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A Comparative Analysis of Vessels Detained under the PSC Agreements of Paris, Tokyo and Viña del Mar

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Abstract: Twenty years ago, in 1992, the International Maritime Organization set the objective of extending the regional Port State Control agreements to the world scale. This would be achieved, it was hoped, by "exporting" the model of the Paris MoU (Memorandum of Understanding) agreement of 1982 to other regional areas. Now would seem to be a good time to consider the prospects for a future scenario where all the countries involved form a truly global network with uniform procedures. The authors of this article put forward an earlier objective that could be the beginning of that global policy, from a detailed look at the three most important regional agreements (Paris, Tokyo and Viña del Mar) that encompass geographically the following areas, respectively: Europe plus Canada, the Asia-Pacific, and South America. To this end, we first make a theoretical comparison based on the legal standards of application, and then present a study made of all the vessels detained under the three agreements, with a view to determining whether or not there are different kinds of behaviours, with regard to the flags and "recognised organizations" used by the vessels to certify their levels of safety. The numerical variables we have taken as basic with respect to compliance with the international standards are: the date that the vessel's keel was laid (age of the vessel) and as significant categorical variables, the type of vessel, the flag, the typology of that flag, the corresponding classification society, and whether or not that society is a member of the IACS (International Association of Classification Societies). The results show a similar trend between the Paris and Tokyo agreements, but in the case of Viña del Mar, the level of efficacy in the control appears to be insufficient in comparison with the standard of the other two.

Key words: Port state control, flags of convenience, maritime safety, globalization.

1. Introduction

The IMO (International Maritime Organization) has carried out valuable work and invested a great deal of effort in implementing rules and regulations covering maritime transportation to ensure compliance with vital standards of shipping safety and marine environmental protection. The SOLAS (safety of life at sea) and MARPOL (maritime agreement regarding oil pollution) Conventions [1, 2] have been adopted by states accounting for more than 90% of the total world fleet [3, 4]. Whereas traditionally, it was the flag state of a vessel that had exclusive regulating responsibility and competences for the safety of that vessel, with the emergence of the open registries, it is the coastal state, the other important state actor in maritime transportation, which is now increasingly assuming similar responsibilities and reacting to the risks posed by sub-standard vessels [5, 6].

In 1978, after the ecological disaster of the Amoco Cadiz in France, the Paris MoU (memorandum of understanding) on PSC (port state control) was created [7]. The function of the PSC consists of the inspection of foreign vessels in national ports, for the purpose of verifying that the conditions of the ship, its equipment and crew comply with the requirements demanded in international conventions [8]. This system of inspections has its origins in a problem on which the IMO has, since its inception, concentrated its efforts: ensuring that all ships meet certain minimum requirements so that they do not present a danger to safe navigation, and guaranteeing that the living and working conditions of crews are acceptable, in the interests of the safe operation of the vessel. On many

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ships flying flags of convenience, the captain, first officer and chief engineer often come from countries where levels of training are not acceptable, while the rest of the crew consist of seamen drawn from such a diverse range of countries, languages and cultures that not even coexistence and mutual tolerance can be safely assumed [9, 10].

The present and still evolving regional system of PSC emerged essentially from two models, one national and the other international but limited to a particular region [11]:

- The American model of the U.S. Coast Guard: 1970 and 1994;
- The European model of the Paris MoU: 1978 and 1982.

The MoU model implies the "ceding" of sovereignty by states, in the sense that maritime governments cooperate with each other with the object of establishing a framework of trust in the agreed control procedures that serve as a reference for all the signatory countries of that MoU. However, in the USA model, that cooperation does not exist, and only the control procedures implemented by and are admitted as valid in the USA. Promoted by the IMO, in recent years, eight more agreements have been signed for the PSC of vessels, all of them are regional in scope (Table 1).

Now that the MoU of Paris has been in existence for 30 years, and those of Viña del Mar and Tokyo for 20, it would seem appropriate to ask what point has been reached in that hypothetical, perhaps utopian, evolution towards a global MoU—an agreement that would facilitate the exchange of information between all maritime countries, and would generate sufficient trust for all national maritime authorities to share the same objectives and criteria. Without getting that far ahead, the authors' intention, as reported in this article, has been to study the three most significant agreements, those that have been in operation sufficiently long to have established patterns or trends, to compare the results, and then to speculate, in no great depth, on whether the countries of these three regions would find it possible to manage the vessel control system jointly and uniformly.

Table 1 Regional PSC agreements.

Paris MoU (1982)
Viña del Mar (Latin American Agreement on PSC of Vessels) (1992)
Tokyo MoU (Asia-Pacific MoU) (1993)
Caribbean MoU (1996)
Mediterranean MoU (1997)
Indian Ocean MoU (1998)
Abuja MoU (West and Central Africa MoU) (1999)
Black Sea MoU (2000)
Riyadh MoU (Gulf Region) (2004)

The objective in the study reported here, therefore, is firstly, to compare the legal framework of the three most well-developed regional PSC agreements (heading the list in Table 1) under which inspection actions have been carried out for two or three decades; and secondly, to collate empirically the most evident results in respect of registries, classification lists, vessels detained by keel date, typology and classification society. On the basis of the results, an attempt is made to determine if inspections and detentions of vessels under the three PSC regimes studied show any hopeful degree of uniformity and consistency.

1.1 Methodological Aspects

To carry out a comparative review of the control mechanisms of the port states in the three regions covered, the first stage was to analyse the legal instruments that govern the three regional agreements, and then the effectiveness of these agreement in practice, using the data on vessels detained provided by the secretariats of the agreements, in advance even of the publication of those data on the web. Rather than looking back over the decades, it was decided to make the comparison for a recent and shorter time period. The data analysed are for the first half of the year 2011, because it coincides with the date of implementation of the NIR (new inspection regime) under the MoU of Paris.

The principal objective set was to analyse the typology of the vessels detained, to determine whether or not different kinds of behaviours exist with respect to the flags and "recognised organisations" used by the owners of vessels to certify their levels of safety. The numerical variables taken as basic with respect to compliance with the international standards are: the date that the vessel's keel was laid (age of the vessel) and as significant categoric variables, the type of vessel, the flag state, the typology of that flag, the corresponding classification society, and whether or not that society is a member of the IACS (International Association of Classification Societies). A classification has been generated (that did not previously exist) for the data of the Viña del Mar agreement, of the same type as that used in the agreements of Paris and Tokyo. This has enabled the compilation of virtual lists of flags (Black-Grey-White and VHR-HR-MHR-MR), in order to make the global data consistent and comparable (because, in the Viña del Mar agreement, the flags of vessels are not classified into those categories). For the treatment of data (covering a total of 1,242 vessels) R-commander, a platform-independent basic-statistics GUI (graphical user interface) for R, has been used [12].

1.2 Review of the State of the Art

Manuals, such as that of Özçayir [13], have analysed in detail the juridical consequences of the implementation of the various PSC regimes. In 2001 and 2003, another two manuals were published, more technical than juridical, one by Piniella and Alcázar [11] and the other by Kidman [14]; both were much more practical and described the inspections of vessels and the way these should be carried out. An article by Aguilar [15] covered the regime of sanctions, and these were associated with the evolution of the PSC regime during those earlier years. A more general study is that of Chatzirigopoulou [16], although its contributions are limited to updating the legal bases of the PSC system. Since 1995, the IMO [17] has also issued a manual, by way of a model course on PSC, updated in the years since then, which has been complemented with another on the procedures [18].

Finally, in this review, reference must be made to the global aspects of these policies and how they are implemented by the governments of states, in response to these challenges, as presented by Li [19] and, more recently for Taiwan, in the study of Liou [20]. Knapp and Frances [21-24] have been pioneers in conducting econometric studies with the object of quantifying the global situation with respect to PSC effectiveness more rationally. Using binary logistic regression, they have established the differences existing in PSC inspections across several regimes [25-27]. They show that treatment of vessels across the regimes varies, indicating room for harmonization in all inspection areas [26]. In parallel, Cariou et al. [28] used data from the Swedish Maritime Administration (1996-2001) to test how a vessel's characteristics influence the length of time between two consecutive PSC inspections, together with the number of deficiencies detected during PSC inspections. In addition, Li and Zheng [19] have researched the effectiveness of PSC and the methods for selecting ships to be inspected adopted by regional PSCs; their study confirmed that the enforcement of PSC is effective in improving ship safety levels in maritime transport. This review of the state of the art is completed with the most recent studies of Bang [29] and Li et al. [30].

2. Comparison of the Three Agreements

As already stated, this study considers only the three longest established PSC agreements, rather than those covering other regions (the Caribbean, Abuja, etc..) which have not reached the levels foreseen regarding their capacity for the detection and reduction of sub-standard vessels.

The mission of each MoU is to promote the effective implementation, and the universal and uniform application, of the relevant IMO/ILO

agreements in ships operating in the region covered by the MoU. With certain minor differences (Table 1) the three MoUs/Agreements of Paris, Tokyo and Viña del Mar are reasonably uniform in the provisions of the international instruments that they seek to monitor, although under the European agreement, the list is more comprehensive.

The MoU of Paris, the first to set up a regional PSC system in 1982, established two groups of inspections: the first was applied generally to all the vessels calling at member countries' ports; and the second was only applied to particular types of vessels considered to be of special risk. Within the group of inspections applied to all types of vessels, two categories can be distinguished: the initial inspection, and the more detailed inspection. The inspections that affect only certain vessels of special risk fall into one single category, the extended inspection. Basically, this is the inspection system that has been adopted generally in the rest of the agreements, commencing with those of Viña del Mar in 1992 and Tokyo in 1993.

The Paris MoU was also the first in establishing a method for selecting the vessels to be inspected; it is this method that has now been modified, from the year 2011. The original method of selection started from the information already available on the vessel; this makes clear the importance of all the agreements having their own system for transmitting vessel data throughout their network. In the case of the Paris MoU, there were two initial procedural criteria for the selection of vessels for inspection: first, the vessel was already listed in the category "vessel for priority inspection"; and second, it had a high "general selection factor".

Since the entry into force of the NIR at the beginning of 2011, each ship in the information system is assigned a ship risk profile, which determines its priority for possible inspection, the maximum interval between inspections, and the scope of the inspection. All ships in the information system are categorised either as high, standard or low risk (HR,

Table 2 Relevant instruments[a].

Paris	Tokyo	Viña
	LL 66	
	LL PROT 88	
	SOLAS 74	
	SOLAS PROTs 78 and 88	
	MARPOL 73/78	
	STCW 78	
	COLREG 72	
	TONNAGE 69	
ILO No. 147	ILO No. 147	
PROT 96		
CLC 1969		CLC 1969
CLC PROT 1992		
+Bunker		
	AFS 2001	

[a]For the purposes of the three memoranda, the relevant instruments are the following:

- International Convention on Load Lines, 1966 (LL 66);
- Protocol of 1988 relating to the International Convention on Load Lines, 1966 (LL PROT 88);
- International Convention for the Safety of Life at Sea, 1974 (SOLAS 74);
- Protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974 (SOLAS PROT 78);
- Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974 (SOLAS PROT 88);
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, and as further amended by the Protocol of 1997 (MARPOL);
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW 78);
- Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 72);
- International Convention on Tonnage Measurement of Ships, 1969 (TONNAGE 69);
- Merchant Shipping (Minimum Standards) Convention, 1976 (ILO Convention No. 147) (ILO No. 147);
- Protocol of 1996 to the Merchant Shipping (Minimum Standards) Convention, 1976 (ILO Convention No. 147) (ILO No. 147);
- International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969);
- Protocol of 1992 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC PROT 1992);
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001 (+Bunker);
- International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001 (AFS 2001).

SR or LR) based on generic and historical parameters. The ship's risk profile is recalculated daily taking into account changes in the more dynamic parameters such as age, the 36 months history, and company performance. Recalculation also occurs after every inspection and when the applicable performance tables for flags and RO (recognized organizations) are changed.

In the selection of ships for inspection under the Tokyo and Viña del Mar MoUs, the authorities determine the order of priority, in principle, based on the ship targeting system adopted by the committee, and they give higher priority to ships with a higher targeting factor value. The authorities carry out inspections, which consist of at least a visit on board a ship in order to check the certificates and documents, and, furthermore, to satisfy themselves that the crew and the overall condition of the ship, its equipment, machinery spaces and accommodation, and hygienic conditions on board, meet the provisions of the relevant instruments. In the absence of valid certificates, or if the ship or its equipment is substantially deficient in meeting the requirements of a relevant instrument, a more detailed inspection is carried out [29, 31, 32]. The Tokyo MoU will introduce the NIR from January 1, 2014.

From the foregoing, it appears that the system of priorities and time windows for inspection currently applied in the Paris MoU could easily be extended to or adopted by the other agreements, as has occurred over the years with the modifications that the European agreement has incorporated, with respect to the rest. The organisational structure based on the committees of maritime authorities with the presence of supranational organisations, on maintaining a permanent secretariat, and on inviting to meetings participants from other agreements, is not only similar between Paris, Tokyo and Viña del Mar, but has been copied generally in all the regional agreements signed to date in the world.

There is, however, a serious problem that has weakened the Viña del Mar agreement since it was first signed: this is the dilemma that many of the MoU signatory countries are not signatories (yet) of some of the international conventions on which the MoU PSC system is based. Another negative factor is that the Viña del Mar countries have not put into operation effective policies and campaigns like those implemented by the Paris and Tokyo MoU countries. It should also be noted, on the downside, that countries with significant traffic like Venezuela, Ecuador and Colombia, have not raised their levels of inspections to the percentage set as an objective in 1992, that is, to achieve the inspection of 15% of vessels calling at their ports.

As is acknowledged in various annual reports of the MoUs, in recent years, there are high and increasing levels of cooperation between the Tokyo and Paris agreements. Representatives of the two secretariats attend the PSC Committee Meeting of each MoU on a regular basis; during the period of 2011, continuous efforts and further coordinated actions were made; for example, there have been several concentrated inspection campaigns, on certain "key" topics, such as structural safety, fire safety systems and others.

Based on the foregoing, it can, in principle, be reasonably assumed that the theoretical concept of PSC is very similar in the three memoranda studied, and their minor differences could be smoothed out in a hypothetical future merger [33]. As has been found in a comparative study of all the MoU's on a global basis [29], the two longest-established agreements, Paris and Tokyo, are considered to be successful. This success is due to not only the role played by the more economically advanced and strong states but also their geographical coverage of the areas where maritime traffic is very dense. These are also regions where the most competent maritime services are available for the training of personnel specialised in the inspection and control of vessels, with land-based and sea-based infrastructures for inspection. Many of the signatory states are also very active in putting into action

specific and periodic campaigns on particular topics that they believe require special attention at certain times, as has recently taken place with the entry into force of the MLC (Maritime Labour Convention) of 2006 [34].

3. Results and Discussion of the Data on Vessels Detained

After reviewing the theoretical framework, the next step is to examine the performance of these inspections in practice. The detention of a vessel for non-compliance with particular regulations and standards stipulated in the international conventions on which the PSC system is based (principally MARPOL, SOLAS, STCW (International Convention on Standards of Training, Certification and Watchkeeping) and recently MLC) represents a serious interference in the maritime transportation business. Detention of a non-complying vessel is the key sanction in the system of control established in the regional agreements, such as those of Paris, Tokyo and Viña del Mar; therefore, detentions are a fundamental indicator for determining whether these agreements are operative and effective.

For the comparison of the data, the more general data included in the annual reports of the MoUs, will be distinguished from the more comprehensive data corresponding to the first six months of 2011. In the latter study, among the three MoUs, inspections were made that resulted in the detention of a total of 1,242 vessels, in absolute numbers. The majority of these detentions, almost 70%, were made following inspections in ports of the Asia-Pacific region, followed by inspections in ports of the countries of the Paris MoU (although in this zone in proportion to the inspections, the level of detention is greater, as will be seen later). The percentage breakdowns of the total data for the three MoUs studied are given in Table 3. What is particularly striking is the scarcity of inspection activity by the countries of South America signatories of the MoU of Viña del Mar. They account for less than 5% of the total inspections made under the three agreements, despite the Viña del Mar MoU having been in existence for 20 years.

The WGB (White, Grey and Black) List[1] presents the full spectrum, from quality flags to flags with a poor performance that is considered high or very high risk. It is based on the total number of inspections and detentions over a 3-year rolling period for flags with at least 30 inspections in the period. The performance of each flag is calculated using a standard formula for statistical calculations in which certain values have been fixed in accordance with agreed Paris MoU policy. Two limits have been included in the system, the black to grey and the grey to white limit. In that same Table 3 of total detentions, the vessels are analysed by type of flag on the Black-Grey-White scale, and on the subscale of four risk categories: VHR (very high risk), HR (high risk), MHR (medium to high risk) and MR (medium risk). ANOVA (an analysis of variance) has been applied that indicates the significance of the relationship between these variables. About 60% of the vessels detained in these three regions are registered in states of the white list. There are, however, significant differences between regions in the vessels detained whose flag states are on the black list; there were many of these in the Asia-Pacific region, 320 vessels, of which nearly 100 were classified as high risk (VHR and HR).

Breaking down the vessels detained by whether or not their classification society is a member of the IACS, it is found that a large proportion of these substandard vessels (almost 40%) were not classified by a society member of the IACS. Further, the majority of the flag states of these vessels are on the black list; the combination of these two adverse attributes indicates that the safety levels of these vessels are reduced to the lowest possible ratings. This

[1]Flag states for which the total number of inspections made over a 3-year rolling period does not reach the minimum of 30 are not included in the Paris MoU White, Grey and Black Lists.

Table 3 Global data: detained ships, by MoU, 1st half year 2011.

	Paris	Tokyo	Viña
n	335	848	59
	26.97%	68.28%	4.75%
By Flag Type[a]			
Black	77	320	2
	23%	37.8%	3.4%
Grey	32	31	8
	9.5%	3.7%	13.6%
White	216	489	45
	64.5%	57.7%	76.3%
By black list per Risk Type[b]			
VHR	9	27	0
	11.7%	8.4%	0%
HR	16	196	0
	20.8%	61.2%	0%
MHR	35	37	0
	45.4%	11.6%	0%
MR	17	60	2
	22.1%	18.8%	100%
By classification Society Type[c]			
IACS	232	478	44
	69.25%	56.4%	74.6%
Non-IACS	93	362	11
	27.75%	42.7%	18.6%

[a]Pearson's chi-squared test:
X-squared = 59.0076, *df* = 4, *p*-value = 4.688e-12
Note: some flags are not classified.
[b]Pearson's chi-squared test:
X-squared = 114.614, *df* = 8, *p*-value < 2.2e-16
[c]Detained ships by

IACS	non- IACS
763	479 (*n*)
61.43	38.57 (%)

IACS

MoU	Black	Grey	White
Paris	9	24	199
Tokyo	48	14	416
Viña	0	4	40

Non-IACS

MoU	Black	Grey	White
Paris	68	8	17
Tokyo	272	17	73
Viña	2	4	5

is a very important finding because it implies the existence of a serious gap in the identification of "recognised organisations" of doubtful reputation.

The age of the vessels detained is also a significant variable, both in total and in each region analysed. Obviously, the older a vessel, the higher its risk category; in the two worst risk categories, VHR and HR, the average age of the vessels detained exceeds 25 years. This difference in vessel age between the three categories of flag is illustrated graphically in Fig. 1, where it is striking that the mean age of the black-listed vessels detained, i.e., those of VHR, exceeds 25 years. Presented in the next Fig. 2 is a boxplot showing the difference of ages between vessels detained; it can be appreciated that the mean age of the vessels detained is similar in the three MoUs, although those detained under the Tokyo MoU are slightly less antiquated. Taking the data for the three regions together, the breakdown of the total database by the type of vessel detained and age is shown in Fig. 3. Here can be appreciated a totally expected finding, given the differences in technical complexity between vessel types: the oldest vessels detained are those of the general cargo type, and the most modern are the tankers. This pattern is uniform for the three agreements compared.

Having obtained the overall results in respect of the three MoU's, the next important step is to determine if individually they follow the same trend or pattern. For this presented in Figs. 4-6 are the results in each of the three MoUs on the relationship between the age of the vessel detained by flag, by flag type (black, grey and white) and by the vessel's classification society (IACS/non-IACS). Here similar parameters and trends are observed, although the relatively small number of vessels detained in the Viña del Mar region might diminish the validity of this comparison.

When a comparison is made of the more global results for the relative PSC efforts applied by the national maritime authorities in this period, according to the annual reports of the three MoUs studied, in the case of the MoU of Paris, approximately 19,000 inspections were carried out, compared with 29,000 under the Tokyo MoU and only 8,500 under the Viña del Mar agreement. Comparing the proportions of these

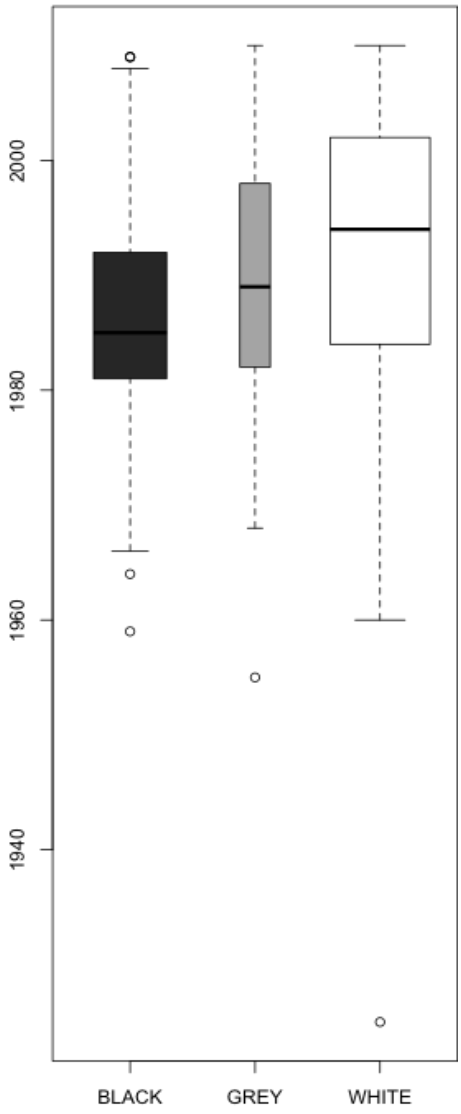

Fig. 1 Keeldate of detained ships, by Flag Type[a].

[a]AnovaModelbetween FlagType and Age

	Df	Sum Sq	MeanSq	F value	Pr(>F)
FlagType	2	11,553	5,777	52.34	<2e-16 ***
Residuals	1,217	134,330	110		

meansd data:n

Black	25.63910	10.17905	399
Grey	22.21127	10.77154	71
White	18.99467	10.65104	750

AnovaModel between Flag and Age

	Df	Sum Sq	MeanSq	F value	Pr(>F)
FlagType2	4	10,300	2,575.0	22.67	<2e-16 ***
Residuals	1,237	140,490	113.6		

VHR	25.97222	9.113526	36
HR	25.23153	8.089266	203
MHR	28.91667	10.584003	72
MR	21.93671	13.073110	79
noBLACK	19.69366	11.005876	852

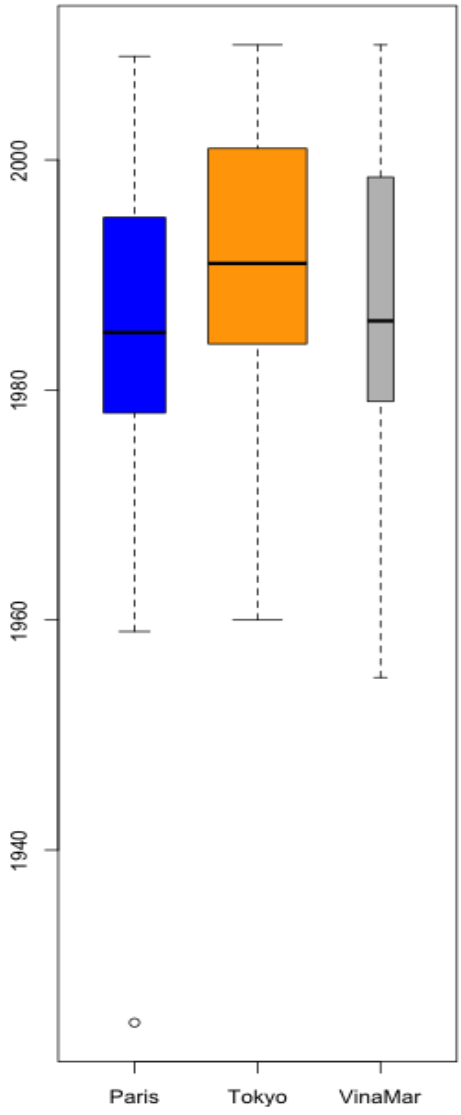

Fig. 2 Keeldate of detained ships, by MoU.

inspections that resulted in detentions of vessels in each region, the most up-to-date figures available, for the year 2011, are as follows: in Paris 3.61%; in Tokyo 1.50% and in Viña del Mar 1.25%. In the same period of time, 2011, the number of deficiencies detected was: Paris, 50,738; Tokyo, 103,549; and Viña del Mar, 20,941. The variety of flags among the vessels inspected is much greater for the Paris and Tokyo agreements than for that of Viña del Mar. There is also a degree of similarity (Figs. 4b-6b and Figs. 4c-6c) in the ages of the vessels detained under the Paris and Tokyo agreements but less, so in those detained under that of Viña del Mar, where older vessels

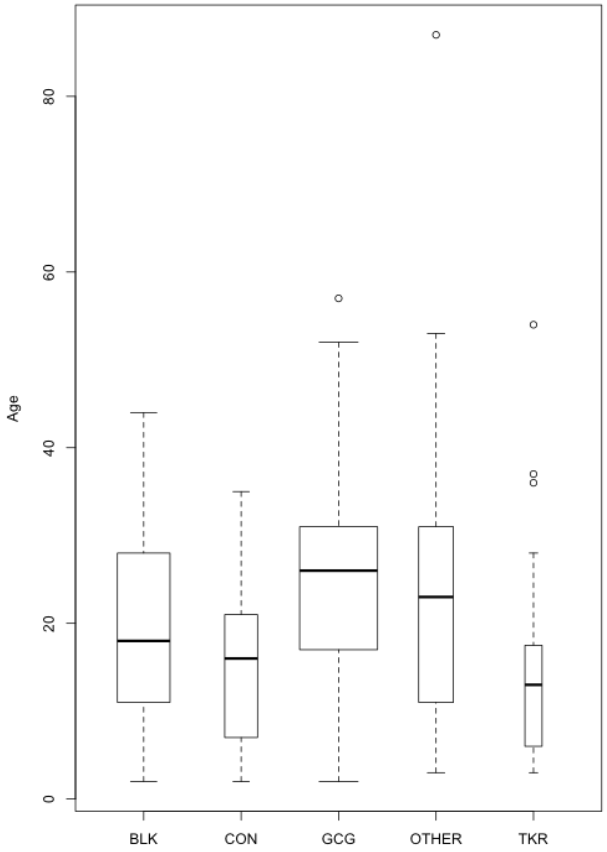

Fig. 3 Age of detained ships, by Type[a].

[a]Type = BLK

MoU	Black	Grey	White
Paris	2	5	49
Tokyo	20	11	208
VinaMar	0	0	0

Type = CON

MoU	Black	Grey	White
Paris	0	1	16
Tokyo	5	2	84
VinaMar	0	0	9

Type = GCG

MoU	Black	Grey	White
Paris	68	20	107
Tokyo	268	13	142
VinaMar	2	6	25

Type = OTHER

MoU	Black	Grey	White
Paris	7	6	36
Tokyo	18	3	45
VinaMar	0	2	8

Type = TKR

MoU	Black	Grey	White
Paris	0	0	8
Tokyo	9	2	10
VinaMar	0	0	1

are detected; in that region on the black list, there are vessels of around 50 years old, with marked profile as substandard and classified by societies/organisations—not members of the IACS. With regard to the type of deficiencies, these are analysed in similar groupings, and the results are presented in Table 4. Here it can be appreciated that differences exist between the regions (which have been highlighted with the shading of the table); this may mean that the inspectors of each MoU tend to take different approaches, whether in response to the instructions given them or by the guidelines that they employ. For example, the percentage of deficiencies found in crew working conditions in the Paris MoU is much higher than in the other two agreements, but the percentage is lower on questions of pollution. This latter finding is possibly because there is a greater awareness in Europe about the natural environment, which results in vessels being better equipped and maintained when entering ports where they are likely to be more strictly inspected.

Another relevant question to ask is whether there were flags or registries that specialized in different geographic zones. To answer this, a comparison has been made of the lists of flags or registries of vessels most frequently sanctioned in both the Paris and Tokyo MoUs, to see if they were similar in this respect. The results are given in Table 5. Highlighted in the table are those flag states that were at the top of the list of detentions. Here it can be appreciated that certain of these flag states figure more frequently in the Asia-Pacific region than in Europe—the most striking cases are those of Cambodia and Panama. Regarding the data for the Viña de Mar region, it is not possible to draw any conclusions because they are so scarce and not representative.

The last comparison is presented in Table 6, in which evidence is examined for any consistency in the flag states black-listed by the Paris and Tokyo MoUs (but not for the Viña del Mar MoU because these criteria are not applicable). For each region, the list is

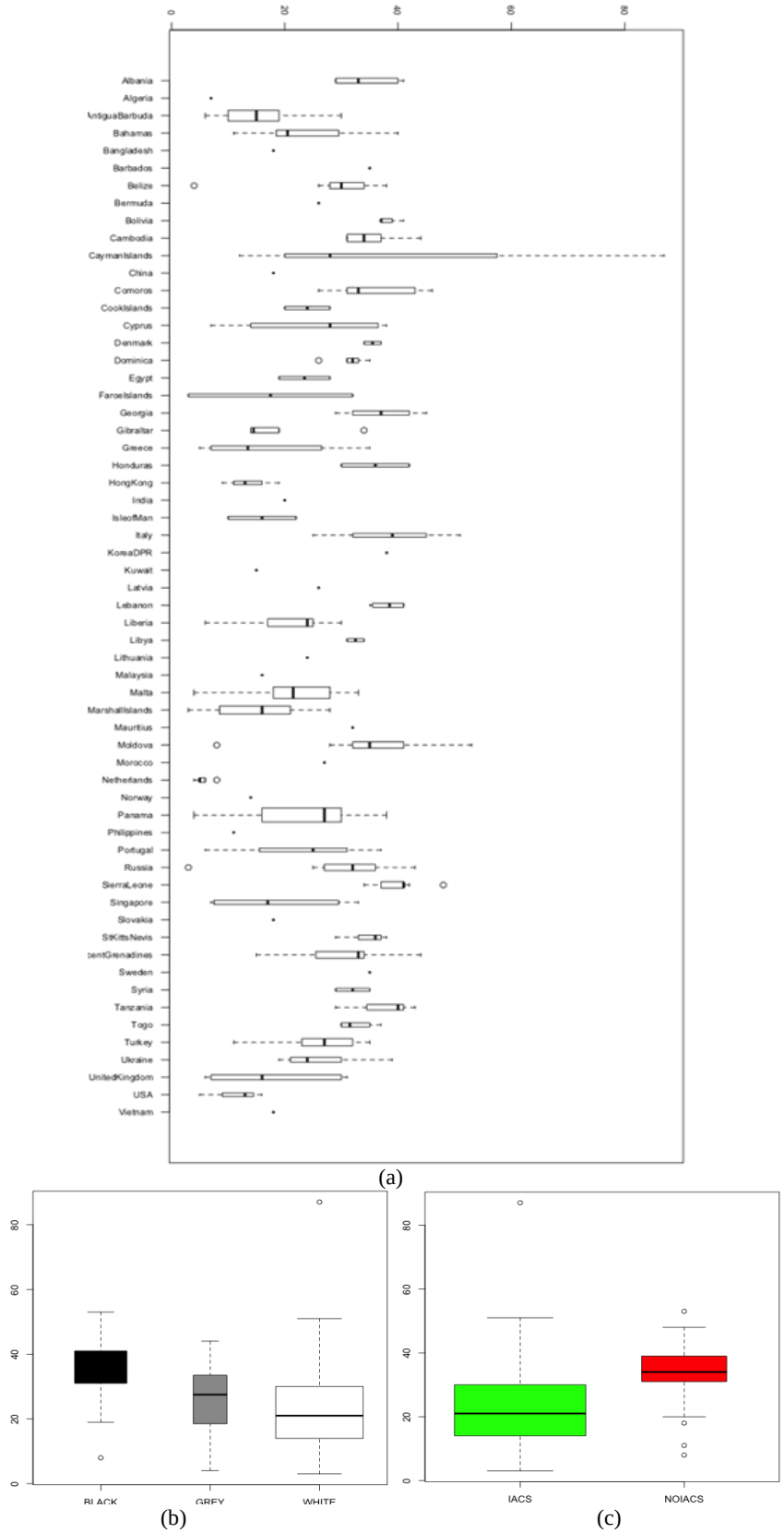

Fig. 4 Detained ships—MoU Paris: (a) age of detained ships per Flag; (b) age of detained ships per Flag Type; Age of detained ships per Class Type.

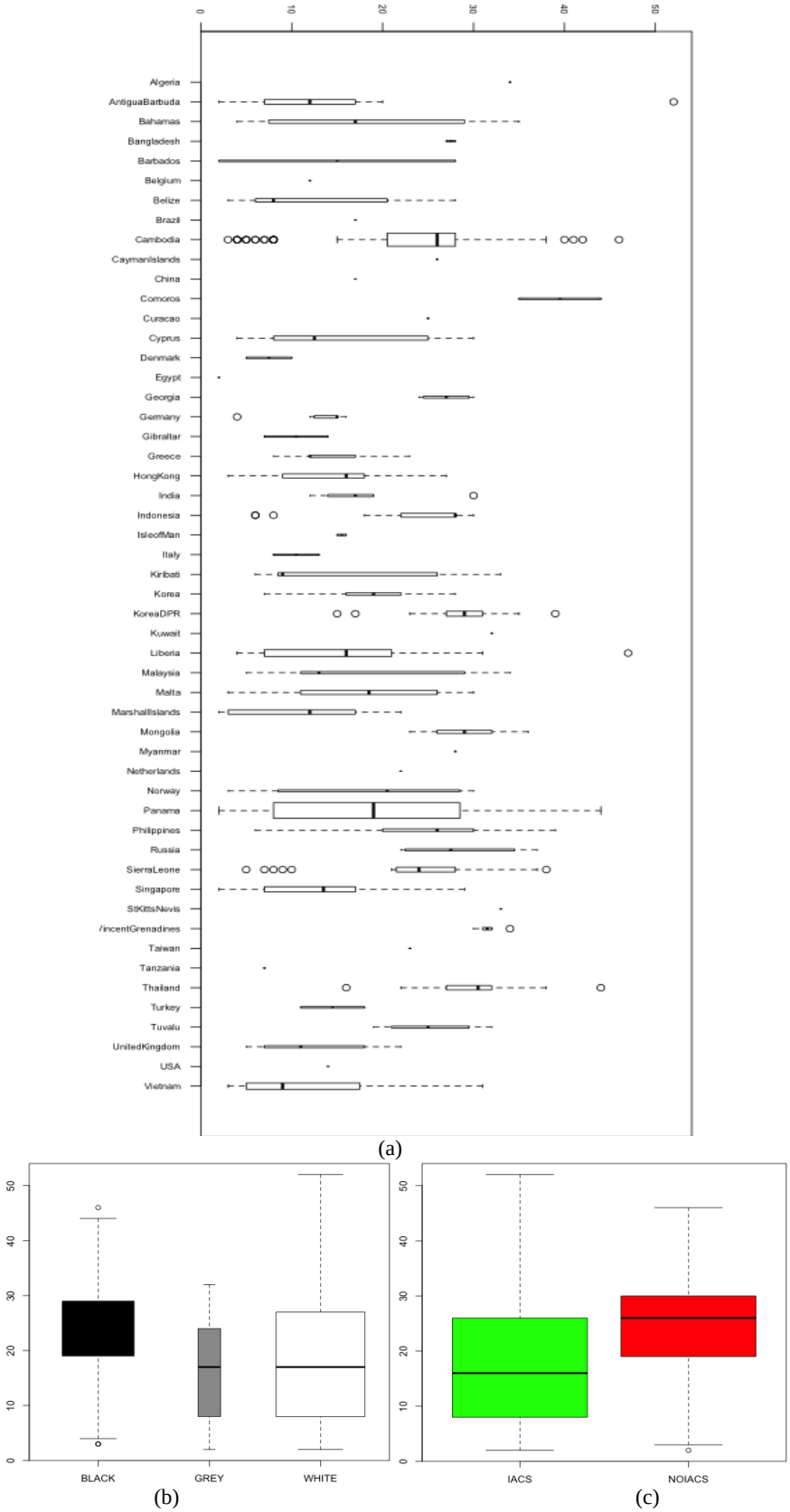

Fig. 5 Detained ships—MoU Tokyo: (a) age of detained ships per Flag; (b) age of detained ships per Flag Type; (c) age of detained ships per Class Type.

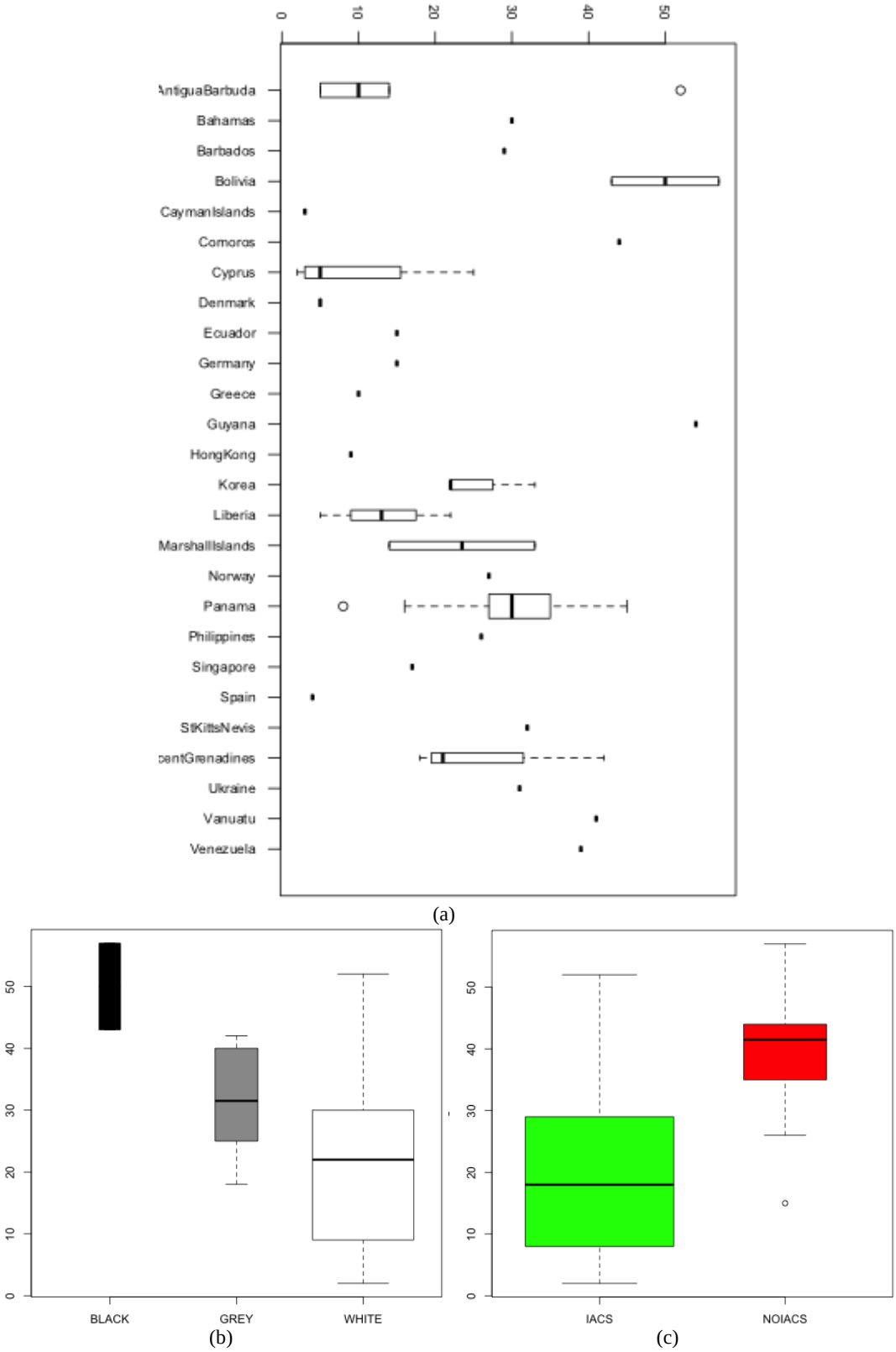

Fig. 6 Detained ships—MoU Viña del Mar: (a) age of detained ships per Flag; (b) age of detained ships per Flag Type; (c) age of detained ships per Class Type.

Table 4 The type of deficiencies.

Some categories of deficiencies	% of total deficiencies		
	Paris MoU	Viña MoU	Tokyo MoU
Certificate and Documentation	11.55	2.64	7.70
Water/weathertight conditions	4.44	7.64	6.35
Radio communications	3.37	2.89	3.19
Fire safety	11.55	17.01	8.46
Alarms	0.83	0.66	0.36
Working and living conditions	14.70	3.20	2.56
Safety of navigation	13.28	16.37	11.35
Life saving appliances	9.55	11.53	8.19
Propulsion and auxiliary machinery	6.29	6.73	16.23
Pollution prevention	3.73	8.93	8.26
ISM code	5.91	3.28	4.02
ISPS code	1.06	2.75	2.82

Table 5 Detained ships, by MoU, 1st half year 2011.

Flag	Paris	Tokyo	Viña
Albania	5	0	0
Algeria	1	1	0
Antigua Barbuda	26	21	6
Bahamas	8	11	1
Bangladesh	1	2	0
Barbados	1	2	0
Belgium	0	1	0
Belize	9	11	0
Bermuda	1	0	0
Bolivia	3	0	2
Brazil	0	1	0
Cambodia	13	171	0
Cayman Islands	3	1	1
China	1	1	0
Comoros	8	2	1
Cook Islands	2	0	0
Curacao	0	1	0
Cyprus	4	16	4
Denmark	2	2	2
Dominica	5	0	0
Ecuador	0	0	1
Egypt	2	1	0
Faroe Islands	2	0	0
Georgia	4	4	0
Germany	0	7	1
Gibraltar	6	2	0
Greece	4	5	1
Guyana	0	0	1
Honduras	2	0	0
Hong Kong	3	17	1
India	1	5	0
Indonesia	0	15	0
Isle of Man	2	2	0
Italy	3	2	0
Kiribati	0	11	0
Korea	0	8	3
Korea DPR	1	25	0
Kuwait	1	1	0
Latvia	1	0	0
Lebanon	4	0	0
Liberia	13	45	3
Libya	2	0	0
Lithuania	1	0	0
Malaysia	1	5	0
Malta	30	18	0
Marshall Islands	15	17	2
Mauritius	1	0	0
Moldova	9	0	0
Mongolia	0	10	0
Morocco	1	0	0
Myanmar	0	1	0
Netherlands	5	1	0
Norway	1	4	1
Panama	45	252	17
Philippines	1	9	1
Portugal	3	0	0
Russia	9	4	0
Sierra Leone	9	23	0
Singapore	4	28	1
Slovakia	1	0	0
Spain	0	0	1
St Kitts Nevis	5	1	1
St Vincent Grenadines	11	6	3
Sweden	1	0	0
Syria	2	0	0
Taiwan	0	1	0
Tanzania	7	2	0
Thailand	0	20	0
Togo	4	0	0
Turkey	11	2	0
Tuvalu	0	4	0
Ukraine	5	0	1
United Kingdom	5	5	0
USA	3	1	0
Vanuatu	0	0	1
Venezuela	0	0	1
Vietnam	1	40	0

Table 6 Comparison of Black Lists in MoUs of Paris and Tokyo Ranking based on excess factor[a].

Paris		Tokyo	
Bolivia	VHR	Sierra Leone	VHR
Libya		Papua NG	
Togo		Georgia	
Sierra Leone	HR	Korea DPR	HR
Tanzania		Cambodia	
Albania			
Moldova	MHR	Mongolia	MHR
St Kitt & Nevis		St Kitt & Nevis	
Comoros		Kiribati	
Cambodia		Indonesia	
Georgia	MR	Thailand	MR
Ukraine		Bangladesh	
Azerbaijan		VietNam	
Lebanon		Tonga	
Syria			
Dominica			
Honduras			

[a]The formula is applicable for sample sizes over a 3-year period.

broken down by risk category. A few flag states appear on the black lists of both agreements: Cambodia, St. Kitts & Nevis and Sierra Leone. However, they do not coincide in respect of the sub-type of risk, where the rankings are different as a result of the prevalence of certain flags of convenience in one or other geographic zone; this is the case of Cambodia for Tokyo and Albania for Paris.

4. Conclusions

The objective set in 1992 by the IMO was the establishment of a global network of regional agreements that were independent but would benefit mutually from cooperation between the corresponding groups of countries. Twenty years later, the global network of regional agreements has been formalized, although their efficacy can only be vouched for in particular areas of the world. Cooperation and the prospects opened up by the exchange of information, harmonization of the inspection and control procedures, and the theoretical and practical training of PSC inspectors, are more encouraging, from a global perspective. The communication networks being developed should enable these agreements to extend their geographic scope and prevent the need for a substandard vessel to be inspected more than once when it calls consecutively at the ports of countries signatories of different regional MoUs. The topic of harmonizing PSC inspections has been on the agenda of the IMO during the past two decades; it has been found that the treatment of vessels across the regimes does vary, but it is possible to identify a common regional area spanning the North Atlantic and that of the Asia-Pacific.

It is clear that the more information that can be compiled by and exchanged between the secretariats of the different agreements, the greater will be the available knowledge on each particular substandard vessel still being operated. This knowledge, in turn, will allow the international maritime community to analyse better the causes of accidents and incidents, and to determine more reliably and accurately the actions necessary to prevent such costly events from occurring again. As can be confirmed from our comparison of the three most important agreements, the legal bases for the application of the vessel control measures are very similar in all three geographic regions; however, the same is not true for the practical criteria applied. Whereas the MoUs of Paris and Tokyo compare favourably in the effectiveness of the controls applied, the inspections carried out in the ports of South America are much less effective. In the particular study undertaken of data reported for the first half of the year 2011, it is evident that, between the Paris and Tokyo MoUs, there are more coincidences than differences in the deficiencies detected. In both geographic regions, the substandard vessels that attempt to hide under a flag convenience are detected in similar ways by the PSC inspectors of Paris and Tokyo; the data reported are similar in respect of the age, typology and flag, although obviously with the specific regional characteristics of each case, as has been demonstrated in the analyses of the data presented in this article.

To summarise the findings reported, it can reasonably be concluded that the efforts being made by countries signatories of the two principal regional agreements on Port State Control, Paris and Tokyo, are resulting in greater cooperation, and in collaboration in the training of PSC inspectors in more internationally uniform ways and with common directives. These two MoUs can be considered to constitute the germ of a future global agreement, in the expectation that other regions may follow their example and develop adequate procedures and competences, since in comparative studies like the one presented here, the controls being implemented under the other regional PSC agreements, such as that of Viña del Mar, are found to be deficient or insufficient.

In any case, a truly global policy would seem to be a very remote prospect, given the variation seen in the applicability of the rest of the agreements for PSC in other regions. There is also evidence of the persistent movement of sub-standard vessels from those areas where they are more likely to be detained, to other areas where their owners and operators think that the likelihood of inspection is much lower. This is a problem that needs to be treated at the supra-regional level, where the IMO has a major role to play, particularly since the IMO is represented as a member with speaking rights in most of the corresponding PSC agreements. In some of those other regions (Abuja, Caribbean, Black Sea, etc.). there are numerous vessels sailing that are in a dangerous condition. However, despite the negative factors and taking this additional worrying trend into account, the possibility of some kind of union between the MoU's of Paris and Tokyo would serve to encourage the states in the rest of the regional agreements to improve their levels of effectiveness and aspire to form part of a new "global PSC club".

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