LacewingMAP - Progress report on the Atlas of African Neuroptera and Megaloptera, 2014 - 2019

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This report describes progress with the atlas of lacewings, defined as the orders Neuroptera and Megaloptera, up to 31 March 2019. The database of the project contained 15,781 records, in two components - 12,898 specimen records and 2,883 photographic records - submitted to the LacewingMAP section of the Virtual Museum, over a period of 4.5 years (September 2014 to March 2019). The average rate of submission of photographic records for LacewingMAP for the four calendar years 2015 to 2018 was 566 per year, three times faster than the rate at which the specimen database grew during the second half of the 20th century. 234 citizen scientists contributed photographic records to LacewingMAP. It seems that almost all of these people have primary interests in other taxa, and that the records submitted to LacewingMAP were a 'by-catch'. Photographs of at least two new species were submitted by citizen scientists during 2018.

What are the lacewings, and why are they interesting?

We live in a world which is lacewing-blind. Most people would not be able to identify a flying insect as a lacewing, let alone distinguish between species (Figures 1 and 2). But almost everyone has encountered an artefact created by the larvae of lacewings. They recognize the distinctive funnel-shaped pits in sandy areas (Figure 3), and they have been told that there is a beast called an antlion lying in wait below to consume any insect that slips down the side of the funnel. But, few people grasp that the antlion is to the lacewing what the caterpillar is to the butterfly. They are blind to the existence, and value, of lacewings, the adults of the creatures that live in the sand.

13 of the 16 recognised families of Neuroptera occur in southern Africa, and both families

Figure 1: With 518 records, *Myrmeleon obscurus* is the most frequently recorded species in the LacewingMAP database. There are 124 photographic records. This photograph was taken by Alan Manson in Pietermaritzburg, KwaZulu-Natal. This record is curated at http://vmus.adu. org.za/?vm=LacewingMAP-9551

of Megaloptera. This report focuses mainly on the Neuroptera, popularly known as lacewings. The Afrotropics (i.e. Africa south of the Sahara Desert) has an especially rich and varied fauna of lacewings and approximately 500 species occur in southern Africa alone, defined as the region south of the Kunene and Zambezi Rivers (Mansell 2002). Furthermore, about half of these are endemic to this area.

Neuroptera are excellent indicators of environmental and habitat transformation, and include key species for signifying areas and faunas that require priority protection. They are vulnerable to habitat fragmentation and pesticide contamination (Mansell 2002, Winterton *et al*. 2010).

The larvae of the lacewings are all specialised predators with unique, highly evolved mouthparts. As predators, lacewing larvae have the potential to have a major impact upon populations of other insects and small Arthropoda, and especially aphids. They have therefore, long been considered an attractive option as biological control agents in greenhouses, orchards and fields (New 1975, Mansell 2002). The recommendation is to augment species native to an area by means of mass rearing, and not to introduce new lacewing species (New 1985).

Only one of the families, the Myrmeleontidae, includes species whose larval stage consists of antlions that construct funnel-shaped pits in sand (Figure 3). The larvae of the other families take on a diverse variety of forms; they range from aquatic to semi-aquatic, and there are species with larvae which live freely in sand, under rock ledges, small caves, holes in trees, and as free-living ambush predators on vegetation. Some are parasites in spider nests, and inquilines in ant nests. Nothing is known about the larvae of some species (Mansell 2002, Winterton *et al*. 2010).

The Neuroptera are model subjects for scientific research because they have a wide diversity of lifestyles. Adults of several families are key pollinators of indigenous flora; especially the family Nemopteridae (the thread-wing and the spoon-and ribbon-wing lacewings) (Mansell 2002).

Figure 2: With 516 records, *Hagenomyia tristis* is the second most frequently recorded species in the LacewingMAP database. There are 154 photographic records. This photograph was taken by Bernardine Altenroxel near Mooketsi, Limpopo. This record is curated at http://vmus.adu. org.za/?vm=LacewingMAP-596

Figure 3: The conical pit-trap constructed in sand or loose soil by larvae of some antlions. The larvae buries itself at the bottom. Ants and other small arthropods fall over the edge, slip to the bottom of the pit-trap and are unable to climb out because of the steepness of the slope and the looseness of the sand. They are pounced on by the antlion larva, which then sucks the body fluids out of its prey. The dry husk is tossed out of the pit, which is then repaired.

What is the objective of LacewingMAP?

Given that the lacewings are important, the long-term objective of the LacewingMAP project is to develop an atlas of the distributions of the Neuroptera and Megaloptera in Africa, focusing initially on southern Africa, then the Afrotropics, and ultimately the African continent. The project is loosely modelled on the "butterfly atlas" and the "reptile atlas" (Mecenero *et al*. 2013, Bates *et al*.2014). For both those projects, the foundational data were the historical specimen record data, supplemented by photographic data uploaded to the "Virtual Museum" by citizen scientists. The Virtual Museum is described by Mecenero *et al*. (2013) and Bates *et al*. (2014). The lacewing atlas uses the same strategy. Specimen records were (and continue to be) assembled by us, photographic records are collected by citizen scientists, and the combined database is curated by the Virtual Museum.

    This report reviews progress up to March 2019. The first image of a lacewing was uploaded to the LacewingMAP section of the Virtual Museum on 19 September 2014. This report is based on the specimen database, plus photographic records assembled over four and a half years, up to 31 March 2018.

What is the volume of records in the LacewingMAP database?

The total number of records in the LacewingMAP database on 31 March 2019 was 15,781 (Table 1). They are split into two components in this database, seamlessly merged as a single entity. The largest component consists of 12,898 records, mainly based on museum specimens, assembled by us, and recorded in a Palpares Relational Database (Mansell & Kenyon 2002). This is supplemented by 2,883 photographic records, submitted to the LacewingMAP section of the Virtual Museum (http://vmus.adu.org.za) by citizen scientists (Table 1). Each photographic record uploaded to the Virtual Museum contains either one, two or three images of the live animal; each record is evaluated by us, and we allocate it to family, genus or species.

Table 1: Numbers of LacewingMAP records for African countries on 31 March 2019. The second column gives the number of photographic records uploaded by citizen scientists; the third total gives the total number of records in the database for each country.

Country	LacewingMAP	Total
Algeria		1
Angola	5	38
Benin		11
Botswana	100	391
Burkina-Faso		26
Burundi		2
Cameroon		33
Cape Verde Islands		11
Central African Republic		8
Chad		8
Comoros		13
Democratic Republic of Congo	3	708
Djibouti		8
Equatorial Guinea		20

Table 1: *(continued)*

Country	LacewingMAP	Total
Eritrea		6
Ethiopia		15
Gabon		25
Gambia		17
Ghana	1	20
Guinea		19
Ivory Coast		36
Kenya	23	205
Lesotho	1	10
Liberia	1	3
Madagascar	4	115
Malawi	170	342
Mali		49
Mauritania		10
Mauritius		3
Mozambique	43	144
Namibia	90	1,020
Niger		24
Nigeria	11	54
Reunion		4
Rwanda		3
Senegal		51
Seychelles		14
Sierra Leone	1	5
Socotra Island (Yemen)		4
Somalia	1	24
South Africa	2,225	10,917
St Helena		2
Sudan	8	20
Swaziland	87	197
Tanzania	13	119
Togo		11
Uganda		21
Zaire		4
Zambia	87	346
Zimbabwe	9	644
Total	2,883	15,781

The majority of the 2,883 photographic records, uploaded to the Virtual Museum were submitted from South Africa (2,225, 77%) (Table 1). A total of 658 records were submitted from 20 other African countries; six countries had more than 40 records: Malawi (170), Botswana (100), Namibia (90), Swaziland (87), Zambia (87) and Mozambique (43) (Table 1).

In the overall database, 10,917 records are from South Africa (Table 1). Countries with totals more than 500 records are Namibia (1,020), Democratic Republic of Congo (708) and Zimbabwe

(644) (Table 1). 50% of Malawi's 342 records are photographic, as are 44% of Swaziland's 197 records, and 30% of Mozambique's 144 (Table 1).

Within the nine provinces of South Africa, the largest contributions of photographic records have come from Northern Cape (484, 21.7% of total of 2,222 for South Africa), Limpopo (456, 20.5%) and KwaZulu-Natal (420, 18.5%) (Table 2). Within the database as a whole, Limpopo has the most records (2,606, 24.6% of 10,594 records for South Africa) and the Northern Cape has 1,688 (15.9%) (Table 2). Three of the photographic records and 323 of the total records from South Africa did not have "province" assigned (Tables 1 and 2).

Table 2: Numbers of LacewingMAP records for the provinces of South Africa on 31 March 2019. The second column gives the number of photographic records uploaded by citizen scientists; the third total gives the total number of records in the database for each province.

Province	LacewingMAP	Total
Eastern Cape	180	867
Free State	65	225
Gauteng	171	918
KwaZulu-Natal	420	1,390
Limpopo	456	2,606
Mpumalanga	161	1,110
North-West	38	622
Northern Cape	484	1,688
Western Cape	249	1,168
Total	2,222	10,594

The average rate of submission of photographic records for LacewingMAP for the four years 2015 to 2018 was 566 per year (Table 3). This rate can be compared with the annual collection rate for the specimen section of the database (Table 4). The photographic rate generated by citizen scientists is 64% above the "best" decade (the 1980s), 5.5 times more than the 20th century as a whole (102 per year), and three times more than the second half of the 20th century (176 per year) (Table 4).

Table 3: Annual totals (1 January to 31 December of each calendar year) of photographic submissions to the LacewingMAP section of the Virtual Museum. The row Pre-start refers to records of lacewings submitted to OdonataMAP. These were not deleted from the Virtual Museum database, and were re-allocated to LacewingMAP when the project started (see Figure 2). The total for 2019 is incomplete.

Year (Jan to Dec)	Number of submissions
Pre-start	21
Sep to Dec 2014	299
2015	547
2016	502

Table 3: *(continued)*

Year (Jan to Dec)	Number of submissions
2017	536
2018	678
Jan to Mar 2019	300
Total (31 Mar 2019)	2883

Table 4: Using the specimen database, the average number of records per year was calculated for each decade of the 20th century, and the 21st century to date.

Decade	Records per year
1900-09	10.8
1910-19	29.1
1920-29	36.0
1930-39	48.6
1940-49	20.4
1950-59	63.3
1960-69	75.0
1970-79	151.3
1980-89	345.5
1990-99	244.1
2000-09	136.9
2010-18	61.3

The monthly pattern of submissions shows a minimum in the winter months from May to August, and a peak in the summer months from December to April (Figure 4). This plot confirms the general pattern of seasonality of conspicuous occurrence of lacewings.

Each record is georeferenced as accurately as feasible. For mapping purposes each record is allocated to a quarter degree grid cell. This 15-minute grid system has been widely used by biodiversity atlas projects in southern Africa (e.g. Mecenero *et al*. 2013, Bates *et al*. 2014). The 15-minute (quarter degree) grid generates 2025 quarter degree grid cells in South Africa, Lesotho and Swaziland. Of these, 835 grid cells (41.2%) have at least one species of lacewing recorded (Figure 5). 230 grid cells have a single species recorded in them. On the other hand, there are only two degree cells with no records at all, one in the Northern Cape and one in North West Province. At this stage, the patterns of species richness still reflect observer effort rather than the true distribution of species richness.

What species are in the LacewingMAP database?

The taxonomy upon which LacewingMAP is based contained 1,249 species in March 2019 (Table 5); this taxonomic spine, which is pivotal for the project, is updated from time to time, as necessary. This taxonomy is of Afrotropical species; 18 of these species are from the order Megaloptera (two families Corydalidae and Sialidae), and the remaining 1,231 species are Neuroptera, classified into 13 families (Table 5). By far, the largest family is the Myrmeleontidae, containing 461 species. 415 species of Neuroptera are currently known from South Africa
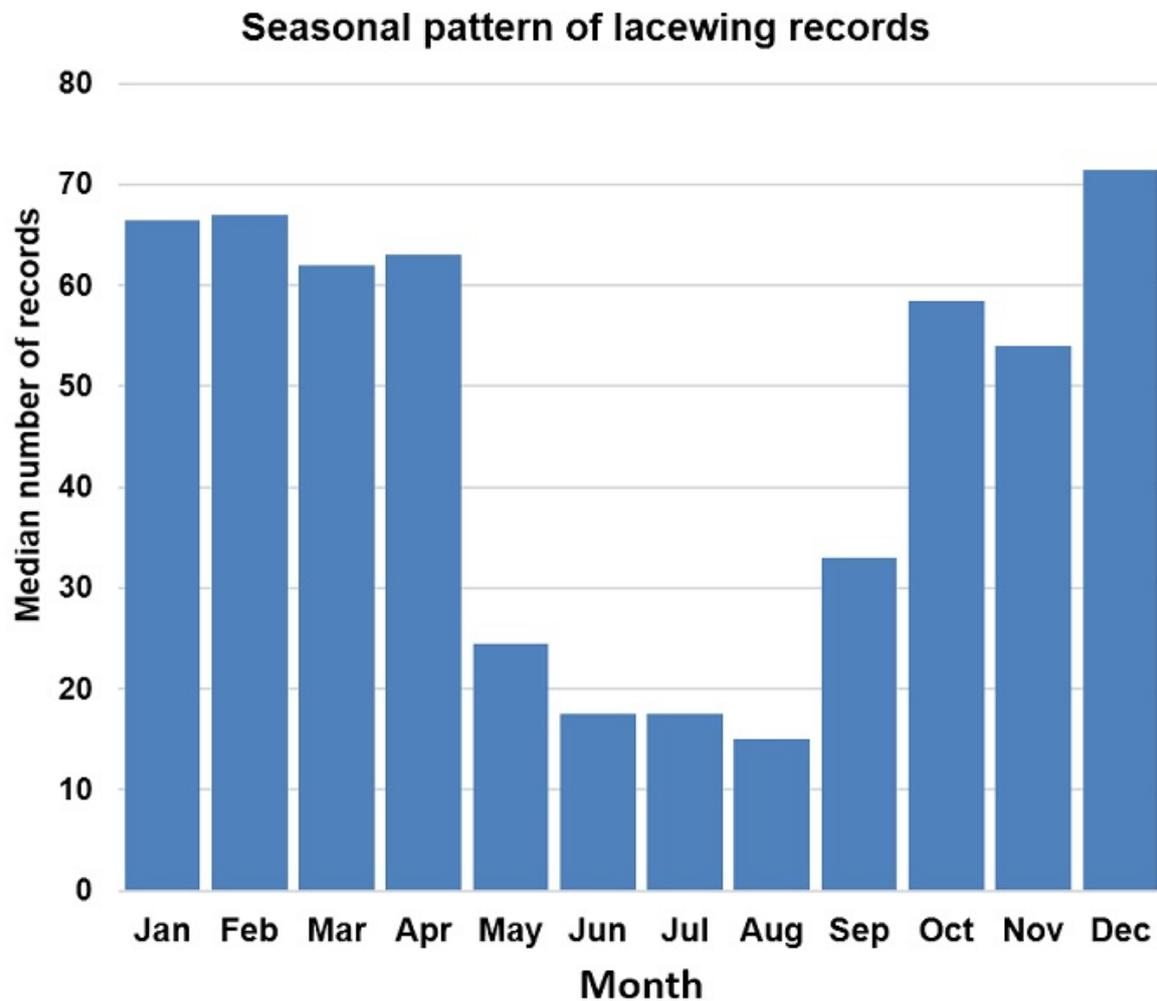
Figure 4: The barplot shows the seasonal pattern of the submission of photographic records to the LacewingMAP section of the Virtual Museum. The height of the bar for each month is the median of the number of records submitted in that month over the four years 2015 to 2018.

Figure 5: LacewingMAP species richness in South Africa, Lesotho and Swaziland per quarter degree grid cell, on 31 March 2019. The species richness is grouped into six classes, with the cutpoints chosen so that, as close as possible with integer arithmetic, 1/6th of the grid cells have the same colour. There is at least one species recorded in 835 of the 2,025 grid cells in the three countries (41.2%).

(Mansell & Oswald 2018), and 834 from the remainder of the Afrotropical Region, i.e. species that do not occur in South Africa.
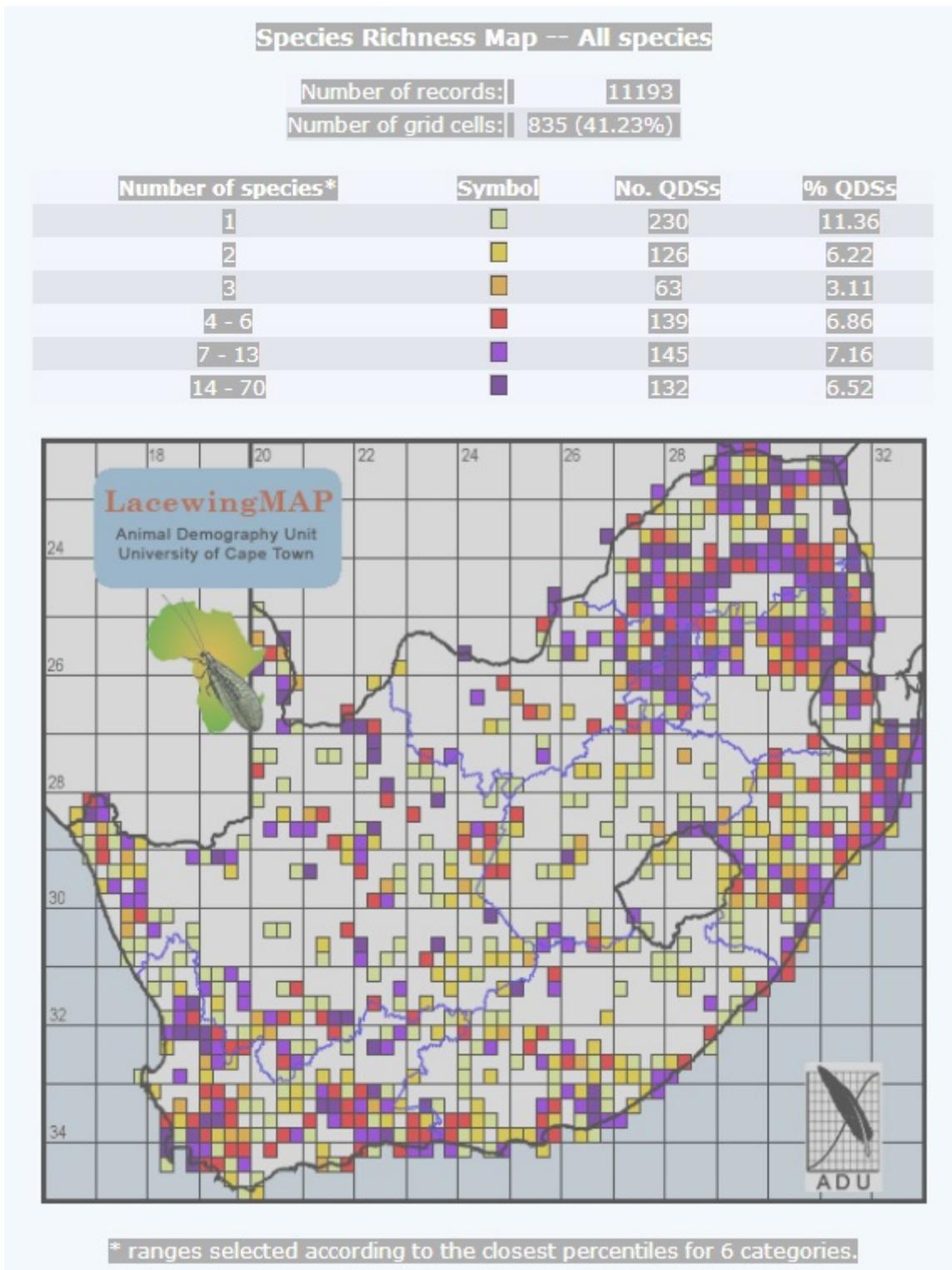
Table 5: The column headed 'Sp. in tax.' (Species in taxonomy) provides the number of species in each of the 15 families in the two orders (Megaloptera and Neuroptera). This is based on the taxonomy in use in LacewingMAP in March 2019. This taxonomic 'spine' is updated at intervals. The remaining columns provide the number of photographic records for each Family which were identified to Family (only), Genus (only) and Species level. For each family, the total number of photographic records is provided (Total), and also the number of species they represent (Sp. rec.).

Order	Family	Sp. in tax.	Family	Genus	Species	Total	Sp. rec.
Megaloptera	Corydalidae	14	0	0	0	0	0
Megaloptera	Sialidae	4	0	0	0	0	0
Neuroptera	Osmylidae	18	3	0	1	4	1
Neuroptera	Nemopteridae	87	0	32	56	88	11
Neuroptera	Mantispidae	100	49	7	6	62	2
Neuroptera	Dilaridae	1	0	0	0	0	0
Neuroptera	Psychopsidae	10	0	2	42	44	4
Neuroptera	Myrmeleontidae	462	51	393	1,441	1,885	88
Neuroptera	Hemerobiidae	55	8	18	19	45	8
Neuroptera	Coniopterygidae	100	1	0	0	1	0
Neuroptera	Chrysopidae	200	217	127	184	528	25
Neuroptera	Rhachiberothidae	11	0	0	0	0	0
Neuroptera	Berothidae	30	0	8	0	8	0
Neuroptera	Ascalaphidae	146	26	26	136	188	25
Neuroptera	Sisyridae	11	0	0	0	0	0
Totals		1,249	355	613	1,885	2,853	164
Percentages			12.4	21.5	66.1	100	NA

Of the 1,249 species in the taxonomy, the overall LacewingMAP database (specimens and photographs) contained records for 952 on 31 March 2019. 20 species had 148 or more records, of which 18 were members of the family Myrmeleontidae (Table 6). The two species with the most records were *Myrmeleon obscurus* (518) and *Hagenomyia tristis* (516) (Figures 1 and 2). The distribution maps for these two species within South Africa, Lesotho and Swaziland (Figures 6 and 7) show distinctly different patterns: it seems probable that *Myrmeleon obscurus* occurs throughout South Africa (Figure 6), but that *Hagenomyia tristis* is confined to the eastern half of the country (Figure 7).

Table 6: The 20 species with the largest numbers of records in the LacewingMAP database (specimen and photographic records combined) on 31 March 2019. The first column provides the species codes used in the Virtual Museum database.

Species code	Family	Species	Records
328640	Myrmeleontidae	*Myrmeleon obscurus*	518
328240	Myrmeleontidae	*Hagenomyia tristis*	516
327920	Myrmeleontidae	*Cueta trivirgata*	456
329340	Myrmeleontidae	*Palpares caffer*	395
327380	Myrmeleontidae	*Banyutus lethalis*	360
327780	Myrmeleontidae	*Creoleon mortifer*	350
328560	Myrmeleontidae	*Myrmeleon alcestris*	272
327540	Myrmeleontidae	*Centroclisis brachygaster*	252
328960	Myrmeleontidae	*Nesoleon boschimanus*	249
328220	Myrmeleontidae	*Hagenomyia lethifer*	243
329060	Myrmeleontidae	*Neuroleon chloranthe*	235
328360	Myrmeleontidae	*Macroleon quinquemaculatus*	230
328580	Myrmeleontidae	*Myrmeleon doralice*	228
327900	Myrmeleontidae	*Cueta punctatissima*	226
331520	Psychopsidae	*Silveira marshalli*	182
329520	Myrmeleontidae	*Palpares sobrinus*	174
321140	Ascalaphidae	*Proctarrelabis involvens*	163
329560	Myrmeleontidae	*Palpares speciosus*	163
328320	Myrmeleontidae	*Lachlathetes moestus*	155
327740	Myrmeleontidae	*Creoleon diana*	148

All 12,898 records in the specimen database are identified to species. Species level identification from photographs is not always possible because many lacewings, and especially the species of "green lacewings" of the family Chrysopidae, can only be identified by dissection.

By 31 March 2019, we had undertaken identifications of 2,853 of the 2,883 photographic records submitted by citizen scientists. This provides a large sample of records from which we can attempt to quantify the extent of the identification issues. 1,885 of the 2,853 records (66.1%) were identified to species level, 613 (21.5%) to genus level only, and 355 (12.4%) to family level only (Table 5). Of those identified to family level only, 217 records (61%) were Chrysopidae (green lacewings), 50 records (14%) were Myrmeleontidae (antlions) and 49 records (14%) were Mantispidae (mantidflies) (Table 5).

Of the 613 records identified to genus level only (Table 5), 348 belonged to five genera: 105 in the genus *Chrysoperla* in the family Chrysopidae, and 83, 79, 67, and 55 in the genera *Centroclisis*, *Cueta*, *Myrmeleon* and *Creoleon*, respectively, of the family Myrmeleontidae (antlions). In summary, the green lacewings, i.e. the family Chrysopidae and especially the genus *Chrysoperla* within this family, and four genera within the family Myrmeleontidae (antlions) present the largest identification challenges from photographs.

In the photographic database, of the 22 species with more than 20 records (Table 7), 15 are also in Table 6, the top 20 species overall. There is one species in Table 7 for which more than half of all records are photographic: *Dichochrysa tacta* (recently renamed *Pseudomallada tactus*) has 43 photographic records and 41 specimen records. The distribution map (Figure 8) demonstrates how the photographic records are helping to "fill in" the range suggested by the
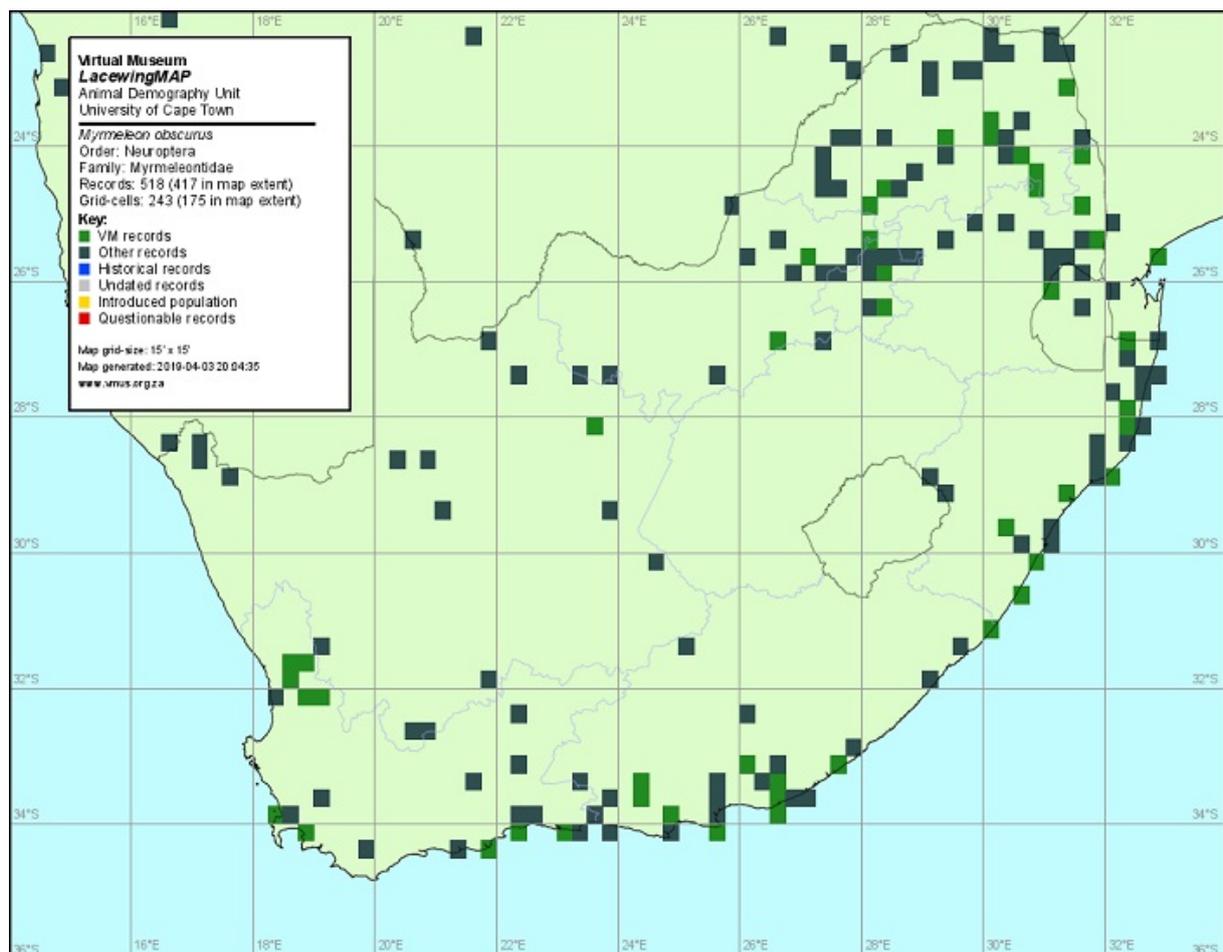
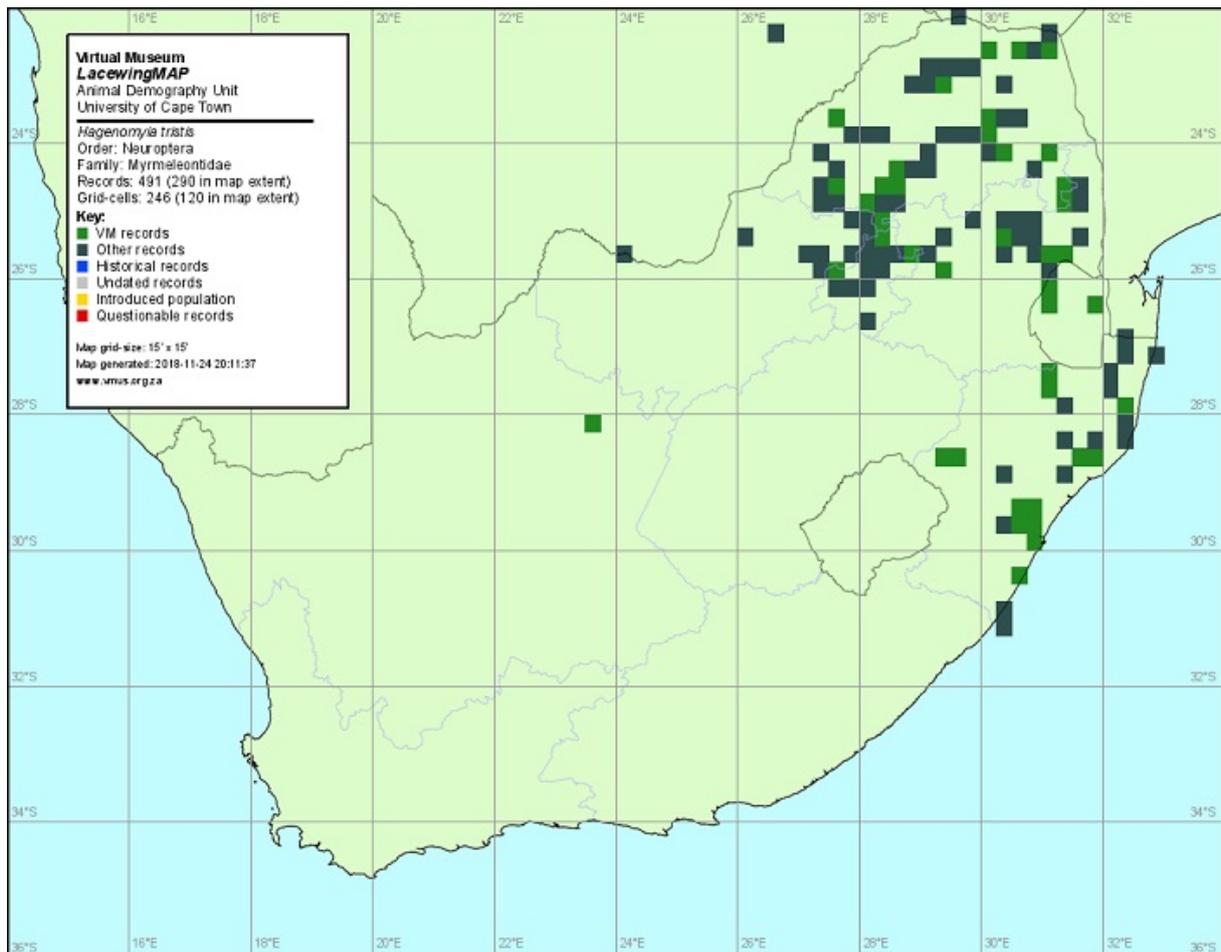Figure 6: Distribution map for *Myrmeleon obscurus* (Figure 1) in South Africa, Lesotho and Swaziland.

Figure 7: Distribution map for *Hagenomyia tristis* (Figure 2) in South Africa, Lesotho and Swaziland.

specimen records.

Table 7: The 22 species with with more than 20 photographic records in the LacewingMAP database on 31 March 2019. The first column provides the species codes used in the Virtual Museum database.

Species code	Family	Species	Records
328240	Myrmeleontidae	*Hagenomyia tristis*	154
327380	Myrmeleontidae	*Banyutus lethalis*	146
328640	Myrmeleontidae	*Myrmeleon obscurus*	124
329340	Myrmeleontidae	*Palpares caffer*	116
327780	Myrmeleontidae	*Creoleon mortifer*	66
327920	Myrmeleontidae	*Cueta trivirgata*	51
328360	Myrmeleontidae	*Macroleon quinquemaculatus*	60
328220	Myrmeleontidae	*Hagenomyia lethifer*	47
328320	Myrmeleontidae	*Lachlathetes moestus*	43
323500	Chrysopidae	*Dichochrysa tacta*	43
327900	Myrmeleontidae	*Cueta punctatissima*	43
329520	Myrmeleontidae	*Palpares sobrinus*	42
329560	Myrmeleontidae	*Palpares speciosus*	38
322860	Chrysopidae	*Chrysemosa jeanneli*	34
329060	Myrmeleontidae	*Neuroleon chloranthe*	30
328560	Myrmeleontidae	*Myrmeleon alcestris*	29
320900	Ascalaphidae	*Eremoides bicristatus*	29
328580	Myrmeleontidae	*Myrmeleon doralice*	26
329440	Myrmeleontidae	*Palpares inclemens*	25
327880	Myrmeleontidae	*Cueta mysteriosa*	23
328960	Myrmeleontidae	*Nesoleon boschimanus*	23
320560	Ascalaphidae	*Ascalaphus bilineatus*	21

The genus *Dichochrysa* (now *Pseudomallada*) is part of the family Chrysopidae, the green lacewings, for which identifications are generally difficult. However, along with the genus *Italochrysa*, most photographic records for both genera were identified to species (88% and 86%, respectively) (LacewingMAP database).

Who are the main contributors of photographic records to the LacewingMAP database?

By March 2019, 234 people had submitted records to LacewingMAP; 36 had submitted more than 20 records (Table 8). It is true to state that none of these 36 people have a primary interest in the lacewings (in the way that people have primary interests in a particular taxon, such as birds, butterflies, reptiles, dragonflies and damselflies, or even spiders or scorpions). 90 people had submitted a single record, and the median number of submissions per observer was three. The Virtual Museum had a total of 2,256 observers on 31 March 2019. Only eight of the 234 participants in LacewingMAP had submitted records only to this section of the Virtual Museum (seven had submitted one record, and one person had submitted 12, the only specialist LacewingMAPper). For 98.8% of the 2,256 Virtual Museum participants, submissions to LacewingMAP were less than 10% of their total numbers of records submitted. These observa-

LacewingMAP Database -- Species Summary information[*]

Species code:	323500
Scientific name:	Dichochrysa tacta
English name:	
Family:	Chrysopidae
Red Data Status:	
Number of records:	74
Number of grid cells:	38 (1.87%)
Number of records not within the geographic scope:	0

Record type	Symbol	No. Rec.	% Rec.	No. QDSs	% QDSs
Non-VM	▢	31	41.89	25	1.23
VM	●	43	58.11	14	0.69
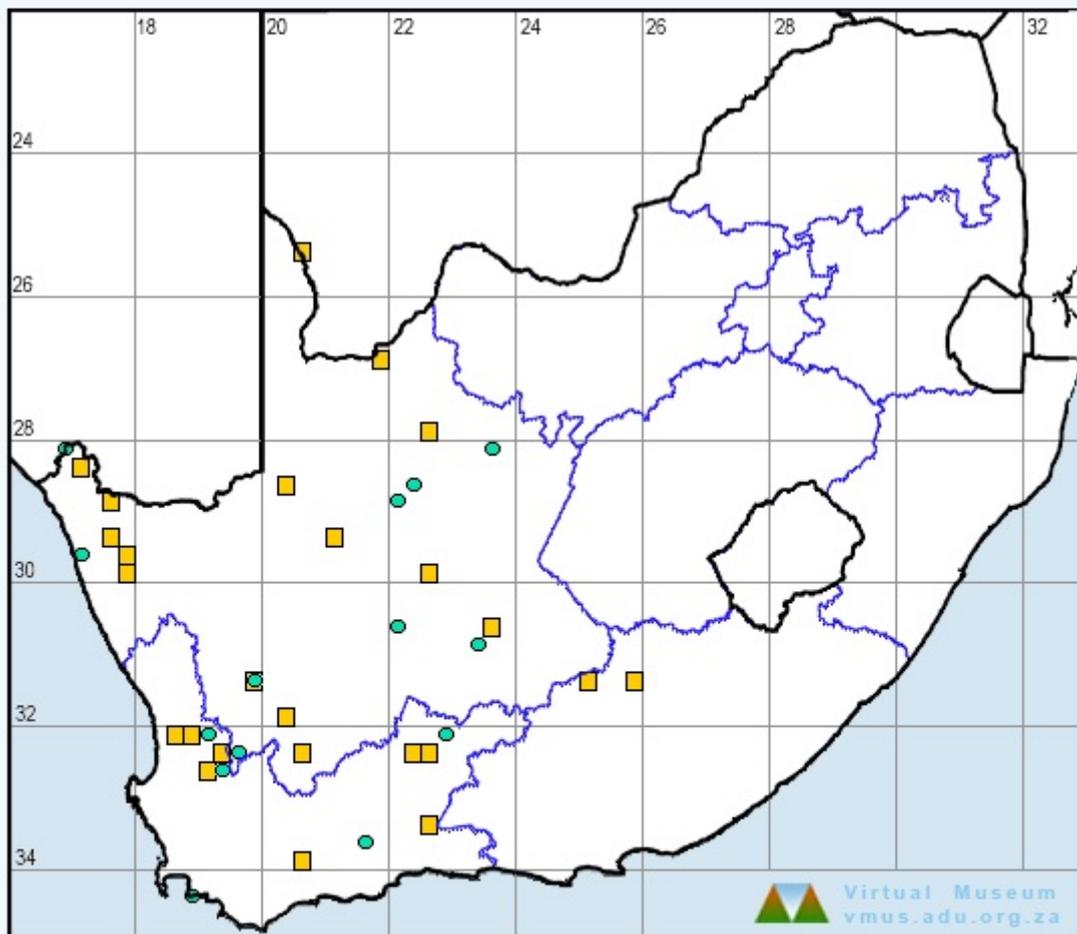
* including accepted records for South Africa, Swaziland and Lesotho only.

Figure 8: Distribution map for *Dichochrysa tacta*, recently renamed *Pseudomallada tactus*, in South Africa, Lesotho and Swaziland. Orange squares denote grid cells having specimen records, and turquoise circles denote grid cells having photographic records.

tions suggest that photographic records are submitted to LacewingMAP opportunistically, as they are encountered. The lacewings are an extremely valuable by-catch.

Table 8: 36 citizen scientists had submitted 20 or more photographic records to LacewingMAP in the period September 2014 to March 2019.

Citizen scientist	Records
Altha Liebenberg	235
Ryan Tippett	193
Gary Brown	161
Vaughan Jessnitz	130
Zenobia van Dyk	107
Alan Manson	102
Dewald du Plessis	90
Kate Braun	81
Pieter Cronje	76
Craig Peter	76
Bernardine Altenroxel	70
Christopher Willis	68
Len de Beer	67
James Harrison	53
Norman Barrett	51
John Wilkinson	46
Luke Kemp	45
Johan Heyns	44
Neil Thomson	39
Sonja Maartens	36
Corné Rautenbach	34
Marita Beneka	33
Les Underhill	32
Rob Dickinson	30
Ross Hawkins	30
Joseph Heymans	30
Fanie Rautenbach	30
Joubert Heymans	28
Quartus Grobler	27
Gert Myburgh	27
Michael Holden	26
Johnstone, Richard Alan	26
Hodgson, Andrew & Heather	24
Dawie de Swardt	23
Joan Young	22
Dave Kennedy	21

What are some of the interesting photographic records in LacewingMAP?

LacewingMAP has contributed many interesting and valuable locality records. It has added a vast number of new locality records and has contributed to our overall knowledge of the distribution of Afrotropical lacewings. Thus it is difficult to single out individual records.

Two records, both from 2018, are outstanding. They highlight the value of the contribution being made by citizen scientists.

LacewingMAP record 15379 is a specimen from Lüderitz Peninsula, southwestern Namibia, on 24 July 2018 (Figure 9). It belongs to the the genus *Palmipenna*. It is doubtless an undescribed species, remarkable for its early appearance (July) and its close proximity to the sea. This record was a total surprise. It is the farthest north that this genus has ever been recorded, and the second record of this genus from Namibia. Previous records of this genus were almost exclusively from the Western Cape, South Africa.

Figure 9: LacewingMAP record 15379, which is probably a new species in the genus *Palmipenna*, from the Lüderitz Peninsula, Namibia. It was submitted by Jessica Kemper, and further details are at http://vmus.adu.org.za/?vm=LacewingMAP-15379

LacewingMAP record 10583 is a specimen of a new antlion (Myrmeleontidae), either in the genus *Fadrina* or the genus *Centroclisis* (Figure 10). It cannot be placed with certainty; it has characteristics of both, and also remarkable for its small size. Provisionally, it is placed in *Fadrina* because of the double costal series in the forewings. This lacewing was found in the Cederberg area on 22 January 2018. This photographic record alerts us to the existence of a previously unknown taxon. It also emphasizes the exceptional lacewing diversity of the Cederberg.

Figure 10: LacewingMAP record 10583, which is probably a new species in the genus *Fadrina*, from the Cederberg area, Western Cape. It was submitted by Zenobia van Dyk and further details are at http://vmus.adu.org.za/?vm=LacewingMAP-10583

What are the priorities for fieldwork for LacewingMAP?

The answer to this is simple. At this stage in the life-cycle of the LacewingMAP project every record, from anywhere in Africa, is valuable.

How do I participate in LacewingMAP?

In a nutshell, the protocol is simple. Take photographs of lacewings, and upload them to the LacewingMAP section of the Virtual Museum website. There is no need to identify the species in the photograph. This gets done by the expert panel for LacewingMAP.

The easiest way to take photographs of lacewings is to be aware that they are attracted to light at night, in exactly the same way that moths are, although usually in far smaller numbers. The entire spectrum of cameras are used to take photographs of lacewings; the most versatile for this type of photography are the new generation of "compact" cameras

Before you can upload into the Virtual Museum you need to register as a citizen scientist. The procedure for doing this is described here: (https://www.slideshare.net/Animal_Demography_Unit/how-to-register-as-a-citizen-scientist-with-the-animal-demography-unit)

Once you are registered, you log on to the website using your email address and password. A "Data upload" section now becomes visible. The critical information that needs to be uploaded into the database is date, place and a series of one to three photographs of a single species, usually different angles on the same individual. Guidance on the upload process is provided in this slide show: https://www.slideshare.net/Animal_Demography_Unit/how-to-submit-records-to-the-virtual-museums

We do our best to identify each record to species level. As described earlier, this is difficult to achieve for several of the lacewing families, and especially for the green lacewings. But this should not deter you from submitting photographs. As a beginner participant, the best strategy for a positive confirmed identification is to take lots of photos of a specimen, and to select the best one, two or three photographs for submission, preferably from different angles. It is helpful to try to get different parts of the specimen in sharp focus in the three pictures.

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