due to unknown data. Concerning the birds, we did not either have data on their relationship to the water quality. In relation to tourism, data assessing the number of visitors would have been interesting to get in order to understand its impact on water quality. For that aspect, it would be interesting to cooperate with camping grounds.

 In addition to that, the link we first identity between bugs, feral animals, birds and water quality cannot be measured.

Hence, we can conclude that tourism, for now, does not result into a negative aspect on Kakadu biodiversity.