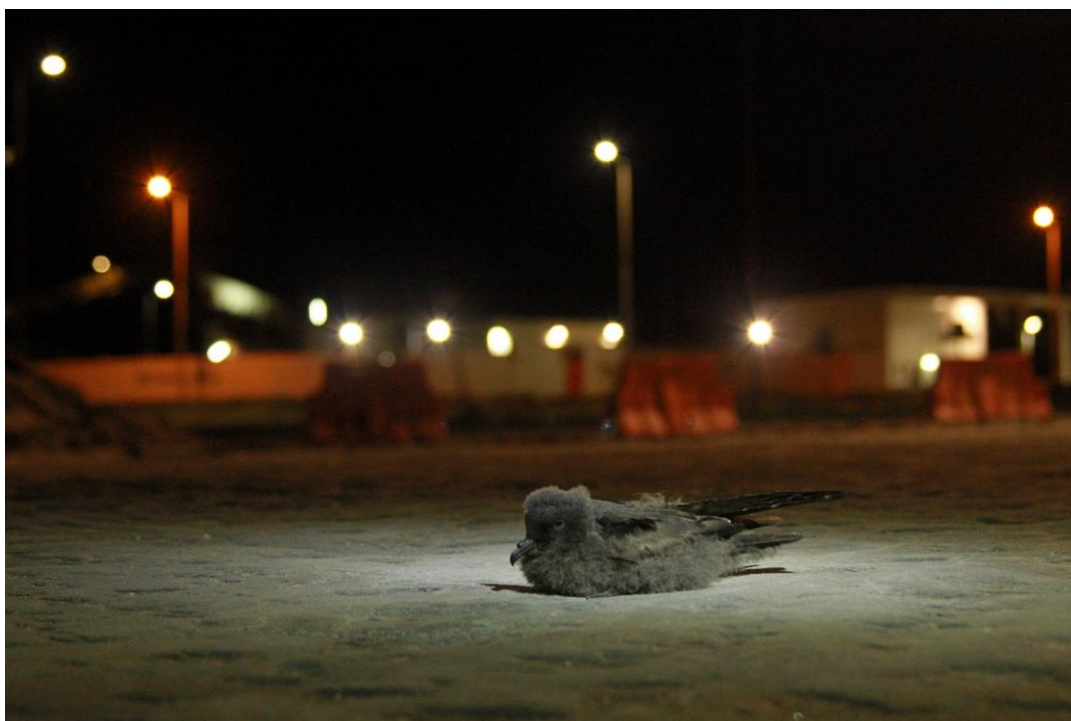


Project: Reducing light pollution for creating safer skies to the Chilean storm-petrels



Report for Pacific Seabird Group's Craig S. Harrison Conservation Fund

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Red de Observadores de Aves y Vida Silvestre de Chile (ROC)

Grant Recipient

Rodrigo Silva Caballero

Phone: +56 9 9240 3104

e-mail: rodrigosilva@redobservadores.cl

Red de Observadores de Aves y Vida Silvestre de Chile

Julio Prado, N°1144, Departamento 31

Providencia, Santiago

e-mail: contacto@redobservadores.cl

webpage: www.redobservadores.cl

1. INTRODUCTION

This report refers to the activities supported by the Pacific Seabird Group's Craig S. Harrison Conservation Fund for the project "Reducing light pollution for creating safer skies to the Chilean storm-petrels", part of the efforts of Red de Observadores de Aves de Chile (ROC) for advancing in natural history and conservation of the storm-petrels of Humboldt's Current.

Beside identifying several long-time sought breeding colonies for Markham's and Hornby's storm-petrels way inland in Atacama, the most arid desert in the world, light pollution stood out among other threats because of several thousands of birds die every year in cities and industries of northern Chile, becoming one of the more serious "fallout" events in the world.

The activities framed into this project were focused into handle the problem of light pollution affecting storm-petrels in Arica and Iquique cities, identifying most conflictive areas, promoting local and national policies but also short-term actions to reduce the impact on storm-petrels and enhancing public awareness about this topic in order to build a supporting community.

The proposal was submitted and accepted to be funded with US\$1990 in January 2019 and activities were planned to run from March to December 2019.



Figure 1. Markham's storm-petrel (*Oceanodroma markhami*) and its breeding ground in Atacama Desert. The species is now classified as Near Threatened by IUCN Red List, after being Data Deficient for a long time mostly because of the lack of knowledge on their breeding sites. In Chile, Markham's storm-petrel is now Endangered, in part, due to habitat degradation because of light pollution.

2. PROPOSED OBJECTIVES

- To quantify the impact of artificial light at night on storm-petrels in Iquique area
- To assess the actions conducted to reduce the impact of artificial light at night on storm-petrels in Iquique area
- To promote a local regulation against light pollution in Iquique
- To promote an agreement involving key stakeholders for voluntarily reducing their impacts during fallout peak season
- To increase the scope of storm-petrel rescue programs in Arica and Iquique through advertising
- To raise awareness in local communities about the impact of light pollution on storm-petrels through recording and editing a short video

3. PROPOSED ACTIVITIES AND ACTIONS

Objectives	Activities	Schedule
To quantify the impact of artificial light at night on storm-petrels in Iquique area	<ul style="list-style-type: none"> • To strengthen relationships with local rescue team in Iquique for them to keep keen records on rescue birds. • To strengthen relationships with local wildlife authority, <i>Servicio Agrícola y Ganadero</i> (SAG). 	March - April 2019
To promote a local regulation against light pollution in Iquique	<ul style="list-style-type: none"> • To meet local authorities in Iquique and promote developing a local normative to reduce the light pollution in the city. 	June - September 2019
To promote an agreement involving key stakeholders for voluntarily reducing their impacts during fallout peak season	<ul style="list-style-type: none"> • To strengthen relationships with local representatives of the Environment Ministry for them to lead the voluntary agreement. • To meet key stakeholders and to convince them about the importance of them to reduce their artificial lighting at night 	March - December 2019
To assess the actions conducted to reduce the impact of artificial light at night on storm-petrels in Iquique area	<ul style="list-style-type: none"> • To meet companies which are the main responsables of fallout in Iquique, to press them for adopting actions for reducing fallout during peak season. 	March - April 2019
To increase the scope of storm-	<ul style="list-style-type: none"> • Advertisement for rescue programs in 	April &

petrel rescue programs in Arica and Iquique through advertising	Arica and Iquique	December 2019
To raise awareness in local communities about the impact of light pollution on storm-petrels through recording and editing a short video	<ul style="list-style-type: none"> Recording and editing a short documentary-movie (3-5 minutes) to share the problem (in Spanish) 	April & December 2019

4. ACTUAL ACTIVITIES AND ACTIONS

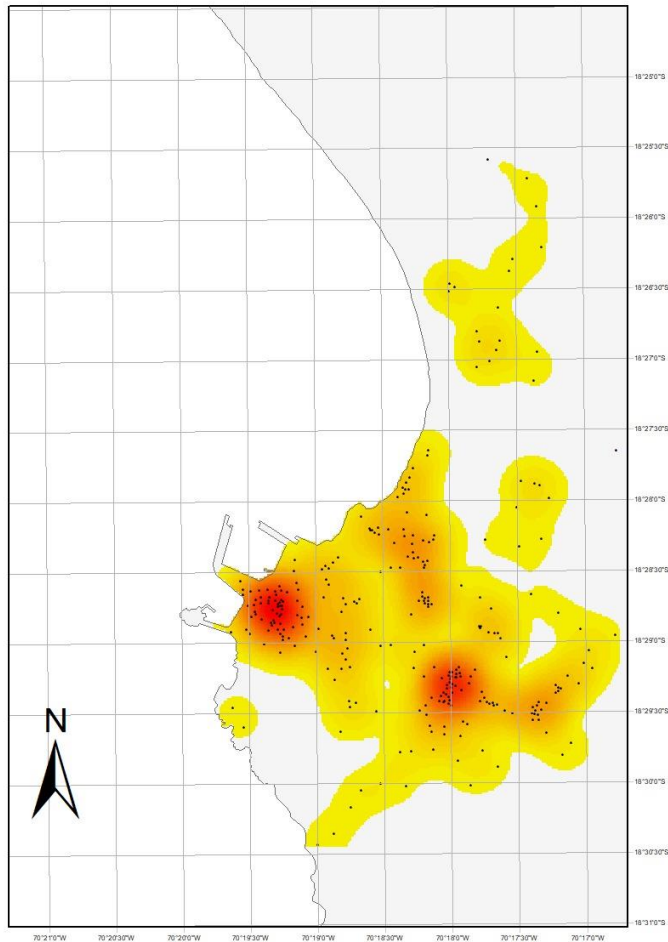
Conducted actions are shown, following proposed objectives.

To quantify the impact of artificial light at night on storm-petrels in Iquique area

Based on a cooperative work with the rescue team grounded in Iquique (ONG Golondrinas de mar, Iquique) we got to know about 1743 storm-petrels rescued for 2018-2019 season, way more than the 892 rescued by them during 2017-2018. To our understanding, the almost-doubled in the number of rescued birds from one year to the next one reflects more the increase in the scope of the rescue in Iquique, more than a truly increase in the fallen birds.

In Arica, although not framed into this specific project when applied, we managed to keep a very keen record of the rescue program thanks to the funding of American Bird Conservancy (ABC), which is coordinated by ROC local team with support of Arica county. For the 2019-2020 season we have rescued +3000 storm-petrels and are still counting, way more than the 1183 that we recorded for the 2018-2019 season. Same as in Iquique, we understand that increasing because of the higher effort of the program. We have already mapped fallout in Arica for the 2018-2019 season resulting in the following map (Figure 2).

Figure 2. Fallout hotspots identified in Arica are Carlos Dittborn Stadium, old town near “Morro de Arica”, new shopping mall and Manuel Castillo and Rodolfo Arenas roundabouts.



To promote a local regulation against light pollution in Iquique

We wrote a draft of county regulation against light-pollution, which we submitted to the counties of Arica (June 2019) and Iquique (September 2019, see Figure 3). See Attached file 1. To date, none of them have implemented it yet (but see next paragraph), since apparently, they are waiting for the national regulation lineament.

Besides that, we promoted the update of national policy against light pollution (*Decreto Supremo 43*) which is currently restricted to regions where astronomical observatories are settled and doesn't control the use of rich blue-spectrum white LEDs. See Attached item 2. This process is still open, and we have been asked to join the extended committee for reviewing the updating proposal, representing the interest groups focused on biodiversity.

To support the latter, we wrote an article about this topic (Assessing the light pollution impacts on seabirds in Chile: diagnosis and proposals), informing with a draft version the updating process of national light pollution act led by Environmental Ministry, in May 2019. The article was submitted to *Ornitología Neotropical* in July 2019, and accepted in November 2019, not yet being copy-edited.

For doing this work we arranged 25 authors from 13 organizations to work together showing for the first time for a country in South America the effects of light pollution on seabirds, reflecting a largely underestimated situation and outstanding the case of storm-petrels in Arica and Iquique, as shown in Figure 4.



Figure 3. Rodrigo Silva (ROC) and Moyra Rojas Tamborino, regional representative of Environment Ministry meeting Mauricio Soria Machiavello, Iquique Major

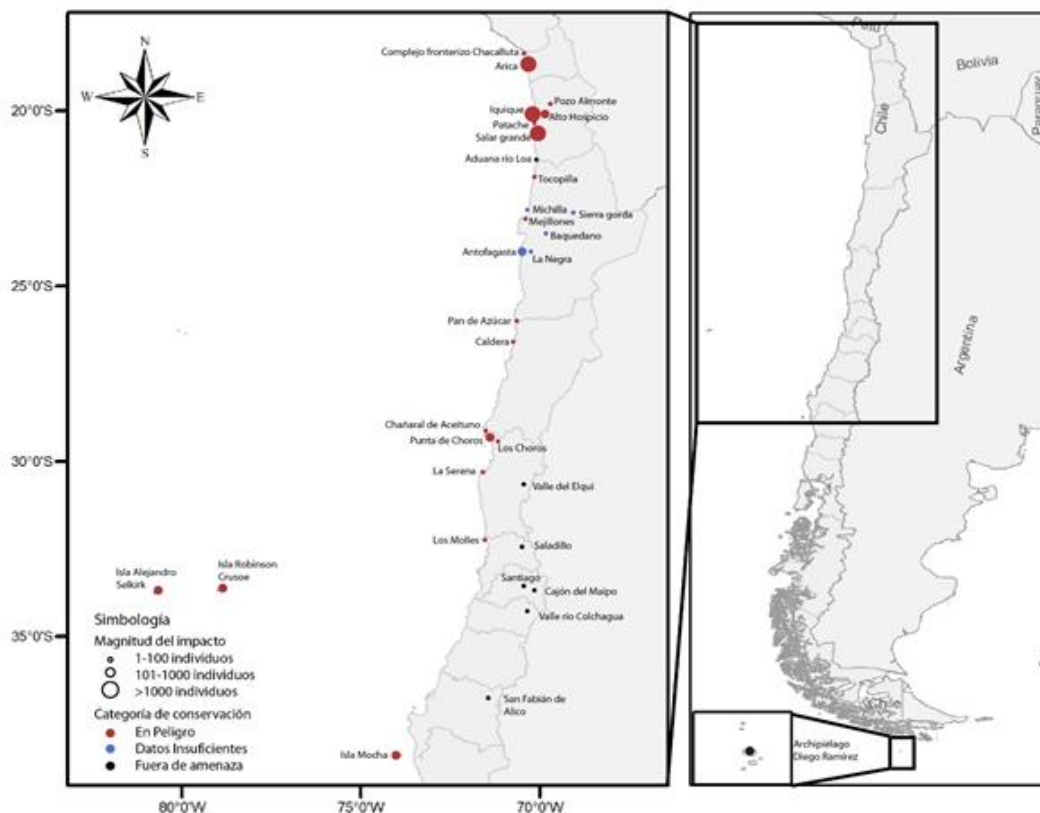


Figure 4. Fallout hotspots for seabirds in Chile, extracted from the article “Assessing the light pollution impacts on seabirds in Chile: diagnosis and proposals” (Silva et al. *in press*). Note the situation in northern Chile, where large numbers of nationally threatened seabirds are affected.

To promote an agreement involving key stakeholders for voluntarily reducing their impacts during fallout peak season

We achieved the local chair of Environment Ministry to release a voluntary agreement called *“Protégelos desde el primer vuelo”* just before the 2019 fallout season in March 2019 (*“Protect them since their first flight”*), referring to the fact that most of the affected birds are fledglings) engaging most of the private and public stakeholders involved in storm-petrel fallout, but apparently as a strategic decision, they excluded ROC. Results for the first season of the agreement are unknown (probably not properly measured), but some adopted actions include:

- Compañía Minera Cordillera (CMC) adopted a series of management actions, as informed in the mail sent on April 11th, 2019 and described in the national newspaper El Mercurio (Figure 5). This included turning off and light replacement (Figure 6) and an improved rescue program.
- The Municipality of Iquique turned off some of their more conflictive lights, but according to the Major, they were requested to turn them on again by the Army, the agency in charge of safety in the area.

For the current season, March - April 2020, there are more actions expected to be adopted, some of them including the previously recalcitrant K+S company, but not detailed information is available on this topic yet. It is likely we will be joined to the agreement board this time.



Antes. La ROC captó en abril de 2018 esta imagen de la compañía minera Cordillera, que opera en Salar Grande, al sur de Iquique. Es uno de los lugares donde caen habitualmente los volantones o polluelos encandilados por la luz.



Después. Tras sumarse al programa del Ministerio de Medio Ambiente, así lucían este mes las instalaciones de la misma minera. Solo están encendidas las luces esenciales.

Campaña en Tarapacá:

Apagan la luz para proteger el vuelo nocturno de las golondrinas de mar

En su viaje desde el desierto, donde nacen, unos 20 mil pichones caerían este mes a tierra encandilados por la luminosidad de algunas industrias instaladas en su camino. Un plan para reducirla al mínimo intenta bajar esa cifra a una mucho más baja.

RICHARD GARCÍA

Sombría resultaba la advertencia de la red de observadores de aves de Chile, ROC, dada a conocer en esta misma sección a fines de marzo. Para este año, la organización calculaba que 20 mil golondrinas de mar caerían en Iquique durante abril.

Hace años que la ROC intenta crear conciencia de lo que ocurre a los llamados volantones, los polluelos que entre marzo y mayo vuelan camino al mar luego de nacer en medio del desierto. La mayoría cae encandilada al sur de la ciudad, por las fuertes luces de las mineras e industrias. Y en el suelo, las aves son presa fácil de depredadores.

Sin embargo, este año el escenario no sería tan negativo gracias al programa "Protégelos desde el primer vuelo", que implementó el Ministerio de Medio Ambiente (MMA) para reducir tanto las caídas como las muertes de las aves. A la iniciativa se han sumado la Municipalidad de Iquique, el Servicio Agrícola y Ganadero y siete empresas privadas.

La iniciativa contempla varias medidas: durante estos meses, las empresas mantendrán la mayor parte de sus luces apagadas, se reorientarán y reemplazarán luminarias urbanas y aumentará el monitoreo de las aves caídas a partir de los reportes que entregan las empresas al SAG.

Al municipio se le entregó una serie de recomendaciones respecto del uso de las luminarias, explica Moyra Rojas, Seremi de Medio Ambiente de Tarapacá. "Les sugie-



Un volantón caído puede ser presa de jotes, perros, zorros, gatos y ratones. A la derecha, una golondrina de mar adulta.



rimos las formas y el tipo de luminarias y también la orientación que deberían tener, por lo menos en los principales sectores donde ha habido hallazgo de estas aves, que son las playa Cavanha y Brava", cuenta Rojas.

Allí, dice, ya se inició el proceso de reorientación de las luces para evitar que las aves se encandilen, que se mantendrá hasta fines de mayo. Esto ha motivado a otros municipios como Alto Hospicio a adoptar medidas similares.

"Estamos muy contentos por-

que se está generando conciencia respecto de la protección que debe tener la golondrina de mar", agrega la seremi.

Desde el año pasado, el ave está en la categoría "en peligro de extinción", por lo que adelantó que durante los próximos meses trabajarán en el plan Recoge, de recuperación, conservación y gestión de la especie. Además se prepara un acuerdo de producción limpia especial con las empresas del sector orientado a su conservación.

"El programa es interesante por-

que tiene el foco en el lugar correcto. Finalmente, se insta a las empresas, que tienen los mayores impactos por luces, a apagar o cambiar su luminaria", dice Rodrigo Silva, investigador del proyecto "Golondrinas del desierto", de la ROC. Destaca que por fin hay varios actores abordando en forma simultánea la problemática.

"Nosotros verificamos la situación en una empresa y el cambio fue sustancial con respecto a lo que observamos en años anteriores. A través de estas acciones, sin duda se va a reducir un montón la cantidad de golondrinas muertas", dice el especialista de la ROC. No obstante, reconoce que en otras instalaciones los cambios todavía no son tan visibles.

El MMA pretende replicar esta estrategia con otras aves migratorias que se ven afectadas por la luminosidad, principalmente durante sus primeros vuelos.

El miércoles último, se publicó en el Diario Oficial una resolución que da inicio al proceso de revisión de la norma de emisión lumínica vigente, que data de 2014. "La propuesta del ministerio es incluir objetivos que antes no estaban considerados, como la protección de la biodiversidad, la afectación de la salud humana y conceptos de eficiencia energética", dice Felipe Riesco, Ministro subrogante de Medio Ambiente.

Todo esto está en el marco de un uso sostenible de la luz artificial, que además incluye la protección de los cielos para la observación astronómica.

Figure 5. The national newspaper El Mercurio announcing the agreement "Protégelos desde el primer vuelo", for reducing the effect of light pollution on storm-petrels in the Tarapacá region.



Figure 6. Light replacement and sign deployment recorded in April 2019 in Tenardita Mine of CMC.

To assess the actions conducted to reduce the impact of artificial light at night on storm-petrels in Iquique area

Due to our absence in the board which defines the scope of the agreement “*Protégelos desde el Primer Vuelo*” and a lack of planning ahead, the results for the first season are nowadays hard to track back, making hard to properly assess the results of the implemented actions. However, due to the huge amount of lights which were switched off, it is likely that several thousands of storm-petrels were prevented to be killed. For the current season (fallout expected to occur during March - April 2020) we have promoted the local chair of Environment Ministry to keep an improved record system of the actions adopted and keen records on fallout monitoring.

To increase the scope of storm-petrel rescue programs in Arica and Iquique through advertising

We commissioned resources to be broadcasted on social media and to be spreaded into the community (Figure 7). In December 2019, during the fallout season in Arica, we delivered about 300 pins and 500 handouts, funded partially with this grant, complemented with funds of American Bird Conservancy. The social media are planned to be exploited during the next fallout season in Iquique, during March - April 2020 (we did not use it for the Arica’s case, since matched with the Chilean social outbreak).



Figure 7: Graphic design for pins and social media



Figure 8: Folding handouts and pins once printed

To raise awareness in local communities about the impact of light pollution on storm-petrels through recording and editing a short video

In cooperation with the Youtube Channel “Wild Track”, by then developing a series of videos regarding different topics of Chilean nature and conservation challenges, we recorded and edited a video for raise awareness about the effect of light pollution on storm-petrels focused in the situation of Iquique. Video is available in the following link: <https://www.dropbox.com/s/i9jgqv4joklylz/Wild%20Track%20Iquique%204.mp4?dl=0>

For doing this we ran a field trip in April 2019, being the video finally edited and available in October 2019. In order to increase the impact of the video we agreed to spread it in March 2020, at the beginning of next fallout season in Iquique.

5. SUBJECTIVE / OBJECTIVE EVALUATION OF THE EFFECTIVENESS OF YOUR ACTIONS IN CONSERVING SEABIRDS

It is hard to assess the impact of this project on the populations of storm-petrels due to the nature of available data. In strict terms, the number of fallen birds in Arica and Iquique increased in >153,5% and 95,4% from 2017-2018 to 2018-2019 respectively, but this is more likely to reflect an increase in public awareness than a real increase in fallen birds. As said, due to the huge amount of lights which were switched off, it is likely that several thousands of storm-petrels were prevented to be killed.

To get a better tool which will allow us to assess the impact of conservation measures, in 2019 we started with ABC and Conservation metrics to use songmeters, for trying to monitor the trends of the breeding populations.

In terms of raising awareness of local authorities to this topic we consider that, although not having success yet in counties to promote a local regulation against light pollution, they have certainly gotten into known this conservation problem. On the other hand, the national update of the policy against light pollution, although not finished yet, is a major success because it's supposed to include white LEDs, whole national territory and biodiversity protection as a goal.

6. COMPARED PROPOSED AND ACTUAL EXPENDITURES

Item	Budget as proposed	Actual expenditures	Balance
Flights Santiago-Iquique	500	480	+20
Flights Santiago-Arica	600	300	+300
Truck rental	770	800	-30
Lodging arrangement	320	540	-220
Meals	400	600	-200
Professional salaries	2,000	2,000	0
Total	4,590	4,720	-130
Grant asked for PSG	1,990	1,990	0
Provided by ROC	2,600	2,730	-130

7. SUGGESTIONS FOR FURTHER WORK OR IMPROVEMENTS TO THE COMPLETED PROJECT DESIGN

For further work, a systematic assessment of fallen birds would be needed, conducted in standardized conditions.

Regarding bird rescue and the assessment of success of release actions, it would be valuable to band as many birds as possible.

8. DATA SUBMISSION TO SEABIRD INFORMATION NETWORK AND GLOBAL SEABIRD COLONY REGISTER

Our project was not focused on generating new information for seabird colonies. Nevertheless, we will submit all the information related to Atacama's storm-petrels to both platforms during the next month.

ATTACHED ITEMS

1. Municipal ordinance draft submitted to Arica and Iquique Municipalities.
2. Letter submitted to the Environment Ministry on May 30th, 2019 as part of the updating process of current regulation against light pollution.