ENVIRONMENTAL PROTECTION
IN THE CARIBBEAN

Radar Surveys for the Endangered Black-capped Petrel on Dominica, West Indies

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PROJECT DESCRIPTION

The Black-capped Petrel is highly endangered due to human impacts. To address these challenges, we surveyed for petrels on the island of Dominica in January 2015 and identified potential nesting areas and flight corridors using proven radar techniques. Additionally, our team deployed three autonomous recording units at potential nesting locations. Our team worked closely with the staff from the Dominica Ministry of Agriculture and Forestry to survey as well as to inform and improve petrel conservation.

EXECUTIVE SUMMARY

Populations of the Black-capped Petrel, one of the most endangered Caribbean seabird species, have been in precipitous decline over the previous 150 years. It is estimated that only 1,000-2,000 pairs of petrels remain. Although they historically nested on Dominica, they are currently known to nest only on the island of Hispaniola. The dire conservation status of the Black-capped Petrel has prompted its listing by various authorities as Endangered (IUCN 2011), Threatened, by the International Council for the Preservation of Birds (Collar and Andrew 1988), and Critically Endangered by the Society for the Study and Conservation of Caribbean Birds (Schreiber and Lee 2000). Further, the North American Waterbird Conservation Plan considers the species to be Highly Imperiled, making it an official Focal Species of the U.S. Fish and Wildlife Service (USFWS).

There is strong evidence to suggest that a nesting population persists on the high volcanic peaks on Dominica. The island historically had substantial populations of Black-capped Petrels (Goetz et al 2012). Through the 19th century, the species was common enough that multiple peaks on the island were named for the petrel including Morne Diablotin and Morne aux Diables. While nesting birds have not been found since the 1860's, two different adult petrels have recently been found in the Roseau Valley below Morne Micotrin, indicating the potential presence of a nesting population (*fide* Dominica Ministry of Agriculture and Forestry).

Because of the logistical challenges of expeditions to these remote, rugged petrel nesting sites in the Caribbean, few researchers had historically visited them (Wingate 1964, Woods 1992, Simons et al. 2002, Goetz et al. 2012) so the species range and abundance is poorly known. Further, all of these researchers have explicitly noted the extreme limitations of using conventional aural and visual methods when surveying species such as petrels that visit breeding areas only at night. Because of these limitations, researchers are able to count only birds visible within the beam of a spotlight, or those which are vocalizing within earshot, and cannot exclude the possibility of double counts. Researchers acknowledge that these limitations lead to counts with modest accuracy and broad confidence intervals.

From 2012-2014, EPIC conducted parallel radar and conventional audio/visual surveys on Hispaniola that demonstrated that Black-capped Petrel is a species for which radar is an effective observation and monitoring tool that far extends researchers' ability to observe and monitor them, and enables accurate, consistent counts.

As part of the current Black-capped Petrel conservation effort, we conducted radar surveys for Black-capped Petrels over a four-week period on Dominica during January 2015. Our goal was to determine if petrel activity persists on Dominica as well as establish baseline population data at numerous nest sites and flight corridor sites throughout Dominica. Herein, we report the results of our surveys.

METHODS:

At all survey sites, our staff simultaneously identified petrels using radar and audio/visual methods. Data collected during previous surveys for petrels on the island of Hispaniola allowed us to better understand the timing of movements of petrels in and around nesting areas. Based on this data,

surveys began at sunset, when petrels become active at the nesting area and flight corridors and ended 3-4 hours later, when petrel activity slowed.

For surveys, we set up our radar within 1.5km of the potential nesting sites or flight corridors. Although radar can detect targets at much greater distances, resolution suffers greatly. Setting the range at 1.5 km is standard practice when surveying for seabirds as it allows the surveyor to detect targets at a substantial range while recording a clear and powerful target on the radar (Cooper et al. 1991). A laptop computer was attached to the radar unit and we recorded all radar images, for subsequent review and analysis.

The radar operator monitored all targets that appeared on the radar's monitor, and recorded time, direction of flight (to the nearest degree), flight behavior (e.g. straight, erratic), velocity (to the nearest 5 km/hr), and if known, noted species and number of individuals detected.

A second surveyor was stationed at the base of the known nesting areas or along flight corridors with 10x binoculars for observations during dusk observations and a night-vision scope when daylight is insufficient. This observer constantly visually scanned the airspace above potential nesting habitat and flight corridors as focused on all visible sky for flying petrels and listened for calling petrels.

The radar and A/V crew communicated during the survey. When the radar crew detected a target that was potentially a petrel it alerted the A/V crew by radio, allowing the A.V crew to locate and identify the target. Similarly, the A/V crew communicated to the radar crew any flying species that it detected, including birds, bats, and large insects. This enabled us to more accurately define the radar image of a Black-capped Petrel and to distinguish it from other nocturnal flying species.

Following each survey, we downloaded data and reviewed the recorded images of the radar survey. During this review, we re-analyzed all targets measuring flight speed, flight direction, and target size. This second evaluation of the survey assured researchers that no targets were missed or incorrectly measured.

In addition to the radar and audio/visual surveys, we deployed three autonomous recording units (ARU's). We deployed the ARU's at three locations on Dominica where we recorded large numbers of petrel targets, Morne Diablotin, Morne Trois Piton, and Morne Micotrin. The exact location of ARU deployment was based both on areas with high activity as well as access for surveyors to deploy the recording units.

Finally, we recorded locations of communication towers throughout Dominica, as we encountered them. When possible, we recorded the tower height, guy status, light status, and purpose.

RESULTS:

While on Dominica, we surveyed 20 stations, including 13 stations on the west coast (Caribbean side) and seven on the east coast (Atlantic side). Ten surveys were adjacent to potential nest areas while ten surveys were along flight corridors (FIGURE ONE).

Over the 20 surveys, we detected 968 Black-capped Petrel-like targets with radar. Petrel-like targets were detected at 17 survey stations while at three survey locations, we detected zero petrel-like targets (TABLE ONE).

Sixty-three percent of petrel-like targets were detected among four locations, Morne Diablotin (*n*=205 targets), Morne Trois Piton (*n*=106 targets), Morne Micotrin (*n*=127 targets), and Morne Anglais (*n*=168 targets).

We visually observed eight Black-capped Petrels with either binoculars or night-vision scope. The eight petrels were observed among five survey sites (TABLE ONE).

The peak period of petrel activity was between 50 minutes and 80 minutes after sunset (FIGURES FOUR through FIGURE SEVEN).

Herein, we detail the petrel activity at each station.

DOM1
Location: Morne Diablotin Northwest Slopes
Dates Surveyed: 6 January 2015
Elevation: 1,863 ft
Distance from Sea: 5.9 km
Black-capped Petrel-like Targets: 43
Black-capped Petrels Observed Visually: 0

This station was located just below the northwest slopes of Morne Diablotin, along a drainage that led to the Caribbean Sea. The weather at this station was marginal as we had rain off and on throughout the whole survey. We detected targets going both away from and towards the nesting habitat on the mountain; however the majority of petrel-like targets were flying towards the coast and away from the mountains. We had a number of targets that were flying 70 km/hr.

While we detected petrels at this station, we felt this was not the main flyway for the mountain. For this station, we were able to survey potential nest habitat and had a large number of targets flying from/to these specific areas. An ARU was deployed at the potential nest area we surveyed from this station. The main trail leading to the summit of Morne Diablotin leads up a ridge on this side of the peak and is adjacent to some promising looking petrel nest habitat.

DOM2
Location: Morne Diablotin South Slopes
Dates Surveyed: 7 January 2015
Elevation: 2,307 ft
Distance from Sea: 5.2 km
Black-capped Petrel-like Targets: 204
Black-capped Petrels Observed Visually: 0

This station had the largest concentration of petrel-like targets on Dominica. The station itself was located at the head of two large drainages that lead from the south slopes of Morne Diablotin to the Caribbean Sea. We detected targets flying both to and from the south slopes as well as using both of these drainages. The one drainage leads to Morne Rachette, while the second drainage leads to Salisbury.

From this station, we also detected small numbers of targets flying towards the west slopes of Morne Diablotin. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains.

We felt like the drainages we were surveying along were the main flyways for petrels that are active around Morne Diablotin. The south slopes of the peak are very remote and access to them would be difficult. However, the Waitikabuli National Trail is in the vicinity and might provide access to this location for nest searching.

DOM3
Location: Morne Trois Piton
Dates Surveyed: 8 January 2015
Elevation: 1,904 ft
Distance from Sea: 6.6 km
Black-capped Petrel-like Targets: 106

Black-capped Petrels Observed Visually: 0

This station was located just below the northwest face of Morne Trois Piton at an intersection of the three drainages, two of which feed towards the Caribbean Sea and one that feeds towards to Atlantic Ocean. This station had the fourth-most petrel-like targets on Dominica.

From this station, we were able to survey three drainages as well as a potential nest area on the northwest face of the mountain. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains. We detected the majority of targets leaving or flying to one specific area on the mountain flank. An ARU was deployed immediately adjacent to this area of high activity.

We feel that the drainages we surveyed are the main petrel flyways for the mountain and the flanks we surveyed are the likeliest candidates for nesting areas. The main trail that climbs to the summit of the peak follows a ridgeline that is adjacent to the potential nest area and would provide good access to this location.

DOM4
Location: Upper Trafalgar Valley
Dates Surveyed: 9 January 2015
Elevation: 1,555 ft
Distance from Sea: 5.5 km
Black-capped Petrel-like Targets: 14
Black-capped Petrels Observed Visually: 0

This station is located just above the location where individual adult petrels were found in 2007 and 2013. The valley the station was located on connects the Caribbean Sea to Morne Micotrin. The night of this survey was very rainy and majority of our petrel-like targets were observed early during the survey as rain later in the survey made seeing targets more difficult. The station itself is along the flyway and we did not survey any nesting habitat from this location. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains.

We surveyed a location later in the month that is up valley from this station and is within the same flyway between the sea and Morne Micotrin. We feel confident that the survey captured the activity for this area.

DOM5
Location: Cold Soufriere
Dates Surveyed: 10 January 2015
Elevation: 1,716 ft
Distance from Sea: 3.2 km
Black-capped Petrel-like Targets: 29
Black-capped Petrels Observed Visually: 0

This location is on the road between Portsmouth and Penville along the ridge on the Penville side of the cold soufriere. We were just below the high peaks of Morne Aux Diables and at the head of two large valleys, one that connected the peaks to the Caribbean Sea and one that connected the peaks to the Atlantic Ocean. The station was located just below a very steeply forested slope that looked promising for nesting petrels.

This station was very windy and we observed, with our night-vision goggles, many bats being blown around the station area. The high winds along with the bat activity made the use of target speed

as the sole indicator of target species less robust than at most stations. However, while we observed bats flying at high speeds due to the wind, their zig-zag flight patterns and parallel-to-the-sea flight direction made detection more clear. At this station, we were confident that targets moving directly between the sea and the mountains at a high rate of velocity and in a straight line were more likely petrels than bats. However, it should be noted that the high winds at this site made clear petrel target detections more difficult. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains.

DOM6
Location: Morne Prosper
Dates Surveyed: 11 January 2015
Elevation: 1,578 ft
Distance from Sea: 5.4 km
Black-capped Petrel-like Targets: 25
Black-capped Petrels Observed Visually: 1

This station surveyed the valley that leads from the Caribbean Sea to the peaks of Morne Watt and Morne Anglais. The weather during this survey included low winds and intermittent rain. We feel confident the numbers of petrel-like targets detected at this station would have been higher had there been less rain cluttering up our radar monitor.

There is some history over the past 100 years of petrels being seen or heard at Morne Watt and activity here was not completely unexpected. Our station was located about half-way along the flyway between the sea and the peaks. No nesting habitat on either Watt or Anglais could be surveyed from our location, but views of each peak from the station showed high elevation steeply forested slopes that look appropriate for nesting petrels.

We observed, with the night vision goggles, a single petrel at close range flying down the valley. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains.

DOM7
Location: Warner
Dates Surveyed: 12 January 2015
Elevation: 914 ft
Distance from Sea: 1.3 km
Black-capped Petrel-like Targets: 82
Black-capped Petrels Observed Visually: 0

This station is located on the ridge just south the mouth of the Layou River. This river forms the well-defined Layou River Valley which is a main drainage between Morne Trois Piton and the Caribbean Sea. We surveyed the head of this valley near Morne Trois Piton on 8 January 2015 and recorded over 100 petrel-like targets.

At this station location, we detected petrel-like targets moving both up and down the valley, including targets that we observed moving along the coastline and then turning up the valley at the mouth and flying past the station towards Morne Trois Piton. This valley appears to be the main petrel flyway between the coast and Morne Trois Piton.

The station was located at the mouth of the valley and therefore no nesting habitat was surveyed from this location. The majority of petrel-like targets detected at this station were flying towards the coast and away from the mountains.

DOM8
Location: Morne Jaune
Dates Surveyed: 13 January 2015
Elevation: 321 ft
Distance from Sea: 1.5 km
Black-capped Petrel-like Targets: 6
Black-capped Petrels Observed Visually: 1

This station was located at the coastal end of the valley that leads from the Atlantic Ocean to Morne Jaune. The station was located where the lowland valleys come together to form one large valley that leads to the northern flanks of Morne Jaune. Ideally, we would have liked to get higher up the valley or on an adjacent ridge, but this station was at the end of the highest passable road.

The winds were calm at the site and we only experienced a little rain. There was very little petrel-like activity at this site. All of the petrel-like targets we detected were flying inland. Additionally, we observed with the night vision goggles, a single petrel at close range flying down the valley.

DOM9
Location: La Plaine
Dates Surveyed: 15 January 2015
Elevation: 509 ft
Distance from Sea: 0.8 km
Black-capped Petrel-like Targets: 6
Black-capped Petrels Observed Visually: 0

This station was located at the mouth a very well defined valley that connects the high peaks above La Plaine with the Atlantic Ocean. We were located at a low elevation but the valley we were surveying was very well defined.

Weather during the survey was excellent, with low winds and no rain. The petrel activity at this site was low. All of the petrel-like targets we detected were flying inland.

DOM10
Location: Freshwater Lake
Dates Surveyed: 16 January 2015
Elevation: 2,551 ft
Distance from Sea: 9.8 km
Black-capped Petrel-like Targets: 0
Black-capped Petrels Observed Visually: 0

This station was located on the eastern flanks of Morne Micotrin. This area is considered one of the rainiest areas on Dominica and it lived up to its name on our survey night. It rained the entire survey period and we were unable to detect a single petrel-like target at this location. The habitat and station look very promising for petrel detection we feel confident we would have detected petrels had the weather been more favorable.

DOM11
Location: Tete Morne
Dates Surveyed: 17 January 2015

Elevation: 1,531 ft
Distance from Sea: 2.0 km
Black-capped Petrel-like Targets: 53
Black-capped Petrels Observed Visually: 3

This station was on the ridgeline just above the village of Tete Morne. From this location, we were able to survey along the south-north ridgeline as well as the valley that connects Tete Morne to the village of Soufriere on the Caribbean Sea. The weather at the station was clear and dry during the night of our survey.

From this location, it was unclear if any nesting habitat was within range of the radar, but if so, it is likely on the west facing slope of the south-north ridge above Tete Morne. From this station, we detected petrel-like targets moving in seaward and inland directions as well as along the south-north ridgeline.

We had a good view of the south-north ridgeline and observed three petrels flying along this ridgeline with the night vision goggles.

DOM12
Location: Laudat
Dates Surveyed: 18 January 2015
Elevation: 2,008 ft
Distance from Sea: 7.1 km
Black-capped Petrel-like Targets: 127
Black-capped Petrels Observed Visually: 2

This site was located on a small ridge on the Caribbean flanks of Morne Micotrin at the head of the Trafalgar Valley. This station as located up the valley from station # 4. The location was very active and had the third most petrel-like targets on radar during our surveys.

The weather at this site during our survey was clear, dry, and calm. While this survey was just below Morne Micotrin, we could not see the nest habitat on the radar. We could, however, see that birds were coming off of and flying to Morne Micotrin. The majority of activity at this site was birds flying towards the Caribbean coast.

Additionally, we observed with binoculars, two petrels flying towards the sea. The targets on the radar were often very close to the station, using the valley as a flyway. An ARU was deployed on Morne Micotrin above this station. The habitat of the deployment location was a steep boulder field covered in elfin cloud forest.

DOM13
Location: Morne Trois Piton
Dates Surveyed: 19 January 2015
Elevation: 1,893 ft
Distance from Sea: 8.8 km
Black-capped Petrel-like Targets: 8
Black-capped Petrels Observed Visually: 0

This site was located on the northern flanks of Morne Trois Piton, just below a prominent steep cliff face. The station is located 0.7 km east of station DOM3. We anticipated this station being as busy as station DOM3. It turned out the petrel activity at this station was very slow, with only 8 petrel-like targets.

The weather at the station was calm, clear, and dry. The radar was able to see the steep cliff area and almost all of the activity originated at this location. The majority of activity was birds leaving the nesting area. We also were able to monitor flyways that led to both the Caribbean Sea and the Atlantic Ocean. The activity at this station was coming/going from the Caribbean Sea.

DOM14
Location: Delices
Dates Surveyed: 20 January 2015
Elevation: 1,100 ft
Distance from Sea: 2.2 km
Black-capped Petrel-like Targets: 35
Black-capped Petrels Observed Visually: 1

This station was located on a prominent ridge above Delices that looks down into the White River Valley. This radar was able to see activity along the White River towards the Boiling Lake area as well as a prominent valley that runs southwards from the Victoria Falls area. This station was surveying a flyway and not a nesting site.

The weather at the station was mostly calm, clear, and dry, with a small portion of time with rain in the region. This station had the highest concentration of petrel-like targets on an Atlantic Ocean originated flyway, with 35 targets. The majority of petrel-like targets at this station were flying towards the mountains from the Atlantic.

In addition to the targets we observed on radar, we saw with the night vision goggles, one petrel flying inland.

The White River Valley is a large, well defined valley that leads from the Atlantic Ocean to the Boiling Lake/Freshwater Lake/Morne Micotrin area and is likely the most important flyway to these regions from the Atlantic.

DOM15
Location: Bellevue
Dates Surveyed: 23 January 2015
Elevation: 1,554 ft
Distance from Sea: 3.4 km
Black-capped Petrel-like Targets: 168
Black-capped Petrels Observed Visually: 0

This location is at a prominent saddle on the ridge between Morne Anglais and Tete Morne, in the village of Bellevue. With the radar we had good views of the western flanks of Morne Anglais as well as the prominent valleys that lead to both the Caribbean Sea and the Atlantic Ocean.

The weather at this station was clear and calm. There was a lot of bat activity, in addition to the petrel-like targets we observed. At this station, we recorded the second most petrel-like targets on Dominica. The majority of targets were flying from Morne Anglais to the Caribbean Sea. Notable, many of the petrel-like targets did not fly directly down the prominent valley but rather appeard to fly over the hillside between Bellevue and Point Michel. The majority of petrel-like targets were flying towards the sea, whole we did record a few targets flying inland as well.

DOM16
Location: Aux Diable Lookout
Dates Surveyed: 24 January 2015

Elevation: 1,290 ft
Distance from Sea: 2.1 km
Black-capped Petrel-like Targets: 4
Black-capped Petrels Observed Visually: 0

This location is on the northwest side of the Morne Aux Diables. The radar has views of both the potential nesting area as well as the flyways that come from both the north and the west portions of the island.

The weather at the station was clear and calm. There was very little petrel-like activity at this station. The targets we did observe were all moving up the flyways towards the mountains.

DOM17
Location: Lower Syndicate
Dates Surveyed: 25 January 2015
Elevation: 1,484 ft
Distance from Sea: 4.7 km
Black-capped Petrel-like Targets: 0
Black-capped Petrels Observed Visually: 0

This station was down the valley that feeds westward through Syndicate from Morne Diablotin. We anticipated this location to have high number of birds but rain throughout the entire survey period eliminated any chance of seeing petrel-like targets at this site.

DOM18
Location: Woodford Hills
Dates Surveyed: 26 January 2015
Elevation: 882 ft
Distance from Sea: 6.1 km
Black-capped Petrel-like Targets: 29
Black-capped Petrels Observed Visually: 0

This station was along a valley that drains from the east flanks of Morne Diablotin towards the Atlantic Ocean. The valley over the lower portions was not well defined however, adjacent to our station; the valley becomes well defined and remains defined until it reaches Morne Diablotin.

The weather at the site was clear and calm. The majority of targets we observed on radar were moving up the valley from the sea towards the mountains. We had no view of any nesting areas from this location with the radar, and the majority of targets we observed were within the flyway.

DOM19
Location: Melville Hall
Dates Surveyed: 27 January 2015
Elevation: 2677 ft
Distance from Sea: 3.5 km
Black-capped Petrel-like Targets: 0
Black-capped Petrels Observed Visually: 0

This station was located in a large valley that runs from the eastern flanks of Morne Diablotin to the Atlantic Ocean. The Melville Hall airport is at the base of this valley. The valley itself was very well defined and we could see the steep cliffs at the head of the valley, on Morne Diablotin.

The weather at the station was clear and calm. We saw a large number of slow targets on the radar but did not see a single petrel-like target during the survey.

DOM20
Location: Bense
Dates Surveyed: 28 January 2015
Elevation: 500 ft
Distance from Sea: 3.4 km
Black-capped Petrel-like Targets: 29
Black-capped Petrels Observed Visually: 0

This station surveys the valley that feeds from the Atlantic Ocean to the northeast flanks of Morne Diablotin. From this station, we could see some very large and distinct cliffs on Morne Diablotin, at the head of the valley we surveyed.

The weather during the survey was clear and calm. The majority of petrel-like targets we observed on radar were moving inland, while a small number were moving seaward. The location of the station was rather low in the valley and only somewhat well-defined at that point. It was surveyed due to the combination of ease of access and being directly along the valley. Had we been able to get higher up the valley where it is more defined, we might have observed more petrel-like targets.

Autonomous Recording Units

Three units were deployed on Dominica; One each at Morne Diablotin, Morne Trois Piton, and Morne Micotrin (FIGURE TWO). The units are downloaded every 60 days and therefore data will be available for these download at the end of March, the end of May, and the end of July 2015. The downloading will be done by Stephen Durand of the Forestry Division.

Communication Towers

We recorded 28 communication towers throughout Dominica (FIGURE THREE). Six of the towers were guyed. The majority of the towers were cell phone towers. The majority of towers we encountered were along the Caribbean Coast. The towers often were along ridgelines or on small peaks along the coast. The majority of towers are along flight corridors. There was a single tower on the summit of Morne Micotrin that was likely the only tower that was at a potential nesting area.

DISCUSSION

The data collected during this study strongly suggest that Black-capped Petrels persist on Dominica. We recorded 968 petrel-like targets over 17 separate sites. In addition, we observed eight individual Black-capped Petrels over 5 separate sites. This data, when coupled with the two recent observations of Black-capped Petrels near Trafalgar, suggests that there are still petrels on the island.

Morne Diablotin had activity on almost all of its flanks. We had petrel-like targets at potential nest areas above Syndicate and above Morne Rachette. We had flight corridor activity at Atlantic-side sites Bense Heights and Woodford Heights. The area of highest activity was at the potential nesting area above Morne Rachette. This southeast facing flank is steep, forested, and appears hard to access. The road above Morne Rachette reaches a spot below the peak where two Caribbean-side valleys meet. The easiest access on the mountain is above Syndicate where the Morne Diablotin trail leads from Syndicate

to the summit. The habitat at the higher elevations is elfin cloud forest with interspersed soil and boulder fields. We encountered numerous natural cavities all along the upper portions of the trail to the summit. There was also small cliff bands observed throughout the upper portions of the mountain.

Morne Trois Piton had petrel-like activity on the north and west sides. The radar station near Warner above the Layou River Valley had quite a bit of petrel-like activity and this valley is most likely a major flyway for petrels accessing Morne Trois Piton. We had no radar stations on either the east or south sides. The east side had a long valley leading to the mountain from Rosalie however; the access to any potential radar stations was very difficult. There was no road access to the south side of the mountain so no radar was done from this side. It should be noted that radar station #13 on the north side of the mountain drains to the Atlantic side and we had very little activity at this station. Alternatively, when surveying near Laudat below Morne Micotrin, we had petrel-like targets flying towards the west and south sides of Morne Trois Piton, although we didn't observe any targets on the south flanks of Morne Trois Piton specifically. The cliffs on the north side, particularly those above station DOM3, are very steep and forested. There are a number of small areas with landslides along this aspect. It appears the west side also is very steep and forested. The Morne Trois Piton trail leads up a ridge on the north flanks and skirts the east side of one of the prominent cliff faces. Access to the west side appears to be very difficult. The habitat near the upper portions of the mountain was elfin cloud forest with steep slopes that are interspersed with soil areas and boulder fields. We observed numerous natural cavities in boulder fields adjacent to the trail to the summit.

We recorded petrel-like activity on the west and south flanks of **Morne Micotrin** as well as flyway activity on the east side. Specifically, we had a large number of petrel-like targets flying in the vicinity of the west flanks above Laudat. The flyway linking Roseau, Trafalgar, Laudat, and Morne Micotrin appears to be a major flyway for the species. The valleys on the Atlantic side near Morne Jaune (station #8) and La Plaine (station DOM 9) had small flights going inland from the Atlantic Ocean and appear to be minor flyways for petrels. These flyways might also be for birds to access cliff locations in the vicinity of the Boiling Lake. There is a trail that accesses the summit of Morne Micotrin that follows the southern flanks from near Freshwater Lake to the summit. Near the summit of the peak, the habitat was steep, elfin cloud forest, with boulder fields containing natural cavities. It should also be noted that there have been petrels found in the valley flyway west of Morne Micotrin over the past 30 years, including in 1980 in Roseau, and 2007 and 2014 in Trafalgar.

The **Morne Watt** area was surveyed from both the east and west sides. The station (DOM14) surveyed on the east side, near Delices, had the majority of targets flying up the valley. This valley leads to the eastern slopes of Morne Watt, but also past those to the Boiling Lake area. It is unclear of the final destination of the birds recorded at station DOM14. The station (DOM6) in Morne Prosper was along a flyway that led past the northern slopes of Morne Anglais to the western side of Morne Watt. The final destination or origin of the petrel-like targets we recorded in this valley is unclear. The flyway on the eastern side had more targets (n=35) compared to that on the western side (n=25), however, rain during the survey on the west side curtailed our survey and the final number of petrel-like targets recorded would likely have been higher. The views we had of this peak from the west side, showed steep forested slopes on the west side of the mountain, however, lack of complete observations of all sides of the peak make any recommendations of where petrels might nest difficult. It should be noted that petrels were seen offshore of the eastern flyway near Delices in both 1982 and 1984.

Morne Anglais in the southern part of Dominica had petrel-like activity on both the north and south slopes. The station (DOM6) in Morne Prosper had petrel-like targets flying along the northern slopes, although it is unclear if these slopes were the final destination for the targets. The station (#15) in Bellevue had a large number of petrel-like targets (n=168) all of which either flew off of or towards Morne Anglais. The slopes of this peak on the north side appeared very steep and had numerous cliffs. The slopes along the south side appeared less steep, but were still forested.

Tete Morne in the southern part of Dominica as well as the adjacent **Morne Fou and Morne Verte** had some potential sightings of petrels in 1980, 1989, and again in 1997. We surveyed (#11) at the top of the ridge between Morne Verte and Morne Fou, above the village of Tete Morne. We had petrel-like targets on radar flying along the ridge between Tete Morne and Morne Fou. We also observed three petrels flying along the ridge below the station. The northern/eastern slopes of this area are developed with houses. The west/southern slopes are very steep and forested with no development. This is the side we observed the petrel activity and is likely where any nesting takes place.

Morne Aux Diables on the northern end of Dominica was surveyed along the eastern (station DOM5), northern (stations DOM5 and DOM16), and western flanks (station DOM16). There was a small amount of activity in this range, the majority of which was on the northern flanks in the forested area above the cold soufriere. The slopes on all sides of this range are very steep and forested. The northern road to Penville goes high on the northern side of this range and provides access to some of the higher areas with nesting potential along this aspect.

Future Effort: The next steps in the process of petrel research on Dominica include collecting audio data at potential nest areas with the ARUs as well as deploying teams to potential nest areas to look for nesting petrels. The ARUs have already been deployed by EPIC (Adam Brown) and Forestry staff (Stephen Durand) and will be downloaded every two months after deployment by Forestry staff. The data will be provided to Matthew McKown of Conservation Metrics who will analyze it for any petrel calls/songs.

For nest searching, ideally, a few members of the staff of Forestry would go to the petrel nest area on Hispaniola to observe the nest colony there as well as observe how nest monitoring activity takes place. Then Forestry staff will partner with foundations from Hispaniola, specifically staff from Grupo Jaragua, to look for petrel nests on Dominica in areas with high potential. Areas that should be focused on include Morne Aux Diables, Morne Diablotin, Morne Trois Piton, Morne Micotrin, Morne Watt, Morne Anglais, Tete Morne, and Morne Fou.

In addition, radar surveys should occur every 3-5 years on Dominica to track population trends, using petrel-like targets as a population index for the island. This will allow us to better understand the effects of future conservation measures.

Once nesting petrels are located, conservation impacts at nesting colony locations should be identified and addressed. These measures might include eliminating introduced predators, reducing tree removal, and eliminating human visitation to nest locations.

Communication towers are well known as a strike hazard for nocturnal migrating birds. Black-capped Petrels migrate each night from the nest colony and the hazard of a strike is high for them in areas along flight corridors or at nest locations. There are numerous examples of Black-capped Petrels striking communication towers on Hispaniola near the nest colonies of Loma del Toro in the Dominican Republic and Tet Kay Jak in Haiti. Measures should be taken to reduce the threat of tower strikes on Dominica be eliminating guy wires on towers, hood/eliminate any security lighting at a towers base, and be sure to have any navigation lights on towers be blinking strobe lights.

The island of Dominica should be included in the international conservation process for Black-capped Petrels. Up until this point, it was believed that petrels on nested on Hispaniola. Now, it appears that petrels exist on Dominica and issues affecting the success of the species on the island should be addressed.

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TABLES

TABLE ONE: Radar station locations, radar-like targets, and petrels seen visually on Dominica, West Indies.

Station	Date	Location	LAT	LONG	Petrel-like Targets	Petrels Observed
DOM1	1/6/2015	Syndicate Visitors Center	15.522481	-61.418731	43	0
DOM2	1/7/2015	Morne Rachette	15.48315	-61.41169	204	0
DOM3	1/8/2015	Pont Casse	15.37790	-61.34446	106	0
DOM4	1/9/2015	Upper Trafalgar	15.32985	-61.34815	14	0
DOM5	1/10/2015	Cold Soufriere	15.62201	-61.43587	29	0
DOM6	1/11/2015	Morne Prosper	15.30925	-61.34182	25	1
DOM7	1/12/2015	Warner	15.39593	-61.40739	82	0
DOM8	1/13/2015	Morne Jaune	15.33925	-61.26026	6	1
DOM9	1/15/2015	La Plaine	15.31878	-61.25055	6	0
DOM10	1/16/2015	Freshwater Lake	15 20 47.1	-61 18 38.6	0	0
DOM11	1/17/2015	Tete Morne	15 14 9.9	-61 20 36.9	53	3
DOM12	1/18/2015	Laudat	15 20 12.9	-61 20 11.9	127	2
DOM13	1/19/2015	Morne Trois Piton	15.38201	-61.33977	8	0
DOM14	1/20/2015	Delices	15.29233	-61.26783	35	1
DOM15	1/23/2015	Bellevue	15.26708	-61.34752	168	0
DOM16	1/24/2015	Aux Diable Lookout	15.61401	-61.44797	4	0
DOM17	1/25/2015	Lower Syndicate	15.52135	-61.43167	0	0
DOM18	1/26/2015	Woodford Hills	15.53807	-61.34922	29	0
DOM19	1/27/2015	Melville Hall	15.52883	-61.31654	0	0
DOM20	1/28/2015	Bense	15.57218	-61.37465	29	0
TOTAL					**968**	

TABLE TWO: ARU station locations and dates of deployment on Dominica, West Indies.

Station	Deploy Date	ARU Location	LAT	LONG	ELEV (ft)
DOM1	1/17/2015	Morne Diablotin	15.509583	-61.407722	3,631
DOM2	1/20/2015	Morne Micotrin	15.342728	-61.318508	3,842
DOM3	1/23/2015	Morne Trois Piton	15.373461	-61.335171	3,193

FIGURES

FIGURE ONE: Map of Black-capped Petrel radar station locations on Dominica, West Indies.

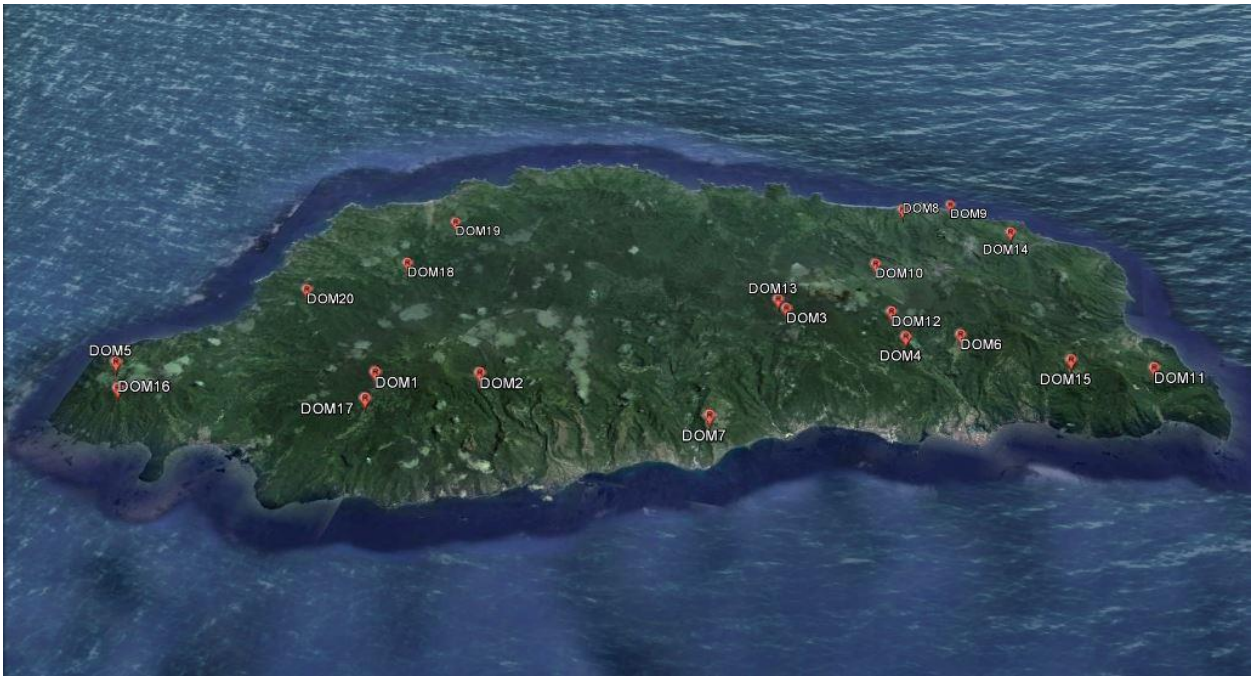

FIGURE TWO: Map of Black-capped Petrel ARU deployment locations on Dominica, West Indies.

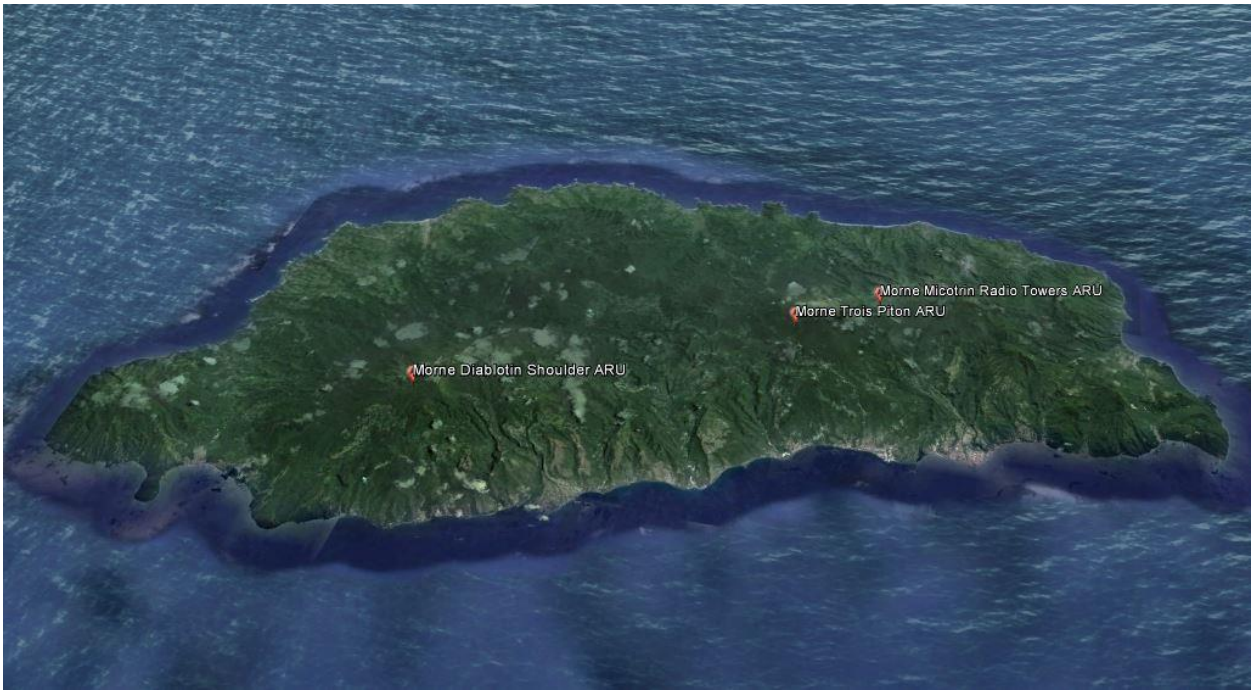

FIGURE THREE: Map of communication tower locations encountered during January 2015 on Dominica, West Indies.

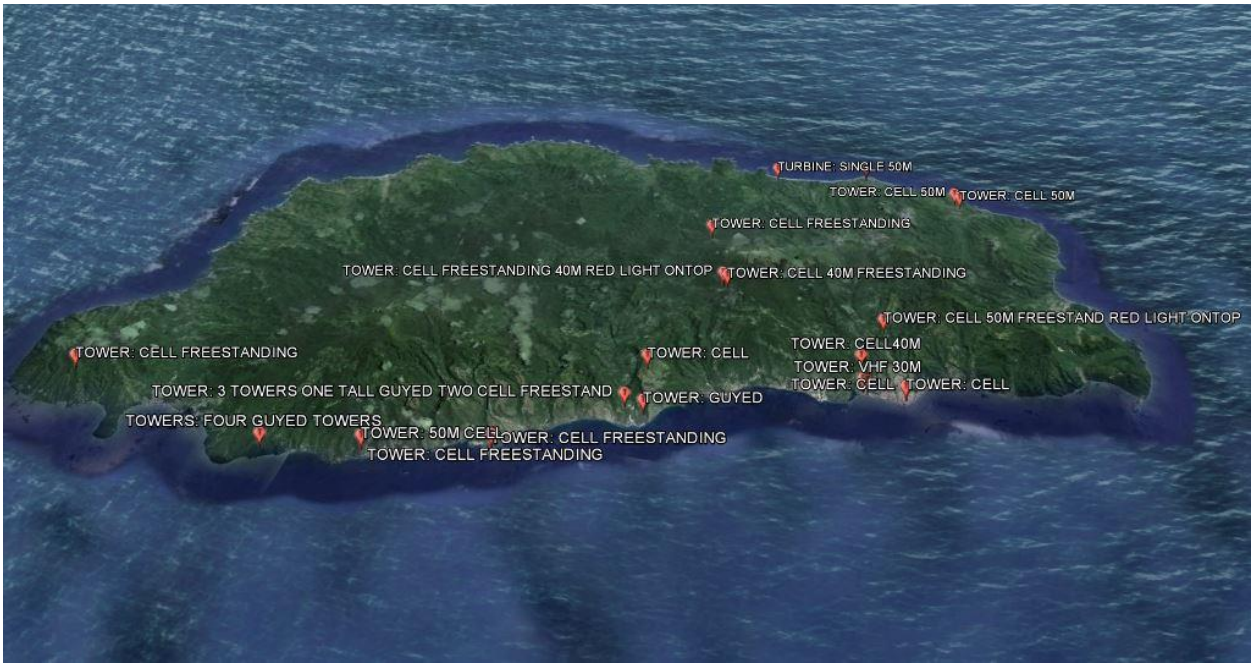

FIGURE FOUR: Timing of petrel-like activity recorded on radar at station DOM2 in the Morne Diablotin area, Dominica, West Indies. Surveys started at sunset and ended 250 minutes after sunset.

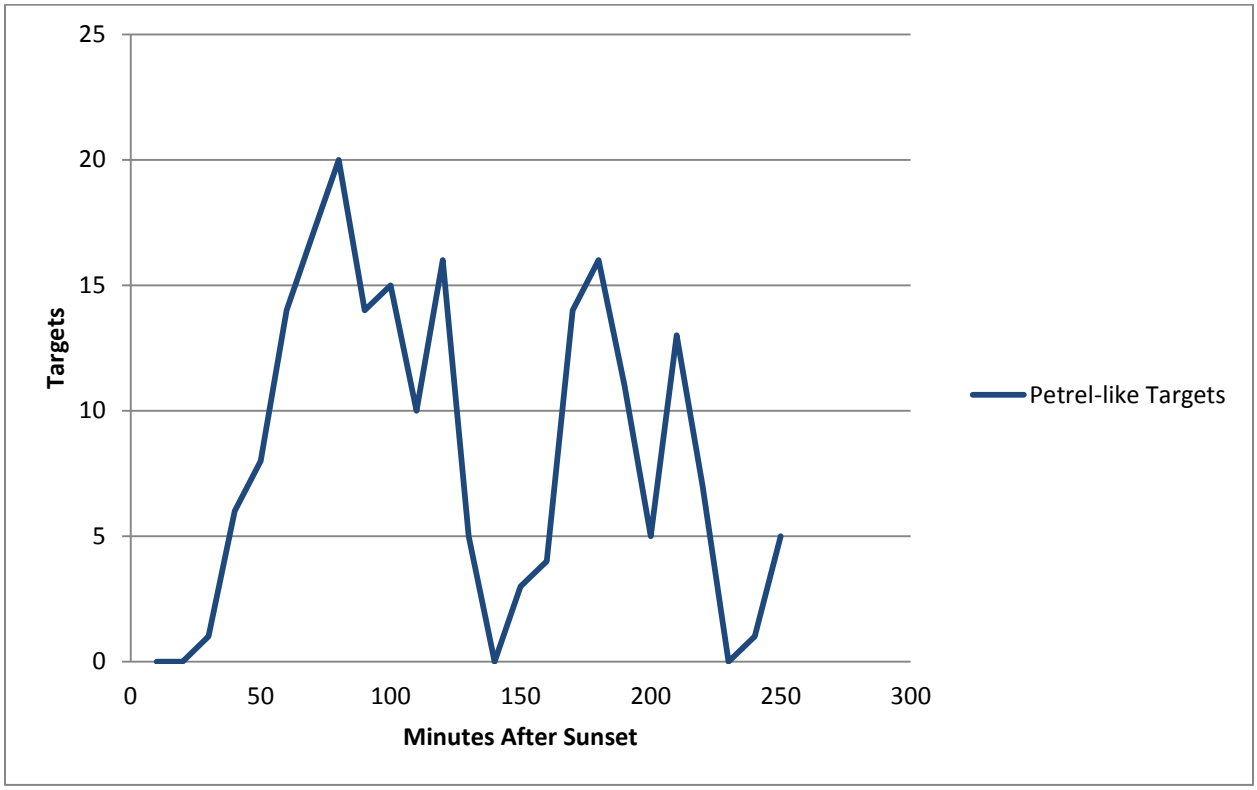

FIGURE FIVE: Timing of petrel-like activity recorded on radar at station DOM3 in the Morne Trois Piton area, Dominica, West Indies. Surveys started at sunset and ended 250 minutes after sunset.

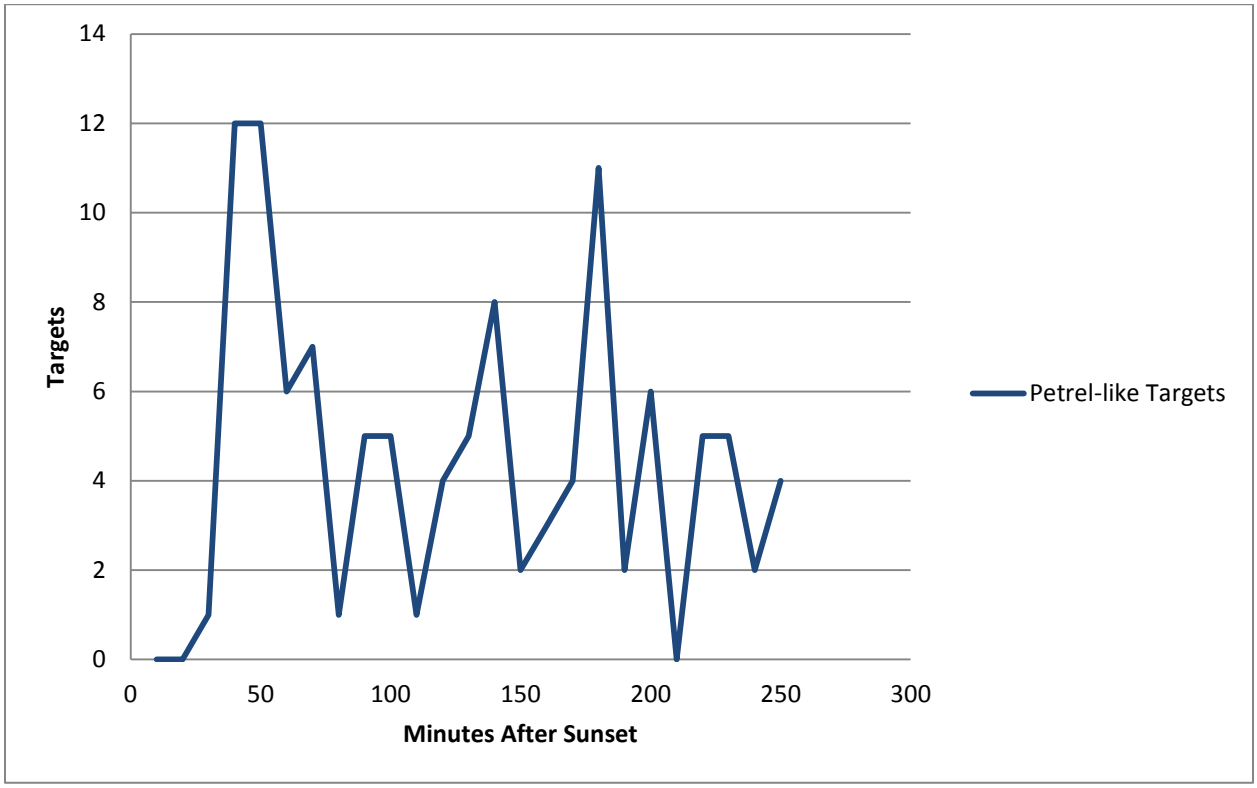

FIGURE SIX: Timing of petrel-like activity recorded on radar at station DOM12 in the Morne Micotrin area, Dominica, West Indies. Surveys started at sunset and ended 184 minutes after sunset.

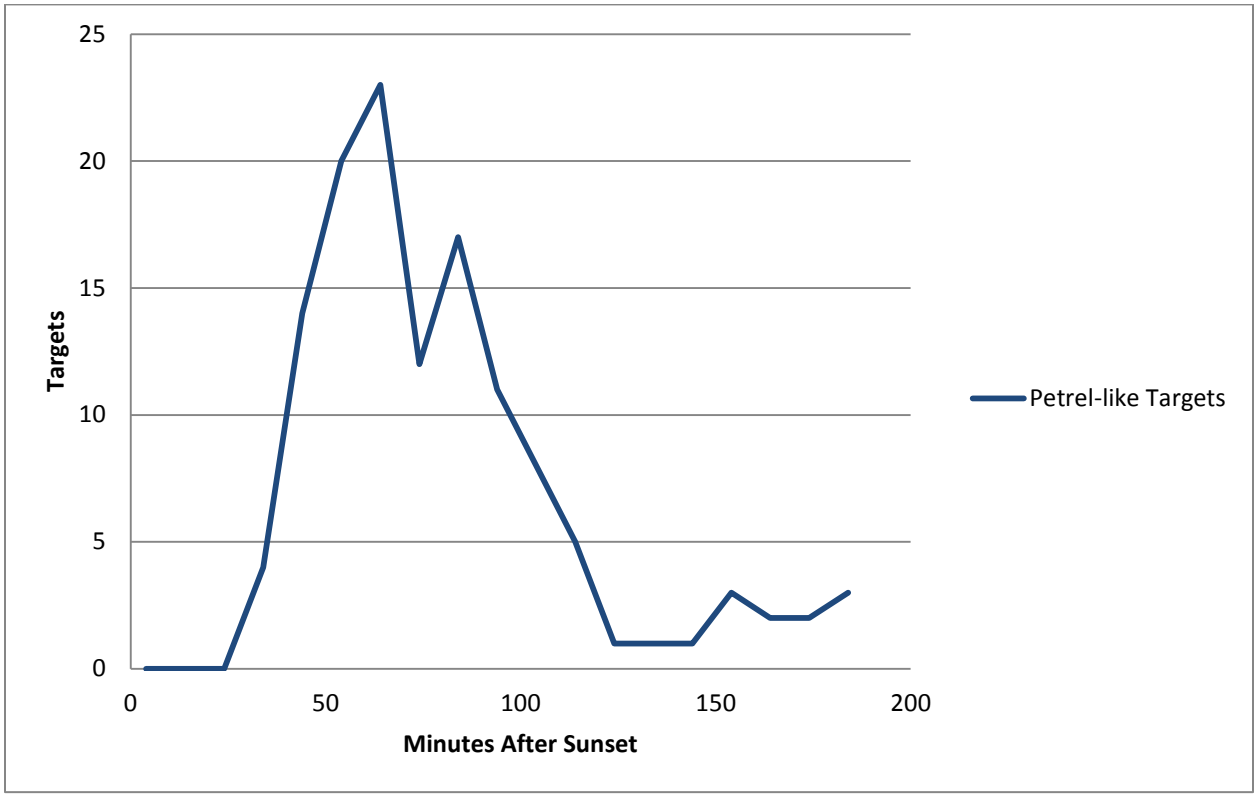

FIGURE SEVEN: Timing of petrel-like activity recorded on radar at station at DOM15 in the Morne Anglais area, Dominica, West Indies. Surveys started at sunset and ended 180 minutes after sunset.