



FFI Norwegian Defence
Research Establishment

21/01852

FFI-RAPPORT

Pattern of Life

– in a maritime military context

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1 February 2022

Keywords

Maritim overvåking

Algoritmer

Metoder

FFI-rapport / FFI report

21/01852

Project number

1527

Electronic ISBN

978-82-464-3363-3

Approvers

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Summary

Norwegian Defence Research Establishment (FFI) has, on request from the Norwegian Joint Headquarters (NJHQ), conducted a study of "Pattern of Life (PoL)". The expression Pattern of Life (PoL) has been used for some years by a diversity of civilian and governmental organizations to describe and reveal how people, ships, air planes, cars, and systems of different kinds move around in an area of interest (e.g. city, harbour, littoral waters or at sea). The ultimate goal has been to discover anomalies in these movements and thereby reveal illegal and suspicious behavior. Our task has been to find a good definition that can be used operationally in connection with maritime surveillance. PoL has for many years been a concept that has been used in connection with different operations conducted by both countries and organizations worldwide. Complex operations have been carried through internationally in which one a priori has assumed that everyone knows what PoL is. However, no good and all-embracing definition has been provided by the literature. This is especially the case for maritime operations in general. Everyone involved states that they are conducting PoL analysis of data collected in connection with different types of operations without any reference to a widely accepted definition of PoL.

We have searched the internet for available literature related to PoL. On the basis of this material we have found both a generic definition of the concept, and developed a maritime version of this definition that can be applied in an operational context. PoL is a complex, diverse and not least dynamic concept that will change with time of the year as well as from year to year. It is therefore necessary with effective maintenance routines of both the sources of information and the libraries used in the analysis to find vessels of interest. These vessels may be pinpointed by the NJHQ for further inspection and identification. This is, however, a different kind of work than we have been asked to perform and will imply more labor such that the concept can be used as effectively as possible.

In this report, we have ended up with a maritime definition of PoL based upon a relatively new paper that gives a generic definition of PoL. This paper also gives a procedure for how PoL should be applied based on information from several sources of information and different types of libraries. In this connection, the perhaps most important aspect of the analysis we can pinpoint here is that PoL is a dynamic concept developing with time, and not a static picture. This fact will be the basis, as well as the limitation, for how PoL analysis should be carried out.

Sammendrag

Forsvarets forskningsinstitutt (FFI) har på oppdrag fra Forsvarets operative hovedkvarter (FOH) gjennomført en studie på Pattern of Life (PoL). Uttrykket Pattern of Life (PoL) har blitt benyttet i noen år av en mengde sivile og statlige organisasjoner og etater for å beskrive og avsløre hvordan mennesker, skip, fly, biler, og systemer ulike slag beveger seg i et område av interesse (e.g. byer, havner og til sjøs). Dette har vi gjort med tanke på å finne en definisjon av begrepet som kan benyttes operativt i forbindelse med maritim overvåking. PoL har i mange år vært et konsept som har blitt benyttet i ulike operasjoner av både nasjoner og organisasjoner verden rundt. Store operasjoner har blitt gjennomført internasjonalt der man a priori har antatt at alle vet hva man snakker om, men ingen god definisjon har blitt gitt i litteraturen som omfatter maritime overvåking generelt. De involverte snakker kun om at de gjennomfører PoL-analyser på data samlet inn i forbindelse med operasjonen uten å henvise til en allment godtatt definisjon av PoL.

Vi har gått gjennom det vi har funnet av tilgjengelig litteratur vedrørende PoL. På basis av dette har vi funnet frem til både en generisk definisjon av begrepet samt en maritim versjon av PoL som vi mener kan benyttes i operativ sammenheng. PoL er et sammensatt og ikke minst dynamisk begrep som vil forandre seg både med årstid og fra år til år. Det er derfor nødvendig med gode vedlikeholdsrutiner av de informasjonskilder og bibliotek som benyttes for å finne frem til en bakgrunn som fører til at mistenkelige skip kan utpekes, og sannsynligvis identifiseres, for videre aksjon fra FOHs side. Dette er imidlertid et annet arbeid enn det vi har blitt spurt om å utføre og vil medføre ytterligere innsats for at konseptet skal kunne benyttes på mest mulig effektiv måte.

I denne rapporten har vi endt opp med en maritim definisjon av PoL basert på et nytt arbeid der en generisk definisjon av PoL har blitt utarbeidet. Denne beskriver også en prosedyre for hvordan PoL skal benyttes og fremskaffes basert på informasjon fra ulike kilder og bibliotek fra tidligere. Det kanskje viktigste i denne sammenheng er at PoL ikke er et statisk begrep, men i høyeste grad et dynamisk begrep som utvikler seg over tid. Dette vil danne både grunnlaget og sette begrensninger for hvordan PoL-analyser skal utføres.

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1 Introduction

The expression Pattern of Life (PoL) has been used for some years by a diversity of civilian and governmental organizations to describe and reveal how people, ships, air planes, cars, and systems of different kinds move around in an area of interest (e.g. city, harbour, littoral waters or at sea). The ultimate goal has been to discover anomalies in these movements and thereby reveal illegal and suspicious behaviour. However, there has not been a common and accepted definition of PoL, even if it has been used as if everybody knows what it means. This report seeks to reach a common understanding of the concept and suggest a definition that can be accepted by military users in an operational context as well as by civilians (both individuals and organizations). The problem of finding a good definition is that the expression PoL is used in very different settings and scenarios. There are examples that span from observing the behavior of people around the Abbottabad compound where Osama bin Laden spent his last days, to ship movements in the Arabian Gulf in order to combat piracy and smuggling. Especially the US Military has exploited the use of PoL and developed a framework that can be used in a variety of situations. There are, however, several questions to be answered before one can start to use PoL in an operational or tactical context. There are also legal questions related to privacy and data collection that must be answered before they are used in PoL analysis. This relates to both people and objects of interest. Much of the PoL analysis that is referenced in the literature involves Artificial intelligence (AI). It is beyond the scope of this report to review the use of AI in connection with PoL. It is, however, clear that AI will become more and more important in the years to come in order to cope with the increasing amount of surveillance data of different kinds.

2 Literature study of Pattern of Life

The international literature is full of references to Pattern of Life. However, published articles and official documents assume that PoL is a predefined expression that is universally accepted. That is definitively not the case as will be illustrated in this section.

One of the most spectacular uses of intelligence studies that can be found in the literature is how Osama bin Laden was found and killed in the city of Abbottabad in Pakistan [1]. This type of data collection and analysis is described as “revealing anomalies from Pattern of Life”. The bin Laden case is interesting because it illustrates what PoL is: “establishing a normal situation as background for the analysis and then discover anomalies from this condition”. In the case of bin Laden a survey of Abbottabad was used to map the handling of garbage in the city as well as different neighborhoods. In addition, telephone and internet services, children going to school etc. were used to establish the background situation. Using this information, the investigators were able to spot one single place that deviated from this pattern: they burned their own garbage, no children were sent to school, they did not have telephone or internet connection and the compound was surrounded by high fences. That laid the foundation for the attack that killed the leader of Al Qaida.

Another example is the maritime operation in the Arabian Sea to prevent piracy, smuggling and terrorism (Combined Maritime Forces (CMF))[2] . This operation has been ongoing for some time and the participating nations have gained experience with operations in a crowded environment with a multitude of different ships and smaller vessels. Due to quick turnover of personnel, it was difficult to keep up-to-date with which part of the traffic that was normal and legitimate, and which part that was suspicious. They have thus started to use a more systematic approach in order to give the personnel responsible for the analysis a better platform and background so they more easily are able to spot suspicious activity. This includes giving them a more intense brief on the situation when they start their work and to present an overview of the traffic in the area. The problem they have to cope with is that the traffic is extremely diversified since the same type of vessels are used both for illegal and legal activity.

These two examples illustrates how PoL has been used by military forces, but do not give any definition of the concept as such. However, the article by Craddock et al [3] from 2016 gives important information on the development of a generic definition of PoL that will be adopted in this report. They also explicitly state that:

“Despite being widely used within the field of intelligence generation, there is no formal definition for the concept of Pattern of Life (PoL)”

This article provides a good basis for the development of a more targeted definition of PoL that can be applied by the intelligence and surveillance community (e.g. NJHQ), especially maritime surveillance. The information and suggestions from this article will be used to a large extent and adapted to the maritime domain.

3 Definition of Pattern of Life

3.1 Earlier studies and definitions of Pattern of Life

There has been many attempts of defining Pattern of Life either published on the web or in the literature. A summary of what can be found by searching the web for the phrase “Pattern of Life” is described in this subsection. This overview is by no means complete, but gives an insight of what seems to be most relevant and interesting. The common feature is that the literature deals with only one aspect of the field and not an all-encompassing definition of the expression. We will here review some of these definitions and later relate them to the generic description found in the article of Craddock et al which will be treated in detail in the coming subsections.

During the operation in the Persian Gulf and Somalia the CMF organization gave the following definition of PoL based on activity at sea[2]:

- *“POL is an observable human activity described as patterns in the maritime domain related to the CMF mission at a specified period and location”*

This definition of PoL is specifically related to the CMF mission, as explicitly stated, and during a specific time period and location. This limits the definition to a specified mission and can thus not be directly applied in general to a situation elsewhere.

Another definition of Pattern of Life can be found in Wikipedia:

- *“Pattern-of-life analysis is a method of surveillance specifically used for documenting or understanding a subject’s habits. This form of observation is generally done without the consent of the subject, with motives including but not limited to security, profit, scientific research, regular censuses, and traffic analysis”*

This is not a direct definition of PoL, but rather a definition of how PoL analysis is performed. This is, as will be presented later in this report, the second step in the way Craddock et al defines PoL and then go on to describe its application.

A third definition is taken from the article by Lansing [1]:

- *“A pattern of life is an observable manifestation of an underlying regularity in human behavior. Here human behavior is meant in the broadest sense to refer to the behavior of individual people, of groups, teams, crowds, and organizations of people, and – more abstractly – of cultures and societies; the term actor will be used to refer to any of these.”*

In addition there must be an underlying regularity in the responsible mechanism(s) that must be understood. Again, this definition is mainly used in connection with the behavior of individuals or a group of people, as well as more abstract objects like e.g. ships, cars or airplanes.

The fourth, and last, definition presented here is the one that has been developed by the NJHQ:

- *“PoL analysis is used to establish situational awareness in a limited geographical area, and during a specific time period, based upon earlier observations and historical data. The analysis seeks to establish an understanding of the normal situation in the limited geographical area, and thereby give a time-limited prediction. PoL analysis is used mainly before and during the conduction of operational activities supporting decision-makers at different levels”*
- *“Divergent analysis is used to explain behavior that diverge from normal behavior, in order to clarify if efforts (situational awareness and prediction) should be initiated. The analysis covers a limited geographical area during a specific time period, and is based on PoL analysis. It can also be used to compare different actors’ behavior with the normal situation. Divergence analysis is used during and in the aftermath of operational activity in support of decision makers at different levels. Data revealed in divergence analysis are incorporated in future PoL analysis”*

In this case, NJHQ is more concerned about **what** PoL “analysis” is used for, rather than giving a **definition** of the concept itself. However, for the coming discussion it is an interesting input, together with the three other definitions given in this subsection.

These definitions are characterized by the fact that **human activities** seem to be in focus. That does not equal focus on the individual human, but rather the broader aspect on activities humans in groups perform. This emphasis is important when it comes to regulatory restraints for actors involved with PoL production. In the definition, that is found in Wikipedia, uses the word **subject** to define PoL. The latter is a more general definition because it involves objects different from humans even if it starts with the wording “PoL analysis”. The definition used by NJHQ is a “working title” for PoL used in the absence of an agreed definition by the military (and political) leaders. We may therefore at this point state that there have been several attempts of defining PoL, but that most of them deals with PoL analysis without defining the concept of PoL in advance.

As already mentioned in section 2, we will use the work by Craddock et al [3] as a starting point for a proposed definition tailored to the domain of maritime surveillance. However, the generic definition of PoL given by Craddock et al has a much wider area of application than maritime surveillance. The Craddock article defines PoL in three steps:

- The definition of entity
- The definition of behavior

-
-
- A generic definition of PoL

These concepts will be described in further detail here.

3.2 Entity

Craddock et al defines entity as an object of interest as follows:

“An entity is a tangible or intangible thing (living or nonliving, individual or a group) which exists in an area of interest and possesses dynamic parameters”

An entity can therefore be many different things such as individuals, a group of people, animals, machines, applications, processes etc. The list can, with the generic definition of “entity” be made as long as necessary.

3.3 Behavior

Again following Craddock et al a generic definition of behavior can expressed as follows:

“A behaviour is a sequence of an entity’s dynamic parameters which can be observed or inferred from observations”

Observation is in this context different aspects of an entity which can be measured by sensors or human observers monitoring the entity, and dynamic parameters which exhibits changes over time.

3.4 Generic definition of Pattern of Life

With the definitions of “entity” and “behavior” in mind, Craddock et al defines PoL as:

“A generic Pattern of Life (i.e. one not restricted to human behaviour) is the repeatable behaviours of an entity which recur at normally-distributed time intervals, under a particular set of conditions”

The term “set of conditions” is defined as:

“A set of conditions is the set of factors which influence an entity’s behaviour”

This definition can be applied to a variety of cases. Surveillance of individuals, smaller groups of people and all the inhabitants in a large city are examples where the concept of PoL has been used to study and map their behavior. Maritime surveillance is another example that is of special interest in this study.

Here, we will discuss how PoL is **produced** and the type of information that can be deduced from the process. Craddock et al defines a PoL **history** as:

“A Pattern of Life history is the set of Patterns of Life which results from combining the PoL from current and past observations for one or more entities, the PoL for similar entities and the PoL which results from other sources”

With this definition of PoL history, Craddock et al goes one step further and defines PoL **processing** as:

“Pattern of Life processing is the creation, maintenance and application of Pattern of Life history which is used to recognize, analyze and predict behaviours and anomalies occurring either currently or in the past”

It should be stressed that an entity’s PoL will change over time, and is therefore not a static property. New observations of an entity becomes available over time and its history therefore needs updating. With the definitions of PoL history and processing, Craddock et al finally define the concept of Pattern of Life **Intelligence** (POLINT):

“Pattern of Life Intelligence is a set of information which is the output of Pattern of Life processing”

Pattern of Life Intelligence (POLINT) can be regarded as similar to Signal Intelligence (SIGINT), Communication Intelligence (COMINT), Geographical Intelligence (GEOINT) etc. The use of the word POLINT has, as we are aware of, not been presented in the literature before the article by Craddock et al. However, the concept has in practice been in use for many years. Today, POLINT is mainly performed manually by humans. Operators of different platforms are inspecting data from surveillance vehicles on the ground, on the sea, in the air and in space. Automated data handling of some aspects of surveillance data has been developed over the years, but is limited to collecting data and showing the surveillance picture in real time. PoL analysis is very limited and needs to be improved in the years to come.

With the three definitions PoL history, processing and intelligence, it is now possible to examine how POLINT is created and describe the processes that use PoL intelligence operationally.

3.5 Generic Pattern of Life processing

Based upon the generic definition of PoL presented above, Craddock et al develop a procedure for PoL processing. This procedure shows how the different elements are interconnected and how they influence each other. It also gives a “recipe” for how PoL information should be

extracted, created and maintained since PoL is a living concept that changes with time. PoL maintenance is important for decision makers not to act upon outdated information.

Our proposed definition, as presented below, is biased by the initial object of this report, maritime surveillance. The definition of PoL is the main focus of this report. However, the operational application by the decision makers is equally important. POLINT is an approach to address the questions of who, what, when, where, why and how for the past, present and future behavior of a specific object (or objects). In Figure 3.2, taken from Craddock et al, the POLINT process is schematically presented. Input to the process is shown by ellipses, while “rounded” boxes show the process itself. There are four sources of input to the POLINT process:

- Observations. Data from different sensors and systems during the time period of interest.
- A priori information. Static data with data from the time period prior to the time period of interest.
- Application specific libraries. These are libraries populated by the users and are used for classification and identification purposes.
- PoL history. Existing data showing previous behavior of an entity (or several entities).

Figure 3.1 shows an example of how POL-history may be presented to an operator. Here, track history is displayed in grid cells where each purple circle indicates the number of previous reported ships, of the same size range, in each cell point. The triangles show the track of one specific ship where the coloring indicates deviations from the known and learned history. The system shown here is part of current work by FFI and Kongsberg Norcontrol (KNC) for The Norwegian Coastal Administration (NCA). The end result is a decision aid system that helps the Vessel Traffic Services operators to early detect possible grounding and collision situations[4][5]. A red color on the triangles, shown in the figure, will result in an alarm.

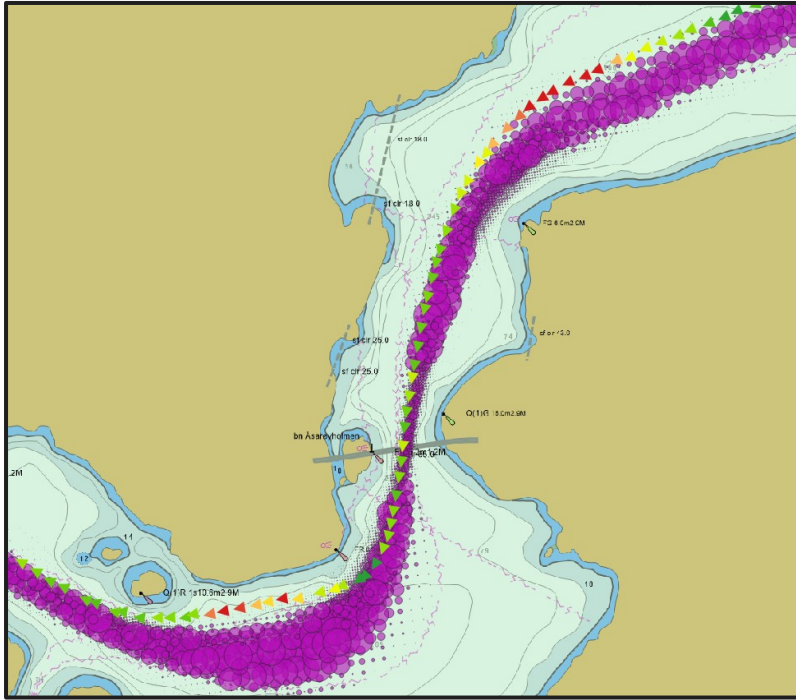


Figure 3.1 The figure shows track history in grid cells where each purple circle indicates the number of previous reported ships, of the same size range, in each cell point. The triangles shows the track of one specific ship where the coloring indicates deviations from the known and learned history. A red color on the triangles indicates an alarming situation (source: FFI).

From these sources of input one can start the POLINT process as shown on the right side in Figure 3.2. These can be summarized as follows:

- A. Behavior extraction. Extracts low level behavior from the input observation and the application specific libraries.
- B. Higher level behavior extraction. The data from the behavior extraction is used to create a behavior hierarchy. The processing is iterative and data from the application specific library as well as a priori information is applied in the procedure in order to identify the behaviors. The result is presented as multiple levels of behavior.
- C. Behavior prediction. This procedure predicts how a behavior of an entity will evolve in the future, based on knowledge of how behaviors have evolved in the past based on PoL history. An entity's behavior can evolve in several directions and is not necessarily unique.

- D. Anomaly detection. Here, currently observed or predicted behavior is compared with PoL history which occurred during similar conditions.
- E. Anomaly assessment. The input from the anomaly detection is used to determine if the observed behavior requires further action/attention from the user. A priori information is also used as information at this step in the procedure.
- F. Intent and causation analysis. This step produces potential reasons why an observed behavior or anomaly is occurring.
- G. POLINT. The final step in the procedure which produces a wide range of information on the entity (or entities) of interest. The result contains behavior information regarding past, present and future behavior of an entity.
- H.

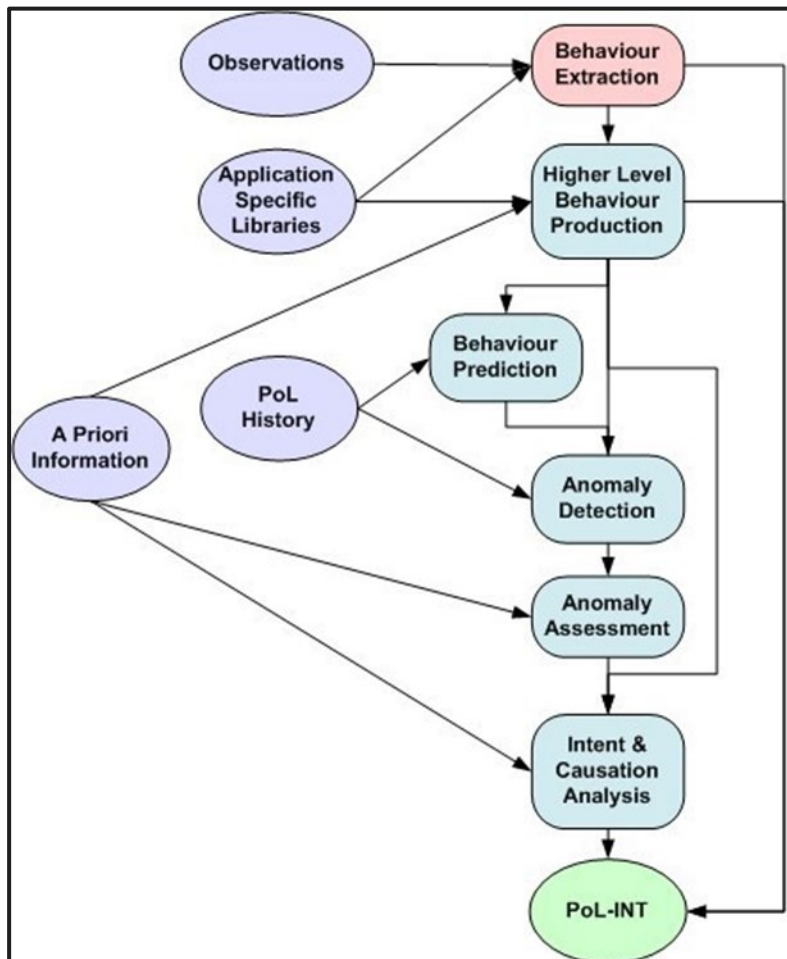


Figure 3.2 The Pattern of Life intelligence processes [3]

The resulting POLINT has three purposes according to Craddock et al:

- i. PoL history creation and maintenance.
- ii. Extension of the application specific library.
- iii. Further exploitation of the behavior information/characteristics.

This is illustrated in Figure 3.3 and shows how POLINT can be used once the information has been created as shown in Figure 3.2. POLINT is used to update both the application specific library and the PoL history. New information is in this way more or less constantly fed into the system such that the background information is up to date in order to understand present behavior and ultimately also predict future behavior. The third element, further exploitation, deals with how POLINT is used once it had been created. This is part of the questions that addresses the basic user information requirements (who, what, when, where, why and how) needed to decide if action is necessary.

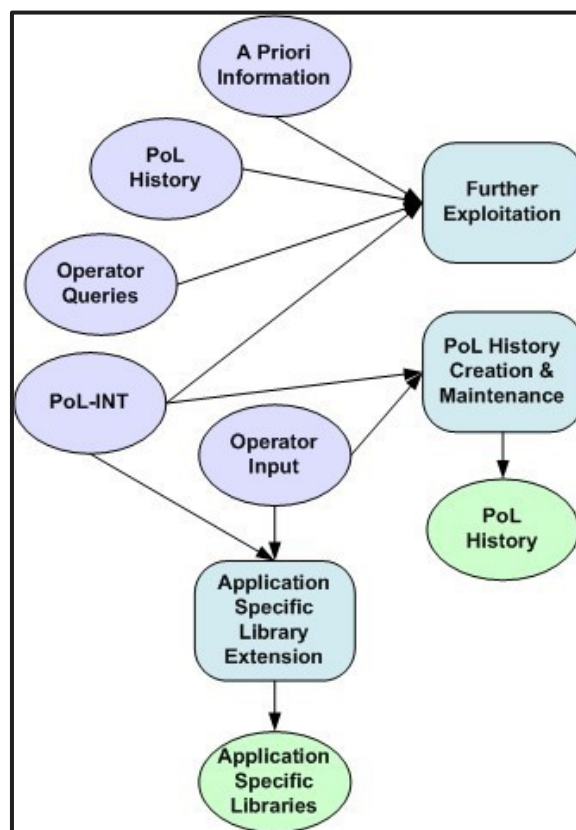


Figure 3.3 Different processes that use Pattern of Life intelligence [3]

A tool for Behavior Analysis (BEAN), developed in a related FFI activity, provides algorithms and operator presentations (see [4], [5] and Figure 3.1) that illustrates items A-E above and gives an example of systems related to PoL history, PoL processing and POLINT.

The generic definition of Pattern of Life and associated POLINT presented above forms a basis for defining a maritime version of these two important concepts.

3.6 Maritime definition of Pattern of Life

Maritime surveillance is based on inputs from both cooperative and non-cooperative sensors and systems. In the first category there are self-reporting systems such as Automatic Identification System (AIS), Vessel Monitoring System (VMS), Long Range Identification and Tracking (LRIT) and SafeSeaNet (EU reporting system). These systems are updated by the owner/operator and in an ideal world contain only correct information about the vessel and parameters the systems produce. They can, however, be manipulated to give false information as well as incorrect information due to unintentional inputs from the users.

In the second category there are sensors and platforms which can observe an object (entity) without the involvement of the object itself. The category consists of sensors or systems like Synthetic Aperture Radar (SAR), electro-optical sensors covering different parts of the spectrum, magnetic sensors, acoustic sensors, RF-sensors and ESM. Information from one or more of these sources of information is today fed into different surveillance systems that combine the information to give an overview of the situation in real time. However, no information is generally available concerning the behavior of the object over time. Nevertheless, there are several initiatives that in a semi-autonomous manner describe a vessel, or a group of vessels, typical behavior over time. One example is ship density plots that show the typical routes used by the majority of ships and deviations from this behavior ([6], [7], see Figure 3.4).

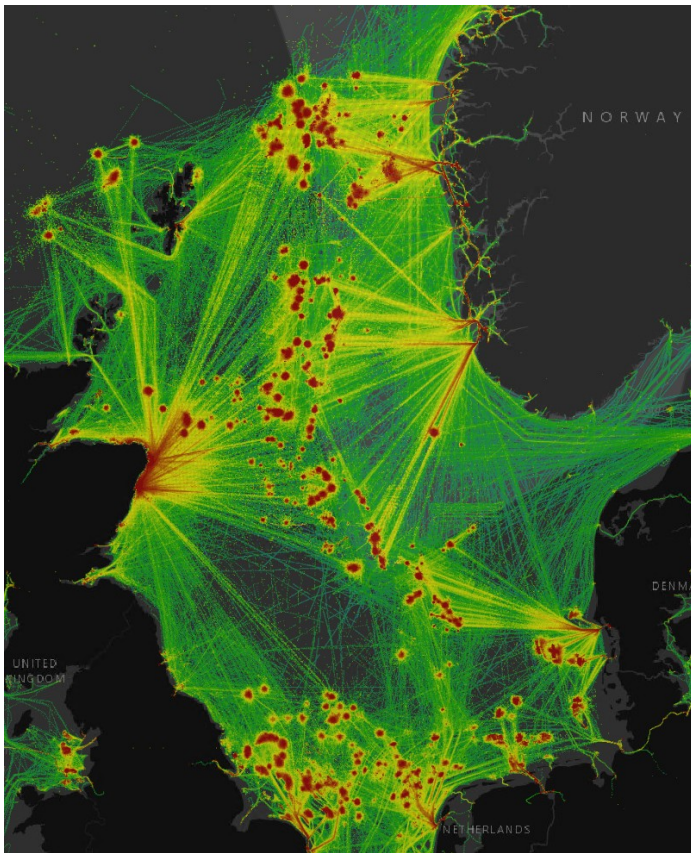


Figure 3.4 Density mapping of offshore related ship traffic [6]

With the generic description and definition of Pattern of Life (PoL) presented in Section 3.4, we propose the following definition of PoL that can be used in a maritime context:

“A Pattern of Life is the repeatable behavior of a vessel (or group of vessels) which recur at normally-distributed time intervals, under a particular set of conditions”

The term **“set of conditions”** is defined as:

“A set of conditions is the set of factors which influence a vessel’s (or a group of vessels) behavior”

This is word by word the same definition as in the generic case except that we have exchanged the word entity with vessel. The same is, however, applicable for every type of entity and the corresponding behavior. With this definition we can start to populate the different boxes in the schematic outline in Figure 3.2 and Figure 3.3. The different elements of the PoL process can now be populated with the different systems, sensors, stored data etc. This is presented in more detail in Section 3.7.

3.7 Maritime definition of Pattern of Life processing

In Section 3.6 a **definition** of Pattern of Life was proposed that can be used in maritime surveillance and to predict the **behavior** of an entity (vessel) in the maritime domain. In Section 3.5 the generic definition of PoL **processing** with all the elements that are involved was presented. This scheme can now be populated with the information from maritime surveillance at present.

There are two aspects of maritime surveillance:

- How is data from different sources treated and put together in order to achieve situational awareness?
- How is the procedure of obtaining information, that can be used in an operational context, applied on the observations?

These two questions are dependent upon how the data are treated such that information are available in a timeframe that makes it possible for decision-makers to act in a timely manner. Data from different sources are today put together by programmatic tools and presented visually to an operator. This procedure gives an overview of the present situation, but does not give any information of what has happened in the past and what will happen in the future. The problem here deals with the level of situational awareness that is possible to achieve and which decision-makers must act upon. There are three levels of situational awareness:

- Situational picture (what is going on)
- Situational understanding (understand what is going on)
- Situational prediction (predict what will happen in the future)

Whether the outcome is surveillance or intelligence is linked to the three levels of situational awareness. The last point, prediction, is certainly linked to intelligence. The complete picture resulting in situational awareness putting together data and information from different sources therefore involve elements from both surveillance and intelligence. An automatic handling of data involving machine learning or artificial intelligence must therefore be employed with care. Information, as well as access to it, must be distributed only to those decision-makers that are in need of the information to conduct their tasks.

In addition there are ethical questions related to sensitive information on individuals as well as other entities such as vessels and their crew, cargo, passengers and shipping company, only to mention a few. These questions are not the main object of our present work, but is mentioned anyhow because many lawmakers have advocated that these possible problems must be solved before AI become widely used. In summary, the possibilities of using AI and related technology are large, but there are questions that needs to be addressed before the huge (and ever increasing) data base that can be used for POLINT is leveraged.

4 Summary and recommendation

This report has presented literature concerning Pattern of Life internet searches. The most striking finding is:

There does not exist a common and accepted definition of Pattern of Life (PoL)

This illustrates that there is a need for the scientific, as well as the military, community to find good and useful definitions of these two concepts that are in wide use worldwide. This is surprising, all the time the concept has been in use for many years, but the different user communities seem to have forgotten the fact that a definition for PoL does not exist. We therefore, by using the generic definition of PoL, recommend the following definition of PoL in a maritime context:

“A Pattern of Life is the repeatable behaviour of a vessel (or group of vessels) which recur at normally-distributed time intervals, under a particular set of conditions”

The term “**set of conditions**” is defined as:

“A set of conditions is the set of factors which influence a vessel’s (or a group of vessels) behaviour”

Thus, we quote what was stated in Chapter 2 what PoL is about:

“Establishing a normal situation as background for the analysis and then discover anomalies from this condition”

An alternative, more elaborate, definition of a maritime PoL may thus be formulated as follows:

“A Pattern of Life is the repeatable behaviour of a vessel (or group of vessels) which recur at normally-distributed time intervals, under a particular set of conditions, thus establishing a normal situation as background for the analysis and then discover anomalies from this condition”

Since AI evidently will become part of Pattern of Life analysis and updating of archives etc., there is also a need for clarification on how AI will be used in the future. This may cause an increasing problem as the amount of data that can be used in PoL analysis increases over the coming years, and legal aspects of using data that may cause problems due to data privacy.

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Abbreviations

AI	Artificial intelligence
AIS	Automatic Identification System
BEAN	Behaviour Analysis COMINT Communication Intelligence
FFI	Forsvarets forskningsinstitutt
FFI	Norwegian Defence Research Establishment
FOH	Forsvarets operative hovedkvarter
GEOINT	Geographical Intelligence
CMF	Combined Maritime Forces
KNC	Kongsberg Norcontrol
NCA	The Norwegian Coastal Administration
LRIT	Long Range Identification and Tracking
NJHQ	Norwegian Joint Headquarters
PoL	Pattern of Life
POLINT	Pattern of Life Intelligence
SIGINT	Signal Intelligence
VMS	Vessel Monitoring System

About FFI

The Norwegian Defence Research Establishment (FFI) was founded 11th of April 1946. It is organised as an administrative agency subordinate to the Ministry of Defence.

FFI's mission

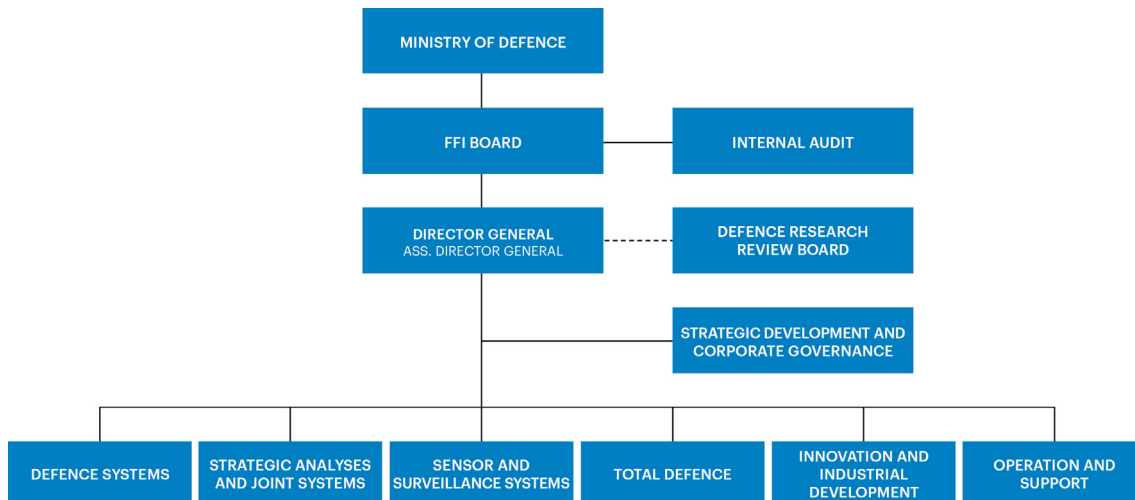
FFI is the prime institution responsible for defence related research in Norway. Its principal mission is to carry out research and development to meet the requirements of the Armed Forces. FFI has the role of chief adviser to the political and military leadership. In particular, the institute shall focus on aspects of the development in science and technology that can influence our security policy or defence planning.

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FFI turns knowledge and ideas into an efficient defence.

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Creative, daring, broad-minded and responsible.



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