

# The Status of Philippine Lake Studies: Scholarly Deficit in Social Science and Small-Lake Research

**Bing Baltazar C. Brillo**

University of the Philippines Los Baños, Philippines  
bbbrillo@yahoo.com

This study surveys the literature on Philippine lake studies using a representative sample from the library databases of the three leading universities in the country. The paper proceeds as follows: firstly, it categorizes the existing lake studies by scholarly orientation (natural science perspective or social science perspective) and by physical size of the particular lake under study (big lake or small lake); secondly, it charts and assesses the overall trajectory of lake studies in the country. The paper concludes that Philippine lake studies are dominated by the natural science-based studies and heavily concentrated on big-lake research. This finding illustrates the gaps in the literature, specifically: one, the need to account for all the existing lakes in the country; two, the need for more social science-based studies on lakes; and three, the need for more outputs on small-lake research. The paper closes with the call to balance scholarly deficit as the way towards meaningful progress in lake studies in the country.

**Keywords:** Philippine Lakes, Small-Lake Studies, Big-Lake Research, Lake Studies, Natural Science, Social Science and Lake

## INTRODUCTION

Lakes are important! This statement is supported by the fact that over 90% of the liquid freshwater on the earth's surface is contained in lakes (Shiklomanov, 1993; International Lake Environment Committee [ILEC], 2007; Nakamura & Rast, 2011, 2012). Since freshwater is a finite resource and fundamental to life, the water resource is integral to human survival and development. From the dawn of civilizations to the present-

day modern societies, lakes—natural or artificial reservoir—have catered to human needs, from rudimentary uses (such as drinking water, source of food, and transportation) to more sophisticated utilization (such as agricultural irrigation, fish farming, flood control, and hydroelectric power). Presently, the looming possibility of a global water crisis further stresses the importance of lakes to humanity (see Seckler, Barker, & Amarasinghe, 1999; Biswas & Tortajada, 2010). Lakes are also essential to the preservation of the world's biodiversity

and ecosystem, as the water resources serve as habitats for a variety of flora and fauna, and play a critical role in natural processes, such as climate mediation and nutrient cycling.

Despite the indisputable importance of lakes as a natural resource, human pursuits such as food production, increasing population, settlements, urbanization, and industrialization have brought unprecedented degradation to many lakes in the world. In the past, this situation is exacerbated by the unfettered, exploitative activities and practices adopted by some lake users. Today, many lakes still suffer from degradation, such as eutrophication, acidification, toxic contamination, water-level changes, salinization, siltation, overfishing, and exotic species/weed infestation (Kira, 1997; World Lake Vision Committee, 2003; ILEC, 2005). This plight has been underscored by the Global Environment Facility-Lake Basin Management Initiative's (GEF-LBMI) study of 28 major lakes around the world from 2003 to 2005, where the project reported that the overall condition of many lakes is not improving (see also discussions in the World Lake Conference 2009 and 2011). The 28 lakes studied are: Aral Sea, Baikal, Baringo, Bhoj Wetland, Biwa, Chad, Champlain, Chilika Lagoon, Cocibolca/Nicaragua, Constance, Dianchi, Great Lakes (N. American), Issyk-Kul, Kariba Reservoir, Laguna de Bay, Malawi/Nyasa, Naivasha, Nakuru, Ohrid, Peipsi/Chudskoe, Sevan, Tanganyika, Titicaca, Toba, Tonle Sap, Tukurui Reservoir, Victoria, and Xingkai/Khanka.

The global situation is mirrored in the Philippines since many lakes in the country are ecologically threatened. This reality was acknowledged in the First National Congress on Philippine Lakes held in 2003 when the body conceded that many lakes in the country are suffering from alarming degradation (Civin-Aralan et al., 2005), and in the Second National Congress on Philippine Lakes held in 2011 when the body echoed the same sentiment—despite incremental improvements, the condition of

many lakes in the country is declining (Civin-Aralar et al., 2011). This situation is exacerbated since the water management approaches adopted in the past (i.e. 1980s to 2000s) have limited long term impact on improving the condition of water resources such as lakes (see Biswas & Tortajada, 2005, 2010).

Under this ominous scenario, Philippine lake studies have been incrementally increasing over the years. This is evident in the ever increasing number of scholarly outputs and researches on lakes in the country. However, the overwhelming majority of the studies seem to reveal that they are: (1) mainly focused on the natural sciences, especially limnology (e.g. Laguna Lake Development Authority [LLDA], 2005, 2008; Caasi, Perez, Hufemia, & Claveria, 2006; Severino, 2007; Zafaralla, 2010) and aquaculture studies (e.g. Garcia & Gutierrez, 1975; Radan, 1977; Guerrero, 1979; Aragon, de Lim, & Tioseco, 1985; Aragon, Cosico, J., & Salayo, 1985; Yater & Smith, 1985; Tan, Garcia, Dator, Tan, & Pemsil, 2011; Daganta, 2013; Solpico et al., 2014), and (2) heavily concentrated on the major lakes in the country, such as Laguna de Bay [93,000 hectares], Lake Lanao [34,000 hectares], Taal Lake [23,420 hectares], Lake Mainit [17,340 hectares], Lake Naujan [8,125 hectares], Lake Buluan [6,134 hectares], Lake Bato [2,810 hectares] and Lake Buhi [1,707 hectares] (e.g. Pantastico & Baldia, 1981; Petersen & Carlos, 1984; Santiago, 1988; Manalili & Guerrero, 1995; Fellizar, 1995; Platon, 2001; Guerrero, 2001; Araullo, 2001; Mercene-Mutia, 2001; Zafaralla, 2001; Siringan & Jaraula, 2005; Roa et al. 2005; Guerrero, 2005).

Even the currently available online lists of Philippine lakes emphasize on the major lakes. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD; formerly, the Philippine Council for Aquaculture and Marine Research and Development [PCAMRD]) reveals only 72 known lakes (Guerrero, 2001; see

also Guerrero, 1999); this list does not include many small lakes and many on the list need to be verified. The World Lake Database of the International Lake Environment Committee Foundation (ILEC) registers only the five major Philippine lakes and no small lake. The LakeNet Global Lake Database<sup>1</sup> and the Wikipedia's list of Philippine lakes<sup>2</sup> record only 42 and 94 lakes, respectively, in which a substantial number of small lakes are unaccounted for. The Philippine Lakes Network (PlaNet), which was conceived in LakeCon2003 to comprehensively supply data on Philippine lakes, still has to takeoff and account for small lakes.<sup>3</sup> Summing up, this preliminary information seems to suggest that the scarcity of lake studies on two aspects: one, on the social sciences; and two, on the minor lakes in the country.

Under this premise, this study verifies and assesses the status of Philippine lake studies by surveying the literature and charting its overall progress. In particular, the existing lake studies are grouped into: (1) scholarly orientation (i.e. whether the study is natural science-based or social science-based research); and (2) the physical size of the lake (i.e. whether the study is a big-lake or a small-lake research). As a caveat, this paper does not exhaustively survey all the studies on lakes in the country; instead, it uses a representative sample from the online library of three leading universities in the country (see methods). The data derived from the representative sample is deemed sufficient since the aim of the study is limited to plotting the general trend of Philippine lake studies. To guide the survey and analysis, the paper offers two propositions: firstly, lake studies in the country are highly skewed in favor of the natural sciences compared to the social sciences; and secondly, lake studies in the country are heavily focused on big lakes relative to small lakes.

## METHODS

Based on the comprehensive list of Philippine lakes, studies on each lake were surveyed using the Online Public Access Catalogue (OPAC) of the three universities in the country; specifically, (1) the University of the Philippines (UP) via its Integrated Library System, (2) De La Salle University (DLSU) via its Millennium Web Catalogue, and (3) Ateneo de Manila University (ADMU) via its Library Online Catalogue. The three universities were chosen for two reasons: one, as the leading academic institutions in the research on environment and natural resources, it can reasonably be assumed that their library databases contain vast collections of materials on Philippine lake studies; and two, as educational institutions with a strong tradition in the natural sciences and the social sciences, they bestow a sense of balance between the scholarly areas. Embracing the principle of microcosm or "a sample of the whole," the library databases of UP, DLSU, and ADMU were adopted as the representative sample of the existing body of scholarly works on lakes in the country. The OPAC survey is deemed sufficient since the objective of this study is restricted to mapping out the general progress of Philippine lake studies. The OPAC survey is also logical since it simplifies and centralizes data gathering, which is necessary given that the literature on lakes in the country is highly fragmented (i.e. scattered in various academic journals and databases of government agencies<sup>4</sup> or research institutions<sup>5</sup>). As other limitations, the OPAC search was done only up to July 2014 and made inclusive, covering the entire collections of each library (i.e. without discriminating on the materials, whether books, journal articles, theses or e-books, and computer files).

The survey was conducted using a two-step procedure. Firstly, an online search for scholarly materials was conducted for each lake on the list. The scholarly materials on each lake were

then tabulated and classified either as a natural science-based study or social science-based study. When a study has both natural science and social science elements, the author subjectively determined the dominant perspective to classify the material. The intent here is to differentiate and measure the advancement of lake studies on both academic areas. Secondly, each lake was classified based on its physical size (i.e. water surface area) to determine whether it is a big lake or a small lake. In this study, a lake with a surface area of 200 hectares or less<sup>6</sup> is deemed a small lake while a lake above this threshold is considered a big lake. The tabulated scholarly materials on each lake were then juxtaposed on the big-lake/small-lake classification. The purpose here is to assess the concentration and measure the variance of lake studies between the big lakes and the small lakes. Overall, the objectives mentioned are designed to empirically substantiate the two propositions forwarded in this study—there is scholarly deficit in social science-based studies and information on small lakes is scarce.

## RESULTS

The first step—obtaining a comprehensive list of Philippine lakes—posed a problem. Several government agencies were repeatedly contacted in order to obtain the official list of lakes in the country. Many of the agencies did not reply, some requested that another agency be contacted, and others suggested that there is no official list of Philippine lakes available at present. Only two agencies under the Department of Environment and Natural Resources (DENR)—the National Mapping and Resource Information Authority (NMARIA) and the Biodiversity Management Bureau ([BMB] formerly, the Protected Areas and Wildlife Bureau [PAWB])—were able to furnish a list of lakes in the country (see NMARIA, 2014; DENR-Biodiversity Management Bureau

2014; Ong, Afuang, & Ambal, 2002; Davies, 1990).<sup>7</sup> However, both NMARIA and BMB conceded that their lists, with 78 lakes and 145 lakes, respectively, are considerably incomplete. NMARIA admitted that their list is unofficial and BMB cited that their list is comprehensive only as far as lakes in Luzon are concerned.

To expand the list of lakes, NMARIA's and BMB's lists were reconciled and combined, and supplemented by two other lists of Philippine lakes—the Wikipedia's list of 94 lakes (Wikipedia, 2014) and the PCAARRD's list of 72 lakes (Guerrero, 2001). This aggregation was made with the sole purpose of coming up with an all-inclusive list of Philippine lakes. The data from Wikipedia were used even if it operates through an open source system in the Internet (where anyone can contribute and make changes). The data from PCAARRD were used even if the author, Dr. Guerrero, wrote that some lakes on his list need verification. Any infirmity on Wikipedia and PCAARRD's data is inconsequential in the study since a non-existing lake would most likely register as zero in the OPAC survey. Under the said assumption, the cumulative total from NMARIA, BMB, Wikipedia, and PCAARRD's list reached 198 lakes. Thus, this figure became the total number of lakes for the study (see Appendices 1 and 2).

From the aggregate list of 198 lakes, the following are the consolidated results of the survey conducted on the OPAC of the three universities. For Table 1, the aim is to differentiate the scholarly orientation by classifying the materials as natural science-based or social science-based and to illustrate the extent of progress between the two academic domains (see Appendix 1 for complete results). For Table 2, the aim is to determine the concentration of lake studies and to reveal the disparity of outputs between big lakes or small lakes (see Appendix 2 for complete results). In Table 3, the top 10 lakes based on the number of studies are juxtaposed with the corresponding results from Table 1 and 2.

**Table 1: Scholarly Orientation of Lake Studies**

| <b>SCHOLARLY ORIENTATION</b> | <b>NUMBER OF STUDIES</b> | <b>PERCENT</b> |
|------------------------------|--------------------------|----------------|
| Under Natural Sciences       | 194                      | 77%            |
| Under Social Sciences        | 58                       | 23%            |
| Total Number of Studies      | 252                      | 100%           |

  

| <b>LAKES</b>          | <b>NUMBER OF LAKES</b> | <b>PERCENT</b> |
|-----------------------|------------------------|----------------|
| Lakes With Studies    | 30                     | 15%            |
| Lakes Without Studies | 168                    | 85%            |
| Total Number of Lakes | 198                    | 100%           |

**Table 2: Concentration by Lake Size**

| <b>LAKE SIZE</b>                | <b>NUMBER OF LAKES</b> | <b>PERCENT</b> |
|---------------------------------|------------------------|----------------|
| Big Lakes                       | 27                     | 14%            |
| Small Lakes                     | 124                    | 63%            |
| Unclassified lakes <sup>8</sup> | 47                     | 24%            |
| Total Number of Lakes           | 198                    | 100%           |

  

| <b>LAKES</b>                                 | <b>NUMBER OF LAKES</b> | <b>PERCENT</b> |
|--|------------------------|----------------|
| Existence need verification <sup>9</sup>     | 39                     | 20%            |
| Surface area need verification <sup>10</sup> | 71                     | 36%            |
| Total Number of Lakes                        | 198                    | 100%           |

  

| <b>LAKE SIZE</b>                 | <b>NUMBER OF STUDIES</b> | <b>PERCENT</b> |
|----------------------------------|--------------------------|----------------|
| Big Lakes                        | 202                      | 80%            |
| Small Lakes                      | 22                       | 9%             |
| Unclassified Lakes <sup>11</sup> | 28                       | 11%            |
| Total Number of Studies          | 252                      | 100%           |

**Table 3: Top 10 Lakes Based on Studies**

| LAKE                    | SURFACE AREA (HECTARES) | CLASSIFICATION (LAKE SIZE) | TOTAL STUDIES | CLASSIFICATION  |                |
|-------------------------|-------------------------|----------------------------|---------------|-----------------|----------------|
|                         |                         |                            |               | NATURAL SCIENCE | SOCIAL SCIENCE |
| Laguna de Bay           | 90,159.68               | Big                        | 103           | 82              | 21             |
| Taal                    | 23,852.94               | Big                        | 37            | 23              | 14             |
| Lanao - Lanao Del Sur   | 36,268.17               | Big                        | 28            | 16              | 12             |
| Angat Reservoir         | nad <sup>12</sup>       | nad                        | 19            | 19              | 0              |
| Sampaloc                | 99.58                   | Small                      | 8             | 7               | 1              |
| Liguasan Marsh          | nad                     | nad                        | 7             | 7               | 0              |
| Sebu                    | 354.62                  | Big                        | 5             | 1               | 4              |
| Buhi <sup>13</sup>      | 1,672.53                | Big                        | 4             | 4               | 0              |
| Pantabangan             | 5,923.00*               | Big                        | 4             | 4               | 0              |
| Tadlac/Tadlak/Alligator | 23.32                   | Small                      | 4             | 4               | 0              |

| TOP TEN LAKES                    | NUMBER OF LAKES |
|----------------------------------|-----------------|
| Big Lakes                        | 6               |
| Small Lakes                      | 2               |
| Unclassified lakes <sup>14</sup> | 2               |

| STUDIES: TOP TEN LAKES           | NUMBER OF STUDIES | PERCENT |
|----------------------------------|-------------------|---------|
| Big Lakes                        | 181               | 83%     |
| Small Lakes                      | 12                | 6%      |
| Unclassified lakes <sup>15</sup> | 26                | 11%     |
| Total Number of Studies          | 219               | 100%    |

| SCHOLARLY ORIENTATION:<br>TOP TEN LAKES | NUMBER OF STUDIES | PERCENT |
|---|-------------------|---------|
| Under Natural Sciences                  | 167               | 76%     |
| Under Social Sciences                   | 52                | 24%     |
| Total Number of Studies                 | 219               | 100%    |

The following are the results of the OPAC survey on Philippine lakes:

1. The immediate issue that came out of the survey is the need to have an official comprehensive list of lakes in the country. No agency, government or private, has a complete inventory of all the existing lakes. The aggregate list of 198 lakes adopted in the survey does not match the publicly stated total number of lakes in the country; for instance, 211 lakes was declared in the First National Congress on Philippine Lakes (Cuvin-Aralar et al., 2005; see also Ong et al., 2002) and 216 lakes was mentioned in the Second National Congress on Philippine Lakes (Icamina, 2011). This variation evidently suggests the need to completely account for all the lakes in the country.
2. A total of 252 studies were found from the three universities' libraries. UP produced most of them (165 materials, 66%); DLSU and ADMU produced 63 (25%) and 24 (9%), respectively. The result revealed that (a) when it comes to lake research in the country, UP leads overwhelmingly (see Appendix 1), and (b) there is a clear shortage of scholarly materials on lakes in the country since there are only 252 studies on 198 lakes on the list.
3. From the total of 252 studies, 194 materials (77%) are from the natural sciences and 58 materials (23%) are from the social sciences. The result revealed the highly skewed trajectory in favor of the natural science-based studies on lakes in the country (see Table 1). Thus, this trend underscores not only the huge gap in literature, but more importantly, the need for more social science-based studies on lakes. Furthermore, a cursory reading of the scholarly materials shows that the natural science-based studies are spearheaded by limnology and aquaculture/fishery research; while the social science-based studies are in need of more scholarly outputs especially in key areas, such as development, governance, socio-economic, and cultural studies.
4. From the total of 198 listed lakes, only 30 lakes (15%) have been studied while an astounding 168 lakes (85%) have not registered even a single scholarly material in the OPAC search. This finding substantiates the alarming scarcity of lake studies among the three universities (see Table 1 and Appendix 1) and highlights the current plight of lake research in the country.
5. From the total of 198 listed lakes, 27 lakes (14%) are classified as big lakes while 124 lakes (63%) are classified as small lakes. This data confirms that a substantial number of small lakes exist in the country (see Table 2 and Appendix 2). Moreover, the numbers of small lakes will likely increase since it is highly probable that most of the unclassified 47 lakes (24%) are small lakes. With this, it is reasonable to assume that the total number of small lakes is around 80% of the total number of lakes in the country.
6. From the total of 198 listed lakes, the existence of 39 lakes (20%) needs confirmation and the surface size area of 71 lakes (36%) needs verification. In the table, these lakes have asterisks beside the name (if its existence needs confirmation) or beside the number (if its surface size area needs to be verification, see Table 2 and Appendix 2). The existence of these provisional data further underscores the urgency of fully accounting and documenting lakes in the country.
7. From the total of 252 scholarly materials, there are 202 studies (80%) on big lakes,

a measly 22 (9%) were studies on small lakes, and 28 studies (11%) were on unclassified lakes. This finding evidently reveals that scholarly works on Philippine lakes are highly concentrated on the big lakes (see Table 2), highlighting the astounding gap between big lake and small lake studies as well as the pressing need for more research on small lakes in the country.

8. Of the top 10 lakes that have been studied, 6 are big lakes and 2 are small lakes (see Table 3). The number of big lakes in the top 10 may go up to 8 since there is a strong likelihood that the 2 unclassified lakes (i.e. Angat Reservoir and Liguasan Marsh) are big lakes. Overall, the top 10 lakes covered have a total of 219 studies. In classifying these studies: there are 181 materials (83%) on big lakes and 12 materials (6%) on small lakes; and there are 167 materials (76%) under the natural sciences and 52 materials (24%) under the social sciences (see Table 3). The data on the top 10 lakes reinforces the observations mentioned (in no.1-6), specifically, the pre-eminence of the big lake research and the natural science perspective in Philippine lake studies.
9. On the entry of the two small lakes in the top 10 (i.e. Sampaloc Lake and Tadalac/Tadlak/Alligator Lake), the following are the possible explanations: (a) both are city lakes (located near or at urban centers); (b) both are proximate to the University of the Philippines Los Banos (which makes them accessible for students and scientists from the university to study); and (c) both are managed by LLDA (which means there is a specialized government agency directly responsible for supervising the lakes).

## Discussion

The results of the survey validated the propositions offered by this paper: (a) shortage of social science-based scholarly outputs, since most are natural science-based; and (b) dearth of information on small lakes, since an overwhelming majority of studies are on big lakes. Overall, the outcome establishes the current direction of lake studies in the country and ascertains the lacuna in literature. In turn, this finding calls for significant progress and redirection of lake scholarship in the country; specifically, the need for more studies on lakes, particularly in accounting for all the existing lakes in the country, and the need to set off research in the social sciences and on small lakes. Documenting all the lakes in the country is necessary since it is the natural starting point for democratizing the attention given to each lake, particularly in ensuring that all lakes (big or small) are given equal consideration by government agencies, stakeholders, and scholars. Furthermore, it is also crucial in order to have a complete picture of the conditions of lakes in the country and to have a better grasp of the issues on the conservation of the natural resource, as natural science-based and big lake studies only give us a partial picture.

Despite comprising the bulk of the existing lakes in the country, most of the lakes that need to be accounted and studied are small lakes. Small lakes are least studied since they are generally deemed to have minimal economic significance which translates to peripheral attention from government agencies, private-funding institutions, and scholars. Additionally, many small lakes are located in remote areas, thus studying them would require more resources and efforts. In the global scale, small lakes are understudied since the spatial extent of lakes, in general, and the cumulative areal extent of small vis-à-vis the world's lakes, in particular, have been underestimated in the past (Lehner &



Doll, 2004; Downing et al., 2006). This century-long misconception has resulted in the under appreciation of the value of small lakes which redounded to little worldwide effort in studying them (Downing, 2010).

There are five main reasons why it is urgent to study small lakes: (1) small lakes' shorter time frame in terms of ecological deterioration; (2) the need for critical information in saving them; (3) the importance of recording them for posterity; (4) the connection to other natural resources; and (5) the crucial role in improving lake communities. The first ground relates to the physical feature of small lakes—being more fragile and vulnerable to environmental deterioration compared to big lakes. Their small size usually equates to reduced natural absorptive capacity in neutralizing pollutants which makes them more susceptible to ecological degradation and irreversibility of damage to the lake. The second ground refers to the necessity of generating data to improve the conditions of small lakes since substantive knowledge is crucial for managing and conserving small lakes. The third ground calls for documenting small lakes for the future generations' sake. Following the maxim all lakes will eventually die, small lakes, other things being equal, become extinct at an accelerated pace compared to big lakes. A case in point is Manlalayes Lake (the twin lake of Gunao/Gunaw Lake in Dolores, Quezon) which dried out a few years ago before anyone is able to document its existence. The fourth ground is anchored on the fact that many small lakes are connected and essential components of the system of other natural resources, such as river system and watershed or basin of big lakes. Thus, addressing the issues and problems of other systems would also demand knowing vital information about small lakes. The fifth ground concerns with the significance of small lakes in promoting local development. Since many of small lakes are surrounded by impoverished communities, it is imperative to study them if

the living conditions of lake residents and their communities would be enhanced.

Globally, the importance of small lakes has been acknowledged with the recent recognition of their abundance and dominance in terms of aggregate areal extent relative to big lakes (Downing et al., 2006; Hanson, Carpenter, Cardille, Coe, & Winslow, 2007). Emerging studies have indicated the great value of small lakes in world's cycles and processes, as they are substantially more biologically active than large lakes and all other global ecosystems (Downing, 2010). For instance, small lakes have disproportionately high hydrologic and nutrient processing rates (Smith, Renwick, Bartley, & Buddemeier, 2002), and their carbon sequestration rate, relative to size, are more intense and complex than big lakes, terrestrial, and marine ecosystems (Downing, 2010). Under this premise, the status of studying small lakes is steadily raised in the global level. However, this development is one-sided and incomplete since the evolving progress on small lake studies is, in general, merely confined to the realm of the natural sciences.

The need for substantive advances in social science-based lake studies is borne by the fact that both natural sciences and social sciences must progress together if one expects to make meaningful and considerable improvement on the conditions of lakes. The two perspectives are interdependent—complementary and supplementary to each other; as environmental and management issues are so intertwined that these concerns cannot be dealt with effectively in isolation. A single perspective is simply inadequate in coping with the multitude of challenges confronting lakes today. The natural science-based studies, specifically limnology and aquaculture, have already made decent progress; thus, it is now time for the social sciences (i.e. development, governance, socio-economic, history, and cultural studies) to post significant gains to parallel and engage the advance in

the natural sciences. In this manner a more inclusive and integrative knowledge building can be attained which, in turn, leads to better understanding and sound solutions to the many problems of lakes in the country.

## ENDNOTES

<sup>1</sup> <http://www.worldlakes.org/searchlakes.asp?countryid=461&Submit2=Search>

<sup>2</sup> [http://en.wikipedia.org/wiki/List\\_of\\_lakes\\_of\\_the\\_Philippines](http://en.wikipedia.org/wiki/List_of_lakes_of_the_Philippines)

<sup>3</sup> The key proponents of PLaNet, Dr. Raymundo Punongbayan, Dr. Norman Tuñgol, and Dr. Jessie Daligdig, died in a tragic helicopter crash in 2005.

<sup>4</sup> Such as (1) the Department of Agriculture: the Bureau of Fisheries and Aquatic Resources Management [BFAR] and the National Fisheries and Development Institute [NFDI]; (2) the Department of Environment and Natural Resources: the Environmental Management Bureau [EMB], the Ecosystems Research and Development Bureau [ERDB], the Biodiversity Management Bureau [BMB] and The Laguna Lake Development Authority [LLDA]; (3) the Department of Science and Technology: the Philippine Institute of Volcanology and Seismology [PHIVOLCS] and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development [PCAARRD].

<sup>5</sup> Such as the Southeast Asian Fisheries Development Center/Aquaculture Department [SEAFDEC/AQD], the Southeast Asian Regional Center for Graduate Study and Research in Agriculture [SEARCA] and the University of the Philippines Limnological Research Station [UPLB LRS].

<sup>6</sup> This figure was subjectively made after surveying the variance in sizes of lakes in the country.

<sup>7</sup> Special thanks to: Director John SF Fabic, Mr. Alvin Laurio and Ms. Ma. Paz Montano of NMARIA; and Director Theresa Mundita S Lim and Ms. Rej Winlove Bungabong of BMB.

<sup>8</sup> Refers to “nad” in the classification by lake size (see appendix 2); includes three lakes (Baao-Bula, Duminagat and Napait/Napalit) whose classification (whether a big or a small lake) cannot be determined due to the huge discrepancy in documented size (surface area) from the different sources.

<sup>9</sup> See asterisks on the lakes’ name (see appendix 2).

<sup>10</sup> See asterisks on the surface area data (see appendix 2).

<sup>11</sup> Angat Reservoir (19 studies), Liguasan Marsh (7 studies), Putian Lake (1 study) and Sultan Lake (1 study).

<sup>12</sup> No available data or no obtained data. \*The data need verification.

<sup>13</sup> With several lakelets.

<sup>14</sup> Refers to “nad” in the classification by lake size (see appendix 2); includes three lakes (Baao-Bula, Duminagat and Napait/Napalit) whose classification (whether a big or a small lake) cannot be determined due to the huge discrepancy in documented size (surface area) from the different sources.

<sup>15</sup> Refers to “nad” in the classification by lake size (see appendix 2); includes three lakes (Baao-Bula, Duminagat and Napait/Napalit) whose classification (whether a big or a small lake) cannot be determined due to the huge discrepancy in documented size (surface area) from the different sources.

<sup>16</sup> Some lakes registered dual names (e.g. Bedbed/Pusong, Dariwidiw/Sarnap, Manamlay/Panikian) or discrepancy in the spellings of their names (e.g. Alindayat/Alindayot, Gunaw/Gunao, Capayahan/Capahayan).

<sup>17</sup> With several lakelets.

<sup>18</sup> Danao is the most popular name for a lake in the country, as there are six lakes with that name, specifically in Albay, Cebu, Ilocos Norte, Negros Oriental, Sorsogon and Leyte (see no. 66-71).

<sup>19</sup> Sometimes there is difficulty in measuring the size n(surface area) of a lake, such as the case of Venado Lake which losses 2/3 of its water during summer.

<sup>20</sup> Some lakes registered huge discrepancy in area size (e.g. Baao-Bula 717.18 or 177.00, Duminagat 1,230.90 or 9.00, Napait/Napalit 1,233.10/36.00) which posed problem in classifying them as big lake or small lake.

<sup>21</sup> See appendix 1.

<sup>22</sup> No available data or no obtained data. \*The data came from Wikipedia and PCAARRD.

<sup>23</sup> With several lakelets.

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## APPENDICES

Appendix 1. *Scholarly Orientation of Lake Studies*

| LAKE <sup>16</sup>     | LOCATION         | TOTAL NUMBER OF STUDIES |      |    |                 |                |
|------------------------|------------------|-------------------------|------|----|-----------------|----------------|
|                        |                  | DLSU                    | ADMU | UP | NATURAL SCIENCE | SOCIAL SCIENCE |
| 1. Aguingay            | Sorsogon         | 0                       | 0    | 0  | 0               | 0              |
| 2. Alindayat/Alindayot | Zambales         | 0                       | 0    | 0  | 0               | 0              |
| 3. Ambuaya             | Ifugao           | 0                       | 0    | 0  | 0               | 0              |
| 4. Ambuklao            | Benguet          | 0                       | 0    | 0  | 0               | 0              |
| 5. Ambulacao           | Benguet          | 0                       | 0    | 0  | 0               | 0              |
| 6. Amulong             | Cagayan          | 0                       | 0    | 0  | 0               | 0              |
| 7. Angat Reservoir     | Bulacan          | 3                       | 1    | 15 | 19              | 0              |
| 8. Apo*                | Bukidnon         | 0                       | 0    | 0  | 0               | 0              |
| 9. Asibanglan          | Kalinga          | 0                       | 0    | 0  | 0               | 0              |
| 10. Baa-Bula           | Camarines Sur    | 0                       | 0    | 0  | 0               | 0              |
| 11. Bababu*            | Dinagat Island   | 0                       | 0    | 0  | 0               | 0              |
| 12. Babadak            | Benguet          | 0                       | 0    | 0  | 0               | 0              |
| 13. Balanan            | Negros Oriental  | 0                       | 0    | 1  | 0               | 1              |
| 14. Balindepaldo       | Negros Oriental  | 0                       | 0    | 0  | 0               | 0              |
| 15. Balinsasayao       | Negros Oriental  | 0                       | 0    | 0  | 0               | 0              |
| 16. Baloi              | Lanao del Norte  | 0                       | 0    | 0  | 0               | 0              |
| 17. Balut              | Maguindanao      | 0                       | 0    | 0  | 0               | 0              |
| 18. Bannata            | Kalinga          | 0                       | 0    | 0  | 0               | 0              |
| 19. Baranibud          | North Cotabato   | 0                       | 0    | 0  | 0               | 0              |
| 20. Baringcu-curong    | Ilocos Sur       | 0                       | 0    | 0  | 0               | 0              |
| 21. Baruyan            | Mindoro Oriental | 0                       | 0    | 0  | 0               | 0              |
| 22. Basak*             | Lanao del Sur    | 0                       | 0    | 0  | 0               | 0              |
| 23. Basao              | Cagayan          | 0                       | 0    | 0  | 0               | 0              |
| 24. Bato               | Camarines Sur    | 0                       | 0    | 2  | 2               | 0              |
| 25. Bedbed/Pusong      | Benguet          | 0                       | 0    | 0  | 0               | 0              |
| 25. Binga              | Benguet          | 0                       | 0    | 0  | 0               | 0              |
| 26. Bito               | Leyte            | 0                       | 0    | 0  | 0               | 0              |
| 27. Black Bird         | Sorsogon         | 0                       | 0    | 0  | 0               | 0              |
| 28. Blingkong*         | North Cotabato   | 0                       | 0    | 0  | 0               | 0              |
| 29. Boiling            | Albay            | 0                       | 0    | 0  | 0               | 0              |
| 30. Bonnong            | Kalinga          | 0                       | 0    | 0  | 0               | 0              |
| 32. Bonot              | Camarines Norte  | 0                       | 0    | 0  | 0               | 0              |
| 33. Botbot             | Mt. Province     | 0                       | 0    | 0  | 0               | 0              |
| 34. Buhi <sup>17</sup> | Camarines Sur    | 1                       | 2    | 1  | 4               | 0              |
| 35. Buluan             | Maguindanao      | 0                       | 0    | 0  | 0               | 0              |
| 36. Bulusan            | Sorsogon         | 1                       | 1    | 1  | 2               | 1              |

|                             |                      |   |   |   |   |   |
|-----------------------------|----------------------|---|---|---|---|---|
| 37. Bunggalaw               | Cagayan              | 0 | 0 | 0 | 0 | 0 |
| 38. Bunot                   | Laguna               | 0 | 0 | 0 | 0 | 0 |
| 39. Buranibua*              | South Cotabato       | 0 | 0 | 0 | 0 | 0 |
| 40. Butig                   | Lanao Del Sur        | 0 | 0 | 0 | 0 | 0 |
| 41. Cabagan 1 / Malasi 1    | Isabela              | 0 | 0 | 0 | 0 | 0 |
| 42. Cabagan 2 / Malasi 2    | Isabela              | 0 | 0 | 0 | 0 | 0 |
| 43. Cabalangan*             | Cagayan              | 0 | 0 | 0 | 0 | 0 |
| 44. Cabalian*               | Leyte                | 0 | 0 | 0 | 0 | 0 |
| 45. Cabugao                 | Palawan              | 0 | 0 | 0 | 0 | 0 |
| 46. Calapan*                | Mindoro Oriental     | 0 | 0 | 0 | 0 | 0 |
| 47. Calibato                | Laguna               | 0 | 0 | 0 | 0 | 0 |
| 48. Caliraya Reservoir      | Laguna               | 2 | 0 | 1 | 1 | 2 |
| 49. Caluangan/ Baruyan      | Oriental Mindoro     | 0 | 0 | 0 | 0 | 0 |
| 50. Camannauan              | Cagayan              | 0 | 0 | 0 | 0 | 0 |
| 51. Cambirag*               | Leyte                | 0 | 0 | 0 | 0 | 0 |
| 52. Canarem                 | Tarlac               | 0 | 0 | 0 | 0 | 0 |
| 53. Canarin                 | Tarlac               | 0 | 0 | 0 | 0 | 0 |
| 54. Candelaria              | Zambales             | 0 | 0 | 0 | 0 | 0 |
| 55. Capayahan/<br>Capahayan | Surigao Del<br>Norte | 0 | 0 | 0 | 0 | 0 |
| 56. Carague                 | Cagayan              | 0 | 0 | 0 | 0 | 0 |
| 57. Caramoan                | Camarines Sur        | 0 | 0 | 0 | 0 | 0 |
| 58. Casiritan               | Cagayan              | 0 | 0 | 0 | 0 | 0 |
| 59. Castila                 | Sorsogon             | 0 | 0 | 0 | 0 | 0 |
| 60. Catol                   | Zambales             | 0 | 0 | 0 | 0 | 0 |
| 61. Coron                   | Palawan              | 0 | 0 | 0 | 0 | 0 |
| 62. Dacula/ Dakula          | Sulu                 | 0 | 0 | 0 | 0 | 0 |
| 63. Dagat Dagatan           | Quezon               | 0 | 0 | 0 | 0 | 0 |
| 64. Dagianan*               | Lanao Del Norte      | 0 | 0 | 0 | 0 | 0 |
| 65. Dagon                   | Agusan Del Sur       | 0 | 0 | 0 | 0 | 0 |
| 66. Danao <sup>18</sup>     | Albay                | 0 | 0 | 0 | 0 | 0 |
| 67. Danao                   | Cebu                 | 0 | 0 | 0 | 0 | 0 |
| 68. Danao                   | Ilocos Norte         | 0 | 0 | 0 | 0 | 0 |
| 69. Danao                   | Negros Oriental      | 0 | 0 | 0 | 0 | 0 |
| 70. Danao*                  | Sorsogon             | 0 | 0 | 0 | 0 | 0 |
| 71. Danao/Imelda            | Leyte                | 0 | 0 | 0 | 0 | 0 |
| 72. Danum                   | Mt. Province         | 0 | 0 | 0 | 0 | 0 |
| 73. Dapao                   | Lanao Del Sur        | 0 | 0 | 0 | 0 | 0 |
| 74. Dariwdiw/ Sarnap        | Ilocos Norte         | 0 | 0 | 0 | 0 | 0 |
| 75. Dasay                   | Zamboanga<br>Del Sur | 0 | 0 | 0 | 0 | 0 |
| 76. Davo*                   | Leyte                | 0 | 0 | 0 | 0 | 0 |
| 77. Dinaykong               | Mt. Province         | 0 | 0 | 0 | 0 | 0 |

|                         |                         |    |   |    |    |    |
|-------------------------|-------------------------|----|---|----|----|----|
| 78. Duminagat           | Misamis Oriental        | 0  | 0 | 0  | 0  | 0  |
| 79. Dunoy 1             | Isabela                 | 0  | 0 | 0  | 0  | 0  |
| 80. Dunoy 2             | Isabela                 | 0  | 0 | 0  | 0  | 0  |
| 81. Ernestine           | Sulu                    | 0  | 0 | 0  | 0  | 0  |
| 82. Furaw Dalag         | Isabela                 | 0  | 0 | 0  | 0  | 0  |
| 83. Galang              | Agusan Del Sur          | 0  | 0 | 0  | 0  | 0  |
| 84. Gawaan              | Mt. Province            | 0  | 0 | 0  | 0  | 0  |
| 85. Gunaw / Gunao       | Quezon                  | 0  | 0 | 0  | 0  | 0  |
| 86. Himbang             | Agusan Del Sur          | 0  | 0 | 0  | 0  | 0  |
| 87. Ibag*               | Leyte                   | 0  | 0 | 0  | 0  | 0  |
| 88. Inkolos Peatland    | Benguet                 | 0  | 0 | 0  | 0  | 0  |
| 89. Jamboree            | National Capital Region | 0  | 0 | 0  | 0  | 0  |
| 90. Jones               | Isabela                 | 0  | 0 | 0  | 0  | 0  |
| 91. Kabalin-an*         | Negros Oriental         | 0  | 0 | 0  | 0  | 0  |
| 92. Kagmutiong Lakelets | Camarines Sur           | 0  | 0 | 0  | 0  | 0  |
| 93. Kalanganan          | Lanao Del Norte         | 0  | 0 | 0  | 0  | 0  |
| 94. Katudgay Lakelets   | Camarines Sur           | 0  | 0 | 0  | 0  | 0  |
| 95. Kawkawayan          | Ilocos Norte            | 0  | 0 | 0  | 0  | 0  |
| 96. Kimkimay            | Abra                    | 0  | 0 | 0  | 0  | 0  |
| 97. La Mesa Reservoir   | Rizal                   | 0  | 0 | 3  | 3  | 0  |
| 98. Labas*              | North Cotabato          | 0  | 0 | 0  | 0  | 0  |
| 99. Ladiaoan/ Ladlaonan | Tarlac                  | 0  | 0 | 0  | 0  | 0  |
| 100. Laguna             | Aklan                   | 0  | 0 | 0  | 0  | 0  |
| 101. Laguna de Bay      | Rizal, Laguna           | 29 | 5 | 69 | 82 | 21 |
| 102. Lalaguna           | Palawan                 | 0  | 0 | 0  | 0  | 0  |
| 103. Lalaguna Marsh     | Quezon                  | 0  | 0 | 0  | 0  | 0  |
| 104. Lalig              | Cagayan                 | 0  | 0 | 0  | 0  | 0  |
| 105. Lamit/Lahit        | South Cotabato          | 0  | 0 | 0  | 0  | 0  |
| 106. Lamybyhen*         | Bukidnon                | 0  | 0 | 0  | 0  | 0  |
| 107. Lanao*             | Bohol                   | 0  | 0 | 0  | 0  | 0  |
| 108. Lanao              | Lanao Del Sur           | 5  | 3 | 20 | 16 | 12 |
| 109. Lantukan           | North Cotabato          | 0  | 0 | 0  | 0  | 0  |
| 110. Latep-Ngapos       | Benguet                 | 0  | 0 | 0  | 0  | 0  |
| 111. Leonard            | Davao Del Norte         | 0  | 0 | 0  | 0  | 0  |
| 112. Libuao*            | Occidental Mindoro      | 0  | 0 | 0  | 0  | 0  |
| 113. Libungan Marsh     | North Cotabato          | 0  | 0 | 0  | 0  | 0  |
| 114. Liguasan Marsh     | North Cotabato          | 2  | 2 | 3  | 7  | 0  |
| 115. Loloog*            | Pangasinan              | 0  | 0 | 0  | 0  | 0  |
| 116. Look/Looc          | Zambales                | 0  | 0 | 0  | 0  | 0  |



|                                 |                       |   |   |   |   |   |
|---------------------------------|-----------------------|---|---|---|---|---|
| 117. Lumao                      | Agusan Del Sur        | 0 | 0 | 0 | 0 | 0 |
| 118. Lumot                      | Laguna                | 0 | 0 | 1 | 0 | 1 |
| 119. Lumpo*                     | Abra                  | 0 | 0 | 0 | 0 | 0 |
| 120. Lunay*                     | Leyte                 | 0 | 0 | 0 | 0 | 0 |
| 121. Mabilog*                   | Negros Oriental       | 0 | 0 | 0 | 0 | 0 |
| 122. Magat Reservoir            | Ifugao, Isabela       | 0 | 0 | 3 | 3 | 0 |
| 123. Mahagnao                   | Leyte                 | 0 | 0 | 0 | 0 | 0 |
| 124. Mahakdum/<br>Mahokdum      | Surigao Del<br>Norte  | 0 | 0 | 0 | 0 | 0 |
| 125. Mainit                     | Agusan Del Norte      | 0 | 0 | 1 | 1 | 0 |
| 126. Makuao Lakelets            | Camarines Sur         | 0 | 0 | 0 | 0 | 0 |
| 127. Malasi                     | Isabela               | 0 | 0 | 0 | 0 | 0 |
| 128. Malimanga                  | Zambales              | 0 | 0 | 0 | 0 | 0 |
| 129. Malinao*                   | North Cotabato        | 0 | 0 | 0 | 0 | 0 |
| 130. Manamlay/<br>Panikian*     | Occidental<br>Mindoro | 0 | 0 | 0 | 0 | 0 |
| 131. Manapao Lakelets           | Camarines Sur         | 0 | 0 | 0 | 0 | 0 |
| 132. Manguao/ Mangua            | Palawan               | 0 | 0 | 1 | 1 | 0 |
| 133. Manipis                    | Camarines Sur         | 0 | 0 | 0 | 0 | 0 |
| 134. Mantohod*                  | Negros Oriental       | 0 | 0 | 0 | 0 | 0 |
| 135. Maobog*                    | Leyte                 | 0 | 0 | 0 | 0 | 0 |
| 136. Mapanuepe                  | Zambales              | 0 | 0 | 0 | 0 | 0 |
| 137. Maughan/ Manghan           | South Cotabato        | 0 | 0 | 0 | 0 | 0 |
| 138. Mohicap/ Muhikap           | Laguna                | 0 | 0 | 0 | 0 | 0 |
| 139. Nabao Oxbow                | Nueva Ecija           | 0 | 0 | 0 | 0 | 0 |
| 140. Nag-aso Boiling*           | Albay                 | 0 | 0 | 0 | 0 | 0 |
| 141. Nailig*                    | Negros Oriental       | 0 | 0 | 0 | 0 | 0 |
| 142. Nalapan*                   | Davao Del Sur         | 0 | 0 | 0 | 0 | 0 |
| 143. Napait/Napalit             | Bukidnon              | 0 | 0 | 0 | 0 | 0 |
| 144. Naujan                     | Mindoro Oriental      | 0 | 0 | 1 | 1 | 0 |
| 145. Nungon                     | South Cotabato        | 0 | 0 | 0 | 0 | 0 |
| 146. Nunungan/<br>Numungan      | Lanao Del Norte       | 0 | 0 | 0 | 0 | 0 |
| 147. Padao*                     | Pangasinan            | 0 | 0 | 0 | 0 | 0 |
| 148. Pagatan/ Dagatan           | Quezon                | 0 | 0 | 0 | 0 | 0 |
| 149. Pagusi                     | Agusan Del Norte      | 0 | 0 | 0 | 0 | 0 |
| 150. Paitan                     | Nueva Ecija           | 0 | 0 | 0 | 0 | 0 |
| 151. Palacpaquen/<br>Palakpakin | Laguna                | 1 | 1 | 0 | 2 | 0 |
| 152. Palidan                    | Benguet               | 0 | 0 | 0 | 0 | 0 |
| 153. Palit                      | Kalinga               | 0 | 0 | 0 | 0 | 0 |

|                                     |                 |    |   |    |    |    |
|-------------------------------------|-----------------|----|---|----|----|----|
| 154. Panamao                        | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 155. Pandin                         | Laguna          | 0  | 0 | 1  | 1  | 0  |
| 156. Pantabangan                    | Nueva Ecija     | 0  | 1 | 3  | 4  | 0  |
| 157. Paoay                          | Ilocos Norte    | 0  | 0 | 3  | 3  | 0  |
| 158. Pendo                          | Lanao Del Norte | 0  | 0 | 0  | 0  | 0  |
| 159. Pinagulbuan*                   | Batangas        | 0  | 0 | 0  | 0  | 0  |
| 160. Pinamaloy/<br>Pinamalay        | Bukidnon        | 0  | 0 | 0  | 0  | 0  |
| 161. Pinatubo Crater                | Zambales        | 0  | 0 | 1  | 0  | 1  |
| 162. Pinsal*                        | Ilocos Sur      | 0  | 0 | 0  | 0  | 0  |
| 163. Pulangi                        | Bukidnon        | 0  | 0 | 0  | 0  | 0  |
| 164. Pulog*                         | Sorsogon        | 0  | 0 | 0  | 0  | 0  |
| 165. Putian                         | Lanao Del Sur   | 0  | 0 | 1  | 1  | 0  |
| 166. Quimquimay*                    | Abra            | 0  | 0 | 0  | 0  | 0  |
| 167. Sampaloc                       | Laguna          | 4  | 1 | 3  | 7  | 1  |
| 168. San Marcos                     | Tarlac          | 0  | 0 | 0  | 0  | 0  |
| 169. San Roque<br>Reservoir         | Pangasinan      | 0  | 0 | 1  | 1  | 0  |
| 170. Sani*                          | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 171. Sapa                           | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 172. Saud                           | Ilocos Norte    | 0  | 0 | 0  | 0  | 0  |
| 173. Sebu                           | South Cotabato  | 1  | 1 | 3  | 1  | 4  |
| 174. Siet/Seit                      | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 175. Singuan                        | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 176. Sta Maria                      | Isabela         | 0  | 0 | 0  | 0  | 0  |
| 177. Sultan                         | South Cotabato  | 0  | 1 | 0  | 1  | 0  |
| 178. Sungculan                      | Bohol           | 0  | 0 | 0  | 0  | 0  |
| 179. Taal Crater/Yellow             | Batangas        | 1  | 0 | 0  | 1  | 0  |
| 180. Taal                           | Batangas        | 12 | 5 | 20 | 23 | 14 |
| 181. Tabeyo                         | Benguet         | 0  | 0 | 0  | 0  | 0  |
| 182. Tadalac/ Tadalak/<br>Alligator | Laguna          | 0  | 0 | 4  | 4  | 0  |
| 183. Tagbun-Saing                   | Palawan         | 0  | 0 | 0  | 0  | 0  |
| 184. Taggay                         | Kalinga         | 0  | 0 | 0  | 0  | 0  |
| 185. Talao*                         | Lanao Del Sur   | 0  | 0 | 0  | 0  | 0  |
| 186. Tambo                          | Tarlac          | 0  | 0 | 0  | 0  | 0  |
| 187. Tayak                          | Camarines Sur   | 0  | 0 | 0  | 0  | 0  |
| 188. Tic-on                         | Agusan Del Sur  | 0  | 0 | 0  | 0  | 0  |
| 189. Ticub/Tikub                    | Quezon          | 0  | 0 | 0  | 0  | 0  |
| 190. Timpuok                        | Sulu            | 0  | 0 | 0  | 0  | 0  |
| 191. Tinagong Dagat*                | Iloilo          | 0  | 0 | 0  | 0  | 0  |
| 192. Twin Lakes                     | Negros Oriental | 0  | 0 | 0  | 0  | 0  |

|                                       |                   |     |      |       |   |      |
|---------------------------------------|-------------------|-----|------|-------|---|------|
| 193. Uacon                            | Zambales          | 0   | 0    | 0     | 0 | 0    |
| 194. Uyaan/Ugaan                      | Lanao Del Sur     | 0   | 0    | 0     | 0 | 0    |
| 195. Venado                           | North Cotabato    | 0   | 0    | 0     | 0 | 0    |
| 196. Wood                             | Zamboanga Del Sur | 1   | 0    | 1     | 2 | 0    |
| 197. Yagumyum*                        | Negros Oriental   | 0   | 0    | 0     | 0 | 0    |
| 198. Yambo                            | Laguna            | 0   | 0    | 1     | 1 | 0    |
| Total number of studies by university |                   | 63  | 24   | 165   |   | 252  |
| Percent                               |                   | 25% | 9.5% | 65.5% |   | 100% |

## Appendix 2. Concentration by lake size

| LAKE                     | SURFACE AREA <sup>19</sup><br>(HECTARES) | CLASSIFICATION BY<br>LAKE SIZE: <sup>20</sup>                   |  | STUDIES<br>PER<br>LAKE <sup>21</sup> |
|--------------------------|--|---|--|--------------------------------------|
|                          |  | BIG LAKE<br>(ABOVE 200 HA) OR<br>SMALL LAKE<br>(200 HA & BELOW) |  |                                      |
| 1. Aguingay              | 2.40                                     | Small   |  | 0                                    |
| 2. Alindayat / Alindayot | 63.53                                    | Small   |  | 0                                    |
| 3. Ambuaya               | 1.73                                     | Small   |  | 0                                    |
| 4. Ambuklao              | 383.00*                                  | Big   |  | 0                                    |
| 5. Ambulalacao           | 0.10                                     | Small   |  | 0                                    |
| 6. Amulong               | 1.80                                     | Small   |  | 0                                    |
| 7. Angat Reservoir       | nad <sup>22</sup>                        | nad   |  | 19                                   |
| 8. Apo*                  | 24.00*                                   | Small   |  | 0                                    |
| 9. Asibanglan            | 1.41                                     | Small   |  | 0                                    |
| 10. Baao-Bula            | 717.18 or 177.00*                        | Big or Small  |  | 0                                    |
| 11. Bababu*              | 5.00*                                    | Small   |  | 0                                    |
| 12. Babadak              | 1.81                                     | Small   |  | 0                                    |
| 13. Balanan              | 25.00*                                   | Small   |  | 1                                    |
| 14. Balindpaldo          | nad                                      | nad   |  | 0                                    |
| 15. Balinsasayao         | 76.00*                                   | Small   |  | 0                                    |
| 16. Baloï                | nad                                      | nad   |  | 0                                    |
| 17. Balut                | nad                                      | nad   |  | 0                                    |
| 18. Bannata              | 0.20                                     | Small   |  | 0                                    |
| 19. Baranibud            | nad                                      | nad   |  | 0                                    |
| 20. Baringcu-curong      | 0.74                                     | Small   |  | 0                                    |
| 21. Baruyan              | nad                                      | nad   |  | 0                                    |
| 22. Basak*               | 15.00*                                   | Small   |  | 0                                    |
| 23. Basao                | 9.8                                      | Small   |  | 0                                    |

|                          |           |       |   |
|--------------------------|-----------|-------|---|
| 24. Bato                 | 3,061.36  | Big   | 2 |
| 25. Bedbed/Pusong        | 0.86      | Small | 0 |
| 26. Binga                | nad       | nad   | 0 |
| 27. Bito                 | 140.00*   | Small | 0 |
| 28. Black Bird           | 0.04      | Small | 0 |
| 29. Blingkong*           | nad       | nad   | 0 |
| 30. Boiling              | 1.64      | Small | 0 |
| 31. Bonnong              | 0.47      | Small | 0 |
| 32. Bonot                | 2.42      | Small | 0 |
| 33. Botbot               | 1.99      | Small | 0 |
| 34. Buhi <sup>24</sup>   | 1,672.53  | Big   | 4 |
| 35. Buluan               | 6,134.00* | Big   | 0 |
| 36. Bulusan              | 27.53     | Small | 3 |
| 37. Bunggalaw            | 6.41      | Small | 0 |
| 38. Bunot                | 36.82     | Small | 0 |
| 39. Buranibua*           | nad       | nad   | 0 |
| 40. Butig                | 25.00*    | Small | 0 |
| 41. Cabagan 1 / Malasi 1 | 14.53     | Small | 0 |
| 42. Cabagan 2 / Malasi 2 | 8.01      | Small | 0 |
| 43. Cabalangan*          | nad       | nad   | 0 |
| 44. Cabalian*            | 15.00*    | Small | 0 |
| 45. Cabugao              | nad       | nad   | 0 |
| 46. Calapan*             | nad       | nad   | 0 |
| 47. Calibato             | 47.58     | Small | 0 |
| 48. Caliraya Reservoir   | 1,050.00* | Big   | 3 |
| 49. Caluangan/ Baruyan   | 182.00*   | Small | 0 |
| 50. Camannauan           | 4.68      | Small | 0 |
| 51. Cambirag*            | nad       | nad   | 0 |
| 52. Canarem              | 59.43     | Small | 0 |
| 53. Canarin              | 103.39    | Small | 0 |
| 54. Candelaria           | 48.00*    | Small | 0 |
| 55. Capayahan/ Capahayan | 22.00*    | Small | 0 |
| 56. Carague              | 24.27     | Small | 0 |
| 57. Caramoan             | 0.10      | Small | 0 |
| 58. Casiritan            | 45.48     | Small | 0 |
| 59. Castila              | 3.15      | Small | 0 |
| 60. Catol                | 19.00*    | Small | 0 |
| 61. Coron                | 1,219.94  | Big   | 0 |
| 62. Dacula/ Dakula       | 12.00*    | Small | 0 |
| 63. Dagat Dagatan        | 24.38     | Small | 0 |

|                             |                   |              |     |
|-----------------------------|-------------------|--------------|-----|
| 64. Dagianan*               | 3.00*             | Small        | 0   |
| 65. Dagon                   | nad               | nad          | 0   |
| 66. Danao – Negros Oriental | 28.00*            | Small        | 0   |
| 67. Danao – Albay           | 18.00*            | Small        | 0   |
| 68. Danao - Cebu            | 680.00*           | Big          | 0   |
| 69. Danao – Ilocos Norte    | 5.40              | Small        | 0   |
| 70. Danao* - Sorsogon*      | 4.00*             | Small        | 0   |
| 71. Danao/Imelda - Leyte    | 148.00            | Small        | 0   |
| 72. Danum                   | 1.36              | Small        | 0   |
| 73. Dapao                   | 1,012.00*         | Big          | 0   |
| 74. Dariwdiw/Sarnap         | 1.45              | Small        | 0   |
| 75. Dasay                   | 40.00*            | Small        | 0   |
| 76. Davo*                   | nad               | nad          | 0   |
| 77. Dinaykong               | 0.11              | Small        | 0   |
| 78. Duminagat               | 1,230.90 or 9.00* | Big or Small | 0   |
| 79. Dunoy 1                 | 0.11              | Small        | 0   |
| 80. Dunoy 2                 | 0.16              | Small        | 0   |
| 81. Ernestine               | 35.00*            | Small        | 0   |
| 82. Furaw Dalag             | 1.86              | Small        | 0   |
| 83. Galang                  | nad               | nad          | 0   |
| 84. Gawaan                  | 0.21              | Small        | 0   |
| 85. Gunaw / Gunao           | 1.32/23.00*       | Small        | 0   |
| 86. Himbang                 | 26.00*            | Small        | 0   |
| 87. Ibag*                   | nad               | nad          | 0   |
| 88. Inkolos Peatland        | 0.66              | Small        | 0   |
| 89. Jamboree                | 2.64              | Small        | 0   |
| 90. Jones                   | 8.23              | Small        | 0   |
| 91. Kabalin-an*             | 2.00*             | Small        | 0   |
| 92. Kagmutiong Lakelets     | 2.09              | Small        | 0   |
| 93. Kalanganan              | 12.00*            | Small        | 0   |
| 94. Katudgay Lakelets       | 1.45              | Small        | 0   |
| 95. Kawkawayan              | 0.35              | Small        | 0   |
| 96. Kimkimay                | 1.32              | Small        | 0   |
| 97. La Mesa Reservoir       | 463*              | Big          | 3   |
| 98. Labas*                  | nad               | nad          | 0   |
| 99. Ladioan/Ladlaonan       | 11.6              | Small        | 0   |
| 100. Laguna de Bay          | 90,159.68         | Big          | 103 |
| 101. Laguna                 | nad               | nad          | 0   |
| 102. Lalaguna               | 89.25             | Small        | 0   |
| 103. Lalaguna Marsh         | nad               | nad          | 0   |

|                            |                      |              |    |
|----------------------------|----------------------|--------------|----|
| 104. Lalig                 | 3.69                 | Small        | 0  |
| 105. Lamit/Lahit           | nad                  | nad          | 0  |
| 106. Lamybyhen*            | nad                  | nad          | 0  |
| 107. Lanao – Bohol*        | 2.00*                | Small        | 0  |
| 108. Lanao – Lanao Del Sur | 36,268.17            | Big          | 28 |
| 109. Lantukan              | nad                  | nad          | 0  |
| 110. Latep-Ngapos          | 0.44                 | Small        | 0  |
| 111. Leonard               | 70.00*               | Small        | 0  |
| 112. Libuao*               | 24.00*               | Small        | 0  |
| 113. Libungan Marsh        | nad                  | nad          | 0  |
| 114. Liguasan Marsh        | nad                  | nad          | 7  |
| 115. Loloog*               | nad                  | nad          | 0  |
| 116. Look/Looc             | 4.82/113.00*         | Small        | 0  |
| 117. Lumao                 | 1,680.00*            | Big          | 0  |
| 118. Lumot                 | 582.00*              | Big          | 1  |
| 119. Lumpo*                | nad                  | nad          | 0  |
| 120. Lunay*                | nad                  | nad          | 0  |
| 121. Mabilog*              | 2.00*                | Small        | 0  |
| 122. Magat Reservoir       | 1,122.00*            | Big          | 3  |
| 123. Mahagnao              | nad                  | nad          | 0  |
| 124. Mahakdum/Mahokdum     | 22.00*               | Small        | 0  |
| 125. Mainit                | 13,514.13/17,340.00* | Big          | 1  |
| 126. Makuao Lakelets       | 0.81                 | Small        | 0  |
| 127. Malasi                | 11.91                | Small        | 0  |
| 128. Malimanga             | 21.87                | Small        | 0  |
| 129. Malinao*              | nad                  | nad          | 0  |
| 130. Manamlay/Panikian*    | 11.00*               | Small        | 0  |
| 131. Manapao Lakelets      | 2.15                 | Small        | 0  |
| 132. Manguao/Mangua        | 1,226.33/741.00*     | Big          | 1  |
| 133. Manipis               | 1.02                 | Small        | 0  |
| 134. Mantohod*             | nad                  | nad          | 0  |
| 135. Maobog*               | nad                  | nad          | 0  |
| 136. Mapanuepe             | 646.06               | Big          | 0  |
| 137. Maughan/Manghan       | 244.27/317.00        | Big          | 0  |
| 138. Mohicap/Muhikap       | 18.68                | Small        | 0  |
| 139. Nabao Oxbow           | 32.06                | Small        | 0  |
| 140. Nag-aso Boiling*      | 3.00*                | Small        | 0  |
| 141. Nailig*               | 11.00*               | Small        | 0  |
| 142. Nalapan*              | 3.00*                | Small        | 0  |
| 143. Napait/Napalit        | 1,233.10/36.00*      | Big or Small | 0  |
| 144. Naujan                | 25,361.82/8,125.00*  | Big          | 1  |

|                              |                |       |    |
|------------------------------|----------------|-------|----|
| 145. Nungon                  | nad            | nad   | 0  |
| 146. Nunungan/Numungan       | 153.00*        | Small | 0  |
| 147. Padao*                  | nad            | nad   | 0  |
| 148. Pagatan/Dagatan         | 3.22           | Small | 0  |
| 149. Pagusi                  | nad            | nad   | 0  |
| 150. Paitan                  | 63.83          | Small | 0  |
| 151. Palacpaquen/Palakpakin  | 51.98          | Small | 2  |
| 152. Palidan                 | 1.66           | Small | 0  |
| 153. Palit                   | 0.2            | Small | 0  |
| 154. Panamao                 | 68.00*         | Small | 0  |
| 155. Pandin                  | 24.83          | Small | 1  |
| 156. Pantabangan             | 5,923.00*      | Big   | 4  |
| 157. Paoay                   | 327.60/403.00* | Big   | 3  |
| 158. Pendo                   | nad            | nad   | 0  |
| 159. Pinagulbuan*            | 2.00*          | Small | 0  |
| 160. Pinamalay/Pinamalay     | 60.00*         | Small | 0  |
| 161. Pinatubo Crater         | 176.13         | Small | 1  |
| 162. Pinsal*                 | nad            | nad   | 0  |
| 163. Pulangi                 | 1,985.00*      | Big   | 0  |
| 164. Pulog*                  | 2.00*          | Small | 0  |
| 165. Putian                  | nad            | nad   | 1  |
| 166. Quimquimay*             | nad            | nad   | 0  |
| 167. Sampaloc                | 99.58          | Small | 8  |
| 168. San Marcos              | 24.00*         | Small | 0  |
| 169. San Roque Reservoir     | 882.00*        | Big   | 1  |
| 170. Sani*                   | 11.00*         | Small | 0  |
| 171. Sapa                    | 112.00*        | Small | 0  |
| 172. Saud                    | 1.62           | Small | 0  |
| 173. Sebu                    | 354.62         | Big   | 5  |
| 174. Siet/Seit               | 59.00*         | Small | 0  |
| 175. Singuan                 | 112.00*        | Small | 0  |
| 176. Sta Maria               | 2.23           | Small | 0  |
| 177. Sultan                  | nad            | nad   | 1  |
| 178. Sungculan               | 49.00*         | Small | 0  |
| 179. Taal                    | 23,852.94      | Big   | 37 |
| 180. Taal Crater/Yellow      | 117.34         | Small | 1  |
| 181. Tabeyo                  | 1.96           | Small | 0  |
| 182. Tادلac/Tادلak/Alligator | 23.32          | Small | 4  |
| 183. Tagbun-Saing            | nad            | nad   | 0  |
| 184. Taggay                  | 0.14           | Small | 0  |
| 185. Talao*                  | nad            | nad   | 0  |

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|                                  |             |       |     |
|----------------------------------|-------------|-------|-----|
| 186. Tambo                       | 91.98       | Small | 0   |
| 187. Tayak                       | 1.4         | Small | 0   |
| 188. Tic-on                      | nad         | nad   | 0   |
| 189. Ticub/Tikub                 | 47.69       | Small | 0   |
| 190. Timpuok                     | 32.00*      | Small | 0   |
| 191. Tinagong Dagat*             | 4.00*       | Small | 0   |
| 192. Twin Lakes                  | 1,227.23    | Big   | 0   |
| 193. Uacon                       | 70.00*      | Small | 0   |
| 194. Uyaan/Ugaan                 | 28.00*      | Small | 0   |
| 195. Venado                      | nad         | nad   | 0   |
| 196. Wood                        | 738.00*     | Big   | 2   |
| 197. Yagumyum*                   | 1.00*       | Small | 0   |
| 198. Yambo                       | 35.12/5.00* | Small | 1   |
| Total number of studies on lakes |             |       | 252 |

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