Updated Aug. 5, 2019

This report should be submitted within 2 weeks after you return to Japan. Please do not change the formatting

（**Abroad**・Domestic）Internship report form（Student） 2019/11/7

(Year/Month/Day)

Name	Andrew KATABA
Laboratory	Toxicology Laboratory
Year (Grade)	3rd Year (D3)
Internship institution	**North-West University**, Potchefstroom campus - Water Research Group, Unit for Environmental Sciences and Management
Internship period	Internship period: 10/07/2019 - 10/25/2019 (Departure Date from Sapporo: 10/05/2019, Arrival Date in Sapporo: 10/27/2019)
Purpose	The purpose of my internship was to broaden my experience in other types of toxicology related research such as nanoecotoxicology using aquatic related models and field-based ecotoxicology studies in fresh water, estuarine and marine ecosystems. During the internship I joined a short study on the effects of lead (Pb) on the subcellular responses and behavior of zebrafish that was jointly conducted by my host professor and his postdoctoral fellow.

- The reason why you chose this institute

I chose this institution because it is a teaching and research university among the top 5% highest ranked universities in the world. It offered several advantages as summarized below. The North West University through the Water Research Group, Unit for Environmental Sciences and Management has a collaborative memorandum of understanding with Hokkaido University through the laboratory of toxicology which made it a place of choice for me to acquire new skills and experience for my future career path. Additionally, North-West University has strong integrated (like one health concept) research approach to ecotoxicology using field sampling and site exposure trials using the national aquatic bioassay facility which is the second largest in the Southern hemisphere and Africa. The different aspects of toxicology and ecotoxicology covering a wide range of pollutants mercury, dichlorodiphenyltrichloroethane (DDT), platinum, and nanoecotoxicology offered at this institution in which honours, masters and doctoral students are involved was a major attraction for me to choose this institution. The competences and research experience that my host Professor Wepner possess (over 26 years' experience in ecotoxicology) was also another reason for choosing this institution as I wanted mentorship to acquire necessary skills, to mitigate environmental pollution especially in developing nations like my country in future. Further, I chose this institution to supplement my PhD theme which focuses on the effects of lead on animals and humans especially children with an alternative research model of Zebrafish to understand developmental toxicity of lead in a model known to share at least 70% genome similarity with humans.

- Result of the activity

During the three weeks internship, I was privileged to join in academic presentations and research activities which were all new and interesting. Figure 1 gives a full list of the major activities I participated in.

I will high light a few of the activities without following a weekly schedule as listed in figure 1.

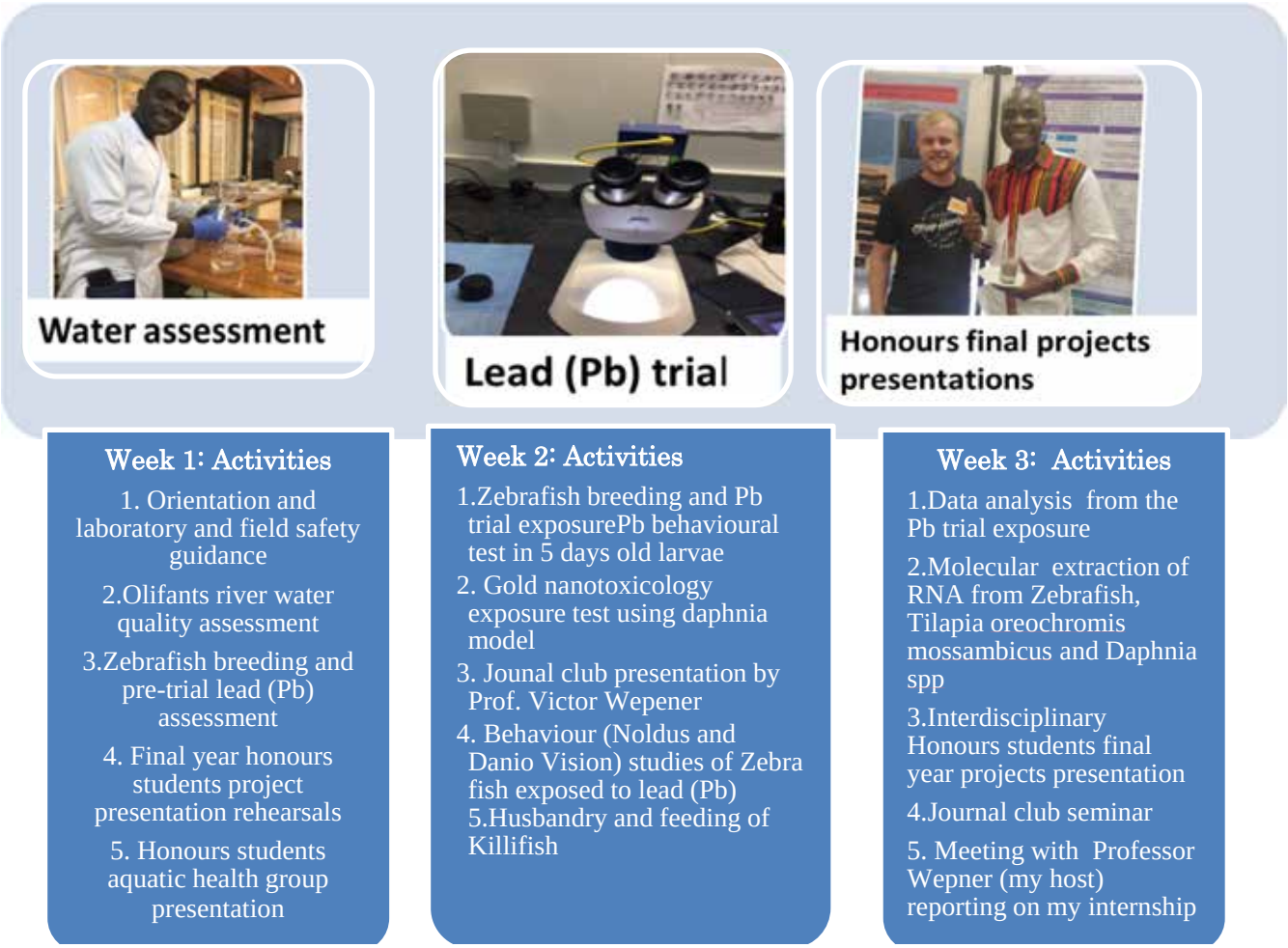

Figure 1: shows list of events and highlights of each week

1. River Water quality assessment: I joined a PhD student in her a work and learnt on how to assess the quality of water by measuring the levels of organic and inorganic pollutants in water samples collected from the Olifants river known to receive discharges from anthropogenic activities such as mining and agriculture related. During this time, we conducted special filtration to separate dissolved from undissolved particulate matter in water as shown in figure 2. The water was then assigned for organic and inorganic analyses. The water for inorganic analyses was acidified in preparation and preservation for analysis.

Figure 2: Water quality assessment

2. Fish breeding and general husbandry: During the internship, I participated in fish breeding activities as well as general husbandry of popular toxicology and test of chemicals fish models namely the Zebrafish (*Danio rerio*), and killifish (*Notobranchius fuzerri*). During this period, I learnt how to sort out Zebrafish fish embryos to ensure that only fertilized ones are selected for experimental studies. At the same time, I learnt about the feeding the killifish from day of hatch. Fresh live brine shrimp (*Artemia* spp.) were reared for a 48-hour period to provide a viable diet to the killifish as shown in figure 3.

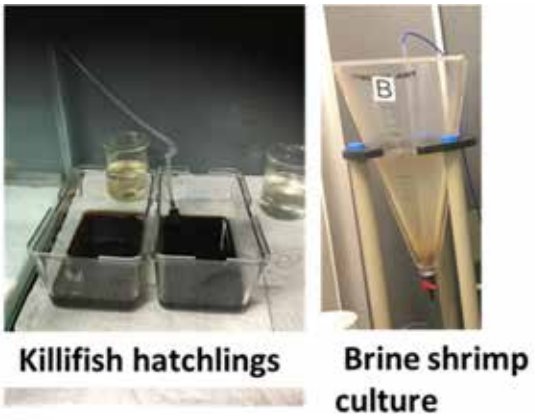

Figure 3: Husbandry activities

3. Nanogold ecotoxicological tests using daphnia magnum models: During the internship, I took part in the exposure study of nanomaterials and their effects of these materials on behaviour and general life of Daphnia *magna* spp one of the Water Research Group Masters student project.

4. Molecular extraction of RNA from Zebrafish, Tilapia (Oreochromis *mossambicus)* and *Daphnia magna*: During this activity, I joined PhD and Masters students (figure 4) and ran RNA extraction trials from aquatic species mentioned above and how learnt how to optimize the RNA yield for assessment of gene expression derangements due to exposure to pollutants.

Figure 4: RNA extraction

5. Lead (Pb) trial experiments on Zebrafish embryo and larvae chronic and acute exposure respectively: My host Professor with his postdoctoral fellow asked me to join in conducting trial experiments to investigate the effects of Pb on embryo development and behaviour using very low levels of lead reported in water systems of Africa and in Kabwe, Zambia average range of 3 µg /L. A trial Pb acute exposure to 5 days old zebrafish using the minimum Pb level reported in Zambia as the lowest levels dosage was designed and conducted with dosage as follows 3 µg/L, 91 µg/L and 250 µg/L. The exposed larvae were placed into the DanioVision observation chamber for 30 minutes and the same experiment was repeated 6 times. At the end of the experiment, I observed that Pb even at very low levels influenced the behaviour of the zebrafish larvae which was seen by an increase in distance swam, a phenomenon that is used to assess the escape response of fish. The exposed group had a statistically significant distance as shown in figure 5.

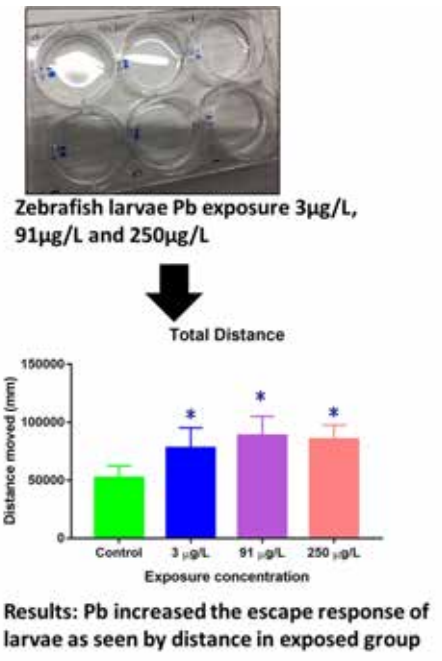

Figure 5: Acute Pb trial

- What do you think the positive impact of the activity will have on your further career path? The internship was a great opportunity for my career path as I received mentorship from my host professor and firsthand experience in a dynamic research and teaching university environment such as North-West University. The internship had a positive impact on my career path and gave me another picture of reputable research facility such as we have at Hokkaido University and North-West University. After my doctoral graduation, I will go back to the university of Zambia to work in research and training (teaching). Working with other faculty members, I plan to further strengthen our toxicology research unit in my department that will be useful in the African region research. In line with my career path goals, the following areas are key in my success as I learnt during my internship; **1**. Co-ordinating big teams researching around major pollution issues like what happens at North West University. Successful research will involve large groups, I need to learn how coordinate big groups. **2**. Establishing strong research integrated units. During my internship I learnt that research units must be integrated with multifaceted disciplines. To achieve my career objectives, I will need to work with different experts using North West University model. **3**.Establishing viable collaborations with other institutions. North West University has strong collaboration partners in more than four universities in the Belgium, Germany and Japan where PhD students go to acquire additional skills for new equipment. **4.** Coordinating many research units for shared research outputs. **5**. Continuous development of technical competences including equipment for modern research. **6**. Sourcing funding for viable and self-sustaining research like the one at North West University. 7.Strong student mentorship and raise good researchers. I will try and do my best in my future career to raise other researchers.

- Advice for your junior fellows:

To my junior fellows I would say it helps to know what you want to achieve and learn before you find a place for your internship. Based on you interests, your supervisor may to help you identify a place from among his or her collaborative institutions for your internship. Once you identity the place for your internship, please start your preparations early. Enjoy your internship period and try to do as much as you can to learn new skills for your future.llll

Approval of supervisor	Institution・Official title・Name Hokkaido University Professor Mayumi Ishizuka

※1 Send the electronic file to the Leading School section, International Affairs Office
※2 Attach a copy certificate of the content of internship activity that is prepared by the counterpart at the internship institution (any form with a signature of the counterpart).
※3 The Steering Committee of the Leading Program will first confirm the content of this report and report will be forwarded to the Educational Affairs Committee for credits evaluation.

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